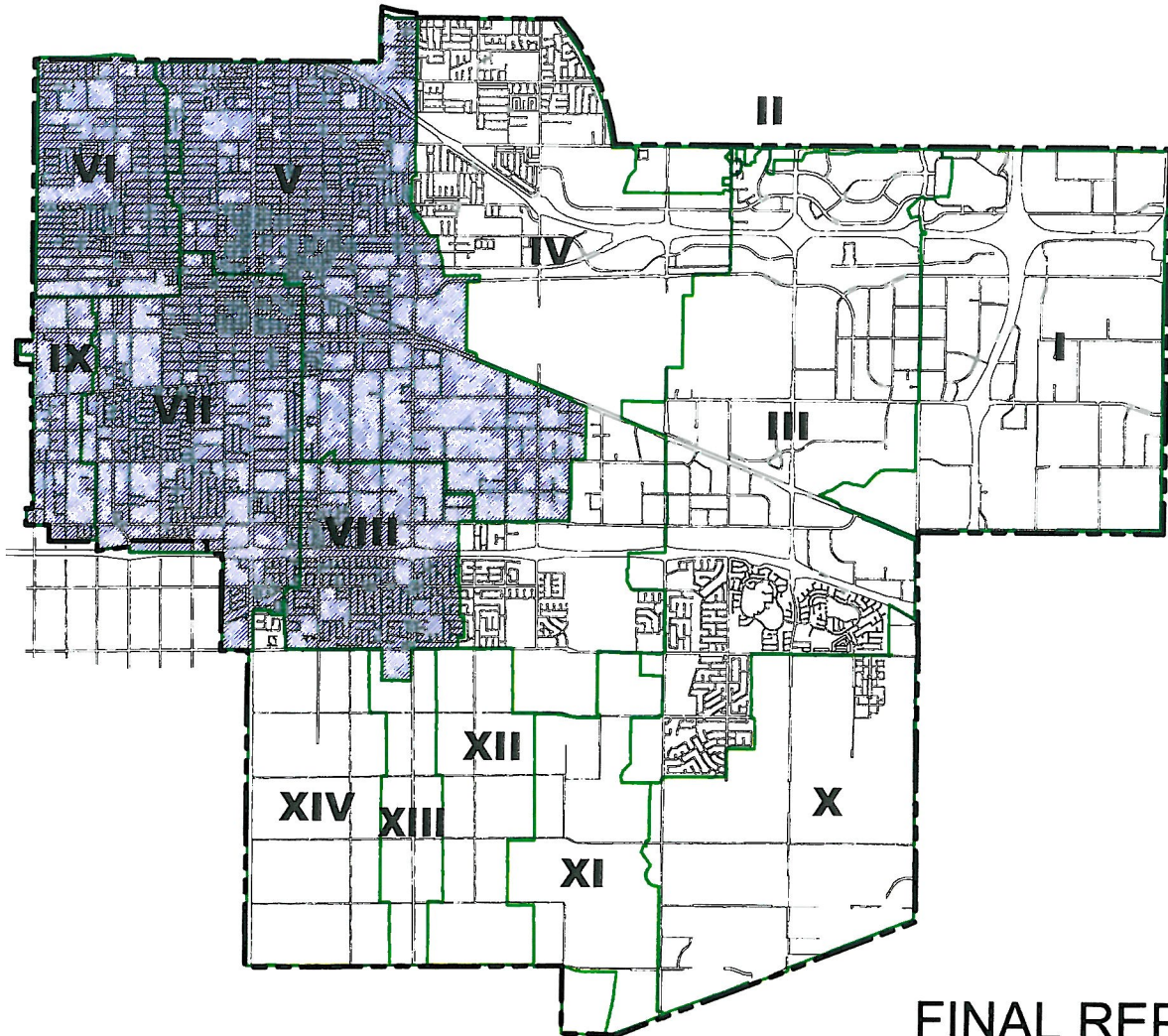


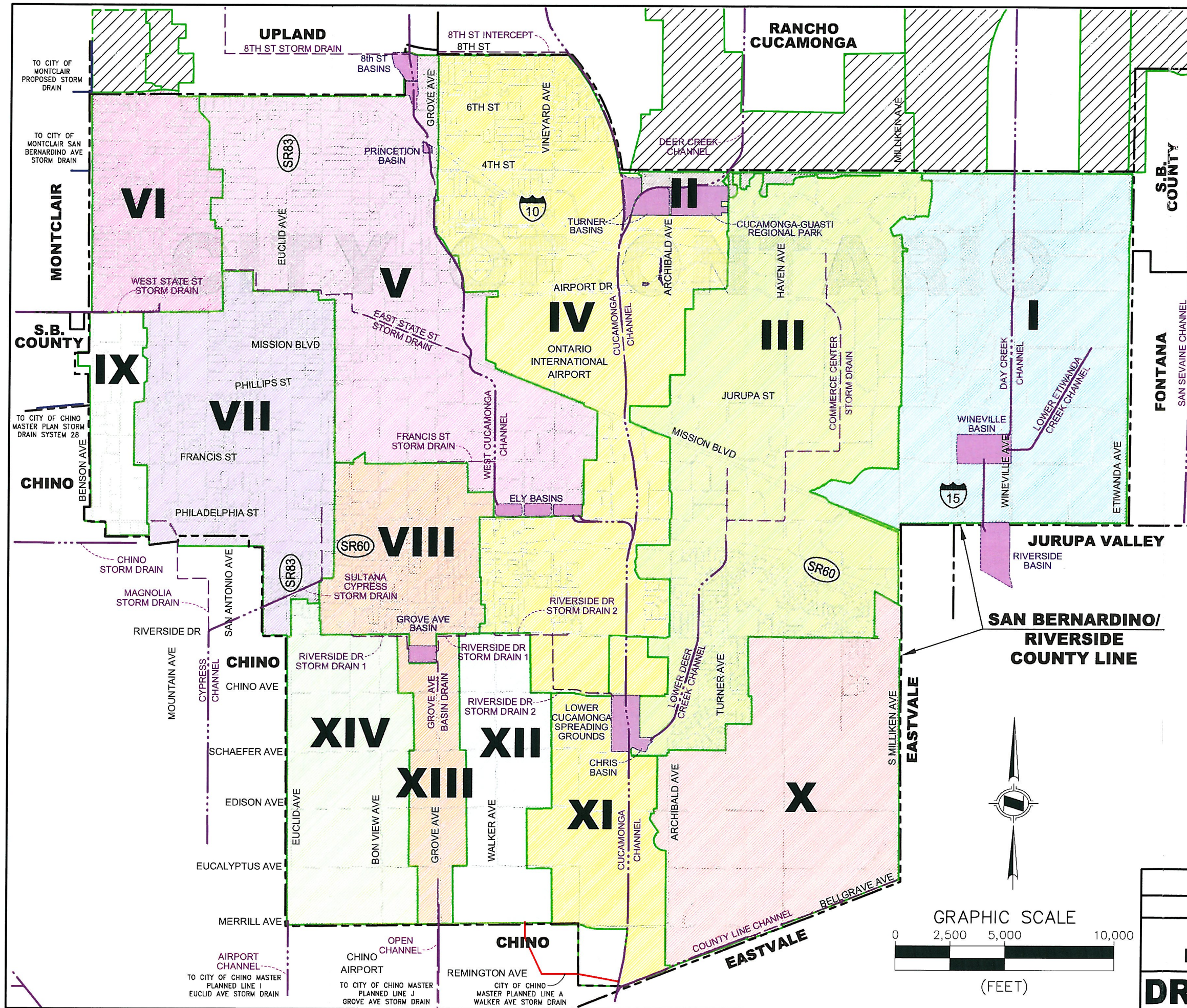


APPENDIX D MASTER PLAN HYDROLOGY CALCULATION

DRAINAGE AREAS V, VI, VII, VIII, IX



FINAL REPORT
MARCH 2012



DRAINAGE AREAS

I	(3,906 AC)
II	(236 AC)
III	(5,174 AC)
IV	(4,937 AC)
V	(4,105 AC)
VI	(1,307 AC)
VII	(2,501 AC)
VIII	(1,286 AC)
IX	(572 AC)
X	(2,903 AC)
XI	(1,471 AC)
XII	(1,255 AC)
XIII	(681 AC)
XIV	(1,758 AC)

LEGEND

	PLANNED STORM DRAIN
	EXISTING COUNTY OPEN CHANNEL
	EXISTING COUNTY STORM DRAIN
	CITY LIMIT LINE
	COUNTY LIMIT LINE
	EXISTING DETENTION BASIN
	OFF-SITE AREAS TRIBUTARY TO CITY OF ONTARIO

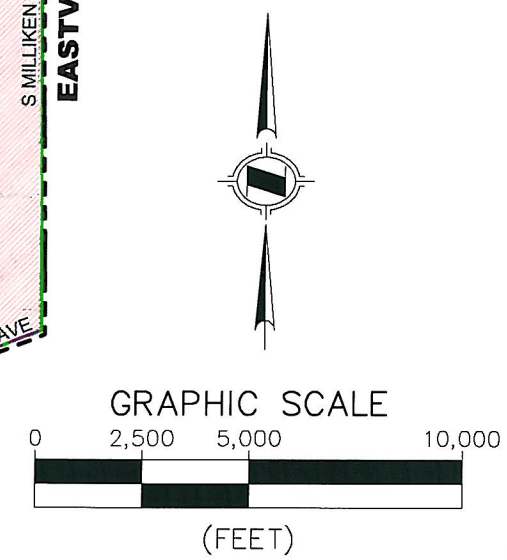


EXHIBIT 7
MARCH 2012
CITY OF ONTARIO
MASTER PLAN OF DRAINAGE
DRAINAGE AREA MAP

03/10/2012

SECTION 5

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
(c) Copyright 1983-2011 Advanced Engineering Software .aes)
Ver. 18.0 Release Date: 07/01/2011 License ID 1239

Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA A) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-26-2011 *

FILE NAME: VAL00.DAT
TIME/DATE OF STUDY: 11:03 07/26/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, STREET-CROSSFALL, CURB GUTTER-GEOMETRIES, MANNING, WIDTH, CROSSFALL, IN- / OUT-/PARK- SIDE / SIDE/ WAY, HEIGHT, WIDTH, LIP, HIKE, FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.761
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.162
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.40 0.98 0.100 32 9.76
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 5.60 0.98 0.500 32 12.49
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.420
SUBAREA RUNOFF(CFS) = 23.64
TOTAL AREA(ACRES) = 7.00 PEAK FLOW RATE(CFS) = 23.64

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1143.00
STREET LENGTH(FEET) = 730.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 38.27
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.73
 HALFSTREET FLOOD WIDTH(FEET) = 32.09
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.23
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.64
 STREET FLOW TRAVEL TIME(MIN.) = 5.45 Tc(MIN.) = 15.21
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.190

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.414
 SUBAREA AREA(ACRES) = 11.60 SUBAREA RUNOFF(CFS) = 29.09
 EFFECTIVE AREA(ACRES) = 18.60 AREA-AVERAGED Fm(INCH/HR) = 0.41
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42
 TOTAL AREA(ACRES) = 18.6 PEAK FLOW RATE(CFS) = 46.60

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.78 HALFSTREET FLOOD WIDTH(FEET) = 36.42
 FLOW VELOCITY(FEET/SEC.) = 2.32 DEPTH*VELOCITY(FT*FT/SEC.) = 1.80
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 730.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 31.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 102.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1530.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 15.21
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.190
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.50	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.393
 SUBAREA AREA(ACRES) = 11.60 SUBAREA RUNOFF(CFS) = 29.30
 EFFECTIVE AREA(ACRES) = 30.20 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 30.2 PEAK FLOW RATE(CFS) = 75.90

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1143.00 DOWNSTREAM(FEET) = 1132.00
 FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 29.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.33
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 75.90
 PIPE TRAVEL TIME(MIN.) = 0.91 Tc(MIN.) = 16.12
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2200.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 16.12
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.081
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	18.50	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.407
 SUBAREA AREA(ACRES) = 24.10 SUBAREA RUNOFF(CFS) = 58.21
 EFFECTIVE AREA(ACRES) = 54.30 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 54.3 PEAK FLOW RATE(CFS) = 131.16

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1132.00 DOWNSTREAM(FEET) = 1119.00
 FLOW LENGTH(FEET) = 640.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 31.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.67
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 131.16
 PIPE TRAVEL TIME(MIN.) = 0.68 Tc(MIN.) = 16.80
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 2840.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 16.80
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.005
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
 COMMERCIAL A 4.20 0.98 0.100 32
 RESIDENTIAL "5-7 DWELLINGS/ACRE" A 9.90 0.98 0.500 32
 SCHOOL A 7.80 0.98 0.600 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.459
 SUBAREA AREA (ACRES) = 21.90 SUBAREA RUNOFF (CFS) = 50.41
 EFFECTIVE AREA (ACRES) = 76.20 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42
 TOTAL AREA (ACRES) = 76.2 PEAK FLOW RATE (CFS) = 177.88

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1119.00 DOWNSTREAM(FEET) = 1095.00
 FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.18
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 177.88
 PIPE TRAVEL TIME (MIN.) = 1.36 Tc (MIN.) = 18.16
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 4160.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 18.16
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.868
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
 COMMERCIAL A 10.00 0.98 0.100 32
 RESIDENTIAL "5-7 DWELLINGS/ACRE" A 33.80 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.409
 SUBAREA AREA (ACRES) = 43.80 SUBAREA RUNOFF (CFS) = 97.35
 EFFECTIVE AREA (ACRES) = 120.00 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42
 TOTAL AREA (ACRES) = 120.0 PEAK FLOW RATE (CFS) = 265.83

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1095.00 DOWNSTREAM(FEET) = 1082.00
 FLOW LENGTH(FEET) = 650.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 18.41
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 265.83
 PIPE TRAVEL TIME (MIN.) = 0.59 Tc (MIN.) = 18.75
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 4810.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 18.75
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.814
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
 COMMERCIAL A 3.10 0.98 0.100 32
 RESIDENTIAL "5-7 DWELLINGS/ACRE" A 9.40 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA AREA (ACRES) = 12.50 SUBAREA RUNOFF (CFS) = 27.26
 EFFECTIVE AREA (ACRES) = 132.50 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42
 TOTAL AREA (ACRES) = 132.5 PEAK FLOW RATE (CFS) = 287.21

 FLOW PROCESS FROM NODE 106.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1082.00 DOWNSTREAM(FEET) = 1081.00
 FLOW LENGTH(FEET) = 1140.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 108.0 INCH PIPE IS 77.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 5.86
 ESTIMATED PIPE DIAMETER (INCH) = 108.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 287.21
 PIPE TRAVEL TIME (MIN.) = 3.24 Tc (MIN.) = 21.99
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 5950.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 21.99
 RAINFALL INTENSITY (INCH/HR) = 2.56
 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.42
 EFFECTIVE STREAM AREA (ACRES) = 132.50
 TOTAL STREAM AREA (ACRES) = 132.50

PEAK FLOW RATE(CFS) AT CONFLUENCE = 287.21

FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 760.00
ELEVATION DATA: UPSTREAM(FEET) = 1165.00 DOWNSTREAM(FEET) = 1148.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.231
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.304

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.30	0.98	0.100	32	9.23
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.20	0.98	0.500	32	11.81

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405
SUBAREA RUNOFF(CFS) = 19.35
TOTAL AREA(ACRES) = 5.50 PEAK FLOW RATE(CFS) = 19.35

FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1148.00 DOWNSTREAM ELEVATION(FEET) = 1145.00
STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 36.08

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.61
HALFSTREET FLOOD WIDTH(FEET) = 22.53
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.42
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.09
STREET FLOW TRAVEL TIME(MIN.) = 1.70 Tc(MIN.) = 10.93

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.888

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.80	0.98	0.100	32

RESIDENTIAL

"5-7 DWELLINGS/ACRE" A 7.80 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394
SUBAREA AREA(ACRES) = 10.60 SUBAREA RUNOFF(CFS) = 33.42
EFFECTIVE AREA(ACRES) = 16.10 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 16.1 PEAK FLOW RATE(CFS) = 50.71

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 26.08
FLOW VELOCITY(FEET/SEC.) = 3.72 DEPTH*VELOCITY(FT*FT/SEC.) = 2.50
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 1110.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1132.00
STREET LENGTH(FEET) = 630.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 76.32

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.67
HALFSTREET FLOOD WIDTH(FEET) = 25.45
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.73
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.82
STREET FLOW TRAVEL TIME(MIN.) = 1.83 Tc(MIN.) = 12.77

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.543

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	15.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.430
SUBAREA AREA(ACRES) = 18.20 SUBAREA RUNOFF(CFS) = 51.17
EFFECTIVE AREA(ACRES) = 34.30 AREA-AVERAGED Fm(INCH/HR) = 0.40
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
TOTAL AREA(ACRES) = 34.3 PEAK FLOW RATE(CFS) = 96.88

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.72 HALFSTREET FLOOD WIDTH(FEET) = 30.41

FLOW VELOCITY (FEET/SEC.) = 6.02 DEPTH*VELOCITY (FT*FT/SEC.) = 4.32
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 113.00 = 1740.00 FEET.

 FLOW PROCESS FROM NODE 113.00 TO NODE 114.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1132.00 DOWNSTREAM (FEET) = 1120.00
 FLOW LENGTH (FEET) = 700.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.67
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 96.88
 PIPE TRAVEL TIME (MIN.) = 0.85 Tc (MIN.) = 13.62
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 114.00 = 2440.00 FEET.

 FLOW PROCESS FROM NODE 114.00 TO NODE 114.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 13.62
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.408
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397
 SUBAREA AREA (ACRES) = 21.80 SUBAREA RUNOFF (CFS) = 59.27
 EFFECTIVE AREA (ACRES) = 56.10 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.41
 TOTAL AREA (ACRES) = 56.1 PEAK FLOW RATE (CFS) = 151.99

 FLOW PROCESS FROM NODE 114.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1120.00 DOWNSTREAM (FEET) = 1081.00
 FLOW LENGTH (FEET) = 1980.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 33.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.09
 ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 151.99
 PIPE TRAVEL TIME (MIN.) = 2.05 Tc (MIN.) = 15.67
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 120.00 = 4420.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 15.67
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.133
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.30	0.98	0.200	32
COMMERCIAL	A	1.50	0.98	0.100	32
COMMERCIAL	A	0.60	0.98	0.100	32
SCHOOL	A	67.80	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.520
 SUBAREA AREA (ACRES) = 89.70 SUBAREA RUNOFF (CFS) = 211.97
 EFFECTIVE AREA (ACRES) = 145.80 AREA-AVERAGED Fm (INCH/HR) = 0.47
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.48
 TOTAL AREA (ACRES) = 145.8 PEAK FLOW RATE (CFS) = 350.07

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION (MIN.) = 15.67
 RAINFALL INTENSITY (INCH/HR) = 3.13
 AREA-AVERAGED Fm (INCH/HR) = 0.47
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.48
 EFFECTIVE STREAM AREA (ACRES) = 145.80
 TOTAL STREAM AREA (ACRES) = 145.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 350.07

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	287.21	21.99	2.557	0.98 (0.41)	0.42	132.5	100.00
2	350.07	15.67	3.133	0.98 (0.47)	0.48	145.8	110.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	609.58	15.67	3.133	0.98 (0.44)	0.45	240.2	110.00
2	561.68	21.99	2.557	0.98 (0.44)	0.45	278.3	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 609.58 Tc (MIN.) = 15.67

EFFECTIVE AREA(ACRES) = 240.23 AREA-AVERAGED Fm(INCH/HR) = 0.44
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.45
 TOTAL AREA(ACRES) = 278.3
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 5950.00 FEET.

PIPE-FLOW(CFS) = 676.17
 PIPE TRAVEL TIME(MIN.) = 1.51 Tc(MIN.) = 18.20
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 122.00 = 9230.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1081.00 DOWNSTREAM(FEET) = 1058.00
 FLOW LENGTH(FEET) = 1310.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 78.0 INCH PIPE IS 62.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 21.34
 ESTIMATED PIPE DIAMETER(INCH) = 78.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 609.58
 PIPE TRAVEL TIME(MIN.) = 1.02 Tc(MIN.) = 16.69
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 121.00 = 7260.00 FEET.

 FLOW PROCESS FROM NODE 121.00 TO NODE 121.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 16.69
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.016
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	17.00	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	13.10	0.98	0.200	32
COMMERCIAL	A	6.80	0.98	0.100	32
COMMERCIAL	A	0.20	0.98	0.100	32
COMMERCIAL	A	0.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.268
 SUBAREA AREA(ACRES) = 48.20 SUBAREA RUNOFF(CFS) = 119.50
 EFFECTIVE AREA(ACRES) = 288.43 AREA-AVERAGED Fm(INCH/HR) = 0.41
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42
 TOTAL AREA(ACRES) = 326.5 PEAK FLOW RATE(CFS) = 676.17

 FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1025.00
 FLOW LENGTH(FEET) = 1970.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 63.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 21.79
 ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1

 FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 18.20
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.864
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	21.60	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	19.60	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	2.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.80	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.70	0.98	0.200	32
COMMERCIAL	A	12.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.164
 SUBAREA AREA(ACRES) = 71.10 SUBAREA RUNOFF(CFS) = 173.01
 EFFECTIVE AREA(ACRES) = 359.53 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 397.6 PEAK FLOW RATE(CFS) = 809.61

 FLOW PROCESS FROM NODE 122.00 TO NODE 140.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1025.00 DOWNSTREAM(FEET) = 1015.00
 FLOW LENGTH(FEET) = 600.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 87.0 INCH PIPE IS 71.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 22.37
 ESTIMATED PIPE DIAMETER(INCH) = 87.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 809.61
 PIPE TRAVEL TIME(MIN.) = 0.45 Tc(MIN.) = 18.65
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00 = 9830.00 FEET.

 FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 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.) = 18.65
 RAINFALL INTENSITY(INCH/HR) = 2.82
 AREA-AVERAGED Fm(INCH/HR) = 0.36

AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.37
 EFFECTIVE STREAM AREA(ACRES) = 359.53
 TOTAL STREAM AREA(ACRES) = 397.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 809.61

 FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 720.00
 ELEVATION DATA: UPSTREAM(FEET) = 1085.00 DOWNSTREAM(FEET) = 1071.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.291
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.287
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.20	0.98	0.100	32	9.29
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.90	0.98	0.500	32	11.89

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.421
 SUBAREA RUNOFF(CFS) = 21.28
 TOTAL AREA(ACRES) = 6.10 PEAK FLOW RATE(CFS) = 21.28

 FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1071.00 DOWNSTREAM ELEVATION(FEET) = 1069.00
 STREET LENGTH(FEET) = 700.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 37.44
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.72
 HALFSTREET FLOOD WIDTH(FEET) = 31.14
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.26
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.64
 STREET FLOW TRAVEL TIME(MIN.) = 5.15 Tc(MIN.) = 14.44
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.290

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.399
 SUBAREA AREA(ACRES) = 12.30 SUBAREA RUNOFF(CFS) = 32.11
 EFFECTIVE AREA(ACRES) = 18.40 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 18.4 PEAK FLOW RATE(CFS) = 47.92

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.78 HALFSTREET FLOOD WIDTH(FEET) = 36.63
 FLOW VELOCITY(FEET/SEC.) = 2.37 DEPTH*VELOCITY(FT*FT/SEC.) = 1.84
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 700.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 33.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 132.00
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 1420.00 FEET.

 FLOW PROCESS FROM NODE 132.00 TO NODE 133.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1069.00 DOWNSTREAM(FEET) = 1058.00
 FLOW LENGTH(FEET) = 680.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.24
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 47.92
 PIPE TRAVEL TIME(MIN.) = 1.01 Tc(MIN.) = 15.45
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 133.00 = 2100.00 FEET.

 FLOW PROCESS FROM NODE 133.00 TO NODE 133.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 15.45
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.159
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	21.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.414
 SUBAREA AREA(ACRES) = 27.50 SUBAREA RUNOFF(CFS) = 68.20
 EFFECTIVE AREA(ACRES) = 45.90 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 45.9 PEAK FLOW RATE(CFS) = 113.96

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*****
FLOW PROCESS FROM NODE 133.00 TO NODE 134.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1048.00
FLOW LENGTH(FEET) = 680.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.38
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 113.96
PIPE TRAVEL TIME(MIN.) = 0.85 Tc(MIN.) = 16.30
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 134.00 = 2780.00 FEET.
*****
FLOW PROCESS FROM NODE 134.00 TO NODE 134.00 IS CODE = 81

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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 16.30
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.060
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       6.70   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       19.10  0.98  0.500  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
SUBAREA AREA(ACRES) = 25.80 SUBAREA RUNOFF(CFS) = 62.08
EFFECTIVE AREA(ACRES) = 71.70 AREA-AVERAGED Fm(INCH/HR) = 0.40
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.41
TOTAL AREA(ACRES) = 71.7 PEAK FLOW RATE(CFS) = 171.93

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*****
FLOW PROCESS FROM NODE 134.00 TO NODE 135.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1048.00 DOWNSTREAM(FEET) = 1025.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.91
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 171.93
PIPE TRAVEL TIME(MIN.) = 1.36 Tc(MIN.) = 17.66
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 135.00 = 4080.00 FEET.

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*****
FLOW PROCESS FROM NODE 135.00 TO NODE 135.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 17.66

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* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.916
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       8.40   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       17.70  0.98  0.500  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       8.00   0.98  0.200  32
PUBLIC PARK         A       4.50   0.98  0.850  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
SUBAREA AREA(ACRES) = 38.60 SUBAREA RUNOFF(CFS) = 88.04
EFFECTIVE AREA(ACRES) = 110.30 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 110.3 PEAK FLOW RATE(CFS) = 250.69

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*****
FLOW PROCESS FROM NODE 135.00 TO NODE 136.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1025.00 DOWNSTREAM(FEET) = 1016.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 69.0 INCH PIPE IS 50.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.25
ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 250.69
PIPE TRAVEL TIME(MIN.) = 1.77 Tc(MIN.) = 19.43
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 136.00 = 5380.00 FEET.

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*****
FLOW PROCESS FROM NODE 136.00 TO NODE 136.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 19.43
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.754
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       3.30   0.98  0.100  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       15.00  0.98  0.200  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       0.50   0.98  0.500  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       0.70   0.98  0.200  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.191
SUBAREA AREA(ACRES) = 19.50 SUBAREA RUNOFF(CFS) = 45.06
EFFECTIVE AREA(ACRES) = 129.80 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 129.8 PEAK FLOW RATE(CFS) = 279.63

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*****
FLOW PROCESS FROM NODE 136.00 TO NODE 140.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1016.00 DOWNSTREAM(FEET) = 1015.00
FLOW LENGTH(FEET) = 310.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 81.0 INCH PIPE IS 63.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.37
ESTIMATED PIPE DIAMETER(INCH) = 81.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 279.63
PIPE TRAVEL TIME(MIN.) = 0.55 Tc(MIN.) = 19.98
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 140.00 = 5690.00 FEET.

*****
FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 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.) = 19.98
RAINFALL INTENSITY(INCH/HR) = 2.71
AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.37
EFFECTIVE STREAM AREA(ACRES) = 129.80
TOTAL STREAM AREA(ACRES) = 129.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 279.63

** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 809.61 18.65 2.822 0.98( 0.36) 0.37 359.5 110.00
1 725.14 25.02 2.366 0.98( 0.37) 0.38 397.6 100.00
2 279.63 19.98 2.708 0.97( 0.36) 0.37 129.8 130.00

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 1083.32 18.65 2.822 0.98( 0.36) 0.37 480.7 110.00
2 1071.57 19.98 2.708 0.98( 0.36) 0.37 497.3 130.00
3 964.06 25.02 2.366 0.98( 0.36) 0.37 527.4 100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 1083.32 Tc(MIN.) = 18.65
EFFECTIVE AREA(ACRES) = 480.67 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 527.4
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00 = 9830.00 FEET.

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*****
FLOW PROCESS FROM NODE 140.00 TO NODE 150.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 998.00
FLOW LENGTH(FEET) = 1500.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 108.0 INCH PIPE IS 80.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 21.18
ESTIMATED PIPE DIAMETER(INCH) = 108.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1083.32
PIPE TRAVEL TIME(MIN.) = 1.18 Tc(MIN.) = 19.83
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 150.00 = 11330.00 FEET.

*****
FLOW PROCESS FROM NODE 150.00 TO NODE 150.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 19.83
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.720
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 15.00 0.98 0.100 32
NATURAL POOR COVER
"BARREN" A 8.50 0.42 1.000 78
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 2.50 0.98 0.200 32
COMMERCIAL A 27.50 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248
SUBAREA AREA(ACRES) = 53.50 SUBAREA RUNOFF(CFS) = 123.64
EFFECTIVE AREA(ACRES) = 534.17 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.95 AREA-AVERAGED Ap = 0.36
TOTAL AREA(ACRES) = 580.9 PEAK FLOW RATE(CFS) = 1144.17

=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 580.9 Tc(MIN.) = 19.83
EFFECTIVE AREA(ACRES) = 534.17 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.95 AREA-AVERAGED Ap = 0.358
PEAK FLOW RATE(CFS) = 1144.17

** PEAK FLOW RATE TABLE **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 1144.17 19.83 2.720 0.95( 0.34) 0.36 534.2 110.00
2 1127.49 21.16 2.616 0.95( 0.34) 0.36 550.8 130.00
3 1021.75 26.24 2.299 0.95( 0.34) 0.36 580.9 100.00

=====
END OF RATIONAL METHOD ANALYSIS

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA A) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-26-2011 *

FILE NAME: VA25.DAT
TIME/DATE OF STUDY: 12:46 07/26/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK-SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.761
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.379
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.40	0.98	0.100	32	9.76
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	5.60	0.98	0.500	32	12.49

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.420
SUBAREA RUNOFF(CFS) = 18.71
TOTAL AREA (ACRES) = 7.00 PEAK FLOW RATE (CFS) = 18.71

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1143.00
STREET LENGTH(FEET) = 730.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 30.06

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.68

HALFSTREET FLOOD WIDTH(FEET) = 27.03

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.12

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.45

STREET FLOW TRAVEL TIME(MIN.) = 5.73 Tc(MIN.) = 15.49

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.561

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.414

SUBAREA AREA(ACRES) = 11.60 SUBAREA RUNOFF(CFS) = 22.53

EFFECTIVE AREA(ACRES) = 18.60 AREA-AVERAGED Fm(INCH/HR) = 0.41

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42

TOTAL AREA(ACRES) = 18.6 PEAK FLOW RATE(CFS) = 36.08

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.72 HALFSTREET FLOOD WIDTH(FEET) = 30.83

FLOW VELOCITY(FEET/SEC.) = 2.21 DEPTH*VELOCITY(FT*FT/SEC.) = 1.59

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1530.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 15.49

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.561

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.50	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.393

SUBAREA AREA(ACRES) = 11.60 SUBAREA RUNOFF(CFS) = 22.74

EFFECTIVE AREA(ACRES) = 30.20 AREA-AVERAGED Fm(INCH/HR) = 0.40

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41

TOTAL AREA(ACRES) = 30.2 PEAK FLOW RATE(CFS) = 58.82

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1143.00 DOWNSTREAM(FEET) = 1132.00

FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.2 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 11.63

ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 58.82

PIPE TRAVEL TIME(MIN.) = 0.96 Tc(MIN.) = 16.45

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2200.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 16.45

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.471

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	18.50	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.407

SUBAREA AREA(ACRES) = 24.10 SUBAREA RUNOFF(CFS) = 44.98

EFFECTIVE AREA(ACRES) = 54.30 AREA-AVERAGED Fm(INCH/HR) = 0.40

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41

TOTAL AREA(ACRES) = 54.3 PEAK FLOW RATE(CFS) = 101.33

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1132.00 DOWNSTREAM(FEET) = 1119.00

FLOW LENGTH(FEET) = 640.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.7 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 14.45

ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 101.33

PIPE TRAVEL TIME(MIN.) = 0.74 Tc(MIN.) = 17.19

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 2840.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.19

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.406

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL	AREA	Fp	Ap	SCS

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LAND USE          GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL        A      4.20     0.98      0.100     32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"  A      9.90     0.98      0.500     32
SCHOOL            A      7.80     0.98      0.600     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.459
SUBAREA AREA(ACRES) = 21.90     SUBAREA RUNOFF(CFS) = 38.61
EFFECTIVE AREA(ACRES) = 76.20     AREA-AVERAGED Fm(INCH/HR) = 0.41
AREA-AVERAGED Fp(INCH/HR) = 0.98     AREA-AVERAGED Ap = 0.42
TOTAL AREA(ACRES) = 76.2     PEAK FLOW RATE(CFS) = 136.80

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PIPE-FLOW VELOCITY(FEET/SEC.) = 17.14
ESTIMATED PIPE DIAMETER(INCH) = 51.00     NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 203.50
PIPE TRAVEL TIME(MIN.) = 0.63     Tc(MIN.) = 19.28
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 4810.00 FEET.

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*****
FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
-----

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ELEVATION DATA: UPSTREAM(FEET) = 1119.00 DOWNSTREAM(FEET) = 1095.00
FLOW LENGTH(FEET) = 1320.00     MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.01
ESTIMATED PIPE DIAMETER(INCH) = 45.00     NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 136.80
PIPE TRAVEL TIME(MIN.) = 1.47     Tc(MIN.) = 18.65
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 4160.00 FEET.

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*****
FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 18.65
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.291
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/  SCS SOIL  AREA    Fp      Ap      SCS
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL        A      10.00   0.98    0.100   32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"  A      33.80   0.98    0.500   32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.409
SUBAREA AREA(ACRES) = 43.80     SUBAREA RUNOFF(CFS) = 74.60
EFFECTIVE AREA(ACRES) = 120.00     AREA-AVERAGED Fm(INCH/HR) = 0.41
AREA-AVERAGED Fp(INCH/HR) = 0.98     AREA-AVERAGED Ap = 0.42
TOTAL AREA(ACRES) = 120.0     PEAK FLOW RATE(CFS) = 203.50

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*****
FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
-----

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ELEVATION DATA: UPSTREAM(FEET) = 1095.00 DOWNSTREAM(FEET) = 1082.00
FLOW LENGTH(FEET) = 650.00     MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 39.8 INCHES

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*****
FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 19.28
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.246
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/  SCS SOIL  AREA    Fp      Ap      SCS
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL        A      3.10    0.98    0.100   32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"  A      9.40    0.98    0.500   32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
SUBAREA AREA(ACRES) = 12.50     SUBAREA RUNOFF(CFS) = 20.87
EFFECTIVE AREA(ACRES) = 132.50     AREA-AVERAGED Fm(INCH/HR) = 0.41
AREA-AVERAGED Fp(INCH/HR) = 0.98     AREA-AVERAGED Ap = 0.42
TOTAL AREA(ACRES) = 132.5     PEAK FLOW RATE(CFS) = 219.47

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*****
FLOW PROCESS FROM NODE 106.00 TO NODE 120.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 1082.00 DOWNSTREAM(FEET) = 1081.00
FLOW LENGTH(FEET) = 1140.00     MANNING'S N = 0.013
DEPTH OF FLOW IN 93.0 INCH PIPE IS 75.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.37
ESTIMATED PIPE DIAMETER(INCH) = 93.00     NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 219.47
PIPE TRAVEL TIME(MIN.) = 3.54     Tc(MIN.) = 22.83
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 5950.00 FEET.

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FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 22.83
RAINFALL INTENSITY(INCH/HR) = 2.03
AREA-AVERAGED Fm(INCH/HR) = 0.41
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.42
EFFECTIVE STREAM AREA(ACRES) = 132.50
TOTAL STREAM AREA(ACRES) = 132.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 219.47

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FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 760.00
ELEVATION DATA: UPSTREAM(FEET) = 1165.00 DOWNSTREAM(FEET) = 1148.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.231
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.494
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.30 0.98 0.100 32 9.23
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 4.20 0.98 0.500 32 11.81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405
SUBAREA RUNOFF(CFS) = 15.34
TOTAL AREA(ACRES) = 5.50 PEAK FLOW RATE(CFS) = 15.34

FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1148.00 DOWNSTREAM ELEVATION(FEET) = 1145.00
STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 28.49
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.57
HALFSTREET FLOOD WIDTH(FEET) = 20.58
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.22
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.83
STREET FLOW TRAVEL TIME(MIN.) = 1.81 Tc(MIN.) = 11.04

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.138
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.80 0.98 0.100 32
RESIDENTIAL

"5-7 DWELLINGS/ACRE" A 7.80 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394
SUBAREA AREA(ACRES) = 10.60 SUBAREA RUNOFF(CFS) = 26.26
EFFECTIVE AREA(ACRES) = 16.10 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 16.1 PEAK FLOW RATE(CFS) = 39.84

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 23.43
FLOW VELOCITY(FEET/SEC.) = 3.51 DEPTH*VELOCITY(FT*FT/SEC.) = 2.20
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 1110.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1132.00
STREET LENGTH(FEET) = 630.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 59.74
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.62
HALFSTREET FLOOD WIDTH(FEET) = 23.17
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.38
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.34

STREET FLOW TRAVEL TIME(MIN.) = 1.95 Tc(MIN.) = 13.00
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.846
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.20 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 15.00 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.430
SUBAREA AREA(ACRES) = 18.20 SUBAREA RUNOFF(CFS) = 39.75
EFFECTIVE AREA(ACRES) = 34.30 AREA-AVERAGED Fm(INCH/HR) = 0.40
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
TOTAL AREA(ACRES) = 34.3 PEAK FLOW RATE(CFS) = 75.35

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.66 HALFSTREET FLOOD WIDTH(FEET) = 25.33
FLOW VELOCITY(FEET/SEC.) = 5.70 DEPTH*VELOCITY(FT*FT/SEC.) = 3.79

LONGEST FLOWPATH FROM NODE 110.00 TO NODE 113.00 = 1740.00 FEET.

FLOW PROCESS FROM NODE 113.00 TO NODE 114.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1132.00 DOWNSTREAM(FEET) = 1120.00
FLOW LENGTH(FEET) = 700.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 28.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.59
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 75.35
PIPE TRAVEL TIME(MIN.) = 0.93 Tc(MIN.) = 13.92
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 114.00 = 2440.00 FEET.

FLOW PROCESS FROM NODE 114.00 TO NODE 114.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 13.92
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.730
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 5.60 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 16.20 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397
SUBAREA AREA(ACRES) = 21.80 SUBAREA RUNOFF(CFS) = 45.97
EFFECTIVE AREA(ACRES) = 56.10 AREA-AVERAGED Fm(INCH/HR) = 0.40
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.41
TOTAL AREA(ACRES) = 56.1 PEAK FLOW RATE(CFS) = 117.77

FLOW PROCESS FROM NODE 114.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1120.00 DOWNSTREAM(FEET) = 1081.00
FLOW LENGTH(FEET) = 1980.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.91
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 117.77
PIPE TRAVEL TIME(MIN.) = 2.21 Tc(MIN.) = 16.14
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 120.00 = 4420.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 16.14
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.499
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.60 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 8.90 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 2.30 0.98 0.200 32
COMMERCIAL A 1.50 0.98 0.100 32
COMMERCIAL A 0.60 0.98 0.100 32
SCHOOL A 67.80 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.520
SUBAREA AREA(ACRES) = 89.70 SUBAREA RUNOFF(CFS) = 160.81
EFFECTIVE AREA(ACRES) = 145.80 AREA-AVERAGED Fm(INCH/HR) = 0.47
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.48
TOTAL AREA(ACRES) = 145.8 PEAK FLOW RATE(CFS) = 266.90

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 16.14
RAINFALL INTENSITY(INCH/HR) = 2.50
AREA-AVERAGED Fm(INCH/HR) = 0.47
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.48
EFFECTIVE STREAM AREA(ACRES) = 145.80
TOTAL STREAM AREA(ACRES) = 145.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 266.90

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	219.47	22.83	2.030	0.98(0.41)	0.42	132.5	100.00
2	266.90	16.14	2.499	0.98(0.47)	0.48	145.8	110.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	466.89	16.14	2.499	0.98(0.44)	0.45	239.5	110.00
2	424.76	22.83	2.030	0.98(0.44)	0.45	278.3	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 466.89 Tc(MIN.) = 16.14
EFFECTIVE AREA(ACRES) = 239.47 AREA-AVERAGED Fm(INCH/HR) = 0.44

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.45
 TOTAL AREA (ACRES) = 278.3
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 5950.00 FEET.

PIPE TRAVEL TIME (MIN.) = 1.62 Tc (MIN.) = 18.84
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 122.00 = 9230.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1081.00 DOWNSTREAM (FEET) = 1058.00
 FLOW LENGTH (FEET) = 1310.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 55.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 20.16
 ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 466.89
 PIPE TRAVEL TIME (MIN.) = 1.08 Tc (MIN.) = 17.22
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 121.00 = 7260.00 FEET.

 FLOW PROCESS FROM NODE 121.00 TO NODE 121.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 17.22
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.404
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	17.00	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	13.10	0.98	0.200	32
COMMERCIAL	A	6.80	0.98	0.100	32
COMMERCIAL	A	0.20	0.98	0.100	32
COMMERCIAL	A	0.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.268
 SUBAREA AREA (ACRES) = 48.20 SUBAREA RUNOFF (CFS) = 92.92
 EFFECTIVE AREA (ACRES) = 287.67 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42
 TOTAL AREA (ACRES) = 326.5 PEAK FLOW RATE (CFS) = 515.75

 FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1058.00 DOWNSTREAM (FEET) = 1025.00
 FLOW LENGTH (FEET) = 1970.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 75.0 INCH PIPE IS 58.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 20.27
 ESTIMATED PIPE DIAMETER (INCH) = 75.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 515.75

 FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 18.84
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.277
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	21.60	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	19.60	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	2.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.80	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.70	0.98	0.200	32
COMMERCIAL	A	12.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.164
 SUBAREA AREA (ACRES) = 71.10 SUBAREA RUNOFF (CFS) = 135.48
 EFFECTIVE AREA (ACRES) = 358.77 AREA-AVERAGED Fm (INCH/HR) = 0.36
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.37
 TOTAL AREA (ACRES) = 397.6 PEAK FLOW RATE (CFS) = 618.54

 FLOW PROCESS FROM NODE 122.00 TO NODE 140.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1025.00 DOWNSTREAM (FEET) = 1015.00
 FLOW LENGTH (FEET) = 600.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 81.0 INCH PIPE IS 61.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 21.24
 ESTIMATED PIPE DIAMETER (INCH) = 81.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 618.54
 PIPE TRAVEL TIME (MIN.) = 0.47 Tc (MIN.) = 19.31
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00 = 9830.00 FEET.

 FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 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.) = 19.31
 RAINFALL INTENSITY (INCH/HR) = 2.24
 AREA-AVERAGED Fm (INCH/HR) = 0.36
 AREA-AVERAGED Fp (INCH/HR) = 0.98

AREA-AVERAGED Ap = 0.37
 EFFECTIVE STREAM AREA (ACRES) = 358.77
 TOTAL STREAM AREA (ACRES) = 397.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 618.54

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.399
 SUBAREA AREA (ACRES) = 12.30 SUBAREA RUNOFF (CFS) = 24.92
 EFFECTIVE AREA (ACRES) = 18.40 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
 TOTAL AREA (ACRES) = 18.4 PEAK FLOW RATE (CFS) = 37.16

 FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 720.00
 ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1071.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.291
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.480
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.20	0.98	0.100	32	9.29
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.90	0.98	0.500	32	11.89

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.421
 SUBAREA RUNOFF (CFS) = 16.85
 TOTAL AREA (ACRES) = 6.10 PEAK FLOW RATE (CFS) = 16.85

 FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION (FEET) = 1071.00 DOWNSTREAM ELEVATION (FEET) = 1069.00
 STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 29.41
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.67
 HALFSTREET FLOOD WIDTH (FEET) = 26.19
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.15
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.45
 STREET FLOW TRAVEL TIME (MIN.) = 5.43 Tc (MIN.) = 14.72

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.640
 SUBAREA LOSS RATE DATA (AMC II):

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.72 HALFSTREET FLOOD WIDTH (FEET) = 31.04
 FLOW VELOCITY (FEET/SEC.) = 2.26 DEPTH*VELOCITY (FT*FT/SEC.) = 1.63
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 1420.00 FEET.

 FLOW PROCESS FROM NODE 132.00 TO NODE 133.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1069.00 DOWNSTREAM (FEET) = 1058.00
 FLOW LENGTH (FEET) = 680.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.55
 ESTIMATED PIPE DIAMETER (INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 37.16
 PIPE TRAVEL TIME (MIN.) = 1.07 Tc (MIN.) = 15.80
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 133.00 = 2100.00 FEET.

 FLOW PROCESS FROM NODE 133.00 TO NODE 133.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc (MIN.) = 15.80
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.531
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	21.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.414
 SUBAREA AREA (ACRES) = 27.50 SUBAREA RUNOFF (CFS) = 52.65
 EFFECTIVE AREA (ACRES) = 45.90 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.41
 TOTAL AREA (ACRES) = 45.9 PEAK FLOW RATE (CFS) = 88.00

 FLOW PROCESS FROM NODE 133.00 TO NODE 134.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<

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>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1048.00
FLOW LENGTH(FEET) = 680.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 31.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.31
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 88.00
PIPE TRAVEL TIME(MIN.) = 0.92 Tc(MIN.) = 16.72
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 134.00 = 2780.00 FEET.

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*****
FLOW PROCESS FROM NODE 134.00 TO NODE 134.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 16.72
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.446
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A        6.70      0.98      0.100      32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        19.10     0.98      0.500      32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
SUBAREA AREA(ACRES) = 25.80 SUBAREA RUNOFF(CFS) = 47.84
EFFECTIVE AREA(ACRES) = 71.70 AREA-AVERAGED Fm(INCH/HR) = 0.40
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.41
TOTAL AREA(ACRES) = 71.7 PEAK FLOW RATE(CFS) = 132.34

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*****
FLOW PROCESS FROM NODE 134.00 TO NODE 135.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 1048.00 DOWNSTREAM(FEET) = 1025.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.78
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 132.34
PIPE TRAVEL TIME(MIN.) = 1.47 Tc(MIN.) = 18.19
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 135.00 = 4080.00 FEET.

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*****
FLOW PROCESS FROM NODE 135.00 TO NODE 135.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 18.19
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.326
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN

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COMMERCIAL              A        8.40      0.98      0.100      32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        17.70     0.98      0.500      32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A         8.00      0.98      0.200      32
PUBLIC PARK             A         4.50      0.98      0.850      32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
SUBAREA AREA(ACRES) = 38.60 SUBAREA RUNOFF(CFS) = 67.55
EFFECTIVE AREA(ACRES) = 110.30 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 110.3 PEAK FLOW RATE(CFS) = 192.13

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FLOW PROCESS FROM NODE 135.00 TO NODE 136.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 1025.00 DOWNSTREAM(FEET) = 1016.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 48.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.25
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 192.13
PIPE TRAVEL TIME(MIN.) = 1.93 Tc(MIN.) = 20.11
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 136.00 = 5380.00 FEET.

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FLOW PROCESS FROM NODE 136.00 TO NODE 136.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 20.11
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.190
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A        3.30      0.98      0.100      32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A        15.00     0.98      0.200      32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A         0.50      0.98      0.500      32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A         0.70      0.98      0.200      32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.191
SUBAREA AREA(ACRES) = 19.50 SUBAREA RUNOFF(CFS) = 35.17
EFFECTIVE AREA(ACRES) = 129.80 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 129.8 PEAK FLOW RATE(CFS) = 213.76

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*****
FLOW PROCESS FROM NODE 136.00 TO NODE 140.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1016.00 DOWNSTREAM(FEET) = 1015.00
FLOW LENGTH(FEET) = 310.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 72.0 INCH PIPE IS 58.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.67
ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 213.76
PIPE TRAVEL TIME(MIN.) = 0.60 Tc(MIN.) = 20.71
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 140.00 = 5690.00 FEET.

FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 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.) = 20.71
RAINFALL INTENSITY(INCH/HR) = 2.15
AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.37
EFFECTIVE STREAM AREA(ACRES) = 129.80
TOTAL STREAM AREA(ACRES) = 129.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 213.76

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 3 rows of data.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 3 rows of data.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 828.13 Tc(MIN.) = 19.31
EFFECTIVE AREA(ACRES) = 479.82 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 527.4
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00 = 9830.00 FEET.

FLOW PROCESS FROM NODE 140.00 TO NODE 150.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 998.00
FLOW LENGTH(FEET) = 1500.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 96.0 INCH PIPE IS 75.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.67
ESTIMATED PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 828.13
PIPE TRAVEL TIME(MIN.) = 1.27 Tc(MIN.) = 20.58
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 150.00 = 11330.00 FEET.

FLOW PROCESS FROM NODE 150.00 TO NODE 150.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 20.58
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.160
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 15.00 0.98 0.100 32
NATURAL POOR COVER
"BARREN" A 8.50 0.42 1.000 78
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 2.50 0.98 0.200 32
COMMERCIAL A 27.50 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248
SUBAREA AREA(ACRES) = 53.50 SUBAREA RUNOFF(CFS) = 96.64
EFFECTIVE AREA(ACRES) = 533.32 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.95 AREA-AVERAGED Ap = 0.36
TOTAL AREA(ACRES) = 580.9 PEAK FLOW RATE(CFS) = 873.24

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 580.9 TC(MIN.) = 20.58
EFFECTIVE AREA(ACRES) = 533.32 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.95 AREA-AVERAGED Ap = 0.358
PEAK FLOW RATE(CFS) = 873.24

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 3 rows of data.

END OF RATIONAL METHOD ANALYSIS

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

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA A) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-26-2011 *

FILE NAME: VA10.DAT
TIME/DATE OF STUDY: 13:04 07/26/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/ SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.761
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.973
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN Tc (MIN.)
COMMERCIAL A 1.40 1.33 0.100 17 9.76
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 5.60 1.33 0.500 17 12.49
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.420
SUBAREA RUNOFF(CFS) = 15.22
TOTAL AREA(ACRES) = 7.00 PEAK FLOW RATE(CFS) = 15.22

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1143.00
STREET LENGTH(FEET) = 730.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 24.06
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.64
 HALFSTREET FLOOD WIDTH(FEET) = 24.06
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.01
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.29
 STREET FLOW TRAVEL TIME(MIN.) = 6.05 Tc(MIN.) = 15.81
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.226

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.50	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	9.10	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.414
 SUBAREA AREA(ACRES) = 11.60 SUBAREA RUNOFF(CFS) = 17.50
 EFFECTIVE AREA(ACRES) = 18.60 AREA-AVERAGED Fm(INCH/HR) = 0.55
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.42
 TOTAL AREA(ACRES) = 18.6 PEAK FLOW RATE(CFS) = 28.01

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.66
 FLOW VELOCITY(FEET/SEC.) = 2.09 DEPTH*VELOCITY(FT*FT/SEC.) = 1.40
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1530.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 15.81
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.226
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.10	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	8.50	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.393
 SUBAREA AREA(ACRES) = 11.60 SUBAREA RUNOFF(CFS) = 17.79
 EFFECTIVE AREA(ACRES) = 30.20 AREA-AVERAGED Fm(INCH/HR) = 0.54
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 30.2 PEAK FLOW RATE(CFS) = 45.80

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1143.00 DOWNSTREAM(FEET) = 1132.00
 FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 23.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.91
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 45.80
 PIPE TRAVEL TIME(MIN.) = 1.02 Tc(MIN.) = 16.83
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2200.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 16.83
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.144
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.60	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	18.50	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.407
 SUBAREA AREA(ACRES) = 24.10 SUBAREA RUNOFF(CFS) = 34.77
 EFFECTIVE AREA(ACRES) = 54.30 AREA-AVERAGED Fm(INCH/HR) = 0.54
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 54.3 PEAK FLOW RATE(CFS) = 78.34

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1132.00 DOWNSTREAM(FEET) = 1119.00
 FLOW LENGTH(FEET) = 640.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.65
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 78.34
 PIPE TRAVEL TIME(MIN.) = 0.78 Tc(MIN.) = 17.61
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 2840.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 17.61
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.086
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.20	1.33	0.100	17

RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 9.90 1.33 0.500 17
 SCHOOL A 7.80 1.33 0.600 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.459
 SUBAREA AREA (ACRES) = 21.90 SUBAREA RUNOFF(CFS) = 29.11
 EFFECTIVE AREA(ACRES) = 76.20 AREA-AVERAGED Fm(INCH/HR) = 0.56
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.42
 TOTAL AREA(ACRES) = 76.2 PEAK FLOW RATE(CFS) = 104.64

PIPE-FLOW(CFS) = 154.36
 PIPE TRAVEL TIME(MIN.) = 0.67 Tc(MIN.) = 19.83
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 4810.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 19.83
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.943
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 3.10 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 9.40 1.33 0.500 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA AREA(ACRES) = 12.50 SUBAREA RUNOFF(CFS) = 15.87
 EFFECTIVE AREA(ACRES) = 132.50 AREA-AVERAGED Fm(INCH/HR) = 0.55
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.42
 TOTAL AREA(ACRES) = 132.5 PEAK FLOW RATE(CFS) = 165.88

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1119.00 DOWNSTREAM(FEET) = 1095.00
 FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.19
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 104.64
 PIPE TRAVEL TIME(MIN.) = 1.55 Tc(MIN.) = 19.17
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 4160.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1082.00 DOWNSTREAM(FEET) = 1081.00
 FLOW LENGTH(FEET) = 1140.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 67.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.01
 ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 165.88
 PIPE TRAVEL TIME(MIN.) = 3.79 Tc(MIN.) = 23.62
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 5950.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 19.17
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.983
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 10.00 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 33.80 1.33 0.500 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.409
 SUBAREA AREA(ACRES) = 43.80 SUBAREA RUNOFF(CFS) = 56.79
 EFFECTIVE AREA(ACRES) = 120.00 AREA-AVERAGED Fm(INCH/HR) = 0.55
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.42
 TOTAL AREA(ACRES) = 120.0 PEAK FLOW RATE(CFS) = 154.36

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 23.62
 RAINFALL INTENSITY(INCH/HR) = 1.75
 AREA-AVERAGED Fm(INCH/HR) = 0.55
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.42
 EFFECTIVE STREAM AREA(ACRES) = 132.50
 TOTAL STREAM AREA(ACRES) = 132.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 165.88

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1095.00 DOWNSTREAM(FEET) = 1082.00
 FLOW LENGTH(FEET) = 650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 16.23
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1

FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 760.00
ELEVATION DATA: UPSTREAM(FEET) = 1165.00 DOWNSTREAM(FEET) = 1148.00

Tc = K*(LENGTH** 3.00)/(ELEVATION CHANGE]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.231

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.074

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.30 1.33 0.100 17 9.23
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 4.20 1.33 0.500 17 11.81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405
SUBAREA RUNOFF(CFS) = 12.55
TOTAL AREA(ACRES) = 5.50 PEAK FLOW RATE(CFS) = 12.55

FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1148.00 DOWNSTREAM ELEVATION(FEET) = 1145.00
STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 23.18
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.54
HALFSTREET FLOOD WIDTH(FEET) = 18.95
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.07
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.65
STREET FLOW TRAVEL TIME(MIN.) = 1.90 Tc(MIN.) = 11.13
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.747

SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.80 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 7.80 1.33 0.500 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394
SUBAREA AREA(ACRES) = 10.60 SUBAREA RUNOFF(CFS) = 21.21
EFFECTIVE AREA(ACRES) = 16.10 AREA-AVERAGED Fm(INCH/HR) = 0.53
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 16.1 PEAK FLOW RATE(CFS) = 32.15

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 21.58
FLOW VELOCITY(FEET/SEC.) = 3.32 DEPTH*VELOCITY(FT*FT/SEC.) = 1.96
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 1110.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1132.00
STREET LENGTH(FEET) = 630.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 47.82
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.58
HALFSTREET FLOOD WIDTH(FEET) = 21.22
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.10
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.97
STREET FLOW TRAVEL TIME(MIN.) = 2.06 Tc(MIN.) = 13.19
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.481
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.20 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 15.00 1.33 0.500 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.430
SUBAREA AREA(ACRES) = 18.20 SUBAREA RUNOFF(CFS) = 31.30
EFFECTIVE AREA(ACRES) = 34.30 AREA-AVERAGED Fm(INCH/HR) = 0.55
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.41
TOTAL AREA(ACRES) = 34.3 PEAK FLOW RATE(CFS) = 59.59

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 23.11
FLOW VELOCITY(FEET/SEC.) = 5.39 DEPTH*VELOCITY(FT*FT/SEC.) = 3.34
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 113.00 = 1740.00 FEET.

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FLOW PROCESS FROM NODE 113.00 TO NODE 114.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1132.00 DOWNSTREAM(FEET) = 1120.00
FLOW LENGTH(FEET) = 700.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.88
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 59.59
PIPE TRAVEL TIME(MIN.) = 0.98 Tc(MIN.) = 14.18
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 114.00 = 2440.00 FEET.

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*****
FLOW PROCESS FROM NODE 114.00 TO NODE 114.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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=====
MAINLINE Tc(MIN.) = 14.18
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.377
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       5.60   1.33  0.100  17
RESIDENTIAL
"5-7 DWELLINGS/ACRE"  A       16.20   1.33  0.500  17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397
SUBAREA AREA(ACRES) = 21.80 SUBAREA RUNOFF(CFS) = 36.28
EFFECTIVE AREA(ACRES) = 56.10 AREA-AVERAGED Fm(INCH/HR) = 0.54
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.41
TOTAL AREA(ACRES) = 56.1 PEAK FLOW RATE(CFS) = 92.64

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*****
FLOW PROCESS FROM NODE 114.00 TO NODE 120.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1120.00 DOWNSTREAM(FEET) = 1081.00
FLOW LENGTH(FEET) = 1980.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.13
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 92.64
PIPE TRAVEL TIME(MIN.) = 2.34 Tc(MIN.) = 16.51
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 120.00 = 4420.00 FEET.

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*****
FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 16.51

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* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.169
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       8.60   1.33  0.100  17
RESIDENTIAL
"5-7 DWELLINGS/ACRE"  A       8.90   1.33  0.500  17
RESIDENTIAL
"11+ DWELLINGS/ACRE"  A       2.30   1.33  0.200  17
COMMERCIAL          A       1.50   1.33  0.100  17
COMMERCIAL          A       0.60   1.33  0.100  17
SCHOOL              A       67.80   1.33  0.600  17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.520
SUBAREA AREA(ACRES) = 89.70 SUBAREA RUNOFF(CFS) = 119.31
EFFECTIVE AREA(ACRES) = 145.80 AREA-AVERAGED Fm(INCH/HR) = 0.63
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.48
TOTAL AREA(ACRES) = 145.8 PEAK FLOW RATE(CFS) = 201.45

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*****
FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

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=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 16.51
RAINFALL INTENSITY(INCH/HR) = 2.17
AREA-AVERAGED Fm(INCH/HR) = 0.63
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.48
EFFECTIVE STREAM AREA(ACRES) = 145.80
TOTAL STREAM AREA(ACRES) = 145.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 201.45

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** CONFLUENCE DATA **
STREAM   Q      Tc  Intensity  Fp(Fm)  Ap  Ae  HEADWATER
NUMBER   (CFS)  (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1        165.88  23.62  1.749  1.33( 0.55) 0.42  132.5  100.00
2        201.45  16.51  2.169  1.33( 0.63) 0.48  145.8  110.00

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

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** PEAK FLOW RATE TABLE **
STREAM   Q      Tc  Intensity  Fp(Fm)  Ap  Ae  HEADWATER
NUMBER   (CFS)  (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1        358.00  16.51  2.169  1.33( 0.60) 0.45  238.4  110.00
2        312.30  23.62  1.749  1.33( 0.59) 0.45  278.3  100.00

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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 358.00 Tc(MIN.) = 16.51
EFFECTIVE AREA(ACRES) = 238.41 AREA-AVERAGED Fm(INCH/HR) = 0.60
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.45
TOTAL AREA(ACRES) = 278.3

```

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 5950.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1081.00 DOWNSTREAM(FEET) = 1058.00
FLOW LENGTH(FEET) = 1310.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 48.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 18.96
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 358.00
PIPE TRAVEL TIME(MIN.) = 1.15 Tc(MIN.) = 17.66
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 121.00 = 7260.00 FEET.

FLOW PROCESS FROM NODE 121.00 TO NODE 121.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 17.66
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.083
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
COMMERCIAL A 10.30 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 17.00 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 13.10 1.33 0.200 17
COMMERCIAL A 6.80 1.33 0.100 17
COMMERCIAL A 0.20 1.33 0.100 17
COMMERCIAL A 0.80 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.268
SUBAREA AREA(ACRES) = 48.20 SUBAREA RUNOFF(CFS) = 74.90
EFFECTIVE AREA(ACRES) = 286.61 AREA-AVERAGED Fm(INCH/HR) = 0.56
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.42
TOTAL AREA(ACRES) = 326.5 PEAK FLOW RATE(CFS) = 392.66

FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1025.00
FLOW LENGTH(FEET) = 1970.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 69.0 INCH PIPE IS 51.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.07
ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 392.66
PIPE TRAVEL TIME(MIN.) = 1.72 Tc(MIN.) = 19.39
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 122.00 = 9230.00 FEET.

FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 19.39
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.970
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
COMMERCIAL A 21.60 1.33 0.100 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 19.60 1.33 0.200 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 2.90 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 12.80 1.33 0.200 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 1.70 1.33 0.200 17
COMMERCIAL A 12.50 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.164
SUBAREA AREA(ACRES) = 71.10 SUBAREA RUNOFF(CFS) = 112.08
EFFECTIVE AREA(ACRES) = 357.71 AREA-AVERAGED Fm(INCH/HR) = 0.49
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 397.6 PEAK FLOW RATE(CFS) = 475.58

FLOW PROCESS FROM NODE 122.00 TO NODE 140.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1025.00 DOWNSTREAM(FEET) = 1015.00
FLOW LENGTH(FEET) = 600.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 72.0 INCH PIPE IS 57.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.71
ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 475.58
PIPE TRAVEL TIME(MIN.) = 0.51 Tc(MIN.) = 19.89
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00 = 9830.00 FEET.

FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 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.) = 19.89
RAINFALL INTENSITY(INCH/HR) = 1.94
AREA-AVERAGED Fm(INCH/HR) = 0.49
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.37
EFFECTIVE STREAM AREA(ACRES) = 357.71

TOTAL STREAM AREA (ACRES) = 397.60
PEAK FLOW RATE (CFS) AT CONFLUENCE = 475.58

FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 720.00
ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1071.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 9.291

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 3.062

SUBAREA T_c AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.20	1.33	0.100	17	9.29
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.90	1.33	0.500	17	11.89

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.421
SUBAREA RUNOFF (CFS) = 13.74
TOTAL AREA (ACRES) = 6.10 PEAK FLOW RATE (CFS) = 13.74

FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1071.00 DOWNSTREAM ELEVATION (FEET) = 1069.00
STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 23.62

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.63
HALFSTREET FLOOD WIDTH (FEET) = 23.69
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.04

PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.29

STREET FLOW TRAVEL TIME (MIN.) = 5.73 T_c (MIN.) = 15.02

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.295

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.20	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.90	1.33	0.500	17

COMMERCIAL A 3.10 1.33 0.100 17

RESIDENTIAL

"5-7 DWELLINGS/ACRE" A 9.20 1.33 0.500 17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.399

SUBAREA AREA (ACRES) = 12.30 SUBAREA RUNOFF (CFS) = 19.54

EFFECTIVE AREA (ACRES) = 18.40 AREA-AVERAGED F_m (INCH/HR) = 0.54

AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.41

TOTAL AREA (ACRES) = 18.4 PEAK FLOW RATE (CFS) = 29.07

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.67 HALFSTREET FLOOD WIDTH (FEET) = 25.98

FLOW VELOCITY (FEET/SEC.) = 2.14 DEPTH*VELOCITY (FT*FT/SEC.) = 1.44

LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 1420.00 FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 133.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1069.00 DOWNSTREAM (FEET) = 1058.00

FLOW LENGTH (FEET) = 680.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.7 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 9.90

ESTIMATED PIPE DIAMETER (INCH) = 27.00 NUMBER OF PIPES = 1

PIPE-FLOW (CFS) = 29.07

PIPE TRAVEL TIME (MIN.) = 1.15 T_c (MIN.) = 16.17

LONGEST FLOWPATH FROM NODE 130.00 TO NODE 133.00 = 2100.00 FEET.

FLOW PROCESS FROM NODE 133.00 TO NODE 133.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

=====

MAINLINE T_c (MIN.) = 16.17

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.196

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.90	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	21.60	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.414

SUBAREA AREA (ACRES) = 27.50 SUBAREA RUNOFF (CFS) = 40.74

EFFECTIVE AREA (ACRES) = 45.90 AREA-AVERAGED F_m (INCH/HR) = 0.55

AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.41

TOTAL AREA (ACRES) = 45.9 PEAK FLOW RATE (CFS) = 68.17

FLOW PROCESS FROM NODE 133.00 TO NODE 134.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1048.00
 FLOW LENGTH(FEET) = 680.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.64
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 68.17
 PIPE TRAVEL TIME(MIN.) = 0.97 Tc(MIN.) = 17.14
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 134.00 = 2780.00 FEET.

 FLOW PROCESS FROM NODE 134.00 TO NODE 134.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.14
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.121
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.70	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	19.10	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
 SUBAREA AREA(ACRES) = 25.80 SUBAREA RUNOFF(CFS) = 37.02
 EFFECTIVE AREA(ACRES) = 71.70 AREA-AVERAGED Fm(INCH/HR) = 0.54
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 71.7 PEAK FLOW RATE(CFS) = 102.07

 FLOW PROCESS FROM NODE 134.00 TO NODE 135.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1048.00 DOWNSTREAM(FEET) = 1025.00
 FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.97
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 102.07
 PIPE TRAVEL TIME(MIN.) = 1.55 Tc(MIN.) = 18.69
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 135.00 = 4080.00 FEET.

 FLOW PROCESS FROM NODE 135.00 TO NODE 135.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 18.69
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.013
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.40	1.33	0.100	17
RESIDENTIAL					

"5-7 DWELLINGS/ACRE"	A	17.70	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.00	1.33	0.200	17
PUBLIC PARK	A	4.50	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
 SUBAREA AREA(ACRES) = 38.60 SUBAREA RUNOFF(CFS) = 51.87
 EFFECTIVE AREA(ACRES) = 110.30 AREA-AVERAGED Fm(INCH/HR) = 0.53
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 110.3 PEAK FLOW RATE(CFS) = 147.01

 FLOW PROCESS FROM NODE 135.00 TO NODE 136.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1025.00 DOWNSTREAM(FEET) = 1016.00
 FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 41.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.75
 ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 147.01
 PIPE TRAVEL TIME(MIN.) = 2.02 Tc(MIN.) = 20.71
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 136.00 = 5380.00 FEET.

 FLOW PROCESS FROM NODE 136.00 TO NODE 136.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 20.71
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.893
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	1.33	0.100	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	15.00	1.33	0.200	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.50	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.70	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.191
 SUBAREA AREA(ACRES) = 19.50 SUBAREA RUNOFF(CFS) = 28.78
 EFFECTIVE AREA(ACRES) = 129.80 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 129.8 PEAK FLOW RATE(CFS) = 163.88

 FLOW PROCESS FROM NODE 136.00 TO NODE 140.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1016.00 DOWNSTREAM(FEET) = 1015.00
 FLOW LENGTH(FEET) = 310.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 51.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.18
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 163.88
 PIPE TRAVEL TIME(MIN.) = 0.63 Tc(MIN.) = 21.34
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 140.00 = 5690.00 FEET.

ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 998.00
 FLOW LENGTH(FEET) = 1500.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 87.0 INCH PIPE IS 68.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.42
 ESTIMATED PIPE DIAMETER(INCH) = 87.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 637.27
 PIPE TRAVEL TIME(MIN.) = 1.36 Tc(MIN.) = 21.25
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 150.00 = 11330.00 FEET.

 FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 1

 FLOW PROCESS FROM NODE 150.00 TO NODE 150.00 IS CODE = 81

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<<

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 21.34
 RAINFALL INTENSITY(INCH/HR) = 1.86
 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.37
 EFFECTIVE STREAM AREA(ACRES) = 129.80
 TOTAL STREAM AREA(ACRES) = 129.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 163.88

=====

MAINLINE Tc(MIN.) = 21.25
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.864
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.00	1.33	0.100	17
NATURAL POOR COVER "BARREN"	A	8.50	0.67	1.000	61
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	2.50	1.33	0.200	17
COMMERCIAL	A	27.50	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.90
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248
 SUBAREA AREA(ACRES) = 53.50 SUBAREA RUNOFF(CFS) = 78.98
 EFFECTIVE AREA(ACRES) = 532.21 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 1.30 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 580.9 PEAK FLOW RATE(CFS) = 670.16

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	475.58	19.89	1.939	1.33(0.49)	0.37	357.7	110.00
1	404.22	27.15	1.609	1.33(0.50)	0.38	397.6	100.00
2	163.88	21.34	1.859	1.33(0.49)	0.37	129.8	130.00

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

=====

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 580.9 TC(MIN.) = 21.25
 EFFECTIVE AREA(ACRES) = 532.21 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 1.30 AREA-AVERAGED Ap = 0.358
 PEAK FLOW RATE(CFS) = 670.16

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	637.27	19.89	1.939	1.33(0.49)	0.37	478.7	110.00
2	625.23	21.34	1.859	1.33(0.49)	0.37	495.5	130.00
3	538.15	27.15	1.609	1.33(0.50)	0.37	527.4	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 637.27 Tc(MIN.) = 19.89
 EFFECTIVE AREA(ACRES) = 478.71 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 527.4
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 140.00 = 9830.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	670.16	21.25	1.864	1.30(0.46)	0.36	532.2	110.00
2	654.71	22.70	1.792	1.30(0.47)	0.36	549.0	130.00
3	569.49	28.58	1.561	1.30(0.47)	0.36	580.9	100.00

=====

END OF RATIONAL METHOD ANALYSIS

 FLOW PROCESS FROM NODE 140.00 TO NODE 150.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA B & C) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-26-2011 *

FILE NAME: VB100.DAT
TIME/DATE OF STUDY: 16:58 07/26/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.4000
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, CROWN TO STREET-CROSSFALL, IN-/OUT-/PARK-SIDE / SIDE/ WAY, HEIGHT (FT), WIDTH (FT), LIP (FT), HIKE (FT), MANNING FACTOR. Contains 2 rows of data.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL (INCH). Rows include 5-MINUTES (0.52), 30-MINUTES (1.06), 1-HOUR (1.40), 3-HOUR (2.54), 6-HOUR (3.70), 24-HOUR (8.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 760.00
ELEVATION DATA: UPSTREAM(FEET) = 1165.00 DOWNSTREAM(FEET) = 1148.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.231
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.304
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.)
COMMERCIAL A 1.60 0.98 0.100 32 9.23
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 4.40 0.98 0.500 32 11.81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.393
SUBAREA RUNOFF(CFS) = 21.17
TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 21.17

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
UPSTREAM ELEVATION(FEET) = 1148.00 DOWNSTREAM ELEVATION(FEET) = 1145.00
STREET LENGTH(FEET) = 740.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020


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>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1082.00 DOWNSTREAM(FEET) = 1058.00
FLOW LENGTH(FEET) = 1120.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.58
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 125.32
PIPE TRAVEL TIME(MIN.) = 1.20 Tc(MIN.) = 19.28
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 205.00 = 5930.00 FEET.

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FLOW PROCESS FROM NODE 205.00 TO NODE 205.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc(MIN.) = 19.28
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.767
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              A        3.50    0.98    0.100   32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        1.70    0.98    0.500   32
COMMERCIAL              A        0.30    0.98    0.100   32
COMMERCIAL              A        1.10    0.98    0.100   32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.203
SUBAREA AREA(ACRES) = 6.60 SUBAREA RUNOFF(CFS) = 15.26
EFFECTIVE AREA(ACRES) = 61.90 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 61.9 PEAK FLOW RATE(CFS) = 135.18

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*****
FLOW PROCESS FROM NODE 205.00 TO NODE 206.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1024.00
FLOW LENGTH(FEET) = 1980.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 35.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.61
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 135.18
PIPE TRAVEL TIME(MIN.) = 2.26 Tc(MIN.) = 21.54
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 206.00 = 7910.00 FEET.

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*****
FLOW PROCESS FROM NODE 206.00 TO NODE 206.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc(MIN.) = 21.54
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.589
SUBAREA LOSS RATE DATA(AMC II):

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DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              A       11.50    0.98    0.100   32
COMMERCIAL              A        7.80    0.98    0.100   32
COMMERCIAL              A        1.70    0.98    0.100   32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 21.00 SUBAREA RUNOFF(CFS) = 47.08
EFFECTIVE AREA(ACRES) = 82.90 AREA-AVERAGED Fm(INCH/HR) = 0.28
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.29
TOTAL AREA(ACRES) = 82.9 PEAK FLOW RATE(CFS) = 172.35

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*****
FLOW PROCESS FROM NODE 206.00 TO NODE 207.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 1024.00 DOWNSTREAM(FEET) = 997.00
FLOW LENGTH(FEET) = 1592.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.63
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 172.35
PIPE TRAVEL TIME(MIN.) = 1.70 Tc(MIN.) = 23.24
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 9502.00 FEET.

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FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc(MIN.) = 23.24
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.474
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              A        8.90    0.98    0.100   32
COMMERCIAL              A        7.00    0.98    0.100   32
PUBLIC PARK             A        0.70    0.98    0.850   32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.132
SUBAREA AREA(ACRES) = 16.60 SUBAREA RUNOFF(CFS) = 35.04
EFFECTIVE AREA(ACRES) = 99.50 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
TOTAL AREA(ACRES) = 99.5 PEAK FLOW RATE(CFS) = 198.79

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FLOW PROCESS FROM NODE 207.00 TO NODE 211.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 997.00 DOWNSTREAM(FEET) = 990.00
FLOW LENGTH(FEET) = 1370.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 50.2 INCHES

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PIPE-FLOW VELOCITY(FEET/SEC.) = 10.26
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 198.79
 PIPE TRAVEL TIME(MIN.) = 2.23 Tc(MIN.) = 25.46
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

 FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 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.) = 25.46
 RAINFALL INTENSITY(INCH/HR) = 2.34
 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.26
 EFFECTIVE STREAM AREA(ACRES) = 99.50
 TOTAL STREAM AREA(ACRES) = 99.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 198.79

*****TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 82.48
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.70
 HALFSTREET FLOOD WIDTH(FEET) = 28.40
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.53
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.85
 STREET FLOW TRAVEL TIME(MIN.) = 4.01 Tc(MIN.) = 14.19
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.325
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.50	0.98	0.100	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	11.40	0.98	0.200	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	7.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.246
 SUBAREA AREA(ACRES) = 26.90 SUBAREA RUNOFF(CFS) = 74.69
 EFFECTIVE AREA(ACRES) = 40.60 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
 TOTAL AREA(ACRES) = 40.6 PEAK FLOW RATE(CFS) = 110.69

 FLOW PROCESS FROM NODE 208.00 TO NODE 209.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

 INITIAL SUBAREA FLOW-LENGTH(FEET) = 750.00
 ELEVATION DATA: UPSTREAM(FEET) = 1055.00 DOWNSTREAM(FEET) = 1045.00

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.76 HALFSTREET FLOOD WIDTH(FEET) = 34.73
 FLOW VELOCITY(FEET/SEC.) = 5.86 DEPTH*VELOCITY(FT*FT/SEC.) = 4.45
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1330.0 FT WITH ELEVATION-DROP = 24.0 FT, IS 83.0 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 210.00
 LONGEST FLOWPATH FROM NODE 208.00 TO NODE 210.00 = 2080.00 FEET.

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.184
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.058
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.90	0.98	0.100	32	10.18
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	10.80	0.98	0.500	32	13.03

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.415
 SUBAREA RUNOFF(CFS) = 45.04
 TOTAL AREA(ACRES) = 13.70 PEAK FLOW RATE(CFS) = 45.04

 FLOW PROCESS FROM NODE 210.00 TO NODE 211.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 FLOW PROCESS FROM NODE 209.00 TO NODE 210.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

 UPSTREAM ELEVATION(FEET) = 1045.00 DOWNSTREAM ELEVATION(FEET) = 1021.00
 STREET LENGTH(FEET) = 1330.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

 ELEVATION DATA: UPSTREAM(FEET) = 1021.00 DOWNSTREAM(FEET) = 990.00
 FLOW LENGTH(FEET) = 1750.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.13
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 110.69
 PIPE TRAVEL TIME(MIN.) = 2.06 Tc(MIN.) = 16.25
 LONGEST FLOWPATH FROM NODE 208.00 TO NODE 211.00 = 3830.00 FEET.

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

 FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 16.25
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.065
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 14.60 0.98 0.100 32
COMMERCIAL A 16.60 0.98 0.100 32
PUBLIC PARK A 1.40 0.98 0.850 32
COMMERCIAL A 11.90 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.124
SUBAREA AREA (ACRES) = 44.50 SUBAREA RUNOFF (CFS) = 117.93
EFFECTIVE AREA (ACRES) = 85.10 AREA-AVERAGED Fm (INCH/HR) = 0.20
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
TOTAL AREA (ACRES) = 85.1 PEAK FLOW RATE (CFS) = 219.12

FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 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.) = 16.25
RAINFALL INTENSITY (INCH/HR) = 3.07
AREA-AVERAGED Fm (INCH/HR) = 0.20
AREA-AVERAGED Fp (INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.21
EFFECTIVE STREAM AREA (ACRES) = 85.10
TOTAL STREAM AREA (ACRES) = 85.10
PEAK FLOW RATE (CFS) AT CONFLUENCE = 219.12

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp (Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 and 2.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp (Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 and 2.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 390.01 Tc (MIN.) = 16.25
EFFECTIVE AREA (ACRES) = 148.62 AREA-AVERAGED Fm (INCH/HR) = 0.23
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.23
TOTAL AREA (ACRES) = 184.6

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1<<<<<

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 870.00
ELEVATION DATA: UPSTREAM (FEET) = 1160.00 DOWNSTREAM (FEET) = 1148.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.734
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.932
SUBAREA Tc AND LOSS RATE DATA (AMC II):

Table with 8 columns: DEVELOPMENT TYPE/ LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows for COMMERCIAL, RESIDENTIAL, and "5-7 DWELLINGS/ACRE".

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1148.00 DOWNSTREAM ELEVATION (FEET) = 1142.00
STREET LENGTH (FEET) = 330.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 39.36
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.56
HALFSTREET FLOOD WIDTH (FEET) = 20.11
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.65
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.61

STREET FLOW TRAVEL TIME(MIN.) = 1.18 Tc(MIN.) = 11.92
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.693
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
 SUBAREA AREA(ACRES) = 11.30 SUBAREA RUNOFF(CFS) = 33.75
 EFFECTIVE AREA(ACRES) = 18.20 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 18.2 PEAK FLOW RATE(CFS) = 54.75

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 22.90
 FLOW VELOCITY(FEET/SEC.) = 5.04 DEPTH*VELOCITY(FT*FT/SEC.) = 3.10
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1200.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1142.00 DOWNSTREAM ELEVATION(FEET) = 1115.00
 STREET LENGTH(FEET) = 1310.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 100.06

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.72
 HALFSTREET FLOOD WIDTH(FEET) = 31.04
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.07
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 4.39
 STREET FLOW TRAVEL TIME(MIN.) = 3.59 Tc(MIN.) = 15.51
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.152

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.60	0.98	0.100	32
CONDOMINIUMS	A	25.00	0.98	0.350	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.30	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.280

SUBAREA AREA(ACRES) = 34.90 SUBAREA RUNOFF(CFS) = 90.44
 EFFECTIVE AREA(ACRES) = 53.10 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
 TOTAL AREA(ACRES) = 53.1 PEAK FLOW RATE(CFS) = 136.34

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.79 HALFSTREET FLOOD WIDTH(FEET) = 37.89
 FLOW VELOCITY(FEET/SEC.) = 6.43 DEPTH*VELOCITY(FT*FT/SEC.) = 5.09
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1310.0 FT WITH ELEVATION-DROP = 27.0 FT, IS 108.9 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 303.00
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2510.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1115.00 DOWNSTREAM(FEET) = 1102.00
 FLOW LENGTH(FEET) = 730.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.87
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 136.34
 PIPE TRAVEL TIME(MIN.) = 0.82 Tc(MIN.) = 16.33
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 3240.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 16.33
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.057
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.90	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397
 SUBAREA AREA(ACRES) = 17.40 SUBAREA RUNOFF(CFS) = 41.81
 EFFECTIVE AREA(ACRES) = 70.50 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA(ACRES) = 70.5 PEAK FLOW RATE(CFS) = 173.57

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 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.) = 16.33

RAINFALL INTENSITY (INCH/HR) = 3.06
 AREA-AVERAGED Fm (INCH/HR) = 0.32
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.33
 EFFECTIVE STREAM AREA (ACRES) = 70.50
 TOTAL STREAM AREA (ACRES) = 70.50
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 173.57

PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.36
 STREET FLOW TRAVEL TIME (MIN.) = 4.18 Tc (MIN.) = 13.04
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.498
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.20	0.98	0.500	32

 FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 750.00
 ELEVATION DATA: UPSTREAM (FEET) = 1160.00 DOWNSTREAM (FEET) = 1140.00

$Tc = K * [(LENGTH * 3.00) / (ELEVATION CHANGE)]^{0.20}$
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.866
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.410
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.80	0.98	0.100	32	8.87
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	3.70	0.98	0.500	32	11.34
SCHOOL	A	4.80	0.98	0.600	32	12.02

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.443
 SUBAREA RUNOFF (CFS) = 40.45
 TOTAL AREA (ACRES) = 11.30 PEAK FLOW RATE (CFS) = 40.45

 FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1140.00 DOWNSTREAM ELEVATION (FEET) = 1115.00
 STREET LENGTH (FEET) = 1320.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 62.45
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.64
 HALFSTREET FLOOD WIDTH (FEET) = 23.96
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 5.27

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.67 HALFSTREET FLOOD WIDTH (FEET) = 25.98
 FLOW VELOCITY (FEET/SEC.) = 5.51 DEPTH*VELOCITY (FT*FT/SEC.) = 3.71
 LONGEST FLOWPATH FROM NODE 305.00 TO NODE 307.00 = 2070.00 FEET.

 FLOW PROCESS FROM NODE 307.00 TO NODE 310.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1110.00
 FLOW LENGTH (FEET) = 670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 33.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.20
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 74.94
 PIPE TRAVEL TIME (MIN.) = 1.21 Tc (MIN.) = 14.26
 LONGEST FLOWPATH FROM NODE 305.00 TO NODE 310.00 = 2740.00 FEET.

 FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 14.26
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.316
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	5.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
 SUBAREA AREA (ACRES) = 7.80 SUBAREA RUNOFF (CFS) = 20.59
 EFFECTIVE AREA (ACRES) = 34.80 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42
 TOTAL AREA (ACRES) = 34.8 PEAK FLOW RATE (CFS) = 91.12

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 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.) = 14.26
RAINFALL INTENSITY (INCH/HR) = 3.32
AREA-AVERAGED Fm (INCH/HR) = 0.41
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.42
EFFECTIVE STREAM AREA (ACRES) = 34.80
TOTAL STREAM AREA (ACRES) = 34.80
PEAK FLOW RATE (CFS) AT CONFLUENCE = 91.12

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 and 2.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 and 2.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 257.02 Tc (MIN.) = 14.26
EFFECTIVE AREA (ACRES) = 96.35 AREA-AVERAGED Fm (INCH/HR) = 0.35
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
TOTAL AREA (ACRES) = 105.3
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 3240.00 FEET.

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1110.00 DOWNSTREAM (FEET) = 1076.00
FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 40.6 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 20.05
ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 257.02
PIPE TRAVEL TIME (MIN.) = 1.11 Tc (MIN.) = 15.36
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 311.00 = 4570.00 FEET.

FLOW PROCESS FROM NODE 311.00 TO NODE 311.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 15.36
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.171
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCSS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 18.30 0.98 0.100 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 0.10 0.98 0.200 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 30.90 0.98 0.500 32
COMMERCIAL A 1.30 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.344
SUBAREA AREA (ACRES) = 50.60 SUBAREA RUNOFF (CFS) = 129.10
EFFECTIVE AREA (ACRES) = 146.95 AREA-AVERAGED Fm (INCH/HR) = 0.35
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
TOTAL AREA (ACRES) = 155.9 PEAK FLOW RATE (CFS) = 373.51

FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1076.00 DOWNSTREAM (FEET) = 1055.00
FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 53.3 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 18.18
ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 373.51
PIPE TRAVEL TIME (MIN.) = 1.21 Tc (MIN.) = 16.57
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 312.00 = 5890.00 FEET.

FLOW PROCESS FROM NODE 312.00 TO NODE 312.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 16.57
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.030
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCSS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 15.90 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 32.20 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 0.80 0.98 0.200 32
COMMERCIAL A 1.30 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.358
SUBAREA AREA (ACRES) = 50.20 SUBAREA RUNOFF (CFS) = 121.10
EFFECTIVE AREA (ACRES) = 197.15 AREA-AVERAGED Fm (INCH/HR) = 0.35

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 206.1 PEAK FLOW RATE (CFS) = 475.96

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 211.00 = 9470.00 FEET.

 FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

 FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 IS CODE = 11

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
 =====

=====

ELEVATION DATA: UPSTREAM (FEET) = 1055.00 DOWNSTREAM (FEET) = 1008.00
 FLOW LENGTH (FEET) = 2620.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 55.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 20.40
 ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 475.96
 PIPE TRAVEL TIME (MIN.) = 2.14 Tc (MIN.) = 18.71
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 313.00 = 8510.00 FEET.

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	508.57	19.48	2.750	0.98 (0.34)	0.35	228.5	305.00
2	491.73	21.56	2.587	0.98 (0.34)	0.35	237.5	300.00

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 211.00 = 9470.00 FEET.

 FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	390.01	16.25	3.065	0.97 (0.23)	0.23	148.6	208.00
2	362.49	25.46	2.341	0.97 (0.23)	0.24	184.6	200.00

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	870.03	16.25	3.065	0.97 (0.29)	0.30	339.3	208.00
2	888.94	19.48	2.750	0.97 (0.30)	0.30	389.8	305.00
3	865.87	21.56	2.587	0.98 (0.30)	0.30	406.9	300.00
4	800.42	25.46	2.341	0.98 (0.29)	0.30	422.1	200.00

TOTAL AREA (ACRES) = 422.1

=====

MAINLINE Tc (MIN.) = 18.71
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.817
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.60	0.98	0.200	32
COMMERCIAL	A	0.60	0.98	0.100	32
COMMERCIAL	A	3.60	0.98	0.100	32
SCHOOL	A	4.40	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.334
 SUBAREA AREA (ACRES) = 31.40 SUBAREA RUNOFF (CFS) = 70.40
 EFFECTIVE AREA (ACRES) = 228.55 AREA-AVERAGED Fm (INCH/HR) = 0.34
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
 TOTAL AREA (ACRES) = 237.5 PEAK FLOW RATE (CFS) = 508.57

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 888.94 Tc (MIN.) = 19.478
 EFFECTIVE AREA (ACRES) = 389.77 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
 TOTAL AREA (ACRES) = 422.1
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

 FLOW PROCESS FROM NODE 313.00 TO NODE 211.00 IS CODE = 31

=====

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 422.1 TC (MIN.) = 19.48
 EFFECTIVE AREA (ACRES) = 389.77 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.303
 PEAK FLOW RATE (CFS) = 888.94

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	870.03	16.25	3.065	0.97 (0.29)	0.30	339.3	208.00
2	888.94	19.48	2.750	0.97 (0.30)	0.30	389.8	305.00
3	865.87	21.56	2.587	0.98 (0.30)	0.30	406.9	300.00
4	800.42	25.46	2.341	0.98 (0.29)	0.30	422.1	200.00

=====

ELEVATION DATA: UPSTREAM (FEET) = 1008.00 DOWNSTREAM (FEET) = 990.00
 FLOW LENGTH (FEET) = 960.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 57.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 20.91
 ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 508.57
 PIPE TRAVEL TIME (MIN.) = 0.77 Tc (MIN.) = 19.48

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

- * ONTARIO MASTER PLAN PF DRAINAGE - BASIN V (AREA B & C)
* 25-YEAR HYDROLOGY ANALYSIS
* P. PAGADUAN 7-26-2011

FILE NAME: VB25.DAT
TIME/DATE OF STUDY: 17:04 07/26/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), IN- / OUT- / PARK- SIDE / SIDE/ WAY, HEIGHT (FT), WIDTH (FT), LIP (FT), HIKE (FT), FACTOR (n). Contains 2 rows of data.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, RAINFALL (INCH). Lists values for 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

=====
FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21
=====

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 760.00
ELEVATION DATA: UPSTREAM(FEET) = 1165.00 DOWNSTREAM(FEET) = 1148.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.231
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.494
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.60 0.98 0.100 32 9.23
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 4.40 0.98 0.500 32 11.81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.393
SUBAREA RUNOFF (CFS) = 16.80
TOTAL AREA (ACRES) = 6.00 PEAK FLOW RATE (CFS) = 16.80

=====
FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62
=====

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

=====
UPSTREAM ELEVATION (FEET) = 1148.00 DOWNSTREAM ELEVATION (FEET) = 1145.00
STREET LENGTH (FEET) = 740.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 30.33

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.65

HALFSTREET FLOOD WIDTH(FEET) = 24.38

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.47

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.60

STREET FLOW TRAVEL TIME(MIN.) = 4.99 Tc(MIN.) = 14.22

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.696

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.355
SUBAREA AREA(ACRES) = 12.70 SUBAREA RUNOFF(CFS) = 26.86
EFFECTIVE AREA(ACRES) = 18.70 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 18.7 PEAK FLOW RATE(CFS) = 39.35

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.70 HALFSTREET FLOOD WIDTH(FEET) = 28.51

FLOW VELOCITY(FEET/SEC.) = 2.63 DEPTH*VELOCITY(FT*FT/SEC.) = 1.83

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1500.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1145.00 DOWNSTREAM(FEET) = 1118.00
FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 27.0 INCH PIPE IS 22.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.32
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 39.35
PIPE TRAVEL TIME(MIN.) = 1.96 Tc(MIN.) = 16.18
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 2830.00 FEET.

FLOW PROCESS FROM NODE 203.00 TO NODE 203.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 16.18
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.495
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.00	0.98	0.500	32
SCHOOL	A	1.80	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.374
SUBAREA AREA(ACRES) = 26.60 SUBAREA RUNOFF(CFS) = 50.99
EFFECTIVE AREA(ACRES) = 45.30 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 45.3 PEAK FLOW RATE(CFS) = 86.96

FLOW PROCESS FROM NODE 203.00 TO NODE 204.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1118.00 DOWNSTREAM(FEET) = 1082.00
FLOW LENGTH(FEET) = 1980.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.53
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 86.96
PIPE TRAVEL TIME(MIN.) = 2.44 Tc(MIN.) = 18.62
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 204.00 = 4810.00 FEET.

FLOW PROCESS FROM NODE 204.00 TO NODE 204.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 18.62
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.294
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	1.70	0.98	0.500	32
SCHOOL	A	3.50	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.343
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 17.63
EFFECTIVE AREA(ACRES) = 55.30 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 55.3 PEAK FLOW RATE(CFS) = 96.37

FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1082.00 DOWNSTREAM(FEET) = 1058.00

FLOW LENGTH(FEET) = 1120.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.73
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 96.37
PIPE TRAVEL TIME(MIN.) = 1.27 Tc(MIN.) = 19.88
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 205.00 = 5930.00 FEET.

FLOW PROCESS FROM NODE 205.00 TO NODE 205.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 19.88
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.205
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	1.70	0.98	0.500	32
COMMERCIAL	A	0.30	0.98	0.100	32
COMMERCIAL	A	1.10	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.203
SUBAREA AREA(ACRES) = 6.60 SUBAREA RUNOFF(CFS) = 11.92
EFFECTIVE AREA(ACRES) = 61.90 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 61.9 PEAK FLOW RATE(CFS) = 103.87

FLOW PROCESS FROM NODE 205.00 TO NODE 206.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1024.00
FLOW LENGTH(FEET) = 1980.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.83
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 103.87
PIPE TRAVEL TIME(MIN.) = 2.39 Tc(MIN.) = 22.27
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 206.00 = 7910.00 FEET.

FLOW PROCESS FROM NODE 206.00 TO NODE 206.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 22.27
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.060
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.50	0.98	0.100	32

COMMERCIAL A 7.80 0.98 0.100 32
COMMERCIAL A 1.70 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 21.00 SUBAREA RUNOFF(CFS) = 37.09
EFFECTIVE AREA(ACRES) = 82.90 AREA-AVERAGED Fm(INCH/HR) = 0.28
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.29
TOTAL AREA(ACRES) = 82.9 PEAK FLOW RATE(CFS) = 132.88

FLOW PROCESS FROM NODE 206.00 TO NODE 207.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1024.00 DOWNSTREAM(FEET) = 997.00
FLOW LENGTH(FEET) = 1592.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.51
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 132.88
PIPE TRAVEL TIME(MIN.) = 1.83 Tc(MIN.) = 24.10
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 9502.00 FEET.

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 24.10
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.965
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.90	0.98	0.100	32
COMMERCIAL	A	7.00	0.98	0.100	32
PUBLIC PARK	A	0.70	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.132
SUBAREA AREA(ACRES) = 16.60 SUBAREA RUNOFF(CFS) = 27.43
EFFECTIVE AREA(ACRES) = 99.50 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
TOTAL AREA(ACRES) = 99.5 PEAK FLOW RATE(CFS) = 153.21

FLOW PROCESS FROM NODE 207.00 TO NODE 211.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 997.00 DOWNSTREAM(FEET) = 990.00
FLOW LENGTH(FEET) = 1370.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 45.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.62
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 153.21

PIPE TRAVEL TIME(MIN.) = 2.37 Tc(MIN.) = 26.47
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 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.) = 26.47
RAINFALL INTENSITY(INCH/HR) = 1.86
AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.26
EFFECTIVE STREAM AREA(ACRES) = 99.50
TOTAL STREAM AREA(ACRES) = 99.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 153.21

FLOW PROCESS FROM NODE 208.00 TO NODE 209.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 750.00
ELEVATION DATA: UPSTREAM(FEET) = 1055.00 DOWNSTREAM(FEET) = 1045.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.184
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.294
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.90	0.98	0.100	32	10.18
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	10.80	0.98	0.500	32	13.03

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.415
SUBAREA RUNOFF(CFS) = 35.62
TOTAL AREA(ACRES) = 13.70 PEAK FLOW RATE(CFS) = 35.62

FLOW PROCESS FROM NODE 209.00 TO NODE 210.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1045.00 DOWNSTREAM ELEVATION(FEET) = 1021.00
STREET LENGTH(FEET) = 1330.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 65.20

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.65
HALFSTREET FLOOD WIDTH(FEET) = 24.59
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.23
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.40
STREET FLOW TRAVEL TIME(MIN.) = 4.24 Tc(MIN.) = 14.42
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.673

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.50	0.98	0.100	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	11.40	0.98	0.200	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	7.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.246
SUBAREA AREA(ACRES) = 26.90 SUBAREA RUNOFF(CFS) = 58.90
EFFECTIVE AREA(ACRES) = 40.60 AREA-AVERAGED Fm(INCH/HR) = 0.30
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
TOTAL AREA(ACRES) = 40.6 PEAK FLOW RATE(CFS) = 86.86

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 29.46
FLOW VELOCITY(FEET/SEC.) = 5.60 DEPTH*VELOCITY(FT*FT/SEC.) = 3.96
LONGEST FLOWPATH FROM NODE 208.00 TO NODE 210.00 = 2080.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 211.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1021.00 DOWNSTREAM(FEET) = 990.00
FLOW LENGTH(FEET) = 1750.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.38
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 86.86
PIPE TRAVEL TIME(MIN.) = 2.18 Tc(MIN.) = 16.61
LONGEST FLOWPATH FROM NODE 208.00 TO NODE 211.00 = 3830.00 FEET.

FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 16.61
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.457
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.60	0.98	0.100	32
COMMERCIAL	A	16.60	0.98	0.100	32
PUBLIC PARK	A	1.40	0.98	0.850	32
COMMERCIAL	A	11.90	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.124
SUBAREA AREA (ACRES) = 44.50 SUBAREA RUNOFF (CFS) = 93.56
EFFECTIVE AREA (ACRES) = 85.10 AREA-AVERAGED Fm (INCH/HR) = 0.20
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
TOTAL AREA (ACRES) = 85.1 PEAK FLOW RATE (CFS) = 172.51

FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 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.) = 16.61
RAINFALL INTENSITY (INCH/HR) = 2.46
AREA-AVERAGED Fm (INCH/HR) = 0.20
AREA-AVERAGED Fp (INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.21
EFFECTIVE STREAM AREA (ACRES) = 85.10
TOTAL STREAM AREA (ACRES) = 85.10
PEAK FLOW RATE (CFS) AT CONFLUENCE = 172.51

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	153.21	26.47	1.857	0.97 (0.25)	0.26	99.5	200.00
2	172.51	16.61	2.457	0.97 (0.20)	0.21	85.1	208.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	304.55	16.61	2.457	0.97 (0.23)	0.23	147.5	208.00
2	279.79	26.47	1.857	0.97 (0.23)	0.24	184.6	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 304.55 Tc (MIN.) = 16.61
EFFECTIVE AREA (ACRES) = 147.51 AREA-AVERAGED Fm (INCH/HR) = 0.23
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.23
TOTAL AREA (ACRES) = 184.6
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<<

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 870.00
ELEVATION DATA: UPSTREAM (FEET) = 1160.00 DOWNSTREAM (FEET) = 1148.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.734
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.192

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.10	0.98	0.100	32	10.73
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	3.80	0.98	0.500	32	13.73

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.320
SUBAREA RUNOFF (CFS) = 17.88
TOTAL AREA (ACRES) = 6.90 PEAK FLOW RATE (CFS) = 17.88

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION (FEET) = 1148.00 DOWNSTREAM ELEVATION (FEET) = 1142.00
STREET LENGTH (FEET) = 330.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 31.18

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.53
HALFSTREET FLOOD WIDTH (FEET) = 18.37
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.37
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.30
STREET FLOW TRAVEL TIME (MIN.) = 1.26 Tc (MIN.) = 11.99
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.986

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	0.98	0.100	32

RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 8.00 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
 SUBAREA AREA (ACRES) = 11.30 SUBAREA RUNOFF (CFS) = 26.57
 EFFECTIVE AREA (ACRES) = 18.20 AREA-AVERAGED Fm (INCH/HR) = 0.35
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 18.2 PEAK FLOW RATE (CFS) = 43.18

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.58 HALFSTREET FLOOD WIDTH (FEET) = 20.90
 FLOW VELOCITY (FEET/SEC.) = 4.74 DEPTH*VELOCITY (FT*FT/SEC.) = 2.73
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1200.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

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UPSTREAM ELEVATION (FEET) = 1142.00 DOWNSTREAM ELEVATION (FEET) = 1115.00
 STREET LENGTH (FEET) = 1310.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 78.77
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.67
 HALFSTREET FLOOD WIDTH (FEET) = 26.08
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 5.77
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.89
 STREET FLOW TRAVEL TIME (MIN.) = 3.78 Tc (MIN.) = 15.77
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.533

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.60	0.98	0.100	32
CONDOMINIUMS	A	25.00	0.98	0.350	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	0.30	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.280
 SUBAREA AREA (ACRES) = 34.90 SUBAREA RUNOFF (CFS) = 71.00
 EFFECTIVE AREA (ACRES) = 53.10 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 53.1 PEAK FLOW RATE (CFS) = 106.76

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.74 HALFSTREET FLOOD WIDTH (FEET) = 32.41
 FLOW VELOCITY (FEET/SEC.) = 6.16 DEPTH*VELOCITY (FT*FT/SEC.) = 4.53
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1310.0 FT WITH ELEVATION-DROP = 27.0 FT, IS 86.8 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 303.00
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2510.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1102.00
 FLOW LENGTH (FEET) = 730.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.10
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 106.76
 PIPE TRAVEL TIME (MIN.) = 0.86 Tc (MIN.) = 16.64
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 3240.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 16.64
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.454
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.50	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	12.90	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397
 SUBAREA AREA (ACRES) = 17.40 SUBAREA RUNOFF (CFS) = 32.37
 EFFECTIVE AREA (ACRES) = 70.50 AREA-AVERAGED Fm (INCH/HR) = 0.32
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA (ACRES) = 70.5 PEAK FLOW RATE (CFS) = 135.33

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 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.) = 16.64
 RAINFALL INTENSITY (INCH/HR) = 2.45
 AREA-AVERAGED Fm (INCH/HR) = 0.32
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.33
 EFFECTIVE STREAM AREA (ACRES) = 70.50
 TOTAL STREAM AREA (ACRES) = 70.50

PEAK FLOW RATE(CFS) AT CONFLUENCE = 135.33

FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 750.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1140.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.866

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.580

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.80	0.98	0.100	32	8.87
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	3.70	0.98	0.500	32	11.34
SCHOOL	A	4.80	0.98	0.600	32	12.02

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.443

SUBAREA RUNOFF(CFS) = 32.01

TOTAL AREA(ACRES) = 11.30 PEAK FLOW RATE(CFS) = 32.01

FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1140.00 DOWNSTREAM ELEVATION(FEET) = 1115.00

STREET LENGTH(FEET) = 1320.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 49.12

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.59

HALFSTREET FLOOD WIDTH(FEET) = 21.80

AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.97

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.95

STREET FLOW TRAVEL TIME(MIN.) = 4.43 Tc(MIN.) = 13.29

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.808

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	5.70	0.98	0.500	32

COMMERCIAL A 3.50 0.98 0.100 32

RESIDENTIAL

"5-7 DWELLINGS/ACRE" A 12.20 0.98 0.500 32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.411

SUBAREA AREA(ACRES) = 15.70 SUBAREA RUNOFF(CFS) = 34.01

EFFECTIVE AREA(ACRES) = 27.00 AREA-AVERAGED Fm(INCH/HR) = 0.41

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42

TOTAL AREA(ACRES) = 27.0 PEAK FLOW RATE(CFS) = 58.17

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 23.27

FLOW VELOCITY(FEET/SEC.) = 5.19 DEPTH*VELOCITY(FT*FT/SEC.) = 3.24

LONGEST FLOWPATH FROM NODE 305.00 TO NODE 307.00 = 2070.00 FEET.

FLOW PROCESS FROM NODE 307.00 TO NODE 310.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1115.00 DOWNSTREAM(FEET) = 1110.00

FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 39.0 INCH PIPE IS 29.2 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 8.72

ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 58.17

PIPE TRAVEL TIME(MIN.) = 1.28 Tc(MIN.) = 14.57

LONGEST FLOWPATH FROM NODE 305.00 TO NODE 310.00 = 2740.00 FEET.

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 14.57

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.657

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	5.70	0.98	0.500	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.392

SUBAREA AREA(ACRES) = 7.80 SUBAREA RUNOFF(CFS) = 15.97

EFFECTIVE AREA(ACRES) = 34.80 AREA-AVERAGED Fm(INCH/HR) = 0.41

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.42

TOTAL AREA(ACRES) = 34.8 PEAK FLOW RATE(CFS) = 70.47

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 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.) = 14.57
 RAINFALL INTENSITY (INCH/HR) = 2.66
 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.42
 EFFECTIVE STREAM AREA (ACRES) = 34.80
 TOTAL STREAM AREA (ACRES) = 34.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 70.47

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	135.33	16.64	2.454	0.98 (0.32)	0.33	70.5	300.00
2	70.47	14.57	2.657	0.98 (0.41)	0.42	34.8	305.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	200.29	14.57	2.657	0.98 (0.35)	0.36	96.6	305.00
2	199.44	16.64	2.454	0.98 (0.35)	0.36	105.3	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 200.29 Tc (MIN.) = 14.57
 EFFECTIVE AREA (ACRES) = 96.55 AREA-AVERAGED Fm (INCH/HR) = 0.35
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 105.3
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 3240.00 FEET.

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1110.00 DOWNSTREAM (FEET) = 1076.00
 FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 18.63
 ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 200.29
 PIPE TRAVEL TIME (MIN.) = 1.19 Tc (MIN.) = 15.76
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 311.00 = 4570.00 FEET.

FLOW PROCESS FROM NODE 311.00 TO NODE 311.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 15.76
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.535
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.30	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.10	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	30.90	0.98	0.500	32
COMMERCIAL	A	1.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.344
 SUBAREA AREA (ACRES) = 50.60 SUBAREA RUNOFF (CFS) = 100.13
 EFFECTIVE AREA (ACRES) = 147.15 AREA-AVERAGED Fm (INCH/HR) = 0.35
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 155.9 PEAK FLOW RATE (CFS) = 289.80

FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1076.00 DOWNSTREAM (FEET) = 1055.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 48.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 17.06
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 289.80
 PIPE TRAVEL TIME (MIN.) = 1.29 Tc (MIN.) = 17.05
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 312.00 = 5890.00 FEET.

FLOW PROCESS FROM NODE 312.00 TO NODE 312.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 17.05
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.418
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	32.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.80	0.98	0.200	32
COMMERCIAL	A	1.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.358
 SUBAREA AREA (ACRES) = 50.20 SUBAREA RUNOFF (CFS) = 93.46
 EFFECTIVE AREA (ACRES) = 197.35 AREA-AVERAGED Fm (INCH/HR) = 0.35
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 206.1 PEAK FLOW RATE (CFS) = 367.78

FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1055.00 DOWNSTREAM(FEET) = 1008.00
 FLOW LENGTH(FEET) = 2620.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 49.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 19.20
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 367.78
 PIPE TRAVEL TIME(MIN.) = 2.27 Tc(MIN.) = 19.33
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 313.00 = 8510.00 FEET.

 FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.33
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.243
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 9.50 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 12.70 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 0.60 0.98 0.200 32
 COMMERCIAL A 0.60 0.98 0.100 32
 COMMERCIAL A 3.60 0.98 0.100 32
 SCHOOL A 4.40 0.98 0.600 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.334
 SUBAREA AREA(ACRES) = 31.40 SUBAREA RUNOFF(CFS) = 54.18
 EFFECTIVE AREA(ACRES) = 228.75 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 237.5 PEAK FLOW RATE(CFS) = 390.88

 FLOW PROCESS FROM NODE 313.00 TO NODE 211.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1008.00 DOWNSTREAM(FEET) = 990.00
 FLOW LENGTH(FEET) = 960.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 51.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 19.70
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 390.88
 PIPE TRAVEL TIME(MIN.) = 0.81 Tc(MIN.) = 20.14
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 211.00 = 9470.00 FEET.

 FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

***** MAIN STREAM CONFLUENCE DATA *****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	390.88	20.14	2.188	0.97 (0.34)	0.35	228.8	305.00
2	376.93	22.27	2.060	0.98 (0.34)	0.35	237.5	300.00

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 211.00 = 9470.00 FEET.

***** MEMORY BANK # 1 CONFLUENCE DATA *****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	304.55	16.61	2.457	0.97 (0.23)	0.23	147.5	208.00
2	279.79	26.47	1.857	0.97 (0.23)	0.24	184.6	200.00

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

***** PEAK FLOW RATE TABLE *****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	673.78	16.61	2.457	0.97 (0.29)	0.30	336.1	208.00
2	686.57	20.14	2.188	0.97 (0.30)	0.30	389.5	305.00
3	667.28	22.27	2.060	0.98 (0.30)	0.30	406.3	300.00
4	612.10	26.47	1.857	0.98 (0.29)	0.30	422.1	200.00

TOTAL AREA(ACRES) = 422.1

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 686.57 Tc(MIN.) = 20.138
 EFFECTIVE AREA(ACRES) = 389.55 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
 TOTAL AREA(ACRES) = 422.1
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 422.1 TC(MIN.) = 20.14
 EFFECTIVE AREA(ACRES) = 389.55 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.303
 PEAK FLOW RATE(CFS) = 686.57

***** PEAK FLOW RATE TABLE *****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	673.78	16.61	2.457	0.97 (0.29)	0.30	336.1	208.00
2	686.57	20.14	2.188	0.97 (0.30)	0.30	389.5	305.00
3	667.28	22.27	2.060	0.98 (0.30)	0.30	406.3	300.00
4	612.10	26.47	1.857	0.98 (0.29)	0.30	422.1	200.00

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA B & C) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-26-2011 *

FILE NAME: VB10.DAT
TIME/DATE OF STUDY: 17:09 07/26/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-/SIDE/SIDE/WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), HIKE (FT), MANNING FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES (0.33), 30-MINUTES (0.68), 1-HOUR (0.90), 3-HOUR (1.60), 6-HOUR (2.31), 24-HOUR (4.36).

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 760.00
ELEVATION DATA: UPSTREAM(FEET) = 1165.00 DOWNSTREAM(FEET) = 1148.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.231
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.074
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.60 1.33 0.100 17 9.23
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 4.40 1.33 0.500 17 11.81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.393
SUBAREA RUNOFF(CFS) = 13.78
TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 13.78

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1148.00 DOWNSTREAM ELEVATION(FEET) = 1145.00
STREET LENGTH(FEET) = 740.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 24.60
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.61
 HALFSTREET FLOOD WIDTH(FEET) = 22.48
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.35
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.43
 STREET FLOW TRAVEL TIME(MIN.) = 5.26 Tc(MIN.) = 14.49
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.346

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.60	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.10	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.355
 SUBAREA AREA(ACRES) = 12.70 SUBAREA RUNOFF(CFS) = 21.42
 EFFECTIVE AREA(ACRES) = 18.70 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 18.7 PEAK FLOW RATE(CFS) = 31.26

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 24.70
 FLOW VELOCITY(FEET/SEC.) = 2.49 DEPTH*VELOCITY(FT*FT/SEC.) = 1.62
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1500.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1145.00 DOWNSTREAM(FEET) = 1118.00
 FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.01
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 31.26
 PIPE TRAVEL TIME(MIN.) = 2.01 Tc(MIN.) = 16.50
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 2830.00 FEET.

 FLOW PROCESS FROM NODE 203.00 TO NODE 203.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 16.50
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.169
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.60	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.10	1.33	0.500	17

COMMERCIAL	A	8.80	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.00	1.33	0.500	17
SCHOOL	A	1.80	1.33	0.600	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.374
 SUBAREA AREA(ACRES) = 26.60 SUBAREA RUNOFF(CFS) = 40.03
 EFFECTIVE AREA(ACRES) = 45.30 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 45.3 PEAK FLOW RATE(CFS) = 68.33

 FLOW PROCESS FROM NODE 203.00 TO NODE 204.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1118.00 DOWNSTREAM(FEET) = 1082.00
 FLOW LENGTH(FEET) = 1980.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 25.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.77
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 68.33
 PIPE TRAVEL TIME(MIN.) = 2.58 Tc(MIN.) = 19.09
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 204.00 = 4810.00 FEET.

 FLOW PROCESS FROM NODE 204.00 TO NODE 204.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 19.09
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.988
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.80	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	1.70	1.33	0.500	17
SCHOOL	A	3.50	1.33	0.600	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.343
 SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 13.79
 EFFECTIVE AREA(ACRES) = 55.30 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 55.3 PEAK FLOW RATE(CFS) = 74.73

 FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1082.00 DOWNSTREAM(FEET) = 1058.00
 FLOW LENGTH(FEET) = 1120.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 25.6 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 13.88
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 74.73
 PIPE TRAVEL TIME (MIN.) = 1.34 Tc (MIN.) = 20.43
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 205.00 = 5930.00 FEET.

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 21.00 SUBAREA RUNOFF (CFS) = 31.12
 EFFECTIVE AREA (ACRES) = 82.90 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 82.9 PEAK FLOW RATE (CFS) = 104.44

 FLOW PROCESS FROM NODE 205.00 TO NODE 205.00 IS CODE = 81

 FLOW PROCESS FROM NODE 206.00 TO NODE 207.00 IS CODE = 31

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

=====

MAINLINE Tc (MIN.) = 20.43
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.909
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	1.70	1.33	0.500	17
COMMERCIAL	A	0.30	1.33	0.100	17
COMMERCIAL	A	1.10	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.203
 SUBAREA AREA (ACRES) = 6.60 SUBAREA RUNOFF (CFS) = 9.74
 EFFECTIVE AREA (ACRES) = 61.90 AREA-AVERAGED Fm (INCH/HR) = 0.46
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
 TOTAL AREA (ACRES) = 61.9 PEAK FLOW RATE (CFS) = 80.51

=====

ELEVATION DATA: UPSTREAM (FEET) = 1024.00 DOWNSTREAM (FEET) = 997.00
 FLOW LENGTH (FEET) = 1592.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.77
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 104.44
 PIPE TRAVEL TIME (MIN.) = 1.93 Tc (MIN.) = 24.89
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 9502.00 FEET.

 FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 FLOW PROCESS FROM NODE 205.00 TO NODE 206.00 IS CODE = 31

=====

MAINLINE Tc (MIN.) = 24.89
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.695
 SUBAREA LOSS RATE DATA (AMC I):

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1058.00 DOWNSTREAM (FEET) = 1024.00
 FLOW LENGTH (FEET) = 1980.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.05
 ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 80.51
 PIPE TRAVEL TIME (MIN.) = 2.53 Tc (MIN.) = 22.96
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 206.00 = 7910.00 FEET.

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.90	1.33	0.100	17
COMMERCIAL	A	7.00	1.33	0.100	17
PUBLIC PARK	A	0.70	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.132
 SUBAREA AREA (ACRES) = 16.60 SUBAREA RUNOFF (CFS) = 22.72
 EFFECTIVE AREA (ACRES) = 99.50 AREA-AVERAGED Fm (INCH/HR) = 0.35
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.26
 TOTAL AREA (ACRES) = 99.5 PEAK FLOW RATE (CFS) = 120.89

 FLOW PROCESS FROM NODE 207.00 TO NODE 211.00 IS CODE = 31

 FLOW PROCESS FROM NODE 206.00 TO NODE 206.00 IS CODE = 81

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

=====

MAINLINE Tc (MIN.) = 22.96
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.779
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.50	1.33	0.100	17
COMMERCIAL	A	7.80	1.33	0.100	17
COMMERCIAL	A	1.70	1.33	0.100	17

=====

ELEVATION DATA: UPSTREAM (FEET) = 997.00 DOWNSTREAM (FEET) = 990.00
 FLOW LENGTH (FEET) = 1370.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.00
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 120.89
 PIPE TRAVEL TIME (MIN.) = 2.54 Tc (MIN.) = 27.42
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 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.) = 27.42
RAINFALL INTENSITY (INCH/HR) = 1.60
AREA-AVERAGED Fm (INCH/HR) = 0.35
AREA-AVERAGED Fp (INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.26
EFFECTIVE STREAM AREA (ACRES) = 99.50
TOTAL STREAM AREA (ACRES) = 99.50
PEAK FLOW RATE (CFS) AT CONFLUENCE = 120.89

FLOW PROCESS FROM NODE 208.00 TO NODE 209.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 750.00
ELEVATION DATA: UPSTREAM (FEET) = 1055.00 DOWNSTREAM (FEET) = 1045.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.184
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.898
SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.90	1.33	0.100	17	10.18
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	10.80	1.33	0.500	17	13.03

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.415
SUBAREA RUNOFF (CFS) = 28.94
TOTAL AREA (ACRES) = 13.70 PEAK FLOW RATE (CFS) = 28.94

FLOW PROCESS FROM NODE 209.00 TO NODE 210.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1045.00 DOWNSTREAM ELEVATION (FEET) = 1021.00
STREET LENGTH (FEET) = 1330.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 53.29

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.61
HALFSTREET FLOOD WIDTH (FEET) = 22.69
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.99
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.05
STREET FLOW TRAVEL TIME (MIN.) = 4.44 Tc (MIN.) = 14.63
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.333

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.50	1.33	0.100	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.40	1.33	0.200	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.00	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.246
SUBAREA AREA (ACRES) = 26.90 SUBAREA RUNOFF (CFS) = 48.55
EFFECTIVE AREA (ACRES) = 40.60 AREA-AVERAGED Fm (INCH/HR) = 0.40
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.30
TOTAL AREA (ACRES) = 40.6 PEAK FLOW RATE (CFS) = 70.51

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.66 HALFSTREET FLOOD WIDTH (FEET) = 25.33
FLOW VELOCITY (FEET/SEC.) = 5.34 DEPTH*VELOCITY (FT*FT/SEC.) = 3.55
LONGEST FLOWPATH FROM NODE 208.00 TO NODE 210.00 = 2080.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 211.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1021.00 DOWNSTREAM (FEET) = 990.00
FLOW LENGTH (FEET) = 1750.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.4 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 12.69
ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 70.51
PIPE TRAVEL TIME (MIN.) = 2.30 Tc (MIN.) = 16.92
LONGEST FLOWPATH FROM NODE 208.00 TO NODE 211.00 = 3830.00 FEET.

FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 16.92
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.137
SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN

COMMERCIAL A 14.60 1.33 0.100 17
 COMMERCIAL A 16.60 1.33 0.100 17
 PUBLIC PARK A 1.40 1.33 0.850 17
 COMMERCIAL A 11.90 1.33 0.100 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.124
 SUBAREA AREA (ACRES) = 44.50 SUBAREA RUNOFF (CFS) = 79.01
 EFFECTIVE AREA (ACRES) = 85.10 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.21
 TOTAL AREA (ACRES) = 85.1 PEAK FLOW RATE (CFS) = 142.37

 FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 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.) = 16.92
 RAINFALL INTENSITY (INCH/HR) = 2.14
 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.21
 EFFECTIVE STREAM AREA (ACRES) = 85.10
 TOTAL STREAM AREA (ACRES) = 85.10
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 142.37

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	120.89	27.42	1.600	1.33 (0.35)	0.26	99.5	200.00
2	142.37	16.92	2.137	1.33 (0.28)	0.21	85.1	208.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	248.94	16.92	2.137	1.33 (0.31)	0.23	146.5	208.00
2	222.11	27.42	1.600	1.33 (0.31)	0.24	184.6	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 248.94 Tc (MIN.) = 16.92
 EFFECTIVE AREA (ACRES) = 146.50 AREA-AVERAGED Fm (INCH/HR) = 0.31
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.23
 TOTAL AREA (ACRES) = 184.6
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

 FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 870.00
 ELEVATION DATA: UPSTREAM (FEET) = 1160.00 DOWNSTREAM (FEET) = 1148.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.734
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.808

SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.10	1.33	0.100	17	10.73
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	3.80	1.33	0.500	17	13.73

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.320
 SUBAREA RUNOFF (CFS) = 14.80
 TOTAL AREA (ACRES) = 6.90 PEAK FLOW RATE (CFS) = 14.80

 FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1148.00 DOWNSTREAM ELEVATION (FEET) = 1142.00
 STREET LENGTH (FEET) = 330.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 25.54
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.50
 HALFSTREET FLOOD WIDTH (FEET) = 16.94
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.17
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.07
 STREET FLOW TRAVEL TIME (MIN.) = 1.32 Tc (MIN.) = 12.05
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.620

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.00	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
 SUBAREA AREA (ACRES) = 11.30 SUBAREA RUNOFF (CFS) = 21.47
 EFFECTIVE AREA (ACRES) = 18.20 AREA-AVERAGED Fm (INCH/HR) = 0.48
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 18.2 PEAK FLOW RATE (CFS) = 35.09

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.54 HALFSTREET FLOOD WIDTH (FEET) = 19.21
 FLOW VELOCITY (FEET/SEC.) = 4.52 DEPTH*VELOCITY (FT*FT/SEC.) = 2.45
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1200.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1142.00 DOWNSTREAM ELEVATION (FEET) = 1115.00
 STREET LENGTH (FEET) = 1310.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 64.01

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.63
 HALFSTREET FLOOD WIDTH (FEET) = 23.80
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 5.47
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.47

STREET FLOW TRAVEL TIME (MIN.) = 3.99 Tc (MIN.) = 16.04

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.206

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.60	1.33	0.100	17
CONDOMINIUMS	A	25.00	1.33	0.350	17
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	0.30	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.280
 SUBAREA AREA (ACRES) = 34.90 SUBAREA RUNOFF (CFS) = 57.63
 EFFECTIVE AREA (ACRES) = 53.10 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 53.1 PEAK FLOW RATE (CFS) = 85.95

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.69 HALFSTREET FLOOD WIDTH (FEET) = 27.87
 FLOW VELOCITY (FEET/SEC.) = 5.88 DEPTH*VELOCITY (FT*FT/SEC.) = 4.07

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2510.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1102.00
 FLOW LENGTH (FEET) = 730.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.2 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 13.39
 ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 85.95

PIPE TRAVEL TIME (MIN.) = 0.91 Tc (MIN.) = 16.95
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 3240.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 16.95

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.135

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.50	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	12.90	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397

SUBAREA AREA (ACRES) = 17.40 SUBAREA RUNOFF (CFS) = 25.18

EFFECTIVE AREA (ACRES) = 70.50 AREA-AVERAGED Fm (INCH/HR) = 0.44

AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.33

TOTAL AREA (ACRES) = 70.5 PEAK FLOW RATE (CFS) = 107.70

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 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.) = 16.95

RAINFALL INTENSITY (INCH/HR) = 2.13

AREA-AVERAGED Fm (INCH/HR) = 0.44

AREA-AVERAGED Fp (INCH/HR) = 1.33

AREA-AVERAGED Ap = 0.33

EFFECTIVE STREAM AREA (ACRES) = 70.50

TOTAL STREAM AREA (ACRES) = 70.50

PEAK FLOW RATE (CFS) AT CONFLUENCE = 107.70

FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 750.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1140.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.866
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.150
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.80 1.33 0.100 17 8.87
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 3.70 1.33 0.500 17 11.34
SCHOOL A 4.80 1.33 0.600 17 12.02
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.443
SUBAREA RUNOFF(CFS) = 26.04
TOTAL AREA(ACRES) = 11.30 PEAK FLOW RATE(CFS) = 26.04

FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1140.00 DOWNSTREAM ELEVATION(FEET) = 1115.00
STREET LENGTH(FEET) = 1320.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 39.55
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.56
HALFSTREET FLOOD WIDTH(FEET) = 20.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.72
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.63
STREET FLOW TRAVEL TIME(MIN.) = 4.66 Tc(MIN.) = 13.53
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.444

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.50 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 12.20 1.33 0.500 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.411

SUBAREA AREA(ACRES) = 15.70 SUBAREA RUNOFF(CFS) = 26.83
EFFECTIVE AREA(ACRES) = 27.00 AREA-AVERAGED Fm(INCH/HR) = 0.56
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.42
TOTAL AREA(ACRES) = 27.0 PEAK FLOW RATE(CFS) = 45.70

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.58 HALFSTREET FLOOD WIDTH(FEET) = 21.16
FLOW VELOCITY(FEET/SEC.) = 4.89 DEPTH*VELOCITY(FT*FT/SEC.) = 2.85
LONGEST FLOWPATH FROM NODE 305.00 TO NODE 307.00 = 2070.00 FEET.

FLOW PROCESS FROM NODE 307.00 TO NODE 310.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1115.00 DOWNSTREAM(FEET) = 1110.00
FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.24
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 45.70
PIPE TRAVEL TIME(MIN.) = 1.36 Tc(MIN.) = 14.88
LONGEST FLOWPATH FROM NODE 305.00 TO NODE 310.00 = 2740.00 FEET.

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 14.88
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.308
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.10 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 5.70 1.33 0.500 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
SUBAREA AREA(ACRES) = 7.80 SUBAREA RUNOFF(CFS) = 12.55
EFFECTIVE AREA(ACRES) = 34.80 AREA-AVERAGED Fm(INCH/HR) = 0.55
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.42
TOTAL AREA(ACRES) = 34.8 PEAK FLOW RATE(CFS) = 54.94

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 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.) = 14.88
RAINFALL INTENSITY(INCH/HR) = 2.31
AREA-AVERAGED Fm(INCH/HR) = 0.55

AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.42
 EFFECTIVE STREAM AREA (ACRES) = 34.80
 TOTAL STREAM AREA (ACRES) = 34.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 54.94

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	107.70	16.95	2.135	1.33 (0.44)	0.33	70.5	300.00
2	54.94	14.88	2.308	1.33 (0.55)	0.42	34.8	305.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	159.15	14.88	2.308	1.33 (0.48)	0.36	96.7	305.00
2	157.21	16.95	2.135	1.33 (0.48)	0.36	105.3	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 159.15 Tc (MIN.) = 14.88
 EFFECTIVE AREA (ACRES) = 96.69 AREA-AVERAGED Fm (INCH/HR) = 0.48
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 105.3
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 3240.00 FEET.

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1110.00 DOWNSTREAM (FEET) = 1076.00
 FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 17.77
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 159.15
 PIPE TRAVEL TIME (MIN.) = 1.25 Tc (MIN.) = 16.13
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 311.00 = 4570.00 FEET.

FLOW PROCESS FROM NODE 311.00 TO NODE 311.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 16.13

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.199

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.30	1.33	0.100	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.10	1.33	0.200	17

RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 30.90 1.33 0.500 17
 COMMERCIAL A 1.30 1.33 0.100 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.344
 SUBAREA AREA (ACRES) = 50.60 SUBAREA RUNOFF (CFS) = 79.32
 EFFECTIVE AREA (ACRES) = 147.29 AREA-AVERAGED Fm (INCH/HR) = 0.47
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 155.9 PEAK FLOW RATE (CFS) = 229.01

FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1076.00 DOWNSTREAM (FEET) = 1055.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.35
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 229.01
 PIPE TRAVEL TIME (MIN.) = 1.35 Tc (MIN.) = 17.48
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 312.00 = 5890.00 FEET.

FLOW PROCESS FROM NODE 312.00 TO NODE 312.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 17.48

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.096

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.90	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	32.20	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.80	1.33	0.200	17
COMMERCIAL	A	1.30	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.358
 SUBAREA AREA (ACRES) = 50.20 SUBAREA RUNOFF (CFS) = 73.21
 EFFECTIVE AREA (ACRES) = 197.49 AREA-AVERAGED Fm (INCH/HR) = 0.47
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 206.1 PEAK FLOW RATE (CFS) = 288.54

FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1055.00 DOWNSTREAM (FEET) = 1008.00
 FLOW LENGTH (FEET) = 2620.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 60.0 INCH PIPE IS 45.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.04
 ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 288.54
 PIPE TRAVEL TIME(MIN.) = 2.42 Tc(MIN.) = 19.90
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 313.00 = 8510.00 FEET.

 FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.90
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.939
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCSS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 9.50 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 12.70 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 0.60 1.33 0.200 17
 COMMERCIAL A 0.60 1.33 0.100 17
 COMMERCIAL A 3.60 1.33 0.100 17
 SCHOOL A 4.40 1.33 0.600 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.334
 SUBAREA AREA(ACRES) = 31.40 SUBAREA RUNOFF(CFS) = 42.27
 EFFECTIVE AREA(ACRES) = 228.89 AREA-AVERAGED Fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 237.5 PEAK FLOW RATE(CFS) = 302.91

 FLOW PROCESS FROM NODE 313.00 TO NODE 211.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1008.00 DOWNSTREAM(FEET) = 990.00
 FLOW LENGTH(FEET) = 960.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 46.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.49
 ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 302.91
 PIPE TRAVEL TIME(MIN.) = 0.87 Tc(MIN.) = 20.76
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 211.00 = 9470.00 FEET.

 FLOW PROCESS FROM NODE 211.00 TO NODE 211.00 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

1 302.91 20.76 1.890 1.33(0.47) 0.35 228.9 305.00
 2 290.08 22.89 1.783 1.33(0.47) 0.35 237.5 300.00
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 211.00 = 9470.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	248.94	16.92	2.137	1.33(0.31)	0.23	146.5	208.00
2	222.11	27.42	1.600	1.33(0.31)	0.24	184.6	200.00

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	538.69	16.92	2.137	1.33(0.40)	0.30	333.1	208.00
2	542.04	20.76	1.890	1.33(0.40)	0.30	389.3	305.00
3	523.78	22.89	1.783	1.33(0.40)	0.30	405.6	300.00
4	471.78	27.42	1.600	1.33(0.40)	0.30	422.1	200.00

TOTAL AREA(ACRES) = 422.1

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 542.04 Tc(MIN.) = 20.763
 EFFECTIVE AREA(ACRES) = 389.32 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.30
 TOTAL AREA(ACRES) = 422.1
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 211.00 = 10872.00 FEET.

 END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 422.1 TC(MIN.) = 20.76
 EFFECTIVE AREA(ACRES) = 389.32 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.303
 PEAK FLOW RATE(CFS) = 542.04

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	538.69	16.92	2.137	1.33(0.40)	0.30	333.1	208.00
2	542.04	20.76	1.890	1.33(0.40)	0.30	389.3	305.00
3	523.78	22.89	1.783	1.33(0.40)	0.30	405.6	300.00
4	471.78	27.42	1.600	1.33(0.40)	0.30	422.1	200.00

 END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA D) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-28-2011 *

FILE NAME: VD100.DAT
TIME/DATE OF STUDY: 14:40 07/28/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/ SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	MANING LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.52
30-MINUTES	1.06
1-HOUR	1.40
3-HOUR	2.54
6-HOUR	3.70
24-HOUR	8.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 820.00
ELEVATION DATA: UPSTREAM(FEET) = 1155.00 DOWNSTREAM(FEET) = 1148.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.538
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.765
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.30	0.98	0.100	32	11.54
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.90	0.98	0.500	32	14.76

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
SUBAREA RUNOFF(CFS) = 22.04
TOTAL AREA(ACRES) = 7.20 PEAK FLOW RATE(CFS) = 22.04

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1148.00 DOWNSTREAM ELEVATION(FEET) = 1145.00
STREET LENGTH(FEET) = 600.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

PIPE-FLOW(CFS) = 224.67
 PIPE TRAVEL TIME(MIN.) = 0.61 Tc(MIN.) = 19.09
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 4710.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 19.09
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.783
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.60	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.40	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
 SUBAREA AREA(ACRES) = 11.20 SUBAREA RUNOFF(CFS) = 24.37
 EFFECTIVE AREA(ACRES) = 113.30 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 113.3 PEAK FLOW RATE(CFS) = 243.97

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1080.00 DOWNSTREAM(FEET) = 1068.00
 FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 49.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.41
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 243.97
 PIPE TRAVEL TIME(MIN.) = 1.62 Tc(MIN.) = 20.71
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 6010.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 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.) = 20.71
 RAINFALL INTENSITY(INCH/HR) = 2.65
 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA(ACRES) = 113.30
 TOTAL STREAM AREA(ACRES) = 113.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 243.97

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 820.00
 ELEVATION DATA: UPSTREAM(FEET) = 1105.00 DOWNSTREAM(FEET) = 1093.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.359
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.016
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.50	0.98	0.100	32	10.36
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.10	0.98	0.500	32	13.26

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.430
 SUBAREA RUNOFF(CFS) = 27.84
 TOTAL AREA(ACRES) = 8.60 PEAK FLOW RATE(CFS) = 27.84

 FLOW PROCESS FROM NODE 108.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1093.00 DOWNSTREAM(FEET) = 1080.00
 FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.15
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 27.84
 PIPE TRAVEL TIME(MIN.) = 2.72 Tc(MIN.) = 13.08
 LONGEST FLOWPATH FROM NODE 107.00 TO NODE 106.00 = 2150.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 13.08
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.492
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA AREA(ACRES) = 21.50 SUBAREA RUNOFF(CFS) = 59.99
 EFFECTIVE AREA(ACRES) = 30.10 AREA-AVERAGED Fm(INCH/HR) = 0.40

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
TOTAL AREA (ACRES) = 30.1 PEAK FLOW RATE (CFS) = 83.77

FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 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.) = 13.08
RAINFALL INTENSITY (INCH/HR) = 3.49
AREA-AVERAGED Fm (INCH/HR) = 0.40
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.41
EFFECTIVE STREAM AREA (ACRES) = 30.10
TOTAL STREAM AREA (ACRES) = 30.10
PEAK FLOW RATE (CFS) AT CONFLUENCE = 83.77

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	243.97	20.71	2.651	0.98 (0.39)	0.40	113.3	100.00
2	83.77	13.08	3.492	0.98 (0.40)	0.41	30.1	107.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	295.24	13.08	3.492	0.98 (0.39)	0.40	101.7	107.00
2	304.95	20.71	2.651	0.98 (0.39)	0.40	143.4	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 304.95 Tc (MIN.) = 20.71
EFFECTIVE AREA (ACRES) = 143.40 AREA-AVERAGED Fm (INCH/HR) = 0.39
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
TOTAL AREA (ACRES) = 143.4
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 6010.00 FEET.

FLOW PROCESS FROM NODE 106.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPE SIZE (NON-PRESSURE FLOW)<<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1080.00 DOWNSTREAM (FEET) = 1045.00
FLOW LENGTH (FEET) = 1350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.6 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 20.97
ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 304.95
PIPE TRAVEL TIME (MIN.) = 1.07 Tc (MIN.) = 21.78
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 7360.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

=====

MAINLINE Tc (MIN.) = 21.78
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.571
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.60	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	37.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
SUBAREA AREA (ACRES) = 53.30 SUBAREA RUNOFF (CFS) = 105.44
EFFECTIVE AREA (ACRES) = 196.70 AREA-AVERAGED Fm (INCH/HR) = 0.39
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
TOTAL AREA (ACRES) = 196.7 PEAK FLOW RATE (CFS) = 386.68

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	410.55	14.16	3.330	0.98 (0.39)	0.40	155.0	107.00
2	386.68	21.78	2.571	0.98 (0.39)	0.40	196.7	100.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE (CFS) = 410.55 Tc (MIN.) = 14.16
AREA-AVERAGED Fm (INCH/HR) = 0.39 AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.40 EFFECTIVE AREA (ACRES) = 154.97

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 14.16
RAINFALL INTENSITY (INCH/HR) = 3.33
AREA-AVERAGED Fm (INCH/HR) = 0.39
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.40
EFFECTIVE STREAM AREA (ACRES) = 154.97
TOTAL STREAM AREA (ACRES) = 196.70
PEAK FLOW RATE (CFS) AT CONFLUENCE = 410.55

FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 770.00
ELEVATION DATA: UPSTREAM (FEET) = 1100.00 DOWNSTREAM (FEET) = 1095.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.884
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.699
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.90	0.98	0.100	32	11.88
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.40	0.98	0.500	32	15.21

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.432
 SUBAREA RUNOFF(CFS) = 15.63
 TOTAL AREA(ACRES) = 5.30 PEAK FLOW RATE(CFS) = 15.63

 FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1095.00 DOWNSTREAM ELEVATION(FEET) = 1085.00
 STREET LENGTH(FEET) = 830.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 33.52
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.57
 HALFSTREET FLOOD WIDTH(FEET) = 20.48
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.82
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.17
 STREET FLOW TRAVEL TIME(MIN.) = 3.62 Tc(MIN.) = 15.50
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.153

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.30	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.50	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
 SUBAREA AREA(ACRES) = 14.30 SUBAREA RUNOFF(CFS) = 35.67
 EFFECTIVE AREA(ACRES) = 19.60 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 19.6 PEAK FLOW RATE(CFS) = 48.70

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 23.75
 FLOW VELOCITY(FEET/SEC.) = 4.18 DEPTH*VELOCITY(FT*FT/SEC.) = 2.65
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 1600.00 FEET.

 FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1085.00 DOWNSTREAM(FEET) = 1050.00
 FLOW LENGTH(FEET) = 1960.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 24.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.39
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 48.70
 PIPE TRAVEL TIME(MIN.) = 2.87 Tc(MIN.) = 18.37
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 113.00 = 3560.00 FEET.

 FLOW PROCESS FROM NODE 113.00 TO NODE 113.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 18.37
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.848
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	36.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.389
 SUBAREA AREA(ACRES) = 49.80 SUBAREA RUNOFF(CFS) = 110.64
 EFFECTIVE AREA(ACRES) = 69.40 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
 TOTAL AREA(ACRES) = 69.4 PEAK FLOW RATE(CFS) = 153.96

 FLOW PROCESS FROM NODE 113.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1050.00 DOWNSTREAM(FEET) = 1045.00
 FLOW LENGTH(FEET) = 1230.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 47.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.85
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 153.96
 PIPE TRAVEL TIME(MIN.) = 2.32 Tc(MIN.) = 20.69
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 120.00 = 4790.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 20.69
RAINFALL INTENSITY (INCH/HR) = 2.65
AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.39
EFFECTIVE STREAM AREA (ACRES) = 69.40
TOTAL STREAM AREA (ACRES) = 69.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 153.96

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 3 rows of data.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 3 rows of data.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 547.38 Tc(MIN.) = 14.16
EFFECTIVE AREA (ACRES) = 202.46 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
TOTAL AREA (ACRES) = 266.1
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 7360.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1025.00
FLOW LENGTH(FEET) = 3000.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 90.0 INCH PIPE IS 71.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.47
ESTIMATED PIPE DIAMETER(INCH) = 90.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 547.38
PIPE TRAVEL TIME(MIN.) = 3.46 Tc(MIN.) = 17.61
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 130.00 = 10360.00 FEET.

FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.61
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.921
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 22.00 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 56.40 0.98 0.500 32
PUBLIC PARK A 5.20 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.417
SUBAREA AREA (ACRES) = 83.60 SUBAREA RUNOFF (CFS) = 189.21
EFFECTIVE AREA (ACRES) = 286.06 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
TOTAL AREA (ACRES) = 349.7 PEAK FLOW RATE (CFS) = 651.19

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 349.7 TC(MIN.) = 17.61
EFFECTIVE AREA (ACRES) = 286.06 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.402
PEAK FLOW RATE (CFS) = 651.19

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 3 rows of data.

END OF RATIONAL METHOD ANALYSIS

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

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA D) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-28-2011 *

FILE NAME: VD25.DAT
TIME/DATE OF STUDY: 15:41 07/28/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with 10 columns: NO., WIDTH (FT), CROSSFALL (FT), IN- / OUT- / PARK- SIDE / SIDE / WAY, HEIGHT (FT), CURB GUTTER-GEOMETRIES: WIDTH (FT), LIP (FT), HIKE (FT), MANNING FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with 2 columns: DURATION, AREA-AVERAGED RAINFALL(INCH). Rows: 5-MINUTES (0.38), 30-MINUTES (0.79), 1-HOUR (1.04), 3-HOUR (1.87), 6-HOUR (2.71), 24-HOUR (5.30).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

=====
FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21
=====

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 820.00
ELEVATION DATA: UPSTREAM(FEET) = 1155.00 DOWNSTREAM(FEET) = 1148.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.538
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.056
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.30 0.98 0.100 32 11.54
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 4.90 0.98 0.500 32 14.76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
SUBAREA RUNOFF(CFS) = 17.45
TOTAL AREA(ACRES) = 7.20 PEAK FLOW RATE(CFS) = 17.45

=====
FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62
=====

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
UPSTREAM ELEVATION(FEET) = 1148.00 DOWNSTREAM ELEVATION(FEET) = 1145.00
STREET LENGTH(FEET) = 600.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 26.44
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.60
 HALFSTREET FLOOD WIDTH(FEET) = 22.22
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.58
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.55
 STREET FLOW TRAVEL TIME(MIN.) = 3.88 Tc(MIN.) = 15.41
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.569

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.50	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	6.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.390
 SUBAREA AREA(ACRES) = 9.10 SUBAREA RUNOFF(CFS) = 17.92
 EFFECTIVE AREA(ACRES) = 16.30 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.38
 TOTAL AREA(ACRES) = 16.3 PEAK FLOW RATE(CFS) = 32.21

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.64 HALFSTREET FLOOD WIDTH(FEET) = 23.96
 FLOW VELOCITY(FEET/SEC.) = 2.72 DEPTH*VELOCITY(FT*FT/SEC.) = 1.73
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1420.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1145.00 DOWNSTREAM(FEET) = 1125.00
 FLOW LENGTH(FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.71
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 32.21
 PIPE TRAVEL TIME(MIN.) = 0.87 Tc(MIN.) = 16.28
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2080.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 16.28
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.486
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.00	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	21.30	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.412
 SUBAREA AREA(ACRES) = 27.30 SUBAREA RUNOFF(CFS) = 51.20
 EFFECTIVE AREA(ACRES) = 43.60 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 43.6 PEAK FLOW RATE(CFS) = 82.20

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1125.00 DOWNSTREAM(FEET) = 1095.00
 FLOW LENGTH(FEET) = 1960.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.46
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 82.20
 PIPE TRAVEL TIME(MIN.) = 2.62 Tc(MIN.) = 18.90
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4040.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 18.90
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.273
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.90	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	44.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405
 SUBAREA AREA(ACRES) = 58.50 SUBAREA RUNOFF(CFS) = 98.88
 EFFECTIVE AREA(ACRES) = 102.10 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 102.1 PEAK FLOW RATE(CFS) = 172.73

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1095.00 DOWNSTREAM(FEET) = 1080.00
 FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.6 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 17.31
 ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 172.73
 PIPE TRAVEL TIME (MIN.) = 0.65 Tc (MIN.) = 19.55
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 4710.00 FEET.

TOTAL STREAM AREA (ACRES) = 113.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 187.33

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 19.55
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.228
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.20	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	7.60	0.98	0.500	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	0.40	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
 SUBAREA AREA (ACRES) = 11.20 SUBAREA RUNOFF (CFS) = 18.77
 EFFECTIVE AREA (ACRES) = 113.30 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 113.3 PEAK FLOW RATE (CFS) = 187.33

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1080.00 DOWNSTREAM (FEET) = 1068.00
 FLOW LENGTH (FEET) = 1300.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 44.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.54
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 187.33
 PIPE TRAVEL TIME (MIN.) = 1.73 Tc (MIN.) = 21.27
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 6010.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 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.) = 21.27
 RAINFALL INTENSITY (INCH/HR) = 2.12
 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA (ACRES) = 113.30

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 820.00
 ELEVATION DATA: UPSTREAM (FEET) = 1105.00 DOWNSTREAM (FEET) = 1093.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.359
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.260
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.50	0.98	0.100	32	10.36
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	7.10	0.98	0.500	32	13.26

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.430
 SUBAREA RUNOFF (CFS) = 21.99
 TOTAL AREA (ACRES) = 8.60 PEAK FLOW RATE (CFS) = 21.99

 FLOW PROCESS FROM NODE 108.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1093.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 7.66
 ESTIMATED PIPE DIAMETER (INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 21.99
 PIPE TRAVEL TIME (MIN.) = 2.89 Tc (MIN.) = 13.25
 LONGEST FLOWPATH FROM NODE 107.00 TO NODE 106.00 = 2150.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 13.25
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.812
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.30	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	16.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401

SUBAREA AREA (ACRES) = 21.50 SUBAREA RUNOFF (CFS) = 46.85
 EFFECTIVE AREA (ACRES) = 30.10 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
 TOTAL AREA (ACRES) = 30.1 PEAK FLOW RATE (CFS) = 65.37

PIPE TRAVEL TIME (MIN.) = 1.15 Tc (MIN.) = 22.43
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 7360.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 1

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION (MIN.) = 13.25
 RAINFALL INTENSITY (INCH/HR) = 2.81
 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA (ACRES) = 30.10
 TOTAL STREAM AREA (ACRES) = 30.10
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 65.37

=====

MAINLINE Tc (MIN.) = 22.43
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.051
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.60	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	37.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
 SUBAREA AREA (ACRES) = 53.30 SUBAREA RUNOFF (CFS) = 80.49
 EFFECTIVE AREA (ACRES) = 196.70 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 196.7 PEAK FLOW RATE (CFS) = 294.58

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	187.33	21.27	2.117	0.98 (0.39)	0.40	113.3	100.00
2	65.37	13.25	2.812	0.98 (0.40)	0.41	30.1	107.00

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	317.17	14.41	2.675	0.98 (0.39)	0.40	154.0	107.00
2	294.58	22.43	2.051	0.98 (0.39)	0.40	196.7	100.00

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

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE (CFS) = 317.17 Tc (MIN.) = 14.41
 AREA-AVERAGED Fm (INCH/HR) = 0.39 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.40 EFFECTIVE AREA (ACRES) = 153.99

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	229.06	13.25	2.812	0.98 (0.39)	0.40	100.7	107.00
2	233.86	21.27	2.117	0.98 (0.39)	0.40	143.4	100.00

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 233.86 Tc (MIN.) = 21.27
 EFFECTIVE AREA (ACRES) = 143.40 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 143.4
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 6010.00 FEET.

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 14.41
 RAINFALL INTENSITY (INCH/HR) = 2.67
 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA (ACRES) = 153.99
 TOTAL STREAM AREA (ACRES) = 196.70
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 317.17

 FLOW PROCESS FROM NODE 106.00 TO NODE 120.00 IS CODE = 31

 FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1080.00 DOWNSTREAM (FEET) = 1045.00
 FLOW LENGTH (FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 19.52
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 233.86

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 770.00

ELEVATION DATA: UPSTREAM(FEET) = 1100.00 DOWNSTREAM(FEET) = 1095.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.884

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.002

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.90	0.98	0.100	32	11.88
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.40	0.98	0.500	32	15.21

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.432
SUBAREA RUNOFF(CFS) = 12.31
TOTAL AREA(ACRES) = 5.30 PEAK FLOW RATE(CFS) = 12.31

FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1095.00 DOWNSTREAM ELEVATION(FEET) = 1085.00
STREET LENGTH(FEET) = 830.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 26.24

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.53
HALFSTREET FLOOD WIDTH(FEET) = 18.58
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.60
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.91
STREET FLOW TRAVEL TIME(MIN.) = 3.84 Tc(MIN.) = 15.72

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.538

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.30	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.50	0.98	0.200	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.392
SUBAREA AREA(ACRES) = 14.30 SUBAREA RUNOFF(CFS) = 27.75
EFFECTIVE AREA(ACRES) = 19.60 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40

TOTAL AREA(ACRES) = 19.6 PEAK FLOW RATE(CFS) = 37.85

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 21.48

FLOW VELOCITY(FEET/SEC.) = 3.94 DEPTH*VELOCITY(FT*FT/SEC.) = 2.32

LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 1600.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1085.00 DOWNSTREAM(FEET) = 1050.00
FLOW LENGTH(FEET) = 1960.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.02
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 37.85
PIPE TRAVEL TIME(MIN.) = 2.96 Tc(MIN.) = 18.69
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 113.00 = 3560.00 FEET.

FLOW PROCESS FROM NODE 113.00 TO NODE 113.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 18.69
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.289
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	36.00	0.98	0.500	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.389
SUBAREA AREA(ACRES) = 49.80 SUBAREA RUNOFF(CFS) = 85.56
EFFECTIVE AREA(ACRES) = 69.40 AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
TOTAL AREA(ACRES) = 69.4 PEAK FLOW RATE(CFS) = 119.01

FLOW PROCESS FROM NODE 113.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1050.00 DOWNSTREAM(FEET) = 1045.00
FLOW LENGTH(FEET) = 1230.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.29
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 119.01
PIPE TRAVEL TIME(MIN.) = 2.47 Tc(MIN.) = 21.16
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 120.00 = 4790.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION (MIN.) = 21.16
 RAINFALL INTENSITY (INCH/HR) = 2.12
 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.39
 EFFECTIVE STREAM AREA (ACRES) = 69.40
 TOTAL STREAM AREA (ACRES) = 69.40
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 119.01

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	317.17	14.41	2.675	0.98 (0.39)	0.40	154.0	107.00
2	294.58	22.43	2.051	0.98 (0.39)	0.40	196.7	100.00
3	119.01	21.16	2.124	0.98 (0.38)	0.39	69.4	110.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	423.85	14.41	2.675	0.98 (0.39)	0.40	201.2	107.00
2	417.17	21.16	2.124	0.98 (0.39)	0.40	259.3	110.00
3	408.61	22.43	2.051	0.98 (0.39)	0.40	266.1	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 423.85 Tc (MIN.) = 14.41
 EFFECTIVE AREA (ACRES) = 201.24 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 266.1
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 7360.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 1045.00 DOWNSTREAM (FEET) = 1025.00
 FLOW LENGTH (FEET) = 3000.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 62.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.73
 ESTIMATED PIPE DIAMETER (INCH) = 84.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 423.85
 PIPE TRAVEL TIME (MIN.) = 3.64 Tc (MIN.) = 18.05
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 130.00 = 10360.00 FEET.

 FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc (MIN.) = 18.05
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.337
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 22.00 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 56.40 0.98 0.500 32
 PUBLIC PARK A 5.20 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.417
 SUBAREA AREA (ACRES) = 83.60 SUBAREA RUNOFF (CFS) = 145.26
 EFFECTIVE AREA (ACRES) = 284.84 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 349.7 PEAK FLOW RATE (CFS) = 498.65

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 349.7 TC (MIN.) = 18.05
 EFFECTIVE AREA (ACRES) = 284.84 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.402
 PEAK FLOW RATE (CFS) = 498.65

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	498.65	18.05	2.337	0.98 (0.39)	0.40	284.8	107.00
2	474.43	24.87	1.928	0.98 (0.39)	0.40	342.9	110.00
3	465.90	26.14	1.871	0.98 (0.39)	0.40	349.7	100.00

 END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA D) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-28-2011 *

FILE NAME: VD10.DAT
TIME/DATE OF STUDY: 16:13 07/28/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with 10 columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-/SIDE/SIDE/WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), STREET FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with 2 columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES (0.33), 30-MINUTES (0.68), 1-HOUR (0.90), 3-HOUR (1.60), 6-HOUR (2.31), 24-HOUR (4.36).

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 820.00
ELEVATION DATA: UPSTREAM(FEET) = 1155.00 DOWNSTREAM(FEET) = 1148.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.538
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.689

Table with 7 columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL, RESIDENTIAL, "5-7 DWELLINGS/ACRE".

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
SUBAREA RUNOFF(CFS) = 14.22
TOTAL AREA(ACRES) = 7.20 PEAK FLOW RATE(CFS) = 14.22

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====

UPSTREAM ELEVATION(FEET) = 1148.00 DOWNSTREAM ELEVATION(FEET) = 1145.00
STREET LENGTH(FEET) = 600.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 21.31
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.57
 HALFSTREET FLOOD WIDTH (FEET) = 20.37
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.46
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.39
 STREET FLOW TRAVEL TIME (MIN.) = 4.07 Tc (MIN.) = 15.61
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.243

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.50	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	6.60	1.33	0.500	17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33					
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.390					
SUBAREA AREA (ACRES) = 9.10 SUBAREA RUNOFF (CFS) = 14.13					
EFFECTIVE AREA (ACRES) = 16.30 AREA-AVERAGED Fm (INCH/HR) = 0.51					
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.38					
TOTAL AREA (ACRES) = 16.3 PEAK FLOW RATE (CFS) = 25.46					

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.60 HALFSTREET FLOOD WIDTH (FEET) = 21.85
 FLOW VELOCITY (FEET/SEC.) = 2.56 DEPTH*VELOCITY (FT*FT/SEC.) = 1.53
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1420.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1145.00 DOWNSTREAM (FEET) = 1125.00
 FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.21
 ESTIMATED PIPE DIAMETER (INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 25.46
 PIPE TRAVEL TIME (MIN.) = 0.90 Tc (MIN.) = 16.51
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2080.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 16.51
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.169
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.90	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	44.60	1.33	0.500	17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33					
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405					
SUBAREA AREA (ACRES) = 58.50 SUBAREA RUNOFF (CFS) = 75.70					
EFFECTIVE AREA (ACRES) = 102.10 AREA-AVERAGED Fm (INCH/HR) = 0.54					
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40					
TOTAL AREA (ACRES) = 102.1 PEAK FLOW RATE (CFS) = 132.33					

COMMERCIAL	A	6.00	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	21.30	1.33	0.500	17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33					
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.412					
SUBAREA AREA (ACRES) = 27.30 SUBAREA RUNOFF (CFS) = 39.84					
EFFECTIVE AREA (ACRES) = 43.60 AREA-AVERAGED Fm (INCH/HR) = 0.53					
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40					
TOTAL AREA (ACRES) = 43.6 PEAK FLOW RATE (CFS) = 64.21					

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1125.00 DOWNSTREAM (FEET) = 1095.00
 FLOW LENGTH (FEET) = 1960.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.76
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 64.21
 PIPE TRAVEL TIME (MIN.) = 2.78 Tc (MIN.) = 19.29
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4040.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 19.29
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.976
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.90	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	44.60	1.33	0.500	17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33					
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405					
SUBAREA AREA (ACRES) = 58.50 SUBAREA RUNOFF (CFS) = 75.70					
EFFECTIVE AREA (ACRES) = 102.10 AREA-AVERAGED Fm (INCH/HR) = 0.54					
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40					
TOTAL AREA (ACRES) = 102.1 PEAK FLOW RATE (CFS) = 132.33					

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1095.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 33.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.95
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 132.33
 PIPE TRAVEL TIME(MIN.) = 0.70 Tc(MIN.) = 19.99
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 4710.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 19.99
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.934
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.20	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.60	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.40	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
 SUBAREA AREA(ACRES) = 11.20 SUBAREA RUNOFF(CFS) = 14.47
 EFFECTIVE AREA(ACRES) = 113.30 AREA-AVERAGED Fm(INCH/HR) = 0.53
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 113.3 PEAK FLOW RATE(CFS) = 142.96

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1080.00 DOWNSTREAM(FEET) = 1068.00
 FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 41.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.66
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 142.96
 PIPE TRAVEL TIME(MIN.) = 1.86 Tc(MIN.) = 21.85
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 6010.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 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.) = 21.85
 RAINFALL INTENSITY(INCH/HR) = 1.83
 AREA-AVERAGED Fm(INCH/HR) = 0.53
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA(ACRES) = 113.30
 TOTAL STREAM AREA(ACRES) = 113.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 142.96

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 820.00
 ELEVATION DATA: UPSTREAM(FEET) = 1105.00 DOWNSTREAM(FEET) = 1093.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.359
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.869
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.50	1.33	0.100	17	10.36
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.10	1.33	0.500	17	13.26

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.430
 SUBAREA RUNOFF(CFS) = 17.78
 TOTAL AREA(ACRES) = 8.60 PEAK FLOW RATE(CFS) = 17.78

 FLOW PROCESS FROM NODE 108.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1093.00 DOWNSTREAM(FEET) = 1080.00
 FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.20
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 17.78
 PIPE TRAVEL TIME(MIN.) = 3.08 Tc(MIN.) = 13.44
 LONGEST FLOWPATH FROM NODE 107.00 TO NODE 106.00 = 2150.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 13.44
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.454
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.30	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.20	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA AREA(ACRES) = 21.50 SUBAREA RUNOFF(CFS) = 37.17
 EFFECTIVE AREA(ACRES) = 30.10 AREA-AVERAGED Fm(INCH/HR) = 0.54

AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.41
 TOTAL AREA (ACRES) = 30.1 PEAK FLOW RATE (CFS) = 51.74

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 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.) = 13.44
 RAINFALL INTENSITY (INCH/HR) = 2.45
 AREA-AVERAGED Fm (INCH/HR) = 0.54
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA (ACRES) = 30.10
 TOTAL STREAM AREA (ACRES) = 30.10
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 51.74

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	142.96	21.85	1.833	1.33 (0.53)	0.40	113.3	100.00
2	51.74	13.44	2.454	1.33 (0.54)	0.41	30.1	107.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	181.61	13.44	2.454	1.33 (0.54)	0.40	99.8	107.00
2	177.89	21.85	1.833	1.33 (0.53)	0.40	143.4	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 181.61 Tc (MIN.) = 13.44
 EFFECTIVE AREA (ACRES) = 99.80 AREA-AVERAGED Fm (INCH/HR) = 0.54
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 143.4
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 6010.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1080.00 DOWNSTREAM (FEET) = 1045.00
 FLOW LENGTH (FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 18.57
 ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 181.61
 PIPE TRAVEL TIME (MIN.) = 1.21 Tc (MIN.) = 14.65
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 7360.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 14.65
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.330
 SUBAREA LOSS RATE DATA (AMC I):
 DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCSS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 15.60 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 37.70 1.33 0.500 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
 SUBAREA AREA (ACRES) = 53.30 SUBAREA RUNOFF (CFS) = 87.38
 EFFECTIVE AREA (ACRES) = 153.10 AREA-AVERAGED Fm (INCH/HR) = 0.53
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 196.7 PEAK FLOW RATE (CFS) = 248.56

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 14.65
 RAINFALL INTENSITY (INCH/HR) = 2.33
 AREA-AVERAGED Fm (INCH/HR) = 0.53
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA (ACRES) = 153.10
 TOTAL STREAM AREA (ACRES) = 196.70
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 248.56

 FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 770.00
 ELEVATION DATA: UPSTREAM (FEET) = 1100.00 DOWNSTREAM (FEET) = 1095.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.884
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.642
 SUBAREA Tc AND LOSS RATE DATA (AMC I):
 DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCSS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 0.90 1.33 0.100 17 11.88
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 4.40 1.33 0.500 17 15.21
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.432$
 SUBAREA RUNOFF(CFS) = 9.86
 TOTAL AREA(ACRES) = 5.30 PEAK FLOW RATE(CFS) = 9.86

 FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1095.00 DOWNSTREAM ELEVATION(FEET) = 1085.00
 STREET LENGTH(FEET) = 830.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 20.82
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.50
 HALFSTREET FLOOD WIDTH(FEET) = 16.94
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.40
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.69
 STREET FLOW TRAVEL TIME(MIN.) = 4.07 T_c (MIN.) = 15.95

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.214
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	10.30	1.33	0.500	17
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	0.50	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.392$
 SUBAREA AREA(ACRES) = 14.30 SUBAREA RUNOFF(CFS) = 21.80
 EFFECTIVE AREA(ACRES) = 19.60 AREA-AVERAGED F_m (INCH/HR) = 0.52
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED $A_p = 0.40$
 TOTAL AREA(ACRES) = 19.6 PEAK FLOW RATE(CFS) = 29.63

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.55 HALFSTREET FLOOD WIDTH(FEET) = 19.53
 FLOW VELOCITY(FEET/SEC.) = 3.70 DEPTH*VELOCITY(FT*FT/SEC.) = 2.03
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 1600.00 FEET.

 FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1085.00 DOWNSTREAM(FEET) = 1050.00
 FLOW LENGTH(FEET) = 1960.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.34
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 29.63
 PIPE TRAVEL TIME(MIN.) = 3.16 T_c (MIN.) = 19.11
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 113.00 = 3560.00 FEET.

 FLOW PROCESS FROM NODE 113.00 TO NODE 113.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE T_c (MIN.) = 19.11
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.987
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	13.80	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	36.00	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.389$
 SUBAREA AREA(ACRES) = 49.80 SUBAREA RUNOFF(CFS) = 65.88
 EFFECTIVE AREA(ACRES) = 69.40 AREA-AVERAGED F_m (INCH/HR) = 0.52
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED $A_p = 0.39$
 TOTAL AREA(ACRES) = 69.4 PEAK FLOW RATE(CFS) = 91.50

 FLOW PROCESS FROM NODE 113.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1050.00 DOWNSTREAM(FEET) = 1045.00
 FLOW LENGTH(FEET) = 1230.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 39.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.72
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 91.50
 PIPE TRAVEL TIME(MIN.) = 2.65 T_c (MIN.) = 21.76
 LONGEST FLOWPATH FROM NODE 110.00 TO NODE 120.00 = 4790.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 21.76
 RAINFALL INTENSITY(INCH/HR) = 1.84
 AREA-AVERAGED F_m (INCH/HR) = 0.52

AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.39
 EFFECTIVE STREAM AREA (ACRES) = 69.40
 TOTAL STREAM AREA (ACRES) = 69.40
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 91.50

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	248.56	14.65	2.330	1.33 (0.53)	0.40	153.1	107.00
1	220.83	23.06	1.775	1.33 (0.53)	0.40	196.7	100.00
2	91.50	21.76	1.838	1.33 (0.52)	0.39	69.4	110.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	333.21	14.65	2.330	1.33 (0.53)	0.40	199.8	107.00
2	316.62	21.76	1.838	1.33 (0.53)	0.40	259.4	110.00
3	307.96	23.06	1.775	1.33 (0.53)	0.40	266.1	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 333.21 Tc (MIN.) = 14.65
 EFFECTIVE AREA (ACRES) = 199.82 AREA-AVERAGED Fm (INCH/HR) = 0.53
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 266.1
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 7360.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1045.00 DOWNSTREAM (FEET) = 1025.00
 FLOW LENGTH (FEET) = 3000.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 75.0 INCH PIPE IS 59.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.80
 ESTIMATED PIPE DIAMETER (INCH) = 75.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 333.21
 PIPE TRAVEL TIME (MIN.) = 3.90 Tc (MIN.) = 18.56
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 130.00 = 10360.00 FEET.

 FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 18.56
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.022
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	22.00	1.33	0.100	17

RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 56.40 1.33 0.500 17
 PUBLIC PARK A 5.20 1.33 0.850 17
 SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.417
 SUBAREA AREA (ACRES) = 83.60 SUBAREA RUNOFF (CFS) = 110.52
 EFFECTIVE AREA (ACRES) = 283.42 AREA-AVERAGED Fm (INCH/HR) = 0.53
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 349.7 PEAK FLOW RATE (CFS) = 379.74

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 349.7 TC (MIN.) = 18.56
 EFFECTIVE AREA (ACRES) = 283.42 AREA-AVERAGED Fm (INCH/HR) = 0.53
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.402
 PEAK FLOW RATE (CFS) = 379.74

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	379.74	18.56	2.022	1.33 (0.53)	0.40	283.4	107.00
2	349.21	25.68	1.664	1.33 (0.53)	0.40	343.0	110.00
3	339.78	27.07	1.612	1.33 (0.53)	0.40	349.7	100.00

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE 0 BASIN V (AREA E) *
* 100-YEAR HYDROLOGY *
* P. PAGADUAN 7-29-2011 *

FILE NAME: VE100.DAT
TIME/DATE OF STUDY: 09:59 07/29/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, CURB GUTTER-GEOMETRIES, MANNING, WIDTH CROSSFALL IN- / OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 880.00
ELEVATION DATA: UPSTREAM(FEET) = 1150.00 DOWNSTREAM(FEET) = 1132.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.966
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.111

Table with columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL, RESIDENTIAL, "5-7 DWELLINGS/ACRE".

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.373
SUBAREA RUNOFF(CFS) = 28.67
TOTAL AREA(ACRES) = 8.50 PEAK FLOW RATE(CFS) = 28.67

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1132.00 DOWNSTREAM ELEVATION(FEET) = 1118.00
STREET LENGTH(FEET) = 640.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 47.15
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.58
 HALFSTREET FLOOD WIDTH(FEET) = 20.85
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.20
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.99
 STREET FLOW TRAVEL TIME(MIN.) = 2.05 Tc(MIN.) = 12.02
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.674

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.00	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	9.50	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA AREA(ACRES) = 12.50 SUBAREA RUNOFF(CFS) = 36.90
 EFFECTIVE AREA(ACRES) = 21.00 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
 TOTAL AREA(ACRES) = 21.0 PEAK FLOW RATE(CFS) = 62.22

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 23.22
 FLOW VELOCITY(FEET/SEC.) = 5.57 DEPTH*VELOCITY(FT*FT/SEC.) = 3.47
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1520.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1118.00 DOWNSTREAM(FEET) = 1104.00
 FLOW LENGTH(FEET) = 1850.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.82
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 62.22
 PIPE TRAVEL TIME(MIN.) = 3.49 Tc(MIN.) = 15.51
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 3370.00 FEET.

 FLOW PROCESS FROM NODE 203.00 TO NODE 203.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 15.51
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.152
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	15.80	0.98	0.500	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	7.50	0.98	0.200	32

COMMERCIAL	A	5.50	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	14.80	0.98	0.500	32
SCHOOL	A	9.50	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.458
 SUBAREA AREA(ACRES) = 29.80 SUBAREA RUNOFF(CFS) = 72.56
 EFFECTIVE AREA(ACRES) = 50.80 AREA-AVERAGED Fm(INCH/HR) = 0.42
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.43
 TOTAL AREA(ACRES) = 50.8 PEAK FLOW RATE(CFS) = 124.93

 FLOW PROCESS FROM NODE 203.00 TO NODE 204.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1104.00 DOWNSTREAM(FEET) = 1080.00
 FLOW LENGTH(FEET) = 1580.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.72
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 124.93
 PIPE TRAVEL TIME(MIN.) = 1.92 Tc(MIN.) = 17.43
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 204.00 = 4950.00 FEET.

 FLOW PROCESS FROM NODE 204.00 TO NODE 204.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.43
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.939
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	15.80	0.98	0.500	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	7.50	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.334
 SUBAREA AREA(ACRES) = 30.20 SUBAREA RUNOFF(CFS) = 71.03
 EFFECTIVE AREA(ACRES) = 81.00 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.39
 TOTAL AREA(ACRES) = 81.0 PEAK FLOW RATE(CFS) = 186.21

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 81.0 TC(MIN.) = 17.43
 EFFECTIVE AREA(ACRES) = 81.00 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.395
 PEAK FLOW RATE(CFS) = 186.21

END OF RATIONAL METHOD ANALYSIS

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 37.23
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.54
 HALFSTREET FLOOD WIDTH(FEET) = 19.00
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.90
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.64
 STREET FLOW TRAVEL TIME(MIN.) = 2.18 Tc(MIN.) = 12.14
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.964

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.50	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA AREA(ACRES) = 12.50 SUBAREA RUNOFF(CFS) = 28.91
 EFFECTIVE AREA(ACRES) = 21.00 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
 TOTAL AREA(ACRES) = 21.0 PEAK FLOW RATE(CFS) = 48.81

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.58 HALFSTREET FLOOD WIDTH(FEET) = 21.11
 FLOW VELOCITY(FEET/SEC.) = 5.25 DEPTH*VELOCITY(FT*FT/SEC.) = 3.05
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1520.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1118.00 DOWNSTREAM(FEET) = 1104.00
 FLOW LENGTH(FEET) = 1850.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.35
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 48.81
 PIPE TRAVEL TIME(MIN.) = 3.69 Tc(MIN.) = 15.84
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 3370.00 FEET.

 FLOW PROCESS FROM NODE 203.00 TO NODE 203.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====
 MAINLINE Tc(MIN.) = 15.84
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.527
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.80	0.98	0.500	32
SCHOOL	A	9.50	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.458
 SUBAREA AREA(ACRES) = 29.80 SUBAREA RUNOFF(CFS) = 55.81
 EFFECTIVE AREA(ACRES) = 50.80 AREA-AVERAGED Fm(INCH/HR) = 0.42
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.43
 TOTAL AREA(ACRES) = 50.8 PEAK FLOW RATE(CFS) = 96.36

 FLOW PROCESS FROM NODE 203.00 TO NODE 204.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1104.00 DOWNSTREAM(FEET) = 1080.00
 FLOW LENGTH(FEET) = 1580.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.98
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 96.36
 PIPE TRAVEL TIME(MIN.) = 2.03 Tc(MIN.) = 17.86
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 204.00 = 4950.00 FEET.

 FLOW PROCESS FROM NODE 204.00 TO NODE 204.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====
 MAINLINE Tc(MIN.) = 17.86
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.351
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	15.80	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	7.50	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.334
 SUBAREA AREA(ACRES) = 30.20 SUBAREA RUNOFF(CFS) = 55.05
 EFFECTIVE AREA(ACRES) = 81.00 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.39
 TOTAL AREA(ACRES) = 81.0 PEAK FLOW RATE(CFS) = 143.35

 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 81.0 TC(MIN.) = 17.86
 EFFECTIVE AREA(ACRES) = 81.00 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.395
 PEAK FLOW RATE(CFS) = 143.35
 =====

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END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA E) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-29-2011 *

FILE NAME: VE10.DAT
TIME/DATE OF STUDY: 10:33 07/29/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-SIDE, PARK-/WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL (INCH)
5-MINUTES 0.33
30-MINUTES 0.68
1-HOUR 0.90
3-HOUR 1.60
6-HOUR 2.31
24-HOUR 4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 880.00
ELEVATION DATA: UPSTREAM(FEET) = 1150.00 DOWNSTREAM(FEET) = 1132.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.966
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.936

Table with columns: SUBAREA Tc AND LOSS RATE DATA(AMC I): DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.)

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1132.00 DOWNSTREAM ELEVATION(FEET) = 1118.00
STREET LENGTH(FEET) = 640.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

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Analysis prepared by:

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Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA F) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-1-2011 *

FILE NAME: VF100.DAT
TIME/DATE OF STUDY: 11:23 08/01/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)

2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.52
30-MINUTES	1.06
1-HOUR	1.40
3-HOUR	2.54
6-HOUR	3.70
24-HOUR	8.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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INITIAL SUBAREA FLOW-LENGTH(FEET) = 860.00
ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1045.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.490
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.986
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.90	0.98	0.100	32	10.49
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	6.60	0.98	0.500	32	13.42

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.411
SUBAREA RUNOFF(CFS) = 27.43
TOTAL AREA(ACRES) = 8.50 PEAK FLOW RATE(CFS) = 27.43

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1045.00 DOWNSTREAM ELEVATION(FEET) = 1018.00
STREET LENGTH(FEET) = 1600.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 54.12
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.62
 HALFSTREET FLOOD WIDTH(FEET) = 23.17
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.87
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.03
 STREET FLOW TRAVEL TIME(MIN.) = 5.48 Tc(MIN.) = 15.97
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.098

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.30	0.98	0.200	32
COMMERCIAL	A	0.10	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.398
 SUBAREA AREA(ACRES) = 21.70 SUBAREA RUNOFF(CFS) = 52.92
 EFFECTIVE AREA(ACRES) = 30.20 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 30.2 PEAK FLOW RATE(CFS) = 73.56

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.68 HALFSTREET FLOOD WIDTH(FEET) = 26.71
 FLOW VELOCITY(FEET/SEC.) = 5.26 DEPTH*VELOCITY(FT*FT/SEC.) = 3.58
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 2460.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1018.00 DOWNSTREAM(FEET) = 1017.00
 FLOW LENGTH(FEET) = 720.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 45.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.87
 ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 73.56
 PIPE TRAVEL TIME(MIN.) = 2.46 Tc(MIN.) = 18.43
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3180.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 313.00 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.) = 18.43
 RAINFALL INTENSITY(INCH/HR) = 2.84
 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA(ACRES) = 30.20
 TOTAL STREAM AREA(ACRES) = 30.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 73.56

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<<<
 =====
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
 ELEVATION DATA: UPSTREAM(FEET) = 1056.00 DOWNSTREAM(FEET) = 1045.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.514
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.769
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	11.51
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.60	0.98	0.500	32	14.73

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA RUNOFF(CFS) = 30.71
 TOTAL AREA(ACRES) = 10.10 PEAK FLOW RATE(CFS) = 30.71

 FLOW PROCESS FROM NODE 305.00 TO NODE 303.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1017.00
 FLOW LENGTH(FEET) = 1650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.19
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 30.71
 PIPE TRAVEL TIME(MIN.) = 2.70 Tc(MIN.) = 14.21
 LONGEST FLOWPATH FROM NODE 304.00 TO NODE 303.00 = 2600.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc(MIN.) = 14.21
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.322
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL	AREA	Fp	Ap	SCS

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	7.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	11.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.30	0.98	0.200	32
COMMERCIAL	A	6.70	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.278
SUBAREA AREA (ACRES) = 27.50 SUBAREA RUNOFF(CFS) = 75.52
EFFECTIVE AREA(ACRES) = 37.60 AREA-AVERAGED F_m (INCH/HR) = 0.30
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.31
TOTAL AREA(ACRES) = 37.6 PEAK FLOW RATE(CFS) = 102.16

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 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.) = 14.21
RAINFALL INTENSITY(INCH/HR) = 3.32
AREA-AVERAGED F_m (INCH/HR) = 0.30
AREA-AVERAGED F_p (INCH/HR) = 0.98
AREA-AVERAGED A_p = 0.31
EFFECTIVE STREAM AREA(ACRES) = 37.60
TOTAL STREAM AREA(ACRES) = 37.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 102.16

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	73.56	18.43	2.842	0.97(0.39)	0.40	30.2	300.00
2	102.16	14.21	3.322	0.98(0.30)	0.31	37.6	304.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	169.99	14.21	3.322	0.97(0.34)	0.35	60.9	304.00
2	159.49	18.43	2.842	0.98(0.34)	0.35	67.8	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 169.99 Tc(MIN.) = 14.21
EFFECTIVE AREA(ACRES) = 60.89 AREA-AVERAGED F_m (INCH/HR) = 0.34
AREA-AVERAGED F_p (INCH/HR) = 0.97 AREA-AVERAGED A_p = 0.35
TOTAL AREA(ACRES) = 67.8
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3180.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1017.00 DOWNSTREAM(FEET) = 985.00
FLOW LENGTH(FEET) = 1730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.85
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 169.99
PIPE TRAVEL TIME(MIN.) = 1.82 Tc(MIN.) = 16.03
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 306.00 = 4910.00 FEET.

FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 16.03
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.090
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 18.40 0.98 0.100 32
COMMERCIAL A 8.60 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 22.70 0.98 0.500 32
COMMERCIAL A 10.10 0.98 0.100 32
PUBLIC PARK A 3.20 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.282
SUBAREA AREA(ACRES) = 63.00 SUBAREA RUNOFF(CFS) = 159.62
EFFECTIVE AREA(ACRES) = 123.89 AREA-AVERAGED F_m (INCH/HR) = 0.31
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.31
TOTAL AREA(ACRES) = 130.8 PEAK FLOW RATE(CFS) = 310.51

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 940.00
ELEVATION DATA: UPSTREAM(FEET) = 1050.00 DOWNSTREAM(FEET) = 1035.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.753
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.927
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.00 0.98 0.100 32 10.75
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 8.10 0.98 0.500 32 13.76
SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.421
SUBAREA RUNOFF(CFS) = 31.97

TOTAL AREA (ACRES) = 10.10 PEAK FLOW RATE (CFS) = 31.97

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 62

=====
ELEVATION DATA: UPSTREAM (FEET) = 1014.00 DOWNSTREAM (FEET) = 995.00
FLOW LENGTH (FEET) = 1280.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.9 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 13.53
ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 120.87
PIPE TRAVEL TIME (MIN.) = 1.58 Tc (MIN.) = 17.12
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 313.00 = 3670.00 FEET.

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 80.21
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.71
HALFSTREET FLOOD WIDTH (FEET) = 30.09
AVERAGE FLOW VELOCITY (FEET/SEC.) = 5.05
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.60
STREET FLOW TRAVEL TIME (MIN.) = 4.79 Tc (MIN.) = 15.54
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.149

MAINLINE Tc (MIN.) = 17.12
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.971
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.30 0.98 0.100 32
COMMERCIAL A 11.10 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 12.20 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 3.80 0.98 0.200 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 2.70 0.98 0.200 32
COMMERCIAL A 1.20 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.244
SUBAREA AREA (ACRES) = 38.30 SUBAREA RUNOFF (CFS) = 94.21
EFFECTIVE AREA (ACRES) = 86.30 AREA-AVERAGED Fm (INCH/HR) = 0.30
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
TOTAL AREA (ACRES) = 86.3 PEAK FLOW RATE (CFS) = 207.42

SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 10.40 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 22.00 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.20 0.98 0.200 32
COMMERCIAL A 1.30 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.343
SUBAREA AREA (ACRES) = 37.90 SUBAREA RUNOFF (CFS) = 95.98
EFFECTIVE AREA (ACRES) = 48.00 AREA-AVERAGED Fm (INCH/HR) = 0.35
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
TOTAL AREA (ACRES) = 48.0 PEAK FLOW RATE (CFS) = 120.87

FLOW PROCESS FROM NODE 313.00 TO NODE 314.00 IS CODE = 31

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.80 HALFSTREET FLOOD WIDTH (FEET) = 38.85
FLOW VELOCITY (FEET/SEC.) = 5.46 DEPTH*VELOCITY (FT*FT/SEC.) = 4.39
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1450.0 FT WITH ELEVATION-DROP = 21.0 FT, IS 107.9 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 312.00
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 2390.00 FEET.

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM (FEET) = 995.00 DOWNSTREAM (FEET) = 970.00
FLOW LENGTH (FEET) = 1730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 43.4 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 15.15
ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 207.42
PIPE TRAVEL TIME (MIN.) = 1.90 Tc (MIN.) = 19.02
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 314.00 = 5400.00 FEET.

FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

FLOW PROCESS FROM NODE 314.00 TO NODE 314.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 19.02
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.789
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 13.00 0.98 0.100 32
COMMERCIAL A 7.90 0.98 0.100 32
COMMERCIAL A 19.40 0.98 0.100 32
PUBLIC PARK A 6.20 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
SUBAREA AREA(ACRES) = 46.50 SUBAREA RUNOFF(CFS) = 108.57
EFFECTIVE AREA(ACRES) = 132.80 AREA-AVERAGED Fm(INCH/HR) = 0.26
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 132.8 PEAK FLOW RATE(CFS) = 301.85

FLOW PROCESS FROM NODE 320.00 TO NODE 321.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
ELEVATION DATA: UPSTREAM(FEET) = 1035.00 DOWNSTREAM(FEET) = 1020.00

Tc = K*((LENGTH** 3.00)/(ELEVATION CHANGE)**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.822
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.912
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.10 0.98 0.100 32 10.82
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 8.50 0.98 0.500 32 13.85
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.421
SUBAREA RUNOFF(CFS) = 33.41
TOTAL AREA(ACRES) = 10.60 PEAK FLOW RATE(CFS) = 33.41

FLOW PROCESS FROM NODE 321.00 TO NODE 322.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 1020.00 DOWNSTREAM ELEVATION(FEET) = 1008.00
STREET LENGTH(FEET) = 780.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 61.94
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.66
HALFSTREET FLOOD WIDTH(FEET) = 24.85
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.86
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.19
STREET FLOW TRAVEL TIME(MIN.) = 2.67 Tc(MIN.) = 13.49
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.427
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.10 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 10.10 0.98 0.500 32
SCHOOL A 7.00 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.456
SUBAREA AREA(ACRES) = 21.20 SUBAREA RUNOFF(CFS) = 56.91
EFFECTIVE AREA(ACRES) = 31.80 AREA-AVERAGED Fm(INCH/HR) = 0.43
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.44
TOTAL AREA(ACRES) = 31.8 PEAK FLOW RATE(CFS) = 85.69

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.72 HALFSTREET FLOOD WIDTH(FEET) = 30.83
FLOW VELOCITY(FEET/SEC.) = 5.24 DEPTH*VELOCITY(FT*FT/SEC.) = 3.78
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 780.0 FT WITH ELEVATION-DROP = 12.0 FT, IS 69.5 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 322.00
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 322.00 = 1730.00 FEET.

FLOW PROCESS FROM NODE 322.00 TO NODE 323.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1008.00 DOWNSTREAM(FEET) = 1002.00
FLOW LENGTH(FEET) = 850.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.36
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 85.69
PIPE TRAVEL TIME(MIN.) = 1.51 Tc(MIN.) = 15.01
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 323.00 = 2580.00 FEET.

FLOW PROCESS FROM NODE 323.00 TO NODE 323.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 15.01
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.215

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	15.60	0.98	0.500	32
COMMERCIAL	A	4.50	0.98	0.100	32
COMMERCIAL	A	0.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.341
SUBAREA AREA (ACRES) = 25.90 SUBAREA RUNOFF (CFS) = 67.20
EFFECTIVE AREA (ACRES) = 57.70 AREA-AVERAGED Fm (INCH/HR) = 0.39
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
TOTAL AREA (ACRES) = 57.7 PEAK FLOW RATE (CFS) = 146.83

FLOW PROCESS FROM NODE 323.00 TO NODE 324.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1002.00 DOWNSTREAM (FEET) = 985.00
FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 31.7 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 17.63
ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 146.83
PIPE TRAVEL TIME (MIN.) = 0.62 Tc (MIN.) = 15.63
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 324.00 = 3240.00 FEET.

FLOW PROCESS FROM NODE 324.00 TO NODE 324.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 15.63
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.138

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	5.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.20	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.30	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.228
SUBAREA AREA (ACRES) = 28.90 SUBAREA RUNOFF (CFS) = 75.84
EFFECTIVE AREA (ACRES) = 86.60 AREA-AVERAGED Fm (INCH/HR) = 0.33
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
TOTAL AREA (ACRES) = 86.6 PEAK FLOW RATE (CFS) = 218.64

FLOW PROCESS FROM NODE 324.00 TO NODE 325.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 985.00 DOWNSTREAM (FEET) = 980.00
FLOW LENGTH (FEET) = 980.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 69.0 INCH PIPE IS 51.4 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 10.53
ESTIMATED PIPE DIAMETER (INCH) = 69.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 218.64
PIPE TRAVEL TIME (MIN.) = 1.55 Tc (MIN.) = 17.18
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 325.00 = 4220.00 FEET.

FLOW PROCESS FROM NODE 325.00 TO NODE 325.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 17.18

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.965
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.30	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.00	0.98	0.200	32
COMMERCIAL	A	12.90	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.128
SUBAREA AREA (ACRES) = 28.20 SUBAREA RUNOFF (CFS) = 72.06
EFFECTIVE AREA (ACRES) = 114.80 AREA-AVERAGED Fm (INCH/HR) = 0.28
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.29
TOTAL AREA (ACRES) = 114.8 PEAK FLOW RATE (CFS) = 277.21

FLOW PROCESS FROM NODE 325.00 TO NODE 326.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 980.00 DOWNSTREAM (FEET) = 945.00
FLOW LENGTH (FEET) = 2650.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 63.0 INCH PIPE IS 47.1 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 15.96
ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 277.21
PIPE TRAVEL TIME (MIN.) = 2.77 Tc (MIN.) = 19.95
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 326.00 = 6870.00 FEET.

FLOW PROCESS FROM NODE 326.00 TO NODE 326.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 19.95

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.711

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.80	0.98	0.100	32
COMMERCIAL	A	23.70	0.98	0.100	32
COMMERCIAL	A	23.60	0.98	0.100	32
COMMERCIAL	A	55.50	0.98	0.100	32
COMMERCIAL	A	21.30	0.98	0.100	32
PUBLIC PARK	A	12.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.162

SUBAREA AREA (ACRES) = 151.50 SUBAREA RUNOFF (CFS) = 347.99

EFFECTIVE AREA (ACRES) = 266.30 AREA-AVERAGED F_m (INCH/HR) = 0.21

AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.22

TOTAL AREA (ACRES) = 266.3 PEAK FLOW RATE (CFS) = 598.95

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 266.3 TC (MIN.) = 19.95

EFFECTIVE AREA (ACRES) = 266.30 AREA-AVERAGED F_m (INCH/HR) = 0.21

AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.217

PEAK FLOW RATE (CFS) = 598.95

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA F) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-1-2011 *

FILE NAME: VF25.DAT
TIME/DATE OF STUDY: 12:50 08/01/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB GUTTER-GEOMETRIES: HEIGHT (FT)	MANNING WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 860.00
ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1045.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.490
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.236
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.90	0.98	0.100	32	10.49
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	6.60	0.98	0.500	32	13.42

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.411
SUBAREA RUNOFF (CFS) = 21.69
TOTAL AREA (ACRES) = 8.50 PEAK FLOW RATE (CFS) = 21.69

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1045.00 DOWNSTREAM ELEVATION (FEET) = 1018.00
STREET LENGTH (FEET) = 1600.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 42.36
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.58
 HALFSTREET FLOOD WIDTH(FEET) = 21.06
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.58
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.65
 STREET FLOW TRAVEL TIME(MIN.) = 5.82 Tc(MIN.) = 16.31
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.483

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.30	0.98	0.200	32
COMMERCIAL	A	0.10	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.398
 SUBAREA AREA(ACRES) = 21.70 SUBAREA RUNOFF(CFS) = 40.91
 EFFECTIVE AREA(ACRES) = 30.20 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 30.2 PEAK FLOW RATE(CFS) = 56.84

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 23.59
 FLOW VELOCITY(FEET/SEC.) = 4.94 DEPTH*VELOCITY(FT*FT/SEC.) = 3.11
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 2460.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1018.00 DOWNSTREAM(FEET) = 1017.00
 FLOW LENGTH(FEET) = 720.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 38.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.64
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 56.84
 PIPE TRAVEL TIME(MIN.) = 2.59 Tc(MIN.) = 18.90
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3180.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 313.00 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.) = 18.90
 RAINFALL INTENSITY(INCH/HR) = 2.27
 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA(ACRES) = 30.20
 TOTAL STREAM AREA(ACRES) = 30.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 56.84

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
 ELEVATION DATA: UPSTREAM(FEET) = 1056.00 DOWNSTREAM(FEET) = 1045.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.514
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.060
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	11.51
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.60	0.98	0.500	32	14.73

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA RUNOFF(CFS) = 24.26
 TOTAL AREA(ACRES) = 10.10 PEAK FLOW RATE(CFS) = 24.26

 FLOW PROCESS FROM NODE 305.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1017.00
 FLOW LENGTH(FEET) = 1650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.52
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 24.26
 PIPE TRAVEL TIME(MIN.) = 2.89 Tc(MIN.) = 14.40
 LONGEST FLOWPATH FROM NODE 304.00 TO NODE 303.00 = 2600.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 14.40
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.675

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	11.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.30	0.98	0.200	32
COMMERCIAL	A	6.70	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.278
SUBAREA AREA(ACRES) = 27.50 SUBAREA RUNOFF(CFS) = 59.51
EFFECTIVE AREA(ACRES) = 37.60 AREA-AVERAGED Fm(INCH/HR) = 0.30
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
TOTAL AREA(ACRES) = 37.6 PEAK FLOW RATE(CFS) = 80.28

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 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.) = 14.40
RAINFALL INTENSITY(INCH/HR) = 2.68
AREA-AVERAGED Fm(INCH/HR) = 0.30
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.31
EFFECTIVE STREAM AREA(ACRES) = 37.60
TOTAL STREAM AREA(ACRES) = 37.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 80.28

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	56.84	18.90	2.273	0.97(0.39)	0.40	30.2	300.00
2	80.28	14.40	2.675	0.98(0.30)	0.31	37.6	304.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	132.87	14.40	2.675	0.98(0.34)	0.35	60.6	304.00
2	123.51	18.90	2.273	0.98(0.34)	0.35	67.8	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 132.87 Tc(MIN.) = 14.40
EFFECTIVE AREA(ACRES) = 60.62 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 67.8
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3180.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1017.00 DOWNSTREAM(FEET) = 985.00
FLOW LENGTH(FEET) = 1730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.08
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 132.87
PIPE TRAVEL TIME(MIN.) = 1.91 Tc(MIN.) = 16.31
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 306.00 = 4910.00 FEET.

FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 16.31
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.483
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.40	0.98	0.100	32
COMMERCIAL	A	8.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	22.70	0.98	0.500	32
COMMERCIAL	A	10.10	0.98	0.100	32
PUBLIC PARK	A	3.20	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.282
SUBAREA AREA(ACRES) = 63.00 SUBAREA RUNOFF(CFS) = 125.17
EFFECTIVE AREA(ACRES) = 123.62 AREA-AVERAGED Fm(INCH/HR) = 0.31
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
TOTAL AREA(ACRES) = 130.8 PEAK FLOW RATE(CFS) = 242.24

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 940.00
ELEVATION DATA: UPSTREAM(FEET) = 1050.00 DOWNSTREAM(FEET) = 1035.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.753
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.188
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.00	0.98	0.100	32	10.75
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	8.10	0.98	0.500	32	13.76

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.421$
 SUBAREA RUNOFF(CFS) = 25.25
 TOTAL AREA(ACRES) = 10.10 PEAK FLOW RATE(CFS) = 25.25

 FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1035.00 DOWNSTREAM ELEVATION(FEET) = 1014.00
 STREET LENGTH(FEET) = 1450.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 62.95
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.66
 HALFSTREET FLOOD WIDTH(FEET) = 25.33
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.77
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.17
 STREET FLOW TRAVEL TIME(MIN.) = 5.07 T_c (MIN.) = 15.82
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.529

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	10.40	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	22.00	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.20	0.98	0.200	32
COMMERCIAL	A	1.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.343$
 SUBAREA AREA(ACRES) = 37.90 SUBAREA RUNOFF(CFS) = 74.83
 EFFECTIVE AREA(ACRES) = 48.00 AREA-AVERAGED F_m (INCH/HR) = 0.35
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.36$
 TOTAL AREA(ACRES) = 48.0 PEAK FLOW RATE(CFS) = 94.09

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.75 HALFSTREET FLOOD WIDTH(FEET) = 33.57
 FLOW VELOCITY(FEET/SEC.) = 5.20 DEPTH*VELOCITY(FT*FT/SEC.) = 3.89
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1450.0 FT WITH ELEVATION-DROP = 21.0 FT, IS 85.5 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 312.00
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 2390.00 FEET.

FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1014.00 DOWNSTREAM(FEET) = 995.00
 FLOW LENGTH(FEET) = 1280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.81
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 94.09
 PIPE TRAVEL TIME(MIN.) = 1.67 T_c (MIN.) = 17.49
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 313.00 = 3670.00 FEET.

 FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE T_c (MIN.) = 17.49
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.381
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	7.30	0.98	0.100	32
COMMERCIAL	A	11.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.80	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.70	0.98	0.200	32
COMMERCIAL	A	1.20	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.244$
 SUBAREA AREA(ACRES) = 38.30 SUBAREA RUNOFF(CFS) = 73.87
 EFFECTIVE AREA(ACRES) = 86.30 AREA-AVERAGED F_m (INCH/HR) = 0.30
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.31$
 TOTAL AREA(ACRES) = 86.3 PEAK FLOW RATE(CFS) = 161.59

 FLOW PROCESS FROM NODE 313.00 TO NODE 314.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 995.00 DOWNSTREAM(FEET) = 970.00
 FLOW LENGTH(FEET) = 1730.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.46
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 161.59
 PIPE TRAVEL TIME(MIN.) = 1.99 T_c (MIN.) = 19.48
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 314.00 = 5400.00 FEET.

FLOW PROCESS FROM NODE 314.00 TO NODE 314.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.48
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.232
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 13.00 0.98 0.100 32
COMMERCIAL A 7.90 0.98 0.100 32
COMMERCIAL A 19.40 0.98 0.100 32
PUBLIC PARK A 6.20 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
SUBAREA AREA(ACRES) = 46.50 SUBAREA RUNOFF(CFS) = 85.24
EFFECTIVE AREA(ACRES) = 132.80 AREA-AVERAGED Fm(INCH/HR) = 0.26
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 132.8 PEAK FLOW RATE(CFS) = 235.23

FLOW PROCESS FROM NODE 320.00 TO NODE 321.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
ELEVATION DATA: UPSTREAM(FEET) = 1035.00 DOWNSTREAM(FEET) = 1020.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.822
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.176
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.10 0.98 0.100 32 10.82
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 8.50 0.98 0.500 32 13.85
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.421
SUBAREA RUNOFF(CFS) = 26.39
TOTAL AREA(ACRES) = 10.60 PEAK FLOW RATE(CFS) = 26.39

FLOW PROCESS FROM NODE 321.00 TO NODE 322.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1020.00 DOWNSTREAM ELEVATION(FEET) = 1008.00
STREET LENGTH(FEET) = 780.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 48.57
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.61
HALFSTREET FLOOD WIDTH(FEET) = 22.59
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.59
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.80
STREET FLOW TRAVEL TIME(MIN.) = 2.83 Tc(MIN.) = 13.65
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.763
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.10 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 10.10 0.98 0.500 32
SCHOOL A 7.00 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.456
SUBAREA AREA(ACRES) = 21.20 SUBAREA RUNOFF(CFS) = 44.23
EFFECTIVE AREA(ACRES) = 31.80 AREA-AVERAGED Fm(INCH/HR) = 0.43
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.44
TOTAL AREA(ACRES) = 31.8 PEAK FLOW RATE(CFS) = 66.67

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.76
FLOW VELOCITY(FEET/SEC.) = 4.95 DEPTH*VELOCITY(FT*FT/SEC.) = 3.31
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 322.00 = 1730.00 FEET.

FLOW PROCESS FROM NODE 322.00 TO NODE 323.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1008.00 DOWNSTREAM(FEET) = 1002.00
FLOW LENGTH(FEET) = 850.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.87
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 66.67
PIPE TRAVEL TIME(MIN.) = 1.60 Tc(MIN.) = 15.25
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 323.00 = 2580.00 FEET.

FLOW PROCESS FROM NODE 323.00 TO NODE 323.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 15.25
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.585
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	15.60	0.98	0.500	32
COMMERCIAL	A	4.50	0.98	0.100	32
COMMERCIAL	A	0.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.341
 SUBAREA AREA (ACRES) = 25.90 SUBAREA RUNOFF (CFS) = 52.51
 EFFECTIVE AREA (ACRES) = 57.70 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 57.7 PEAK FLOW RATE (CFS) = 114.11

 FLOW PROCESS FROM NODE 323.00 TO NODE 324.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 1002.00 DOWNSTREAM (FEET) = 985.00
 FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.27
 ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 114.11
 PIPE TRAVEL TIME (MIN.) = 0.68 Tc (MIN.) = 15.93
 LONGEST FLOWPATH FROM NODE 320.00 TO NODE 324.00 = 3240.00 FEET.

 FLOW PROCESS FROM NODE 324.00 TO NODE 324.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc (MIN.) = 15.93
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.519
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	5.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.20	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.30	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.228
 SUBAREA AREA (ACRES) = 28.90 SUBAREA RUNOFF (CFS) = 59.74
 EFFECTIVE AREA (ACRES) = 86.60 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
 TOTAL AREA (ACRES) = 86.6 PEAK FLOW RATE (CFS) = 170.40

 FLOW PROCESS FROM NODE 324.00 TO NODE 325.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 985.00 DOWNSTREAM (FEET) = 980.00
 FLOW LENGTH (FEET) = 980.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 46.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.91
 ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 170.40
 PIPE TRAVEL TIME (MIN.) = 1.65 Tc (MIN.) = 17.58
 LONGEST FLOWPATH FROM NODE 320.00 TO NODE 325.00 = 4220.00 FEET.

 FLOW PROCESS FROM NODE 325.00 TO NODE 325.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc (MIN.) = 17.58
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.374
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.30	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.00	0.98	0.200	32
COMMERCIAL	A	12.90	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.128
 SUBAREA AREA (ACRES) = 28.20 SUBAREA RUNOFF (CFS) = 57.08
 EFFECTIVE AREA (ACRES) = 114.80 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 114.8 PEAK FLOW RATE (CFS) = 216.21

 FLOW PROCESS FROM NODE 325.00 TO NODE 326.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 980.00 DOWNSTREAM (FEET) = 945.00
 FLOW LENGTH (FEET) = 2650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.96
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 216.21
 PIPE TRAVEL TIME (MIN.) = 2.95 Tc (MIN.) = 20.53
 LONGEST FLOWPATH FROM NODE 320.00 TO NODE 326.00 = 6870.00 FEET.

 FLOW PROCESS FROM NODE 326.00 TO NODE 326.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc (MIN.) = 20.53
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.163
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.80	0.98	0.100	32
COMMERCIAL	A	23.70	0.98	0.100	32
COMMERCIAL	A	23.60	0.98	0.100	32
COMMERCIAL	A	55.50	0.98	0.100	32
COMMERCIAL	A	21.30	0.98	0.100	32
PUBLIC PARK	A	12.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.162

SUBAREA AREA (ACRES) = 151.50 SUBAREA RUNOFF (CFS) = 273.33

EFFECTIVE AREA (ACRES) = 266.30 AREA-AVERAGED Fm (INCH/HR) = 0.21

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22

TOTAL AREA (ACRES) = 266.3 PEAK FLOW RATE (CFS) = 467.72

=====
 END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 266.3 TC (MIN.) = 20.53

EFFECTIVE AREA (ACRES) = 266.30 AREA-AVERAGED Fm (INCH/HR) = 0.21

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.217

PEAK FLOW RATE (CFS) = 467.72

=====
 END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA F) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-1-2011 *

FILE NAME: VF10.DAT
TIME/DATE OF STUDY: 12:58 08/01/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	MANNING LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 860.00
ELEVATION DATA: UPSTREAM(FEET) = 1058.00 DOWNSTREAM(FEET) = 1045.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.490
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.847
SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.90	1.33	0.100	17	10.49
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	6.60	1.33	0.500	17	13.42

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.411
SUBAREA RUNOFF(CFS) = 17.61
TOTAL AREA(ACRES) = 8.50 PEAK FLOW RATE(CFS) = 17.61

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1045.00 DOWNSTREAM ELEVATION(FEET) = 1018.00
STREET LENGTH(FEET) = 1600.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 33.73
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.54
 HALFSTREET FLOOD WIDTH(FEET) = 19.21
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.35
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.36
 STREET FLOW TRAVEL TIME(MIN.) = 6.14 Tc(MIN.) = 16.63
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.160

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.20	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.10	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.30	1.33	0.200	17
COMMERCIAL	A	0.10	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.398
 SUBAREA AREA(ACRES) = 21.70 SUBAREA RUNOFF(CFS) = 31.85
 EFFECTIVE AREA(ACRES) = 30.20 AREA-AVERAGED Fm(INCH/HR) = 0.53
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 30.2 PEAK FLOW RATE(CFS) = 44.21

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 21.37
 FLOW VELOCITY(FEET/SEC.) = 4.65 DEPTH*VELOCITY(FT*FT/SEC.) = 2.72
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 2460.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1018.00 DOWNSTREAM(FEET) = 1017.00
 FLOW LENGTH(FEET) = 720.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 36.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.32
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 44.21
 PIPE TRAVEL TIME(MIN.) = 2.77 Tc(MIN.) = 19.40
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3180.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 313.00 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.) = 19.40
 RAINFALL INTENSITY(INCH/HR) = 1.97
 AREA-AVERAGED Fm(INCH/HR) = 0.53
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA(ACRES) = 30.20
 TOTAL STREAM AREA(ACRES) = 30.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 44.21

FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
 ELEVATION DATA: UPSTREAM(FEET) = 1056.00 DOWNSTREAM(FEET) = 1045.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.514
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.692
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	1.33	0.100	17	11.51
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.60	1.33	0.500	17	14.73

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA RUNOFF(CFS) = 19.63
 TOTAL AREA(ACRES) = 10.10 PEAK FLOW RATE(CFS) = 19.63

FLOW PROCESS FROM NODE 305.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1017.00
 FLOW LENGTH(FEET) = 1650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.20
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 19.63
 PIPE TRAVEL TIME(MIN.) = 2.99 Tc(MIN.) = 14.50
 LONGEST FLOWPATH FROM NODE 304.00 TO NODE 303.00 = 2600.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 14.50
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.344
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ SCS SOIL	AREA	Fp	Ap	SCS
-------------------------------	------	----	----	-----

LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 7.60 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 11.90 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 1.30 1.33 0.200 17
 COMMERCIAL A 6.70 1.33 0.100 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.278
 SUBAREA AREA (ACRES) = 27.50 SUBAREA RUNOFF (CFS) = 48.89
 EFFECTIVE AREA (ACRES) = 37.60 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 37.6 PEAK FLOW RATE (CFS) = 65.36

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 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.) = 14.50
 RAINFALL INTENSITY (INCH/HR) = 2.34
 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.31
 EFFECTIVE STREAM AREA (ACRES) = 37.60
 TOTAL STREAM AREA (ACRES) = 37.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 65.36

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	44.21	19.40	1.969	1.33 (0.53)	0.40	30.2	300.00
2	65.36	14.50	2.344	1.33 (0.41)	0.31	37.6	304.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	107.05	14.50	2.344	1.33 (0.46)	0.34	60.2	304.00
2	96.86	19.40	1.969	1.33 (0.47)	0.35	67.8	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 107.05 Tc (MIN.) = 14.50
 EFFECTIVE AREA (ACRES) = 60.18 AREA-AVERAGED Fm (INCH/HR) = 0.46
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.34
 TOTAL AREA (ACRES) = 67.8
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3180.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1017.00 DOWNSTREAM (FEET) = 985.00
 FLOW LENGTH (FEET) = 1730.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.34
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 107.05
 PIPE TRAVEL TIME (MIN.) = 2.01 Tc (MIN.) = 16.51
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 306.00 = 4910.00 FEET.

 FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 16.51
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.169
 SUBAREA LOSS RATE DATA (AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 18.40 1.33 0.100 17
 COMMERCIAL A 8.60 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 22.70 1.33 0.500 17
 COMMERCIAL A 10.10 1.33 0.100 17
 PUBLIC PARK A 3.20 1.33 0.850 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.282
 SUBAREA AREA (ACRES) = 63.00 SUBAREA RUNOFF (CFS) = 101.71
 EFFECTIVE AREA (ACRES) = 123.18 AREA-AVERAGED Fm (INCH/HR) = 0.42
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 130.8 PEAK FLOW RATE (CFS) = 194.34

 FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 940.00
 ELEVATION DATA: UPSTREAM (FEET) = 1050.00 DOWNSTREAM (FEET) = 1035.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.753
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.805
 SUBAREA Tc AND LOSS RATE DATA (AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 2.00 1.33 0.100 17 10.75
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 8.10 1.33 0.500 17 13.76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.421
 SUBAREA RUNOFF (CFS) = 20.42

TOTAL AREA (ACRES) = 10.10 PEAK FLOW RATE (CFS) = 20.42

FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1035.00 DOWNSTREAM ELEVATION (FEET) = 1014.00
STREET LENGTH (FEET) = 1450.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 50.47
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.62
HALFSTREET FLOOD WIDTH (FEET) = 23.22
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.52
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.82
STREET FLOW TRAVEL TIME (MIN.) = 5.34 Tc (MIN.) = 16.10

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.202
SUBAREA LOSS RATE DATA (AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 10.40 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 22.00 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.20 1.33 0.200 17
COMMERCIAL A 1.30 1.33 0.100 17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.343
SUBAREA AREA (ACRES) = 37.90 SUBAREA RUNOFF (CFS) = 59.56
EFFECTIVE AREA (ACRES) = 48.00 AREA-AVERAGED Fm (INCH/HR) = 0.48
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.36
TOTAL AREA (ACRES) = 48.0 PEAK FLOW RATE (CFS) = 74.50

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.70 HALFSTREET FLOOD WIDTH (FEET) = 28.61
FLOW VELOCITY (FEET/SEC.) = 4.96 DEPTH*VELOCITY (FT*FT/SEC.) = 3.46
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1450.0 FT WITH ELEVATION-DROP = 21.0 FT, IS 69.7 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 312.00
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 2390.00 FEET.

FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1014.00 DOWNSTREAM (FEET) = 995.00
FLOW LENGTH (FEET) = 1280.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.1 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 12.12
ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 74.50
PIPE TRAVEL TIME (MIN.) = 1.76 Tc (MIN.) = 17.86
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 313.00 = 3670.00 FEET.

FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 17.86
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.069
SUBAREA LOSS RATE DATA (AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.30 1.33 0.100 17
COMMERCIAL A 11.10 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 12.20 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 3.80 1.33 0.200 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 2.70 1.33 0.200 17
COMMERCIAL A 1.20 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.244
SUBAREA AREA (ACRES) = 38.30 SUBAREA RUNOFF (CFS) = 60.14
EFFECTIVE AREA (ACRES) = 86.30 AREA-AVERAGED Fm (INCH/HR) = 0.41
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
TOTAL AREA (ACRES) = 86.3 PEAK FLOW RATE (CFS) = 128.90

FLOW PROCESS FROM NODE 313.00 TO NODE 314.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 995.00 DOWNSTREAM (FEET) = 970.00
FLOW LENGTH (FEET) = 1730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.5 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 13.42
ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 128.90
PIPE TRAVEL TIME (MIN.) = 2.15 Tc (MIN.) = 20.01
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 314.00 = 5400.00 FEET.

FLOW PROCESS FROM NODE 314.00 TO NODE 314.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 20.01
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.933
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 13.00 1.33 0.100 17
COMMERCIAL A 7.90 1.33 0.100 17
COMMERCIAL A 19.40 1.33 0.100 17
PUBLIC PARK A 6.20 1.33 0.850 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
SUBAREA AREA(ACRES) = 46.50 SUBAREA RUNOFF(CFS) = 69.77
EFFECTIVE AREA(ACRES) = 132.80 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 132.8 PEAK FLOW RATE(CFS) = 188.08

FLOW PROCESS FROM NODE 320.00 TO NODE 321.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
ELEVATION DATA: UPSTREAM(FEET) = 1035.00 DOWNSTREAM(FEET) = 1020.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.822
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.795
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.10 1.33 0.100 17 10.82
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 8.50 1.33 0.500 17 13.85
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.421
SUBAREA RUNOFF(CFS) = 21.33
TOTAL AREA(ACRES) = 10.60 PEAK FLOW RATE(CFS) = 21.33

FLOW PROCESS FROM NODE 321.00 TO NODE 322.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1020.00 DOWNSTREAM ELEVATION(FEET) = 1008.00
STREET LENGTH(FEET) = 780.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 38.65
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.57
HALFSTREET FLOOD WIDTH(FEET) = 20.64
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.34
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.48
STREET FLOW TRAVEL TIME(MIN.) = 2.99 Tc(MIN.) = 13.81
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.414

SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.10 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 10.10 1.33 0.500 17
SCHOOL A 7.00 1.33 0.600 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.456
SUBAREA AREA(ACRES) = 21.20 SUBAREA RUNOFF(CFS) = 34.51
EFFECTIVE AREA(ACRES) = 31.80 AREA-AVERAGED Fm(INCH/HR) = 0.59
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.44
TOTAL AREA(ACRES) = 31.8 PEAK FLOW RATE(CFS) = 52.21

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 23.27
FLOW VELOCITY(FEET/SEC.) = 4.66 DEPTH*VELOCITY(FT*FT/SEC.) = 2.90
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 322.00 = 1730.00 FEET.

FLOW PROCESS FROM NODE 322.00 TO NODE 323.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1008.00 DOWNSTREAM(FEET) = 1002.00
FLOW LENGTH(FEET) = 850.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.38
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 52.21
PIPE TRAVEL TIME(MIN.) = 1.69 Tc(MIN.) = 15.50
LONGEST FLOWPATH FROM NODE 320.00 TO NODE 323.00 = 2580.00 FEET.

FLOW PROCESS FROM NODE 323.00 TO NODE 323.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 15.50
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.252
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN

COMMERCIAL A 5.50 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 15.60 1.33 0.500 17
 COMMERCIAL A 4.50 1.33 0.100 17
 COMMERCIAL A 0.30 1.33 0.100 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.341
 SUBAREA AREA (ACRES) = 25.90 SUBAREA RUNOFF (CFS) = 41.95
 EFFECTIVE AREA (ACRES) = 57.70 AREA-AVERAGED Fm (INCH/HR) = 0.53
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 57.7 PEAK FLOW RATE (CFS) = 89.53

 FLOW PROCESS FROM NODE 323.00 TO NODE 324.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1002.00 DOWNSTREAM (FEET) = 985.00
 FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.39
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 89.53
 PIPE TRAVEL TIME (MIN.) = 0.71 Tc (MIN.) = 16.22
 LONGEST FLOWPATH FROM NODE 320.00 TO NODE 324.00 = 3240.00 FEET.

 FLOW PROCESS FROM NODE 324.00 TO NODE 324.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 16.22
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.192
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.30	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	5.10	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.20	1.33	0.200	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.30	1.33	0.200	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.228
 SUBAREA AREA (ACRES) = 28.90 SUBAREA RUNOFF (CFS) = 49.16
 EFFECTIVE AREA (ACRES) = 86.60 AREA-AVERAGED Fm (INCH/HR) = 0.45
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.34
 TOTAL AREA (ACRES) = 86.6 PEAK FLOW RATE (CFS) = 135.57

 FLOW PROCESS FROM NODE 324.00 TO NODE 325.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 985.00 DOWNSTREAM (FEET) = 980.00
 FLOW LENGTH (FEET) = 980.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.31
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 135.57
 PIPE TRAVEL TIME (MIN.) = 1.76 Tc (MIN.) = 17.97
 LONGEST FLOWPATH FROM NODE 320.00 TO NODE 325.00 = 4220.00 FEET.

 FLOW PROCESS FROM NODE 325.00 TO NODE 325.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 17.97
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.061
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.30	1.33	0.100	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.00	1.33	0.200	17
COMMERCIAL	A	12.90	1.33	0.100	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.128
 SUBAREA AREA (ACRES) = 28.20 SUBAREA RUNOFF (CFS) = 47.99
 EFFECTIVE AREA (ACRES) = 114.80 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 114.8 PEAK FLOW RATE (CFS) = 173.34

 FLOW PROCESS FROM NODE 325.00 TO NODE 326.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 980.00 DOWNSTREAM (FEET) = 945.00
 FLOW LENGTH (FEET) = 2650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 41.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.95
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 173.34
 PIPE TRAVEL TIME (MIN.) = 3.17 Tc (MIN.) = 21.14
 LONGEST FLOWPATH FROM NODE 320.00 TO NODE 326.00 = 6870.00 FEET.

 FLOW PROCESS FROM NODE 326.00 TO NODE 326.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 21.14
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.870
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.30	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	5.10	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.20	1.33	0.200	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.30	1.33	0.200	17

COMMERCIAL	A	14.80	1.33	0.100	17
COMMERCIAL	A	23.70	1.33	0.100	17
COMMERCIAL	A	23.60	1.33	0.100	17
COMMERCIAL	A	55.50	1.33	0.100	17
COMMERCIAL	A	21.30	1.33	0.100	17
PUBLIC PARK	A	12.60	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.162
 SUBAREA AREA (ACRES) = 151.50 SUBAREA RUNOFF (CFS) = 225.56
 EFFECTIVE AREA (ACRES) = 266.30 AREA-AVERAGED F_m (INCH/HR) = 0.29
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.22
 TOTAL AREA (ACRES) = 266.3 PEAK FLOW RATE (CFS) = 379.14

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 END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 266.3 TC (MIN.) = 21.14
 EFFECTIVE AREA (ACRES) = 266.30 AREA-AVERAGED F_m (INCH/HR) = 0.29
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.217
 PEAK FLOW RATE (CFS) = 379.14
 =====

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 END OF RATIONAL METHOD ANALYSIS
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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA G, H, I, J, K) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-1-2011 *

FILE NAME: VG100.DAT
TIME/DATE OF STUDY: 14:15 08/01/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.52
30-MINUTES	1.06
1-HOUR	1.40
3-HOUR	2.54
6-HOUR	3.70
24-HOUR	8.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1650.00
ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1085.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 13.120
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.485
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.10	0.98	0.100	32	13.12
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	4.20	0.98	0.200	32	13.98

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.158
SUBAREA RUNOFF (CFS) = 21.89
TOTAL AREA (ACRES) = 7.30 PEAK FLOW RATE (CFS) = 21.89

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1070.00
FLOW LENGTH (FEET) = 820.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 16.2 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 9.68
ESTIMATED PIPE DIAMETER (INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 21.89
PIPE TRAVEL TIME (MIN.) = 1.41 Tc (MIN.) = 14.53
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 2470.00 FEET.

FLOW PROCESS FROM NODE 402.00 TO NODE 402.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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MAINLINE Tc(MIN.) = 14.53
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.278
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.90	0.98	0.200	32
PUBLIC PARK	A	4.50	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA AREA(ACRES) = 15.40 SUBAREA RUNOFF(CFS) = 40.71
EFFECTIVE AREA(ACRES) = 22.70 AREA-AVERAGED Fm(INCH/HR) = 0.28
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
TOTAL AREA(ACRES) = 22.7 PEAK FLOW RATE(CFS) = 61.24

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 760.00
ELEVATION DATA: UPSTREAM(FEET) = 1078.00 DOWNSTREAM(FEET) = 1068.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.265
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.038
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.80	0.98	0.100	32	10.27
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	5.00	0.98	0.500	32	13.14

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394
SUBAREA RUNOFF(CFS) = 22.36
TOTAL AREA(ACRES) = 6.80 PEAK FLOW RATE(CFS) = 22.36

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

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UPSTREAM ELEVATION(FEET) = 1068.00 DOWNSTREAM ELEVATION(FEET) = 1050.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 61.27
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.64
HALFSTREET FLOOD WIDTH(FEET) = 24.01
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.14
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.28
STREET FLOW TRAVEL TIME(MIN.) = 3.24 Tc(MIN.) = 13.50
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.426

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	19.50	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.70	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
SUBAREA AREA(ACRES) = 28.20 SUBAREA RUNOFF(CFS) = 77.47
EFFECTIVE AREA(ACRES) = 35.00 AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.38
TOTAL AREA(ACRES) = 35.0 PEAK FLOW RATE(CFS) = 96.08

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.73 HALFSTREET FLOOD WIDTH(FEET) = 31.67
FLOW VELOCITY(FEET/SEC.) = 5.70 DEPTH*VELOCITY(FT*FT/SEC.) = 4.15
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1000.0 FT WITH ELEVATION-DROP = 18.0 FT, IS 90.2 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 502.00
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 1760.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1050.00 DOWNSTREAM(FEET) = 1040.00
FLOW LENGTH(FEET) = 1180.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 35.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.27
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 96.08
PIPE TRAVEL TIME(MIN.) = 1.91 Tc(MIN.) = 15.42
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 2940.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 15.42

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.164

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	3.60	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.50	0.98	0.200	32
PUBLIC PARK	A	26.20	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.655
SUBAREA AREA (ACRES) = 38.30 SUBAREA RUNOFF (CFS) = 87.05
EFFECTIVE AREA (ACRES) = 73.30 AREA-AVERAGED Fm (INCH/HR) = 0.51
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.53
TOTAL AREA (ACRES) = 73.3 PEAK FLOW RATE (CFS) = 174.88

FLOW PROCESS FROM NODE 600.00 TO NODE 601.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 660.00

ELEVATION DATA: UPSTREAM (FEET) = 1025.00 DOWNSTREAM (FEET) = 1012.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.950

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.385

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.80	0.98	0.100	32	8.95
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	2.40	0.98	0.200	32	9.54
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	4.40	0.98	0.200	32	9.54
PUBLIC PARK	A	1.00	0.98	0.850	32	14.22

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.249
SUBAREA RUNOFF (CFS) = 35.79
TOTAL AREA (ACRES) = 9.60 PEAK FLOW RATE (CFS) = 35.79

FLOW PROCESS FROM NODE 601.00 TO NODE 602.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1012.00 DOWNSTREAM ELEVATION (FEET) = 1000.00

STREET LENGTH (FEET) = 940.00 CURB HEIGHT (INCHES) = 8.0

STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00

INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 62.36

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.68

HALFSTREET FLOOD WIDTH (FEET) = 26.29

AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.53

PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.06

STREET FLOW TRAVEL TIME (MIN.) = 3.46 Tc (MIN.) = 12.40

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.605

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	2.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	9.70	0.98	0.200	32
PUBLIC PARK	A	1.50	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.269
SUBAREA AREA (ACRES) = 17.60 SUBAREA RUNOFF (CFS) = 52.94
EFFECTIVE AREA (ACRES) = 27.20 AREA-AVERAGED Fm (INCH/HR) = 0.26
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.26
TOTAL AREA (ACRES) = 27.2 PEAK FLOW RATE (CFS) = 81.99

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.73 HALFSTREET FLOOD WIDTH (FEET) = 31.88

FLOW VELOCITY (FEET/SEC.) = 4.82 DEPTH*VELOCITY (FT*FT/SEC.) = 3.53

LONGEST FLOWPATH FROM NODE 600.00 TO NODE 602.00 = 1600.00 FEET.

FLOW PROCESS FROM NODE 610.00 TO NODE 611.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 930.00

ELEVATION DATA: UPSTREAM (FEET) = 1000.00 DOWNSTREAM (FEET) = 990.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.587

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.755

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)

COMMERCIAL A 2.20 0.98 0.100 32 11.59
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 7.40 0.98 0.200 32 12.35
 PUBLIC PARK A 4.90 0.98 0.850 32 18.41
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA RUNOFF (CFS) = 43.86
 TOTAL AREA (ACRES) = 14.50 PEAK FLOW RATE (CFS) = 43.86

FLOW PROCESS FROM NODE 701.00 TO NODE 702.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION (FEET) = 970.00 DOWNSTREAM ELEVATION (FEET) = 960.00
 STREET LENGTH (FEET) = 600.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 49.11
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.60
 HALFSTREET FLOOD WIDTH (FEET) = 22.32
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.75
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.87
 STREET FLOW TRAVEL TIME (MIN.) = 2.11 Tc (MIN.) = 12.16
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.648

SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 2.60 0.98 0.100 32
 COMMERCIAL A 2.20 0.98 0.100 32
 COMMERCIAL A 10.40 0.98 0.100 32
 PUBLIC PARK A 1.60 0.98 0.850 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.171
 SUBAREA AREA (ACRES) = 16.80 SUBAREA RUNOFF (CFS) = 52.63
 EFFECTIVE AREA (ACRES) = 23.60 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.23
 TOTAL AREA (ACRES) = 23.6 PEAK FLOW RATE (CFS) = 72.72

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.68 HALFSTREET FLOOD WIDTH (FEET) = 26.61
 FLOW VELOCITY (FEET/SEC.) = 5.22 DEPTH*VELOCITY (FT*FT/SEC.) = 3.54
 LONGEST FLOWPATH FROM NODE 700.00 TO NODE 702.00 = 1380.00 FEET.

 FLOW PROCESS FROM NODE 702.00 TO NODE 702.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc (MIN.) = 12.16
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.648
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 1.40 0.98 0.100 32

 FLOW PROCESS FROM NODE 620.00 TO NODE 621.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1280.00
 ELEVATION DATA: UPSTREAM (FEET) = 990.00 DOWNSTREAM (FEET) = 980.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 14.035
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.347
 SUBAREA Tc AND LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 2.80 0.98 0.100 32 14.03
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 13.90 0.98 0.200 32 14.96
 PUBLIC PARK A 1.10 0.98 0.850 32 22.30
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.224
 SUBAREA RUNOFF (CFS) = 50.12
 TOTAL AREA (ACRES) = 17.80 PEAK FLOW RATE (CFS) = 50.12

 FLOW PROCESS FROM NODE 700.00 TO NODE 701.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 780.00
 ELEVATION DATA: UPSTREAM (FEET) = 982.00 DOWNSTREAM (FEET) = 970.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.053
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.089
 SUBAREA Tc AND LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 4.30 0.98 0.100 32 10.05
 PUBLIC PARK A 2.50 0.98 0.850 32 15.97
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.376
 SUBAREA RUNOFF (CFS) = 22.78
 TOTAL AREA (ACRES) = 6.80 PEAK FLOW RATE (CFS) = 22.78

COMMERCIAL A 6.10 0.98 0.100 32
 PUBLIC PARK A 6.90 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.459
 SUBAREA AREA (ACRES) = 14.40 SUBAREA RUNOFF (CFS) = 41.48
 EFFECTIVE AREA (ACRES) = 38.00 AREA-AVERAGED Fm (INCH/HR) = 0.31
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
 TOTAL AREA (ACRES) = 38.0 PEAK FLOW RATE (CFS) = 114.19

PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.10
 STREET FLOW TRAVEL TIME (MIN.) = 7.90 Tc (MIN.) = 16.66
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.020
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.40	0.98	0.200	32
COMMERCIAL	A	0.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.249
 SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 68.49
 EFFECTIVE AREA (ACRES) = 37.60 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 37.6 PEAK FLOW RATE (CFS) = 92.61

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.79 HALFSTREET FLOOD WIDTH (FEET) = 37.37
 FLOW VELOCITY (FEET/SEC.) = 4.45 DEPTH*VELOCITY (FT*FT/SEC.) = 3.50
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 2010.0 FT WITH ELEVATION-DROP = 20.0 FT, IS 70.3 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 802.00
 LONGEST FLOWPATH FROM NODE 800.00 TO NODE 802.00 = 2630.00 FEET.

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 37.6 TC (MIN.) = 16.66
 EFFECTIVE AREA (ACRES) = 37.60 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.290
 PEAK FLOW RATE (CFS) = 92.61

END OF RATIONAL METHOD ANALYSIS

 FLOW PROCESS FROM NODE 800.00 TO NODE 801.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH (FEET) = 620.00
 ELEVATION DATA: UPSTREAM (FEET) = 1102.00 DOWNSTREAM (FEET) = 1090.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.759
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.442
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	8.76
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.70	0.98	0.500	32	11.21

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.402
 SUBAREA RUNOFF (CFS) = 37.18
 TOTAL AREA (ACRES) = 10.20 PEAK FLOW RATE (CFS) = 37.18

 FLOW PROCESS FROM NODE 801.00 TO NODE 802.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====
 UPSTREAM ELEVATION (FEET) = 1090.00 DOWNSTREAM ELEVATION (FEET) = 1070.00
 STREET LENGTH (FEET) = 2010.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 71.81
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.73
 HALFSTREET FLOOD WIDTH (FEET) = 31.78
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.24

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA G, H, I, J, K) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-1-2011 *

FILE NAME: VG25.DAT
TIME/DATE OF STUDY: 15:15 08/01/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY (INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL
HALF- CROWN TO STREET-CROSSFALL: CURB GUTTER-GEOMETRIES: MANNING
WIDTH CROSSFALL, IN- / OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR
NO. (FT) (FT) SIDE / SIDE/ WAY (FT) (FT) (FT) (n)
=====
1 30.0 20.0 0.018/0.018/0.020 0.67 2.00 0.0312 0.167 0.0150
2 32.0 27.0 0.020/0.020/0.020 0.67 2.00 0.0312 0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with 2 columns: DURATION, AREA-AVERAGED RAINFALL (INCH). Rows include 5-MINUTES (0.38), 30-MINUTES (0.79), 1-HOUR (1.04), 3-HOUR (1.87), 6-HOUR (2.71), 24-HOUR (5.30).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21
=====

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH (FEET) = 1650.00
ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1085.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 13.120
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.829
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 3.10 0.98 0.100 32 13.12
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.20 0.98 0.200 32 13.98
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.158
SUBAREA RUNOFF (CFS) = 17.58
TOTAL AREA (ACRES) = 7.30 PEAK FLOW RATE (CFS) = 17.58

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 31
=====

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====
ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1070.00
FLOW LENGTH (FEET) = 820.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.8 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 9.04
ESTIMATED PIPE DIAMETER (INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 17.58

PIPE TRAVEL TIME(MIN.) = 1.51 Tc(MIN.) = 14.63
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 2470.00 FEET.

FLOW PROCESS FROM NODE 402.00 TO NODE 402.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 14.63
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.650
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.30 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 0.70 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 1.90 0.98 0.200 32
PUBLIC PARK A 4.50 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA AREA(ACRES) = 15.40 SUBAREA RUNOFF(CFS) = 32.01
EFFECTIVE AREA(ACRES) = 22.70 AREA-AVERAGED Fm(INCH/HR) = 0.28
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
TOTAL AREA(ACRES) = 22.7 PEAK FLOW RATE(CFS) = 48.41

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 760.00
ELEVATION DATA: UPSTREAM(FEET) = 1078.00 DOWNSTREAM(FEET) = 1068.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.265
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.278
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.80 0.98 0.100 32 10.27
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 5.00 0.98 0.500 32 13.14
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394
SUBAREA RUNOFF(CFS) = 17.71
TOTAL AREA(ACRES) = 6.80 PEAK FLOW RATE(CFS) = 17.71

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1068.00 DOWNSTREAM ELEVATION(FEET) = 1050.00

STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 48.13
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.60
HALFSTREET FLOOD WIDTH(FEET) = 21.85
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.85
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.89
STREET FLOW TRAVEL TIME(MIN.) = 3.44 Tc(MIN.) = 13.70

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.757
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.00 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 19.50 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 1.70 0.98 0.200 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
SUBAREA AREA(ACRES) = 28.20 SUBAREA RUNOFF(CFS) = 60.50
EFFECTIVE AREA(ACRES) = 35.00 AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.38
TOTAL AREA(ACRES) = 35.0 PEAK FLOW RATE(CFS) = 75.02

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.68 HALFSTREET FLOOD WIDTH(FEET) = 26.50
FLOW VELOCITY(FEET/SEC.) = 5.41 DEPTH*VELOCITY(FT*FT/SEC.) = 3.67
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1000.0 FT WITH ELEVATION-DROP = 18.0 FT, IS 71.4 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 502.00
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 1760.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1050.00 DOWNSTREAM(FEET) = 1040.00
FLOW LENGTH(FEET) = 1180.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.75
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 75.02
PIPE TRAVEL TIME(MIN.) = 2.02 Tc(MIN.) = 15.72

LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 2940.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 15.72
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.539
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.00 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 3.60 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 1.50 0.98 0.200 32
PUBLIC PARK A 26.20 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.655
SUBAREA AREA (ACRES) = 38.30 SUBAREA RUNOFF (CFS) = 65.51
EFFECTIVE AREA (ACRES) = 73.30 AREA-AVERAGED Fm (INCH/HR) = 0.51
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.53
TOTAL AREA (ACRES) = 73.3 PEAK FLOW RATE (CFS) = 133.66

FLOW PROCESS FROM NODE 600.00 TO NODE 601.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 660.00
ELEVATION DATA: UPSTREAM (FEET) = 1025.00 DOWNSTREAM (FEET) = 1012.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.950
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.559
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.80 0.98 0.100 32 8.95
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 2.40 0.98 0.200 32 9.54
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.40 0.98 0.200 32 9.54
PUBLIC PARK A 1.00 0.98 0.850 32 14.22
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.249
SUBAREA RUNOFF (CFS) = 28.66
TOTAL AREA (ACRES) = 9.60 PEAK FLOW RATE (CFS) = 28.66

FLOW PROCESS FROM NODE 601.00 TO NODE 602.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1012.00 DOWNSTREAM ELEVATION (FEET) = 1000.00
STREET LENGTH (FEET) = 940.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 49.64
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.63
HALFSTREET FLOOD WIDTH (FEET) = 23.64
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.30
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.71
STREET FLOW TRAVEL TIME (MIN.) = 3.65 Tc (MIN.) = 12.60

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.899
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.20 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 2.20 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 9.70 0.98 0.200 32
PUBLIC PARK A 1.50 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.269
SUBAREA AREA (ACRES) = 17.60 SUBAREA RUNOFF (CFS) = 41.77
EFFECTIVE AREA (ACRES) = 27.20 AREA-AVERAGED Fm (INCH/HR) = 0.26
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.26
TOTAL AREA (ACRES) = 27.2 PEAK FLOW RATE (CFS) = 64.72

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.68 HALFSTREET FLOOD WIDTH (FEET) = 27.03
FLOW VELOCITY (FEET/SEC.) = 4.57 DEPTH*VELOCITY (FT*FT/SEC.) = 3.12
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 602.00 = 1600.00 FEET.

FLOW PROCESS FROM NODE 610.00 TO NODE 611.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 930.00
ELEVATION DATA: UPSTREAM (FEET) = 1000.00 DOWNSTREAM (FEET) = 990.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.587
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.049
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/
LAND USE

SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL A	2.20	0.98	0.100	32	11.59
RESIDENTIAL "11+ DWELLINGS/ACRE"	7.40	0.98	0.200	32	12.35
PUBLIC PARK A	4.90	0.98	0.850	32	18.41

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA RUNOFF (CFS) = 34.64
 TOTAL AREA (ACRES) = 14.50 PEAK FLOW RATE (CFS) = 34.64

 FLOW PROCESS FROM NODE 620.00 TO NODE 621.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH (FEET) = 1280.00
 ELEVATION DATA: UPSTREAM (FEET) = 990.00 DOWNSTREAM (FEET) = 980.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 14.035
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.717
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.80	0.98	0.100	32	14.03
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	13.90	0.98	0.200	32	14.96
PUBLIC PARK	A	1.10	0.98	0.850	32	22.30

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.224
 SUBAREA RUNOFF (CFS) = 40.03
 TOTAL AREA (ACRES) = 17.80 PEAK FLOW RATE (CFS) = 40.03

 FLOW PROCESS FROM NODE 700.00 TO NODE 701.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH (FEET) = 780.00
 ELEVATION DATA: UPSTREAM (FEET) = 982.00 DOWNSTREAM (FEET) = 970.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.053
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.320
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	4.30	0.98	0.100	32	10.05
PUBLIC PARK	A	2.50	0.98	0.850	32	15.97

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.376
 SUBAREA RUNOFF (CFS) = 18.07
 TOTAL AREA (ACRES) = 6.80 PEAK FLOW RATE (CFS) = 18.07

 FLOW PROCESS FROM NODE 701.00 TO NODE 702.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====
 UPSTREAM ELEVATION (FEET) = 970.00 DOWNSTREAM ELEVATION (FEET) = 960.00
 STREET LENGTH (FEET) = 600.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 39.08
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.57
 HALFSTREET FLOOD WIDTH (FEET) = 20.42
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.48
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.54
 STREET FLOW TRAVEL TIME (MIN.) = 2.23 Tc (MIN.) = 12.28
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.943

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.60	0.98	0.100	32
COMMERCIAL	A	2.20	0.98	0.100	32
COMMERCIAL	A	10.40	0.98	0.100	32
PUBLIC PARK	A	1.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.171
 SUBAREA AREA (ACRES) = 16.80 SUBAREA RUNOFF (CFS) = 41.98
 EFFECTIVE AREA (ACRES) = 23.60 AREA-AVERAGED Fp (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.23
 TOTAL AREA (ACRES) = 23.6 PEAK FLOW RATE (CFS) = 57.75

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.63 HALFSTREET FLOOD WIDTH (FEET) = 23.80
 FLOW VELOCITY (FEET/SEC.) = 4.93 DEPTH*VELOCITY (FT*FT/SEC.) = 3.13
 LONGEST FLOWPATH FROM NODE 700.00 TO NODE 702.00 = 1380.00 FEET.

 FLOW PROCESS FROM NODE 702.00 TO NODE 702.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 12.28
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.943
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ SCS SOIL	AREA	Fp	Ap	SCS
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LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	1.40	0.98	0.100	32
COMMERCIAL	A	6.10	0.98	0.100	32
PUBLIC PARK	A	6.90	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.459
SUBAREA AREA (ACRES) = 14.40 SUBAREA RUNOFF (CFS) = 32.34
EFFECTIVE AREA (ACRES) = 38.00 AREA-AVERAGED F_m (INCH/HR) = 0.31
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.32
TOTAL AREA (ACRES) = 38.0 PEAK FLOW RATE (CFS) = 90.09

HALFSTREET FLOOD WIDTH (FEET) = 26.82
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.04
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.75
STREET FLOW TRAVEL TIME (MIN.) = 8.29 T_c (MIN.) = 17.05
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.418

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	7.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.40	0.98	0.200	32
COMMERCIAL	A	0.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.249
SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 53.63
EFFECTIVE AREA (ACRES) = 37.60 AREA-AVERAGED F_m (INCH/HR) = 0.28
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.29
TOTAL AREA (ACRES) = 37.6 PEAK FLOW RATE (CFS) = 72.23

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.73 HALFSTREET FLOOD WIDTH (FEET) = 31.88
FLOW VELOCITY (FEET/SEC.) = 4.25 DEPTH*VELOCITY (FT*FT/SEC.) = 3.11
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 2010.0 FT WITH ELEVATION-DROP = 20.0 FT, IS 55.9 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 802.00
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 802.00 = 2630.00 FEET.

END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 37.6 T_c (MIN.) = 17.05
EFFECTIVE AREA (ACRES) = 37.60 AREA-AVERAGED F_m (INCH/HR) = 0.28
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.290
PEAK FLOW RATE (CFS) = 72.23

END OF RATIONAL METHOD ANALYSIS

FLOW PROCESS FROM NODE 800.00 TO NODE 801.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 620.00
ELEVATION DATA: UPSTREAM (FEET) = 1102.00 DOWNSTREAM (FEET) = 1090.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 8.759
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.606
SUBAREA T_c AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	8.76
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.70	0.98	0.500	32	11.21

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.402
SUBAREA RUNOFF (CFS) = 29.50
TOTAL AREA (ACRES) = 10.20 PEAK FLOW RATE (CFS) = 29.50

FLOW PROCESS FROM NODE 801.00 TO NODE 802.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1090.00 DOWNSTREAM ELEVATION (FEET) = 1070.00
STREET LENGTH (FEET) = 2010.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 56.68
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.68

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA G, H, I, J, K) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-1-2011 *

FILE NAME: VG10.DAT
TIME/DATE OF STUDY: 15:45 08/01/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB GUTTER-GEOMETRIES: HEIGHT (FT)	MANNING WIDTH LIP HIKE (FT) (FT) (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0312 0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00 0.0312 0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN

OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.30
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1650.00
ELEVATION DATA: UPSTREAM(FEET) = 1115.00 DOWNSTREAM(FEET) = 1085.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.120
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.490
SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.10	1.33	0.100	17	13.12
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	4.20	1.33	0.200	17	13.98

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.158
SUBAREA RUNOFF(CFS) = 14.98
TOTAL AREA(ACRES) = 7.30 PEAK FLOW RATE(CFS) = 14.98

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1085.00 DOWNSTREAM(FEET) = 1070.00
FLOW LENGTH(FEET) = 820.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 14.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.82
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 14.98
PIPE TRAVEL TIME(MIN.) = 1.55 Tc(MIN.) = 14.67
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 2470.00 FEET.

FLOW PROCESS FROM NODE 402.00 TO NODE 402.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.30	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.70	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.90	1.33	0.200	17
PUBLIC PARK	A	4.50	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA AREA (ACRES) = 15.40 SUBAREA RUNOFF(CFS) = 25.83
EFFECTIVE AREA (ACRES) = 22.70 AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.29
TOTAL AREA (ACRES) = 22.7 PEAK FLOW RATE (CFS) = 39.75

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 760.00
ELEVATION DATA: UPSTREAM (FEET) = 1078.00 DOWNSTREAM (FEET) = 1068.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.265
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.885
SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.80	1.33	0.100	17	10.27
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	5.00	1.33	0.500	17	13.14

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394
SUBAREA RUNOFF (CFS) = 14.45
TOTAL AREA (ACRES) = 6.80 PEAK FLOW RATE (CFS) = 14.45

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1068.00 DOWNSTREAM ELEVATION (FEET) = 1050.00
STREET LENGTH (FEET) = 1000.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 38.69

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.56
HALFSTREET FLOOD WIDTH (FEET) = 20.06
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.59
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.57
STREET FLOW TRAVEL TIME (MIN.) = 3.63 Tc (MIN.) = 13.89

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.405
SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.00	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	19.50	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.70	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
SUBAREA AREA (ACRES) = 28.20 SUBAREA RUNOFF (CFS) = 48.16
EFFECTIVE AREA (ACRES) = 35.00 AREA-AVERAGED Fm (INCH/HR) = 0.51
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.38
TOTAL AREA (ACRES) = 35.0 PEAK FLOW RATE (CFS) = 59.67

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.63 HALFSTREET FLOOD WIDTH (FEET) = 23.75
FLOW VELOCITY (FEET/SEC.) = 5.12 DEPTH*VELOCITY (FT*FT/SEC.) = 3.24
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 1760.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1050.00 DOWNSTREAM (FEET) = 1040.00
FLOW LENGTH (FEET) = 1180.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.3 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 9.24
ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 59.67
PIPE TRAVEL TIME (MIN.) = 2.13 Tc (MIN.) = 16.02
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 2940.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc (MIN.) = 16.02

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.208

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.00	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	3.60	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.50	1.33	0.200	17
PUBLIC PARK	A	26.20	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.655

SUBAREA AREA (ACRES) = 38.30 SUBAREA RUNOFF (CFS) = 46.16

EFFECTIVE AREA (ACRES) = 73.30 AREA-AVERAGED Fm (INCH/HR) = 0.70

AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.53

TOTAL AREA (ACRES) = 73.3 PEAK FLOW RATE (CFS) = 99.62

FLOW PROCESS FROM NODE 600.00 TO NODE 601.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 660.00

ELEVATION DATA: UPSTREAM (FEET) = 1025.00 DOWNSTREAM (FEET) = 1012.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.950

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 3.132

SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.80	1.33	0.100	17	8.95
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	2.40	1.33	0.200	17	9.54
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	4.40	1.33	0.200	17	9.54
PUBLIC PARK	A	1.00	1.33	0.850	17	14.22

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.249

SUBAREA RUNOFF (CFS) = 24.20

TOTAL AREA (ACRES) = 9.60 PEAK FLOW RATE (CFS) = 24.20

FLOW PROCESS FROM NODE 601.00 TO NODE 602.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<

=====

UPSTREAM ELEVATION (FEET) = 1012.00 DOWNSTREAM ELEVATION (FEET) = 1000.00

STREET LENGTH (FEET) = 940.00 CURB HEIGHT (INCHES) = 8.0

STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00

INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 41.52

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.60

HALFSTREET FLOOD WIDTH (FEET) = 22.06

AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.11

PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.46

STREET FLOW TRAVEL TIME (MIN.) = 3.82 Tc (MIN.) = 12.76

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.531

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.20	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	2.20	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	9.70	1.33	0.200	17
PUBLIC PARK	A	1.50	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.269

SUBAREA AREA (ACRES) = 17.60 SUBAREA RUNOFF (CFS) = 34.43

EFFECTIVE AREA (ACRES) = 27.20 AREA-AVERAGED Fm (INCH/HR) = 0.35

AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.26

TOTAL AREA (ACRES) = 27.2 PEAK FLOW RATE (CFS) = 53.44

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.64 HALFSTREET FLOOD WIDTH (FEET) = 24.33

FLOW VELOCITY (FEET/SEC.) = 4.38 DEPTH*VELOCITY (FT*FT/SEC.) = 2.82

LONGEST FLOWPATH FROM NODE 600.00 TO NODE 602.00 = 1600.00 FEET.

FLOW PROCESS FROM NODE 610.00 TO NODE 611.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 930.00

ELEVATION DATA: UPSTREAM (FEET) = 1000.00 DOWNSTREAM (FEET) = 990.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.587

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.682

SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.20	1.33	0.100	17	11.59
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	7.40	1.33	0.200	17	12.35

PUBLIC PARK A 4.90 1.33 0.850 17 18.41
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA RUNOFF(CFS) = 27.99
 TOTAL AREA(ACRES) = 14.50 PEAK FLOW RATE(CFS) = 27.99

 FLOW PROCESS FROM NODE 620.00 TO NODE 621.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1280.00
 ELEVATION DATA: UPSTREAM(FEET) = 990.00 DOWNSTREAM(FEET) = 980.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.035
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.391
 SUBAREA Tc AND LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 2.80 1.33 0.100 17 14.03
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 13.90 1.33 0.200 17 14.96
 PUBLIC PARK A 1.10 1.33 0.850 17 22.30
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.224
 SUBAREA RUNOFF(CFS) = 33.53
 TOTAL AREA(ACRES) = 17.80 PEAK FLOW RATE(CFS) = 33.53

 FLOW PROCESS FROM NODE 700.00 TO NODE 701.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 780.00
 ELEVATION DATA: UPSTREAM(FEET) = 982.00 DOWNSTREAM(FEET) = 970.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.053
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.921
 SUBAREA Tc AND LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 4.30 1.33 0.100 17 10.05
 PUBLIC PARK A 2.50 1.33 0.850 17 15.97
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.376
 SUBAREA RUNOFF(CFS) = 14.82
 TOTAL AREA(ACRES) = 6.80 PEAK FLOW RATE(CFS) = 14.82

 FLOW PROCESS FROM NODE 701.00 TO NODE 702.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION(FEET) = 970.00 DOWNSTREAM ELEVATION(FEET) = 960.00
 STREET LENGTH(FEET) = 600.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 32.60

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.54
 HALFSTREET FLOOD WIDTH(FEET) = 19.00
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.29
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.31
 STREET FLOW TRAVEL TIME(MIN.) = 2.33 Tc(MIN.) = 12.38
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.577

SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 2.60 1.33 0.100 17
 COMMERCIAL A 2.20 1.33 0.100 17
 COMMERCIAL A 10.40 1.33 0.100 17
 PUBLIC PARK A 1.60 1.33 0.850 17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.171
 SUBAREA AREA(ACRES) = 16.80 SUBAREA RUNOFF(CFS) = 35.53
 EFFECTIVE AREA(ACRES) = 23.60 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 23.6 PEAK FLOW RATE(CFS) = 48.25

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.60 HALFSTREET FLOOD WIDTH(FEET) = 22.22
 FLOW VELOCITY(FEET/SEC.) = 4.71 DEPTH*VELOCITY(FT*FT/SEC.) = 2.84
 LONGEST FLOWPATH FROM NODE 700.00 TO NODE 702.00 = 1380.00 FEET.

 FLOW PROCESS FROM NODE 702.00 TO NODE 702.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

=====

MAINLINE Tc(MIN.) = 12.38
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.577
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 1.40 1.33 0.100 17
 COMMERCIAL A 6.10 1.33 0.100 17
 PUBLIC PARK A 6.90 1.33 0.850 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.459
 SUBAREA AREA (ACRES) = 14.40 SUBAREA RUNOFF (CFS) = 25.50
 EFFECTIVE AREA (ACRES) = 38.00 AREA-AVERAGED Fm (INCH/HR) = 0.42
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.32
 TOTAL AREA (ACRES) = 38.0 PEAK FLOW RATE (CFS) = 73.74

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.60	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.10	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	12.40	1.33	0.200	17
COMMERCIAL	A	0.30	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.249
 SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 43.55
 EFFECTIVE AREA (ACRES) = 37.60 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 37.6 PEAK FLOW RATE (CFS) = 57.90

 FLOW PROCESS FROM NODE 800.00 TO NODE 801.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 620.00
 ELEVATION DATA: UPSTREAM (FEET) = 1102.00 DOWNSTREAM (FEET) = 1090.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.759
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 3.173
 SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	1.33	0.100	17	8.76
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.70	1.33	0.500	17	11.21

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.402
 SUBAREA RUNOFF (CFS) = 24.22
 TOTAL AREA (ACRES) = 10.20 PEAK FLOW RATE (CFS) = 24.22

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.68 HALFSTREET FLOOD WIDTH (FEET) = 27.24
 FLOW VELOCITY (FEET/SEC.) = 4.06 DEPTH*VELOCITY (FT*FT/SEC.) = 2.78
 LONGEST FLOWPATH FROM NODE 800.00 TO NODE 802.00 = 2630.00 FEET.

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 37.6 TC (MIN.) = 17.47
 EFFECTIVE AREA (ACRES) = 37.60 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.290
 PEAK FLOW RATE (CFS) = 57.90

END OF RATIONAL METHOD ANALYSIS

 FLOW PROCESS FROM NODE 801.00 TO NODE 802.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1090.00 DOWNSTREAM ELEVATION (FEET) = 1070.00
 STREET LENGTH (FEET) = 2010.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 46.39
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.64
 HALFSTREET FLOOD WIDTH (FEET) = 24.17
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.85
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.47
 STREET FLOW TRAVEL TIME (MIN.) = 8.71 Tc (MIN.) = 17.47
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.097

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Analysis prepared by:

HUNSAKER & ASSOCIATES
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Y) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-30-2011 *

FILE NAME: VY100.DAT
TIME/DATE OF STUDY: 15:32 11/30/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with 9 columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-SIDE, PARK-WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.50
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with 2 columns: DURATION, RAINFALL (INCH). Rows: 5-MINUTES (0.52), 30-MINUTES (1.06), 1-HOUR (1.40), 3-HOUR (2.46), 6-HOUR (3.50), 24-HOUR (8.50).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 690.00
ELEVATION DATA: UPSTREAM (FEET) = 1175.00 DOWNSTREAM (FEET) = 1160.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.932
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.390

Table with 7 columns: SUBAREA Tc AND LOSS RATE DATA (AMC II): DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL, RESIDENTIAL, "5-7 DWELLINGS/ACRE".

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.371
SUBAREA RUNOFF (CFS) = 42.78
TOTAL AREA (ACRES) = 11.80 PEAK FLOW RATE (CFS) = 42.78

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====

UPSTREAM ELEVATION (FEET) = 1160.00 DOWNSTREAM ELEVATION (FEET) = 1145.00
STREET LENGTH (FEET) = 680.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 66.85
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.64
 HALFSTREET FLOOD WIDTH(FEET) = 23.85
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.69
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.61
 STREET FLOW TRAVEL TIME(MIN.) = 1.99 Tc(MIN.) = 10.93
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.890
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 5.30 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 9.80 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.360
 SUBAREA AREA(ACRES) = 15.10 SUBAREA RUNOFF(CFS) = 48.10
 EFFECTIVE AREA(ACRES) = 26.90 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 26.9 PEAK FLOW RATE(CFS) = 85.57

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.68 HALFSTREET FLOOD WIDTH(FEET) = 27.14
 FLOW VELOCITY(FEET/SEC.) = 6.02 DEPTH*VELOCITY(FT*FT/SEC.) = 4.12
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1370.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1118.00
 STREET LENGTH(FEET) = 1280.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 125.96
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.77
 HALFSTREET FLOOD WIDTH(FEET) = 35.78
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.41
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 4.94

STREET FLOW TRAVEL TIME(MIN.) = 3.33 Tc(MIN.) = 14.25
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.316
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 10.00 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 20.30 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.368
 SUBAREA AREA(ACRES) = 30.30 SUBAREA RUNOFF(CFS) = 80.66
 EFFECTIVE AREA(ACRES) = 57.20 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 57.2 PEAK FLOW RATE(CFS) = 152.34

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.81 HALFSTREET FLOOD WIDTH(FEET) = 39.22
 FLOW VELOCITY(FEET/SEC.) = 6.70 DEPTH*VELOCITY(FT*FT/SEC.) = 5.44
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1280.0 FT WITH ELEVATION-DROP = 27.0 FT, IS 93.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2650.00 FEET.

=====
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 57.2 TC(MIN.) = 14.25
 EFFECTIVE AREA(ACRES) = 57.20 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.366
 PEAK FLOW RATE(CFS) = 152.34
 =====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Y) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-30-2011 *

FILE NAME: VY25.DAT
TIME/DATE OF STUDY: 15:38 11/30/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.950
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1070
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK-SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GUTTER GEOMETRIES LIP (FT)	HIKE (FT)	MANNING FACTOR
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.50

SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	RAINFALL (INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 690.00
ELEVATION DATA: UPSTREAM (FEET) = 1175.00 DOWNSTREAM (FEET) = 1160.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.932
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.471
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.80	0.98	0.100	32	8.93
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	8.00	0.98	0.500	32	11.43

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.371
SUBAREA RUNOFF (CFS) = 33.02
TOTAL AREA (ACRES) = 11.80 PEAK FLOW RATE (CFS) = 33.02

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1160.00 DOWNSTREAM ELEVATION (FEET) = 1145.00
STREET LENGTH (FEET) = 680.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 51.42
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.59
 HALFSTREET FLOOD WIDTH(FEET) = 21.53
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.33
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.14
 STREET FLOW TRAVEL TIME(MIN.) = 2.13 Tc(MIN.) = 11.06
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.053

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.80	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.360
 SUBAREA AREA(ACRES) = 15.10 SUBAREA RUNOFF(CFS) = 36.73
 EFFECTIVE AREA(ACRES) = 26.90 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 26.9 PEAK FLOW RATE(CFS) = 65.32

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 23.64
 FLOW VELOCITY(FEET/SEC.) = 5.65 DEPTH*VELOCITY(FT*FT/SEC.) = 3.57
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1370.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1118.00
 STREET LENGTH(FEET) = 1280.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 95.77
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.71
 HALFSTREET FLOOD WIDTH(FEET) = 29.88

AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.07
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 4.32
 STREET FLOW TRAVEL TIME(MIN.) = 3.51 Tc(MIN.) = 14.57
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.588
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	20.30	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.368
 SUBAREA AREA(ACRES) = 30.30 SUBAREA RUNOFF(CFS) = 60.78
 EFFECTIVE AREA(ACRES) = 57.20 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 57.2 PEAK FLOW RATE(CFS) = 114.83

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.75 HALFSTREET FLOOD WIDTH(FEET) = 33.78
 FLOW VELOCITY(FEET/SEC.) = 6.29 DEPTH*VELOCITY(FT*FT/SEC.) = 4.72
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2650.00 FEET.

=====

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 57.2 TC(MIN.) = 14.57
 EFFECTIVE AREA(ACRES) = 57.20 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.366
 PEAK FLOW RATE(CFS) = 114.83

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Y) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-30-2011 *

FILE NAME: VY10.DAT
TIME/DATE OF STUDY: 15:52 11/30/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 0.9500

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.50
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 690.00
ELEVATION DATA: UPSTREAM (FEET) = 1175.00 DOWNSTREAM (FEET) = 1160.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 8.932
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.979
SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.80	1.33	0.100	17	8.93
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	8.00	1.33	0.500	17	11.43

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.371
SUBAREA RUNOFF (CFS) = 26.40
TOTAL AREA (ACRES) = 11.80 PEAK FLOW RATE (CFS) = 26.40

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1160.00 DOWNSTREAM ELEVATION (FEET) = 1145.00
STREET LENGTH (FEET) = 680.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 40.87
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.55
 HALFSTREET FLOOD WIDTH(FEET) = 19.69
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.03
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.78
 STREET FLOW TRAVEL TIME(MIN.) = 2.25 Tc(MIN.) = 11.19
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.603

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.30	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	9.80	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.360
 SUBAREA AREA(ACRES) = 15.10 SUBAREA RUNOFF(CFS) = 28.88
 EFFECTIVE AREA(ACRES) = 26.90 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 26.9 PEAK FLOW RATE(CFS) = 51.28

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 21.53
 FLOW VELOCITY(FEET/SEC.) = 5.31 DEPTH*VELOCITY(FT*FT/SEC.) = 3.13
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1370.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1118.00
 STREET LENGTH(FEET) = 1280.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 74.56
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.66
 HALFSTREET FLOOD WIDTH(FEET) = 25.12
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.74
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.79

STREET FLOW TRAVEL TIME(MIN.) = 3.72 Tc(MIN.) = 14.91
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.191

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.00	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	20.30	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.368
 SUBAREA AREA(ACRES) = 30.30 SUBAREA RUNOFF(CFS) = 46.42
 EFFECTIVE AREA(ACRES) = 57.20 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.37
 TOTAL AREA(ACRES) = 57.2 PEAK FLOW RATE(CFS) = 87.73

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.69 HALFSTREET FLOOD WIDTH(FEET) = 28.09
 FLOW VELOCITY(FEET/SEC.) = 5.96 DEPTH*VELOCITY(FT*FT/SEC.) = 4.13
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2650.00 FEET.

=====

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 57.2 TC(MIN.) = 14.91
 EFFECTIVE AREA(ACRES) = 57.20 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.366
 PEAK FLOW RATE(CFS) = 87.73

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Z) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-30-2011 *

FILE NAME: VZ100.DAT
TIME/DATE OF STUDY: 13:02 11/30/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

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 32.0 27.0 0.020/0.020/0.020 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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION RAINFALL(INCH)
5-MINUTES 0.52
30-MINUTES 1.06
1-HOUR 1.40
3-HOUR 2.54
6-HOUR 3.70
24-HOUR 8.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1130.00
ELEVATION DATA: UPSTREAM(FEET) = 1150.00 DOWNSTREAM(FEET) = 1146.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.643
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.136

SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.50 0.98 0.100 32 15.64
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 2.50 0.98 0.200 32 16.67
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.150
SUBAREA RUNOFF(CFS) = 13.46
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 13.46

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62
=====

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====

UPSTREAM ELEVATION(FEET) = 1146.00 DOWNSTREAM ELEVATION(FEET) = 1125.00
STREET LENGTH(FEET) = 1670.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 38.05
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.59
 HALFSTREET FLOOD WIDTH(FEET) = 21.37
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.00
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.34
 STREET FLOW TRAVEL TIME(MIN.) = 6.96 Tc(MIN.) = 22.60
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.515

SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 5.70 0.98 0.100 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 17.00 0.98 0.200 32
 PUBLIC PARK A 0.60 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.192
 SUBAREA AREA(ACRES) = 23.30 SUBAREA RUNOFF(CFS) = 48.80
 EFFECTIVE AREA(ACRES) = 28.30 AREA-AVERAGED Fm(INCH/HR) = 0.18
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.18
 TOTAL AREA(ACRES) = 28.3 PEAK FLOW RATE(CFS) = 59.46

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.45
 FLOW VELOCITY(FEET/SEC.) = 4.47 DEPTH*VELOCITY(FT*FT/SEC.) = 2.98
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1670.0 FT WITH ELEVATION-DROP = 21.0 FT, IS 65.8 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 3.00
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 2800.00 FEET.

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

 INITIAL SUBAREA FLOW-LENGTH(FEET) = 1030.00
 ELEVATION DATA: UPSTREAM(FEET) = 1130.00 DOWNSTREAM(FEET) = 1115.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.107
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.658
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	6.30	0.98	0.200	32	12.11
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98						
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200						
SUBAREA RUNOFF(CFS) = 19.63						
TOTAL AREA(ACRES) = 6.30 PEAK FLOW RATE(CFS) = 19.63						

 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

 UPSTREAM ELEVATION(FEET) = 1115.00 DOWNSTREAM ELEVATION(FEET) = 1100.00
 STREET LENGTH(FEET) = 1070.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 30.57
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.54
 HALFSTREET FLOOD WIDTH(FEET) = 19.16
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.96
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.14
 STREET FLOW TRAVEL TIME(MIN.) = 4.50 Tc(MIN.) = 16.61
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.025

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" A 6.30 0.98 0.200 32
 PUBLIC PARK A 2.90 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405
 SUBAREA AREA(ACRES) = 9.20 SUBAREA RUNOFF(CFS) = 21.78
 EFFECTIVE AREA(ACRES) = 15.50 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
 TOTAL AREA(ACRES) = 15.5 PEAK FLOW RATE(CFS) = 37.83

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.58 HALFSTREET FLOOD WIDTH(FEET) = 20.85
 FLOW VELOCITY(FEET/SEC.) = 4.17 DEPTH*VELOCITY(FT*FT/SEC.) = 2.40
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 2100.00 FEET.

 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

 MAINLINE Tc(MIN.) = 16.61
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.025
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN

COMMERCIAL	A	4.00	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	13.00	0.98	0.200	32
PUBLIC PARK	A	0.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.192
SUBAREA AREA (ACRES) = 17.40 SUBAREA RUNOFF (CFS) = 44.45
EFFECTIVE AREA (ACRES) = 32.90 AREA-AVERAGED F_m (INCH/HR) = 0.25
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.25
TOTAL AREA (ACRES) = 32.9 PEAK FLOW RATE (CFS) = 82.28

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 32.9 TC (MIN.) = 16.61
EFFECTIVE AREA (ACRES) = 32.90 AREA-AVERAGED F_m (INCH/HR) = 0.25
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.253
PEAK FLOW RATE (CFS) = 82.28

=====
END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Z) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-30-2011 *

FILE NAME: VZ25.DAT
TIME/DATE OF STUDY: 13:44 11/30/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK-SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1130.00
ELEVATION DATA: UPSTREAM(FEET) = 1150.00 DOWNSTREAM(FEET) = 1146.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.643
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.546
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	15.64
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	2.50	0.98	0.200	32	16.67

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.150
SUBAREA RUNOFF(CFS) = 10.80
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 10.80

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1146.00 DOWNSTREAM ELEVATION(FEET) = 1125.00
STREET LENGTH(FEET) = 1670.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 30.19
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.55
 HALFSTREET FLOOD WIDTH (FEET) = 19.48
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.79
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.08
 STREET FLOW TRAVEL TIME (MIN.) = 7.34 Tc (MIN.) = 22.99
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.021
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	17.00	0.98	0.200	32
PUBLIC PARK	A	0.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.192
 SUBAREA AREA (ACRES) = 23.30 SUBAREA RUNOFF (CFS) = 38.45
 EFFECTIVE AREA (ACRES) = 28.30 AREA-AVERAGED Fm (INCH/HR) = 0.18
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.18
 TOTAL AREA (ACRES) = 28.3 PEAK FLOW RATE (CFS) = 46.89

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.62 HALFSTREET FLOOD WIDTH (FEET) = 23.17
 FLOW VELOCITY (FEET/SEC.) = 4.22 DEPTH*VELOCITY (FT*FT/SEC.) = 2.62
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 2800.00 FEET.

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1030.00
 ELEVATION DATA: UPSTREAM (FEET) = 1130.00 DOWNSTREAM (FEET) = 1115.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.107
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.969
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	6.30	0.98	0.200	32	12.11

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA RUNOFF (CFS) = 15.73
 TOTAL AREA (ACRES) = 6.30 PEAK FLOW RATE (CFS) = 15.73

 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION (FEET) = 1115.00 DOWNSTREAM ELEVATION (FEET) = 1100.00
 STREET LENGTH (FEET) = 1070.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 24.21
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.51
 HALFSTREET FLOOD WIDTH (FEET) = 17.47
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.73
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.90
 STREET FLOW TRAVEL TIME (MIN.) = 4.78 Tc (MIN.) = 16.88
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.432
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	6.30	0.98	0.200	32
PUBLIC PARK	A	2.90	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405
 SUBAREA AREA (ACRES) = 9.20 SUBAREA RUNOFF (CFS) = 16.87
 EFFECTIVE AREA (ACRES) = 15.50 AREA-AVERAGED Fm (INCH/HR) = 0.31
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
 TOTAL AREA (ACRES) = 15.5 PEAK FLOW RATE (CFS) = 29.56

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.54 HALFSTREET FLOOD WIDTH (FEET) = 18.90
 FLOW VELOCITY (FEET/SEC.) = 3.93 DEPTH*VELOCITY (FT*FT/SEC.) = 2.11
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 2100.00 FEET.

 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc (MIN.) = 16.88
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.432
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.00	0.98	0.100	32

RESIDENTIAL

"11+ DWELLINGS/ACRE"	A	13.00	0.98	0.200	32
PUBLIC PARK	A	0.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.192

SUBAREA AREA (ACRES) = 17.40 SUBAREA RUNOFF (CFS) = 35.16

EFFECTIVE AREA (ACRES) = 32.90 AREA-AVERAGED F_m (INCH/HR) = 0.25

AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.25

TOTAL AREA (ACRES) = 32.9 PEAK FLOW RATE (CFS) = 64.71

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 32.9 TC (MIN.) = 16.88

EFFECTIVE AREA (ACRES) = 32.90 AREA-AVERAGED F_m (INCH/HR) = 0.25

AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.253

PEAK FLOW RATE (CFS) = 64.71

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Z) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-30-2011 *

FILE NAME: VZ10.DAT
TIME/DATE OF STUDY: 13:51 11/30/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO STREET-CROSSFALL:		CURB GUTTER-GEOMETRIES:				MANNING FACTOR (n)		
	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE	OUT- / SIDE	HEIGHT (FT)	WIDTH LIP (FT)			
1	30.0	20.0	0.018/0.018/0.020	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1130.00
ELEVATION DATA: UPSTREAM(FEET) = 1150.00 DOWNSTREAM(FEET) = 1146.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.643
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.240
SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	1.33	0.100	17	15.64
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	2.50	1.33	0.200	17	16.67

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.150
SUBAREA RUNOFF(CFS) = 9.18
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 9.18

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1146.00 DOWNSTREAM ELEVATION(FEET) = 1125.00
STREET LENGTH(FEET) = 1670.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 25.16
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.52
 HALFSTREET FLOOD WIDTH(FEET) = 18.10
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.63
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.89
 STREET FLOW TRAVEL TIME(MIN.) = 7.67 Tc(MIN.) = 23.31
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.763

SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 5.70 1.33 0.100 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 17.00 1.33 0.200 17
 PUBLIC PARK A 0.60 1.33 0.850 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.192
 SUBAREA AREA(ACRES) = 23.30 SUBAREA RUNOFF(CFS) = 31.62
 EFFECTIVE AREA(ACRES) = 28.30 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.18
 TOTAL AREA(ACRES) = 28.3 PEAK FLOW RATE(CFS) = 38.66

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 21.48
 FLOW VELOCITY(FEET/SEC.) = 4.02 DEPTH*VELOCITY(FT*FT/SEC.) = 2.37
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 2800.00 FEET.

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1030.00
 ELEVATION DATA: UPSTREAM(FEET) = 1130.00 DOWNSTREAM(FEET) = 1115.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.107
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.613
 SUBAREA Tc AND LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 6.30 1.33 0.200 17 12.11
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA RUNOFF(CFS) = 13.31
 TOTAL AREA(ACRES) = 6.30 PEAK FLOW RATE(CFS) = 13.31

 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION(FEET) = 1115.00 DOWNSTREAM ELEVATION(FEET) = 1100.00
 STREET LENGTH(FEET) = 1070.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 19.93
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.48
 HALFSTREET FLOOD WIDTH(FEET) = 16.15
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.56
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.71
 STREET FLOW TRAVEL TIME(MIN.) = 5.01 Tc(MIN.) = 17.12
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.122

SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 6.30 1.33 0.200 17
 PUBLIC PARK A 2.90 1.33 0.850 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.405
 SUBAREA AREA(ACRES) = 9.20 SUBAREA RUNOFF(CFS) = 13.12
 EFFECTIVE AREA(ACRES) = 15.50 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.32
 TOTAL AREA(ACRES) = 15.5 PEAK FLOW RATE(CFS) = 23.65

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.50 HALFSTREET FLOOD WIDTH(FEET) = 17.31
 FLOW VELOCITY(FEET/SEC.) = 3.71 DEPTH*VELOCITY(FT*FT/SEC.) = 1.87
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 2100.00 FEET.

 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 17.12
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.122
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 4.00 1.33 0.100 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 13.00 1.33 0.200 17

PUBLIC PARK A 0.40 1.33 0.850 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.192
SUBAREA AREA (ACRES) = 17.40 SUBAREA RUNOFF (CFS) = 29.25
EFFECTIVE AREA (ACRES) = 32.90 AREA-AVERAGED F_m (INCH/HR) = 0.34
AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.25
TOTAL AREA (ACRES) = 32.9 PEAK FLOW RATE (CFS) = 52.90

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 32.9 TC (MIN.) = 17.12
EFFECTIVE AREA (ACRES) = 32.90 AREA-AVERAGED F_m (INCH/HR) = 0.34
AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.253
PEAK FLOW RATE (CFS) = 52.90

=====
END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA A,L,M,N) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-4-2011 *

FILE NAME: VALMN100.DAT
TIME/DATE OF STUDY: 15:37 11/04/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0312 0.167 0.0150	
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00 0.0312 0.167 0.0150	

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.52
30-MINUTES	1.06
1-HOUR	1.40
3-HOUR	2.46
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
ELEVATION DATA: UPSTREAM(FEET) = 988.00 DOWNSTREAM(FEET) = 976.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.315
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.537
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 3.00 0.98 0.100 32 11.32
COMMERCIAL A 5.70 0.98 0.100 32 11.32
PUBLIC PARK A 1.70 0.98 0.850 32 17.98
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.223
SUBAREA RUNOFF(CFS) = 31.07
TOTAL AREA(ACRES) = 10.40 PEAK FLOW RATE(CFS) = 31.07

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 976.00 DOWNSTREAM ELEVATION(FEET) = 965.00
STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 51.53
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.62
 HALFSTREET FLOOD WIDTH(FEET) = 23.33
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.58
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.86
 STREET FLOW TRAVEL TIME(MIN.) = 2.73 Tc(MIN.) = 14.05
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.107
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.80	0.98	0.100	32
COMMERCIAL	A	10.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.70	0.98	0.500	32
PUBLIC PARK	A	0.90	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.162
 SUBAREA AREA(ACRES) = 15.40 SUBAREA RUNOFF(CFS) = 40.87
 EFFECTIVE AREA(ACRES) = 25.80 AREA-AVERAGED Fm(INCH/HR) = 0.18
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.19
 TOTAL AREA(ACRES) = 25.8 PEAK FLOW RATE(CFS) = 67.91

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.68 HALFSTREET FLOOD WIDTH(FEET) = 26.61
 FLOW VELOCITY(FEET/SEC.) = 4.88 DEPTH*VELOCITY(FT*FT/SEC.) = 3.31
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1700.00 FEET.

 FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

 UPSTREAM ELEVATION(FEET) = 965.00 DOWNSTREAM ELEVATION(FEET) = 940.00
 STREET LENGTH(FEET) = 1570.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 107.56
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.77
 HALFSTREET FLOOD WIDTH(FEET) = 35.47

AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.54
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 4.25
 STREET FLOW TRAVEL TIME(MIN.) = 4.72 Tc(MIN.) = 18.77
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.611
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.20	0.98	0.100	32
COMMERCIAL	A	9.70	0.98	0.100	32
COMMERCIAL	A	16.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.50	0.98	0.500	32
PUBLIC PARK	A	1.80	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.187
 SUBAREA AREA(ACRES) = 36.20 SUBAREA RUNOFF(CFS) = 79.11
 EFFECTIVE AREA(ACRES) = 62.00 AREA-AVERAGED Fm(INCH/HR) = 0.18
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.19
 TOTAL AREA(ACRES) = 62.0 PEAK FLOW RATE(CFS) = 135.51

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.82 HALFSTREET FLOOD WIDTH(FEET) = 39.46
 FLOW VELOCITY(FEET/SEC.) = 5.86 DEPTH*VELOCITY(FT*FT/SEC.) = 4.79
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1570.0 FT WITH ELEVATION-DROP = 25.0 FT, IS 99.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 4.00
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 3270.00 FEET.

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 940.00 DOWNSTREAM(FEET) = 925.00
 FLOW LENGTH(FEET) = 930.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.18
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 135.51
 PIPE TRAVEL TIME(MIN.) = 1.09 Tc(MIN.) = 19.86
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 4200.00 FEET.

 FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 19.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.523
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32
COMMERCIAL	A	2.20	0.98	0.100	32
RESIDENTIAL					

"5-7 DWELLINGS/ACRE" A 19.70 0.98 0.500 32
 PUBLIC PARK A 1.20 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397
 SUBAREA AREA(ACRES) = 29.60 SUBAREA RUNOFF(CFS) = 56.92
 EFFECTIVE AREA(ACRES) = 91.60 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
 TOTAL AREA(ACRES) = 91.6 PEAK FLOW RATE(CFS) = 187.57

 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 925.00 DOWNSTREAM(FEET) = 898.00
 FLOW LENGTH(FEET) = 2230.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.86
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 187.57
 PIPE TRAVEL TIME(MIN.) = 2.68 Tc(MIN.) = 22.55
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 6430.00 FEET.

 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc(MIN.) = 22.55
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.339
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 6.30 0.98 0.100 32
 COMMERCIAL A 50.00 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 14.40 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.181
 SUBAREA AREA(ACRES) = 70.70 SUBAREA RUNOFF(CFS) = 137.56
 EFFECTIVE AREA(ACRES) = 162.30 AREA-AVERAGED Fm(INCH/HR) = 0.22
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22
 TOTAL AREA(ACRES) = 162.3 PEAK FLOW RATE(CFS) = 309.91

 FLOW PROCESS FROM NODE 6.00 TO NODE 10.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 898.00 DOWNSTREAM(FEET) = 882.00
 FLOW LENGTH(FEET) = 1360.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 51.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.61
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 309.91
 PIPE TRAVEL TIME(MIN.) = 1.45 Tc(MIN.) = 24.00
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 7790.00 FEET.

 FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc(MIN.) = 24.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.253
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 7.20 0.98 0.100 32
 COMMERCIAL A 18.60 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 9.00 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 0.80 0.98 0.200 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 8.20 0.98 0.200 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.203
 SUBAREA AREA(ACRES) = 43.80 SUBAREA RUNOFF(CFS) = 81.01
 EFFECTIVE AREA(ACRES) = 206.10 AREA-AVERAGED Fm(INCH/HR) = 0.21
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22
 TOTAL AREA(ACRES) = 206.1 PEAK FLOW RATE(CFS) = 378.37

 FLOW PROCESS FROM NODE 10.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 882.00 DOWNSTREAM(FEET) = 876.00
 FLOW LENGTH(FEET) = 1940.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 90.0 INCH PIPE IS 73.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.86
 ESTIMATED PIPE DIAMETER(INCH) = 90.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 378.37
 PIPE TRAVEL TIME(MIN.) = 3.28 Tc(MIN.) = 27.28
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
 =====

 FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00
 ELEVATION DATA: UPSTREAM(FEET) = 976.00 DOWNSTREAM(FEET) = 965.00

DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 22.80
 FLOW VELOCITY(FEET/SEC.) = 5.25 DEPTH*VELOCITY(FT*FT/SEC.) = 3.23
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1750.00 FEET.

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.874
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.436
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.90	0.98	0.100	32	11.87
COMMERCIAL	A	7.40	0.98	0.100	32	11.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 30.95
 TOTAL AREA(ACRES) = 10.30 PEAK FLOW RATE(CFS) = 30.95

 FLOW PROCESS FROM NODE 102.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 950.00 DOWNSTREAM(FEET) = 948.00
 FLOW LENGTH(FEET) = 720.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.88
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 56.59
 PIPE TRAVEL TIME(MIN.) = 2.04 Tc(MIN.) = 16.42
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 2470.00 FEET.

 FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 965.00 DOWNSTREAM ELEVATION(FEET) = 950.00
 STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 45.51
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.58
 HALFSTREET FLOOD WIDTH(FEET) = 20.90
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.99
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.88
 STREET FLOW TRAVEL TIME(MIN.) = 2.50 Tc(MIN.) = 14.38

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.064
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.40	0.98	0.100	32
COMMERCIAL	A	10.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 10.90 SUBAREA RUNOFF(CFS) = 29.10
 EFFECTIVE AREA(ACRES) = 21.20 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 21.2 PEAK FLOW RATE(CFS) = 56.59

END OF SUBAREA STREET FLOW HYDRAULICS:

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 16.42
 RAINFALL INTENSITY(INCH/HR) = 2.83
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 21.20
 TOTAL STREAM AREA(ACRES) = 21.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 56.59

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 870.00
 ELEVATION DATA: UPSTREAM(FEET) = 975.00 DOWNSTREAM(FEET) = 962.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.563
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.686
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.80	0.98	0.100	32	10.56
COMMERCIAL	A	4.20	0.98	0.100	32	10.56

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 25.84
 TOTAL AREA(ACRES) = 8.00 PEAK FLOW RATE(CFS) = 25.84

"5-7 DWELLINGS/ACRE" A 19.40 0.98 0.500 32
 PUBLIC PARK A 11.80 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.365
 SUBAREA AREA (ACRES) = 62.60 SUBAREA RUNOFF (CFS) = 147.13
 EFFECTIVE AREA (ACRES) = 101.62 AREA-AVERAGED Fm (INCH/HR) = 0.26
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
 TOTAL AREA (ACRES) = 105.8 PEAK FLOW RATE (CFS) = 247.94

ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 319.14
 PIPE TRAVEL TIME (MIN.) = 3.62 Tc (MIN.) = 21.07
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 9070.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 21.07
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.436
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.40	0.98	0.100	32
COMMERCIAL	A	45.00	0.98	0.100	32
SCHOOL	A	4.60	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.140
 SUBAREA AREA (ACRES) = 57.00 SUBAREA RUNOFF (CFS) = 117.95
 EFFECTIVE AREA (ACRES) = 200.02 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 204.2 PEAK FLOW RATE (CFS) = 399.58

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	399.58	21.07	2.436	0.97 (0.22)	0.22	200.0	103.00
2	370.33	24.42	2.229	0.97 (0.21)	0.22	204.2	100.00

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 9070.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	378.37	27.28	2.086	0.98 (0.21)	0.22	206.1	1.00

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	746.35	21.07	2.436	0.97 (0.21)	0.22	359.2	103.00
2	734.98	24.42	2.229	0.97 (0.21)	0.22	388.7	100.00
3	722.42	27.28	2.086	0.97 (0.21)	0.22	410.3	1.00

TOTAL AREA (ACRES) = 410.3

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 746.35 Tc (MIN.) = 21.065
 EFFECTIVE AREA (ACRES) = 359.18 AREA-AVERAGED Fm (INCH/HR) = 0.21
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22

 FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 925.00 DOWNSTREAM (FEET) = 900.00
 FLOW LENGTH (FEET) = 2050.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 47.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.92
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 247.94
 PIPE TRAVEL TIME (MIN.) = 2.29 Tc (MIN.) = 17.45
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 6100.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 17.45
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.728
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.80	0.98	0.100	32
COMMERCIAL	A	24.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.00	0.98	0.500	32
SCHOOL	A	4.60	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.233
 SUBAREA AREA (ACRES) = 41.40 SUBAREA RUNOFF (CFS) = 93.17
 EFFECTIVE AREA (ACRES) = 143.02 AREA-AVERAGED Fm (INCH/HR) = 0.25
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 147.2 PEAK FLOW RATE (CFS) = 319.14

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 900.00 DOWNSTREAM (FEET) = 876.00
 FLOW LENGTH (FEET) = 2970.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 55.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.69

TOTAL AREA (ACRES) = 410.3
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 108.00 TO NODE 207.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 876.00 DOWNSTREAM (FEET) = 875.00
FLOW LENGTH (FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 120.0 INCH PIPE IS 89.8 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 5.92
ESTIMATED PIPE DIAMETER (INCH) = 120.00 NUMBER OF PIPES = 2
PIPE-FLOW (CFS) = 746.35
PIPE TRAVEL TIME (MIN.) = 3.66 Tc (MIN.) = 24.73
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 207.00 = 11030.00 FEET.

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1100.00
ELEVATION DATA: UPSTREAM (FEET) = 970.00 DOWNSTREAM (FEET) = 948.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.945
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.608
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.30 0.98 0.100 32 10.95
COMMERCIAL A 8.20 0.98 0.100 32 10.95
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 30.02
TOTAL AREA (ACRES) = 9.50 PEAK FLOW RATE (CFS) = 30.02

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>> (STREET TABLE SECTION # 2 USED) <<<<<<<

UPSTREAM ELEVATION (FEET) = 948.00 DOWNSTREAM ELEVATION (FEET) = 920.00
STREET LENGTH (FEET) = 2320.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 66.47
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.69
HALFSTREET FLOOD WIDTH (FEET) = 28.09
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.51
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.13
STREET FLOW TRAVEL TIME (MIN.) = 8.57 Tc (MIN.) = 19.51
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.551

SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.70 0.98 0.100 32
COMMERCIAL A 7.90 0.98 0.100 32
COMMERCIAL A 10.20 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 6.90 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.182
SUBAREA AREA (ACRES) = 33.70 SUBAREA RUNOFF (CFS) = 71.98
EFFECTIVE AREA (ACRES) = 43.20 AREA-AVERAGED Fm (INCH/HR) = 0.16
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.16
TOTAL AREA (ACRES) = 43.2 PEAK FLOW RATE (CFS) = 92.95

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.77 HALFSTREET FLOOD WIDTH (FEET) = 35.26
FLOW VELOCITY (FEET/SEC.) = 4.82 DEPTH*VELOCITY (FT*FT/SEC.) = 3.69
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 2320.0 FT WITH ELEVATION-DROP = 28.0 FT, IS 80.7 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 202.00
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 3420.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 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.) = 19.51
RAINFALL INTENSITY (INCH/HR) = 2.55
AREA-AVERAGED Fm (INCH/HR) = 0.16

AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.16
 EFFECTIVE STREAM AREA (ACRES) = 43.20
 TOTAL STREAM AREA (ACRES) = 43.20
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 92.95

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 12.70 SUBAREA RUNOFF (CFS) = 33.31
 EFFECTIVE AREA (ACRES) = 29.00 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 29.0 PEAK FLOW RATE (CFS) = 76.05

 FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1230.00
 ELEVATION DATA: UPSTREAM (FEET) = 960.00 DOWNSTREAM (FEET) = 944.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.474
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.336
 SUBAREA Tc AND LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 3.80 0.98 0.100 32 12.47
 COMMERCIAL A 12.50 0.98 0.100 32 12.47
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF (CFS) = 47.51
 TOTAL AREA (ACRES) = 16.30 PEAK FLOW RATE (CFS) = 47.51

 FLOW PROCESS FROM NODE 205.00 TO NODE 202.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 944.00 DOWNSTREAM (FEET) = 920.00
 FLOW LENGTH (FEET) = 1540.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.06
 ESTIMATED PIPE DIAMETER (INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 47.51
 PIPE TRAVEL TIME (MIN.) = 2.32 Tc (MIN.) = 14.80
 LONGEST FLOWPATH FROM NODE 204.00 TO NODE 202.00 = 2770.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====

MAINLINE Tc (MIN.) = 14.80
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.011
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 3.70 0.98 0.100 32
 COMMERCIAL A 4.50 0.98 0.100 32
 COMMERCIAL A 4.50 0.98 0.100 32

 FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 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.) = 14.80
 RAINFALL INTENSITY (INCH/HR) = 3.01
 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA (ACRES) = 29.00
 TOTAL STREAM AREA (ACRES) = 29.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 76.05

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	92.95	19.51	2.551	0.98 (0.16)	0.16	43.2	200.00
2	76.05	14.80	3.011	0.98 (0.10)	0.10	29.0	204.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	160.11	14.80	3.011	0.98 (0.13)	0.13	61.8	204.00
2	156.98	19.51	2.551	0.98 (0.13)	0.14	72.2	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 160.11 Tc (MIN.) = 14.80
 EFFECTIVE AREA (ACRES) = 61.76 AREA-AVERAGED Fm (INCH/HR) = 0.13
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.13
 TOTAL AREA (ACRES) = 72.2
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 3420.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 206.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 920.00 DOWNSTREAM (FEET) = 895.00
 FLOW LENGTH (FEET) = 2070.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.33

ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 160.11
 PIPE TRAVEL TIME(MIN.) = 2.59 Tc(MIN.) = 17.38
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 206.00 = 5490.00 FEET.

 FLOW PROCESS FROM NODE 206.00 TO NODE 206.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 17.38
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.734
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.70	0.98	0.100	32
COMMERCIAL	A	58.60	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 63.30 SUBAREA RUNOFF(CFS) = 150.18
 EFFECTIVE AREA(ACRES) = 125.06 AREA-AVERAGED Fm(INCH/HR) = 0.11
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.12
 TOTAL AREA(ACRES) = 135.5 PEAK FLOW RATE(CFS) = 294.86

 FLOW PROCESS FROM NODE 206.00 TO NODE 207.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 895.00 DOWNSTREAM(FEET) = 875.00
 FLOW LENGTH(FEET) = 2300.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 69.0 INCH PIPE IS 52.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.80
 ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 294.86
 PIPE TRAVEL TIME(MIN.) = 2.78 Tc(MIN.) = 20.16
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 7790.00 FEET.

 FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 20.16
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.501
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32
COMMERCIAL	A	46.70	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 53.20 SUBAREA RUNOFF(CFS) = 115.08
 EFFECTIVE AREA(ACRES) = 178.26 AREA-AVERAGED Fm(INCH/HR) = 0.11
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11

TOTAL AREA(ACRES) = 188.7 PEAK FLOW RATE(CFS) = 383.76

 FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

 ** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	383.76	20.16	2.501	0.98(0.11)	0.11	178.3	204.00
2	354.72	24.96	2.200	0.98(0.11)	0.11	188.7	200.00

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 7790.00 FEET.

 ** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	746.35	24.73	2.213	0.97(0.21)	0.22	359.2	103.00
2	734.98	28.09	2.050	0.97(0.21)	0.22	388.7	100.00
3	722.42	30.95	1.934	0.97(0.21)	0.22	410.3	1.00

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 207.00 = 11030.00 FEET.

 ** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1080.14	20.16	2.501	0.98(0.17)	0.18	471.1	204.00
2	1102.48	24.73	2.213	0.97(0.18)	0.18	547.4	103.00
3	1100.28	24.96	2.200	0.97(0.18)	0.18	549.9	200.00
4	1064.09	28.09	2.050	0.97(0.18)	0.18	577.4	100.00
5	1031.85	30.95	1.934	0.97(0.18)	0.19	599.0	1.00

TOTAL AREA(ACRES) = 599.0

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1102.48 Tc(MIN.) = 24.726
 EFFECTIVE AREA(ACRES) = 547.37 AREA-AVERAGED Fm(INCH/HR) = 0.18
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.18
 TOTAL AREA(ACRES) = 599.0
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 207.00 = 11030.00 FEET.

 FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 207.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 875.00 DOWNSTREAM(FEET) = 874.00
 FLOW LENGTH(FEET) = 700.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 120.0 INCH PIPE IS 96.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.11

ESTIMATED PIPE DIAMETER (INCH) = 120.00 NUMBER OF PIPES = 2
 PIPE-FLOW (CFS) = 1102.48
 PIPE TRAVEL TIME (MIN.) = 1.44 Tc (MIN.) = 26.16
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 10

 >>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
 =====

 FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1060.00
 ELEVATION DATA: UPSTREAM (FEET) = 950.00 DOWNSTREAM (FEET) = 940.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.533
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.327
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.40	0.98	0.100	32	12.53
COMMERCIAL	A	3.60	0.98	0.100	32	12.53

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF (CFS) = 20.34
 TOTAL AREA (ACRES) = 7.00 PEAK FLOW RATE (CFS) = 20.34

 FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 940.00 DOWNSTREAM (FEET) = 918.00
 FLOW LENGTH (FEET) = 1410.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 16.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 8.95
 ESTIMATED PIPE DIAMETER (INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 20.34
 PIPE TRAVEL TIME (MIN.) = 2.63 Tc (MIN.) = 15.16
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 2470.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 15.16
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.968
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	22.80	0.98	0.100	32
COMMERCIAL	A	12.50	0.98	0.100	32
COMMERCIAL	A	12.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 47.70 SUBAREA RUNOFF (CFS) = 123.22
 EFFECTIVE AREA (ACRES) = 54.70 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 54.7 PEAK FLOW RATE (CFS) = 141.30

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 918.00 DOWNSTREAM (FEET) = 905.00
 FLOW LENGTH (FEET) = 1200.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.54
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 141.30
 PIPE TRAVEL TIME (MIN.) = 1.60 Tc (MIN.) = 16.75
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3670.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 16.75
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.795
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	26.30	0.98	0.100	32
COMMERCIAL	A	5.60	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 31.90 SUBAREA RUNOFF (CFS) = 77.44
 EFFECTIVE AREA (ACRES) = 86.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 86.6 PEAK FLOW RATE (CFS) = 210.23

 FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 905.00 DOWNSTREAM (FEET) = 874.00
 FLOW LENGTH (FEET) = 2650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 44.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.12

ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 210.23
 PIPE TRAVEL TIME(MIN.) = 3.13 Tc(MIN.) = 19.88
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 6320.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.88
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.522
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 68.60 0.98 0.100 32
 COMMERCIAL A 10.40 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 79.00 SUBAREA RUNOFF(CFS) = 172.38
 EFFECTIVE AREA(ACRES) = 165.60 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 165.6 PEAK FLOW RATE(CFS) = 361.35

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	361.35	19.88	2.522	0.98(0.10)	0.10	165.6	300.00

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 6320.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1080.14	21.60	2.400	0.98(0.17)	0.18	471.1	204.00
2	1102.48	26.16	2.139	0.97(0.18)	0.18	547.4	103.00
3	1100.28	26.40	2.128	0.97(0.18)	0.18	549.9	200.00
4	1064.09	29.53	1.989	0.97(0.18)	0.18	577.4	100.00
5	1031.85	32.40	1.882	0.97(0.18)	0.19	599.0	1.00

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1410.25	19.88	2.522	0.97(0.15)	0.16	599.3	300.00
2	1423.25	21.60	2.400	0.98(0.15)	0.16	636.7	204.00
3	1406.74	26.16	2.139	0.97(0.16)	0.16	713.0	103.00
4	1402.87	26.40	2.128	0.97(0.16)	0.16	715.5	200.00
5	1346.02	29.53	1.989	0.97(0.16)	0.17	743.0	100.00
6	1297.74	32.40	1.882	0.97(0.16)	0.17	764.6	1.00

TOTAL AREA(ACRES) = 764.6

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 1423.25 Tc(MIN.) = 21.601
 EFFECTIVE AREA(ACRES) = 636.73 AREA-AVERAGED Fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.16
 TOTAL AREA(ACRES) = 764.6
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.52;30M= 1.06;1H= 1.40;3H= 2.46;6H= 3.50;24H= 7.00
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT= 0.0%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.54; LAG(HR) = 0.43; Fm(INCH/HR) = 0.16; Ybar = 0.19
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 764.6
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0328; Lca/L=0.4,n=.0294; Lca/L=0.5,n=.0270;Lca/L=0.6,n=.0252
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 368.32
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 1365.49
 TOTAL PEAK FLOW RATE(CFS) = 1365.49 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) = 1423.25
 (UPSTREAM NODE PEAK FLOW RATE(CFS) = 1423.25)
 PEAK FLOW RATE(CFS) USED = 1423.25

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 874.00 DOWNSTREAM(FEET) = 870.00
 FLOW LENGTH(FEET) = 2590.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 132.0 INCH PIPE IS 102.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.97
 ESTIMATED PIPE DIAMETER(INCH) = 132.00 NUMBER OF PIPES = 2
 PIPE-FLOW(CFS) = 1423.25
 PIPE TRAVEL TIME(MIN.) = 4.81 Tc(MIN.) = 37.21
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 305.00 = 14320.00 FEET.

 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 37.21
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.732
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.90	0.98	0.100	32
COMMERCIAL	A	1.80	0.98	0.100	32
COMMERCIAL	A	0.60	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 5.30
UNIT-HYDROGRAPH DATA:
RAINFALL(INCH): 5M= 0.52;30M= 1.06;1H= 1.40;3H= 2.46;6H= 3.50;24H= 7.00
S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT= 0.0%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
Tc(HR) = 0.62; LAG(HR) = 0.50; Fm(INCH/HR) = 0.16; Ybar = 0.19
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 769.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 305.00 = 14320.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0313; Lca/L=0.4,n=.0281; Lca/L=0.5,n=.0258;Lca/L=0.6,n=.0241
TIME OF PEAK FLOW(HR) = 16.58 RUNOFF VOLUME(AF) = 371.04
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 1254.07
TOTAL AREA(ACRES) = 769.9 PEAK FLOW RATE(CFS) = 1423.25
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 305.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 850.00
FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 114.0 INCH PIPE IS 82.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 25.85
ESTIMATED PIPE DIAMETER(INCH) = 114.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1423.25
PIPE TRAVEL TIME(MIN.) = 0.81 Tc(MIN.) = 38.02
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 210.00 = 15580.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 38.02
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.709
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
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COMMERCIAL	A	4.90	0.98	0.100	32
COMMERCIAL	A	28.70	0.98	0.100	32
PUBLIC PARK	A	1.30	0.98	0.850	32
COMMERCIAL	A	4.10	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.125
SUBAREA AREA(ACRES) = 39.00
UNIT-HYDROGRAPH DATA:
RAINFALL(INCH): 5M= 0.52;30M= 1.06;1H= 1.40;3H= 2.46;6H= 3.50;24H= 7.00
S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT= 0.0%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
Tc(HR) = 0.63; LAG(HR) = 0.51; Fm(INCH/HR) = 0.16; Ybar = 0.19
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 808.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 210.00 = 15580.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0304; Lca/L=0.4,n=.0273; Lca/L=0.5,n=.0251;Lca/L=0.6,n=.0234
TIME OF PEAK FLOW(HR) = 16.58 RUNOFF VOLUME(AF) = 390.60
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 1310.50
TOTAL AREA(ACRES) = 808.9 PEAK FLOW RATE(CFS) = 1423.25
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

=====

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 808.9 TC(MIN.) = 38.02
AREA-AVERAGED Fm(INCH/HR) = 0.16 Ybar = 0.19
PEAK FLOW RATE(CFS) = 1423.25

=====

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA A,L,M,N) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-4-2011 *

FILE NAME: VALMN25.DAT
TIME/DATE OF STUDY: 15:46 11/04/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / PARK-SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

=====

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
ELEVATION DATA: UPSTREAM(FEET) = 988.00 DOWNSTREAM(FEET) = 976.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.315
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.825

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.00	0.98	0.100	32	11.32
COMMERCIAL	A	5.70	0.98	0.100	32	11.32
PUBLIC PARK	A	1.70	0.98	0.850	32	17.98

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.223
SUBAREA RUNOFF(CFS) = 24.41
TOTAL AREA(ACRES) = 10.40 PEAK FLOW RATE(CFS) = 24.41

=====

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 976.00 DOWNSTREAM ELEVATION(FEET) = 965.00
STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 40.42
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.58
 HALFSTREET FLOOD WIDTH(FEET) = 21.22
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.31
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.51
 STREET FLOW TRAVEL TIME(MIN.) = 2.90 Tc(MIN.) = 14.22
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.464
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.80	0.98	0.100	32
COMMERCIAL	A	10.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.70	0.98	0.500	32
PUBLIC PARK	A	0.90	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.162
 SUBAREA AREA(ACRES) = 15.40 SUBAREA RUNOFF(CFS) = 31.96
 EFFECTIVE AREA(ACRES) = 25.80 AREA-AVERAGED Fm(INCH/HR) = 0.18
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.19
 TOTAL AREA(ACRES) = 25.8 PEAK FLOW RATE(CFS) = 52.99

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 23.59
 FLOW VELOCITY(FEET/SEC.) = 4.60 DEPTH*VELOCITY(FT*FT/SEC.) = 2.90
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1700.00 FEET.

 FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 965.00 DOWNSTREAM ELEVATION(FEET) = 940.00
 STREET LENGTH(FEET) = 1570.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 83.64
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.71
 HALFSTREET FLOOD WIDTH(FEET) = 29.98
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.28
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.76
 STREET FLOW TRAVEL TIME(MIN.) = 4.95 Tc(MIN.) = 19.17
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.059
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.20	0.98	0.100	32
COMMERCIAL	A	9.70	0.98	0.100	32
COMMERCIAL	A	16.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.50	0.98	0.500	32
PUBLIC PARK	A	1.80	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.187
 SUBAREA AREA(ACRES) = 36.20 SUBAREA RUNOFF(CFS) = 61.15
 EFFECTIVE AREA(ACRES) = 62.00 AREA-AVERAGED Fm(INCH/HR) = 0.18
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.19
 TOTAL AREA(ACRES) = 62.0 PEAK FLOW RATE(CFS) = 104.75

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.76 HALFSTREET FLOOD WIDTH(FEET) = 34.84
 FLOW VELOCITY(FEET/SEC.) = 5.52 DEPTH*VELOCITY(FT*FT/SEC.) = 4.20
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1570.0 FT WITH ELEVATION-DROP = 25.0 FT, IS 78.0 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 4.00
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 3270.00 FEET.

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 940.00 DOWNSTREAM(FEET) = 925.00
 FLOW LENGTH(FEET) = 930.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.47
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 104.75
 PIPE TRAVEL TIME(MIN.) = 1.15 Tc(MIN.) = 20.32
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 4200.00 FEET.

 FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 20.32
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.989
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32

COMMERCIAL A 2.20 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 19.70 0.98 0.500 32
 PUBLIC PARK A 1.20 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397
 SUBAREA AREA (ACRES) = 29.60 SUBAREA RUNOFF (CFS) = 42.67
 EFFECTIVE AREA (ACRES) = 91.60 AREA-AVERAGED Fm (INCH/HR) = 0.25
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 91.6 PEAK FLOW RATE (CFS) = 143.47

 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 925.00 DOWNSTREAM (FEET) = 898.00
 FLOW LENGTH (FEET) = 2230.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.18
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 143.47
 PIPE TRAVEL TIME (MIN.) = 2.82 Tc (MIN.) = 23.14
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 6430.00 FEET.

 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 23.14
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.839
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.30	0.98	0.100	32
COMMERCIAL	A	50.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.40	0.98	0.500	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.181
 SUBAREA AREA (ACRES) = 70.70 SUBAREA RUNOFF (CFS) = 105.78
 EFFECTIVE AREA (ACRES) = 162.30 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 162.3 PEAK FLOW RATE (CFS) = 236.96

 FLOW PROCESS FROM NODE 6.00 TO NODE 10.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 898.00 DOWNSTREAM (FEET) = 882.00
 FLOW LENGTH (FEET) = 1360.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 46.1 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 14.63
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 236.96
 PIPE TRAVEL TIME (MIN.) = 1.55 Tc (MIN.) = 24.69
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 7790.00 FEET.

 FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 24.69
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.769
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.20	0.98	0.100	32
COMMERCIAL	A	18.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.00	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.80	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.20	0.98	0.200	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.203
 SUBAREA AREA (ACRES) = 43.80 SUBAREA RUNOFF (CFS) = 61.95
 EFFECTIVE AREA (ACRES) = 206.10 AREA-AVERAGED Fm (INCH/HR) = 0.21
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 206.1 PEAK FLOW RATE (CFS) = 288.66

 FLOW PROCESS FROM NODE 10.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 882.00 DOWNSTREAM (FEET) = 876.00
 FLOW LENGTH (FEET) = 1940.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 62.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.35
 ESTIMATED PIPE DIAMETER (INCH) = 84.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 288.66
 PIPE TRAVEL TIME (MIN.) = 3.46 Tc (MIN.) = 28.15
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
 =====

 FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1000.00
ELEVATION DATA: UPSTREAM (FEET) = 976.00 DOWNSTREAM (FEET) = 965.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.874

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.745

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.90	0.98	0.100	32	11.87
COMMERCIAL	A	7.40	0.98	0.100	32	11.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF (CFS) = 24.54

TOTAL AREA (ACRES) = 10.30 PEAK FLOW RATE (CFS) = 24.54

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION (FEET) = 965.00 DOWNSTREAM ELEVATION (FEET) = 950.00
STREET LENGTH (FEET) = 750.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00

INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 36.01

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.54

HALFSTREET FLOOD WIDTH (FEET) = 19.05

AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.71

PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.54

STREET FLOW TRAVEL TIME (MIN.) = 2.65 Tc (MIN.) = 14.53

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.432

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.40	0.98	0.100	32
COMMERCIAL	A	10.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA (ACRES) = 10.90 SUBAREA RUNOFF (CFS) = 22.90

EFFECTIVE AREA (ACRES) = 21.20 AREA-AVERAGED Fm (INCH/HR) = 0.10

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10

TOTAL AREA (ACRES) = 21.2 PEAK FLOW RATE (CFS) = 44.55

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.57 HALFSTREET FLOOD WIDTH (FEET) = 20.74

FLOW VELOCITY (FEET/SEC.) = 4.96 DEPTH*VELOCITY (FT*FT/SEC.) = 2.84

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1750.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM (FEET) = 950.00 DOWNSTREAM (FEET) = 948.00

FLOW LENGTH (FEET) = 720.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.3 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 5.60

ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1

PIPE-FLOW (CFS) = 44.55

PIPE TRAVEL TIME (MIN.) = 2.14 Tc (MIN.) = 16.67

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 2470.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 16.67

RAINFALL INTENSITY (INCH/HR) = 2.24

AREA-AVERAGED Fm (INCH/HR) = 0.10

AREA-AVERAGED Fp (INCH/HR) = 0.98

AREA-AVERAGED Ap = 0.10

EFFECTIVE STREAM AREA (ACRES) = 21.20

TOTAL STREAM AREA (ACRES) = 21.20

PEAK FLOW RATE (CFS) AT CONFLUENCE = 44.55

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 870.00

ELEVATION DATA: UPSTREAM (FEET) = 975.00 DOWNSTREAM (FEET) = 962.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.563

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.944

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.80	0.98	0.100	32	10.56
COMMERCIAL	A	4.20	0.98	0.100	32	10.56

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 20.50
 TOTAL AREA(ACRES) = 8.00 PEAK FLOW RATE(CFS) = 20.50

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 962.00 DOWNSTREAM ELEVATION(FEET) = 948.00
 STREET LENGTH(FEET) = 760.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 36.04

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.55
 HALFSTREET FLOOD WIDTH(FEET) = 19.37
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.57
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.49
 STREET FLOW TRAVEL TIME(MIN.) = 2.77 Tc(MIN.) = 13.33
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.560

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.40	0.98	0.100	32
COMMERCIAL	A	9.60	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 14.00 SUBAREA RUNOFF(CFS) = 31.03
 EFFECTIVE AREA(ACRES) = 22.00 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 22.0 PEAK FLOW RATE(CFS) = 48.77

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.60 HALFSTREET FLOOD WIDTH(FEET) = 21.85
 FLOW VELOCITY(FEET/SEC.) = 4.91 DEPTH*VELOCITY(FT*FT/SEC.) = 2.92
 LONGEST FLOWPATH FROM NODE 103.00 TO NODE 105.00 = 1630.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 13.33

RAINFALL INTENSITY(INCH/HR) = 2.56
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 22.00
 TOTAL STREAM AREA(ACRES) = 22.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 48.77

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	44.55	16.67	2.240	0.98(0.10)	0.10	21.2	100.00
2	48.77	13.33	2.560	0.98(0.10)	0.10	22.0	103.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	89.74	13.33	2.560	0.98(0.10)	0.10	39.0	103.00
2	86.96	16.67	2.240	0.98(0.10)	0.10	43.2	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 89.74 Tc(MIN.) = 13.33
 EFFECTIVE AREA(ACRES) = 38.96 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 43.2
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 2470.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 948.00 DOWNSTREAM(FEET) = 925.00
 FLOW LENGTH(FEET) = 1580.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.61
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 89.74
 PIPE TRAVEL TIME(MIN.) = 2.09 Tc(MIN.) = 15.42
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 4050.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 15.42
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.346
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.50	0.98	0.100	32

COMMERCIAL A 25.90 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 19.40 0.98 0.500 32
 PUBLIC PARK A 11.80 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.365
 SUBAREA AREA (ACRES) = 62.60 SUBAREA RUNOFF (CFS) = 112.13
 EFFECTIVE AREA (ACRES) = 101.56 AREA-AVERAGED Fm (INCH/HR) = 0.26
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
 TOTAL AREA (ACRES) = 105.8 PEAK FLOW RATE (CFS) = 190.98

 FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 925.00 DOWNSTREAM(FEET) = 900.00
 FLOW LENGTH(FEET) = 2050.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 43.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.92
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 190.98
 PIPE TRAVEL TIME (MIN.) = 2.45 Tc (MIN.) = 17.88
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 6100.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 17.88
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.147
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 4.80 0.98 0.100 32
 COMMERCIAL A 24.00 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 8.00 0.98 0.500 32
 SCHOOL A 4.60 0.98 0.600 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.233
 SUBAREA AREA (ACRES) = 41.40 SUBAREA RUNOFF (CFS) = 71.55
 EFFECTIVE AREA (ACRES) = 142.96 AREA-AVERAGED Fm (INCH/HR) = 0.25
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 147.2 PEAK FLOW RATE (CFS) = 244.35

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 900.00 DOWNSTREAM(FEET) = 876.00
 FLOW LENGTH(FEET) = 2970.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 66.0 INCH PIPE IS 49.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.87
 ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 244.35
 PIPE TRAVEL TIME (MIN.) = 3.85 Tc (MIN.) = 21.72
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 9070.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 21.72
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.910
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 7.40 0.98 0.100 32
 COMMERCIAL A 45.00 0.98 0.100 32
 SCHOOL A 4.60 0.98 0.600 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.140
 SUBAREA AREA (ACRES) = 57.00 SUBAREA RUNOFF (CFS) = 90.99
 EFFECTIVE AREA (ACRES) = 199.96 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 204.2 PEAK FLOW RATE (CFS) = 304.85

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 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
 1 304.85 21.72 1.910 0.97 (0.22) 0.22 200.0 103.00
 2 281.50 25.24 1.746 0.97 (0.21) 0.22 204.2 100.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 9070.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
 STREAM Q Tc Intensity Fp (Fm) Ap Ae HEADWATER
 NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
 1 288.66 28.15 1.635 0.98 (0.21) 0.22 206.1 1.00
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM Q Tc Intensity Fp (Fm) Ap Ae HEADWATER
 NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
 1 570.70 21.72 1.910 0.98 (0.21) 0.22 359.0 103.00
 2 560.48 25.24 1.746 0.97 (0.21) 0.22 389.1 100.00
 3 549.88 28.15 1.635 0.97 (0.21) 0.22 410.3 1.00
 TOTAL AREA (ACRES) = 410.3

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 570.70 Tc (MIN.) = 21.723

EFFECTIVE AREA (ACRES) = 359.03 AREA-AVERAGED Fm (INCH/HR) = 0.21
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 410.3
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 108.00 TO NODE 207.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 876.00 DOWNSTREAM (FEET) = 875.00
 FLOW LENGTH (FEET) = 1300.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 138.0 INCH PIPE IS 108.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 6.53
 ESTIMATED PIPE DIAMETER (INCH) = 138.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 570.70
 PIPE TRAVEL TIME (MIN.) = 3.32 Tc (MIN.) = 25.04
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 207.00 = 11030.00 FEET.

 FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1100.00
 ELEVATION DATA: UPSTREAM (FEET) = 970.00 DOWNSTREAM (FEET) = 948.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.945
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.882
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.30	0.98	0.100	32	10.95
COMMERCIAL	A	8.20	0.98	0.100	32	10.95

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF (CFS) = 23.81
 TOTAL AREA (ACRES) = 9.50 PEAK FLOW RATE (CFS) = 23.81

 FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 948.00 DOWNSTREAM ELEVATION (FEET) = 920.00
 STREET LENGTH (FEET) = 2320.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 52.00
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.64
 HALFSTREET FLOOD WIDTH (FEET) = 24.33
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.26
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.74
 STREET FLOW TRAVEL TIME (MIN.) = 9.08 Tc (MIN.) = 20.03
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.006
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.70	0.98	0.100	32
COMMERCIAL	A	7.90	0.98	0.100	32
COMMERCIAL	A	10.20	0.98	0.100	32

RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 6.90 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.182
 SUBAREA AREA (ACRES) = 33.70 SUBAREA RUNOFF (CFS) = 55.46
 EFFECTIVE AREA (ACRES) = 43.20 AREA-AVERAGED Fm (INCH/HR) = 0.16
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.16
 TOTAL AREA (ACRES) = 43.2 PEAK FLOW RATE (CFS) = 71.77

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.71 HALFSTREET FLOOD WIDTH (FEET) = 29.67
 FLOW VELOCITY (FEET/SEC.) = 4.59 DEPTH*VELOCITY (FT*FT/SEC.) = 3.25
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 2320.0 FT WITH ELEVATION-DROP = 28.0 FT, IS 63.4 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 202.00
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 3420.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 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.) = 20.03

RAINFALL INTENSITY (INCH/HR) = 2.01
 AREA-AVERAGED Fm (INCH/HR) = 0.16
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.16
 EFFECTIVE STREAM AREA (ACRES) = 43.20
 TOTAL STREAM AREA (ACRES) = 43.20
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 71.77

COMMERCIAL A 4.50 0.98 0.100 32
 COMMERCIAL A 4.50 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 12.70 SUBAREA RUNOFF (CFS) = 26.22
 EFFECTIVE AREA (ACRES) = 29.00 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 29.0 PEAK FLOW RATE (CFS) = 59.88

FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1230.00
 ELEVATION DATA: UPSTREAM (FEET) = 960.00 DOWNSTREAM (FEET) = 944.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.474
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.665
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.80	0.98	0.100	32	12.47
COMMERCIAL	A	12.50	0.98	0.100	32	12.47

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF (CFS) = 37.66
 TOTAL AREA (ACRES) = 16.30 PEAK FLOW RATE (CFS) = 37.66

FLOW PROCESS FROM NODE 205.00 TO NODE 202.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 944.00 DOWNSTREAM (FEET) = 920.00
 FLOW LENGTH (FEET) = 1540.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.42
 ESTIMATED PIPE DIAMETER (INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 37.66
 PIPE TRAVEL TIME (MIN.) = 2.46 Tc (MIN.) = 14.94
 LONGEST FLOWPATH FROM NODE 204.00 TO NODE 202.00 = 2770.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc (MIN.) = 14.94
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.392
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.70	0.98	0.100	32

FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 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.) = 14.94
 RAINFALL INTENSITY (INCH/HR) = 2.39
 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA (ACRES) = 29.00
 TOTAL STREAM AREA (ACRES) = 29.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 59.88

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	71.77	20.03	2.006	0.98 (0.16)	0.16	43.2	200.00
2	59.88	14.94	2.392	0.98 (0.10)	0.10	29.0	204.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	124.60	14.94	2.392	0.98 (0.13)	0.13	61.2	204.00
2	121.58	20.03	2.006	0.98 (0.13)	0.14	72.2	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 124.60 Tc (MIN.) = 14.94
 EFFECTIVE AREA (ACRES) = 61.22 AREA-AVERAGED Fm (INCH/HR) = 0.13
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.13
 TOTAL AREA (ACRES) = 72.2
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 3420.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 206.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 920.00 DOWNSTREAM (FEET) = 895.00
 FLOW LENGTH (FEET) = 2070.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.0 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 12.68
ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 124.60
PIPE TRAVEL TIME (MIN.) = 2.72 Tc (MIN.) = 17.66
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 206.00 = 5490.00 FEET.

FLOW PROCESS FROM NODE 206.00 TO NODE 206.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 17.66
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.163
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.70 0.98 0.100 32
COMMERCIAL A 58.60 0.98 0.100 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 63.30 SUBAREA RUNOFF (CFS) = 117.69
EFFECTIVE AREA (ACRES) = 124.52 AREA-AVERAGED Fm (INCH/HR) = 0.11
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.12
TOTAL AREA (ACRES) = 135.5 PEAK FLOW RATE (CFS) = 229.70

FLOW PROCESS FROM NODE 206.00 TO NODE 207.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 895.00 DOWNSTREAM (FEET) = 875.00
FLOW LENGTH (FEET) = 2300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 63.0 INCH PIPE IS 48.0 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 12.98
ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 229.70
PIPE TRAVEL TIME (MIN.) = 2.95 Tc (MIN.) = 20.61
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 7790.00 FEET.

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 20.61
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.972
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 6.50 0.98 0.100 32
COMMERCIAL A 46.70 0.98 0.100 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 53.20 SUBAREA RUNOFF (CFS) = 89.73

EFFECTIVE AREA (ACRES) = 177.72 AREA-AVERAGED Fm (INCH/HR) = 0.11
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
TOTAL AREA (ACRES) = 188.7 PEAK FLOW RATE (CFS) = 297.95

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

=====

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	297.95	20.61	1.972	0.98 (0.11)	0.11	177.7	204.00
2	273.66	25.80	1.723	0.98 (0.11)	0.11	188.7	200.00

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 7790.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	570.70	25.04	1.754	0.98 (0.21)	0.22	359.0	103.00
2	560.48	28.57	1.621	0.97 (0.21)	0.22	389.1	100.00
3	549.88	31.48	1.529	0.97 (0.21)	0.22	410.3	1.00

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 207.00 = 11030.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	834.02	20.61	1.972	0.98 (0.18)	0.18	473.2	204.00
2	847.91	25.04	1.754	0.98 (0.18)	0.18	546.1	103.00
3	842.17	25.80	1.723	0.98 (0.18)	0.18	554.2	200.00
4	816.78	28.57	1.621	0.97 (0.18)	0.18	577.8	100.00
5	790.63	31.48	1.529	0.97 (0.18)	0.19	599.0	1.00

TOTAL AREA (ACRES) = 599.0

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 847.91 Tc (MIN.) = 25.042
EFFECTIVE AREA (ACRES) = 546.12 AREA-AVERAGED Fm (INCH/HR) = 0.18
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.18
TOTAL AREA (ACRES) = 599.0
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 207.00 = 11030.00 FEET.

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 207.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 875.00 DOWNSTREAM (FEET) = 874.00
FLOW LENGTH (FEET) = 700.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 144.0 INCH PIPE IS 110.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.13
 ESTIMATED PIPE DIAMETER (INCH) = 144.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 847.91
 PIPE TRAVEL TIME (MIN.) = 1.28 Tc (MIN.) = 26.32
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

 INITIAL SUBAREA FLOW-LENGTH (FEET) = 1060.00
 ELEVATION DATA: UPSTREAM (FEET) = 950.00 DOWNSTREAM (FEET) = 940.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.533
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.657
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.40	0.98	0.100	32	12.53
COMMERCIAL	A	3.60	0.98	0.100	32	12.53

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF (CFS) = 16.13
 TOTAL AREA (ACRES) = 7.00 PEAK FLOW RATE (CFS) = 16.13

 FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 940.00 DOWNSTREAM (FEET) = 918.00
 FLOW LENGTH (FEET) = 1410.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 8.34
 ESTIMATED PIPE DIAMETER (INCH) = 21.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 16.13
 PIPE TRAVEL TIME (MIN.) = 2.82 Tc (MIN.) = 15.35
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 2470.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc (MIN.) = 15.35

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.353
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	22.80	0.98	0.100	32
COMMERCIAL	A	12.50	0.98	0.100	32
COMMERCIAL	A	12.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 47.70 SUBAREA RUNOFF (CFS) = 96.83
 EFFECTIVE AREA (ACRES) = 54.70 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 54.7 PEAK FLOW RATE (CFS) = 111.04

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 918.00 DOWNSTREAM (FEET) = 905.00
 FLOW LENGTH (FEET) = 1200.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.62
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 111.04
 PIPE TRAVEL TIME (MIN.) = 1.72 Tc (MIN.) = 17.07
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3670.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc (MIN.) = 17.07
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.208
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	26.30	0.98	0.100	32
COMMERCIAL	A	5.60	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 31.90 SUBAREA RUNOFF (CFS) = 60.58
 EFFECTIVE AREA (ACRES) = 86.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 86.6 PEAK FLOW RATE (CFS) = 164.46

 FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 905.00 DOWNSTREAM (FEET) = 874.00
 FLOW LENGTH (FEET) = 2650.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 54.0 INCH PIPE IS 38.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.46
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 164.46
 PIPE TRAVEL TIME (MIN.) = 3.28 Tc (MIN.) = 20.35
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 6320.00 FEET.

6 998.52 32.79 1.492 0.97(0.16) 0.17 764.6 1.00
 TOTAL AREA (ACRES) = 764.6

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 1102.91 Tc (MIN.) = 21.891
 EFFECTIVE AREA (ACRES) = 638.83 AREA-AVERAGED Fm (INCH/HR) = 0.15
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.16
 TOTAL AREA (ACRES) = 764.6
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 20.35
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.987
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 68.60 0.98 0.100 32
 COMMERCIAL A 10.40 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 79.00 SUBAREA RUNOFF (CFS) = 134.32
 EFFECTIVE AREA (ACRES) = 165.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 165.6 PEAK FLOW RATE (CFS) = 281.55

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	281.55	20.35	1.987	0.98(0.10)	0.10	165.6	300.00

 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 6320.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	834.02	21.89	1.902	0.98(0.18)	0.18	473.2	204.00
2	847.91	26.32	1.703	0.98(0.18)	0.18	546.1	103.00
3	842.17	27.08	1.674	0.98(0.18)	0.18	554.2	200.00
4	816.78	29.85	1.579	0.97(0.18)	0.18	577.8	100.00
5	790.63	32.79	1.492	0.97(0.18)	0.19	599.0	1.00

 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1095.13	20.35	1.987	0.98(0.15)	0.16	605.6	300.00
2	1102.91	21.89	1.902	0.98(0.15)	0.16	638.8	204.00
3	1087.14	26.32	1.703	0.97(0.16)	0.16	711.7	103.00
4	1077.11	27.08	1.674	0.98(0.16)	0.16	719.8	200.00
5	1037.55	29.85	1.579	0.97(0.16)	0.17	743.4	100.00

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:
 RAINFALL (INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY (DEV.)=100.0%;VALLEY (UNDEV.)/DESERT= 0.0%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT (UNDEV.)= 0.0%
 Tc (HR) = 0.55; LAG (HR) = 0.44; Fm (INCH/HR) = 0.16; Ybar = 0.20
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 764.6
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0332; Lca/L=0.4,n=.0297; Lca/L=0.5,n=.0273;Lca/L=0.6,n=.0255
 TIME OF PEAK FLOW (HR) = 16.50 RUNOFF VOLUME (AF) = 273.41
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE (CFS) = 985.23
 TOTAL PEAK FLOW RATE (CFS) = 985.23 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE (CFS) = 1102.91
 (UPSTREAM NODE PEAK FLOW RATE (CFS) = 1102.91)
 PEAK FLOW RATE (CFS) USED = 1102.91

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 874.00 DOWNSTREAM (FEET) = 870.00
 FLOW LENGTH (FEET) = 2590.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 120.0 INCH PIPE IS 93.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 8.42
 ESTIMATED PIPE DIAMETER (INCH) = 120.00 NUMBER OF PIPES = 2
 PIPE-FLOW (CFS) = 1102.91
 PIPE TRAVEL TIME (MIN.) = 5.13 Tc (MIN.) = 37.91
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 305.00 = 14320.00 FEET.

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FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 37.91
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.368
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.90 0.98 0.100 32
COMMERCIAL A 1.80 0.98 0.100 32
COMMERCIAL A 0.60 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 5.30
UNIT-HYDROGRAPH DATA:
RAINFALL(INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT= 0.0%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
Tc(HR) = 0.63; LAG(HR) = 0.51; Fm(INCH/HR) = 0.16; Ybar = 0.20
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 769.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 305.00 = 14320.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0319; Lca/L=0.4,n=.0286; Lca/L=0.5,n=.0263;Lca/L=0.6,n=.0245
TIME OF PEAK FLOW(HR) = 16.58 RUNOFF VOLUME(AF) = 275.44
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 908.09
TOTAL AREA(ACRES) = 769.9 PEAK FLOW RATE(CFS) = 1102.91
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

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FLOW PROCESS FROM NODE 305.00 TO NODE 210.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 850.00
FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 102.0 INCH PIPE IS 76.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 24.13
ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1102.91
PIPE TRAVEL TIME(MIN.) = 0.87 Tc(MIN.) = 38.78
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 210.00 = 15580.00 FEET.

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FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 38.78
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.349
SUBAREA LOSS RATE DATA(AMC II):

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DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.90 0.98 0.100 32
COMMERCIAL A 28.70 0.98 0.100 32
PUBLIC PARK A 1.30 0.98 0.850 32
COMMERCIAL A 4.10 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.125
SUBAREA AREA(ACRES) = 39.00
UNIT-HYDROGRAPH DATA:
RAINFALL(INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT= 0.0%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
Tc(HR) = 0.65; LAG(HR) = 0.52; Fm(INCH/HR) = 0.16; Ybar = 0.20
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 808.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 210.00 = 15580.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0311; Lca/L=0.4,n=.0278; Lca/L=0.5,n=.0256;Lca/L=0.6,n=.0239
TIME OF PEAK FLOW(HR) = 16.58 RUNOFF VOLUME(AF) = 290.00
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 945.63
TOTAL AREA(ACRES) = 808.9 PEAK FLOW RATE(CFS) = 1102.91
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 808.9 TC(MIN.) = 38.78
AREA-AVERAGED Fm(INCH/HR)= 0.16 Ybar = 0.20
PEAK FLOW RATE(CFS) = 1102.91
=====
END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA A,L,M,N) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-4-2011 *

FILE NAME: VALMN10.DAT
TIME/DATE OF STUDY: 16:05 11/04/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	MANNING LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00

SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 950.00
ELEVATION DATA: UPSTREAM (FEET) = 988.00 DOWNSTREAM (FEET) = 976.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.315
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.449
SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.00	1.33	0.100	17	11.32
COMMERCIAL	A	5.70	1.33	0.100	17	11.32
PUBLIC PARK	A	1.70	1.33	0.850	17	17.98

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.223
SUBAREA RUNOFF (CFS) = 20.15
TOTAL AREA (ACRES) = 10.40 PEAK FLOW RATE (CFS) = 20.15

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 976.00 DOWNSTREAM ELEVATION (FEET) = 965.00
STREET LENGTH (FEET) = 750.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 33.40
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.55
 HALFSTREET FLOOD WIDTH(FEET) = 19.69
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.11
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.27
 STREET FLOW TRAVEL TIME(MIN.) = 3.04 Tc(MIN.) = 14.36
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.123
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.80	1.33	0.100	17
COMMERCIAL	A	10.00	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.70	1.33	0.500	17
PUBLIC PARK	A	0.90	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.162
 SUBAREA AREA(ACRES) = 15.40 SUBAREA RUNOFF(CFS) = 26.44
 EFFECTIVE AREA(ACRES) = 25.80 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.19
 TOTAL AREA(ACRES) = 25.8 PEAK FLOW RATE(CFS) = 43.54

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.60 HALFSTREET FLOOD WIDTH(FEET) = 21.85
 FLOW VELOCITY(FEET/SEC.) = 4.39 DEPTH*VELOCITY(FT*FT/SEC.) = 2.61
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 1700.00 FEET.

 FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

 UPSTREAM ELEVATION(FEET) = 965.00 DOWNSTREAM ELEVATION(FEET) = 940.00
 STREET LENGTH(FEET) = 1570.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 68.32
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.67
 HALFSTREET FLOOD WIDTH(FEET) = 25.87

AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.05
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.39
 STREET FLOW TRAVEL TIME(MIN.) = 5.18 Tc(MIN.) = 19.54
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.764
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.20	1.33	0.100	17
COMMERCIAL	A	9.70	1.33	0.100	17
COMMERCIAL	A	16.00	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.50	1.33	0.500	17
PUBLIC PARK	A	1.80	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.187
 SUBAREA AREA(ACRES) = 36.20 SUBAREA RUNOFF(CFS) = 49.39
 EFFECTIVE AREA(ACRES) = 62.00 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.19
 TOTAL AREA(ACRES) = 62.0 PEAK FLOW RATE(CFS) = 84.60

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 30.19
 FLOW VELOCITY(FEET/SEC.) = 5.30 DEPTH*VELOCITY(FT*FT/SEC.) = 3.79
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 3270.00 FEET.

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 940.00 DOWNSTREAM(FEET) = 925.00
 FLOW LENGTH(FEET) = 930.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 29.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.80
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 84.60
 PIPE TRAVEL TIME(MIN.) = 1.21 Tc(MIN.) = 20.75
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 4200.00 FEET.

 FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 20.75
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.702
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	1.33	0.100	17
COMMERCIAL	A	2.20	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	19.70	1.33	0.500	17
PUBLIC PARK	A	1.20	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.397
 SUBAREA AREA (ACRES) = 29.60 SUBAREA RUNOFF (CFS) = 31.30
 EFFECTIVE AREA (ACRES) = 91.60 AREA-AVERAGED Fm (INCH/HR) = 0.34
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 91.6 PEAK FLOW RATE (CFS) = 112.42

 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 925.00 DOWNSTREAM (FEET) = 898.00
 FLOW LENGTH (FEET) = 2230.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.26
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 112.42
 PIPE TRAVEL TIME (MIN.) = 3.03 Tc (MIN.) = 23.79
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 6430.00 FEET.

 FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc (MIN.) = 23.79
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.568
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.30	1.33	0.100	17
COMMERCIAL	A	50.00	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.40	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.181
 SUBAREA AREA (ACRES) = 70.70 SUBAREA RUNOFF (CFS) = 84.44
 EFFECTIVE AREA (ACRES) = 162.30 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 162.3 PEAK FLOW RATE (CFS) = 185.83

 FLOW PROCESS FROM NODE 6.00 TO NODE 10.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 898.00 DOWNSTREAM (FEET) = 882.00
 FLOW LENGTH (FEET) = 1360.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 43.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.67
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 185.83
 PIPE TRAVEL TIME (MIN.) = 1.66 Tc (MIN.) = 25.44
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 7790.00 FEET.

 FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc (MIN.) = 25.44
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.506
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.20	1.33	0.100	17
COMMERCIAL	A	18.60	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.00	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.80	1.33	0.200	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.20	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.203
 SUBAREA AREA (ACRES) = 43.80 SUBAREA RUNOFF (CFS) = 48.75
 EFFECTIVE AREA (ACRES) = 206.10 AREA-AVERAGED Fm (INCH/HR) = 0.29
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 206.1 PEAK FLOW RATE (CFS) = 225.51

 FLOW PROCESS FROM NODE 10.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

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ELEVATION DATA: UPSTREAM (FEET) = 882.00 DOWNSTREAM (FEET) = 876.00
 FLOW LENGTH (FEET) = 1940.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 75.0 INCH PIPE IS 58.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 8.72
 ESTIMATED PIPE DIAMETER (INCH) = 75.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 225.51
 PIPE TRAVEL TIME (MIN.) = 3.71 Tc (MIN.) = 29.15
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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INITIAL SUBAREA FLOW-LENGTH (FEET) = 1000.00
 ELEVATION DATA: UPSTREAM (FEET) = 976.00 DOWNSTREAM (FEET) = 965.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.874
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.379
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.90	1.33	0.100	17	11.87
COMMERCIAL	A	7.40	1.33	0.100	17	11.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 20.82
 TOTAL AREA(ACRES) = 10.30 PEAK FLOW RATE(CFS) = 20.82

 FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

 UPSTREAM ELEVATION(FEET) = 965.00 DOWNSTREAM ELEVATION(FEET) = 950.00
 STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 30.47
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.52
 HALFSTREET FLOOD WIDTH(FEET) = 17.84
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.52
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.33
 STREET FLOW TRAVEL TIME(MIN.) = 2.77 Tc(MIN.) = 14.64

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.098
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.40	1.33	0.100	17
COMMERCIAL	A	10.50	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 10.90 SUBAREA RUNOFF(CFS) = 19.28
 EFFECTIVE AREA(ACRES) = 21.20 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 21.2 PEAK FLOW RATE(CFS) = 37.50

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.55 HALFSTREET FLOOD WIDTH(FEET) = 19.37
 FLOW VELOCITY(FEET/SEC.) = 4.76 DEPTH*VELOCITY(FT*FT/SEC.) = 2.60
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1750.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 950.00 DOWNSTREAM(FEET) = 948.00
 FLOW LENGTH(FEET) = 720.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.34
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 37.50
 PIPE TRAVEL TIME(MIN.) = 2.25 Tc(MIN.) = 16.89
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 2470.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 16.89
 RAINFALL INTENSITY(INCH/HR) = 1.93
 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 21.20
 TOTAL STREAM AREA(ACRES) = 21.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 37.50

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

 INITIAL SUBAREA FLOW-LENGTH(FEET) = 870.00
 ELEVATION DATA: UPSTREAM(FEET) = 975.00 DOWNSTREAM(FEET) = 962.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.563
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.552
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.80	1.33	0.100	17	10.56
COMMERCIAL	A	4.20	1.33	0.100	17	10.56

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 17.42
 TOTAL AREA(ACRES) = 8.00 PEAK FLOW RATE(CFS) = 17.42

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 962.00 DOWNSTREAM ELEVATION (FEET) = 948.00
 STREET LENGTH (FEET) = 760.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 30.52
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.52
 HALFWAY FLOOD WIDTH (FEET) = 18.16
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.38
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.28
 STREET FLOW TRAVEL TIME (MIN.) = 2.89 Tc (MIN.) = 13.46
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.207

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.40	1.33	0.100	17
COMMERCIAL	A	9.60	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 14.00 SUBAREA RUNOFF (CFS) = 26.13
 EFFECTIVE AREA (ACRES) = 22.00 AREA-AVERAGED Fm (INCH/HR) = 0.13
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 22.00 PEAK FLOW RATE (CFS) = 41.06

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.57 HALFWAY FLOOD WIDTH (FEET) = 20.42
 FLOW VELOCITY (FEET/SEC.) = 4.71 DEPTH*VELOCITY (FT*FT/SEC.) = 2.67
 LONGEST FLOWPATH FROM NODE 103.00 TO NODE 105.00 = 1630.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 13.46
 RAINFALL INTENSITY (INCH/HR) = 2.21
 AREA-AVERAGED Fm (INCH/HR) = 0.13
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA (ACRES) = 22.00

TOTAL STREAM AREA (ACRES) = 22.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 41.06

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	37.50	16.89	1.926	1.33 (0.13)	0.10	21.2	100.00
2	41.06	13.46	2.207	1.33 (0.13)	0.10	22.0	103.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	75.63	13.46	2.207	1.33 (0.13)	0.10	38.9	103.00
2	73.00	16.89	1.926	1.33 (0.13)	0.10	43.2	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 75.63 Tc (MIN.) = 13.46
 EFFECTIVE AREA (ACRES) = 38.90 AREA-AVERAGED Fm (INCH/HR) = 0.13
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 43.2
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 2470.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

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ELEVATION DATA: UPSTREAM (FEET) = 948.00 DOWNSTREAM (FEET) = 925.00
 FLOW LENGTH (FEET) = 1580.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.05
 ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 75.63
 PIPE TRAVEL TIME (MIN.) = 2.18 Tc (MIN.) = 15.64
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 4050.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 15.64
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.016
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.50	1.33	0.100	17
COMMERCIAL	A	25.90	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	19.40	1.33	0.500	17
PUBLIC PARK	A	11.80	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.365$
 SUBAREA AREA (ACRES) = 62.60 SUBAREA RUNOFF (CFS) = 86.26
 EFFECTIVE AREA (ACRES) = 101.50 AREA-AVERAGED F_m (INCH/HR) = 0.35
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED $A_p = 0.26$
 TOTAL AREA (ACRES) = 105.8 PEAK FLOW RATE (CFS) = 152.20

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 9070.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE T_c (MIN.) = 22.30
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.630
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	7.40	1.33	0.100	17
COMMERCIAL	A	45.00	1.33	0.100	17
SCHOOL	A	4.60	1.33	0.600	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.140$
 SUBAREA AREA (ACRES) = 57.00 SUBAREA RUNOFF (CFS) = 74.06
 EFFECTIVE AREA (ACRES) = 199.90 AREA-AVERAGED F_m (INCH/HR) = 0.29
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED $A_p = 0.22$
 TOTAL AREA (ACRES) = 204.2 PEAK FLOW RATE (CFS) = 240.19

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

=====

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	F_p (F_m) (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	240.19	22.30	1.630	1.33 (0.29)	0.22	199.9	103.00
2	219.87	25.96	1.488	1.33 (0.29)	0.22	204.2	100.00

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 9070.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	F_p (F_m) (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	225.51	29.15	1.388	1.33 (0.29)	0.22	206.1	1.00

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	F_p (F_m) (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	450.72	22.30	1.630	1.33 (0.29)	0.22	357.5	103.00
2	438.97	25.96	1.488	1.33 (0.29)	0.22	387.7	100.00
3	426.98	29.15	1.388	1.33 (0.29)	0.22	410.3	1.00

TOTAL AREA (ACRES) = 410.3

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 450.72 T_c (MIN.) = 22.296
 EFFECTIVE AREA (ACRES) = 357.52 AREA-AVERAGED F_m (INCH/HR) = 0.29
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED $A_p = 0.22$
 TOTAL AREA (ACRES) = 410.3
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 108.00 = 9730.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 925.00 DOWNSTREAM (FEET) = 900.00
 FLOW LENGTH (FEET) = 2050.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 38.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.33
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 152.20
 PIPE TRAVEL TIME (MIN.) = 2.56 T_c (MIN.) = 18.21
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 6100.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE T_c (MIN.) = 18.21
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.841
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	4.80	1.33	0.100	17
COMMERCIAL	A	24.00	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.00	1.33	0.500	17
SCHOOL	A	4.60	1.33	0.600	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.233$
 SUBAREA AREA (ACRES) = 41.40 SUBAREA RUNOFF (CFS) = 57.07
 EFFECTIVE AREA (ACRES) = 142.90 AREA-AVERAGED F_m (INCH/HR) = 0.34
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED $A_p = 0.25$
 TOTAL AREA (ACRES) = 147.2 PEAK FLOW RATE (CFS) = 193.23

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 900.00 DOWNSTREAM (FEET) = 876.00
 FLOW LENGTH (FEET) = 2970.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 45.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.10
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 193.23
 PIPE TRAVEL TIME (MIN.) = 4.09 T_c (MIN.) = 22.30

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<<

FLOW PROCESS FROM NODE 108.00 TO NODE 207.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 876.00 DOWNSTREAM(FEET) = 875.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 126.0 INCH PIPE IS 99.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.15
ESTIMATED PIPE DIAMETER(INCH) = 126.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 450.72
PIPE TRAVEL TIME(MIN.) = 3.53 Tc(MIN.) = 25.82
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 207.00 = 11030.00 FEET.

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<<

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1100.00
ELEVATION DATA: UPSTREAM(FEET) = 970.00 DOWNSTREAM(FEET) = 948.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.945
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.498
SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.30	1.33	0.100	17	10.95
COMMERCIAL	A	8.20	1.33	0.100	17	10.95

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 20.22
TOTAL AREA(ACRES) = 9.50 PEAK FLOW RATE(CFS) = 20.22

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION(FEET) = 948.00 DOWNSTREAM ELEVATION(FEET) = 920.00

STREET LENGTH(FEET) = 2320.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 43.05
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.61
HALFSTREET FLOOD WIDTH(FEET) = 22.59
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.07
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.48
STREET FLOW TRAVEL TIME(MIN.) = 9.51 Tc(MIN.) = 20.45
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.717

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.70	1.33	0.100	17
COMMERCIAL	A	7.90	1.33	0.100	17
COMMERCIAL	A	10.20	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	6.90	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.182
SUBAREA AREA(ACRES) = 33.70 SUBAREA RUNOFF(CFS) = 44.74
EFFECTIVE AREA(ACRES) = 43.20 AREA-AVERAGED Fm(INCH/HR) = 0.22
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.16
TOTAL AREA(ACRES) = 43.2 PEAK FLOW RATE(CFS) = 58.29

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.45
FLOW VELOCITY(FEET/SEC.) = 4.38 DEPTH*VELOCITY(FT*FT/SEC.) = 2.92
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 3420.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 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.) = 20.45
RAINFALL INTENSITY(INCH/HR) = 1.72
AREA-AVERAGED Fm(INCH/HR) = 0.22
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.16
EFFECTIVE STREAM AREA(ACRES) = 43.20
TOTAL STREAM AREA(ACRES) = 43.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 58.29

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*****
FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1230.00
ELEVATION DATA: UPSTREAM(FEET) = 960.00 DOWNSTREAM(FEET) = 944.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.474
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.310
SUBAREA Tc AND LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 3.80 1.33 0.100 17 12.47
COMMERCIAL A 12.50 1.33 0.100 17 12.47
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 31.93
TOTAL AREA(ACRES) = 16.30 PEAK FLOW RATE(CFS) = 31.93
```

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*****
FLOW PROCESS FROM NODE 205.00 TO NODE 202.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 944.00 DOWNSTREAM(FEET) = 920.00
FLOW LENGTH(FEET) = 1540.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 27.0 INCH PIPE IS 20.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.87
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 31.93
PIPE TRAVEL TIME(MIN.) = 2.60 Tc(MIN.) = 15.07
LONGEST FLOWPATH FROM NODE 204.00 TO NODE 202.00 = 2770.00 FEET.
```

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*****
FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 15.07
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.062
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.70 1.33 0.100 17
COMMERCIAL A 4.50 1.33 0.100 17
COMMERCIAL A 4.50 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 12.70 SUBAREA RUNOFF(CFS) = 22.05
EFFECTIVE AREA(ACRES) = 29.00 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 29.00 PEAK FLOW RATE(CFS) = 50.34
```

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*****
FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 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.) = 15.07
RAINFALL INTENSITY(INCH/HR) = 2.06
AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 29.00
TOTAL STREAM AREA(ACRES) = 29.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 50.34
```

```
** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 58.29 20.45 1.717 1.33( 0.22) 0.16 43.2 200.00
2 50.34 15.07 2.062 1.33( 0.13) 0.10 29.0 204.00
```

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
1 103.19 15.07 2.062 1.33( 0.18) 0.13 60.8 204.00
2 99.63 20.45 1.717 1.33( 0.18) 0.14 72.2 200.00
```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 103.19 Tc(MIN.) = 15.07
EFFECTIVE AREA(ACRES) = 60.84 AREA-AVERAGED Fm(INCH/HR) = 0.18
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 72.2
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 3420.00 FEET.

```
*****
FLOW PROCESS FROM NODE 202.00 TO NODE 206.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 920.00 DOWNSTREAM(FEET) = 895.00
FLOW LENGTH(FEET) = 2070.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.12
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 103.19
PIPE TRAVEL TIME(MIN.) = 2.85 Tc(MIN.) = 17.92
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 206.00 = 5490.00 FEET.
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*****
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FLOW PROCESS FROM NODE 206.00 TO NODE 206.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 17.92
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.858
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.70 1.33 0.100 17
COMMERCIAL A 58.60 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 63.30 SUBAREA RUNOFF(CFS) = 98.31
EFFECTIVE AREA(ACRES) = 124.14 AREA-AVERAGED Fm(INCH/HR) = 0.15
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.12
TOTAL AREA(ACRES) = 135.5 PEAK FLOW RATE(CFS) = 190.36

FLOW PROCESS FROM NODE 206.00 TO NODE 207.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 895.00 DOWNSTREAM(FEET) = 875.00
FLOW LENGTH(FEET) = 2300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 43.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.47
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 190.36
PIPE TRAVEL TIME(MIN.) = 3.07 Tc(MIN.) = 20.99
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 7790.00 FEET.

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 20.99
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.690
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 6.50 1.33 0.100 17
COMMERCIAL A 46.70 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 53.20 SUBAREA RUNOFF(CFS) = 74.56
EFFECTIVE AREA(ACRES) = 177.34 AREA-AVERAGED Fm(INCH/HR) = 0.15
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.11
TOTAL AREA(ACRES) = 188.7 PEAK FLOW RATE(CFS) = 246.11

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<

** MAIN STREAM CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 and 2, plus longest flowpath summary.

** MEMORY BANK # 1 CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1, 2, and 3, plus longest flowpath summary.

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 through 5, plus total area summary.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 677.24 Tc(MIN.) = 25.821
EFFECTIVE AREA(ACRES) = 544.87 AREA-AVERAGED Fm(INCH/HR) = 0.24
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 599.0
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 207.00 = 11030.00 FEET.

FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<

FLOW PROCESS FROM NODE 207.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 875.00 DOWNSTREAM(FEET) = 874.00
FLOW LENGTH(FEET) = 700.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 132.0 INCH PIPE IS 101.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.62
ESTIMATED PIPE DIAMETER(INCH) = 132.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 677.24
PIPE TRAVEL TIME(MIN.) = 1.35 Tc(MIN.) = 27.17
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 10
 >>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<<

 FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1060.00
 ELEVATION DATA: UPSTREAM(FEET) = 950.00 DOWNSTREAM(FEET) = 940.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 12.533
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.303
 SUBAREA T_c AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	3.40	1.33	0.100	17	12.53
COMMERCIAL	A	3.60	1.33	0.100	17	12.53

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA RUNOFF(CFS) = 13.67
 TOTAL AREA(ACRES) = 7.00 PEAK FLOW RATE(CFS) = 13.67

 FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 940.00 DOWNSTREAM(FEET) = 918.00
 FLOW LENGTH(FEET) = 1410.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.12
 ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 13.67
 PIPE TRAVEL TIME(MIN.) = 2.89 T_c (MIN.) = 15.43
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 2470.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE T_c (MIN.) = 15.43
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.033
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	22.80	1.33	0.100	17
COMMERCIAL	A	12.50	1.33	0.100	17
COMMERCIAL	A	12.40	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA AREA(ACRES) = 47.70 SUBAREA RUNOFF(CFS) = 81.59
 EFFECTIVE AREA(ACRES) = 54.70 AREA-AVERAGED F_m (INCH/HR) = 0.13
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.10
 TOTAL AREA(ACRES) = 54.7 PEAK FLOW RATE(CFS) = 93.56

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 918.00 DOWNSTREAM(FEET) = 905.00
 FLOW LENGTH(FEET) = 1200.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 34.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.10
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 93.56
 PIPE TRAVEL TIME(MIN.) = 1.80 T_c (MIN.) = 17.23
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 3670.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE T_c (MIN.) = 17.23
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.903
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	26.30	1.33	0.100	17
COMMERCIAL	A	5.60	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA AREA(ACRES) = 31.90 SUBAREA RUNOFF(CFS) = 50.82
 EFFECTIVE AREA(ACRES) = 86.60 AREA-AVERAGED F_m (INCH/HR) = 0.13
 AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.10
 TOTAL AREA(ACRES) = 86.6 PEAK FLOW RATE(CFS) = 137.95

 FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 905.00 DOWNSTREAM(FEET) = 874.00
 FLOW LENGTH(FEET) = 2650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 39.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.61
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 137.95
 PIPE TRAVEL TIME(MIN.) = 3.50 T_c (MIN.) = 20.73
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 6320.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 20.73
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.703
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	68.60	1.33	0.100	17
COMMERCIAL	A	10.40	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 79.00 SUBAREA RUNOFF(CFS) = 111.62
 EFFECTIVE AREA(ACRES) = 165.60 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 165.6 PEAK FLOW RATE(CFS) = 233.99

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	233.99	20.73	1.703	1.33(0.13)	0.10	165.6	300.00

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 6320.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	672.84	22.35	1.628	1.33(0.24)	0.18	468.0	204.00
2	677.24	27.17	1.448	1.33(0.24)	0.18	544.9	103.00
3	672.50	27.83	1.427	1.33(0.24)	0.18	551.6	200.00
4	647.19	30.85	1.341	1.33(0.25)	0.18	576.4	100.00
5	621.78	34.09	1.264	1.33(0.25)	0.19	599.0	1.00

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	891.86	20.73	1.703	1.33(0.21)	0.16	599.8	300.00
2	895.66	22.35	1.628	1.33(0.21)	0.16	633.6	204.00
3	873.19	27.17	1.448	1.33(0.22)	0.16	710.5	103.00
4	865.40	27.83	1.427	1.33(0.22)	0.16	717.2	200.00
5	827.33	30.85	1.341	1.33(0.22)	0.17	742.0	100.00
6	791.27	34.09	1.264	1.33(0.22)	0.17	764.6	1.00

TOTAL AREA(ACRES) = 764.6

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 895.66 Tc(MIN.) = 22.347
 EFFECTIVE AREA(ACRES) = 633.61 AREA-AVERAGED Fm(INCH/HR) = 0.21
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.16
 TOTAL AREA(ACRES) = 764.6

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.)=100.0%;VALLEY(UNDEV.)/DESERT= 0.0%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.57; LAG(HR) = 0.45; Fm(INCH/HR) = 0.22; Ybar = 0.21
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 764.6
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 304.00 = 11730.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0345; Lca/L=0.4,n=.0309; Lca/L=0.5,n=.0284;Lca/L=0.6,n=.0265
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 221.66
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 805.95
 TOTAL PEAK FLOW RATE(CFS) = 805.95 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) = 895.66
 (UPSTREAM NODE PEAK FLOW RATE(CFS) = 895.66)
 PEAK FLOW RATE(CFS) USED = 895.66

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 874.00 DOWNSTREAM(FEET) = 870.00
 FLOW LENGTH(FEET) = 2590.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 144.0 INCH PIPE IS 111.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.51
 ESTIMATED PIPE DIAMETER(INCH) = 144.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 895.66
 PIPE TRAVEL TIME(MIN.) = 4.54 Tc(MIN.) = 38.63
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 305.00 = 14320.00 FEET.

FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 38.63
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.172
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.90	1.33	0.100	17
COMMERCIAL	A	1.80	1.33	0.100	17
COMMERCIAL	A	0.60	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
* RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
* IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.

SUBAREA AREA (ACRES) = 5.30
UNIT-HYDROGRAPH DATA:
RAINFALL (INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
S-GRAPH: VALLEY (DEV.)=100.0%;VALLEY (UNDEV.)/DESERT= 0.0%

MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT (UNDEV.)= 0.0%
Tc (HR) = 0.64; LAG (HR) = 0.52; Fm (INCH/HR) = 0.22; Ybar = 0.21
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.

DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 769.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 305.00 = 14320.00 FEET.

EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0325; Lca/L=0.4,n=.0292; Lca/L=0.5,n=.0268;Lca/L=0.6,n=.0250
TIME OF PEAK FLOW (HR) = 16.58 RUNOFF VOLUME (AF) = 223.31

UNIT-HYDROGRAPH PEAK FLOW RATE (CFS) = 754.56
TOTAL AREA (ACRES) = 769.9 PEAK FLOW RATE (CFS) = 895.66

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 305.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 870.00 DOWNSTREAM (FEET) = 850.00
FLOW LENGTH (FEET) = 1260.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 93.0 INCH PIPE IS 72.2 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 22.78
ESTIMATED PIPE DIAMETER (INCH) = 93.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 895.66
PIPE TRAVEL TIME (MIN.) = 0.92 Tc (MIN.) = 39.55
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 210.00 = 15580.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc (MIN.) = 39.55
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.156
SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.90	1.33	0.100	17
COMMERCIAL	A	28.70	1.33	0.100	17
PUBLIC PARK	A	1.30	1.33	0.850	17
COMMERCIAL	A	4.10	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.125
* RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
* IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
SUBAREA AREA (ACRES) = 39.00

UNIT-HYDROGRAPH DATA:
RAINFALL (INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
S-GRAPH: VALLEY (DEV.)=100.0%;VALLEY (UNDEV.)/DESERT= 0.0%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT (UNDEV.)= 0.0%

Tc (HR) = 0.66; LAG (HR) = 0.53; Fm (INCH/HR) = 0.22; Ybar = 0.21
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00

UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 808.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 210.00 = 15580.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:

Lca/L=0.3,n=.0317; Lca/L=0.4,n=.0284; Lca/L=0.5,n=.0261;Lca/L=0.6,n=.0243
TIME OF PEAK FLOW (HR) = 16.58 RUNOFF VOLUME (AF) = 235.13
UNIT-HYDROGRAPH PEAK FLOW RATE (CFS) = 784.83
TOTAL AREA (ACRES) = 808.9 PEAK FLOW RATE (CFS) = 895.66
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

=====

END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 808.9 TC (MIN.) = 39.55
AREA-AVERAGED Fm (INCH/HR) = 0.22 Ybar = 0.21
PEAK FLOW RATE (CFS) = 895.66

=====

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA P) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-4-2011 *

FILE NAME: VP100.DAT
TIME/DATE OF STUDY: 13:35 11/04/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I; IN/HR) vs. LOG(Tc; MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), IN- / OUT- / SIDE / SIDE / WAY, HEIGHT (FT), CURB GUTTER GEOMETRIES: MANNING, GUTTER GEOMETRIES: MANNING, WIDTH (FT), LIP (FT), HIKE (FT), FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL (INCH)
5-MINUTES 0.52
30-MINUTES 1.06
1-HOUR 1.40
3-HOUR 2.46
6-HOUR 3.50
24-HOUR 7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1420.00
ELEVATION DATA: UPSTREAM (FEET) = 900.00 DOWNSTREAM (FEET) = 885.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 13.773
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.385

Table with columns: SUBAREA Tc AND LOSS RATE DATA (AMC II): DEVELOPMENT TYPE/ LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.)

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

ELEVATION DATA: UPSTREAM (FEET) = 885.00 DOWNSTREAM (FEET) = 883.00
FLOW LENGTH (FEET) = 620.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.1 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 6.29
ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 54.74
PIPE TRAVEL TIME (MIN.) = 1.64 Tc (MIN.) = 15.42
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 2040.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 502.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 15.42
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.164
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.00	0.98	0.100	32
COMMERCIAL	A	2.50	0.98	0.100	32
COMMERCIAL	A	35.00	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 41.50 SUBAREA RUNOFF (CFS) = 114.53
 EFFECTIVE AREA (ACRES) = 60.00 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 60.0 PEAK FLOW RATE (CFS) = 165.59

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 883.00 DOWNSTREAM (FEET) = 870.00
 FLOW LENGTH (FEET) = 2580.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 45.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.82
 ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 165.59
 PIPE TRAVEL TIME (MIN.) = 4.38 Tc (MIN.) = 19.80
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 4620.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 19.80
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.723
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.30	0.98	0.100	32
COMMERCIAL	A	51.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 61.60 SUBAREA RUNOFF (CFS) = 145.56
 EFFECTIVE AREA (ACRES) = 121.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 121.6 PEAK FLOW RATE (CFS) = 287.34

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 121.6 TC (MIN.) = 19.80

EFFECTIVE AREA (ACRES) = 121.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE (CFS) = 287.34

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

- * ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA P) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-4-2011 *

FILE NAME: VP25.DAT
TIME/DATE OF STUDY: 13:41 11/04/2011

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN- / OUT- / PARK- SIDE / SIDE/ WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL(INCH)
5-MINUTES 0.38
30-MINUTES 0.79
1-HOUR 1.04
3-HOUR 1.87
6-HOUR 2.71
24-HOUR 5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1420.00
ELEVATION DATA: UPSTREAM(FEET) = 900.00 DOWNSTREAM(FEET) = 885.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.773
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.511
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.10 0.98 0.100 32 13.77
COMMERCIAL A 17.40 0.98 0.100 32 13.77
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 40.19
TOTAL AREA(ACRES) = 18.50 PEAK FLOW RATE(CFS) = 40.19

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 883.00
FLOW LENGTH(FEET) = 620.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.76
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 40.19
PIPE TRAVEL TIME(MIN.) = 1.79 Tc(MIN.) = 15.57

LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 2040.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 502.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
MAINLINE Tc (MIN.) = 15.57
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.333
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
COMMERCIAL A 4.00 0.98 0.100 32
COMMERCIAL A 2.50 0.98 0.100 32
COMMERCIAL A 35.00 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 41.50 SUBAREA RUNOFF (CFS) = 83.50
EFFECTIVE AREA (ACRES) = 60.00 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 60.0 PEAK FLOW RATE (CFS) = 120.73

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

=====
ELEVATION DATA: UPSTREAM (FEET) = 883.00 DOWNSTREAM (FEET) = 870.00
FLOW LENGTH (FEET) = 2580.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.7 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 8.94
ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 120.73
PIPE TRAVEL TIME (MIN.) = 4.81 Tc (MIN.) = 20.38
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 4620.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
MAINLINE Tc (MIN.) = 20.38
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.985
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
COMMERCIAL A 10.30 0.98 0.100 32
COMMERCIAL A 51.30 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 61.60 SUBAREA RUNOFF (CFS) = 104.66
EFFECTIVE AREA (ACRES) = 121.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 121.6 PEAK FLOW RATE (CFS) = 206.59
=====

END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 121.6 TC (MIN.) = 20.38
EFFECTIVE AREA (ACRES) = 121.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE (CFS) = 206.59

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA P) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 11-4-2011 *

FILE NAME: VP10.DAT
TIME/DATE OF STUDY: 13:44 11/04/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB GUTTER-GEOMETRIES: HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1420.00
ELEVATION DATA: UPSTREAM (FEET) = 900.00 DOWNSTREAM (FEET) = 885.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 13.773
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.176

SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.10	1.33	0.100	17	13.77
COMMERCIAL	A	17.40	1.33	0.100	17	13.77

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 34.02
TOTAL AREA (ACRES) = 18.50 PEAK FLOW RATE (CFS) = 34.02

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 885.00 DOWNSTREAM (FEET) = 883.00
FLOW LENGTH (FEET) = 620.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 26.7 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 5.63
ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 34.02
PIPE TRAVEL TIME (MIN.) = 1.83 Tc (MIN.) = 15.61
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 2040.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 502.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 15.61

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.019

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.00	1.33	0.100	17
COMMERCIAL	A	2.50	1.33	0.100	17
COMMERCIAL	A	35.00	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 41.50 SUBAREA RUNOFF(CFS) = 70.45

EFFECTIVE AREA(ACRES) = 60.00 AREA-AVERAGED Fm(INCH/HR) = 0.13

AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 60.0 PEAK FLOW RATE(CFS) = 101.85

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 883.00 DOWNSTREAM(FEET) = 870.00

FLOW LENGTH(FEET) = 2580.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 51.0 INCH PIPE IS 39.7 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 8.60

ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 101.85

PIPE TRAVEL TIME(MIN.) = 5.00 Tc(MIN.) = 20.61

LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 4620.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 20.61

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.709

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.30	1.33	0.100	17
COMMERCIAL	A	51.30	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 61.60 SUBAREA RUNOFF(CFS) = 87.38

EFFECTIVE AREA(ACRES) = 121.60 AREA-AVERAGED Fm(INCH/HR) = 0.13

AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 121.6 PEAK FLOW RATE(CFS) = 172.48

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 121.6 TC(MIN.) = 20.61

EFFECTIVE AREA(ACRES) = 121.60 AREA-AVERAGED Fm(INCH/HR) = 0.13

AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.100

PEAK FLOW RATE(CFS) = 172.48

END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA L) *
* 100-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: ONT5L100.DAT
TIME/DATE OF STUDY: 14:44 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, CURB GUTTER-GEOMETRIES, MANNING FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL (INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 700.00 TO NODE 701.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 704.00
ELEVATION DATA: UPSTREAM (FEET) = 920.00 DOWNSTREAM (FEET) = 906.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.166
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.013
SUBAREA Tc AND LOSS RATE DATA (AMC II):

Table with columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL, PUBLIC PARK.

FLOW PROCESS FROM NODE 701.00 TO NODE 702.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 906.00 DOWNSTREAM ELEVATION (FEET) = 900.00
STREET LENGTH (FEET) = 850.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 61.57

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.73
 HALFSTREET FLOOD WIDTH(FEET) = 32.09
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.59
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.63
 STREET FLOW TRAVEL TIME(MIN.) = 3.94 Tc(MIN.) = 13.11
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.238

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	0.98	0.100	32
COMMERCIAL	A	15.70	0.98	0.100	32
PUBLIC PARK	A	1.10	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.141

SUBAREA AREA(ACRES) = 20.10 SUBAREA RUNOFF(CFS) = 56.09

EFFECTIVE AREA(ACRES) = 29.70 AREA-AVERAGED Fm(INCH/HR) = 0.14

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.14

TOTAL AREA(ACRES) = 29.7 PEAK FLOW RATE(CFS) = 82.82

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.80 HALFSTREET FLOOD WIDTH(FEET) = 38.67

FLOW VELOCITY(FEET/SEC.) = 3.79 DEPTH*VELOCITY(FT*FT/SEC.) = 3.03

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 850.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 58.8 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 702.00

LONGEST FLOWPATH FROM NODE 700.00 TO NODE 702.00 = 1554.00 FEET.

=====
 END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 29.7 TC(MIN.) = 13.11

EFFECTIVE AREA(ACRES) = 29.70 AREA-AVERAGED Fm(INCH/HR) = 0.14

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.143

PEAK FLOW RATE(CFS) = 82.82
 =====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA I) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT5L25.DAT
TIME/DATE OF STUDY: 14:45 10/17/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENT'S (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY (INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO		STREET-CROSSFALL:		CURB GUTTER-GEOMETRIES:				MANNING FACTOR
	WIDTH (FT)	CROSSFALL (FT)	IN- / OUT- / SIDE / SIDE/ WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)		
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150	
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150	

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 700.00 TO NODE 701.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 704.00
ELEVATION DATA: UPSTREAM (FEET) = 920.00 DOWNSTREAM (FEET) = 906.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.166
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.206

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	9.00	0.98	0.100	32	9.17
PUBLIC PARK	A	0.60	0.98	0.850	32	14.56

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.147
SUBAREA RUNOFF (CFS) = 26.46
TOTAL AREA (ACRES) = 9.60 PEAK FLOW RATE (CFS) = 26.46

FLOW PROCESS FROM NODE 701.00 TO NODE 702.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 906.00 DOWNSTREAM ELEVATION (FEET) = 900.00
STREET LENGTH (FEET) = 850.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 48.49

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.68
 HALFSTREET FLOOD WIDTH(FEET) = 27.14
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.41
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.33
 STREET FLOW TRAVEL TIME(MIN.) = 4.15 Tc(MIN.) = 13.32

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.562

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	0.98	0.100	32
COMMERCIAL	A	15.70	0.98	0.100	32
PUBLIC PARK	A	1.10	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.141

SUBAREA AREA(ACRES) = 20.10 SUBAREA RUNOFF(CFS) = 43.87

EFFECTIVE AREA(ACRES) = 29.70 AREA-AVERAGED Fm(INCH/HR) = 0.14

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.14

TOTAL AREA(ACRES) = 29.7 PEAK FLOW RATE(CFS) = 64.77

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 33.25

FLOW VELOCITY(FEET/SEC.) = 3.62 DEPTH*VELOCITY(FT*FT/SEC.) = 2.70

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 850.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 46.5 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 702.00

LONGEST FLOWPATH FROM NODE 700.00 TO NODE 702.00 = 1554.00 FEET.

=====
 END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 29.7 TC(MIN.) = 13.32

EFFECTIVE AREA(ACRES) = 29.70 AREA-AVERAGED Fm(INCH/HR) = 0.14

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.143

PEAK FLOW RATE(CFS) = 64.77
 =====

END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA L) *
* 10-YEAR HYDROLOGY ANALYSIS *

FILE NAME: ONT5L10.DAT
TIME/DATE OF STUDY: 14:46 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, CURB GUTTER-GEOMETRIES, MANNING FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL (INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 700.00 TO NODE 701.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 704.00
ELEVATION DATA: UPSTREAM(FEET) = 920.00 DOWNSTREAM(FEET) = 906.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.166
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.779
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 9.00 0.98 0.100 32 9.17
PUBLIC PARK A 0.60 0.98 0.850 32 14.56
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.147
SUBAREA RUNOFF(CFS) = 22.77
TOTAL AREA(ACRES) = 9.60 PEAK FLOW RATE(CFS) = 22.77

FLOW PROCESS FROM NODE 701.00 TO NODE 702.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====

UPSTREAM ELEVATION(FEET) = 906.00 DOWNSTREAM ELEVATION(FEET) = 900.00
STREET LENGTH(FEET) = 850.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFBSTREETS CARRYING RUNOFF = 2

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) = 41.57
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.65
 HALFSTREET FLOOD WIDTH(FEET) = 24.75
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.29
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.15
 STREET FLOW TRAVEL TIME(MIN.) = 4.30 Tc(MIN.) = 13.47
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.206

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	0.98	0.100	32
COMMERCIAL	A	15.70	0.98	0.100	32
PUBLIC PARK	A	1.10	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.141
 SUBAREA AREA(ACRES) = 20.10 SUBAREA RUNOFF(CFS) = 37.41
 EFFECTIVE AREA(ACRES) = 29.70 AREA-AVERAGED Fm(INCH/HR) = 0.14
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.14
 TOTAL AREA(ACRES) = 29.7 PEAK FLOW RATE(CFS) = 55.23

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 29.77
 FLOW VELOCITY(FEET/SEC.) = 3.52 DEPTH*VELOCITY(FT*FT/SEC.) = 2.50
 LONGEST FLOWPATH FROM NODE 700.00 TO NODE 702.00 = 1554.00 FEET.

=====
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 29.7 TC(MIN.) = 13.47
 EFFECTIVE AREA(ACRES) = 29.70 AREA-AVERAGED Fm(INCH/HR) = 0.14
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.143
 PEAK FLOW RATE(CFS) = 55.23
 =====

=====
 END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA M) *
* 100-YEAR HYDROLOGY ANALYSIS *

FILE NAME: ONT5M100.DAT
TIME/DATE OF STUDY: 14:57 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with 10 columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-SIDE, PARK-/SIDE/WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with 2 columns: DURATION, AREA-AVERAGED RAINFALL (INCH). Rows: 5-MINUTES (0.48), 30-MINUTES (0.99), 1-HOUR (1.30), 3-HOUR (2.39), 6-HOUR (3.50), 24-HOUR (7.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 710.00 TO NODE 711.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 870.00
ELEVATION DATA: UPSTREAM(FEET) = 900.00 DOWNSTREAM(FEET) = 890.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.132
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.572
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 9.40 0.98 0.100 32 11.13
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 29.39
TOTAL AREA(ACRES) = 9.40 PEAK FLOW RATE(CFS) = 29.39

FLOW PROCESS FROM NODE 711.00 TO NODE 712.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====

UPSTREAM ELEVATION(FEET) = 890.00 DOWNSTREAM ELEVATION(FEET) = 885.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 51.93

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.73

HALFSTREET FLOOD WIDTH(FEET) = 32.20

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.02

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.22

STREET FLOW TRAVEL TIME(MIN.) = 5.52 Tc(MIN.) = 16.66

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.805

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.70	0.98	0.100	32
COMMERCIAL	A	15.10	0.98	0.100	32
PUBLIC PARK	A	2.20	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.187

SUBAREA AREA(ACRES) = 19.00 SUBAREA RUNOFF(CFS) = 44.85

EFFECTIVE AREA(ACRES) = 28.40 AREA-AVERAGED Fm(INCH/HR) = 0.15

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.16

TOTAL AREA(ACRES) = 28.4 PEAK FLOW RATE(CFS) = 67.75

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.79 HALFSTREET FLOOD WIDTH(FEET) = 38.21

FLOW VELOCITY(FEET/SEC.) = 3.16 DEPTH*VELOCITY(FT*FT/SEC.) = 2.51

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 1000.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 50.3 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 712.00

LONGEST FLOWPATH FROM NODE 710.00 TO NODE 712.00 = 1870.00 FEET.

=====
END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 28.4 TC(MIN.) = 16.66

EFFECTIVE AREA(ACRES) = 28.40 AREA-AVERAGED Fm(INCH/HR) = 0.15

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.158

PEAK FLOW RATE(CFS) = 67.75
=====

END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA M) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONTSM25.DAT
TIME/DATE OF STUDY: 14:58 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY (INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES: LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 710.00 TO NODE 711.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 870.00
ELEVATION DATA: UPSTREAM (FEET) = 900.00 DOWNSTREAM (FEET) = 890.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.132
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.853
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	9.40	0.98	0.100	32	11.13

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 23.31
TOTAL AREA (ACRES) = 9.40 PEAK FLOW RATE (CFS) = 23.31

FLOW PROCESS FROM NODE 711.00 TO NODE 712.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 890.00 DOWNSTREAM ELEVATION (FEET) = 885.00
STREET LENGTH (FEET) = 1000.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 40.84

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.68
 HALFSTREET FLOOD WIDTH(FEET) = 27.14
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.88
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.97
 STREET FLOW TRAVEL TIME(MIN.) = 5.80 Tc(MIN.) = 16.93

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.219

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.70	0.98	0.100	32
COMMERCIAL	A	15.10	0.98	0.100	32
PUBLIC PARK	A	2.20	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.187
 SUBAREA AREA(ACRES) = 19.00 SUBAREA RUNOFF(CFS) = 34.82
 EFFECTIVE AREA(ACRES) = 28.40 AREA-AVERAGED Fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.16
 TOTAL AREA(ACRES) = 28.4 PEAK FLOW RATE(CFS) = 52.77

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 32.51
 FLOW VELOCITY(FEET/SEC.) = 3.03 DEPTH*VELOCITY(FT*FT/SEC.) = 2.24
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1000.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 39.6 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 712.00
 LONGEST FLOWPATH FROM NODE 710.00 TO NODE 712.00 = 1870.00 FEET.

=====
 END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 28.4 TC(MIN.) = 16.93
 EFFECTIVE AREA(ACRES) = 28.40 AREA-AVERAGED Fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.158
 PEAK FLOW RATE(CFS) = 52.77
 =====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA M) *
* 10-YEAR HYDROLOGY ANALYSIS *
* * *

FILE NAME: ONT5M10.DAT
TIME/DATE OF STUDY: 14:58 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB GUTTER-GEOMETRIES: HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 710.00 TO NODE 711.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 870.00
ELEVATION DATA: UPSTREAM (FEET) = 900.00 DOWNSTREAM (FEET) = 890.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.132
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.473
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	9.40	0.98	0.100	32	11.13

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 20.09
TOTAL AREA (ACRES) = 9.40 PEAK FLOW RATE (CFS) = 20.09

FLOW PROCESS FROM NODE 711.00 TO NODE 712.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 890.00 DOWNSTREAM ELEVATION (FEET) = 885.00
STREET LENGTH (FEET) = 1000.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 34.97
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.65
HALFSTREET FLOOD WIDTH (FEET) = 24.75
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.77
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.81
STREET FLOW TRAVEL TIME (MIN.) = 6.02 Tc (MIN.) = 17.15
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.908

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.70	0.98	0.100	32
COMMERCIAL	A	15.10	0.98	0.100	32
PUBLIC PARK	A	2.20	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.187
SUBAREA AREA (ACRES) = 19.00 SUBAREA RUNOFF (CFS) = 29.51
EFFECTIVE AREA (ACRES) = 28.40 AREA-AVERAGED Fm (INCH/HR) = 0.15
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.16
TOTAL AREA (ACRES) = 28.4 PEAK FLOW RATE (CFS) = 44.83

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.70 HALFSTREET FLOOD WIDTH (FEET) = 29.03
FLOW VELOCITY (FEET/SEC.) = 2.94 DEPTH*VELOCITY (FT*FT/SEC.) = 2.06
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 712.00 = 1870.00 FEET.

=====
END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 28.4 TC (MIN.) = 17.15
EFFECTIVE AREA (ACRES) = 28.40 AREA-AVERAGED Fm (INCH/HR) = 0.15
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.158
PEAK FLOW RATE (CFS) = 44.83
=====

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA N) *
* 100-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: ONT5N100.DAT
TIME/DATE OF STUDY: 15:02 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	MANNING LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 720.00 TO NODE 721.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 400.00
ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 880.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.023
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.348
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	5.10	0.98	0.100	32	8.02
PUBLIC PARK	A	0.70	0.98	0.850	32	12.75
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98						
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.191						
SUBAREA RUNOFF(CFS) = 21.72						
TOTAL AREA(ACRES) = 5.80 PEAK FLOW RATE(CFS) = 21.72						

FLOW PROCESS FROM NODE 721.00 TO NODE 722.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 880.00 DOWNSTREAM ELEVATION(FEET) = 870.00
STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 42.30
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.61
HALFSTREET FLOOD WIDTH(FEET) = 22.80
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.93
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.41
STREET FLOW TRAVEL TIME(MIN.) = 3.82 Tc(MIN.) = 11.84
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.442
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.00	0.98	0.100	32
COMMERCIAL	A	10.50	0.98	0.100	32
PUBLIC PARK	A	1.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.176
SUBAREA AREA(ACRES) = 13.90 SUBAREA RUNOFF(CFS) = 40.91
EFFECTIVE AREA(ACRES) = 19.70 AREA-AVERAGED Fm(INCH/HR) = 0.18
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 19.7 PEAK FLOW RATE(CFS) = 57.91

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 26.19
FLOW VELOCITY(FEET/SEC.) = 4.23 DEPTH*VELOCITY(FT*FT/SEC.) = 2.85
LONGEST FLOWPATH FROM NODE 720.00 TO NODE 722.00 = 1300.00 FEET.

=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 19.7 TC(MIN.) = 11.84
EFFECTIVE AREA(ACRES) = 19.70 AREA-AVERAGED Fm(INCH/HR) = 0.18
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.180
PEAK FLOW RATE(CFS) = 57.91
=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA N) *
* 25-YEAR HYDROLOGY ANALYSIS *

FILE NAME: ONT5N25.DAT
TIME/DATE OF STUDY: 15:02 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES: LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 720.00 TO NODE 721.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 400.00
ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 880.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.023
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.473
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 5.10 0.98 0.100 32 8.02
PUBLIC PARK A 0.70 0.98 0.850 32 12.75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.191
SUBAREA RUNOFF(CFS) = 17.16
TOTAL AREA(ACRES) = 5.80 PEAK FLOW RATE(CFS) = 17.16

FLOW PROCESS FROM NODE 721.00 TO NODE 722.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 880.00 DOWNSTREAM ELEVATION(FEET) = 870.00
STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 33.19
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.57
 HALFSTREET FLOOD WIDTH(FEET) = 20.74
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.69
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.12
 STREET FLOW TRAVEL TIME(MIN.) = 4.06 Tc(MIN.) = 12.08
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.716

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.00	0.98	0.100	32
COMMERCIAL	A	10.50	0.98	0.100	32
PUBLIC PARK	A	1.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.176
 SUBAREA AREA(ACRES) = 13.90 SUBAREA RUNOFF(CFS) = 31.84
 EFFECTIVE AREA(ACRES) = 19.70 AREA-AVERAGED Fm(INCH/HR) = 0.18
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.18
 TOTAL AREA(ACRES) = 19.7 PEAK FLOW RATE(CFS) = 45.05

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 23.38
 FLOW VELOCITY(FEET/SEC.) = 3.98 DEPTH*VELOCITY(FT*FT/SEC.) = 2.49
 LONGEST FLOWPATH FROM NODE 720.00 TO NODE 722.00 = 1300.00 FEET.

=====
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 19.7 TC(MIN.) = 12.08
 EFFECTIVE AREA(ACRES) = 19.70 AREA-AVERAGED Fm(INCH/HR) = 0.18
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.180
 PEAK FLOW RATE(CFS) = 45.05
 =====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
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Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA N) *
* 10-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: ONT5N10.DAT
TIME/DATE OF STUDY: 15:03 10/17/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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---*TIME-OF-CONCENTRATION MODEL*---

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO		STREET-CROSSFALL:		CURB GUTTER-GEOMETRIES:		MANNING	
	WIDTH	CROSSFALL	IN- /	OUT-/PARK-	HEIGHT	WIDTH	LIP	HIKE
	(FT)	(FT)	SIDE /	SIDE/ WAY	(FT)	(FT)	(FT)	(n)
1	30.0	20.0	0.018/0.018/0.020		0.67	2.00	0.0312	0.167
2	32.0	27.0	0.020/0.020/0.020		0.67	2.00	0.0312	0.167

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	RAINFALL(INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 720.00 TO NODE 721.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 400.00
ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 880.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.023
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.010
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	5.10	0.98	0.100	32	8.02
PUBLIC PARK	A	0.70	0.98	0.850	32	12.75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.191
SUBAREA RUNOFF(CFS) = 14.74
TOTAL AREA(ACRES) = 5.80 PEAK FLOW RATE(CFS) = 14.74

FLOW PROCESS FROM NODE 721.00 TO NODE 722.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 880.00 DOWNSTREAM ELEVATION(FEET) = 870.00
STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 28.38
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.55
HALFSTREET FLOOD WIDTH(FEET) = 19.48
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.56
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.95
STREET FLOW TRAVEL TIME(MIN.) = 4.21 Tc(MIN.) = 12.23
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.337
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.00	0.98	0.100	32
COMMERCIAL	A	10.50	0.98	0.100	32
PUBLIC PARK	A	1.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.176
SUBAREA AREA(ACRES) = 13.90 SUBAREA RUNOFF(CFS) = 27.09
EFFECTIVE AREA(ACRES) = 19.70 AREA-AVERAGED Fm(INCH/HR) = 0.18
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 19.7 PEAK FLOW RATE(CFS) = 38.32

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.60 HALFSTREET FLOOD WIDTH(FEET) = 21.95
FLOW VELOCITY(FEET/SEC.) = 3.83 DEPTH*VELOCITY(FT*FT/SEC.) = 2.28
LONGEST FLOWPATH FROM NODE 720.00 TO NODE 722.00 = 1300.00 FEET.

=====
END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 19.7 TC(MIN.) = 12.23
EFFECTIVE AREA(ACRES) = 19.70 AREA-AVERAGED Fm(INCH/HR) = 0.18
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.180
PEAK FLOW RATE(CFS) = 38.32
=====

=====
END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA O) *
* 100-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: ONT50100.DAT
TIME/DATE OF STUDY: 15:06 10/17/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
- (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 730.00 TO NODE 731.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 800.00
ELEVATION DATA: UPSTREAM (FEET) = 870.00 DOWNSTREAM (FEET) = 860.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.586
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.681
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	7.80	0.98	0.100	32	10.59
PUBLIC PARK	A	1.10	0.98	0.850	32	16.82

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.193
SUBAREA RUNOFF (CFS) = 27.98
TOTAL AREA (ACRES) = 8.90 PEAK FLOW RATE (CFS) = 27.98

FLOW PROCESS FROM NODE 731.00 TO NODE 732.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION (FEET) = 860.00 DOWNSTREAM ELEVATION (FEET) = 855.00
STREET LENGTH (FEET) = 900.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 54.43

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.73
HALFSTREET FLOOD WIDTH(FEET) = 32.09
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.18
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.33
STREET FLOW TRAVEL TIME(MIN.) = 4.72 Tc(MIN.) = 15.31

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.950

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.30	0.98	0.100	32
COMMERCIAL	A	15.30	0.98	0.100	32
PUBLIC PARK	A	3.90	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.236

SUBAREA AREA(ACRES) = 21.50 SUBAREA RUNOFF(CFS) = 52.63

EFFECTIVE AREA(ACRES) = 30.40 AREA-AVERAGED Fm(INCH/HR) = 0.22

AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.223

TOTAL AREA(ACRES) = 30.4 PEAK FLOW RATE(CFS) = 74.76

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.80 HALFSTREET FLOOD WIDTH(FEET) = 38.85
FLOW VELOCITY(FEET/SEC.) = 3.38 DEPTH*VELOCITY(FT*FT/SEC.) = 2.71

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 900.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 58.4 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 732.00

LONGEST FLOWPATH FROM NODE 730.00 TO NODE 732.00 = 1700.00 FEET.

=====
END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 30.4 TC(MIN.) = 15.31
EFFECTIVE AREA(ACRES) = 30.40 AREA-AVERAGED Fm(INCH/HR) = 0.22
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.223
PEAK FLOW RATE(CFS) = 74.76
=====

=====
END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA O) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT5025.DAT
TIME/DATE OF STUDY: 15:07 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), IN- / OUT- / PARK- SIDE / SIDE/ WAY, HEIGHT (FT), WIDTH (FT), LIP (FT), HIKE (FT), FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES (0.48), 30-MINUTES (0.99), 1-HOUR (1.30), 3-HOUR (2.39), 6-HOUR (3.50), 24-HOUR (7.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 730.00 TO NODE 731.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 860.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.586
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.941
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 7.80 0.98 0.100 32 10.59
PUBLIC PARK A 1.10 0.98 0.850 32 16.82
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.193
SUBAREA RUNOFF(CFS) = 22.05
TOTAL AREA(ACRES) = 8.90 PEAK FLOW RATE(CFS) = 22.05

FLOW PROCESS FROM NODE 731.00 TO NODE 732.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
UPSTREAM ELEVATION(FEET) = 860.00 DOWNSTREAM ELEVATION(FEET) = 855.00
STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 42.54
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.68
 HALFSTREET FLOOD WIDTH(FEET) = 26.92
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.02
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.06
 STREET FLOW TRAVEL TIME(MIN.) = 4.97 Tc(MIN.) = 15.55

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.334
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.30	0.98	0.100	32
COMMERCIAL	A	15.30	0.98	0.100	32
PUBLIC PARK	A	3.90	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.236
 SUBAREA AREA(ACRES) = 21.50 SUBAREA RUNOFF(CFS) = 40.72
 EFFECTIVE AREA(ACRES) = 30.40 AREA-AVERAGED Fm(INCH/HR) = 0.22
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22
 TOTAL AREA(ACRES) = 30.4 PEAK FLOW RATE(CFS) = 57.91

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.75 HALFSTREET FLOOD WIDTH(FEET) = 33.46
 FLOW VELOCITY(FEET/SEC.) = 3.21 DEPTH*VELOCITY(FT*FT/SEC.) = 2.40
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 900.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 45.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 732.00
 LONGEST FLOWPATH FROM NODE 730.00 TO NODE 732.00 = 1700.00 FEET.

=====
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 30.4 TC(MIN.) = 15.55
 EFFECTIVE AREA(ACRES) = 30.40 AREA-AVERAGED Fm(INCH/HR) = 0.22
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.223
 PEAK FLOW RATE(CFS) = 57.91
 =====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA O) *
* 10-YEAR HYDROLOGY ANALYSIS *

FILE NAME: ONT5010.DAT
TIME/DATE OF STUDY: 15:08 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN- / OUT- / SIDE / SIDE / WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL (INCH). Rows: 5-MINUTES (0.48), 30-MINUTES (0.99), 1-HOUR (1.30), 3-HOUR (2.39), 6-HOUR (3.50), 24-HOUR (7.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 730.00 TO NODE 731.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 860.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.586
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.549
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN Tc (MIN.)
COMMERCIAL A 7.80 0.98 0.100 32 10.59
PUBLIC PARK A 1.10 0.98 0.850 32 16.82
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.193
SUBAREA RUNOFF(CFS) = 18.91
TOTAL AREA(ACRES) = 8.90 PEAK FLOW RATE(CFS) = 18.91

FLOW PROCESS FROM NODE 731.00 TO NODE 732.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 860.00 DOWNSTREAM ELEVATION(FEET) = 855.00
STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFBSTREETS CARRYING RUNOFF = 2

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) = 36.25
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.65
HALFSTREET FLOOD WIDTH(FEET) = 24.59
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.91
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.89
STREET FLOW TRAVEL TIME(MIN.) = 5.16 Tc(MIN.) = 15.75
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.008
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.30	0.98	0.100	32
COMMERCIAL	A	15.30	0.98	0.100	32
PUBLIC PARK	A	3.90	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.236
SUBAREA AREA(ACRES) = 21.50 SUBAREA RUNOFF(CFS) = 34.40
EFFECTIVE AREA(ACRES) = 30.40 AREA-AVERAGED Fm(INCH/HR) = 0.22
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22
TOTAL AREA(ACRES) = 30.4 PEAK FLOW RATE(CFS) = 48.99

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 29.77
FLOW VELOCITY(FEET/SEC.) = 3.12 DEPTH*VELOCITY(FT*FT/SEC.) = 2.22
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 900.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 39.0 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 732.00
LONGEST FLOWPATH FROM NODE 730.00 TO NODE 732.00 = 1700.00 FEET.

=====
END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 30.4 TC(MIN.) = 15.75
EFFECTIVE AREA(ACRES) = 30.40 AREA-AVERAGED Fm(INCH/HR) = 0.22
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.223
PEAK FLOW RATE(CFS) = 48.99
=====

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA P) *
* 100-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT5P100.DAT
TIME/DATE OF STUDY: 15:12 10/17/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/ SIDE / SIDE/ WAY	CURB GUTTER-GEOMETRIES: HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 800.00 TO NODE 801.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1600.00
ELEVATION DATA: UPSTREAM(FEET) = 920.00 DOWNSTREAM(FEET) = 905.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.795
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.011

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.00	0.98	0.100	32	14.80
COMMERCIAL	A	7.00	0.98	0.100	32	14.80

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 26.22
TOTAL AREA (ACRES) = 10.00 PEAK FLOW RATE (CFS) = 26.22

FLOW PROCESS FROM NODE 801.00 TO NODE 802.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 905.00 DOWNSTREAM ELEVATION(FEET) = 898.00
STREET LENGTH(FEET) = 680.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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) = 47.61
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.64
HALFSTREET FLOOD WIDTH(FEET) = 24.27
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.91
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.52
STREET FLOW TRAVEL TIME(MIN.) = 2.90 Tc(MIN.) = 17.69
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.705
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.70	0.98	0.100	32
COMMERCIAL	A	14.50	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 18.20 SUBAREA RUNOFF(CFS) = 42.71
EFFECTIVE AREA(ACRES) = 28.20 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 28.2 PEAK FLOW RATE(CFS) = 66.18

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 29.67
FLOW VELOCITY(FEET/SEC.) = 4.23 DEPTH*VELOCITY(FT*FT/SEC.) = 3.00
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 680.0 FT WITH ELEVATION-DROP = 7.0 FT, IS 59.7 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 802.00
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 802.00 = 2280.00 FEET.

FLOW PROCESS FROM NODE 802.00 TO NODE 803.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 898.00 DOWNSTREAM(FEET) = 885.00
FLOW LENGTH(FEET) = 1250.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.24
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 66.18
PIPE TRAVEL TIME(MIN.) = 2.03 Tc(MIN.) = 19.73
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 803.00 = 3530.00 FEET.

FLOW PROCESS FROM NODE 803.00 TO NODE 803.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc(MIN.) = 19.73
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.534
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.70	0.98	0.100	32
COMMERCIAL	A	35.50	0.98	0.100	32

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	5.70	0.98	0.100	32
COMMERCIAL	A	26.70	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 32.40 SUBAREA RUNOFF(CFS) = 71.05
EFFECTIVE AREA(ACRES) = 60.60 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 60.6 PEAK FLOW RATE(CFS) = 132.89

FLOW PROCESS FROM NODE 803.00 TO NODE 804.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 870.00
FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.28
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 132.89
PIPE TRAVEL TIME(MIN.) = 1.83 Tc(MIN.) = 21.56
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 804.00 = 4880.00 FEET.

FLOW PROCESS FROM NODE 804.00 TO NODE 804.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc(MIN.) = 21.56
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.403
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.70	0.98	0.100	32
COMMERCIAL	A	35.50	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 42.20 SUBAREA RUNOFF(CFS) = 87.55
EFFECTIVE AREA(ACRES) = 102.80 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 102.8 PEAK FLOW RATE(CFS) = 213.27

FLOW PROCESS FROM NODE 804.00 TO NODE 805.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 845.00
FLOW LENGTH(FEET) = 1950.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.74
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 213.27

PIPE TRAVEL TIME (MIN.) = 2.20 Tc (MIN.) = 23.76
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 805.00 = 6830.00 FEET.

FLOW PROCESS FROM NODE 805.00 TO NODE 805.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 23.76

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.266

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.30	0.98	0.100	32
COMMERCIAL	A	49.60	0.98	0.100	32
PUBLIC PARK	A	2.00	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.125

SUBAREA AREA (ACRES) = 59.90 SUBAREA RUNOFF (CFS) = 115.60

EFFECTIVE AREA (ACRES) = 162.70 AREA-AVERAGED Fm (INCH/HR) = 0.11

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11

TOTAL AREA (ACRES) = 162.7 PEAK FLOW RATE (CFS) = 316.25

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 162.7 TC (MIN.) = 23.76

EFFECTIVE AREA (ACRES) = 162.70 AREA-AVERAGED Fm (INCH/HR) = 0.11

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.109

PEAK FLOW RATE (CFS) = 316.25

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

HUNSAKER & ASSOCIATES
Irvine, Inc
Planning * Engineering * Surveying
Three Hughes * Irvine, California 92618 * (949)583-1010

***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA P) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT5P25.DAT
TIME/DATE OF STUDY: 15:12 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER GEOMETRIES: HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150	
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150	

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 800.00 TO NODE 801.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1600.00
ELEVATION DATA: UPSTREAM(FEET) = 920.00 DOWNSTREAM(FEET) = 905.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.795
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.406
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.00	0.98	0.100	32	14.80
COMMERCIAL	A	7.00	0.98	0.100	32	14.80

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 20.77
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 20.77

FLOW PROCESS FROM NODE 801.00 TO NODE 802.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 905.00 DOWNSTREAM ELEVATION(FEET) = 898.00
STREET LENGTH(FEET) = 680.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 37.60
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.60
 HALFSTREET FLOOD WIDTH(FEET) = 22.11
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.70
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.22
 STREET FLOW TRAVEL TIME(MIN.) = 3.06 Tc(MIN.) = 17.86

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.149
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.70	0.98	0.100	32
COMMERCIAL	A	14.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 18.20 SUBAREA RUNOFF(CFS) = 33.60
 EFFECTIVE AREA(ACRES) = 28.20 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 28.2 PEAK FLOW RATE(CFS) = 52.06

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.66 HALFSTREET FLOOD WIDTH(FEET) = 25.12
 FLOW VELOCITY(FEET/SEC.) = 4.01 DEPTH*VELOCITY(FT*FT/SEC.) = 2.65
 LONGEST FLOWPATH FROM NODE 800.00 TO NODE 802.00 = 2280.00 FEET.

 FLOW PROCESS FROM NODE 802.00 TO NODE 803.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 898.00 DOWNSTREAM(FEET) = 885.00
 FLOW LENGTH(FEET) = 1250.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 25.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.67
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 52.06
 PIPE TRAVEL TIME(MIN.) = 2.15 Tc(MIN.) = 20.01
 LONGEST FLOWPATH FROM NODE 800.00 TO NODE 803.00 = 3530.00 FEET.

 FLOW PROCESS FROM NODE 803.00 TO NODE 803.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 20.01
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.007
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
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COMMERCIAL	A	5.70	0.98	0.100	32
COMMERCIAL	A	26.70	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 32.40 SUBAREA RUNOFF(CFS) = 55.68
 EFFECTIVE AREA(ACRES) = 60.60 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 60.6 PEAK FLOW RATE(CFS) = 104.14

 FLOW PROCESS FROM NODE 803.00 TO NODE 804.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 870.00
 FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.70
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 104.14
 PIPE TRAVEL TIME(MIN.) = 1.92 Tc(MIN.) = 21.93
 LONGEST FLOWPATH FROM NODE 800.00 TO NODE 804.00 = 4880.00 FEET.

 FLOW PROCESS FROM NODE 804.00 TO NODE 804.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 21.93
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.899
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.70	0.98	0.100	32
COMMERCIAL	A	35.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 42.20 SUBAREA RUNOFF(CFS) = 68.44
 EFFECTIVE AREA(ACRES) = 102.80 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 102.8 PEAK FLOW RATE(CFS) = 166.71

 FLOW PROCESS FROM NODE 804.00 TO NODE 805.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 845.00
 FLOW LENGTH(FEET) = 1950.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.74
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 166.71
 PIPE TRAVEL TIME(MIN.) = 2.37 Tc(MIN.) = 24.30

LONGEST FLOWPATH FROM NODE 800.00 TO NODE 805.00 = 6830.00 FEET.

FLOW PROCESS FROM NODE 805.00 TO NODE 805.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc (MIN.) = 24.30
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.786
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.30	0.98	0.100	32
COMMERCIAL	A	49.60	0.98	0.100	32
PUBLIC PARK	A	2.00	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.125
SUBAREA AREA (ACRES) = 59.90 SUBAREA RUNOFF (CFS) = 89.72
EFFECTIVE AREA (ACRES) = 162.70 AREA-AVERAGED Fm (INCH/HR) = 0.11
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
TOTAL AREA (ACRES) = 162.7 PEAK FLOW RATE (CFS) = 245.95

=====

END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 162.7 TC (MIN.) = 24.30
EFFECTIVE AREA (ACRES) = 162.70 AREA-AVERAGED Fm (INCH/HR) = 0.11
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.109
PEAK FLOW RATE (CFS) = 245.95

END OF RATIONAL METHOD ANALYSIS

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 32.30
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.58
HALFSTREET FLOOD WIDTH(FEET) = 20.85
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.56
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.05
STREET FLOW TRAVEL TIME(MIN.) = 3.18 Tc(MIN.) = 17.98
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.855

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.70 0.98 0.100 32
COMMERCIAL A 14.50 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 18.20 SUBAREA RUNOFF(CFS) = 28.78
EFFECTIVE AREA(ACRES) = 28.20 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 28.2 PEAK FLOW RATE(CFS) = 44.60

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 23.64
FLOW VELOCITY(FEET/SEC.) = 3.86 DEPTH*VELOCITY(FT*FT/SEC.) = 2.44
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 802.00 = 2280.00 FEET.

FLOW PROCESS FROM NODE 802.00 TO NODE 803.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 898.00 DOWNSTREAM(FEET) = 885.00
FLOW LENGTH(FEET) = 1250.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.22
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 44.60
PIPE TRAVEL TIME(MIN.) = 2.26 Tc(MIN.) = 20.24
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 803.00 = 3530.00 FEET.

FLOW PROCESS FROM NODE 803.00 TO NODE 803.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc(MIN.) = 20.24
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.728
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 5.70 0.98 0.100 32
COMMERCIAL A 26.70 0.98 0.100 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 32.40 SUBAREA RUNOFF(CFS) = 47.53
EFFECTIVE AREA(ACRES) = 60.60 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 60.6 PEAK FLOW RATE(CFS) = 88.90

FLOW PROCESS FROM NODE 803.00 TO NODE 804.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 870.00
FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.21
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 88.90
PIPE TRAVEL TIME(MIN.) = 2.01 Tc(MIN.) = 22.25
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 804.00 = 4880.00 FEET.

FLOW PROCESS FROM NODE 804.00 TO NODE 804.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc(MIN.) = 22.25
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.632
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 6.70 0.98 0.100 32
COMMERCIAL A 35.50 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 42.20 SUBAREA RUNOFF(CFS) = 58.29
EFFECTIVE AREA(ACRES) = 102.80 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 102.8 PEAK FLOW RATE(CFS) = 141.99

FLOW PROCESS FROM NODE 804.00 TO NODE 805.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 845.00
FLOW LENGTH(FEET) = 1950.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.19
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 141.99
PIPE TRAVEL TIME(MIN.) = 2.46 Tc(MIN.) = 24.71
LONGEST FLOWPATH FROM NODE 800.00 TO NODE 805.00 = 6830.00 FEET.

FLOW PROCESS FROM NODE 805.00 TO NODE 805.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 24.71

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.533

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.30	0.98	0.100	32
COMMERCIAL	A	49.60	0.98	0.100	32
PUBLIC PARK	A	2.00	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.125

SUBAREA AREA(ACRES) = 59.90 SUBAREA RUNOFF(CFS) = 76.05

EFFECTIVE AREA(ACRES) = 162.70 AREA-AVERAGED Fm(INCH/HR) = 0.11

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11

TOTAL AREA(ACRES) = 162.7 PEAK FLOW RATE(CFS) = 208.82

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 162.7 TC(MIN.) = 24.71

EFFECTIVE AREA(ACRES) = 162.70 AREA-AVERAGED Fm(INCH/HR) = 0.11

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.109

PEAK FLOW RATE(CFS) = 208.82

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Q) *
* 100-YEAR HYDROLOGY ANALYSIS *

FILE NAME: ONT5Q100.DAT
TIME/DATE OF STUDY: 15:16 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN- / OUT- / SIDE / SIDE / WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GUTTER LIP (FT), GEOMETRIES HIKE (FT), MANNING FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL (INCH)
5-MINUTES 0.48
30-MINUTES 0.99
1-HOUR 1.30
3-HOUR 2.39
6-HOUR 3.50
24-HOUR 7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 900.00 TO NODE 901.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1400.00
ELEVATION DATA: UPSTREAM (FEET) = 912.00 DOWNSTREAM (FEET) = 900.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 14.280
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.076

Table with columns: SUBAREA Tc AND LOSS RATE DATA (AMC II): DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.)

FLOW PROCESS FROM NODE 901.00 TO NODE 902.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 900.00 DOWNSTREAM ELEVATION (FEET) = 896.00
STREET LENGTH (FEET) = 1290.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 20.31
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.60
HALFSTREET FLOOD WIDTH(FEET) = 22.01
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.02
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.21
STREET FLOW TRAVEL TIME(MIN.) = 10.65 Tc(MIN.) = 24.93
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.202

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.40 0.98 0.100 32
COMMERCIAL A 6.50 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 8.90 SUBAREA RUNOFF(CFS) = 16.85
EFFECTIVE AREA(ACRES) = 13.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 13.3 PEAK FLOW RATE(CFS) = 25.19

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.64 HALFSTREET FLOOD WIDTH(FEET) = 23.91
FLOW VELOCITY(FEET/SEC.) = 2.13 DEPTH*VELOCITY(FT*FT/SEC.) = 1.36
LONGEST FLOWPATH FROM NODE 900.00 TO NODE 902.00 = 2690.00 FEET.

FLOW PROCESS FROM NODE 902.00 TO NODE 903.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 896.00 DOWNSTREAM(FEET) = 884.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 27.0 INCH PIPE IS 21.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.56
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 25.19
PIPE TRAVEL TIME(MIN.) = 2.91 Tc(MIN.) = 27.84
LONGEST FLOWPATH FROM NODE 900.00 TO NODE 903.00 = 4010.00 FEET.

FLOW PROCESS FROM NODE 903.00 TO NODE 903.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 27.84
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.061
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 5.80 0.98 0.100 32
COMMERCIAL A 15.00 0.98 0.100 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 20.80 SUBAREA RUNOFF(CFS) = 36.75
EFFECTIVE AREA(ACRES) = 34.10 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 34.1 PEAK FLOW RATE(CFS) = 60.25

FLOW PROCESS FROM NODE 903.00 TO NODE 904.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 884.00 DOWNSTREAM(FEET) = 868.00
FLOW LENGTH(FEET) = 1340.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.47
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 60.25
PIPE TRAVEL TIME(MIN.) = 2.13 Tc(MIN.) = 29.98
LONGEST FLOWPATH FROM NODE 900.00 TO NODE 904.00 = 5350.00 FEET.

FLOW PROCESS FROM NODE 904.00 TO NODE 904.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 29.98
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.971

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 5.70 0.98 0.100 32
COMMERCIAL A 17.70 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 23.40 SUBAREA RUNOFF(CFS) = 39.46
EFFECTIVE AREA(ACRES) = 57.50 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 57.5 PEAK FLOW RATE(CFS) = 96.97

FLOW PROCESS FROM NODE 904.00 TO NODE 905.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 868.00 DOWNSTREAM(FEET) = 845.00
FLOW LENGTH(FEET) = 1970.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 34.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.52
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 96.97
PIPE TRAVEL TIME(MIN.) = 2.85 Tc(MIN.) = 32.83
LONGEST FLOWPATH FROM NODE 900.00 TO NODE 905.00 = 7320.00 FEET.

FLOW PROCESS FROM NODE 905.00 TO NODE 905.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 32.83

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 1.867

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.80	0.98	0.100	32
COMMERCIAL	A	25.00	0.98	0.100	32
PUBLIC PARK	A	1.00	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.122

SUBAREA AREA (ACRES) = 33.80 SUBAREA RUNOFF (CFS) = 53.16

EFFECTIVE AREA (ACRES) = 91.30 AREA-AVERAGED Fm (INCH/HR) = 0.11

AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.11

TOTAL AREA (ACRES) = 91.3 PEAK FLOW RATE (CFS) = 144.72

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 91.3 TC (MIN.) = 32.83

EFFECTIVE AREA (ACRES) = 91.30 AREA-AVERAGED Fm (INCH/HR) = 0.11

AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.108

PEAK FLOW RATE (CFS) = 144.72

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Q) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT5Q25.DAT
TIME/DATE OF STUDY: 15:17 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY (INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 900.00 TO NODE 901.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1400.00
ELEVATION DATA: UPSTREAM (FEET) = 912.00 DOWNSTREAM (FEET) = 900.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 14.280
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.457
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.20	0.98	0.100	32	14.28
COMMERCIAL	A	1.20	0.98	0.100	32	14.28

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 9.34
TOTAL AREA (ACRES) = 4.40 PEAK FLOW RATE (CFS) = 9.34

FLOW PROCESS FROM NODE 901.00 TO NODE 902.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 900.00 DOWNSTREAM ELEVATION (FEET) = 896.00
STREET LENGTH (FEET) = 1290.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 15.97
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.56
 HALFSTREET FLOOD WIDTH(FEET) = 20.00
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.91
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.06
 STREET FLOW TRAVEL TIME(MIN.) = 11.29 Tc(MIN.) = 25.56

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.733
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.40	0.98	0.100	32
COMMERCIAL	A	6.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 8.90 SUBAREA RUNOFF(CFS) = 13.10
 EFFECTIVE AREA(ACRES) = 13.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 13.3 PEAK FLOW RATE(CFS) = 19.57

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 21.69
 FLOW VELOCITY(FEET/SEC.) = 2.00 DEPTH*VELOCITY(FT*FT/SEC.) = 1.18
 LONGEST FLOWPATH FROM NODE 900.00 TO NODE 902.00 = 2690.00 FEET.

 FLOW PROCESS FROM NODE 902.00 TO NODE 903.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 896.00 DOWNSTREAM(FEET) = 884.00
 FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 17.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.27
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 19.57
 PIPE TRAVEL TIME(MIN.) = 3.03 Tc(MIN.) = 28.59
 LONGEST FLOWPATH FROM NODE 900.00 TO NODE 903.00 = 4010.00 FEET.

 FLOW PROCESS FROM NODE 903.00 TO NODE 903.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 28.59
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.620
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	0.98	0.100	32
COMMERCIAL	A	17.70	0.98	0.100	32

COMMERCIAL	A	5.80	0.98	0.100	32
COMMERCIAL	A	15.00	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 20.80 SUBAREA RUNOFF(CFS) = 28.50
 EFFECTIVE AREA(ACRES) = 34.10 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 34.1 PEAK FLOW RATE(CFS) = 46.73

 FLOW PROCESS FROM NODE 903.00 TO NODE 904.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 884.00 DOWNSTREAM(FEET) = 868.00
 FLOW LENGTH(FEET) = 1340.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 24.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.85
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 46.73
 PIPE TRAVEL TIME(MIN.) = 2.27 Tc(MIN.) = 30.86
 LONGEST FLOWPATH FROM NODE 900.00 TO NODE 904.00 = 5350.00 FEET.

 FLOW PROCESS FROM NODE 904.00 TO NODE 904.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 30.86
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.548
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	0.98	0.100	32
COMMERCIAL	A	17.70	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 23.40 SUBAREA RUNOFF(CFS) = 30.54
 EFFECTIVE AREA(ACRES) = 57.50 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 57.5 PEAK FLOW RATE(CFS) = 75.05

 FLOW PROCESS FROM NODE 904.00 TO NODE 905.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 868.00 DOWNSTREAM(FEET) = 845.00
 FLOW LENGTH(FEET) = 1970.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.94
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 75.05
 PIPE TRAVEL TIME(MIN.) = 3.00 Tc(MIN.) = 33.86

LONGEST FLOWPATH FROM NODE 900.00 TO NODE 905.00 = 7320.00 FEET.

FLOW PROCESS FROM NODE 905.00 TO NODE 905.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc (MIN.) = 33.86					
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.464					
SUBAREA LOSS RATE DATA (AMC II):					
DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.80	0.98	0.100	32
COMMERCIAL	A	25.00	0.98	0.100	32
PUBLIC PARK	A	1.00	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.122
SUBAREA AREA (ACRES) = 33.80 SUBAREA RUNOFF (CFS) = 40.91
EFFECTIVE AREA (ACRES) = 91.30 AREA-AVERAGED Fm (INCH/HR) = 0.11
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.11
TOTAL AREA (ACRES) = 91.3 PEAK FLOW RATE (CFS) = 111.61

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES)	=	91.3	TC (MIN.)	=	33.86
EFFECTIVE AREA (ACRES)	=	91.30	AREA-AVERAGED Fm (INCH/HR)	=	0.11
AREA-AVERAGED Fp (INCH/HR)	=	0.97	AREA-AVERAGED Ap	=	0.108
PEAK FLOW RATE (CFS)	=	111.61			

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA Q) *
* 10-YEAR HYDROLOGY ANALYSIS *

FILE NAME: ONT5Q10.DAT
TIME/DATE OF STUDY: 15:17 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, CURB GUTTER-GEOMETRIES, MANNING FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 900.00 TO NODE 901.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1400.00
ELEVATION DATA: UPSTREAM(FEET) = 912.00 DOWNSTREAM(FEET) = 900.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.280
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.130
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 3.20 0.98 0.100 32 14.28
COMMERCIAL A 1.20 0.98 0.100 32 14.28
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 8.05
TOTAL AREA(ACRES) = 4.40 PEAK FLOW RATE(CFS) = 8.05

FLOW PROCESS FROM NODE 901.00 TO NODE 902.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 900.00 DOWNSTREAM ELEVATION(FEET) = 896.00
STREET LENGTH(FEET) = 1290.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 13.68
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.53
HALFSTREET FLOOD WIDTH (FEET) = 18.79
AVERAGE FLOW VELOCITY (FEET/SEC.) = 1.84
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 0.98
STREET FLOW TRAVEL TIME (MIN.) = 11.70 Tc (MIN.) = 25.98
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.487
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.40	0.98	0.100	32
COMMERCIAL	A	6.50	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 8.90 SUBAREA RUNOFF (CFS) = 11.13
EFFECTIVE AREA (ACRES) = 13.30 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 13.3 PEAK FLOW RATE (CFS) = 16.64

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.56 HALFSTREET FLOOD WIDTH (FEET) = 20.32
FLOW VELOCITY (FEET/SEC.) = 1.93 DEPTH*VELOCITY (FT*FT/SEC.) = 1.09
LONGEST FLOWPATH FROM NODE 900.00 TO NODE 902.00 = 2690.00 FEET.

FLOW PROCESS FROM NODE 902.00 TO NODE 903.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM (FEET) = 896.00 DOWNSTREAM (FEET) = 884.00
FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.2 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 6.91
ESTIMATED PIPE DIAMETER (INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 16.64
PIPE TRAVEL TIME (MIN.) = 3.18 Tc (MIN.) = 29.16
LONGEST FLOWPATH FROM NODE 900.00 TO NODE 903.00 = 4010.00 FEET.

FLOW PROCESS FROM NODE 903.00 TO NODE 903.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc (MIN.) = 29.16
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.388
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.80	0.98	0.100	32
COMMERCIAL	A	15.00	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 20.80 SUBAREA RUNOFF (CFS) = 24.15
EFFECTIVE AREA (ACRES) = 34.10 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 34.1 PEAK FLOW RATE (CFS) = 39.59

FLOW PROCESS FROM NODE 903.00 TO NODE 904.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM (FEET) = 884.00 DOWNSTREAM (FEET) = 868.00
FLOW LENGTH (FEET) = 1340.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 24.3 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 9.31
ESTIMATED PIPE DIAMETER (INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 39.59
PIPE TRAVEL TIME (MIN.) = 2.40 Tc (MIN.) = 31.56
LONGEST FLOWPATH FROM NODE 900.00 TO NODE 904.00 = 5350.00 FEET.

FLOW PROCESS FROM NODE 904.00 TO NODE 904.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc (MIN.) = 31.56
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.323
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	0.98	0.100	32
COMMERCIAL	A	17.70	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 23.40 SUBAREA RUNOFF (CFS) = 25.82
EFFECTIVE AREA (ACRES) = 57.50 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 57.5 PEAK FLOW RATE (CFS) = 63.44

FLOW PROCESS FROM NODE 904.00 TO NODE 905.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM (FEET) = 868.00 DOWNSTREAM (FEET) = 845.00
FLOW LENGTH (FEET) = 1970.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 29.0 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 10.39
ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 63.44
PIPE TRAVEL TIME (MIN.) = 3.16 Tc (MIN.) = 34.72
LONGEST FLOWPATH FROM NODE 900.00 TO NODE 905.00 = 7320.00 FEET.

FLOW PROCESS FROM NODE 905.00 TO NODE 905.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 34.72

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.250

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.80	0.98	0.100	32
COMMERCIAL	A	25.00	0.98	0.100	32
PUBLIC PARK	A	1.00	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.122

SUBAREA AREA (ACRES) = 33.80 SUBAREA RUNOFF (CFS) = 34.39

EFFECTIVE AREA (ACRES) = 91.30 AREA-AVERAGED Fm (INCH/HR) = 0.11

AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.11

TOTAL AREA (ACRES) = 91.3 PEAK FLOW RATE (CFS) = 94.02

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 91.3 TC (MIN.) = 34.72

EFFECTIVE AREA (ACRES) = 91.30 AREA-AVERAGED Fm (INCH/HR) = 0.11

AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.108

PEAK FLOW RATE (CFS) = 94.02

END OF RATIONAL METHOD ANALYSIS

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA R) *
* 100-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT5R100.DAT
TIME/DATE OF STUDY: 15:31 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 950.00 TO NODE 951.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1400.00
ELEVATION DATA: UPSTREAM (FEET) = 905.00 DOWNSTREAM (FEET) = 890.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 13.656
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.160
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.00	0.98	0.100	32	13.66
COMMERCIAL	A	1.20	0.98	0.100	32	13.66

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 11.57
TOTAL AREA (ACRES) = 4.20 PEAK FLOW RATE (CFS) = 11.57

FLOW PROCESS FROM NODE 951.00 TO NODE 952.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION (FEET) = 890.00 DOWNSTREAM ELEVATION (FEET) = 888.00
STREET LENGTH (FEET) = 350.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA AREA (ACRES) = 40.40 SUBAREA RUNOFF (CFS) = 92.25
 EFFECTIVE AREA (ACRES) = 106.60 AREA-AVERAGED F_m (INCH/HR) = 0.10
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.10
 TOTAL AREA (ACRES) = 106.6 PEAK FLOW RATE (CFS) = 243.42

SUBAREA AREA (ACRES) = 58.00 SUBAREA RUNOFF (CFS) = 122.24
 EFFECTIVE AREA (ACRES) = 180.40 AREA-AVERAGED F_m (INCH/HR) = 0.10
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.10
 TOTAL AREA (ACRES) = 180.4 PEAK FLOW RATE (CFS) = 381.31

 FLOW PROCESS FROM NODE 954.00 TO NODE 954.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE T_c (MIN.) = 18.49
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.635
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	0.60	0.98	0.100	32
COMMERCIAL	A	15.20	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA AREA (ACRES) = 15.80 SUBAREA RUNOFF (CFS) = 36.08
 EFFECTIVE AREA (ACRES) = 122.40 AREA-AVERAGED F_m (INCH/HR) = 0.10
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.10
 TOTAL AREA (ACRES) = 122.4 PEAK FLOW RATE (CFS) = 279.50

 FLOW PROCESS FROM NODE 954.00 TO NODE 955.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

ELEVATION DATA: UPSTREAM (FEET) = 860.00 DOWNSTREAM (FEET) = 845.00
 FLOW LENGTH (FEET) = 1890.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 69.0 INCH PIPE IS 52.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.17
 ESTIMATED PIPE DIAMETER (INCH) = 69.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 279.50
 PIPE TRAVEL TIME (MIN.) = 2.39 T_c (MIN.) = 20.88
 LONGEST FLOWPATH FROM NODE 950.00 TO NODE 955.00 = 5720.00 FEET.

 FLOW PROCESS FROM NODE 955.00 TO NODE 955.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE T_c (MIN.) = 20.88
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.449
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	9.10	0.98	0.100	32
COMMERCIAL	A	48.10	0.98	0.100	32
PUBLIC PARK	A	0.80	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.110

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 180.4 T_c (MIN.) = 20.88
 EFFECTIVE AREA (ACRES) = 180.40 AREA-AVERAGED F_m (INCH/HR) = 0.10
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.103
 PEAK FLOW RATE (CFS) = 381.31

=====

END OF RATIONAL METHOD ANALYSIS

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA R) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT5R25.DAT
TIME/DATE OF STUDY: 15:31 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), IN-SIDE / OUT-SIDE WAY, HEIGHT (FT), CURB LIP (FT), GUTTER HIKE (FT), GEOMETRIES, MANNING FACTOR. Contains 2 rows of data.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL(INCH). Rows include 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 950.00 TO NODE 951.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1400.00
ELEVATION DATA: UPSTREAM(FEET) = 905.00 DOWNSTREAM(FEET) = 890.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.656
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.524
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ LAND USE SCS SOIL AREA Fp Ap SCS Tc
GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 3.00 0.98 0.100 32 13.66
COMMERCIAL A 1.20 0.98 0.100 32 13.66
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 9.17
TOTAL AREA(ACRES) = 4.20 PEAK FLOW RATE(CFS) = 9.17

FLOW PROCESS FROM NODE 951.00 TO NODE 952.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
UPSTREAM ELEVATION(FEET) = 890.00 DOWNSTREAM ELEVATION(FEET) = 888.00
STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 25.63
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.59
 HALFSTREET FLOOD WIDTH(FEET) = 21.37
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.69
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.58
 STREET FLOW TRAVEL TIME(MIN.) = 2.17 Tc(MIN.) = 15.82
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.311
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.70	0.98	0.100	32
COMMERCIAL	A	13.80	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 16.50 SUBAREA RUNOFF(CFS) = 32.86
 EFFECTIVE AREA(ACRES) = 20.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 20.7 PEAK FLOW RATE(CFS) = 41.23

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.98
 FLOW VELOCITY(FEET/SEC.) = 3.03 DEPTH*VELOCITY(FT*FT/SEC.) = 2.04
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 350.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 47.0 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 952.00
 LONGEST FLOWPATH FROM NODE 950.00 TO NODE 952.00 = 1750.00 FEET.

 FLOW PROCESS FROM NODE 952.00 TO NODE 953.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPS'TREAM(FEET) = 888.00 DOWNSTREAM(FEET) = 880.00
 FLOW LENGTH(FEET) = 750.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 23.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.22
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 41.23
 PIPE TRAVEL TIME(MIN.) = 1.36 Tc(MIN.) = 17.18
 LONGEST FLOWPATH FROM NODE 950.00 TO NODE 953.00 = 2500.00 FEET.

 FLOW PROCESS FROM NODE 953.00 TO NODE 953.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc(MIN.) = 17.18
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.199

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.50	0.98	0.100	32
COMMERCIAL	A	21.50	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 29.00 SUBAREA RUNOFF(CFS) = 54.86
 EFFECTIVE AREA(ACRES) = 49.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 49.7 PEAK FLOW RATE(CFS) = 94.02

 FLOW PROCESS FROM NODE 953.00 TO NODE 953.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc(MIN.) = 17.18
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.199
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.10	0.98	0.100	32
COMMERCIAL	A	15.40	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 16.50 SUBAREA RUNOFF(CFS) = 31.21
 EFFECTIVE AREA(ACRES) = 66.20 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 66.2 PEAK FLOW RATE(CFS) = 125.23

 FLOW PROCESS FROM NODE 953.00 TO NODE 954.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 880.00 DOWNSTREAM(FEET) = 860.00
 FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.66
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 125.23
 PIPE TRAVEL TIME(MIN.) = 1.62 Tc(MIN.) = 18.80
 LONGEST FLOWPATH FROM NODE 950.00 TO NODE 954.00 = 3830.00 FEET.

 FLOW PROCESS FROM NODE 954.00 TO NODE 954.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc(MIN.) = 18.80
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.083
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------

COMMERCIAL A 7.60 0.98 0.100 32
 COMMERCIAL A 32.80 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 40.40 SUBAREA RUNOFF (CFS) = 72.21
 EFFECTIVE AREA (ACRES) = 106.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 106.6 PEAK FLOW RATE (CFS) = 190.53

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.110
 SUBAREA AREA (ACRES) = 58.00 SUBAREA RUNOFF (CFS) = 95.17
 EFFECTIVE AREA (ACRES) = 180.40 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 180.4 PEAK FLOW RATE (CFS) = 297.13

 FLOW PROCESS FROM NODE 954.00 TO NODE 954.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc (MIN.) = 18.80
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.083
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.60	0.98	0.100	32
COMMERCIAL	A	15.20	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 15.80 SUBAREA RUNOFF (CFS) = 28.24
 EFFECTIVE AREA (ACRES) = 122.40 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 122.4 PEAK FLOW RATE (CFS) = 218.77

 FLOW PROCESS FROM NODE 954.00 TO NODE 955.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM (FEET) = 860.00 DOWNSTREAM (FEET) = 845.00
 FLOW LENGTH (FEET) = 1890.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 47.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.40
 ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 218.77
 PIPE TRAVEL TIME (MIN.) = 2.54 Tc (MIN.) = 21.34
 LONGEST FLOWPATH FROM NODE 950.00 TO NODE 955.00 = 5720.00 FEET.

 FLOW PROCESS FROM NODE 955.00 TO NODE 955.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc (MIN.) = 21.34
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.931
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.10	0.98	0.100	32
COMMERCIAL	A	48.10	0.98	0.100	32
PUBLIC PARK	A	0.80	0.98	0.850	32

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 180.4 TC (MIN.) = 21.34
 EFFECTIVE AREA (ACRES) = 180.40 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.103
 PEAK FLOW RATE (CFS) = 297.13

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN V (AREA R) *
* 10-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: ONT5R10.DAT
TIME/DATE OF STUDY: 15:31 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-/PARK-SIDE / SIDE/WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GUTTER LIP (FT), GUTTER HIKE (FT), MANNING FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.60
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.00
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES (0.48), 30-MINUTES (0.99), 1-HOUR (1.30), 3-HOUR (2.39), 6-HOUR (3.50), 24-HOUR (7.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 950.00 TO NODE 951.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1400.00
ELEVATION DATA: UPSTREAM(FEET) = 905.00 DOWNSTREAM(FEET) = 890.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.656

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.187

SUBAREA Tc AND LOSS RATE DATA(AMC II):

Table with columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL A (3.00, 0.98, 0.100, 32, 13.66), COMMERCIAL A (1.20, 0.98, 0.100, 32, 13.66).

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 7.90

TOTAL AREA(ACRES) = 4.20 PEAK FLOW RATE(CFS) = 7.90

FLOW PROCESS FROM NODE 951.00 TO NODE 952.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 890.00 DOWNSTREAM ELEVATION(FEET) = 888.00

STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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) = 22.02
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.56
HALFSTREET FLOOD WIDTH(FEET) = 20.11
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.60
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.46
STREET FLOW TRAVEL TIME(MIN.) = 2.24 Tc(MIN.) = 15.90
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.997

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.70 0.98 0.100 32
COMMERCIAL A 13.80 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 16.50 SUBAREA RUNOFF(CFS) = 28.20
EFFECTIVE AREA(ACRES) = 20.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 20.7 PEAK FLOW RATE(CFS) = 35.38

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.64 HALFSTREET FLOOD WIDTH(FEET) = 24.22
FLOW VELOCITY(FEET/SEC.) = 2.92 DEPTH*VELOCITY(FT*FT/SEC.) = 1.88
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 350.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 40.6 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 952.00
LONGEST FLOWPATH FROM NODE 950.00 TO NODE 952.00 = 1750.00 FEET.

FLOW PROCESS FROM NODE 952.00 TO NODE 953.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 888.00 DOWNSTREAM(FEET) = 880.00
FLOW LENGTH(FEET) = 750.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 23.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.77
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 35.38
PIPE TRAVEL TIME(MIN.) = 1.43 Tc(MIN.) = 17.32
LONGEST FLOWPATH FROM NODE 950.00 TO NODE 953.00 = 2500.00 FEET.

FLOW PROCESS FROM NODE 953.00 TO NODE 953.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.32
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.896
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.60 0.98 0.100 32
COMMERCIAL A 32.80 0.98 0.100 32

LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.50 0.98 0.100 32
COMMERCIAL A 21.50 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 29.00 SUBAREA RUNOFF(CFS) = 46.95
EFFECTIVE AREA(ACRES) = 49.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 49.7 PEAK FLOW RATE(CFS) = 80.47

FLOW PROCESS FROM NODE 953.00 TO NODE 953.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.32
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.896
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 1.10 0.98 0.100 32
COMMERCIAL A 15.40 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 16.50 SUBAREA RUNOFF(CFS) = 26.71
EFFECTIVE AREA(ACRES) = 66.20 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 66.2 PEAK FLOW RATE(CFS) = 107.18

FLOW PROCESS FROM NODE 953.00 TO NODE 954.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 880.00 DOWNSTREAM(FEET) = 860.00
FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 33.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.07
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 107.18
PIPE TRAVEL TIME(MIN.) = 1.70 Tc(MIN.) = 19.02
LONGEST FLOWPATH FROM NODE 950.00 TO NODE 954.00 = 3830.00 FEET.

FLOW PROCESS FROM NODE 954.00 TO NODE 954.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.02
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.793
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.60 0.98 0.100 32
COMMERCIAL A 32.80 0.98 0.100 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA AREA (ACRES) = 40.40 SUBAREA RUNOFF (CFS) = 61.65
 EFFECTIVE AREA (ACRES) = 106.60 AREA-AVERAGED F_m (INCH/HR) = 0.10
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.10
 TOTAL AREA (ACRES) = 106.6 PEAK FLOW RATE (CFS) = 162.67

SUBAREA AREA (ACRES) = 58.00 SUBAREA RUNOFF (CFS) = 80.98
 EFFECTIVE AREA (ACRES) = 180.40 AREA-AVERAGED F_m (INCH/HR) = 0.10
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.10
 TOTAL AREA (ACRES) = 180.4 PEAK FLOW RATE (CFS) = 252.97

=====
 END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 180.4 TC (MIN.) = 21.65
 EFFECTIVE AREA (ACRES) = 180.40 AREA-AVERAGED F_m (INCH/HR) = 0.10
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.103
 PEAK FLOW RATE (CFS) = 252.97
 =====

=====
 END OF RATIONAL METHOD ANALYSIS
 =====

 FLOW PROCESS FROM NODE 954.00 TO NODE 954.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
 MAINLINE T_c (MIN.) = 19.02
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.793
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA F_p A_p SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 0.60 0.98 0.100 32
 COMMERCIAL A 15.20 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA AREA (ACRES) = 15.80 SUBAREA RUNOFF (CFS) = 24.11
 EFFECTIVE AREA (ACRES) = 122.40 AREA-AVERAGED F_m (INCH/HR) = 0.10
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.10
 TOTAL AREA (ACRES) = 122.4 PEAK FLOW RATE (CFS) = 186.78

 FLOW PROCESS FROM NODE 954.00 TO NODE 955.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====
 ELEVATION DATA: UPSTREAM (FEET) = 860.00 DOWNSTREAM (FEET) = 845.00
 FLOW LENGTH (FEET) = 1890.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 44.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.96
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 186.78
 PIPE TRAVEL TIME (MIN.) = 2.63 T_c (MIN.) = 21.65
 LONGEST FLOWPATH FROM NODE 950.00 TO NODE 955.00 = 5720.00 FEET.

 FLOW PROCESS FROM NODE 955.00 TO NODE 955.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
 MAINLINE T_c (MIN.) = 21.65
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.659
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA F_p A_p SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 9.10 0.98 0.100 32
 COMMERCIAL A 48.10 0.98 0.100 32
 PUBLIC PARK A 0.80 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.110

SECTION 6

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA A) *
* 100-YEAR HYDRAULIC ANALYSIS *
* P. PAGADUAN 12-10-2011 *

FILE NAME: 6A100ULT.DAT
TIME/DATE OF STUDY: 12:16 12/10/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-/SIDE/SIDE/WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH (INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH (INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL (INCH)
5-MINUTES 0.52
30-MINUTES 1.06
1-HOUR 1.40
3-HOUR 2.54
6-HOUR 3.70
24-HOUR 7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 700.00
ELEVATION DATA: UPSTREAM (FEET) = 1160.00 DOWNSTREAM (FEET) = 1145.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.010
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.367
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCSS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.70 0.98 0.100 32 9.01
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.30 0.98 0.200 32 9.60
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.172
SUBAREA RUNOFF (CFS) = 22.68
TOTAL AREA (ACRES) = 6.00 PEAK FLOW RATE (CFS) = 22.68

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1145.00 DOWNSTREAM ELEVATION (FEET) = 1140.00
STREET LENGTH (FEET) = 750.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 40.55
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.65
 HALFSTREET FLOOD WIDTH(FEET) = 24.80
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.20
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.09
 STREET FLOW TRAVEL TIME(MIN.) = 3.91 Tc(MIN.) = 12.92
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.518
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.80	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.90	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.289
 SUBAREA AREA(ACRES) = 12.20 SUBAREA RUNOFF(CFS) = 35.53
 EFFECTIVE AREA(ACRES) = 18.20 AREA-AVERAGED Fm(INCH/HR) = 0.24
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
 TOTAL AREA(ACRES) = 18.2 PEAK FLOW RATE(CFS) = 53.62

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 29.77
 FLOW VELOCITY(FEET/SEC.) = 3.41 DEPTH*VELOCITY(FT*FT/SEC.) = 2.42
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1450.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1140.00 DOWNSTREAM ELEVATION(FEET) = 1135.00
 STREET LENGTH(FEET) = 1420.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 76.93
 STREET FLOWING FULL
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.86

HALFSTREET FLOOD WIDTH(FEET) = 41.48
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.92
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.50
 STREET FLOW TRAVEL TIME(MIN.) = 8.11 Tc(MIN.) = 21.03
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.626
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.30	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 46.16
 EFFECTIVE AREA(ACRES) = 41.00 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA(ACRES) = 41.0 PEAK FLOW RATE(CFS) = 85.18

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.88 HALFSTREET FLOOD WIDTH(FEET) = 42.64
 FLOW VELOCITY(FEET/SEC.) = 3.01 DEPTH*VELOCITY(FT*FT/SEC.) = 2.65
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1420.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 53.2 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2870.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1135.00 DOWNSTREAM(FEET) = 2.00
 FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 14.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 56.14
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 85.18
 PIPE TRAVEL TIME(MIN.) = 0.39 Tc(MIN.) = 21.42
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4190.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 21.42
 RAINFALL INTENSITY(INCH/HR) = 2.60
 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.33
 EFFECTIVE STREAM AREA(ACRES) = 41.00
 TOTAL STREAM AREA(ACRES) = 41.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 85.18

FLOW PROCESS FROM NODE 103.10 TO NODE 103.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 1145.00 DOWNSTREAM(FEET) = 1126.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.311

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.282

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 3.50 0.98 0.100 32 9.31
RESIDENTIAL

"11+ DWELLINGS/ACRE" A 3.30 0.98 0.200 32 9.92
COMMERCIAL A 2.20 0.98 0.100 32 9.31

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.137

SUBAREA RUNOFF(CFS) = 33.60
TOTAL AREA(ACRES) = 9.00 PEAK FLOW RATE(CFS) = 33.60

FLOW PROCESS FROM NODE 103.20 TO NODE 103.30 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 1126.00 DOWNSTREAM ELEVATION(FEET) = 1112.00
STREET LENGTH(FEET) = 1600.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 57.98

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.70

HALFSTREET FLOOD WIDTH(FEET) = 28.61

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.86

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.70

STREET FLOW TRAVEL TIME(MIN.) = 6.91 Tc(MIN.) = 16.22

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.069

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.60 0.98 0.100 32

RESIDENTIAL

"11+ DWELLINGS/ACRE" A 8.20 0.98 0.200 32

RESIDENTIAL

"11+ DWELLINGS/ACRE" A 7.80 0.98 0.200 32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.186

SUBAREA AREA(ACRES) = 18.60 SUBAREA RUNOFF(CFS) = 48.33

EFFECTIVE AREA(ACRES) = 27.60 AREA-AVERAGED Fm(INCH/HR) = 0.17

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.17

TOTAL AREA(ACRES) = 27.6 PEAK FLOW RATE(CFS) = 72.11

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 33.25

FLOW VELOCITY(FEET/SEC.) = 4.03 DEPTH*VELOCITY(FT*FT/SEC.) = 3.00

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 1600.0 FT WITH ELEVATION-DROP = 14.0 FT, IS 50.8 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.30

LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.30 = 2400.00 FEET.

FLOW PROCESS FROM NODE 103.30 TO NODE 103.40 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 1112.00 DOWNSTREAM ELEVATION(FEET) = 1110.00

STREET LENGTH(FEET) = 550.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 101.72

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.92

HALFSTREET FLOOD WIDTH(FEET) = 44.59

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.21

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.94

STREET FLOW TRAVEL TIME(MIN.) = 2.86 Tc(MIN.) = 19.08

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.784

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.60 0.98 0.100 32
RESIDENTIAL

"5-7 DWELLINGS/ACRE" A 17.70 0.98 0.500 32

RESIDENTIAL

"11+ DWELLINGS/ACRE" A 4.90 0.98 0.200 32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.378$
 SUBAREA AREA (ACRES) = 27.20 SUBAREA RUNOFF (CFS) = 59.12
 EFFECTIVE AREA (ACRES) = 54.80 AREA-AVERAGED F_m (INCH/HR) = 0.27
 AREA-AVERAGED F_p (INCH/HR) = 0.97 AREA-AVERAGED $A_p = 0.27$
 TOTAL AREA (ACRES) = 54.8 PEAK FLOW RATE (CFS) = 124.16

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.97 HALFSTREET FLOOD WIDTH (FEET) = 47.22
 FLOW VELOCITY (FEET/SEC.) = 3.40 DEPTH*VELOCITY (FT*FT/SEC.) = 3.30
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 550.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 82.5 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.40
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.40 = 2950.00 FEET.

 FLOW PROCESS FROM NODE 103.40 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1110.00 DOWNSTREAM (FEET) = 1105.00
 FLOW LENGTH (FEET) = 560.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.33
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 124.16
 PIPE TRAVEL TIME (MIN.) = 0.82 T_c (MIN.) = 19.90
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 104.00 = 3510.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE T_c (MIN.) = 19.90
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.714
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/	SCS SOIL	AREA	F_p	A_p	SCS
LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	5.70	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.372$
 SUBAREA AREA (ACRES) = 17.80 SUBAREA RUNOFF (CFS) = 37.67
 EFFECTIVE AREA (ACRES) = 72.60 AREA-AVERAGED F_m (INCH/HR) = 0.29
 AREA-AVERAGED F_p (INCH/HR) = 0.97 AREA-AVERAGED $A_p = 0.30$
 TOTAL AREA (ACRES) = 72.6 PEAK FLOW RATE (CFS) = 158.39

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 19.90
 RAINFALL INTENSITY (INCH/HR) = 2.71
 AREA-AVERAGED F_m (INCH/HR) = 0.29
 AREA-AVERAGED F_p (INCH/HR) = 0.97
 AREA-AVERAGED $A_p = 0.30$
 EFFECTIVE STREAM AREA (ACRES) = 72.60
 TOTAL STREAM AREA (ACRES) = 72.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 158.39

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	F_p (Fm) (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	85.18	21.42	2.597	0.98 (0.32)	0.33	41.0	100.00
2	158.39	19.90	2.714	0.97 (0.29)	0.30	72.6	103.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	F_p (Fm) (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	241.60	19.90	2.714	0.97 (0.30)	0.31	110.7	103.10
2	235.92	21.42	2.597	0.97 (0.30)	0.31	113.6	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 241.60 T_c (MIN.) = 19.90
 EFFECTIVE AREA (ACRES) = 110.69 AREA-AVERAGED F_m (INCH/HR) = 0.30
 AREA-AVERAGED F_p (INCH/HR) = 0.97 AREA-AVERAGED $A_p = 0.31$
 TOTAL AREA (ACRES) = 113.6
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4190.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1105.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 41.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 17.70
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 241.60
 PIPE TRAVEL TIME (MIN.) = 1.25 T_c (MIN.) = 21.16
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 5520.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 21.16
 RAINFALL INTENSITY (INCH/HR) = 2.62

AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.31
 EFFECTIVE STREAM AREA (ACRES) = 110.69
 TOTAL STREAM AREA (ACRES) = 113.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 241.60

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.20	0.98	0.500	32
COMMERCIAL	A	4.30	0.98	0.100	32
PUBLIC PARK	A	7.40	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.422
 SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 54.88
 EFFECTIVE AREA (ACRES) = 36.90 AREA-AVERAGED Fm (INCH/HR) = 0.52
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.53
 TOTAL AREA (ACRES) = 36.9 PEAK FLOW RATE (CFS) = 70.34

 FLOW PROCESS FROM NODE 104.10 TO NODE 104.20 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH (FEET) = 900.00
 ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1100.00

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.69 HALFSTREET FLOOD WIDTH (FEET) = 27.98
 FLOW VELOCITY (FEET/SEC.) = 4.79 DEPTH*VELOCITY (FT*FT/SEC.) = 3.32
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1100.0 FT WITH ELEVATION-DROP = 15.0 FT, IS 81.4 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 104.30
 LONGEST FLOWPATH FROM NODE 104.10 TO NODE 104.30 = 2000.00 FEET.

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 16.645
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.022
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
PUBLIC PARK	A	9.50	0.98	0.850	32	16.64

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF (CFS) = 18.75
 TOTAL AREA (ACRES) = 9.50 PEAK FLOW RATE (CFS) = 18.75

 FLOW PROCESS FROM NODE 104.30 TO NODE 105.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

 FLOW PROCESS FROM NODE 104.20 TO NODE 104.30 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====
 UPSTREAM ELEVATION (FEET) = 1100.00 DOWNSTREAM ELEVATION (FEET) = 1085.00
 STREET LENGTH (FEET) = 1100.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 1100.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 35.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 7.52
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 70.34
 PIPE TRAVEL TIME (MIN.) = 2.44 Tc (MIN.) = 23.32
 LONGEST FLOWPATH FROM NODE 104.10 TO NODE 105.00 = 3100.00 FEET.

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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

MAINLINE Tc (MIN.) = 23.32
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.468
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.70	0.98	0.500	32
PUBLIC PARK	A	2.90	0.98	0.850	32
SCHOOL	A	9.50	0.98	0.600	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.485
 SUBAREA AREA (ACRES) = 43.70 SUBAREA RUNOFF (CFS) = 78.49
 EFFECTIVE AREA (ACRES) = 80.60 AREA-AVERAGED Fm (INCH/HR) = 0.49

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 46.17
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.61
 HALFSTREET FLOOD WIDTH (FEET) = 22.69
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.32
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.65
 STREET FLOW TRAVEL TIME (MIN.) = 4.24 Tc (MIN.) = 20.88
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.637
 SUBAREA LOSS RATE DATA (AMC II):

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51
 TOTAL AREA (ACRES) = 80.6 PEAK FLOW RATE (CFS) = 143.21

=====
 END OF RATIONAL METHOD ANALYSIS
 =====

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 23.32
 RAINFALL INTENSITY (INCH/HR) = 2.47
 AREA-AVERAGED Fm (INCH/HR) = 0.49
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.51
 EFFECTIVE STREAM AREA (ACRES) = 80.60
 TOTAL STREAM AREA (ACRES) = 80.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 143.21

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	241.60	21.16	2.617	0.97 (0.30)	0.31	110.7	103.10
1	235.92	22.71	2.508	0.97 (0.30)	0.31	113.6	100.00
2	143.21	23.32	2.468	0.98 (0.49)	0.51	80.6	104.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	381.30	21.16	2.617	0.97 (0.38)	0.39	183.8	103.10
2	378.17	22.71	2.508	0.98 (0.38)	0.39	192.1	100.00
3	374.86	23.32	2.468	0.98 (0.38)	0.39	194.2	104.10

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 381.30 Tc (MIN.) = 21.16
 EFFECTIVE AREA (ACRES) = 183.81 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.39
 TOTAL AREA (ACRES) = 194.2
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 5520.00 FEET.

=====
 END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 194.2 TC (MIN.) = 21.16
 EFFECTIVE AREA (ACRES) = 183.81 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.387
 PEAK FLOW RATE (CFS) = 381.30

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	381.30	21.16	2.617	0.97 (0.38)	0.39	183.8	103.10
2	378.17	22.71	2.508	0.98 (0.38)	0.39	192.1	100.00
3	374.86	23.32	2.468	0.98 (0.38)	0.39	194.2	104.10

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA A) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 12-10-2011 *

FILE NAME: 6A25ULT.DAT
TIME/DATE OF STUDY: 12:24 12/10/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), IN- / OUT- / PARK- SIDE / SIDE/ WAY, HEIGHT (FT), CURB GUTTER-GEOMETRIES: MANNING, LIP HIKE FACTOR. Contains 2 rows of data.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, RAINFALL(INCH). Rows include 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

=====
FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21
=====

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.010
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.545
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.70 0.98 0.100 32 9.01
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.30 0.98 0.200 32 9.60
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.172
SUBAREA RUNOFF(CFS) = 18.24
TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 18.24

=====
FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62
=====

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1140.00
STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 32.31
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.61
 HALFSTREET FLOOD WIDTH(FEET) = 22.69
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.03
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.85
 STREET FLOW TRAVEL TIME(MIN.) = 4.13 Tc(MIN.) = 13.14
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.827
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.80	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.90	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.289
 SUBAREA AREA(ACRES) = 12.20 SUBAREA RUNOFF(CFS) = 27.94
 EFFECTIVE AREA(ACRES) = 18.20 AREA-AVERAGED Fm(INCH/HR) = 0.24
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
 TOTAL AREA(ACRES) = 18.2 PEAK FLOW RATE(CFS) = 42.30

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.66 HALFSTREET FLOOD WIDTH(FEET) = 25.22
 FLOW VELOCITY(FEET/SEC.) = 3.23 DEPTH*VELOCITY(FT*FT/SEC.) = 2.14
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1450.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====
 UPSTREAM ELEVATION(FEET) = 1140.00 DOWNSTREAM ELEVATION(FEET) = 1135.00
 STREET LENGTH(FEET) = 1420.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 59.99
 STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.80
 HALFSTREET FLOOD WIDTH(FEET) = 38.91
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.70
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.17
 STREET FLOW TRAVEL TIME(MIN.) = 8.78 Tc(MIN.) = 21.92
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.080
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.30	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 34.95
 EFFECTIVE AREA(ACRES) = 41.00 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA(ACRES) = 41.0 PEAK FLOW RATE(CFS) = 65.02

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.82 HALFSTREET FLOOD WIDTH(FEET) = 39.71
 FLOW VELOCITY(FEET/SEC.) = 2.77 DEPTH*VELOCITY(FT*FT/SEC.) = 2.27
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1420.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 41.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2870.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1135.00 DOWNSTREAM(FEET) = 2.00
 FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 11.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 54.01
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 65.02
 PIPE TRAVEL TIME(MIN.) = 0.41 Tc(MIN.) = 22.32
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4190.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 22.32
 RAINFALL INTENSITY(INCH/HR) = 2.06
 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.33
 EFFECTIVE STREAM AREA(ACRES) = 41.00

TOTAL STREAM AREA(ACRES) = 41.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 65.02

 FLOW PROCESS FROM NODE 103.10 TO NODE 103.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
 ELEVATION DATA: UPSTREAM(FEET) = 1145.00 DOWNSTREAM(FEET) = 1126.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.311
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.476
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.50	0.98	0.100	32	9.31
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	3.30	0.98	0.200	32	9.92
COMMERCIAL	A	2.20	0.98	0.100	32	9.31

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.137
 SUBAREA RUNOFF(CFS) = 27.08
 TOTAL AREA(ACRES) = 9.00 PEAK FLOW RATE(CFS) = 27.08

 FLOW PROCESS FROM NODE 103.20 TO NODE 103.30 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION(FEET) = 1126.00 DOWNSTREAM ELEVATION(FEET) = 1112.00
 STREET LENGTH(FEET) = 1600.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 46.35
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.65
 HALFSTREET FLOOD WIDTH(FEET) = 24.80
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.65
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.39
 STREET FLOW TRAVEL TIME(MIN.) = 7.30 Tc(MIN.) = 16.61
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.456
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	17.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.90	0.98	0.200	32

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	2.60	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.20	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	7.80	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.186
 SUBAREA AREA(ACRES) = 18.60 SUBAREA RUNOFF(CFS) = 38.08
 EFFECTIVE AREA(ACRES) = 27.60 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.17
 TOTAL AREA(ACRES) = 27.6 PEAK FLOW RATE(CFS) = 56.90

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.69 HALFSTREET FLOOD WIDTH(FEET) = 28.19
 FLOW VELOCITY(FEET/SEC.) = 3.85 DEPTH*VELOCITY(FT*FT/SEC.) = 2.67
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.30 = 2400.00 FEET.

 FLOW PROCESS FROM NODE 103.30 TO NODE 103.40 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION(FEET) = 1112.00 DOWNSTREAM ELEVATION(FEET) = 1110.00
 STREET LENGTH(FEET) = 550.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 79.59
 STREET FLOWING FULL
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.86
 HALFSTREET FLOOD WIDTH(FEET) = 41.66
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.98
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.57
 STREET FLOW TRAVEL TIME(MIN.) = 3.07 Tc(MIN.) = 19.68
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.219
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	17.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.90	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.378

AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.31
 EFFECTIVE STREAM AREA (ACRES) = 110.37
 TOTAL STREAM AREA (ACRES) = 113.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 185.69

 FLOW PROCESS FROM NODE 104.10 TO NODE 104.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 900.00
 ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1100.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 16.645
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.453
 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.)
 PUBLIC PARK A 9.50 0.98 0.850 32 16.64
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF (CFS) = 13.89
 TOTAL AREA (ACRES) = 9.50 PEAK FLOW RATE (CFS) = 13.89

 FLOW PROCESS FROM NODE 104.20 TO NODE 104.30 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION (FEET) = 1100.00 DOWNSTREAM ELEVATION (FEET) = 1085.00
 STREET LENGTH (FEET) = 1100.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 34.95
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.56
 HALFSTREET FLOOD WIDTH (FEET) = 20.32
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.05
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.29
 STREET FLOW TRAVEL TIME (MIN.) = 4.53 Tc (MIN.) = 21.17
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.123
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	7.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.20	0.98	0.500	32
COMMERCIAL	A	4.30	0.98	0.100	32
PUBLIC PARK	A	7.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.422
 SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 42.20
 EFFECTIVE AREA (ACRES) = 36.90 AREA-AVERAGED Fm (INCH/HR) = 0.52
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.53
 TOTAL AREA (ACRES) = 36.9 PEAK FLOW RATE (CFS) = 53.27

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.64 HALFSTREET FLOOD WIDTH (FEET) = 24.01
 FLOW VELOCITY (FEET/SEC.) = 4.47 DEPTH*VELOCITY (FT*FT/SEC.) = 2.86
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1100.0 FT WITH ELEVATION-DROP = 15.0 FT, IS 64.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 104.30
 LONGEST FLOWPATH FROM NODE 104.10 TO NODE 104.30 = 2000.00 FEET.

 FLOW PROCESS FROM NODE 104.30 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 1100.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 7.11
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 53.27
 PIPE TRAVEL TIME (MIN.) = 2.58 Tc (MIN.) = 23.75
 LONGEST FLOWPATH FROM NODE 104.10 TO NODE 105.00 = 3100.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 23.75
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.982
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 6.60 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 24.70 0.98 0.500 32
 PUBLIC PARK A 2.90 0.98 0.850 32
 SCHOOL A 9.50 0.98 0.600 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.485
 SUBAREA AREA (ACRES) = 43.70 SUBAREA RUNOFF (CFS) = 59.36
 EFFECTIVE AREA (ACRES) = 80.60 AREA-AVERAGED Fm (INCH/HR) = 0.49
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51

TOTAL AREA(ACRES) = 80.6 PEAK FLOW RATE(CFS) = 107.94

=====
END OF RATIONAL METHOD ANALYSIS

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 23.75
RAINFALL INTENSITY(INCH/HR) = 1.98
AREA-AVERAGED Fm(INCH/HR) = 0.49
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.51
EFFECTIVE STREAM AREA(ACRES) = 80.60
TOTAL STREAM AREA(ACRES) = 80.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 107.94

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1, 1, 2.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1, 2, 3.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 291.83 Tc(MIN.) = 21.91
EFFECTIVE AREA(ACRES) = 184.71 AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
TOTAL AREA(ACRES) = 194.2
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 5520.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 194.2 TC(MIN.) = 21.91
EFFECTIVE AREA(ACRES) = 184.71 AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.387
PEAK FLOW RATE(CFS) = 291.83

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1, 2, 3.

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA A) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 12-10-2011 *

FILE NAME: 6A10ULT.DAT
TIME/DATE OF STUDY: 12:28 12/10/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with 10 columns: NO., HALF-CROWN TO STREET-CROSSFALL WIDTH (FT), CROWN TO STREET-CROSSFALL IN- / OUT- / PARK- SIDE / SIDE / WAY (FT), CURB GUTTER-GEOMETRIES HEIGHT (FT), GUTTER-GEOMETRIES WIDTH (FT), GUTTER-GEOMETRIES LIP (FT), GUTTER-GEOMETRIES HIKE (FT), MANNING FACTOR (n), and an unlabeled column. Rows 1 and 2 show data for different street sections.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with 2 columns: DURATION, RAINFALL(INCH). Rows include 5-MINUTES (0.33), 30-MINUTES (0.68), 1-HOUR (0.90), 3-HOUR (1.60), 6-HOUR (2.31), and 24-HOUR (4.36).

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.010
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.119
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.70 1.33 0.100 17 9.01
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.30 1.33 0.200 17 9.60
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.172
SUBAREA RUNOFF(CFS) = 15.61
TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 15.61

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1140.00
STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 27.14
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.58
HALFSTREET FLOOD WIDTH(FEET) = 21.22
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.89
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.69
STREET FLOW TRAVEL TIME(MIN.) = 4.32 Tc(MIN.) = 13.33
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.466
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.50 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 4.80 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 3.90 1.33 0.200 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.289
SUBAREA AREA(ACRES) = 12.20 SUBAREA RUNOFF(CFS) = 22.86
EFFECTIVE AREA(ACRES) = 18.20 AREA-AVERAGED Fm(INCH/HR) = 0.33
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.25
TOTAL AREA(ACRES) = 18.2 PEAK FLOW RATE(CFS) = 34.94

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.63 HALFSTREET FLOOD WIDTH(FEET) = 23.38
FLOW VELOCITY(FEET/SEC.) = 3.09 DEPTH*VELOCITY(FT*FT/SEC.) = 1.93
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1450.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1140.00 DOWNSTREAM ELEVATION(FEET) = 1135.00
STREET LENGTH(FEET) = 1420.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 48.28
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.76
HALFSTREET FLOOD WIDTH(FEET) = 34.41

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.58
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.96
STREET FLOW TRAVEL TIME(MIN.) = 9.16 Tc(MIN.) = 22.49
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.802
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 6.50 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 16.30 1.33 0.500 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 26.46
EFFECTIVE AREA(ACRES) = 41.00 AREA-AVERAGED Fm(INCH/HR) = 0.43
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.33
TOTAL AREA(ACRES) = 41.0 PEAK FLOW RATE(CFS) = 50.52

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.77 HALFSTREET FLOOD WIDTH(FEET) = 35.47
FLOW VELOCITY(FEET/SEC.) = 2.60 DEPTH*VELOCITY(FT*FT/SEC.) = 2.00
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1420.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 33.0 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2870.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1135.00 DOWNSTREAM(FEET) = 2.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 51.09
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 50.52
PIPE TRAVEL TIME(MIN.) = 0.43 Tc(MIN.) = 22.92
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4190.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 22.92
RAINFALL INTENSITY(INCH/HR) = 1.78
AREA-AVERAGED Fm(INCH/HR) = 0.43
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.33
EFFECTIVE STREAM AREA(ACRES) = 41.00
TOTAL STREAM AREA(ACRES) = 41.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 50.52

FLOW PROCESS FROM NODE 103.10 TO NODE 103.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 1145.00 DOWNSTREAM(FEET) = 1126.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 9.311

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.058

SUBAREA T_c AND LOSS RATE DATA(AMC I) :

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.50	1.33	0.100	17	9.31
RESIDENTIAL						

"11+ DWELLINGS/ACRE" A 3.30 1.33 0.200 17 9.92

COMMERCIAL A 2.20 1.33 0.100 17 9.31

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.137

SUBAREA RUNOFF(CFS) = 23.30

TOTAL AREA(ACRES) = 9.00 PEAK FLOW RATE(CFS) = 23.30

FLOW PROCESS FROM NODE 103.20 TO NODE 103.30 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1126.00 DOWNSTREAM ELEVATION(FEET) = 1112.00
STREET LENGTH(FEET) = 1600.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2

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) = 39.35

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.62

HALFSTREET FLOOD WIDTH(FEET) = 23.22

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.53

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.20

STREET FLOW TRAVEL TIME(MIN.) = 7.56 T_c (MIN.) = 16.87

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.141

SUBAREA LOSS RATE DATA(AMC I) :

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.60	1.33	0.100	17

RESIDENTIAL	"11+ DWELLINGS/ACRE"	A	8.20	1.33	0.200	17
RESIDENTIAL	"11+ DWELLINGS/ACRE"	A	7.80	1.33	0.200	17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33						
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.186						
SUBAREA AREA(ACRES) = 18.60 SUBAREA RUNOFF(CFS) = 31.70						
EFFECTIVE AREA(ACRES) = 27.60 AREA-AVERAGED Fm(INCH/HR) = 0.23						
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.17						
TOTAL AREA(ACRES) = 27.6 PEAK FLOW RATE(CFS) = 47.57						

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.66 HALFSTREET FLOOD WIDTH(FEET) = 25.01

FLOW VELOCITY(FEET/SEC.) = 3.69 DEPTH*VELOCITY(FT*FT/SEC.) = 2.43

LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.30 = 2400.00 FEET.

FLOW PROCESS FROM NODE 103.30 TO NODE 103.40 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1112.00 DOWNSTREAM ELEVATION(FEET) = 1110.00
STREET LENGTH(FEET) = 550.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2

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) = 65.04

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.82

HALFSTREET FLOOD WIDTH(FEET) = 39.59

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.79

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.28

STREET FLOW TRAVEL TIME(MIN.) = 3.28 T_c (MIN.) = 20.16

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.924

SUBAREA LOSS RATE DATA(AMC I) :

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.60	1.33	0.100	17
RESIDENTIAL					

"5-7 DWELLINGS/ACRE" A 17.70 1.33 0.500 17

RESIDENTIAL

"11+ DWELLINGS/ACRE" A 4.90 1.33 0.200 17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.378

SUBAREA AREA(ACRES) = 27.20 SUBAREA RUNOFF(CFS) = 34.80

EFFECTIVE AREA(ACRES) = 54.80 AREA-AVERAGED Fm(INCH/HR) = 0.36

AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.27
 TOTAL AREA (ACRES) = 54.8 PEAK FLOW RATE (CFS) = 76.99

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.85 HALFSTREET FLOOD WIDTH (FEET) = 41.30
 FLOW VELOCITY (FEET/SEC.) = 2.95 DEPTH*VELOCITY (FT*FT/SEC.) = 2.52
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 550.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 53.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.40
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.40 = 2950.00 FEET.

 FLOW PROCESS FROM NODE 103.40 TO NODE 104.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1110.00 DOWNSTREAM (FEET) = 1105.00
 FLOW LENGTH (FEET) = 560.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.01
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 76.99
 PIPE TRAVEL TIME (MIN.) = 0.93 Tc (MIN.) = 21.09
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 104.00 = 3510.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 21.09
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.873
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	12.10	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
 SUBAREA AREA (ACRES) = 17.80 SUBAREA RUNOFF (CFS) = 22.09
 EFFECTIVE AREA (ACRES) = 72.60 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.30
 TOTAL AREA (ACRES) = 72.6 PEAK FLOW RATE (CFS) = 96.54

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 21.09
 RAINFALL INTENSITY (INCH/HR) = 1.87

AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.30
 EFFECTIVE STREAM AREA (ACRES) = 72.60
 TOTAL STREAM AREA (ACRES) = 72.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 96.54

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	50.52	22.92	1.781	1.33 (0.43)	0.33	41.0	100.00
2	96.54	21.09	1.873	1.33 (0.40)	0.30	72.6	103.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	146.17	21.09	1.873	1.33 (0.41)	0.31	110.3	103.10
2	141.10	22.92	1.781	1.33 (0.41)	0.31	113.6	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 146.17 Tc (MIN.) = 21.09
 EFFECTIVE AREA (ACRES) = 110.33 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 113.6
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4190.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1105.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.31
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 146.17
 PIPE TRAVEL TIME (MIN.) = 1.45 Tc (MIN.) = 22.54
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 5520.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 22.54
 RAINFALL INTENSITY (INCH/HR) = 1.80
 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.31

>>>>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.) = 24.43
RAINFALL INTENSITY (INCH/HR) = 1.71
AREA-AVERAGED Fm (INCH/HR) = 0.67
AREA-AVERAGED Fp (INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.51
EFFECTIVE STREAM AREA (ACRES) = 80.60
TOTAL STREAM AREA (ACRES) = 80.60
PEAK FLOW RATE (CFS) AT CONFLUENCE = 75.58

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	146.17	22.54	1.799	1.33 (0.41)	0.31	110.3	103.10
1	141.10	24.37	1.717	1.33 (0.41)	0.31	113.6	100.00
2	75.58	24.43	1.715	1.33 (0.67)	0.51	80.6	104.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	221.58	22.54	1.799	1.33 (0.51)	0.39	184.7	103.10
2	216.68	24.37	1.717	1.33 (0.52)	0.39	194.0	100.00
3	216.41	24.43	1.715	1.33 (0.52)	0.39	194.2	104.10

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 221.58 Tc (MIN.) = 22.54
EFFECTIVE AREA (ACRES) = 184.69 AREA-AVERAGED Fm (INCH/HR) = 0.51
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.39
TOTAL AREA (ACRES) = 194.2
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 5520.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 194.2 TC (MIN.) = 22.54
EFFECTIVE AREA (ACRES) = 184.69 AREA-AVERAGED Fm (INCH/HR) = 0.51
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.387
PEAK FLOW RATE (CFS) = 221.58

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	221.58	22.54	1.799	1.33 (0.51)	0.39	184.7	103.10
2	216.68	24.37	1.717	1.33 (0.52)	0.39	194.0	100.00
3	216.41	24.43	1.715	1.33 (0.52)	0.39	194.2	104.10

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA A) *
* 100-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: ONT6A100.DAT
TIME/DATE OF STUDY: 15:53 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with 10 columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-/PARK-SIDE / SIDE/ WAY, CURB HEIGHT (FT), GUTTER GEOMETRIES (FT), MANNING HIKE (FT), MANNING FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with 2 columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES (0.52), 30-MINUTES (1.06), 1-HOUR (1.40), 3-HOUR (2.54), 6-HOUR (3.70), 24-HOUR (7.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.010
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.367

Table with 7 columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL, RESIDENTIAL, "11+ DWELLINGS/ACRE".

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.172
SUBAREA RUNOFF(CFS) = 22.68
TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 22.68

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1140.00
STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 40.55

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.65
 HALFSTREET FLOOD WIDTH(FEET) = 24.80
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.20
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.09
 STREET FLOW TRAVEL TIME(MIN.) = 3.91 Tc(MIN.) = 12.92
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.518

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.80	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.90	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.289
 SUBAREA AREA(ACRES) = 12.20 SUBAREA RUNOFF(CFS) = 35.53
 EFFECTIVE AREA(ACRES) = 18.20 AREA-AVERAGED Fm(INCH/HR) = 0.24
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
 TOTAL AREA(ACRES) = 18.2 PEAK FLOW RATE(CFS) = 53.62

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 29.77
 FLOW VELOCITY(FEET/SEC.) = 3.41 DEPTH*VELOCITY(FT*FT/SEC.) = 2.42
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1450.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1140.00 DOWNSTREAM ELEVATION(FEET) = 1135.00
 STREET LENGTH(FEET) = 1420.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 76.93

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.86

HALFSTREET FLOOD WIDTH(FEET) = 41.48
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.92
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.50
 STREET FLOW TRAVEL TIME(MIN.) = 8.11 Tc(MIN.) = 21.03
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.626

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.30	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 46.16
 EFFECTIVE AREA(ACRES) = 41.00 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA(ACRES) = 41.0 PEAK FLOW RATE(CFS) = 85.18

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.88 HALFSTREET FLOOD WIDTH(FEET) = 42.64
 FLOW VELOCITY(FEET/SEC.) = 3.01 DEPTH*VELOCITY(FT*FT/SEC.) = 2.65
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1420.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 53.2 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2870.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 832.00
 ELEVATION DATA: UPSTREAM(FEET) = 1250.00 DOWNSTREAM(FEET) = 1235.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.994
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.104

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.90	0.98	0.100	32	9.99
COMMERCIAL	A	6.50	0.98	0.100	32	9.99
PUBLIC PARK	A	0.30	0.98	0.850	32	15.88

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.129

SUBAREA RUNOFF(CFS) = 27.57

TOTAL AREA(ACRES) = 7.70 PEAK FLOW RATE(CFS) = 27.57

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1135.00 DOWNSTREAM(FEET) = 2.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 43.69
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 27.57
PIPE TRAVEL TIME(MIN.) = 0.50 Tc(MIN.) = 10.50
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 104.00 = 2152.00 FEET.

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1235.00 DOWNSTREAM ELEVATION(FEET) = 1233.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 46.63
STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.81
HALFSTREET FLOOD WIDTH(FEET) = 39.22
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.05
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.66
STREET FLOW TRAVEL TIME(MIN.) = 8.12 Tc(MIN.) = 18.62
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.825

SUBAREA LOSS RATE DATA(AMC II):

Table with 6 columns: DEVELOPMENT TYPE/, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN. Rows include COMMERCIAL, PUBLIC PARK.

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.134
SUBAREA AREA(ACRES) = 15.50 SUBAREA RUNOFF(CFS) = 37.59
EFFECTIVE AREA(ACRES) = 23.20 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 23.2 PEAK FLOW RATE(CFS) = 56.30

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.85 HALFSTREET FLOOD WIDTH(FEET) = 41.17
FLOW VELOCITY(FEET/SEC.) = 2.18 DEPTH*VELOCITY(FT*FT/SEC.) = 1.85
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1000.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 40.3 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 3.00
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 3152.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1233.00 DOWNSTREAM ELEVATION(FEET) = 1231.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 71.96
STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.91
HALFSTREET FLOOD WIDTH(FEET) = 43.98
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.35
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.13
STREET FLOW TRAVEL TIME(MIN.) = 7.10 Tc(MIN.) = 25.72
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.328

SUBAREA LOSS RATE DATA(AMC II):

Table with 6 columns: DEVELOPMENT TYPE/, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN. Rows include COMMERCIAL, PUBLIC PARK.

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.92 HALFSTREET FLOOD WIDTH(FEET) = 44.90
FLOW VELOCITY(FEET/SEC.) = 2.39 DEPTH*VELOCITY(FT*FT/SEC.) = 2.21
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1000.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 41.1 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 4.00
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 4152.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1231.00 DOWNSTREAM(FEET) = 1211.00
FLOW LENGTH(FEET) = 780.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 24.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.04
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 77.16
PIPE TRAVEL TIME(MIN.) = 0.86 Tc(MIN.) = 26.58
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 4932.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 26.58
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.282
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 18.60 0.98 0.100 32
COMMERCIAL A 12.80 0.98 0.100 32
SCHOOL A 4.00 0.98 0.600 32
PUBLIC PARK A 6.10 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.258
SUBAREA AREA(ACRES) = 41.50 SUBAREA RUNOFF(CFS) = 75.82
EFFECTIVE AREA(ACRES) = 80.60 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 80.6 PEAK FLOW RATE(CFS) = 151.37

FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1211.00 DOWNSTREAM(FEET) = 1196.00
FLOW LENGTH(FEET) = 550.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 31.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 18.14
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 151.37
PIPE TRAVEL TIME(MIN.) = 0.51 Tc(MIN.) = 27.08
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 5482.00 FEET.

FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 27.08
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.256

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 11.90 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 19.60 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 8.00 0.98 0.200 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.319
SUBAREA AREA(ACRES) = 39.50 SUBAREA RUNOFF(CFS) = 69.16
EFFECTIVE AREA(ACRES) = 120.10 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.24
TOTAL AREA(ACRES) = 120.1 PEAK FLOW RATE(CFS) = 218.67

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1196.00 DOWNSTREAM(FEET) = 1150.00
FLOW LENGTH(FEET) = 1750.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.51
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 218.67
PIPE TRAVEL TIME(MIN.) = 1.49 Tc(MIN.) = 28.58
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 7232.00 FEET.

FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 28.58
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.185
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 31.80 0.98 0.100 32
COMMERCIAL A 2.30 0.98 0.100 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 60.00 0.98 0.200 32
PUBLIC PARK A 9.10 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.224
SUBAREA AREA(ACRES) = 103.20 SUBAREA RUNOFF(CFS) = 182.60
EFFECTIVE AREA(ACRES) = 223.30 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.23
TOTAL AREA(ACRES) = 223.3 PEAK FLOW RATE(CFS) = 393.54

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FLOW PROCESS FROM NODE      7.00 TO NODE      103.00 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      393.54  28.58  2.185  0.98( 0.23) 0.23  223.3  1.00
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      103.00 =      7232.00 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      85.18  21.03  2.626  0.98( 0.32) 0.33  41.0  100.00
LONGEST FLOWPATH FROM NODE      100.00 TO NODE      103.00 =      2870.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM      Q      Tc  Intensity  Fp(Fm)  Ap  Ae  HEADWATER
NUMBER     (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES)  NODE
1      440.05  21.03  2.626  0.97( 0.24) 0.25  205.3  100.00
2      462.43  28.58  2.185  0.98( 0.24) 0.25  264.3  1.00
TOTAL AREA (ACRES) =      264.3

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      462.43  Tc(MIN.) = 28.580
EFFECTIVE AREA(ACRES) =      264.30  AREA-AVERAGED Fm(INCH/HR) = 0.24
AREA-AVERAGED Fp(INCH/HR) = 0.97  AREA-AVERAGED Ap = 0.25
TOTAL AREA(ACRES) =      264.3
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      103.00 =      7232.00 FEET.

*****
FLOW PROCESS FROM NODE      103.00 TO NODE      103.00 IS CODE = 12
-----
>>>>CLEAR MEMORY BANK # 1 <<<<
=====
*****
FLOW PROCESS FROM NODE      103.00 TO NODE      104.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1135.00  DOWNSTREAM(FEET) = 1105.00
FLOW LENGTH(FEET) = 1320.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 69.0 INCH PIPE IS 51.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 22.24
ESTIMATED PIPE DIAMETER(INCH) = 69.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) =      462.43
PIPE TRAVEL TIME(MIN.) = 0.99  Tc(MIN.) = 29.57
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      104.00 =      8552.00 FEET.

*****
FLOW PROCESS FROM NODE      104.00 TO NODE      104.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

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=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 29.57
RAINFALL INTENSITY(INCH/HR) = 2.14
AREA-AVERAGED Fm(INCH/HR) = 0.24
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.25
EFFECTIVE STREAM AREA(ACRES) =      264.30
TOTAL STREAM AREA(ACRES) =      264.30
PEAK FLOW RATE(CFS) AT CONFLUENCE =      462.43

*****
FLOW PROCESS FROM NODE      103.10 TO NODE      103.20 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 1145.00  DOWNSTREAM(FEET) = 1126.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.311
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.282
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/  SCS SOIL  AREA  Fp  Ap  SCS  Tc
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL        A      3.50  0.98  0.100  32  9.31
RESIDENTIAL
"11+ DWELLINGS/ACRE"  A      3.30  0.98  0.200  32  9.92
COMMERCIAL        A      2.20  0.98  0.100  32  9.31
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.137
SUBAREA RUNOFF(CFS) =      33.60
TOTAL AREA(ACRES) = 9.00  PEAK FLOW RATE(CFS) =      33.60

*****
FLOW PROCESS FROM NODE      103.20 TO NODE      103.30 IS CODE = 62
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 1126.00  DOWNSTREAM ELEVATION(FEET) = 1112.00
STREET LENGTH(FEET) = 1600.00  CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      57.98

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STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.70
HALFSTREET FLOOD WIDTH (FEET) = 28.61
AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.86
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.70
STREET FLOW TRAVEL TIME (MIN.) = 6.91 Tc (MIN.) = 16.22
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.069
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.60 0.98 0.100 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 8.20 0.98 0.200 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 7.80 0.98 0.200 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.186
SUBAREA AREA (ACRES) = 18.60 SUBAREA RUNOFF (CFS) = 48.33
EFFECTIVE AREA (ACRES) = 27.60 AREA-AVERAGED Fm (INCH/HR) = 0.17
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.17
TOTAL AREA (ACRES) = 27.6 PEAK FLOW RATE (CFS) = 72.11

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.74 HALFSTREET FLOOD WIDTH (FEET) = 33.25
FLOW VELOCITY (FEET/SEC.) = 4.03 DEPTH*VELOCITY (FT*FT/SEC.) = 3.00
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1600.0 FT WITH ELEVATION-DROP = 14.0 FT, IS 50.8 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.30
LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.30 = 2400.00 FEET.

FLOW PROCESS FROM NODE 103.30 TO NODE 103.40 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION (FEET) = 1112.00 DOWNSTREAM ELEVATION (FEET) = 1110.00
STREET LENGTH (FEET) = 550.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 101.72

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.92
HALFSTREET FLOOD WIDTH (FEET) = 44.59
AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.21
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.94

STREET FLOW TRAVEL TIME (MIN.) = 2.86 Tc (MIN.) = 19.08
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.784

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.60 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 17.70 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.90 0.98 0.200 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.378
SUBAREA AREA (ACRES) = 27.20 SUBAREA RUNOFF (CFS) = 59.12
EFFECTIVE AREA (ACRES) = 54.80 AREA-AVERAGED Fm (INCH/HR) = 0.27
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.27
TOTAL AREA (ACRES) = 54.8 PEAK FLOW RATE (CFS) = 124.16

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.97 HALFSTREET FLOOD WIDTH (FEET) = 47.22
FLOW VELOCITY (FEET/SEC.) = 3.40 DEPTH*VELOCITY (FT*FT/SEC.) = 3.30
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 550.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 82.5 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.40
LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.40 = 2950.00 FEET.

FLOW PROCESS FROM NODE 103.40 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1110.00 DOWNSTREAM (FEET) = 1105.00
FLOW LENGTH (FEET) = 560.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.8 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 11.33
ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 124.16
PIPE TRAVEL TIME (MIN.) = 0.82 Tc (MIN.) = 19.90
LONGEST FLOWPATH FROM NODE 103.10 TO NODE 104.00 = 3510.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc (MIN.) = 19.90
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.714
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 5.70 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 12.10 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
SUBAREA AREA (ACRES) = 17.80 SUBAREA RUNOFF (CFS) = 37.67

EFFECTIVE AREA (ACRES) = 72.60 AREA-AVERAGED Fm (INCH/HR) = 0.29
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
 TOTAL AREA (ACRES) = 72.6 PEAK FLOW RATE (CFS) = 158.39

PIPE-FLOW (CFS) = 587.90
 PIPE TRAVEL TIME (MIN.) = 1.01 Tc (MIN.) = 23.05
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 105.00 = 9882.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 19.90
 RAINFALL INTENSITY (INCH/HR) = 2.71
 AREA-AVERAGED Fm (INCH/HR) = 0.29
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.30
 EFFECTIVE STREAM AREA (ACRES) = 72.60
 TOTAL STREAM AREA (ACRES) = 72.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 158.39

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	440.05	22.04	2.553	0.97 (0.24)	0.25	205.3	100.00
1	462.43	29.57	2.141	0.98 (0.24)	0.25	264.3	1.00
2	158.39	19.90	2.714	0.97 (0.29)	0.30	72.6	103.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	583.49	19.90	2.714	0.98 (0.26)	0.26	258.0	103.10
2	587.90	22.04	2.553	0.97 (0.26)	0.26	277.9	100.00
3	583.33	29.57	2.141	0.97 (0.25)	0.26	336.9	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 587.90 Tc (MIN.) = 22.04
 EFFECTIVE AREA (ACRES) = 277.92 AREA-AVERAGED Fm (INCH/HR) = 0.26
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
 TOTAL AREA (ACRES) = 336.9
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 104.00 = 8552.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1105.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 78.0 INCH PIPE IS 58.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 21.97
 ESTIMATED PIPE DIAMETER (INCH) = 78.00 NUMBER OF PIPES = 1

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 23.05
 RAINFALL INTENSITY (INCH/HR) = 2.49
 AREA-AVERAGED Fm (INCH/HR) = 0.26
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.26
 EFFECTIVE STREAM AREA (ACRES) = 277.92
 TOTAL STREAM AREA (ACRES) = 336.90
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 587.90

 FLOW PROCESS FROM NODE 104.10 TO NODE 104.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 900.00
 ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1100.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 16.645
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.022
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
PUBLIC PARK	A	9.50	0.98	0.850	32	16.64

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF (CFS) = 18.75
 TOTAL AREA (ACRES) = 9.50 PEAK FLOW RATE (CFS) = 18.75

 FLOW PROCESS FROM NODE 104.20 TO NODE 104.30 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1100.00 DOWNSTREAM ELEVATION (FEET) = 1085.00
 STREET LENGTH (FEET) = 1100.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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) = 46.17
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.61
 HALFSTREET FLOOD WIDTH (FEET) = 22.69
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.32
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.65
 STREET FLOW TRAVEL TIME (MIN.) = 4.24 Tc (MIN.) = 20.88
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.637

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.20	0.98	0.500	32
COMMERCIAL	A	4.30	0.98	0.100	32
PUBLIC PARK	A	7.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.422
 SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 54.88
 EFFECTIVE AREA (ACRES) = 36.90 AREA-AVERAGED Fm (INCH/HR) = 0.52
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.53
 TOTAL AREA (ACRES) = 36.9 PEAK FLOW RATE (CFS) = 70.34

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.69 HALFSTREET FLOOD WIDTH (FEET) = 27.98
 FLOW VELOCITY (FEET/SEC.) = 4.79 DEPTH*VELOCITY (FT*FT/SEC.) = 3.32
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1100.0 FT WITH ELEVATION-DROP = 15.0 FT, IS 81.4 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 104.30
 LONGEST FLOWPATH FROM NODE 104.10 TO NODE 104.30 = 2000.00 FEET.

 FLOW PROCESS FROM NODE 104.30 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 1100.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 35.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 7.52
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFG) = 70.34
 PIPE TRAVEL TIME (MIN.) = 2.44 Tc (MIN.) = 23.32
 LONGEST FLOWPATH FROM NODE 104.10 TO NODE 105.00 = 3100.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

=====

MAINLINE Tc (MIN.) = 23.32

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.468
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.70	0.98	0.500	32
PUBLIC PARK	A	2.90	0.98	0.850	32
SCHOOL	A	9.50	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.485
 SUBAREA AREA (ACRES) = 43.70 SUBAREA RUNOFF (CFS) = 78.49
 EFFECTIVE AREA (ACRES) = 80.60 AREA-AVERAGED Fm (INCH/HR) = 0.49
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51
 TOTAL AREA (ACRES) = 80.6 PEAK FLOW RATE (CFS) = 143.21

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 23.32
 RAINFALL INTENSITY (INCH/HR) = 2.47
 AREA-AVERAGED Fm (INCH/HR) = 0.49
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.51
 EFFECTIVE STREAM AREA (ACRES) = 80.60
 TOTAL STREAM AREA (ACRES) = 80.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 143.21

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	583.49	20.91	2.635	0.98 (0.26)	0.26	258.0	103.10
1	587.90	23.05	2.485	0.97 (0.26)	0.26	277.9	100.00
1	583.33	30.58	2.098	0.97 (0.25)	0.26	336.9	1.00
2	143.21	23.32	2.468	0.98 (0.49)	0.51	80.6	104.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	722.77	20.91	2.635	0.98 (0.31)	0.32	330.3	103.10
2	730.70	23.05	2.485	0.97 (0.31)	0.32	357.6	100.00
3	730.95	23.32	2.468	0.97 (0.31)	0.32	360.6	104.10
4	699.69	30.58	2.098	0.98 (0.30)	0.31	417.5	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 730.95 Tc (MIN.) = 23.32
 EFFECTIVE AREA (ACRES) = 360.63 AREA-AVERAGED Fm (INCH/HR) = 0.31
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.32

TOTAL AREA(ACRES) = 417.5
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 105.00 = 9882.00 FEET.

=====
 END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 417.5 TC(MIN.) = 23.32
 EFFECTIVE AREA(ACRES) = 360.63 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.317
 PEAK FLOW RATE(CFS) = 730.95

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	722.77	20.91	2.635	0.98 (0.31)	0.32	330.3	103.10
2	730.70	23.05	2.485	0.97 (0.31)	0.32	357.6	100.00
3	730.95	23.32	2.468	0.97 (0.31)	0.32	360.6	104.10
4	699.69	30.58	2.098	0.98 (0.30)	0.31	417.5	1.00

=====
 END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA A) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT6A25.DAT
TIME/DATE OF STUDY: 15:53 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	IN- / OUT- / PARK- SIDE / SIDE/ WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.010
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.545
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.70	0.98	0.100	32	9.01
RESIDENTIAL	A	4.30	0.98	0.200	32	9.60

"11+ DWELLINGS/ACRE"
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.172
SUBAREA RUNOFF(CFS) = 18.24
TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 18.24

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1140.00
STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 32.31
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.61
 HALFSTREET FLOOD WIDTH(FEET) = 22.69
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.03
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.85
 STREET FLOW TRAVEL TIME(MIN.) = 4.13 Tc(MIN.) = 13.14
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.827
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.80	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.90	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.289
 SUBAREA AREA(ACRES) = 12.20 SUBAREA RUNOFF(CFS) = 27.94
 EFFECTIVE AREA(ACRES) = 18.20 AREA-AVERAGED Fm(INCH/HR) = 0.24
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
 TOTAL AREA(ACRES) = 18.2 PEAK FLOW RATE(CFS) = 42.30

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.66 HALFSTREET FLOOD WIDTH(FEET) = 25.22
 FLOW VELOCITY(FEET/SEC.) = 3.23 DEPTH*VELOCITY(FT*FT/SEC.) = 2.14
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1450.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1140.00 DOWNSTREAM ELEVATION(FEET) = 1135.00
 STREET LENGTH(FEET) = 1420.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 59.99
 STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.80
 HALFSTREET FLOOD WIDTH(FEET) = 38.91
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.70
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.17
 STREET FLOW TRAVEL TIME(MIN.) = 8.78 Tc(MIN.) = 21.92
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.080
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.30	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 34.95
 EFFECTIVE AREA(ACRES) = 41.00 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA(ACRES) = 41.0 PEAK FLOW RATE(CFS) = 65.02

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.82 HALFSTREET FLOOD WIDTH(FEET) = 39.71
 FLOW VELOCITY(FEET/SEC.) = 2.77 DEPTH*VELOCITY(FT*FT/SEC.) = 2.27
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1420.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 41.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2870.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 832.00
 ELEVATION DATA: UPSTREAM(FEET) = 1250.00 DOWNSTREAM(FEET) = 1235.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.994
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.331
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.90	0.98	0.100	32	9.99
COMMERCIAL	A	6.50	0.98	0.100	32	9.99
PUBLIC PARK	A	0.30	0.98	0.850	32	15.88

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.129
 SUBAREA RUNOFF(CFS) = 22.21
 TOTAL AREA(ACRES) = 7.70 PEAK FLOW RATE(CFS) = 22.21

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1135.00 DOWNSTREAM(FEET) = 2.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 41.17
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 22.21
PIPE TRAVEL TIME(MIN.) = 0.53 Tc(MIN.) = 10.53
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 104.00 = 2152.00 FEET.

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1235.00 DOWNSTREAM ELEVATION(FEET) = 1233.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 37.22
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.76
HALFSTREET FLOOD WIDTH(FEET) = 34.94
AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.95
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.49
STREET FLOW TRAVEL TIME(MIN.) = 8.53 Tc(MIN.) = 19.06
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.262

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.60	0.98	0.100	32
COMMERCIAL	A	13.20	0.98	0.100	32
PUBLIC PARK	A	0.70	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.134
SUBAREA AREA(ACRES) = 15.50 SUBAREA RUNOFF(CFS) = 29.73
EFFECTIVE AREA(ACRES) = 23.20 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 23.2 PEAK FLOW RATE(CFS) = 44.53

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.80 HALFSTREET FLOOD WIDTH(FEET) = 38.79
FLOW VELOCITY(FEET/SEC.) = 2.02 DEPTH*VELOCITY(FT*FT/SEC.) = 1.62
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1000.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 32.3 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 3.00
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 3152.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1233.00 DOWNSTREAM ELEVATION(FEET) = 1231.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 56.76

STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.85
HALFSTREET FLOOD WIDTH(FEET) = 41.23
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.19
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.86
STREET FLOW TRAVEL TIME(MIN.) = 7.62 Tc(MIN.) = 26.68
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.848

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.80	0.98	0.100	32
COMMERCIAL	A	2.10	0.98	0.100	32
PUBLIC PARK	A	1.00	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.147
SUBAREA AREA(ACRES) = 15.90 SUBAREA RUNOFF(CFS) = 24.39
EFFECTIVE AREA(ACRES) = 39.10 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.14
TOTAL AREA(ACRES) = 39.1 PEAK FLOW RATE(CFS) = 60.29

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.86 HALFSTREET FLOOD WIDTH(FEET) = 41.91
FLOW VELOCITY(FEET/SEC.) = 2.23 DEPTH*VELOCITY(FT*FT/SEC.) = 1.93
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1000.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 33.0 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 4.00

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 4152.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1231.00 DOWNSTREAM(FEET) = 1211.00
FLOW LENGTH(FEET) = 780.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.15
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 60.29
PIPE TRAVEL TIME(MIN.) = 0.92 Tc(MIN.) = 27.60
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 4932.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 27.60
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.811
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 18.60 0.98 0.100 32
COMMERCIAL A 12.80 0.98 0.100 32
SCHOOL A 4.00 0.98 0.600 32
PUBLIC PARK A 6.10 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.258
SUBAREA AREA(ACRES) = 41.50 SUBAREA RUNOFF(CFS) = 58.23
EFFECTIVE AREA(ACRES) = 80.60 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 80.6 PEAK FLOW RATE(CFS) = 117.21

FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1211.00 DOWNSTREAM(FEET) = 1196.00
FLOW LENGTH(FEET) = 550.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 16.74
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 117.21
PIPE TRAVEL TIME(MIN.) = 0.55 Tc(MIN.) = 28.15
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 6.00 = 5482.00 FEET.

FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 28.15
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.790
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 11.90 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 19.60 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 8.00 0.98 0.200 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.319
SUBAREA AREA(ACRES) = 39.50 SUBAREA RUNOFF(CFS) = 52.58
EFFECTIVE AREA(ACRES) = 120.10 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.24
TOTAL AREA(ACRES) = 120.1 PEAK FLOW RATE(CFS) = 168.25

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1196.00 DOWNSTREAM(FEET) = 1150.00
FLOW LENGTH(FEET) = 1750.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 35.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 18.08
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 168.25
PIPE TRAVEL TIME(MIN.) = 1.61 Tc(MIN.) = 29.76
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 7.00 = 7232.00 FEET.

FLOW PROCESS FROM NODE 7.00 TO NODE 7.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 29.76
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.731
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 31.80 0.98 0.100 32
COMMERCIAL A 2.30 0.98 0.100 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 60.00 0.98 0.200 32
PUBLIC PARK A 9.10 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.224
SUBAREA AREA(ACRES) = 103.20 SUBAREA RUNOFF(CFS) = 140.46
EFFECTIVE AREA(ACRES) = 223.30 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.23
TOTAL AREA(ACRES) = 223.3 PEAK FLOW RATE(CFS) = 302.34

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*****
FLOW PROCESS FROM NODE      7.00 TO NODE      103.00 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         302.34  29.76  1.731  0.98( 0.23) 0.23   223.3   1.00
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      103.00 =      7232.00 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         65.02  21.92  2.080  0.98( 0.32) 0.33   41.0   100.00
LONGEST FLOWPATH FROM NODE      100.00 TO NODE      103.00 =      2870.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM      Q      Tc  Intensity  Fp(Fm)    Ap    Ae    HEADWATER
NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)  (ACRES)  NODE
1         339.29  21.92  2.080  0.97( 0.24) 0.25   205.4   100.00
2         354.49  29.76  1.731  0.98( 0.24) 0.25   264.3   100.00
TOTAL AREA (ACRES) =      264.3

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      354.49  Tc(MIN.) =      29.762
EFFECTIVE AREA(ACRES) =      264.30  AREA-AVERAGED Fm(INCH/HR) =      0.24
AREA-AVERAGED Fp(INCH/HR) =      0.97  AREA-AVERAGED Ap =      0.25
TOTAL AREA(ACRES) =      264.3
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      103.00 =      7232.00 FEET.

*****
FLOW PROCESS FROM NODE      103.00 TO NODE      103.00 IS CODE = 12
-----
>>>>CLEAR MEMORY BANK # 1 <<<<
-----
*****
FLOW PROCESS FROM NODE      103.00 TO NODE      104.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
-----
ELEVATION DATA: UPSTREAM(FEET) = 1135.00  DOWNSTREAM(FEET) = 1105.00
FLOW LENGTH(FEET) = 1320.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 63.0 INCH PIPE IS 46.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 20.87
ESTIMATED PIPE DIAMETER(INCH) = 63.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) =      354.49
PIPE TRAVEL TIME(MIN.) = 1.05  Tc(MIN.) = 30.82
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      104.00 =      8552.00 FEET.

*****
FLOW PROCESS FROM NODE      104.00 TO NODE      104.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 30.82
RAINFALL INTENSITY(INCH/HR) = 1.70
AREA-AVERAGED Fm(INCH/HR) = 0.24
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.25
EFFECTIVE STREAM AREA(ACRES) =      264.30
TOTAL STREAM AREA(ACRES) =      264.30
PEAK FLOW RATE(CFS) AT CONFLUENCE =      354.49

*****
FLOW PROCESS FROM NODE      103.10 TO NODE      103.20 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
-----
INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 1145.00  DOWNSTREAM(FEET) = 1126.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.311
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.476
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/  SCS SOIL AREA  Fp      Ap      SCS  Tc
LAND USE          GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL        A          3.50    0.98    0.100  32   9.31
RESIDENTIAL
"11+ DWELLINGS/ACRE"  A          3.30    0.98    0.200  32   9.92
COMMERCIAL        A          2.20    0.98    0.100  32   9.31
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.137
SUBAREA RUNOFF(CFS) =      27.08
TOTAL AREA(ACRES) =      9.00  PEAK FLOW RATE(CFS) =      27.08

*****
FLOW PROCESS FROM NODE      103.20 TO NODE      103.30 IS CODE = 62
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<
-----
UPSTREAM ELEVATION(FEET) = 1126.00  DOWNSTREAM ELEVATION(FEET) = 1112.00
STREET LENGTH(FEET) = 1600.00  CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 46.35
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.65
 HALFSTREET FLOOD WIDTH (FEET) = 24.80
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.65
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.39
 STREET FLOW TRAVEL TIME (MIN.) = 7.30 Tc (MIN.) = 16.61
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.456

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.60	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.20	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	7.80	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.186
 SUBAREA AREA (ACRES) = 18.60 SUBAREA RUNOFF (CFS) = 38.08
 EFFECTIVE AREA (ACRES) = 27.60 AREA-AVERAGED Fm (INCH/HR) = 0.17
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.17
 TOTAL AREA (ACRES) = 27.6 PEAK FLOW RATE (CFS) = 56.90

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.69 HALFSTREET FLOOD WIDTH (FEET) = 28.19
 FLOW VELOCITY (FEET/SEC.) = 3.85 DEPTH*VELOCITY (FT*FT/SEC.) = 2.67
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.30 = 2400.00 FEET.

 FLOW PROCESS FROM NODE 103.30 TO NODE 103.40 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1112.00 DOWNSTREAM ELEVATION (FEET) = 1110.00
 STREET LENGTH (FEET) = 550.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 79.59
 STREET FLOWING FULL
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.86
 HALFSTREET FLOOD WIDTH (FEET) = 41.66
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.98
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.57
 STREET FLOW TRAVEL TIME (MIN.) = 3.07 Tc (MIN.) = 19.68
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.219

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	17.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.90	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.378
 SUBAREA AREA (ACRES) = 27.20 SUBAREA RUNOFF (CFS) = 45.28
 EFFECTIVE AREA (ACRES) = 54.80 AREA-AVERAGED Fm (INCH/HR) = 0.27
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.27
 TOTAL AREA (ACRES) = 54.8 PEAK FLOW RATE (CFS) = 96.27

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.91 HALFSTREET FLOOD WIDTH (FEET) = 43.92
 FLOW VELOCITY (FEET/SEC.) = 3.15 DEPTH*VELOCITY (FT*FT/SEC.) = 2.85
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 550.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 65.3 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.40
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.40 = 2950.00 FEET.

 FLOW PROCESS FROM NODE 103.40 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1110.00 DOWNSTREAM (FEET) = 1105.00
 FLOW LENGTH (FEET) = 560.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.52
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 96.27
 PIPE TRAVEL TIME (MIN.) = 0.89 Tc (MIN.) = 20.57
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 104.00 = 3510.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 20.57
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.161
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
 SUBAREA AREA (ACRES) = 17.80 SUBAREA RUNOFF (CFS) = 28.80
 EFFECTIVE AREA (ACRES) = 72.60 AREA-AVERAGED Fm (INCH/HR) = 0.29
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30

TOTAL AREA (ACRES) = 72.6 PEAK FLOW RATE (CFS) = 122.22

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 105.00 = 9882.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 1

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 20.57
RAINFALL INTENSITY (INCH/HR) = 2.16
AREA-AVERAGED Fm (INCH/HR) = 0.29
AREA-AVERAGED Fp (INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.30
EFFECTIVE STREAM AREA (ACRES) = 72.60
TOTAL STREAM AREA (ACRES) = 72.60
PEAK FLOW RATE (CFS) AT CONFLUENCE = 122.22

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 24.09
RAINFALL INTENSITY (INCH/HR) = 1.97
AREA-AVERAGED Fm (INCH/HR) = 0.26
AREA-AVERAGED Fp (INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.26
EFFECTIVE STREAM AREA (ACRES) = 278.04
TOTAL STREAM AREA (ACRES) = 336.90
PEAK FLOW RATE (CFS) AT CONFLUENCE = 452.35

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	339.29	23.00	2.021	0.97 (0.24)	0.25	205.4	100.00
1	354.49	30.82	1.695	0.98 (0.24)	0.25	264.3	1.00
2	122.22	20.57	2.161	0.97 (0.29)	0.30	72.6	103.10

FLOW PROCESS FROM NODE 104.10 TO NODE 104.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 900.00
ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1100.00

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	449.58	20.57	2.161	0.97 (0.26)	0.26	256.3	103.10
2	452.35	23.00	2.021	0.97 (0.26)	0.26	278.0	100.00
3	446.30	30.82	1.695	0.97 (0.25)	0.26	336.9	1.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 16.645
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.453
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCSS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
PUBLIC PARK A 9.50 0.98 0.850 32 16.64
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.850
SUBAREA RUNOFF (CFS) = 13.89
TOTAL AREA (ACRES) = 9.50 PEAK FLOW RATE (CFS) = 13.89

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 452.35 Tc (MIN.) = 23.00
EFFECTIVE AREA (ACRES) = 278.04 AREA-AVERAGED Fm (INCH/HR) = 0.26
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
TOTAL AREA (ACRES) = 336.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 104.00 = 8552.00 FEET.

FLOW PROCESS FROM NODE 104.20 TO NODE 104.30 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1100.00 DOWNSTREAM ELEVATION (FEET) = 1085.00
STREET LENGTH (FEET) = 1100.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

ELEVATION DATA: UPSTREAM (FEET) = 1105.00 DOWNSTREAM (FEET) = 1080.00
FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 69.0 INCH PIPE IS 55.1 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 20.35
ESTIMATED PIPE DIAMETER (INCH) = 69.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 452.35
PIPE TRAVEL TIME (MIN.) = 1.09 Tc (MIN.) = 24.09

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 34.95
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.56
HALFSTREET FLOOD WIDTH (FEET) = 20.32
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.05
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.29
STREET FLOW TRAVEL TIME (MIN.) = 4.53 Tc (MIN.) = 21.17
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.123

SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.50 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 8.20 0.98 0.500 32
COMMERCIAL A 4.30 0.98 0.100 32
PUBLIC PARK A 7.40 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.422
SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 42.20
EFFECTIVE AREA (ACRES) = 36.90 AREA-AVERAGED Fm (INCH/HR) = 0.52
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.53
TOTAL AREA (ACRES) = 36.9 PEAK FLOW RATE (CFS) = 53.27

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.64 HALFSTREET FLOOD WIDTH (FEET) = 24.01
FLOW VELOCITY (FEET/SEC.) = 4.47 DEPTH*VELOCITY (FT*FT/SEC.) = 2.86
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1100.0 FT WITH ELEVATION-DROP = 15.0 FT, IS 64.1 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 104.30
LONGEST FLOWPATH FROM NODE 104.10 TO NODE 104.30 = 2000.00 FEET.

FLOW PROCESS FROM NODE 104.30 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====

ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1080.00
FLOW LENGTH (FEET) = 1100.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.5 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 7.11
ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 53.27
PIPE TRAVEL TIME (MIN.) = 2.58 Tc (MIN.) = 23.75
LONGEST FLOWPATH FROM NODE 104.10 TO NODE 105.00 = 3100.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====

MAINLINE Tc (MIN.) = 23.75
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.982
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 6.60 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 24.70 0.98 0.500 32
PUBLIC PARK A 2.90 0.98 0.850 32
SCHOOL A 9.50 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.485
SUBAREA AREA (ACRES) = 43.70 SUBAREA RUNOFF (CFS) = 59.36
EFFECTIVE AREA (ACRES) = 80.60 AREA-AVERAGED Fm (INCH/HR) = 0.49
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51
TOTAL AREA (ACRES) = 80.6 PEAK FLOW RATE (CFS) = 107.94

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 23.75
RAINFALL INTENSITY (INCH/HR) = 1.98
AREA-AVERAGED Fm (INCH/HR) = 0.49
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.51
EFFECTIVE STREAM AREA (ACRES) = 80.60
TOTAL STREAM AREA (ACRES) = 80.60
PEAK FLOW RATE (CFS) AT CONFLUENCE = 107.94

** CONFLUENCE DATA **

STREAM Q Tc Intensity Fp (Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 449.58 21.66 2.095 0.97 (0.26) 0.26 256.3 103.10
1 452.35 24.09 1.965 0.97 (0.26) 0.26 278.0 100.00
1 446.30 31.91 1.660 0.97 (0.25) 0.26 336.9 1.00
2 107.94 23.75 1.982 0.98 (0.49) 0.51 80.6 104.10

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
1 555.46 21.66 2.095 0.98 (0.31) 0.32 329.8 103.10
2 559.91 23.75 1.982 0.97 (0.31) 0.32 355.7 104.10
3 559.09 24.09 1.965 0.98 (0.31) 0.32 358.6 100.00
4 530.90 31.91 1.660 0.98 (0.30) 0.31 417.5 1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 559.91 Tc (MIN.) = 23.75
EFFECTIVE AREA (ACRES) = 355.66 AREA-AVERAGED Fm (INCH/HR) = 0.31
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
TOTAL AREA (ACRES) = 417.5
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 105.00 = 9882.00 FEET.

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=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 417.5 TC(MIN.) = 23.75
EFFECTIVE AREA(ACRES) = 355.66 AREA-AVERAGED Fm(INCH/HR) = 0.31
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.318
PEAK FLOW RATE(CFS) = 559.91

```

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	555.46	21.66	2.095	0.98(0.31)	0.32	329.8	103.10
2	559.91	23.75	1.982	0.97(0.31)	0.32	355.7	104.10
3	559.09	24.09	1.965	0.98(0.31)	0.32	358.6	100.00
4	530.90	31.91	1.660	0.98(0.30)	0.31	417.5	1.00

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END OF RATIONAL METHOD ANALYSIS

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA A) *
* 10-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: ONT6A10.DAT
TIME/DATE OF STUDY: 15:54 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, STREET-CROSSFALL, CURB HEIGHT, GUTTER WIDTH, LIP, HIKE, GEOMETRIES, MANNING FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.010
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.119
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN Tc (MIN.)
COMMERCIAL A 1.70 1.33 0.100 17 9.01
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 4.30 1.33 0.200 17 9.60
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.172
SUBAREA RUNOFF(CFS) = 15.61
TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 15.61

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1140.00
STREET LENGTH(FEET) = 750.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 27.14
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.58
 HALFSTREET FLOOD WIDTH(FEET) = 21.22
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.89
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.69
 STREET FLOW TRAVEL TIME (MIN.) = 4.32 Tc (MIN.) = 13.33
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.466

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.80	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.90	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.289
 SUBAREA AREA (ACRES) = 12.20 SUBAREA RUNOFF (CFS) = 22.86
 EFFECTIVE AREA (ACRES) = 18.20 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 18.2 PEAK FLOW RATE (CFS) = 34.94

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.63 HALFSTREET FLOOD WIDTH (FEET) = 23.38
 FLOW VELOCITY (FEET/SEC.) = 3.09 DEPTH*VELOCITY (FT*FT/SEC.) = 1.93
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1450.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>> COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <<<<<<
 >>>> (STREET TABLE SECTION # 2 USED) <<<<<<
 =====

UPSTREAM ELEVATION (FEET) = 1140.00 DOWNSTREAM ELEVATION (FEET) = 1135.00
 STREET LENGTH (FEET) = 1420.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 48.28
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.76
 HALFSTREET FLOOD WIDTH (FEET) = 34.41

AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.58
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.96
 STREET FLOW TRAVEL TIME (MIN.) = 9.16 Tc (MIN.) = 22.49
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.802
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.30	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA AREA (ACRES) = 22.80 SUBAREA RUNOFF (CFS) = 26.46
 EFFECTIVE AREA (ACRES) = 41.00 AREA-AVERAGED Fm (INCH/HR) = 0.43
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.33
 TOTAL AREA (ACRES) = 41.0 PEAK FLOW RATE (CFS) = 50.52

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.77 HALFSTREET FLOOD WIDTH (FEET) = 35.47
 FLOW VELOCITY (FEET/SEC.) = 2.60 DEPTH*VELOCITY (FT*FT/SEC.) = 2.00
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1420.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 33.0 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2870.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 10

>>>> MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<<
 =====

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

>>>> RATIONAL METHOD INITIAL SUBAREA ANALYSIS <<<<<<
 >> USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA <<
 =====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 832.00
 ELEVATION DATA: UPSTREAM (FEET) = 1250.00 DOWNSTREAM (FEET) = 1235.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.994
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.931
 SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.90	1.33	0.100	17	9.99
COMMERCIAL	A	6.50	1.33	0.100	17	9.99
PUBLIC PARK	A	0.30	1.33	0.850	17	15.88

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.129
 SUBAREA RUNOFF (CFS) = 19.12
 TOTAL AREA (ACRES) = 7.70 PEAK FLOW RATE (CFS) = 19.12

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

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-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1135.00 DOWNSTREAM(FEET) = 2.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 39.49
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 19.12
PIPE TRAVEL TIME(MIN.) = 0.56 Tc(MIN.) = 10.55
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 104.00 = 2152.00 FEET.

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*****
FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 62
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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 1235.00 DOWNSTREAM ELEVATION(FEET) = 1233.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

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SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 31.77
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.73
HALFSTREET FLOOD WIDTH(FEET) = 31.46
AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.90
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.38
STREET FLOW TRAVEL TIME(MIN.) = 8.78 Tc(MIN.) = 19.33
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.973
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 1.60 1.33 0.100 17
COMMERCIAL A 13.20 1.33 0.100 17
PUBLIC PARK A 0.70 1.33 0.850 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.134
SUBAREA AREA(ACRES) = 15.50 SUBAREA RUNOFF(CFS) = 25.04
EFFECTIVE AREA(ACRES) = 23.20 AREA-AVERAGED Fm(INCH/HR) = 0.18
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 23.2 PEAK FLOW RATE(CFS) = 37.53

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END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.76 HALFSTREET FLOOD WIDTH(FEET) = 35.15

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FLOW VELOCITY(FEET/SEC.) = 1.95 DEPTH*VELOCITY(FT*FT/SEC.) = 1.49
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1000.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 27.6 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 3.00
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 3152.00 FEET.

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*****
FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 62
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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 1233.00 DOWNSTREAM ELEVATION(FEET) = 1231.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

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SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 47.61
***STREET FLOWING FULL***
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.81
HALFSTREET FLOOD WIDTH(FEET) = 39.40
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.07
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.69
STREET FLOW TRAVEL TIME(MIN.) = 8.05 Tc(MIN.) = 27.39
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.601
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 12.80 1.33 0.100 17
COMMERCIAL A 2.10 1.33 0.100 17
PUBLIC PARK A 1.00 1.33 0.850 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.147
SUBAREA AREA(ACRES) = 15.90 SUBAREA RUNOFF(CFS) = 20.11
EFFECTIVE AREA(ACRES) = 39.10 AREA-AVERAGED Fm(INCH/HR) = 0.18
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.14
TOTAL AREA(ACRES) = 39.1 PEAK FLOW RATE(CFS) = 49.87

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END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.82 HALFSTREET FLOOD WIDTH(FEET) = 39.89
FLOW VELOCITY(FEET/SEC.) = 2.10 DEPTH*VELOCITY(FT*FT/SEC.) = 1.73
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1000.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 28.0 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 4.00
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 4152.00 FEET.

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FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1231.00  DOWNSTREAM(FEET) = 1211.00
FLOW LENGTH(FEET) = 780.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.43
ESTIMATED PIPE DIAMETER(INCH) = 30.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 49.87
PIPE TRAVEL TIME(MIN.) = 0.97  Tc(MIN.) = 28.36
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 = 4932.00 FEET.

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FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 28.36
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.568
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/  SCS SOIL  AREA  Fp  Ap  SCS
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL        A      18.60  1.33  0.100  17
COMMERCIAL        A      12.80  1.33  0.100  17
SCHOOL            A       4.00  1.33  0.600  17
PUBLIC PARK       A       6.10  1.33  0.850  17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.258
SUBAREA AREA(ACRES) = 41.50  SUBAREA RUNOFF(CFS) = 45.74
EFFECTIVE AREA(ACRES) = 80.60  AREA-AVERAGED Fm(INCH/HR) = 0.27
AREA-AVERAGED Fp(INCH/HR) = 1.33  AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 80.6  PEAK FLOW RATE(CFS) = 94.45

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*****
FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1211.00  DOWNSTREAM(FEET) = 1196.00
FLOW LENGTH(FEET) = 550.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 28.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.87
ESTIMATED PIPE DIAMETER(INCH) = 36.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 94.45
PIPE TRAVEL TIME(MIN.) = 0.58  Tc(MIN.) = 28.93
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 = 5482.00 FEET.

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*****
FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 28.93

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* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.549
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/  SCS SOIL  AREA  Fp  Ap  SCS
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL        A      11.90  1.33  0.100  17
RESIDENTIAL
"5-7 DWELLINGS/ACRE"  A      19.60  1.33  0.500  17
RESIDENTIAL
"11+ DWELLINGS/ACRE"  A       8.00  1.33  0.200  17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.319
SUBAREA AREA(ACRES) = 39.50  SUBAREA RUNOFF(CFS) = 40.02
EFFECTIVE AREA(ACRES) = 120.10  AREA-AVERAGED Fm(INCH/HR) = 0.32
AREA-AVERAGED Fp(INCH/HR) = 1.33  AREA-AVERAGED Ap = 0.24
TOTAL AREA(ACRES) = 120.1  PEAK FLOW RATE(CFS) = 133.10

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*****
FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1196.00  DOWNSTREAM(FEET) = 1150.00
FLOW LENGTH(FEET) = 1750.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 17.19
ESTIMATED PIPE DIAMETER(INCH) = 42.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 133.10
PIPE TRAVEL TIME(MIN.) = 1.70  Tc(MIN.) = 30.63
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 = 7232.00 FEET.

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*****
FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc(MIN.) = 30.63
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.497
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/  SCS SOIL  AREA  Fp  Ap  SCS
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL        A      31.80  1.33  0.100  17
COMMERCIAL        A       2.30  1.33  0.100  17
RESIDENTIAL
"11+ DWELLINGS/ACRE"  A      60.00  1.33  0.200  17
PUBLIC PARK       A       9.10  1.33  0.850  17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.224
SUBAREA AREA(ACRES) = 103.20  SUBAREA RUNOFF(CFS) = 111.37
EFFECTIVE AREA(ACRES) = 223.30  AREA-AVERAGED Fm(INCH/HR) = 0.31
AREA-AVERAGED Fp(INCH/HR) = 1.33  AREA-AVERAGED Ap = 0.23
TOTAL AREA(ACRES) = 223.3  PEAK FLOW RATE(CFS) = 238.85

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FLOW PROCESS FROM NODE      7.00 TO NODE      103.00 IS CODE = 11
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>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	238.85	30.63	1.497	1.33 (0.31)	0.23	223.3	1.00

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 103.00 = 7232.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	50.52	22.49	1.802	1.33 (0.43)	0.33	41.0	100.00

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2870.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	270.87	22.49	1.802	1.33 (0.33)	0.25	205.0	100.00
2	278.12	30.63	1.497	1.33 (0.33)	0.25	264.3	1.00

TOTAL AREA (ACRES) = 264.3

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 278.12 Tc(MIN.) = 30.630
EFFECTIVE AREA(ACRES) = 264.30 AREA-AVERAGED Fm(INCH/HR) = 0.33
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.25
TOTAL AREA(ACRES) = 264.3
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 103.00 = 7232.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1135.00 DOWNSTREAM(FEET) = 1105.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.58
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 278.12
PIPE TRAVEL TIME(MIN.) = 1.12 Tc(MIN.) = 31.75
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 104.00 = 8552.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 31.75
RAINFALL INTENSITY(INCH/HR) = 1.46
AREA-AVERAGED Fm(INCH/HR) = 0.33
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.25
EFFECTIVE STREAM AREA(ACRES) = 264.30
TOTAL STREAM AREA(ACRES) = 264.30
PEAK FLOW RATE(CFS) AT CONFLUENCE = 278.12

FLOW PROCESS FROM NODE 103.10 TO NODE 103.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 1145.00 DOWNSTREAM(FEET) = 1126.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.311
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.058
SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.50	1.33	0.100	17	9.31
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	3.30	1.33	0.200	17	9.92
COMMERCIAL	A	2.20	1.33	0.100	17	9.31

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.137
SUBAREA RUNOFF(CFS) = 23.30
TOTAL AREA(ACRES) = 9.00 PEAK FLOW RATE(CFS) = 23.30

FLOW PROCESS FROM NODE 103.20 TO NODE 103.30 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1126.00 DOWNSTREAM ELEVATION(FEET) = 1112.00
STREET LENGTH(FEET) = 1600.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 39.35
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.62

HALFSTREET FLOOD WIDTH(FEET) = 23.22
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.53
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.20
 STREET FLOW TRAVEL TIME(MIN.) = 7.56 Tc(MIN.) = 16.87
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.141
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.60	1.33	0.100	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.20	1.33	0.200	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	7.80	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.186
 SUBAREA AREA(ACRES) = 18.60 SUBAREA RUNOFF(CFS) = 31.70
 EFFECTIVE AREA(ACRES) = 27.60 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.17
 TOTAL AREA(ACRES) = 27.6 PEAK FLOW RATE(CFS) = 47.57

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.66 HALFSTREET FLOOD WIDTH(FEET) = 25.01
 FLOW VELOCITY(FEET/SEC.) = 3.69 DEPTH*VELOCITY(FT*FT/SEC.) = 2.43
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.30 = 2400.00 FEET.

 FLOW PROCESS FROM NODE 103.30 TO NODE 103.40 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
 UPSTREAM ELEVATION(FEET) = 1112.00 DOWNSTREAM ELEVATION(FEET) = 1110.00
 STREET LENGTH(FEET) = 550.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 65.04
 STREET FLOWING FULL
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.82
 HALFSTREET FLOOD WIDTH(FEET) = 39.59
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.79
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.28
 STREET FLOW TRAVEL TIME(MIN.) = 3.28 Tc(MIN.) = 20.16
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.924

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.10	1.33	0.500	17

COMMERCIAL	A	4.60	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	17.70	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.90	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.378
 SUBAREA AREA(ACRES) = 27.20 SUBAREA RUNOFF(CFS) = 34.80
 EFFECTIVE AREA(ACRES) = 54.80 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.27
 TOTAL AREA(ACRES) = 54.8 PEAK FLOW RATE(CFS) = 76.99

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.85 HALFSTREET FLOOD WIDTH(FEET) = 41.30
 FLOW VELOCITY(FEET/SEC.) = 2.95 DEPTH*VELOCITY(FT*FT/SEC.) = 2.52
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 550.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 53.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.40
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 103.40 = 2950.00 FEET.

 FLOW PROCESS FROM NODE 103.40 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====
 ELEVATION DATA: UPSTREAM(FEET) = 1110.00 DOWNSTREAM(FEET) = 1105.00
 FLOW LENGTH(FEET) = 560.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.01
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 76.99
 PIPE TRAVEL TIME(MIN.) = 0.93 Tc(MIN.) = 21.09
 LONGEST FLOWPATH FROM NODE 103.10 TO NODE 104.00 = 3510.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
 MAINLINE Tc(MIN.) = 21.09
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.873
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.10	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
 SUBAREA AREA(ACRES) = 17.80 SUBAREA RUNOFF(CFS) = 22.09
 EFFECTIVE AREA(ACRES) = 72.60 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.30
 TOTAL AREA(ACRES) = 72.6 PEAK FLOW RATE(CFS) = 96.54

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 21.09
RAINFALL INTENSITY(INCH/HR) = 1.87
AREA-AVERAGED Fm(INCH/HR) = 0.40
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.30
EFFECTIVE STREAM AREA(ACRES) = 72.60
TOTAL STREAM AREA(ACRES) = 72.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 96.54

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1, 1, 2.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1, 2, 3.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 359.42 Tc(MIN.) = 21.09
EFFECTIVE AREA(ACRES) = 255.63 AREA-AVERAGED Fm(INCH/HR) = 0.35
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.26
TOTAL AREA(ACRES) = 336.9
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 104.00 = 8552.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1105.00 DOWNSTREAM(FEET) = 1080.00
FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 63.0 INCH PIPE IS 51.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.16
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 359.42
PIPE TRAVEL TIME(MIN.) = 1.16 Tc(MIN.) = 22.25
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 105.00 = 9882.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 22.25
RAINFALL INTENSITY(INCH/HR) = 1.81
AREA-AVERAGED Fm(INCH/HR) = 0.35
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.26
EFFECTIVE STREAM AREA(ACRES) = 255.63
TOTAL STREAM AREA(ACRES) = 336.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 359.42

FLOW PROCESS FROM NODE 104.10 TO NODE 104.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 900.00
ELEVATION DATA: UPSTREAM(FEET) = 1115.00 DOWNSTREAM(FEET) = 1100.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.645
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.158
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
PUBLIC PARK A 9.50 1.33 0.850 17 16.64
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
SUBAREA RUNOFF(CFS) = 8.80
TOTAL AREA(ACRES) = 9.50 PEAK FLOW RATE(CFS) = 8.80

FLOW PROCESS FROM NODE 104.20 TO NODE 104.30 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1100.00 DOWNSTREAM ELEVATION(FEET) = 1085.00
STREET LENGTH(FEET) = 1100.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 24.56

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.51
 HALFSTREET FLOOD WIDTH (FEET) = 17.68
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.70
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.90
 STREET FLOW TRAVEL TIME (MIN.) = 4.95 Tc (MIN.) = 21.60
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.846

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.50	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	8.20	1.33	0.500	17
COMMERCIAL	A	4.30	1.33	0.100	17
PUBLIC PARK	A	7.40	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.422
 SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 31.70
 EFFECTIVE AREA (ACRES) = 36.90 AREA-AVERAGED Fm (INCH/HR) = 0.71
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.53
 TOTAL AREA (ACRES) = 36.9 PEAK FLOW RATE (CFS) = 37.83

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.58 HALFSTREET FLOOD WIDTH (FEET) = 21.00
 FLOW VELOCITY (FEET/SEC.) = 4.11 DEPTH*VELOCITY (FT*FT/SEC.) = 2.38
 LONGEST FLOWPATH FROM NODE 104.10 TO NODE 104.30 = 2000.00 FEET.

 FLOW PROCESS FROM NODE 104.30 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1085.00 DOWNSTREAM (FEET) = 1080.00
 FLOW LENGTH (FEET) = 1100.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 6.47
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 37.83
 PIPE TRAVEL TIME (MIN.) = 2.83 Tc (MIN.) = 24.43
 LONGEST FLOWPATH FROM NODE 104.10 TO NODE 105.00 = 3100.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 24.43
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.715

SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.60	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.70	1.33	0.500	17
PUBLIC PARK	A	2.90	1.33	0.850	17

SCHOOL A 9.50 1.33 0.600 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.485
 SUBAREA AREA (ACRES) = 43.70 SUBAREA RUNOFF (CFS) = 42.12
 EFFECTIVE AREA (ACRES) = 80.60 AREA-AVERAGED Fm (INCH/HR) = 0.67
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.51
 TOTAL AREA (ACRES) = 80.6 PEAK FLOW RATE (CFS) = 75.58

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 24.43
 RAINFALL INTENSITY (INCH/HR) = 1.71
 AREA-AVERAGED Fm (INCH/HR) = 0.67
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.51
 EFFECTIVE STREAM AREA (ACRES) = 80.60
 TOTAL STREAM AREA (ACRES) = 80.60
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 75.58

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	359.42	22.25	1.814	1.33 (0.35)	0.26	255.6	103.10
1	359.38	24.77	1.700	1.33 (0.35)	0.26	277.6	100.00
1	348.02	32.91	1.434	1.33 (0.34)	0.26	336.9	1.00
2	75.58	24.43	1.715	1.33 (0.67)	0.51	80.6	104.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	434.80	22.25	1.814	1.33 (0.42)	0.32	329.0	103.10
2	434.97	24.43	1.715	1.33 (0.42)	0.32	355.2	104.10
3	433.92	24.77	1.700	1.33 (0.42)	0.32	358.2	100.00
4	403.24	32.91	1.434	1.33 (0.41)	0.31	417.5	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 434.97 Tc (MIN.) = 24.43
 EFFECTIVE AREA (ACRES) = 355.17 AREA-AVERAGED Fm (INCH/HR) = 0.42
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.32
 TOTAL AREA (ACRES) = 417.5
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 105.00 = 9882.00 FEET.

=====

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 417.5 TC (MIN.) = 24.43
 EFFECTIVE AREA (ACRES) = 355.17 AREA-AVERAGED Fm (INCH/HR) = 0.42
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.318
 PEAK FLOW RATE (CFS) = 434.97

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	434.80	22.25	1.814	1.33 (0.42)	0.32	329.0	103.10
2	434.97	24.43	1.715	1.33 (0.42)	0.32	355.2	104.10
3	433.92	24.77	1.700	1.33 (0.42)	0.32	358.2	100.00
4	403.24	32.91	1.434	1.33 (0.41)	0.31	417.5	1.00

=====
 END OF RATIONAL METHOD ANALYSIS
 =====

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN IV (AREA B) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-21-2011 *

FILE NAME: VIB100.DAT
TIME/DATE OF STUDY: 16:26 07/21/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES: LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL (INCH)
5-MINUTES	0.52
30-MINUTES	1.06
1-HOUR	1.40
3-HOUR	2.54
6-HOUR	3.70
24-HOUR	8.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

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) = 780.00
ELEVATION DATA: UPSTREAM (FEET) = 1250.00 DOWNSTREAM (FEET) = 1235.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.614
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.200
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	6.20	0.98	0.100	32	9.61
PUBLIC PARK	A	0.30	0.98	0.850	32	15.28

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.135
SUBAREA RUNOFF (CFS) = 23.80
TOTAL AREA (ACRES) = 6.50 PEAK FLOW RATE (CFS) = 23.80

FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

=====

MAINLINE Tc (MIN.) = 9.61
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 4.200
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.40	0.98	0.100	32
PUBLIC PARK	A	0.50	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.132
SUBAREA AREA (ACRES) = 11.90 SUBAREA RUNOFF (CFS) = 43.61
EFFECTIVE AREA (ACRES) = 18.40 AREA-AVERAGED Fm (INCH/HR) = 0.13
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.13
TOTAL AREA (ACRES) = 18.4 PEAK FLOW RATE (CFS) = 67.41

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FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1235.00 DOWNSTREAM(FEET) = 1223.00
FLOW LENGTH(FEET) = 620.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 24.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.08
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 67.41
PIPE TRAVEL TIME(MIN.) = 0.79 Tc(MIN.) = 10.40
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 1400.00 FEET.

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FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 10.40
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.006
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE           GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A       11.00   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       9.50   0.98  0.500  32
RESIDENTIAL
".4 DWELLING/ACRE"  A       3.50   0.98  0.900  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
SUBAREA AREA(ACRES) = 24.00 SUBAREA RUNOFF(CFS) = 78.63
EFFECTIVE AREA(ACRES) = 42.40 AREA-AVERAGED Fm(INCH/HR) = 0.26
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 42.4 PEAK FLOW RATE(CFS) = 142.82

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*****
FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1223.00 DOWNSTREAM(FEET) = 1185.00
FLOW LENGTH(FEET) = 2350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.66
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 142.82
PIPE TRAVEL TIME(MIN.) = 2.67 Tc(MIN.) = 13.08
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 13.00 = 3750.00 FEET.

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*****
FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc(MIN.) = 13.08
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.492
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE           GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A       69.70   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      15.10   0.98  0.500  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       8.90   0.98  0.200  32
SCHOOL             A       2.70   0.98  0.600  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.186
SUBAREA AREA(ACRES) = 96.40 SUBAREA RUNOFF(CFS) = 287.27
EFFECTIVE AREA(ACRES) = 138.80 AREA-AVERAGED Fm(INCH/HR) = 0.21
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
TOTAL AREA(ACRES) = 138.8 PEAK FLOW RATE(CFS) = 410.50

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*****
FLOW PROCESS FROM NODE 13.00 TO NODE 303.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1185.00 DOWNSTREAM(FEET) = 1143.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 48.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 24.31
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 410.50
PIPE TRAVEL TIME(MIN.) = 0.89 Tc(MIN.) = 13.97
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 303.00 = 5050.00 FEET.

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*****
FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.97
RAINFALL INTENSITY(INCH/HR) = 3.36
AREA-AVERAGED Fm(INCH/HR) = 0.21
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.21
EFFECTIVE STREAM AREA(ACRES) = 138.80
TOTAL STREAM AREA(ACRES) = 138.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 410.50

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*****
FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 730.00

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ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.240

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.302

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.60	0.98	0.100	32	9.24
RESIDENTIAL						

"5-7 DWELLINGS/ACRE" A 4.10 0.98 0.500 32 11.82

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.388

SUBAREA RUNOFF(CFS) = 20.13

TOTAL AREA(ACRES) = 5.70 PEAK FLOW RATE(CFS) = 20.13

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1145.00 DOWNSTREAM ELEVATION(FEET) = 1144.00

STREET LENGTH(FEET) = 700.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 34.37

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.78

HALFSTREET FLOOD WIDTH(FEET) = 36.94

AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.68

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.31

STREET FLOW TRAVEL TIME(MIN.) = 6.96 Tc(MIN.) = 16.19

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.072

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.00	0.98	0.100	32
RESIDENTIAL					

"5-7 DWELLINGS/ACRE" A 5.20 0.98 0.500 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.286

SUBAREA AREA(ACRES) = 11.20 SUBAREA RUNOFF(CFS) = 28.16

EFFECTIVE AREA(ACRES) = 16.90 AREA-AVERAGED Fm(INCH/HR) = 0.31

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32

TOTAL AREA(ACRES) = 16.9 PEAK FLOW RATE(CFS) = 41.98

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.82 HALFSTREET FLOOD WIDTH(FEET) = 39.83

FLOW VELOCITY(FEET/SEC.) = 1.77 DEPTH*VELOCITY(FT*FT/SEC.) = 1.46

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 700.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 29.0 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 302.00

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1430.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1144.00 DOWNSTREAM(FEET) = 1143.00

FLOW LENGTH(FEET) = 750.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.4 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 4.22

ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 41.98

PIPE TRAVEL TIME(MIN.) = 2.96 Tc(MIN.) = 19.16

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2180.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.16

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.777

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.90	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 11.90 SUBAREA RUNOFF(CFS) = 28.70

EFFECTIVE AREA(ACRES) = 28.80 AREA-AVERAGED Fm(INCH/HR) = 0.22

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.23

TOTAL AREA(ACRES) = 28.8 PEAK FLOW RATE(CFS) = 66.20

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.16

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.777

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.20	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 10.20 SUBAREA RUNOFF(CFS) = 24.60

EFFECTIVE AREA(ACRES) = 39.00 AREA-AVERAGED Fm(INCH/HR) = 0.19

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
 TOTAL AREA (ACRES) = 39.0 PEAK FLOW RATE (CFS) = 90.80

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 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.) = 19.16
 RAINFALL INTENSITY (INCH/HR) = 2.78
 AREA-AVERAGED Fm (INCH/HR) = 0.19
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.20
 EFFECTIVE STREAM AREA (ACRES) = 39.00
 TOTAL STREAM AREA (ACRES) = 39.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 90.80

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	410.50	13.97	3.357	0.97 (0.21)	0.21	138.8	10.00
2	90.80	19.16	2.777	0.98 (0.19)	0.20	39.0	300.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	491.55	13.97	3.357	0.97 (0.20)	0.21	167.2	10.00
2	425.81	19.16	2.777	0.98 (0.20)	0.21	177.8	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 491.55 Tc (MIN.) = 13.97
 EFFECTIVE AREA (ACRES) = 167.24 AREA-AVERAGED Fm (INCH/HR) = 0.20
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
 TOTAL AREA (ACRES) = 177.8
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 303.00 = 5050.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1143.00 DOWNSTREAM (FEET) = 1115.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 69.0 INCH PIPE IS 56.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 21.62
 ESTIMATED PIPE DIAMETER (INCH) = 69.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 491.55
 PIPE TRAVEL TIME (MIN.) = 1.02 Tc (MIN.) = 14.99
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 306.00 = 6370.00 FEET.

 FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 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.) = 14.99
 RAINFALL INTENSITY (INCH/HR) = 3.22
 AREA-AVERAGED Fm (INCH/HR) = 0.20
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.21
 EFFECTIVE STREAM AREA (ACRES) = 167.24
 TOTAL STREAM AREA (ACRES) = 177.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 491.55

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1050.00
 ELEVATION DATA: UPSTREAM (FEET) = 1145.00 DOWNSTREAM (FEET) = 1129.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.344
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.803
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.00	0.98	0.100	32	11.34
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	9.40	0.98	0.500	32	14.52

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403
 SUBAREA RUNOFF (CFS) = 38.06
 TOTAL AREA (ACRES) = 12.40 PEAK FLOW RATE (CFS) = 38.06

 FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1129.00 DOWNSTREAM ELEVATION (FEET) = 1115.00
 STREET LENGTH (FEET) = 770.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

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

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 72.48
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.67
HALFSTREET FLOOD WIDTH(FEET) = 25.76
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.38
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.60
STREET FLOW TRAVEL TIME(MIN.) = 2.39 Tc(MIN.) = 13.73

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	578.46	13.73	3.392	0.97(0.24)	0.24	190.8	304.00
2	587.85	14.99	3.218	0.97(0.23)	0.24	204.8	10.00
3	504.24	20.20	2.690	0.97(0.23)	0.24	215.4	300.00

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.392
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.10 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 17.10 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.371
SUBAREA AREA (ACRES) = 25.20 SUBAREA RUNOFF (CFS) = 68.71
EFFECTIVE AREA (ACRES) = 37.60 AREA-AVERAGED Fm (INCH/HR) = 0.37
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.38
TOTAL AREA (ACRES) = 37.6 PEAK FLOW RATE (CFS) = 102.17

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 587.85 Tc (MIN.) = 14.99
EFFECTIVE AREA (ACRES) = 204.84 AREA-AVERAGED Fm (INCH/HR) = 0.23
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.24
TOTAL AREA (ACRES) = 215.4
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 306.00 = 6370.00 FEET.

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.74 HALFSTREET FLOOD WIDTH (FEET) = 32.83
FLOW VELOCITY (FEET/SEC.) = 5.80 DEPTH*VELOCITY (FT*FT/SEC.) = 4.30
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 770.0 FT WITH ELEVATION-DROP = 14.0 FT, IS 86.7 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 306.00
LONGEST FLOWPATH FROM NODE 304.00 TO NODE 306.00 = 1820.00 FEET.

FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
=====

FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 1

MAINLINE Tc (MIN.) = 14.99
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.218
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 24.00 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 24.00 SUBAREA RUNOFF (CFS) = 67.41
EFFECTIVE AREA (ACRES) = 228.84 AREA-AVERAGED Fm (INCH/HR) = 0.22
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.23
TOTAL AREA (ACRES) = 239.4 PEAK FLOW RATE (CFS) = 617.46

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<<
=====

FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 31

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 13.73
RAINFALL INTENSITY (INCH/HR) = 3.39
AREA-AVERAGED Fm (INCH/HR) = 0.37
AREA-AVERAGED Fp (INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.38
EFFECTIVE STREAM AREA (ACRES) = 37.60
TOTAL STREAM AREA (ACRES) = 37.60
PEAK FLOW RATE (CFS) AT CONFLUENCE = 102.17

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
=====

ELEVATION DATA: UPSTREAM (FEET) = 1115.00 DOWNSTREAM (FEET) = 1102.00
FLOW LENGTH (FEET) = 640.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 78.0 INCH PIPE IS 59.2 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 22.86
ESTIMATED PIPE DIAMETER (INCH) = 78.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 617.46
PIPE TRAVEL TIME (MIN.) = 0.47 Tc (MIN.) = 15.45
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 307.00 = 7010.00 FEET.

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	491.55	14.99	3.218	0.97(0.20)	0.21	167.2	10.00
1	425.81	20.20	2.690	0.98(0.20)	0.21	177.8	300.00
2	102.17	13.73	3.392	0.97(0.37)	0.38	37.6	304.00

FLOW PROCESS FROM NODE 307.00 TO NODE 307.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
=====

MAINLINE Tc (MIN.) = 15.45

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.160
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 4.00 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 21.80 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.438
 SUBAREA AREA (ACRES) = 25.80 SUBAREA RUNOFF (CFS) = 63.45
 EFFECTIVE AREA (ACRES) = 254.64 AREA-AVERAGED Fm (INCH/HR) = 0.24
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 265.2 PEAK FLOW RATE (CFS) = 668.83

 FLOW PROCESS FROM NODE 307.00 TO NODE 308.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 1102.00 DOWNSTREAM (FEET) = 1090.00
 FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 81.0 INCH PIPE IS 63.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 22.25
 ESTIMATED PIPE DIAMETER (INCH) = 81.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 668.83
 PIPE TRAVEL TIME (MIN.) = 0.49 Tc (MIN.) = 15.95
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 308.00 = 7670.00 FEET.

 FLOW PROCESS FROM NODE 308.00 TO NODE 308.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 15.95
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.100
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 5.10 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 7.50 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 4.50 0.98 0.200 32
 COMMERCIAL A 9.40 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.230
 SUBAREA AREA (ACRES) = 26.50 SUBAREA RUNOFF (CFS) = 68.59
 EFFECTIVE AREA (ACRES) = 281.14 AREA-AVERAGED Fm (INCH/HR) = 0.24
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 291.7 PEAK FLOW RATE (CFS) = 723.86

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	724.91	14.69	3.257	0.97(0.24)	0.25	267.1	304.00

2	723.86	15.95	3.100	0.97(0.24)	0.25	281.1	10.00
3	623.62	21.20	2.613	0.97(0.24)	0.24	291.7	300.00

NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE (CFS) = 724.91 Tc (MIN.) = 14.69
 AREA-AVERAGED Fm (INCH/HR) = 0.24 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.25 EFFECTIVE AREA (ACRES) = 267.13

 FLOW PROCESS FROM NODE 308.00 TO NODE 309.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 1090.00 DOWNSTREAM (FEET) = 1055.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 78.0 INCH PIPE IS 60.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 26.18
 ESTIMATED PIPE DIAMETER (INCH) = 78.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 724.91
 PIPE TRAVEL TIME (MIN.) = 0.84 Tc (MIN.) = 15.53
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 309.00 = 8990.00 FEET.

 FLOW PROCESS FROM NODE 309.00 TO NODE 309.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 15.53

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.150
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 17.70 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 24.00 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 3.20 0.98 0.200 32
 COMMERCIAL A 14.30 0.98 0.100 32
 COMMERCIAL A 0.40 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.266
 SUBAREA AREA (ACRES) = 59.60 SUBAREA RUNOFF (CFS) = 155.02
 EFFECTIVE AREA (ACRES) = 326.73 AREA-AVERAGED Fm (INCH/HR) = 0.24
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 351.3 PEAK FLOW RATE (CFS) = 854.23

 FLOW PROCESS FROM NODE 309.00 TO NODE 320.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 1055.00 DOWNSTREAM (FEET) = 1054.00
 FLOW LENGTH (FEET) = 1420.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 126.0 INCH PIPE IS 98.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 5.88

ESTIMATED PIPE DIAMETER(INCH) = 126.00 NUMBER OF PIPES = 2
PIPE-FLOW(CFS) = 854.23
PIPE TRAVEL TIME(MIN.) = 4.03 Tc(MIN.) = 19.56
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 320.00 = 10410.00 FEET.

FLOW PROCESS FROM NODE 320.00 TO NODE 320.00 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.) = 19.56
RAINFALL INTENSITY(INCH/HR) = 2.74
AREA-AVERAGED Fm(INCH/HR) = 0.24
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.25
EFFECTIVE STREAM AREA(ACRES) = 326.73
TOTAL STREAM AREA(ACRES) = 351.30
PEAK FLOW RATE(CFS) AT CONFLUENCE = 854.23

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 960.00
ELEVATION DATA: UPSTREAM(FEET) = 1145.00 DOWNSTREAM(FEET) = 1130.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.890
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.898

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.70	0.98	0.100	32	10.89
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	9.60	0.98	0.500	32	13.93

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.412
SUBAREA RUNOFF(CFS) = 38.70
TOTAL AREA(ACRES) = 12.30 PEAK FLOW RATE(CFS) = 38.70

FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1130.00 DOWNSTREAM ELEVATION(FEET) = 1118.00
STREET LENGTH(FEET) = 660.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 58.59

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.63
HALFSTREET FLOOD WIDTH(FEET) = 23.54
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.11
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.22
STREET FLOW TRAVEL TIME(MIN.) = 2.15 Tc(MIN.) = 13.04
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.498
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.60	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	10.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.399
SUBAREA AREA(ACRES) = 14.20 SUBAREA RUNOFF(CFS) = 39.74
EFFECTIVE AREA(ACRES) = 26.50 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 26.5 PEAK FLOW RATE(CFS) = 74.01

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 26.19
FLOW VELOCITY(FEET/SEC.) = 5.40 DEPTH*VELOCITY(FT*FT/SEC.) = 3.64
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 1620.00 FEET.

FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1118.00 DOWNSTREAM(FEET) = 1092.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.37
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 74.01
PIPE TRAVEL TIME(MIN.) = 1.65 Tc(MIN.) = 14.69
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 313.00 = 2940.00 FEET.

FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 14.69
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.257
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN

COMMERCIAL A 6.60 0.98 0.100 32

RESIDENTIAL "5-7 DWELLINGS/ACRE" A 22.00 0.98 0.500 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.408

SUBAREA AREA (ACRES) = 28.60 SUBAREA RUNOFF (CFS) = 73.62

EFFECTIVE AREA (ACRES) = 55.10 AREA-AVERAGED Fm (INCH/HR) = 0.40

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41

TOTAL AREA (ACRES) = 55.1 PEAK FLOW RATE (CFS) = 141.89

FLOW PROCESS FROM NODE 313.00 TO NODE 320.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1092.00 DOWNSTREAM (FEET) = 1054.00

FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.0 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 18.02

ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1

PIPE-FLOW (CFS) = 141.89

PIPE TRAVEL TIME (MIN.) = 1.22 Tc (MIN.) = 15.91

LONGEST FLOWPATH FROM NODE 310.00 TO NODE 320.00 = 4260.00 FEET.

FLOW PROCESS FROM NODE 320.00 TO NODE 320.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 15.91

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.105

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN

COMMERCIAL A 13.10 0.98 0.100 32

RESIDENTIAL "5-7 DWELLINGS/ACRE" A 31.60 0.98 0.500 32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383

SUBAREA AREA (ACRES) = 44.70 SUBAREA RUNOFF (CFS) = 109.90

EFFECTIVE AREA (ACRES) = 99.80 AREA-AVERAGED Fm (INCH/HR) = 0.39

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40

TOTAL AREA (ACRES) = 99.8 PEAK FLOW RATE (CFS) = 244.24

FLOW PROCESS FROM NODE 320.00 TO NODE 320.00 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.) = 15.91

RAINFALL INTENSITY (INCH/HR) = 3.11

AREA-AVERAGED Fm (INCH/HR) = 0.39

AREA-AVERAGED Fp (INCH/HR) = 0.98

AREA-AVERAGED Ap = 0.40

EFFECTIVE STREAM AREA (ACRES) = 99.80

TOTAL STREAM AREA (ACRES) = 99.80

PEAK FLOW RATE (CFS) AT CONFLUENCE = 244.24

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	854.23	19.56	2.743	0.98 (0.24)	0.25	326.7	304.00
1	847.38	20.82	2.642	0.98 (0.24)	0.25	340.7	10.00
1	730.24	26.24	2.300	0.98 (0.24)	0.25	351.3	300.00
2	244.24	15.91	3.105	0.98 (0.39)	0.40	99.8	310.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1039.67	15.91	3.105	0.97 (0.28)	0.29	365.5	310.00
2	1065.94	19.56	2.743	0.98 (0.28)	0.28	426.5	304.00
3	1050.05	20.82	2.642	0.98 (0.28)	0.28	440.5	10.00
4	902.13	26.24	2.300	0.97 (0.27)	0.28	451.1	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 1065.94 Tc (MIN.) = 19.56

EFFECTIVE AREA (ACRES) = 426.53 AREA-AVERAGED Fm (INCH/HR) = 0.28

AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.28

TOTAL AREA (ACRES) = 451.1

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 320.00 = 10410.00 FEET.

FLOW PROCESS FROM NODE 320.00 TO NODE 321.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1054.00 DOWNSTREAM (FEET) = 1045.00

FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 120.0 INCH PIPE IS 87.0 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 17.47

ESTIMATED PIPE DIAMETER (INCH) = 120.00 NUMBER OF PIPES = 1

PIPE-FLOW (CFS) = 1065.94

PIPE TRAVEL TIME (MIN.) = 1.27 Tc (MIN.) = 20.83

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 321.00 = 11740.00 FEET.

FLOW PROCESS FROM NODE 321.00 TO NODE 321.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 20.83

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.641

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	23.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.399
SUBAREA AREA(ACRES) = 31.70 SUBAREA RUNOFF(CFS) = 64.26
EFFECTIVE AREA(ACRES) = 458.23 AREA-AVERAGED Fm(INCH/HR) = 0.29
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.29
TOTAL AREA(ACRES) = 482.8 PEAK FLOW RATE(CFS) = 1065.94
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

ELEVATION DATA: UPSTREAM(FEET) = 1025.00 DOWNSTREAM(FEET) = 1000.00
FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 96.0 INCH PIPE IS 75.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 25.15
ESTIMATED PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1065.94
PIPE TRAVEL TIME(MIN.) = 0.89 Tc(MIN.) = 22.67
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 323.00 = 14420.00 FEET.

FLOW PROCESS FROM NODE 323.00 TO NODE 323.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 22.67
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.511
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.40	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	7.30	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.334
SUBAREA AREA(ACRES) = 44.90 SUBAREA RUNOFF(CFS) = 88.31
EFFECTIVE AREA(ACRES) = 547.53 AREA-AVERAGED Fm(INCH/HR) = 0.30
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
TOTAL AREA(ACRES) = 572.1 PEAK FLOW RATE(CFS) = 1091.66

FLOW PROCESS FROM NODE 323.00 TO NODE 340.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1000.00 DOWNSTREAM(FEET) = 996.00
FLOW LENGTH(FEET) = 1430.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 138.0 INCH PIPE IS 108.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.45
ESTIMATED PIPE DIAMETER(INCH) = 138.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1091.66
PIPE TRAVEL TIME(MIN.) = 1.91 Tc(MIN.) = 24.58
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.

FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 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.) = 24.58
RAINFALL INTENSITY(INCH/HR) = 2.39
AREA-AVERAGED Fm(INCH/HR) = 0.30

FLOW PROCESS FROM NODE 321.00 TO NODE 322.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1025.00
FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 102.0 INCH PIPE IS 76.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 23.47
ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1065.94
PIPE TRAVEL TIME(MIN.) = 0.94 Tc(MIN.) = 21.77
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 322.00 = 13070.00 FEET.

FLOW PROCESS FROM NODE 322.00 TO NODE 322.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 21.77
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.572
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	30.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.376
SUBAREA AREA(ACRES) = 44.40 SUBAREA RUNOFF(CFS) = 88.14
EFFECTIVE AREA(ACRES) = 502.63 AREA-AVERAGED Fm(INCH/HR) = 0.29
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
TOTAL AREA(ACRES) = 527.2 PEAK FLOW RATE(CFS) = 1065.94
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 322.00 TO NODE 323.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.30
 EFFECTIVE STREAM AREA (ACRES) = 547.53
 TOTAL STREAM AREA (ACRES) = 572.10
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 1091.66

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	1.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	5.30	0.98	0.200	32
COMMERCIAL	A	5.70	0.98	0.100	32
PUBLIC PARK	A	1.40	0.98	0.850	32
PUBLIC PARK	A	2.40	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.294
 SUBAREA AREA (ACRES) = 19.70 SUBAREA RUNOFF (CFS) = 49.12
 EFFECTIVE AREA (ACRES) = 29.70 AREA-AVERAGED Fm (INCH/HR) = 0.32
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA (ACRES) = 29.7 PEAK FLOW RATE (CFS) = 73.09

 FLOW PROCESS FROM NODE 330.00 TO NODE 331.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 930.00
 ELEVATION DATA: UPSTREAM (FEET) = 1064.00 DOWNSTREAM (FEET) = 1055.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.834
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.708
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.40	0.98	0.100	32	11.83
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.60	0.98	0.500	32	15.14

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA RUNOFF (CFS) = 29.83
 TOTAL AREA (ACRES) = 10.00 PEAK FLOW RATE (CFS) = 29.83

 FLOW PROCESS FROM NODE 331.00 TO NODE 332.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1055.00 DOWNSTREAM ELEVATION (FEET) = 1052.00
 STREET LENGTH (FEET) = 750.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 54.45
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.77
 HALFSTREET FLOOD WIDTH (FEET) = 35.68
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.78
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.14
 STREET FLOW TRAVEL TIME (MIN.) = 4.49 Tc (MIN.) = 16.33
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.057

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.83 HALFSTREET FLOOD WIDTH (FEET) = 40.20
 FLOW VELOCITY (FEET/SEC.) = 3.01 DEPTH*VELOCITY (FT*FT/SEC.) = 2.50
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 750.0 FT WITH ELEVATION-DROP = 3.0 FT, IS 57.2 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 332.00
 LONGEST FLOWPATH FROM NODE 330.00 TO NODE 332.00 = 1680.00 FEET.

 FLOW PROCESS FROM NODE 332.00 TO NODE 333.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1052.00 DOWNSTREAM (FEET) = 1041.00
 FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 28.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.40
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 73.09
 PIPE TRAVEL TIME (MIN.) = 0.89 Tc (MIN.) = 17.21
 LONGEST FLOWPATH FROM NODE 330.00 TO NODE 333.00 = 2340.00 FEET.

 FLOW PROCESS FROM NODE 333.00 TO NODE 333.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 17.21
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.961
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.50	0.98	0.200	32

COMMERCIAL A 2.90 0.98 0.100 32
 PUBLIC PARK A 8.10 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
 SUBAREA AREA(ACRES) = 35.60 SUBAREA RUNOFF(CFS) = 82.65
 EFFECTIVE AREA(ACRES) = 65.30 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 65.3 PEAK FLOW RATE(CFS) = 153.18

FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 46.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 17.22
 ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 280.35
 PIPE TRAVEL TIME(MIN.) = 1.31 Tc(MIN.) = 19.98
 LONGEST FLOWPATH FROM NODE 330.00 TO NODE 340.00 = 5020.00 FEET.

 FLOW PROCESS FROM NODE 333.00 TO NODE 334.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1041.00 DOWNSTREAM(FEET) = 1018.00
 FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.23
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 153.18
 PIPE TRAVEL TIME(MIN.) = 1.46 Tc(MIN.) = 18.67
 LONGEST FLOWPATH FROM NODE 330.00 TO NODE 334.00 = 3670.00 FEET.

 FLOW PROCESS FROM NODE 334.00 TO NODE 334.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc(MIN.) = 18.67
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.821
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.60	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.30	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	10.80	0.98	0.200	32
SCHOOL	A	4.80	0.98	0.600	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.329
 SUBAREA AREA(ACRES) = 60.20 SUBAREA RUNOFF(CFS) = 135.44
 EFFECTIVE AREA(ACRES) = 125.50 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 125.5 PEAK FLOW RATE(CFS) = 280.35

 FLOW PROCESS FROM NODE 334.00 TO NODE 340.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1018.00 DOWNSTREAM(FEET) = 996.00

 FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc(MIN.) = 19.98
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.708
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	17.10	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	16.50	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	17.40	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	5.10	0.98	0.200	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.263
 SUBAREA AREA(ACRES) = 56.10 SUBAREA RUNOFF(CFS) = 123.82
 EFFECTIVE AREA(ACRES) = 181.60 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
 TOTAL AREA(ACRES) = 181.6 PEAK FLOW RATE(CFS) = 391.50

 FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 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.) = 19.98
 RAINFALL INTENSITY(INCH/HR) = 2.71
 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.32
 EFFECTIVE STREAM AREA(ACRES) = 181.60
 TOTAL STREAM AREA(ACRES) = 181.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 391.50

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1088.12	20.96	2.631	0.97(0.30)	0.31	486.5	310.00
1	1091.66	24.58	2.391	0.97(0.30)	0.30	547.5	304.00
1	1079.31	25.87	2.319	0.98(0.29)	0.30	561.5	10.00
1	953.38	31.49	2.061	0.97(0.29)	0.30	572.1	300.00

2 391.50 19.98 2.708 0.98(0.31) 0.32 181.6 330.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1462.74	19.98	2.708	0.97(0.30)	0.31	645.2	330.00
2	1466.97	20.96	2.631	0.98(0.30)	0.31	668.1	310.00
3	1431.34	24.58	2.391	0.97(0.30)	0.31	729.1	304.00
4	1407.17	25.87	2.319	0.98(0.30)	0.31	743.1	10.00
5	1239.08	31.49	2.061	0.97(0.30)	0.30	753.7	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1466.97 Tc(MIN.) = 20.96
EFFECTIVE AREA(ACRES) = 668.12 AREA-AVERAGED Fm(INCH/HR) = 0.30
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
TOTAL AREA(ACRES) = 753.7
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.

FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:

RAINFALL(INCH): 5M= 0.52;30M= 1.06;1H= 1.40;3H= 2.54;6H= 3.70;24H= 8.00
S-GRAPH: VALLEY(DEV.)= 99.5%;VALLEY(UNDEV.)/DESERT= 0.5%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
Tc(HR) = 0.43; LAG(HR) = 0.34; Fm(INCH/HR) = 0.30; Ybar = 0.30
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 753.7
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.

EQUIVALENT BASIN FACTOR APPROXIMATIONS:

Lca/L=0.3,n=.0229; Lca/L=0.4,n=.0205; Lca/L=0.5,n=.0189;Lca/L=0.6,n=.0176
TIME OF PEAK FLOW(HR) = 16.42 RUNOFF VOLUME(AF) = 359.60
UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 1445.53
TOTAL PEAK FLOW RATE(CFS) = 1445.53 (SOURCE FLOW INCLUDED)
RATIONAL METHOD PEAK FLOW RATE(CFS) = 1466.97
(UPSTREAM NODE PEAK FLOW RATE(CFS) = 1466.97)
PEAK FLOW RATE(CFS) USED = 1466.97

FLOW PROCESS FROM NODE 340.00 TO NODE 350.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 996.00 DOWNSTREAM(FEET) = 975.00
FLOW LENGTH(FEET) = 1190.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 108.0 INCH PIPE IS 87.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 26.59

ESTIMATED PIPE DIAMETER(INCH) = 108.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1466.97
PIPE TRAVEL TIME(MIN.) = 0.75 Tc(MIN.) = 26.62
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 350.00 = 17040.00 FEET.

FLOW PROCESS FROM NODE 350.00 TO NODE 350.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 26.62
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.280
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.00	0.98	0.100	32
COMMERCIAL	A	24.50	0.98	0.100	32
COMMERCIAL	A	10.30	0.98	0.100	32
PUBLIC PARK	A	32.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
SUBAREA AREA(ACRES) = 82.20

UNIT-HYDROGRAPH DATA:

RAINFALL(INCH): 5M= 0.52;30M= 1.06;1H= 1.40;3H= 2.54;6H= 3.70;24H= 8.00
S-GRAPH: VALLEY(DEV.)= 99.6%;VALLEY(UNDEV.)/DESERT= 0.4%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
Tc(HR) = 0.44; LAG(HR) = 0.35; Fm(INCH/HR) = 0.31; Ybar = 0.31
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
3HR = 0.99; 6HR = 1.00; 24HR= 1.00

UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 835.9
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 350.00 = 17040.00 FEET.

EQUIVALENT BASIN FACTOR APPROXIMATIONS:

Lca/L=0.3,n=.0223; Lca/L=0.4,n=.0200; Lca/L=0.5,n=.0184;Lca/L=0.6,n=.0172
TIME OF PEAK FLOW(HR) = 16.42 RUNOFF VOLUME(AF) = 394.46
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 1563.86
TOTAL AREA(ACRES) = 835.9 PEAK FLOW RATE(CFS) = 1563.86

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 835.9 TC(MIN.) = 26.62
AREA-AVERAGED Fm(INCH/HR)= 0.31 Ybar = 0.31
PEAK FLOW RATE(CFS) = 1563.86

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA B) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-21-2011 *

FILE NAME: VIB25.DAT
TIME/DATE OF STUDY: 17:42 07/21/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.400
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.1365
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITON (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

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) = 780.00
ELEVATION DATA: UPSTREAM(FEET) = 1250.00 DOWNSTREAM(FEET) = 1235.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.614
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.410
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	6.20	0.98	0.100	32	9.61
PUBLIC PARK	A	0.30	0.98	0.850	32	15.28

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.135
SUBAREA RUNOFF(CFS) = 19.18
TOTAL AREA(ACRES) = 6.50 PEAK FLOW RATE(CFS) = 19.18

FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 9.61
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.410
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.40	0.98	0.100	32
PUBLIC PARK	A	0.50	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.132
SUBAREA AREA(ACRES) = 11.90 SUBAREA RUNOFF(CFS) = 35.14
EFFECTIVE AREA(ACRES) = 18.40 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 18.4 PEAK FLOW RATE(CFS) = 54.32

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1235.00 DOWNSTREAM(FEET) = 1223.00
FLOW LENGTH(FEET) = 620.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.38
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 54.32
PIPE TRAVEL TIME(MIN.) = 0.83 Tc(MIN.) = 10.45
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 1400.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 10.45
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.244
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 11.00 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 9.50 0.98 0.500 32
RESIDENTIAL
".4 DWELLING/ACRE" A 3.50 0.98 0.900 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
SUBAREA AREA(ACRES) = 24.00 SUBAREA RUNOFF(CFS) = 62.16
EFFECTIVE AREA(ACRES) = 42.40 AREA-AVERAGED Fm(INCH/HR) = 0.26
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 42.4 PEAK FLOW RATE(CFS) = 113.73

FLOW PROCESS FROM NODE 12.00 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) = 1223.00 DOWNSTREAM(FEET) = 1185.00
FLOW LENGTH(FEET) = 2350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 34.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.56
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 113.73
PIPE TRAVEL TIME(MIN.) = 2.89 Tc(MIN.) = 13.34
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 13.00 = 3750.00 FEET.

FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 13.34
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.802
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 69.70 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 15.10 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 8.90 0.98 0.200 32
SCHOOL A 2.70 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.186
SUBAREA AREA(ACRES) = 96.40 SUBAREA RUNOFF(CFS) = 227.35
EFFECTIVE AREA(ACRES) = 138.80 AREA-AVERAGED Fm(INCH/HR) = 0.21
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
TOTAL AREA(ACRES) = 138.8 PEAK FLOW RATE(CFS) = 324.22

FLOW PROCESS FROM NODE 13.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1185.00 DOWNSTREAM(FEET) = 1143.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 41.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 23.28
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 324.22
PIPE TRAVEL TIME(MIN.) = 0.93 Tc(MIN.) = 14.27
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 303.00 = 5050.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 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.) = 14.27
RAINFALL INTENSITY(INCH/HR) = 2.69
AREA-AVERAGED Fm(INCH/HR) = 0.21
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.21
EFFECTIVE STREAM AREA(ACRES) = 138.80
TOTAL STREAM AREA(ACRES) = 138.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 324.22

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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=====
INITIAL SUBAREA FLOW-LENGTH (FEET) = 730.00
ELEVATION DATA: UPSTREAM (FEET) = 1160.00 DOWNSTREAM (FEET) = 1145.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.240
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.492
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS  Tc
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
COMMERCIAL              A        1.60     0.98     0.100     32   9.24
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        4.10     0.98     0.500     32  11.82
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.388
SUBAREA RUNOFF (CFS) = 15.97
TOTAL AREA (ACRES) = 5.70 PEAK FLOW RATE (CFS) = 15.97

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FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<
=====
UPSTREAM ELEVATION (FEET) = 1145.00 DOWNSTREAM ELEVATION (FEET) = 1144.00
STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 27.10
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.73
HALFSTREET FLOOD WIDTH (FEET) = 31.67
AVERAGE FLOW VELOCITY (FEET/SEC.) = 1.61
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.17
STREET FLOW TRAVEL TIME (MIN.) = 7.26 Tc (MIN.) = 16.50
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.466
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A        6.00     0.98     0.100     32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        5.20     0.98     0.500     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.286
SUBAREA AREA (ACRES) = 11.20 SUBAREA RUNOFF (CFS) = 22.05
EFFECTIVE AREA (ACRES) = 16.90 AREA-AVERAGED Fm (INCH/HR) = 0.31
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32

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TOTAL AREA (ACRES) = 16.9 PEAK FLOW RATE (CFS) = 32.75

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.77 HALFSTREET FLOOD WIDTH (FEET) = 35.78
FLOW VELOCITY (FEET/SEC.) = 1.67 DEPTH*VELOCITY (FT*FT/SEC.) = 1.28
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 700.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 23.0 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 302.00
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1430.00 FEET.

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FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM (FEET) = 1144.00 DOWNSTREAM (FEET) = 1143.00
FLOW LENGTH (FEET) = 750.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 34.3 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 3.89
ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 32.75
PIPE TRAVEL TIME (MIN.) = 3.21 Tc (MIN.) = 19.71
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2180.00 FEET.

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*****
FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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=====
MAINLINE Tc (MIN.) = 19.71
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.216
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A        11.90     0.98     0.100     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AREA (ACRES) = 11.90 SUBAREA RUNOFF (CFS) = 22.69
EFFECTIVE AREA (ACRES) = 28.80 AREA-AVERAGED Fm (INCH/HR) = 0.22
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.23
TOTAL AREA (ACRES) = 28.8 PEAK FLOW RATE (CFS) = 51.65

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*****
FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc (MIN.) = 19.71
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.216
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A        10.20     0.98     0.100     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

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SUBAREA AREA (ACRES) = 10.20 SUBAREA RUNOFF (CFS) = 19.45
 EFFECTIVE AREA (ACRES) = 39.00 AREA-AVERAGED Fm (INCH/HR) = 0.19
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
 TOTAL AREA (ACRES) = 39.0 PEAK FLOW RATE (CFS) = 71.10

PIPE TRAVEL TIME (MIN.) = 1.06 Tc (MIN.) = 15.33
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 306.00 = 6370.00 FEET.

 FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 1

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION (MIN.) = 19.71
 RAINFALL INTENSITY (INCH/HR) = 2.22
 AREA-AVERAGED Fm (INCH/HR) = 0.19
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.20
 EFFECTIVE STREAM AREA (ACRES) = 39.00
 TOTAL STREAM AREA (ACRES) = 39.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 71.10

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 15.33
 RAINFALL INTENSITY (INCH/HR) = 2.58
 AREA-AVERAGED Fm (INCH/HR) = 0.20
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.21
 EFFECTIVE STREAM AREA (ACRES) = 167.03
 TOTAL STREAM AREA (ACRES) = 177.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 387.73

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 21

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	324.22	14.27	2.691	0.97 (0.21)	0.21	138.8	10.00
2	71.10	19.71	2.216	0.98 (0.19)	0.20	39.0	300.00

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1050.00
 ELEVATION DATA: UPSTREAM (FEET) = 1145.00 DOWNSTREAM (FEET) = 1129.00

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

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.344
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.088

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.00	0.98	0.100	32	11.34
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	9.40	0.98	0.500	32	14.52

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.403
 SUBAREA RUNOFF (CFS) = 30.07
 TOTAL AREA (ACRES) = 12.40 PEAK FLOW RATE (CFS) = 30.07

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	387.73	14.27	2.691	0.98 (0.20)	0.21	167.0	10.00
2	333.41	19.71	2.216	0.98 (0.20)	0.21	177.8	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 387.73 Tc (MIN.) = 14.27
 EFFECTIVE AREA (ACRES) = 167.03 AREA-AVERAGED Fm (INCH/HR) = 0.20
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.21
 TOTAL AREA (ACRES) = 177.8
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 303.00 = 5050.00 FEET.

 FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 62

 FLOW PROCESS FROM NODE 303.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1143.00 DOWNSTREAM (FEET) = 1115.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 48.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 20.80
 ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 387.73

=====

UPSTREAM ELEVATION (FEET) = 1129.00 DOWNSTREAM ELEVATION (FEET) = 1115.00
 STREET LENGTH (FEET) = 770.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	21.80	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.438
SUBAREA AREA(ACRES) = 25.80 SUBAREA RUNOFF(CFS) = 48.81
EFFECTIVE AREA(ACRES) = 254.43 AREA-AVERAGED Fm(INCH/HR) = 0.24
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.25
TOTAL AREA(ACRES) = 265.2 PEAK FLOW RATE(CFS) = 523.87

FLOW PROCESS FROM NODE 307.00 TO NODE 308.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1102.00 DOWNSTREAM(FEET) = 1090.00
FLOW LENGTH(FEET) = 660.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 75.0 INCH PIPE IS 56.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 21.06
ESTIMATED PIPE DIAMETER(INCH) = 75.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 523.87
PIPE TRAVEL TIME(MIN.) = 0.52 Tc(MIN.) = 16.34
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 308.00 = 7670.00 FEET.

FLOW PROCESS FROM NODE 308.00 TO NODE 308.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc(MIN.) = 16.34
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.480
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.50	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.50	0.98	0.200	32
COMMERCIAL	A	9.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.230
SUBAREA AREA(ACRES) = 26.50 SUBAREA RUNOFF(CFS) = 53.80
EFFECTIVE AREA(ACRES) = 280.93 AREA-AVERAGED Fm(INCH/HR) = 0.24
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.25
TOTAL AREA(ACRES) = 291.7 PEAK FLOW RATE(CFS) = 566.49

** PEAK FLOW RATE TABLE **

S'TREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap (DECIMAL)	Ae (ACRES)	HEADWATER NODE
1	567.79	14.89	2.622	0.97(0.24)	0.25	265.0	304.00
2	566.49	16.34	2.480	0.97(0.24)	0.25	280.9	10.00

3 483.81 21.90 2.081 0.97(0.24) 0.24 291.7 300.00
NEW PEAK FLOW DATA ARE:
PEAK FLOW RATE(CFS) = 567.79 Tc(MIN.) = 14.89
AREA-AVERAGED Fm(INCH/HR) = 0.24 AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.25 EFFECTIVE AREA(ACRES) = 265.01

FLOW PROCESS FROM NODE 308.00 TO NODE 309.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1090.00 DOWNSTREAM(FEET) = 1055.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 72.0 INCH PIPE IS 54.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 24.75
ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 567.79
PIPE TRAVEL TIME(MIN.) = 0.89 Tc(MIN.) = 15.78
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 309.00 = 8990.00 FEET.

FLOW PROCESS FROM NODE 309.00 TO NODE 309.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc(MIN.) = 15.78
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.533
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	17.70	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.00	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.20	0.98	0.200	32
COMMERCIAL	A	14.30	0.98	0.100	32
COMMERCIAL	A	0.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.266
SUBAREA AREA(ACRES) = 59.60 SUBAREA RUNOFF(CFS) = 121.92
EFFECTIVE AREA(ACRES) = 324.61 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
TOTAL AREA(ACRES) = 351.3 PEAK FLOW RATE(CFS) = 668.33

FLOW PROCESS FROM NODE 309.00 TO NODE 320.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1055.00 DOWNSTREAM(FEET) = 1054.00
FLOW LENGTH(FEET) = 1420.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 114.0 INCH PIPE IS 91.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.50
ESTIMATED PIPE DIAMETER(INCH) = 114.00 NUMBER OF PIPES = 2

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	6.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	22.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.408
SUBAREA AREA (ACRES) = 28.60 SUBAREA RUNOFF (CFS) = 57.21
EFFECTIVE AREA (ACRES) = 55.10 AREA-AVERAGED Fm (INCH/HR) = 0.40
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
TOTAL AREA (ACRES) = 55.1 PEAK FLOW RATE (CFS) = 110.28

FLOW PROCESS FROM NODE 313.00 TO NODE 320.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1092.00 DOWNSTREAM (FEET) = 1054.00
FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.4 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 17.04
ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 110.28
PIPE TRAVEL TIME (MIN.) = 1.29 Tc (MIN.) = 16.21
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 320.00 = 4260.00 FEET.

FLOW PROCESS FROM NODE 320.00 TO NODE 320.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 16.21
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.493
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	31.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
SUBAREA AREA (ACRES) = 44.70 SUBAREA RUNOFF (CFS) = 85.27
EFFECTIVE AREA (ACRES) = 99.80 AREA-AVERAGED Fm (INCH/HR) = 0.39
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
TOTAL AREA (ACRES) = 99.8 PEAK FLOW RATE (CFS) = 189.23

FLOW PROCESS FROM NODE 320.00 TO NODE 320.00 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.) = 16.21
RAINFALL INTENSITY (INCH/HR) = 2.49

AREA-AVERAGED Fm (INCH/HR) = 0.39
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.40
EFFECTIVE STREAM AREA (ACRES) = 99.80
TOTAL STREAM AREA (ACRES) = 99.80
PEAK FLOW RATE (CFS) AT CONFLUENCE = 189.23

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	668.33	20.08	2.192	0.98 (0.25)	0.25	324.6	304.00
1	661.81	21.53	2.102	0.98 (0.24)	0.25	340.5	10.00
1	565.14	26.62	1.851	0.98 (0.24)	0.25	351.3	300.00
2	189.23	16.21	2.493	0.98 (0.39)	0.40	99.8	310.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	811.95	16.21	2.493	0.98 (0.28)	0.29	361.8	310.00
2	830.53	20.08	2.192	0.98 (0.28)	0.29	424.4	304.00
3	815.94	21.53	2.102	0.98 (0.28)	0.28	440.3	10.00
4	696.71	26.62	1.851	0.97 (0.27)	0.28	451.1	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 830.53 Tc (MIN.) = 20.08
EFFECTIVE AREA (ACRES) = 424.41 AREA-AVERAGED Fm (INCH/HR) = 0.28
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
TOTAL AREA (ACRES) = 451.1
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 320.00 = 10410.00 FEET.

FLOW PROCESS FROM NODE 320.00 TO NODE 321.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1054.00 DOWNSTREAM (FEET) = 1045.00
FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 108.0 INCH PIPE IS 80.4 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 16.35
ESTIMATED PIPE DIAMETER (INCH) = 108.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 830.53
PIPE TRAVEL TIME (MIN.) = 1.36 Tc (MIN.) = 21.44
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 321.00 = 11740.00 FEET.

FLOW PROCESS FROM NODE 321.00 TO NODE 321.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 21.44
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.108
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
 COMMERCIAL A 8.00 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 23.70 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.399
 SUBAREA AREA (ACRES) = 31.70 SUBAREA RUNOFF (CFS) = 49.03
 EFFECTIVE AREA (ACRES) = 456.11 AREA-AVERAGED Fm (INCH/HR) = 0.29
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 482.8 PEAK FLOW RATE (CFS) = 830.53
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 FLOW PROCESS FROM NODE 321.00 TO NODE 322.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 1045.00 DOWNSTREAM (FEET) = 1025.00
 FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 90.0 INCH PIPE IS 72.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 21.73
 ESTIMATED PIPE DIAMETER (INCH) = 90.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 830.53
 PIPE TRAVEL TIME (MIN.) = 1.02 Tc (MIN.) = 22.46
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 322.00 = 13070.00 FEET.

 FLOW PROCESS FROM NODE 322.00 TO NODE 322.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 22.46
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.050
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
 COMMERCIAL A 13.80 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 30.60 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.376
 SUBAREA AREA (ACRES) = 44.40 SUBAREA RUNOFF (CFS) = 67.26
 EFFECTIVE AREA (ACRES) = 500.51 AREA-AVERAGED Fm (INCH/HR) = 0.29
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.30
 TOTAL AREA (ACRES) = 527.2 PEAK FLOW RATE (CFS) = 830.53
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 FLOW PROCESS FROM NODE 322.00 TO NODE 323.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 1025.00 DOWNSTREAM (FEET) = 1000.00

FLOW LENGTH (FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 87.0 INCH PIPE IS 69.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 23.57
 ESTIMATED PIPE DIAMETER (INCH) = 87.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 830.53
 PIPE TRAVEL TIME (MIN.) = 0.95 Tc (MIN.) = 23.41
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 323.00 = 14420.00 FEET.

 FLOW PROCESS FROM NODE 323.00 TO NODE 323.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 23.41
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.999
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
 COMMERCIAL A 13.20 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 24.40 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 7.30 0.98 0.200 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.334
 SUBAREA AREA (ACRES) = 44.90 SUBAREA RUNOFF (CFS) = 67.63
 EFFECTIVE AREA (ACRES) = 545.41 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.30
 TOTAL AREA (ACRES) = 572.1 PEAK FLOW RATE (CFS) = 836.10

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	836.65	19.54	2.228	0.98 (0.30)	0.31	482.8	310.00
2	836.10	23.41	1.999	0.98 (0.30)	0.30	545.4	304.00
3	825.91	24.87	1.928	0.98 (0.29)	0.30	561.3	10.00
4	735.24	30.10	1.719	0.97 (0.29)	0.30	572.1	300.00

NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE (CFS) = 836.65 Tc (MIN.) = 19.54
 AREA-AVERAGED Fm (INCH/HR) = 0.30 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.31 EFFECTIVE AREA (ACRES) = 482.77

 FLOW PROCESS FROM NODE 323.00 TO NODE 340.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 1000.00 DOWNSTREAM (FEET) = 996.00
 FLOW LENGTH (FEET) = 1430.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 126.0 INCH PIPE IS 97.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.70
 ESTIMATED PIPE DIAMETER (INCH) = 126.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 836.65
 PIPE TRAVEL TIME (MIN.) = 2.04 Tc (MIN.) = 21.58
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.

Manning's FRICTION FACTOR for Streetflow Section (curb-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 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.) = 21.58
RAINFALL INTENSITY (INCH/HR) = 2.10
AREA-AVERAGED Fm (INCH/HR) = 0.30
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.31
EFFECTIVE STREAM AREA (ACRES) = 482.77
TOTAL STREAM AREA (ACRES) = 572.10
PEAK FLOW RATE (CFS) AT CONFLUENCE = 836.65

FLOW PROCESS FROM NODE 330.00 TO NODE 331.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 930.00
ELEVATION DATA: UPSTREAM (FEET) = 1064.00 DOWNSTREAM (FEET) = 1055.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.834
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.010

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.40	0.98	0.100	32	11.83
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	7.60	0.98	0.500	32	15.14

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
SUBAREA RUNOFF (CFS) = 23.55
TOTAL AREA (ACRES) = 10.00 PEAK FLOW RATE (CFS) = 23.55

FLOW PROCESS FROM NODE 331.00 TO NODE 332.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1055.00 DOWNSTREAM ELEVATION (FEET) = 1052.00
STREET LENGTH (FEET) = 750.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL (DECIMAL) = 0.020

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 42.90
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.72
HALFSTREET FLOOD WIDTH (FEET) = 30.51
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.66
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.91
STREET FLOW TRAVEL TIME (MIN.) = 4.71 Tc (MIN.) = 16.54
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.462
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	1.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	5.30	0.98	0.200	32
COMMERCIAL	A	5.70	0.98	0.100	32
PUBLIC PARK	A	1.40	0.98	0.850	32
PUBLIC PARK	A	2.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.294
SUBAREA AREA (ACRES) = 19.70 SUBAREA RUNOFF (CFS) = 38.58
EFFECTIVE AREA (ACRES) = 29.70 AREA-AVERAGED Fm (INCH/HR) = 0.32
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
TOTAL AREA (ACRES) = 29.7 PEAK FLOW RATE (CFS) = 57.19

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.78 HALFSTREET FLOOD WIDTH (FEET) = 36.73
FLOW VELOCITY (FEET/SEC.) = 2.81 DEPTH*VELOCITY (FT*FT/SEC.) = 2.19
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 750.0 FT WITH ELEVATION-DROP = 3.0 FT, IS 45.5 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 332.00
LONGEST FLOWPATH FROM NODE 330.00 TO NODE 332.00 = 1680.00 FEET.

FLOW PROCESS FROM NODE 332.00 TO NODE 333.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1052.00 DOWNSTREAM (FEET) = 1041.00
FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.3 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 11.69
ESTIMATED PIPE DIAMETER (INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 57.19
PIPE TRAVEL TIME (MIN.) = 0.94 Tc (MIN.) = 17.48
LONGEST FLOWPATH FROM NODE 330.00 TO NODE 333.00 = 2340.00 FEET.

FLOW PROCESS FROM NODE 333.00 TO NODE 333.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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=====
MAINLINE Tc (MIN.) = 17.48
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.382
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A       11.20    0.98     0.100     32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A       9.90    0.98     0.500     32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A       3.50    0.98     0.200     32
COMMERCIAL              A       2.90    0.98     0.100     32
PUBLIC PARK             A       8.10    0.98     0.850     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
SUBAREA AREA (ACRES) = 35.60      SUBAREA RUNOFF (CFS) = 64.08
EFFECTIVE AREA (ACRES) = 65.30   AREA-AVERAGED Fm (INCH/HR) = 0.35
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
TOTAL AREA (ACRES) = 65.3        PEAK FLOW RATE (CFS) = 119.13

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FLOW PROCESS FROM NODE 333.00 TO NODE 334.00 IS CODE = 31

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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

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=====
ELEVATION DATA: UPSTREAM (FEET) = 1041.00 DOWNSTREAM (FEET) = 1018.00
FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 31.5 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 14.42
ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 119.13
PIPE TRAVEL TIME (MIN.) = 1.54 Tc (MIN.) = 19.02
LONGEST FLOWPATH FROM NODE 330.00 TO NODE 334.00 = 3670.00 FEET.

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FLOW PROCESS FROM NODE 334.00 TO NODE 334.00 IS CODE = 81

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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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=====
MAINLINE Tc (MIN.) = 19.02
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.265
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A       15.60    0.98     0.100     32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A       4.30    0.98     0.200     32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A       24.70    0.98     0.500     32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A       10.80    0.98     0.200     32
SCHOOL                  A       4.80    0.98     0.600     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.329
SUBAREA AREA (ACRES) = 60.20      SUBAREA RUNOFF (CFS) = 105.31

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EFFECTIVE AREA (ACRES) = 125.50 AREA-AVERAGED Fm (INCH/HR) = 0.34
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA (ACRES) = 125.5        PEAK FLOW RATE (CFS) = 217.53

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*****
FLOW PROCESS FROM NODE 334.00 TO NODE 340.00 IS CODE = 31

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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

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=====
ELEVATION DATA: UPSTREAM (FEET) = 1018.00 DOWNSTREAM (FEET) = 996.00
FLOW LENGTH (FEET) = 1350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.8 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 16.08
ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 217.53
PIPE TRAVEL TIME (MIN.) = 1.40 Tc (MIN.) = 20.42
LONGEST FLOWPATH FROM NODE 330.00 TO NODE 340.00 = 5020.00 FEET.

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*****
FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 81

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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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=====
MAINLINE Tc (MIN.) = 20.42
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.170
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A       17.10    0.98     0.100     32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A       16.50    0.98     0.200     32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A       17.40    0.98     0.500     32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A       5.10    0.98     0.200     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.263
SUBAREA AREA (ACRES) = 56.10      SUBAREA RUNOFF (CFS) = 96.64
EFFECTIVE AREA (ACRES) = 181.60   AREA-AVERAGED Fm (INCH/HR) = 0.31
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
TOTAL AREA (ACRES) = 181.6        PEAK FLOW RATE (CFS) = 303.51

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*****
FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 1

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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

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=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 20.42
RAINFALL INTENSITY (INCH/HR) = 2.17
AREA-AVERAGED Fm (INCH/HR) = 0.31
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.32

```

EFFECTIVE STREAM AREA(ACRES) = 181.60
 TOTAL STREAM AREA(ACRES) = 181.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 303.51

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	836.65	21.58	2.099	0.98(0.30)	0.31	482.8	310.00
1	836.10	25.45	1.901	0.98(0.30)	0.30	545.4	304.00
1	825.91	26.91	1.839	0.98(0.29)	0.30	561.3	10.00
1	735.24	32.21	1.651	0.97(0.29)	0.30	572.1	300.00
2	303.51	20.42	2.170	0.98(0.31)	0.32	181.6	330.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1126.32	20.42	2.170	0.98(0.31)	0.31	638.3	330.00
2	1128.56	21.58	2.099	0.98(0.31)	0.31	664.4	310.00
3	1095.69	25.45	1.901	0.98(0.30)	0.31	727.0	304.00
4	1075.27	26.91	1.839	0.98(0.30)	0.31	742.9	10.00
5	953.87	32.21	1.651	0.97(0.30)	0.30	753.7	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1128.56 Tc(MIN.) = 21.58
 EFFECTIVE AREA(ACRES) = 664.37 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
 TOTAL AREA(ACRES) = 753.7
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.

FLOW PROCESS FROM NODE 340.00 TO NODE 350.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 996.00 DOWNSTREAM(FEET) = 975.00
 FLOW LENGTH(FEET) = 1190.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 102.0 INCH PIPE IS 74.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 25.35
 ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1128.56
 PIPE TRAVEL TIME(MIN.) = 0.78 Tc(MIN.) = 27.69
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 350.00 = 17040.00 FEET.

FLOW PROCESS FROM NODE 350.00 TO NODE 350.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 27.69
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.807
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN
 COMMERCIAL A 15.00 0.98 0.100 32
 COMMERCIAL A 24.50 0.98 0.100 32
 COMMERCIAL A 10.30 0.98 0.100 32
 PUBLIC PARK A 32.40 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
 SUBAREA AREA(ACRES) = 82.20

UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY(DEV.)= 99.6%;VALLEY(UNDEV.)/DESERT= 0.4%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.46; LAG(HR) = 0.37; Fm(INCH/HR) = 0.31; Ybar = 0.34
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 2.50 TOTAL AREA(ACRES) = 835.9
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 350.00 = 17040.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0232; Lca/L=0.4,n=.0208; Lca/L=0.5,n=.0191;Lca/L=0.6,n=.0178
 TIME OF PEAK FLOW(HR) = 16.42 RUNOFF VOLUME(AF) = 265.01
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 1088.33
 TOTAL AREA(ACRES) = 835.9 PEAK FLOW RATE(CFS) = 1128.56
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 835.9 TC(MIN.) = 27.69
 AREA-AVERAGED Fm(INCH/HR)= 0.31 Ybar = 0.34
 PEAK FLOW RATE(CFS) = 1128.56

FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY(DEV.)= 99.5%;VALLEY(UNDEV.)/DESERT= 0.5%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.45; LAG(HR) = 0.36; Fm(INCH/HR) = 0.30; Ybar = 0.33
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 2.50 TOTAL AREA(ACRES) = 753.7
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0238; Lca/L=0.4,n=.0213; Lca/L=0.5,n=.0196;Lca/L=0.6,n=.0183
 TIME OF PEAK FLOW(HR) = 16.42 RUNOFF VOLUME(AF) = 243.92
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 1006.77
 TOTAL PEAK FLOW RATE(CFS) = 1006.77 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) = 1128.56
 (UPSTREAM NODE PEAK FLOW RATE(CFS) = 1128.56)
 PEAK FLOW RATE(CFS) USED = 1128.56

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

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

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA B) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 7-21-2011 *

FILE NAME: VIB10.DAT
TIME/DATE OF STUDY: 17:44 07/21/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

---*TIME-OF-CONCENTRATION MODEL*---

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, CURB GUTTER-GEOMETRIES, MANNING FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL (INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

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) = 780.00
ELEVATION DATA: UPSTREAM (FEET) = 1250.00 DOWNSTREAM (FEET) = 1235.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.614
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 3.000
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 6.20 0.98 0.100 32 9.61
PUBLIC PARK A 0.30 0.98 0.850 32 15.28
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.135
SUBAREA RUNOFF (CFS) = 16.78
TOTAL AREA (ACRES) = 6.50 PEAK FLOW RATE (CFS) = 16.78

FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====
MAINLINE Tc (MIN.) = 9.61
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 3.000
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 11.40 0.98 0.100 32
PUBLIC PARK A 0.50 0.98 0.850 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.132
SUBAREA AREA (ACRES) = 11.90 SUBAREA RUNOFF (CFS) = 30.76
EFFECTIVE AREA (ACRES) = 18.40 AREA-AVERAGED Fm (INCH/HR) = 0.13
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.13
TOTAL AREA (ACRES) = 18.4 PEAK FLOW RATE (CFS) = 47.54

```

FLOW PROCESS FROM NODE      11.00 TO NODE      12.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1235.00  DOWNSTREAM(FEET) = 1223.00
FLOW LENGTH(FEET) = 620.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.81
ESTIMATED PIPE DIAMETER(INCH) = 30.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 47.54
PIPE TRAVEL TIME(MIN.) = 0.87  Tc(MIN.) = 10.49
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      12.00 = 1400.00 FEET.

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*****
FLOW PROCESS FROM NODE      12.00 TO NODE      12.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 10.49
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.847
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE           GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A       11.00   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       9.50   0.98  0.500  32
RESIDENTIAL
".4 DWELLING/ACRE"  A       3.50   0.98  0.900  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
SUBAREA AREA(ACRES) = 24.00  SUBAREA RUNOFF(CFS) = 53.61
EFFECTIVE AREA(ACRES) = 42.40  AREA-AVERAGED Fm(INCH/HR) = 0.26
AREA-AVERAGED Fp(INCH/HR) = 0.98  AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 42.4  PEAK FLOW RATE(CFS) = 98.62

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*****
FLOW PROCESS FROM NODE      12.00 TO NODE      13.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1223.00  DOWNSTREAM(FEET) = 1185.00
FLOW LENGTH(FEET) = 2350.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.38
ESTIMATED PIPE DIAMETER(INCH) = 42.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 98.62
PIPE TRAVEL TIME(MIN.) = 2.93  Tc(MIN.) = 13.42
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      13.00 = 3750.00 FEET.

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*****
FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 13.42
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.456
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE           GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A       69.70   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      15.10   0.98  0.500  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       8.90   0.98  0.200  32
SCHOOL             A       2.70   0.98  0.600  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.186
SUBAREA AREA(ACRES) = 96.40  SUBAREA RUNOFF(CFS) = 197.40
EFFECTIVE AREA(ACRES) = 138.80  AREA-AVERAGED Fm(INCH/HR) = 0.21
AREA-AVERAGED Fp(INCH/HR) = 0.97  AREA-AVERAGED Ap = 0.21
TOTAL AREA(ACRES) = 138.8  PEAK FLOW RATE(CFS) = 281.10

```

```

*****
FLOW PROCESS FROM NODE      13.00 TO NODE      303.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1185.00  DOWNSTREAM(FEET) = 1143.00
FLOW LENGTH(FEET) = 1300.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 39.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 22.46
ESTIMATED PIPE DIAMETER(INCH) = 54.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 281.10
PIPE TRAVEL TIME(MIN.) = 0.96  Tc(MIN.) = 14.38
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      303.00 = 5050.00 FEET.

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*****
FLOW PROCESS FROM NODE      303.00 TO NODE      303.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====

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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 14.38
RAINFALL INTENSITY(INCH/HR) = 2.36
AREA-AVERAGED Fm(INCH/HR) = 0.21
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.21
EFFECTIVE STREAM AREA(ACRES) = 138.80
TOTAL STREAM AREA(ACRES) = 138.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 281.10

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*****
FLOW PROCESS FROM NODE      300.00 TO NODE      301.00 IS CODE = 21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 730.00

```

ELEVATION DATA: UPSTREAM(FEET) = 1160.00 DOWNSTREAM(FEET) = 1145.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 9.240
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 3.073

SUBAREA T_c AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	A	1.60	0.98	0.100	32	9.24
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	4.10	0.98	0.500	32	11.82

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.388
 SUBAREA RUNOFF (CFS) = 13.82
 TOTAL AREA (ACRES) = 5.70 PEAK FLOW RATE (CFS) = 13.82

 FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION (FEET) = 1145.00 DOWNSTREAM ELEVATION (FEET) = 1144.00
 STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 23.36
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.70
 HALFSTREET FLOOD WIDTH (FEET) = 28.51
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 1.56
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.09
 STREET FLOW TRAVEL TIME (MIN.) = 7.47 T_c (MIN.) = 16.71
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.153

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	6.00	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	5.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.286
 SUBAREA AREA (ACRES) = 11.20 SUBAREA RUNOFF (CFS) = 18.89
 EFFECTIVE AREA (ACRES) = 16.90 AREA-AVERAGED F_m (INCH/HR) = 0.31
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.32
 TOTAL AREA (ACRES) = 16.9 PEAK FLOW RATE (CFS) = 28.00

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.74 HALFSTREET FLOOD WIDTH (FEET) = 32.41
 FLOW VELOCITY (FEET/SEC.) = 1.61 DEPTH*VELOCITY (FT*FT/SEC.) = 1.19
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 700.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 19.9 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 302.00
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1430.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 1144.00 DOWNSTREAM (FEET) = 1143.00
 FLOW LENGTH (FEET) = 750.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 3.83
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 28.00
 PIPE TRAVEL TIME (MIN.) = 3.26 T_c (MIN.) = 19.97
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2180.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE T_c (MIN.) = 19.97
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.935
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	11.90	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA AREA (ACRES) = 11.90 SUBAREA RUNOFF (CFS) = 19.68
 EFFECTIVE AREA (ACRES) = 28.80 AREA-AVERAGED F_m (INCH/HR) = 0.22
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.23
 TOTAL AREA (ACRES) = 28.8 PEAK FLOW RATE (CFS) = 44.36

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE T_c (MIN.) = 19.97
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.935
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	10.20	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA AREA (ACRES) = 10.20 SUBAREA RUNOFF (CFS) = 16.87
 EFFECTIVE AREA (ACRES) = 39.00 AREA-AVERAGED F_m (INCH/HR) = 0.19

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
 TOTAL AREA (ACRES) = 39.0 PEAK FLOW RATE (CFS) = 61.22

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 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.) = 19.97
 RAINFALL INTENSITY (INCH/HR) = 1.93
 AREA-AVERAGED Fm (INCH/HR) = 0.19
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.20
 EFFECTIVE STREAM AREA (ACRES) = 39.00
 TOTAL STREAM AREA (ACRES) = 39.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 61.22

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	281.10	14.38	2.356	0.97 (0.21)	0.21	138.8	10.00
2	61.22	19.97	1.935	0.98 (0.19)	0.20	39.0	300.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	335.83	14.38	2.356	0.97 (0.20)	0.21	166.9	10.00
2	287.21	19.97	1.935	0.98 (0.20)	0.21	177.8	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 335.83 Tc (MIN.) = 14.38
 EFFECTIVE AREA (ACRES) = 166.88 AREA-AVERAGED Fm (INCH/HR) = 0.20
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
 TOTAL AREA (ACRES) = 177.8
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 303.00 = 5050.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 1143.00 DOWNSTREAM (FEET) = 1115.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 48.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 19.70
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 335.83
 PIPE TRAVEL TIME (MIN.) = 1.12 Tc (MIN.) = 15.50
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 306.00 = 6370.00 FEET.

 FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 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.) = 15.50
 RAINFALL INTENSITY (INCH/HR) = 2.25
 AREA-AVERAGED Fm (INCH/HR) = 0.20
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.21
 EFFECTIVE STREAM AREA (ACRES) = 166.88
 TOTAL STREAM AREA (ACRES) = 177.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 335.83

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1050.00
 ELEVATION DATA: UPSTREAM (FEET) = 1145.00 DOWNSTREAM (FEET) = 1129.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.344
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.717
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.00	0.98	0.100	32	11.34
RESIDENTIAL	A	9.40	0.98	0.500	32	14.52

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403
 SUBAREA RUNOFF (CFS) = 25.93
 TOTAL AREA (ACRES) = 12.40 PEAK FLOW RATE (CFS) = 25.93

 FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1129.00 DOWNSTREAM ELEVATION (FEET) = 1115.00
 STREET LENGTH (FEET) = 770.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 49.06
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.60
HALFSTREET FLOOD WIDTH(FEET) = 21.95
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.90
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.92
STREET FLOW TRAVEL TIME(MIN.) = 2.62 Tc(MIN.) = 13.96
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.398
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.10	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	17.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.371
SUBAREA AREA(ACRES) = 25.20 SUBAREA RUNOFF(CFS) = 46.18
EFFECTIVE AREA(ACRES) = 37.60 AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.38
TOTAL AREA(ACRES) = 37.6 PEAK FLOW RATE(CFS) = 68.55

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.66 HALFSTREET FLOOD WIDTH(FEET) = 25.01
FLOW VELOCITY(FEET/SEC.) = 5.32 DEPTH*VELOCITY(FT*FT/SEC.) = 3.50
LONGEST FLOWPATH FROM NODE 304.00 TO NODE 306.00 = 1820.00 FEET.

FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 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.) = 13.96
RAINFALL INTENSITY(INCH/HR) = 2.40
AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.38
EFFECTIVE STREAM AREA(ACRES) = 37.60
TOTAL STREAM AREA(ACRES) = 37.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 68.55

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	335.83	15.50	2.253	0.97(0.20)	0.21	166.9	10.00
1	287.21	21.13	1.870	0.98(0.20)	0.21	177.8	300.00
2	68.55	13.96	2.398	0.97(0.37)	0.38	37.6	304.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	392.61	13.96	2.398	0.98(0.24)	0.24	188.0	304.00
2	399.46	15.50	2.253	0.97(0.23)	0.24	204.5	10.00
3	337.91	21.13	1.870	0.97(0.23)	0.24	215.4	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 399.46 Tc(MIN.) = 15.50
EFFECTIVE AREA(ACRES) = 204.48 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.24
TOTAL AREA(ACRES) = 215.4
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 306.00 = 6370.00 FEET.

FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
=====

MAINLINE Tc(MIN.) = 15.50
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.253
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	24.00	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 24.00 SUBAREA RUNOFF(CFS) = 46.55
EFFECTIVE AREA(ACRES) = 228.48 AREA-AVERAGED Fm(INCH/HR) = 0.22
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.23
TOTAL AREA(ACRES) = 239.4 PEAK FLOW RATE(CFS) = 417.97

FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1115.00 DOWNSTREAM(FEET) = 1102.00
FLOW LENGTH(FEET) = 640.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 52.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 20.53
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 417.97
PIPE TRAVEL TIME(MIN.) = 0.52 Tc(MIN.) = 16.02
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 307.00 = 7010.00 FEET.

FLOW PROCESS FROM NODE 307.00 TO NODE 307.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
=====

MAINLINE Tc(MIN.) = 16.02
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.209
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL	AREA	Fp	Ap	SCS
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LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	4.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	21.80	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.438
SUBAREA AREA (ACRES) = 25.80 SUBAREA RUNOFF (CFS) = 41.37
EFFECTIVE AREA (ACRES) = 254.28 AREA-AVERAGED Fm (INCH/HR) = 0.24
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.25
TOTAL AREA (ACRES) = 265.2 PEAK FLOW RATE (CFS) = 450.26

FLOW PROCESS FROM NODE 307.00 TO NODE 308.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1102.00 DOWNSTREAM(FEET) = 1090.00
FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 69.0 INCH PIPE IS 55.8 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 20.02
ESTIMATED PIPE DIAMETER (INCH) = 69.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 450.26
PIPE TRAVEL TIME (MIN.) = 0.55 Tc (MIN.) = 16.57
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 308.00 = 7670.00 FEET.

FLOW PROCESS FROM NODE 308.00 TO NODE 308.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc (MIN.) = 16.57
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.164
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.50	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.50	0.98	0.200	32
COMMERCIAL	A	9.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.230
SUBAREA AREA (ACRES) = 26.50 SUBAREA RUNOFF (CFS) = 46.27
EFFECTIVE AREA (ACRES) = 280.78 AREA-AVERAGED Fm (INCH/HR) = 0.24
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.25
TOTAL AREA (ACRES) = 291.7 PEAK FLOW RATE (CFS) = 486.41

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	488.16	15.03	2.294	0.98 (0.24)	0.25	264.3	304.00
2	486.41	16.57	2.164	0.98 (0.24)	0.25	280.8	10.00
3	413.85	22.23	1.814	0.97 (0.24)	0.24	291.7	300.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE (CFS) = 488.16 Tc (MIN.) = 15.03
AREA-AVERAGED Fm (INCH/HR) = 0.24 AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.25 EFFECTIVE AREA (ACRES) = 264.27

FLOW PROCESS FROM NODE 308.00 TO NODE 309.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1090.00 DOWNSTREAM(FEET) = 1055.00
FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 54.0 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 23.47
ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 488.16
PIPE TRAVEL TIME (MIN.) = 0.94 Tc (MIN.) = 15.97
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 309.00 = 8990.00 FEET.

FLOW PROCESS FROM NODE 309.00 TO NODE 309.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

MAINLINE Tc (MIN.) = 15.97
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.213
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	17.70	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.00	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.20	0.98	0.200	32
COMMERCIAL	A	14.30	0.98	0.100	32
COMMERCIAL	A	0.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.266
SUBAREA AREA (ACRES) = 59.60 SUBAREA RUNOFF (CFS) = 104.74
EFFECTIVE AREA (ACRES) = 323.87 AREA-AVERAGED Fm (INCH/HR) = 0.25
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
TOTAL AREA (ACRES) = 351.3 PEAK FLOW RATE (CFS) = 573.45

FLOW PROCESS FROM NODE 309.00 TO NODE 320.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1055.00 DOWNSTREAM(FEET) = 1054.00
FLOW LENGTH (FEET) = 1420.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 144.0 INCH PIPE IS 106.6 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 6.39
ESTIMATED PIPE DIAMETER (INCH) = 144.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 573.45
PIPE TRAVEL TIME (MIN.) = 3.71 Tc (MIN.) = 19.68

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 320.00 = 10410.00 FEET.

FLOW PROCESS FROM NODE 320.00 TO NODE 320.00 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.) = 19.68
RAINFALL INTENSITY (INCH/HR) = 1.95
AREA-AVERAGED Fm (INCH/HR) = 0.25
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.25
EFFECTIVE STREAM AREA (ACRES) = 323.87
TOTAL STREAM AREA (ACRES) = 351.30
PEAK FLOW RATE (CFS) AT CONFLUENCE = 573.45

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 960.00
ELEVATION DATA: UPSTREAM (FEET) = 1145.00 DOWNSTREAM (FEET) = 1130.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.890
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.784
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.70 0.98 0.100 32 10.89
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 9.60 0.98 0.500 32 13.93
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.412
SUBAREA RUNOFF (CFS) = 26.37
TOTAL AREA (ACRES) = 12.30 PEAK FLOW RATE (CFS) = 26.37

FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1130.00 DOWNSTREAM ELEVATION (FEET) = 1118.00
STREET LENGTH (FEET) = 660.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 39.72
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.56
HALFSTREET FLOOD WIDTH (FEET) = 20.21
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.64
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.61
STREET FLOW TRAVEL TIME (MIN.) = 2.37 Tc (MIN.) = 13.26
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.474
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.60	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	10.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.399
SUBAREA AREA (ACRES) = 14.20 SUBAREA RUNOFF (CFS) = 26.65
EFFECTIVE AREA (ACRES) = 26.50 AREA-AVERAGED Fm (INCH/HR) = 0.39
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
TOTAL AREA (ACRES) = 26.5 PEAK FLOW RATE (CFS) = 49.59

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.60 HALFSTREET FLOOD WIDTH (FEET) = 22.06
FLOW VELOCITY (FEET/SEC.) = 4.90 DEPTH*VELOCITY (FT*FT/SEC.) = 2.94
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 1620.00 FEET.

FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 1118.00 DOWNSTREAM (FEET) = 1092.00
FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 23.6 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 11.95
ESTIMATED PIPE DIAMETER (INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 49.59
PIPE TRAVEL TIME (MIN.) = 1.84 Tc (MIN.) = 15.10
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 313.00 = 2940.00 FEET.

FLOW PROCESS FROM NODE 313.00 TO NODE 313.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 15.10
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.288
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 6.60 0.98 0.100 32

RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 22.00 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.408
 SUBAREA AREA (ACRES) = 28.60 SUBAREA RUNOFF (CFS) = 48.67
 EFFECTIVE AREA (ACRES) = 55.10 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
 TOTAL AREA (ACRES) = 55.1 PEAK FLOW RATE (CFS) = 93.83

 FLOW PROCESS FROM NODE 313.00 TO NODE 320.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 1092.00 DOWNSTREAM (FEET) = 1054.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.26
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 93.83
 PIPE TRAVEL TIME (MIN.) = 1.35 Tc (MIN.) = 16.45
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 320.00 = 4260.00 FEET.

 FLOW PROCESS FROM NODE 320.00 TO NODE 320.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 16.45
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.173
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.10	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	31.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.383
 SUBAREA AREA (ACRES) = 44.70 SUBAREA RUNOFF (CFS) = 72.42
 EFFECTIVE AREA (ACRES) = 99.80 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 99.8 PEAK FLOW RATE (CFS) = 160.56

 FLOW PROCESS FROM NODE 320.00 TO NODE 320.00 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.) = 16.45
 RAINFALL INTENSITY (INCH/HR) = 2.17
 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.98

AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA (ACRES) = 99.80
 TOTAL STREAM AREA (ACRES) = 99.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 160.56

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	573.45	19.68	1.952	0.98 (0.25)	0.25	323.9	304.00
1	567.03	21.29	1.862	0.98 (0.24)	0.25	340.4	10.00
1	482.74	27.11	1.611	0.98 (0.24)	0.25	351.3	300.00
2	160.56	16.45	2.173	0.98 (0.39)	0.40	99.8	310.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	702.19	16.45	2.173	0.97 (0.28)	0.29	370.6	310.00
2	714.13	19.68	1.952	0.97 (0.28)	0.29	423.7	304.00
3	699.62	21.29	1.862	0.97 (0.28)	0.28	440.2	10.00
4	592.77	27.11	1.611	0.97 (0.27)	0.28	451.1	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 714.13 Tc (MIN.) = 19.68
 EFFECTIVE AREA (ACRES) = 423.67 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 451.1
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 320.00 = 10410.00 FEET.

 FLOW PROCESS FROM NODE 320.00 TO NODE 321.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 1054.00 DOWNSTREAM (FEET) = 1045.00
 FLOW LENGTH (FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 102.0 INCH PIPE IS 76.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.74
 ESTIMATED PIPE DIAMETER (INCH) = 102.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 714.13
 PIPE TRAVEL TIME (MIN.) = 1.41 Tc (MIN.) = 21.09
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 321.00 = 11740.00 FEET.

 FLOW PROCESS FROM NODE 321.00 TO NODE 321.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 21.09
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.873
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.10	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	31.60	0.98	0.500	32

COMMERCIAL A 8.00 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 23.70 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.399
 SUBAREA AREA(ACRES) = 31.70 SUBAREA RUNOFF(CFS) = 42.33
 EFFECTIVE AREA(ACRES) = 455.37 AREA-AVERAGED Fm(INCH/HR) = 0.29
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.29
 TOTAL AREA(ACRES) = 482.8 PEAK FLOW RATE(CFS) = 714.13
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 FLOW PROCESS FROM NODE 321.00 TO NODE 322.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1025.00
 FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 87.0 INCH PIPE IS 66.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 21.17
 ESTIMATED PIPE DIAMETER(INCH) = 87.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 714.13
 PIPE TRAVEL TIME(MIN.) = 1.05 Tc(MIN.) = 22.13
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 322.00 = 13070.00 FEET.

 FLOW PROCESS FROM NODE 322.00 TO NODE 322.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 22.13
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.819
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 13.80 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 30.60 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.376
 SUBAREA AREA(ACRES) = 44.40 SUBAREA RUNOFF(CFS) = 58.06
 EFFECTIVE AREA(ACRES) = 499.77 AREA-AVERAGED Fm(INCH/HR) = 0.29
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
 TOTAL AREA(ACRES) = 527.2 PEAK FLOW RATE(CFS) = 714.13
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 FLOW PROCESS FROM NODE 322.00 TO NODE 323.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1025.00 DOWNSTREAM(FEET) = 1000.00
 FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 63.4 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 22.92
 ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 714.13
 PIPE TRAVEL TIME(MIN.) = 0.98 Tc(MIN.) = 23.11
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 323.00 = 14420.00 FEET.

 FLOW PROCESS FROM NODE 323.00 TO NODE 323.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 23.11
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.772
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 13.20 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 24.40 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 7.30 0.98 0.200 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.334
 SUBAREA AREA(ACRES) = 44.90 SUBAREA RUNOFF(CFS) = 58.48
 EFFECTIVE AREA(ACRES) = 544.67 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
 TOTAL AREA(ACRES) = 572.1 PEAK FLOW RATE(CFS) = 723.82

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	724.22	19.91	1.938	0.98(0.30)	0.31	491.6	310.00
2	723.82	23.11	1.772	0.97(0.30)	0.30	544.7	304.00
3	710.76	24.77	1.700	0.97(0.29)	0.30	561.2	10.00
4	619.44	30.72	1.494	0.97(0.29)	0.30	572.1	300.00

 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) = 724.22 Tc(MIN.) = 19.91
 AREA-AVERAGED Fm(INCH/HR) = 0.30 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.31 EFFECTIVE AREA(ACRES) = 491.59

 FLOW PROCESS FROM NODE 323.00 TO NODE 340.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 1000.00 DOWNSTREAM(FEET) = 996.00
 FLOW LENGTH(FEET) = 1430.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 120.0 INCH PIPE IS 91.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.31
 ESTIMATED PIPE DIAMETER(INCH) = 120.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 724.22
 PIPE TRAVEL TIME(MIN.) = 2.11 Tc(MIN.) = 22.02
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.

FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 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.) = 22.02
 RAINFALL INTENSITY (INCH/HR) = 1.82
 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.31
 EFFECTIVE STREAM AREA (ACRES) = 491.59
 TOTAL STREAM AREA (ACRES) = 572.10
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 724.22

 FLOW PROCESS FROM NODE 330.00 TO NODE 331.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

 INITIAL SUBAREA FLOW-LENGTH (FEET) = 930.00
 ELEVATION DATA: UPSTREAM (FEET) = 1064.00 DOWNSTREAM (FEET) = 1055.00

 $T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.834
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.649
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.40	0.98	0.100	32	11.83
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	7.60	0.98	0.500	32	15.14

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA RUNOFF (CFS) = 20.29
 TOTAL AREA (ACRES) = 10.00 PEAK FLOW RATE (CFS) = 20.29

 FLOW PROCESS FROM NODE 331.00 TO NODE 332.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

 UPSTREAM ELEVATION (FEET) = 1055.00 DOWNSTREAM ELEVATION (FEET) = 1052.00
 STREET LENGTH (FEET) = 750.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 36.92
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.69
 HALFSTREET FLOOD WIDTH (FEET) = 27.35
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.58
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.77
 STREET FLOW TRAVEL TIME (MIN.) = 4.85 Tc (MIN.) = 16.68
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.156
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.80	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	1.10	0.98	0.500	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	5.30	0.98	0.200	32
COMMERCIAL	A	5.70	0.98	0.100	32
PUBLIC PARK	A	1.40	0.98	0.850	32
PUBLIC PARK	A	2.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.294
 SUBAREA AREA (ACRES) = 19.70 SUBAREA RUNOFF (CFS) = 33.14
 EFFECTIVE AREA (ACRES) = 29.70 AREA-AVERAGED Fm (INCH/HR) = 0.32
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA (ACRES) = 29.7 PEAK FLOW RATE (CFS) = 48.99

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.75 HALFSTREET FLOOD WIDTH (FEET) = 33.36
 FLOW VELOCITY (FEET/SEC.) = 2.73 DEPTH*VELOCITY (FT*FT/SEC.) = 2.03
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 750.0 FT WITH ELEVATION-DROP = 3.0 FT, IS 39.4 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 332.00
 LONGEST FLOWPATH FROM NODE 330.00 TO NODE 332.00 = 1680.00 FEET.

 FLOW PROCESS FROM NODE 332.00 TO NODE 333.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 1052.00 DOWNSTREAM (FEET) = 1041.00
 FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.43
 ESTIMATED PIPE DIAMETER (INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 48.99
 PIPE TRAVEL TIME (MIN.) = 0.96 Tc (MIN.) = 17.64
 LONGEST FLOWPATH FROM NODE 330.00 TO NODE 333.00 = 2340.00 FEET.

 FLOW PROCESS FROM NODE 333.00 TO NODE 333.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc (MIN.) = 17.64

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.084
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.50	0.98	0.200	32
COMMERCIAL	A	2.90	0.98	0.100	32
PUBLIC PARK	A	8.10	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
 SUBAREA AREA(ACRES) = 35.60 SUBAREA RUNOFF(CFS) = 54.54
 EFFECTIVE AREA(ACRES) = 65.30 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 65.3 PEAK FLOW RATE(CFS) = 101.62

TOTAL AREA(ACRES) = 125.5 PEAK FLOW RATE(CFS) = 185.19

 FLOW PROCESS FROM NODE 334.00 TO NODE 340.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1018.00 DOWNSTREAM(FEET) = 996.00
 FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.48
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 185.19
 PIPE TRAVEL TIME(MIN.) = 1.45 Tc(MIN.) = 20.70
 LONGEST FLOWPATH FROM NODE 330.00 TO NODE 340.00 = 5020.00 FEET.

 FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 20.70
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.894
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	17.10	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	16.50	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	17.40	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	5.10	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.263
 SUBAREA AREA(ACRES) = 56.10 SUBAREA RUNOFF(CFS) = 82.68
 EFFECTIVE AREA(ACRES) = 181.60 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
 TOTAL AREA(ACRES) = 181.6 PEAK FLOW RATE(CFS) = 258.33

 FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 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.) = 20.70
 RAINFALL INTENSITY(INCH/HR) = 1.89
 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.32
 EFFECTIVE STREAM AREA(ACRES) = 181.60
 TOTAL STREAM AREA(ACRES) = 181.60

 FLOW PROCESS FROM NODE 333.00 TO NODE 334.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1041.00 DOWNSTREAM(FEET) = 1018.00
 FLOW LENGTH(FEET) = 1330.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.83
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 101.62
 PIPE TRAVEL TIME(MIN.) = 1.60 Tc(MIN.) = 19.25
 LONGEST FLOWPATH FROM NODE 330.00 TO NODE 334.00 = 3670.00 FEET.

 FLOW PROCESS FROM NODE 334.00 TO NODE 334.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 19.25
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.978
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.60	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.30	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	10.80	0.98	0.200	32
SCHOOL	A	4.80	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.329
 SUBAREA AREA(ACRES) = 60.20 SUBAREA RUNOFF(CFS) = 89.80
 EFFECTIVE AREA(ACRES) = 125.50 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35

PEAK FLOW RATE(CFS) AT CONFLUENCE = 258.33

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	724.22	22.02	1.825	0.98 (0.30)	0.31	491.6	310.00
1	723.88	25.22	1.682	0.97 (0.30)	0.30	544.7	304.00
1	710.76	26.88	1.619	0.97 (0.29)	0.30	561.2	10.00
1	619.44	32.91	1.434	0.97 (0.29)	0.30	572.1	300.00
2	258.33	20.70	1.894	0.98 (0.31)	0.32	181.6	330.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	969.95	20.70	1.894	0.98 (0.30)	0.31	643.7	330.00
2	971.28	22.02	1.825	0.98 (0.30)	0.31	673.2	310.00
3	947.55	25.22	1.682	0.97 (0.30)	0.31	726.3	304.00
4	924.18	26.88	1.619	0.97 (0.30)	0.31	742.8	10.00
5	802.61	32.91	1.434	0.97 (0.30)	0.30	753.7	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 971.28 Tc(MIN.) = 22.02
EFFECTIVE AREA(ACRES) = 673.19 AREA-AVERAGED Fm(INCH/HR) = 0.30
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
TOTAL AREA(ACRES) = 753.7
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.

FLOW PROCESS FROM NODE 340.00 TO NODE 340.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:

RAINFALL (INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
S-GRAPH: VALLEY (DEV.)= 99.5%;VALLEY (UNDEV.)/DESERT= 0.5%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT (UNDEV.)= 0.0%
Tc (HR) = 0.45; LAG (HR) = 0.36; Fm (INCH/HR) = 0.30; Ybar = 0.34
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
3HR = 0.99; 6HR = 1.00; 24HR = 1.00
UNIT-INTERVAL (MIN) = 2.50 TOTAL AREA (ACRES) = 753.7
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 340.00 = 15850.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0238; Lca/L=0.4,n=.0213; Lca/L=0.5,n=.0196;Lca/L=0.6,n=.0183
TIME OF PEAK FLOW (HR) = 16.42 RUNOFF VOLUME (AF) = 197.86
UNIT-HYDROGRAPH METHOD PEAK FLOW RATE (CFS) = 852.58
TOTAL PEAK FLOW RATE (CFS) = 852.58 (SOURCE FLOW INCLUDED)
RATIONAL METHOD PEAK FLOW RATE (CFS) = 971.28
(UPSTREAM NODE PEAK FLOW RATE (CFS) = 971.28)
PEAK FLOW RATE (CFS) USED = 971.28

FLOW PROCESS FROM NODE 340.00 TO NODE 350.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 996.00 DOWNSTREAM (FEET) = 975.00
FLOW LENGTH (FEET) = 1190.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 93.0 INCH PIPE IS 74.2 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 24.06
ESTIMATED PIPE DIAMETER (INCH) = 93.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 971.28
PIPE TRAVEL TIME (MIN.) = 0.82 Tc (MIN.) = 27.71
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 350.00 = 17040.00 FEET.

FLOW PROCESS FROM NODE 350.00 TO NODE 350.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 27.71
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.590
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.00	0.98	0.100	32
COMMERCIAL	A	24.50	0.98	0.100	32
COMMERCIAL	A	10.30	0.98	0.100	32
PUBLIC PARK	A	32.40	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.396
SUBAREA AREA (ACRES) = 82.20
UNIT-HYDROGRAPH DATA:
RAINFALL (INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
S-GRAPH: VALLEY (DEV.)= 99.6%;VALLEY (UNDEV.)/DESERT= 0.4%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT (UNDEV.)= 0.0%
Tc (HR) = 0.46; LAG (HR) = 0.37; Fm (INCH/HR) = 0.31; Ybar = 0.35
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
3HR = 0.99; 6HR = 1.00; 24HR = 1.00
UNIT-INTERVAL (MIN) = 2.50 TOTAL AREA (ACRES) = 835.9
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 350.00 = 17040.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0232; Lca/L=0.4,n=.0208; Lca/L=0.5,n=.0191;Lca/L=0.6,n=.0179
TIME OF PEAK FLOW (HR) = 16.42 RUNOFF VOLUME (AF) = 215.02
UNIT-HYDROGRAPH PEAK FLOW RATE (CFS) = 921.27
TOTAL AREA (ACRES) = 835.9 PEAK FLOW RATE (CFS) = 971.28
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 835.9 TC (MIN.) = 27.71
AREA-AVERAGED Fm (INCH/HR) = 0.31 Ybar = 0.35
PEAK FLOW RATE (CFS) = 971.28

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA C) *
* 100-YEAR HYDROLOGY ANALYSIS *

FILE NAME: ONT6C100.DAT
TIME/DATE OF STUDY: 15:57 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO STREET-CROSSFALL:		CURB GUTTER-GEOMETRIES:				MANNING FACTOR (n)		
	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE	OUT- / SIDE	HEIGHT (FT)	WIDTH (FT)			
1	30.0	20.0	0.018/0.018	0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020	0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.52
30-MINUTES	1.06
1-HOUR	1.40
3-HOUR	2.54
6-HOUR	3.70
24-HOUR	8.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 920.00
ELEVATION DATA: UPSTREAM(FEET) = 1090.00 DOWNSTREAM(FEET) = 1074.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.479
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.989
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	10.48
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	5.00	0.98	0.200	32	11.17
COMMERCIAL	A	2.10	0.98	0.100	32	10.48

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.152
SUBAREA RUNOFF(CFS) = 33.18
TOTAL AREA(ACRES) = 9.60 PEAK FLOW RATE(CFS) = 33.18

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1074.00 DOWNSTREAM ELEVATION(FEET) = 1060.00
STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 68.18
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.67
 HALFSTREET FLOOD WIDTH(FEET) = 26.08
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.00
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.36
 STREET FLOW TRAVEL TIME(MIN.) = 3.00 Tc(MIN.) = 13.48
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.429
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.40	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	6.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.50	0.98	0.200	32
SCHOOL	A	9.30	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.391
 SUBAREA AREA(ACRES) = 25.40 SUBAREA RUNOFF(CFS) = 69.69
 EFFECTIVE AREA(ACRES) = 35.00 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA(ACRES) = 35.0 PEAK FLOW RATE(CFS) = 98.03

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.75 HALFSTREET FLOOD WIDTH(FEET) = 33.67
 FLOW VELOCITY(FEET/SEC.) = 5.39 DEPTH*VELOCITY(FT*FT/SEC.) = 4.04
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 900.0 FT WITH ELEVATION-DROP = 14.0 FT, IS 81.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 202.00
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1820.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1060.00 DOWNSTREAM(FEET) = 1055.00
 FLOW LENGTH(FEET) = 1520.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.23
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 98.03
 PIPE TRAVEL TIME(MIN.) = 3.50 Tc(MIN.) = 16.99
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 3340.00 FEET.

 FLOW PROCESS FROM NODE 203.00 TO NODE 203.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	33.80	0.98	0.500	32

MAINLINE Tc(MIN.) = 16.99
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.985
 SUBAREA LOSS RATE DATA(AMC II):
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.395
 SUBAREA AREA(ACRES) = 45.90 SUBAREA RUNOFF(CFS) = 107.43
 EFFECTIVE AREA(ACRES) = 80.90 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 80.9 PEAK FLOW RATE(CFS) = 191.47

 FLOW PROCESS FROM NODE 203.00 TO NODE 212.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1055.00 DOWNSTREAM(FEET) = 1045.00
 FLOW LENGTH(FEET) = 600.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 41.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.67
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 191.47
 PIPE TRAVEL TIME(MIN.) = 0.64 Tc(MIN.) = 17.62
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 212.00 = 3940.00 FEET.

 FLOW PROCESS FROM NODE 212.00 TO NODE 212.00 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.) = 17.62
 RAINFALL INTENSITY(INCH/HR) = 2.92
 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 80.90
 TOTAL STREAM AREA(ACRES) = 80.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 191.47

 FLOW PROCESS FROM NODE 210.00 TO NODE 211.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 740.00
 ELEVATION DATA: UPSTREAM(FEET) = 1060.00 DOWNSTREAM(FEET) = 1049.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.911
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.124
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.70	0.98	0.100	32	9.91
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	5.70	0.98	0.500	32	12.68

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.408
 SUBAREA RUNOFF(CFS) = 24.82
 TOTAL AREA(ACRES) = 7.40 PEAK FLOW RATE(CFS) = 24.82

 FLOW PROCESS FROM NODE 211.00 TO NODE 212.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1049.00 DOWNSTREAM ELEVATION(FEET) = 1045.00
 STREET LENGTH(FEET) = 1080.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 44.18
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.73
 HALFSTREET FLOOD WIDTH(FEET) = 31.99
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.59
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.90
 STREET FLOW TRAVEL TIME(MIN.) = 6.96 Tc(MIN.) = 16.87
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.998

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.40	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.340
 SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 38.39
 EFFECTIVE AREA(ACRES) = 23.40 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 23.4 PEAK FLOW RATE(CFS) = 55.71

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.78 HALFSTREET FLOOD WIDTH(FEET) = 37.16
 FLOW VELOCITY(FEET/SEC.) = 2.70 DEPTH*VELOCITY(FT*FT/SEC.) = 2.12
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1080.0 FT WITH ELEVATION-DROP = 4.0 FT, IS 41.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 212.00
 LONGEST FLOWPATH FROM NODE 210.00 TO NODE 212.00 = 1820.00 FEET.

 FLOW PROCESS FROM NODE 212.00 TO NODE 212.00 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.) = 16.87
 RAINFALL INTENSITY(INCH/HR) = 3.00
 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 23.40
 TOTAL STREAM AREA(ACRES) = 23.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 55.71

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	191.47	17.62	2.920	0.98(0.36)	0.36	80.9	200.00
2	55.71	16.87	2.998	0.98(0.35)	0.36	23.4	210.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	244.53	16.87	2.998	0.98(0.35)	0.36	100.8	210.00
2	245.54	17.62	2.920	0.98(0.35)	0.36	104.3	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 245.54 Tc(MIN.) = 17.62
 EFFECTIVE AREA(ACRES) = 104.30 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 104.3
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 212.00 = 3940.00 FEET.

 FLOW PROCESS FROM NODE 212.00 TO NODE 216.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1030.00
 FLOW LENGTH(FEET) = 820.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 17.53

ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 245.54
 PIPE TRAVEL TIME(MIN.) = 0.78 Tc(MIN.) = 18.40
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 216.00 = 4760.00 FEET.

 FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 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.) = 18.40
 RAINFALL INTENSITY(INCH/HR) = 2.84
 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 104.30
 TOTAL STREAM AREA(ACRES) = 104.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 245.54

 FLOW PROCESS FROM NODE 213.00 TO NODE 214.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 860.00
 ELEVATION DATA: UPSTREAM(FEET) = 1065.00 DOWNSTREAM(FEET) = 1050.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.865
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.903
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32	10.86
PUBLIC PARK	A	7.90	0.98	0.850	32	16.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.777
 SUBAREA RUNOFF(CFS) = 25.20
 TOTAL AREA(ACRES) = 8.90 PEAK FLOW RATE(CFS) = 25.20

 FLOW PROCESS FROM NODE 214.00 TO NODE 215.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<

=====

UPSTREAM ELEVATION(FEET) = 1050.00 DOWNSTREAM ELEVATION(FEET) = 1038.00
 STREET LENGTH(FEET) = 800.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 52.24

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.63
 HALFSTREET FLOOD WIDTH(FEET) = 23.38
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.62
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.89
 STREET FLOW TRAVEL TIME(MIN.) = 2.89 Tc(MIN.) = 13.75
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.389

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.50	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.50	0.98	0.200	32
PUBLIC PARK	A	19.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.757
 SUBAREA AREA(ACRES) = 22.60 SUBAREA RUNOFF(CFS) = 53.91
 EFFECTIVE AREA(ACRES) = 31.50 AREA-AVERAGED Fm(INCH/HR) = 0.74
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.76
 TOTAL AREA(ACRES) = 31.5 PEAK FLOW RATE(CFS) = 74.98

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.70 HALFSTREET FLOOD WIDTH(FEET) = 28.30
 FLOW VELOCITY(FEET/SEC.) = 5.05 DEPTH*VELOCITY(FT*FT/SEC.) = 3.51
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 800.0 FT WITH ELEVATION-DROP = 12.0 FT, IS 67.4 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 215.00
 LONGEST FLOWPATH FROM NODE 213.00 TO NODE 215.00 = 1660.00 FEET.

 FLOW PROCESS FROM NODE 215.00 TO NODE 216.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1038.00 DOWNSTREAM(FEET) = 1030.00
 FLOW LENGTH(FEET) = 1630.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.82
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 74.98
 PIPE TRAVEL TIME(MIN.) = 3.47 Tc(MIN.) = 17.22
 LONGEST FLOWPATH FROM NODE 213.00 TO NODE 216.00 = 3290.00 FEET.

 FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<


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=====
MAINLINE Tc(MIN.) = 17.22
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.960
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A      3.70    0.98      0.100     32
PUBLIC PARK             A      22.80   0.98      0.850     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.745
SUBAREA AREA(ACRES) = 26.50      SUBAREA RUNOFF(CFS) = 53.27
EFFECTIVE AREA(ACRES) = 58.00    AREA-AVERAGED Fm(INCH/HR) = 0.74
AREA-AVERAGED Fp(INCH/HR) = 0.97  AREA-AVERAGED Ap = 0.75
TOTAL AREA(ACRES) = 58.0      PEAK FLOW RATE(CFS) = 116.11

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FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 17.22
RAINFALL INTENSITY(INCH/HR) = 2.96
AREA-AVERAGED Fm(INCH/HR) = 0.74
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.75
EFFECTIVE STREAM AREA(ACRES) = 58.00
TOTAL STREAM AREA(ACRES) = 58.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 116.11

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** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	244.53	17.65	2.917	0.98(0.35)	0.36	100.8	210.00
1	245.54	18.40	2.845	0.98(0.35)	0.36	104.3	200.00
2	116.11	17.22	2.960	0.97(0.74)	0.75	58.0	213.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	358.76	17.22	2.960	0.97(0.50)	0.51	156.4	213.00
2	358.41	17.65	2.917	0.98(0.49)	0.51	158.8	210.00
3	355.64	18.40	2.845	0.97(0.49)	0.50	162.3	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 358.76 Tc(MIN.) = 17.22
EFFECTIVE AREA(ACRES) = 156.41 AREA-AVERAGED Fm(INCH/HR) = 0.50
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.51
TOTAL AREA(ACRES) = 162.3
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 216.00 = 4760.00 FEET.

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*****
FLOW PROCESS FROM NODE 216.00 TO NODE 222.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 1030.00 DOWNSTREAM(FEET) = 1018.00
FLOW LENGTH(FEET) = 760.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 51.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 18.08
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 358.76
PIPE TRAVEL TIME(MIN.) = 0.70 Tc(MIN.) = 17.93
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 222.00 = 5520.00 FEET.

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FLOW PROCESS FROM NODE 222.00 TO NODE 222.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 17.93
RAINFALL INTENSITY(INCH/HR) = 2.89
AREA-AVERAGED Fm(INCH/HR) = 0.50
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.51
EFFECTIVE STREAM AREA(ACRES) = 156.41
TOTAL STREAM AREA(ACRES) = 162.30
PEAK FLOW RATE(CFS) AT CONFLUENCE = 358.76

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FLOW PROCESS FROM NODE 220.00 TO NODE 221.00 IS CODE = 21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
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INITIAL SUBAREA FLOW-LENGTH(FEET) = 770.00
ELEVATION DATA: UPSTREAM(FEET) = 1035.00 DOWNSTREAM(FEET) = 1024.00

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Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.151
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.066
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS  Tc
LAND USE                GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
COMMERCIAL              A      2.10    0.98      0.100     32  10.15
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A      5.30    0.98      0.500     32  12.99
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
SUBAREA RUNOFF(CFS) = 24.57
TOTAL AREA(ACRES) = 7.40 PEAK FLOW RATE(CFS) = 24.57

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FLOW PROCESS FROM NODE 221.00 TO NODE 222.00 IS CODE = 62

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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

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UPSTREAM ELEVATION(FEET) = 1024.00 DOWNSTREAM ELEVATION(FEET) = 1018.00
STREET LENGTH(FEET) = 520.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 40.34
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.60
HALFSTREET FLOOD WIDTH(FEET) = 22.22
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.94
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.37

STREET FLOW TRAVEL TIME(MIN.) = 2.20 Tc(MIN.) = 12.35
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.614

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.40	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	8.50	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.412
SUBAREA AREA(ACRES) = 10.90 SUBAREA RUNOFF(CFS) = 31.51
EFFECTIVE AREA(ACRES) = 18.30 AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 18.3 PEAK FLOW RATE(CFS) = 53.07

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 24.75
FLOW VELOCITY(FEET/SEC.) = 4.20 DEPTH*VELOCITY(FT*FT/SEC.) = 2.74
LONGEST FLOWPATH FROM NODE 220.00 TO NODE 222.00 = 1290.00 FEET.

FLOW PROCESS FROM NODE 222.00 TO NODE 222.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 12.35
RAINFALL INTENSITY(INCH/HR) = 3.61
AREA-AVERAGED Fm(INCH/HR) = 0.39
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.40

EFFECTIVE STREAM AREA(ACRES) = 18.30
TOTAL STREAM AREA(ACRES) = 18.30
PEAK FLOW RATE(CFS) AT CONFLUENCE = 53.07

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	358.76	17.93	2.890	0.97(0.50)	0.51	156.4	213.00
1	358.41	18.35	2.850	0.98(0.49)	0.51	158.8	210.00
1	355.64	19.10	2.782	0.97(0.49)	0.50	162.3	200.00
2	53.07	12.35	3.614	0.97(0.39)	0.40	18.3	220.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	375.01	12.35	3.614	0.97(0.48)	0.49	126.1	220.00
2	399.92	17.93	2.890	0.97(0.49)	0.50	174.7	213.00
3	398.90	18.35	2.850	0.98(0.48)	0.50	177.1	210.00
4	395.00	19.10	2.782	0.97(0.48)	0.49	180.6	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 399.92 Tc(MIN.) = 17.93
EFFECTIVE AREA(ACRES) = 174.71 AREA-AVERAGED Fm(INCH/HR) = 0.49
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.50
TOTAL AREA(ACRES) = 180.6
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 222.00 = 5520.00 FEET.

FLOW PROCESS FROM NODE 222.00 TO NODE 225.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1018.00 DOWNSTREAM(FEET) = 1008.00
FLOW LENGTH(FEET) = 580.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 69.0 INCH PIPE IS 51.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.35
ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 399.92
PIPE TRAVEL TIME(MIN.) = 0.50 Tc(MIN.) = 18.42
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 225.00 = 6100.00 FEET.

FLOW PROCESS FROM NODE 225.00 TO NODE 225.00 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.) = 18.42
RAINFALL INTENSITY(INCH/HR) = 2.84
AREA-AVERAGED Fm(INCH/HR) = 0.49
AREA-AVERAGED Fp(INCH/HR) = 0.97

AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 174.71
 TOTAL STREAM AREA(ACRES) = 180.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 399.92

 FLOW PROCESS FROM NODE 223.00 TO NODE 224.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 620.00
 ELEVATION DATA: UPSTREAM(FEET) = 1019.00 DOWNSTREAM(FEET) = 1009.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.085
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.345

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.30	0.98	0.100	32	9.08
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	4.90	0.98	0.500	32	11.62

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
 SUBAREA RUNOFF(CFS) = 25.81
 TOTAL AREA(ACRES) = 7.20 PEAK FLOW RATE(CFS) = 25.81

 FLOW PROCESS FROM NODE 224.00 TO NODE 225.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1009.00 DOWNSTREAM ELEVATION(FEET) = 1008.00
 STREET LENGTH(FEET) = 580.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 36.50
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.77
 HALFSTREET FLOOD WIDTH(FEET) = 36.21
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.83
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.42
 STREET FLOW TRAVEL TIME(MIN.) = 5.28 Tc(MIN.) = 14.37

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.300
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.00	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	5.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
 SUBAREA AREA(ACRES) = 8.00 SUBAREA RUNOFF(CFS) = 21.31
 EFFECTIVE AREA(ACRES) = 15.20 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 15.2 PEAK FLOW RATE(CFS) = 40.34

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.80 HALFSTREET FLOOD WIDTH(FEET) = 38.53
 FLOW VELOCITY(FEET/SEC.) = 1.86 DEPTH*VELOCITY(FT*FT/SEC.) = 1.48
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 580.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 21.9 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 225.00
 LONGEST FLOWPATH FROM NODE 223.00 TO NODE 225.00 = 1200.00 FEET.

 FLOW PROCESS FROM NODE 225.00 TO NODE 225.00 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.) = 14.37
 RAINFALL INTENSITY(INCH/HR) = 3.30
 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 15.20
 TOTAL STREAM AREA(ACRES) = 15.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 40.34

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	375.01	12.86	3.527	0.97(0.48)	0.49	126.1	220.00
1	399.92	18.42	2.843	0.97(0.49)	0.50	174.7	213.00
1	398.90	18.85	2.805	0.98(0.48)	0.50	177.1	210.00
1	395.00	19.60	2.739	0.97(0.48)	0.49	180.6	200.00
2	40.34	14.37	3.300	0.98(0.35)	0.36	15.2	223.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	413.90	12.86	3.527	0.97(0.47)	0.48	139.7	220.00
2	422.09	14.37	3.300	0.97(0.47)	0.48	154.4	223.00
3	434.00	18.42	2.843	0.97(0.47)	0.49	189.9	213.00
4	432.46	18.85	2.805	0.98(0.47)	0.49	192.3	210.00

5 427.66 19.60 2.739 0.97(0.47) 0.48 195.8 200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 434.00 Tc(MIN.) = 18.42
EFFECTIVE AREA(ACRES) = 189.91 AREA-AVERAGED Fm(INCH/HR) = 0.47
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.49
TOTAL AREA(ACRES) = 195.8
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 225.00 = 6100.00 FEET.

FLOW PROCESS FROM NODE 225.00 TO NODE 229.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1008.00 DOWNSTREAM(FEET) = 1000.00
FLOW LENGTH(FEET) = 540.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 72.0 INCH PIPE IS 55.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 18.54
ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 434.00
PIPE TRAVEL TIME(MIN.) = 0.49 Tc(MIN.) = 18.91
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 229.00 = 6640.00 FEET.

FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 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.) = 18.91
RAINFALL INTENSITY(INCH/HR) = 2.80
AREA-AVERAGED Fm(INCH/HR) = 0.47
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.49
EFFECTIVE STREAM AREA(ACRES) = 189.91
TOTAL STREAM AREA(ACRES) = 195.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 434.00

FLOW PROCESS FROM NODE 226.00 TO NODE 227.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1060.00
ELEVATION DATA: UPSTREAM(FEET) = 1038.00 DOWNSTREAM(FEET) = 1020.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.143
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.844
SUBAREA Tc AND LOSS RATE DATA(AMC II):

Table with 8 columns: DEVELOPMENT TYPE/, SCS SOIL, AREA, Fp, Ap, SCS, Tc. Row 1: COMMERCIAL, A, 1.60, 0.98, 0.100, 32, 11.14

RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 5.00 0.98 0.500 32 14.26
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403
SUBAREA RUNOFF(CFS) = 20.50
TOTAL AREA(ACRES) = 6.60 PEAK FLOW RATE(CFS) = 20.50

FLOW PROCESS FROM NODE 227.00 TO NODE 228.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1020.00 DOWNSTREAM ELEVATION(FEET) = 1015.00
STREET LENGTH(FEET) = 690.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 43.39
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.66
HALFSTREET FLOOD WIDTH(FEET) = 25.07
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.35
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.21
STREET FLOW TRAVEL TIME(MIN.) = 3.43 Tc(MIN.) = 14.57
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.272

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 5.70 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 11.70 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.369
SUBAREA AREA(ACRES) = 17.40 SUBAREA RUNOFF(CFS) = 45.61
EFFECTIVE AREA(ACRES) = 24.00 AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.38
TOTAL AREA(ACRES) = 24.0 PEAK FLOW RATE(CFS) = 62.72

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 32.30
FLOW VELOCITY(FEET/SEC.) = 3.63 DEPTH*VELOCITY(FT*FT/SEC.) = 2.67
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 690.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 54.6 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 228.00
LONGEST FLOWPATH FROM NODE 226.00 TO NODE 228.00 = 1750.00 FEET.

```

FLOW PROCESS FROM NODE 228.00 TO NODE 229.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 1000.00
FLOW LENGTH(FEET) = 1900.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.00
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 62.72
PIPE TRAVEL TIME(MIN.) = 3.52 Tc(MIN.) = 18.09
LONGEST FLOWPATH FROM NODE 226.00 TO NODE 229.00 = 3650.00 FEET.

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*****
FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 IS CODE = 81
-----

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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 18.09
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.874
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.50 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 18.90 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
SUBAREA AREA(ACRES) = 26.40 SUBAREA RUNOFF(CFS) = 59.34
EFFECTIVE AREA(ACRES) = 50.40 AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.38
TOTAL AREA(ACRES) = 50.4 PEAK FLOW RATE(CFS) = 113.46

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```

*****
FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 IS CODE = 1
-----

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```

>>>>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.) = 18.09
RAINFALL INTENSITY(INCH/HR) = 2.87
AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.38
EFFECTIVE STREAM AREA(ACRES) = 50.40
TOTAL STREAM AREA(ACRES) = 50.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 113.46

```

```

** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 413.90 13.35 3.449 0.97( 0.47) 0.48 139.7 220.00
1 422.09 14.85 3.235 0.97( 0.47) 0.48 154.4 223.00

```

```

1 434.00 18.91 2.799 0.97( 0.47) 0.49 189.9 213.00
1 432.46 19.33 2.762 0.98( 0.47) 0.49 192.3 210.00
1 427.66 20.09 2.699 0.97( 0.47) 0.48 195.8 200.00
2 113.46 18.09 2.874 0.97( 0.37) 0.38 50.4 226.00

```

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

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** PEAK FLOW RATE TABLE **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 516.88 13.35 3.449 0.97( 0.45) 0.46 176.9 220.00
2 528.70 14.85 3.235 0.97( 0.45) 0.46 195.8 223.00
3 545.06 18.09 2.874 0.97( 0.45) 0.46 233.1 226.00
4 544.04 18.91 2.799 0.97( 0.45) 0.46 240.3 213.00
5 540.83 19.33 2.762 0.98( 0.45) 0.46 242.7 210.00
6 533.18 20.09 2.699 0.97( 0.45) 0.46 246.2 200.00

```

```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 545.06 Tc(MIN.) = 18.09
EFFECTIVE AREA(ACRES) = 233.14 AREA-AVERAGED Fm(INCH/HR) = 0.45
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.46
TOTAL AREA(ACRES) = 246.2
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 229.00 = 6640.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 229.00 TO NODE 234.00 IS CODE = 31
-----

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```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1000.00 DOWNSTREAM(FEET) = 995.00
FLOW LENGTH(FEET) = 340.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 78.0 INCH PIPE IS 61.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.51
ESTIMATED PIPE DIAMETER(INCH) = 78.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 545.06
PIPE TRAVEL TIME(MIN.) = 0.29 Tc(MIN.) = 18.38
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 234.00 = 6980.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 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.) = 18.38
RAINFALL INTENSITY(INCH/HR) = 2.85
AREA-AVERAGED Fm(INCH/HR) = 0.45
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.46
EFFECTIVE STREAM AREA(ACRES) = 233.14
TOTAL STREAM AREA(ACRES) = 246.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 545.06

```

```
*****
FLOW PROCESS FROM NODE 230.00 TO NODE 231.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 720.00
ELEVATION DATA: UPSTREAM(FEET) = 1042.00 DOWNSTREAM(FEET) = 1028.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.291
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.287
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA  Fp      Ap      SCS  Tc
LAND USE              GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL            A        1.90   0.98    0.100   32   9.29
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A        5.80   0.98    0.500   32  11.89
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
SUBAREA RUNOFF(CFS) = 27.00
TOTAL AREA(ACRES) = 7.70 PEAK FLOW RATE(CFS) = 27.00
```

```
*****
FLOW PROCESS FROM NODE 231.00 TO NODE 232.00 IS CODE = 62
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 1028.00 DOWNSTREAM ELEVATION(FEET) = 1014.00
STREET LENGTH(FEET) = 820.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
```

```
**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 43.52
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.58
HALFSTREET FLOOD WIDTH(FEET) = 21.22
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.64
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.70
STREET FLOW TRAVEL TIME(MIN.) = 2.95 Tc(MIN.) = 12.24
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.634
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA  Fp      Ap      SCS
LAND USE              GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL            A        3.50   0.98    0.100   32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A        7.70   0.98    0.500   32
```

```
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
SUBAREA AREA(ACRES) = 11.20 SUBAREA RUNOFF(CFS) = 32.95
EFFECTIVE AREA(ACRES) = 18.90 AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
TOTAL AREA(ACRES) = 18.9 PEAK FLOW RATE(CFS) = 55.42

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 23.33
FLOW VELOCITY(FEET/SEC.) = 4.92 DEPTH*VELOCITY(FT*FT/SEC.) = 3.07
LONGEST FLOWPATH FROM NODE 230.00 TO NODE 232.00 = 1540.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE 232.00 TO NODE 233.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1014.00 DOWNSTREAM(FEET) = 1000.00
FLOW LENGTH(FEET) = 850.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 24.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.59
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 55.42
PIPE TRAVEL TIME(MIN.) = 1.22 Tc(MIN.) = 13.46
LONGEST FLOWPATH FROM NODE 230.00 TO NODE 233.00 = 2390.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE 233.00 TO NODE 233.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 13.46
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.432
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA  Fp      Ap      SCS
LAND USE              GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL            A        5.50   0.98    0.100   32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A        7.70   0.98    0.500   32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A        5.60   0.98    0.200   32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.294
SUBAREA AREA(ACRES) = 18.80 SUBAREA RUNOFF(CFS) = 53.23
EFFECTIVE AREA(ACRES) = 37.70 AREA-AVERAGED Fm(INCH/HR) = 0.33
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
TOTAL AREA(ACRES) = 37.7 PEAK FLOW RATE(CFS) = 105.22
```

```
*****
FLOW PROCESS FROM NODE 233.00 TO NODE 234.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1000.00 DOWNSTREAM(FEET) = 995.00
```

FLOW LENGTH (FEET) = 1780.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 45.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 6.93
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 105.22
 PIPE TRAVEL TIME (MIN.) = 4.28 Tc (MIN.) = 17.74
 LONGEST FLOWPATH FROM NODE 230.00 TO NODE 234.00 = 4170.00 FEET.

2 121.56 17.74 2.908 0.98 (0.31) 0.32 52.0 230.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	628.23	13.64	3.404	0.98 (0.42)	0.43	216.9	220.00
2	644.04	15.15	3.198	0.98 (0.42)	0.43	240.2	223.00
3	663.39	17.74	2.908	0.97 (0.42)	0.44	277.8	230.00
4	663.77	18.38	2.847	0.97 (0.43)	0.44	285.1	226.00
5	659.31	19.20	2.774	0.97 (0.43)	0.44	292.3	213.00
6	654.41	19.62	2.737	0.97 (0.43)	0.44	294.7	210.00
7	643.88	20.38	2.676	0.97 (0.43)	0.44	298.2	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 663.77 Tc (MIN.) = 18.38
 EFFECTIVE AREA (ACRES) = 285.14 AREA-AVERAGED Fm (INCH/HR) = 0.43
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.44
 TOTAL AREA (ACRES) = 298.2
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 234.00 = 6980.00 FEET.

FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc (MIN.) = 17.74

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.908

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.10	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	4.00	0.98	0.500	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	7.20	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.262

SUBAREA AREA (ACRES) = 14.30 SUBAREA RUNOFF (CFS) = 34.14

EFFECTIVE AREA (ACRES) = 52.00 AREA-AVERAGED Fm (INCH/HR) = 0.31

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32

TOTAL AREA (ACRES) = 52.0 PEAK FLOW RATE (CFS) = 121.56

FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 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.) = 17.74

RAINFALL INTENSITY (INCH/HR) = 2.91

AREA-AVERAGED Fm (INCH/HR) = 0.31

AREA-AVERAGED Fp (INCH/HR) = 0.98

AREA-AVERAGED Ap = 0.32

EFFECTIVE STREAM AREA (ACRES) = 52.00

TOTAL STREAM AREA (ACRES) = 52.00

PEAK FLOW RATE (CFS) AT CONFLUENCE = 121.56

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	516.88	13.64	3.404	0.97 (0.45)	0.46	176.9	220.00
1	528.70	15.15	3.198	0.97 (0.45)	0.46	195.8	223.00
1	545.06	18.38	2.847	0.97 (0.45)	0.46	233.1	226.00
1	544.04	19.20	2.774	0.97 (0.45)	0.46	240.3	213.00
1	540.83	19.62	2.737	0.98 (0.45)	0.46	242.7	210.00
1	533.18	20.38	2.676	0.97 (0.45)	0.46	246.2	200.00

FLOW PROCESS FROM NODE 234.00 TO NODE 242.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<

ELEVATION DATA: UPSTREAM (FEET) = 995.00 DOWNSTREAM (FEET) = 988.00

FLOW LENGTH (FEET) = 480.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 84.0 INCH PIPE IS 66.1 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 20.42

ESTIMATED PIPE DIAMETER (INCH) = 84.00 NUMBER OF PIPES = 1

PIPE-FLOW (CFS) = 663.77

PIPE TRAVEL TIME (MIN.) = 0.39 Tc (MIN.) = 18.77

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 242.00 = 7460.00 FEET.

FLOW PROCESS FROM NODE 242.00 TO NODE 242.00 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.) = 18.77

RAINFALL INTENSITY (INCH/HR) = 2.81

AREA-AVERAGED Fm (INCH/HR) = 0.43

AREA-AVERAGED Fp (INCH/HR) = 0.97

AREA-AVERAGED Ap = 0.44

EFFECTIVE STREAM AREA (ACRES) = 285.14

TOTAL STREAM AREA (ACRES) = 298.20

PEAK FLOW RATE (CFS) AT CONFLUENCE = 663.77

FLOW PROCESS FROM NODE 240.00 TO NODE 241.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00
 ELEVATION DATA: UPSTREAM(FEET) = 1005.00 DOWNSTREAM(FEET) = 995.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.102
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.658

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.60	0.98	0.100	32	12.10
COMMERCIAL	A	6.80	0.98	0.100	32	12.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 33.33
 TOTAL AREA(ACRES) = 10.40 PEAK FLOW RATE(CFS) = 33.33

 FLOW PROCESS FROM NODE 241.00 TO NODE 242.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION(FEET) = 995.00 DOWNSTREAM ELEVATION(FEET) = 988.00
 STREET LENGTH(FEET) = 2080.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 56.12
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.80
 HALFSTREET FLOOD WIDTH(FEET) = 38.42
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.60
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.07
 STREET FLOW TRAVEL TIME(MIN.) = 13.34 Tc(MIN.) = 25.45
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.342

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.30	0.98	0.100	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	17.50	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.177
 SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 44.53

EFFECTIVE AREA(ACRES) = 33.20 AREA-AVERAGED Fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.15
 TOTAL AREA(ACRES) = 33.2 PEAK FLOW RATE(CFS) = 65.54

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.83 HALFSTREET FLOOD WIDTH(FEET) = 40.01
 FLOW VELOCITY(FEET/SEC.) = 2.73 DEPTH*VELOCITY(FT*FT/SEC.) = 2.26
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 2080.0 FT WITH ELEVATION-DROP = 7.0 FT, IS 51.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 242.00
 LONGEST FLOWPATH FROM NODE 240.00 TO NODE 242.00 = 3080.00 FEET.

 FLOW PROCESS FROM NODE 242.00 TO NODE 242.00 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.) = 25.45
 RAINFALL INTENSITY(INCH/HR) = 2.34
 AREA-AVERAGED Fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.15
 EFFECTIVE STREAM AREA(ACRES) = 33.20
 TOTAL STREAM AREA(ACRES) = 33.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 65.54

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	628.23	14.04	3.347	0.98(0.42)	0.43	216.9	220.00
1	644.04	15.54	3.149	0.98(0.42)	0.43	240.2	223.00
1	663.39	18.14	2.870	0.97(0.42)	0.44	277.8	230.00
1	663.77	18.77	2.811	0.97(0.43)	0.44	285.1	226.00
1	659.31	19.59	2.740	0.97(0.43)	0.44	292.3	213.00
1	654.41	20.02	2.705	0.97(0.43)	0.44	294.7	210.00
1	643.88	20.77	2.645	0.97(0.43)	0.44	298.2	200.00
2	65.54	25.45	2.342	0.98(0.15)	0.15	33.2	240.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	680.95	14.04	3.347	0.98(0.40)	0.41	235.2	220.00
2	698.78	15.54	3.149	0.98(0.40)	0.41	260.5	223.00
3	721.34	18.14	2.870	0.97(0.40)	0.41	301.4	230.00
4	722.46	18.77	2.811	0.97(0.40)	0.41	309.6	226.00
5	718.93	19.59	2.740	0.98(0.41)	0.42	317.9	213.00
6	714.49	20.02	2.705	0.97(0.40)	0.41	320.8	210.00
7	704.78	20.77	2.645	0.97(0.40)	0.41	325.3	200.00
8	621.46	25.45	2.342	0.97(0.40)	0.41	331.4	240.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 722.46 Tc(MIN.) = 18.77
 EFFECTIVE AREA(ACRES) = 309.64 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 331.4
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 242.00 = 7460.00 FEET.

 FLOW PROCESS FROM NODE 242.00 TO NODE 253.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 988.00 DOWNSTREAM(FEET) = 978.00
 FLOW LENGTH(FEET) = 530.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 63.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 23.14
 ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 722.46
 PIPE TRAVEL TIME(MIN.) = 0.38 Tc(MIN.) = 19.15
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 253.00 = 7990.00 FEET.

 FLOW PROCESS FROM NODE 253.00 TO NODE 253.00 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.) = 19.15
 RAINFALL INTENSITY(INCH/HR) = 2.78
 AREA-AVERAGED Fm(INCH/HR) = 0.40
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.41
 EFFECTIVE STREAM AREA(ACRES) = 309.64
 TOTAL STREAM AREA(ACRES) = 331.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 722.46

 FLOW PROCESS FROM NODE 250.00 TO NODE 251.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 930.00
 ELEVATION DATA: UPSTREAM(FEET) = 996.00 DOWNSTREAM(FEET) = 986.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.587
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.755
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	7.50	0.98	0.100	32	11.59
COMMERCIAL	A	1.50	0.98	0.100	32	11.59

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 29.63
 TOTAL AREA(ACRES) = 9.00 PEAK FLOW RATE(CFS) = 29.63

 FLOW PROCESS FROM NODE 251.00 TO NODE 252.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION(FEET) = 986.00 DOWNSTREAM ELEVATION(FEET) = 981.00
 STREET LENGTH(FEET) = 940.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 42.99
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.69
 HALFSTREET FLOOD WIDTH(FEET) = 27.56
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.98
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.05
 STREET FLOW TRAVEL TIME(MIN.) = 5.26 Tc(MIN.) = 16.85
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.000

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.00	0.98	0.100	32
COMMERCIAL	A	2.20	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 10.20 SUBAREA RUNOFF(CFS) = 26.64
 EFFECTIVE AREA(ACRES) = 19.20 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 19.2 PEAK FLOW RATE(CFS) = 50.15

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.72 HALFSTREET FLOOD WIDTH(FEET) = 30.83
 FLOW VELOCITY(FEET/SEC.) = 3.07 DEPTH*VELOCITY(FT*FT/SEC.) = 2.21
 LONGEST FLOWPATH FROM NODE 250.00 TO NODE 252.00 = 1870.00 FEET.

 FLOW PROCESS FROM NODE 252.00 TO NODE 253.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION(FEET) = 981.00 DOWNSTREAM ELEVATION(FEET) = 978.00
 STREET LENGTH(FEET) = 1280.00 CURB HEIGHT(INCHES) = 8.0


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=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 19.71
RAINFALL INTENSITY (INCH/HR) = 2.73
AREA-AVERAGED Fm (INCH/HR) = 0.38
AREA-AVERAGED Fp (INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.39
EFFECTIVE STREAM AREA (ACRES) = 335.36
TOTAL STREAM AREA (ACRES) = 365.90
PEAK FLOW RATE (CFS) AT CONFLUENCE = 784.50

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*****
FLOW PROCESS FROM NODE 260.00 TO NODE 261.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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=====
INITIAL SUBAREA FLOW-LENGTH (FEET) = 880.00
ELEVATION DATA: UPSTREAM (FEET) = 990.00 DOWNSTREAM (FEET) = 980.00

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Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.209
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.831
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS   Tc
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL          A       5.80   0.98  0.100  32   11.21
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 19.49
TOTAL AREA (ACRES) = 5.80 PEAK FLOW RATE (CFS) = 19.49

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*****
FLOW PROCESS FROM NODE 261.00 TO NODE 262.00 IS CODE = 62
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

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=====
UPSTREAM ELEVATION (FEET) = 980.00 DOWNSTREAM ELEVATION (FEET) = 975.00
STREET LENGTH (FEET) = 320.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

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SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 29.72
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.53
HALFSTREET FLOOD WIDTH (FEET) = 18.58

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AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.08
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.16
STREET FLOW TRAVEL TIME (MIN.) = 1.31 Tc (MIN.) = 12.52
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.585
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       0.50   0.98  0.100  32
PUBLIC PARK         A       7.60   0.98  0.850  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.804
SUBAREA AREA (ACRES) = 8.10 SUBAREA RUNOFF (CFS) = 20.43
EFFECTIVE AREA (ACRES) = 13.90 AREA-AVERAGED Fm (INCH/HR) = 0.50
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51
TOTAL AREA (ACRES) = 13.9 PEAK FLOW RATE (CFS) = 38.63

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END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.57 HALFSTREET FLOOD WIDTH (FEET) = 20.58
FLOW VELOCITY (FEET/SEC.) = 4.36 DEPTH*VELOCITY (FT*FT/SEC.) = 2.49
LONGEST FLOWPATH FROM NODE 260.00 TO NODE 262.00 = 1200.00 FEET.

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*****
FLOW PROCESS FROM NODE 262.00 TO NODE 263.00 IS CODE = 62
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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

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=====
UPSTREAM ELEVATION (FEET) = 975.00 DOWNSTREAM ELEVATION (FEET) = 970.00
STREET LENGTH (FEET) = 1000.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

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```

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 54.65
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.75
HALFSTREET FLOOD WIDTH (FEET) = 33.36
AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.04
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.27
STREET FLOW TRAVEL TIME (MIN.) = 5.48 Tc (MIN.) = 18.00
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.883
SUBAREA LOSS RATE DATA (AMC II):

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DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       0.50   0.98  0.100  32
COMMERCIAL          A       6.40   0.98  0.100  32
PUBLIC PARK         A       7.90   0.98  0.850  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.500

```

SUBAREA AREA (ACRES) = 14.80 SUBAREA RUNOFF (CFS) = 31.91
 EFFECTIVE AREA (ACRES) = 28.70 AREA-AVERAGED Fm (INCH/HR) = 0.49
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51
 TOTAL AREA (ACRES) = 28.7 PEAK FLOW RATE (CFS) = 61.76

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.77 HALFSTREET FLOOD WIDTH (FEET) = 36.00
 FLOW VELOCITY (FEET/SEC.) = 3.12 DEPTH*VELOCITY (FT*FT/SEC.) = 2.41
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1000.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 38.3 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 263.00
 LONGEST FLOWPATH FROM NODE 260.00 TO NODE 263.00 = 2200.00 FEET.

FLOW PROCESS FROM NODE 263.00 TO NODE 264.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 970.00 DOWNSTREAM (FEET) = 968.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 40.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 4.87
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 61.76
 PIPE TRAVEL TIME (MIN.) = 4.51 Tc (MIN.) = 22.51
 LONGEST FLOWPATH FROM NODE 260.00 TO NODE 264.00 = 3520.00 FEET.

FLOW PROCESS FROM NODE 264.00 TO NODE 264.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 22.51
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.521
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.00	0.98	0.100	32
COMMERCIAL	A	8.60	0.98	0.100	32
PUBLIC PARK	A	10.70	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.495
 SUBAREA AREA (ACRES) = 20.30 SUBAREA RUNOFF (CFS) = 37.24
 EFFECTIVE AREA (ACRES) = 49.00 AREA-AVERAGED Fm (INCH/HR) = 0.49
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.50
 TOTAL AREA (ACRES) = 49.0 PEAK FLOW RATE (CFS) = 89.64

FLOW PROCESS FROM NODE 264.00 TO NODE 264.00 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.) = 22.51
 RAINFALL INTENSITY (INCH/HR) = 2.52
 AREA-AVERAGED Fm (INCH/HR) = 0.49
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA (ACRES) = 49.00
 TOTAL STREAM AREA (ACRES) = 49.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 89.64

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	736.66	14.99	3.217	0.98 (0.38)	0.39	254.6	220.00
1	756.63	16.48	3.040	0.97 (0.38)	0.39	281.9	223.00
1	782.60	19.07	2.785	0.97 (0.38)	0.39	326.3	230.00
1	784.50	19.71	2.730	0.97 (0.38)	0.39	335.4	226.00
1	781.96	20.53	2.665	0.98 (0.38)	0.39	344.7	213.00
1	778.03	20.95	2.632	0.97 (0.38)	0.39	348.2	210.00
1	769.21	21.72	2.576	0.98 (0.38)	0.39	353.7	200.00
1	693.53	26.26	2.299	0.97 (0.37)	0.38	365.7	250.00
1	690.49	26.42	2.290	0.97 (0.37)	0.38	365.9	240.00
2	89.64	22.51	2.521	0.97 (0.49)	0.50	49.0	260.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	816.81	14.99	3.217	0.98 (0.39)	0.40	287.2	220.00
2	839.00	16.48	3.040	0.97 (0.39)	0.40	317.8	223.00
3	868.39	19.07	2.785	0.97 (0.39)	0.40	367.8	230.00
4	871.06	19.71	2.730	0.97 (0.39)	0.40	378.3	226.00
5	869.47	20.53	2.665	0.98 (0.39)	0.40	389.4	213.00
6	866.01	20.95	2.632	0.97 (0.39)	0.40	393.8	210.00
7	858.02	21.72	2.576	0.97 (0.39)	0.40	401.0	200.00
8	845.62	22.51	2.521	0.97 (0.39)	0.40	404.8	260.00
9	773.36	26.26	2.299	0.97 (0.38)	0.39	414.7	250.00
10	769.93	26.42	2.290	0.97 (0.38)	0.39	414.9	240.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 871.06 Tc (MIN.) = 19.71
 EFFECTIVE AREA (ACRES) = 378.26 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 414.9
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 264.00 = 8650.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 414.9 TC (MIN.) = 19.71
 EFFECTIVE AREA (ACRES) = 378.26 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.403
 PEAK FLOW RATE (CFS) = 871.06

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
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1	816.81	14.99	3.217	0.98 (0.39)	0.40	287.2	220.00
2	839.00	16.48	3.040	0.97 (0.39)	0.40	317.8	223.00
3	868.39	19.07	2.785	0.97 (0.39)	0.40	367.8	230.00
4	871.06	19.71	2.730	0.97 (0.39)	0.40	378.3	226.00
5	869.47	20.53	2.665	0.98 (0.39)	0.40	389.4	213.00
6	866.01	20.95	2.632	0.97 (0.39)	0.40	393.8	210.00
7	858.02	21.72	2.576	0.97 (0.39)	0.40	401.0	200.00
8	845.62	22.51	2.521	0.97 (0.39)	0.40	404.8	260.00
9	773.36	26.26	2.299	0.97 (0.38)	0.39	414.7	250.00
10	769.93	26.42	2.290	0.97 (0.38)	0.39	414.9	240.00

=====
 END OF RATIONAL METHOD ANALYSIS
 =====

INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 54.07

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.63
HALFSTREET FLOOD WIDTH(FEET) = 23.54
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.72
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.97
STREET FLOW TRAVEL TIME(MIN.) = 3.18 Tc(MIN.) = 13.66
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.762

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.40	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	6.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.50	0.98	0.200	32
SCHOOL	A	9.30	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.391
SUBAREA AREA(ACRES) = 25.40 SUBAREA RUNOFF(CFS) = 54.44
EFFECTIVE AREA(ACRES) = 35.00 AREA-AVERAGED Fm(INCH/HR) = 0.32
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
TOTAL AREA(ACRES) = 35.0 PEAK FLOW RATE(CFS) = 77.02

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.70 HALFSTREET FLOOD WIDTH(FEET) = 28.51
FLOW VELOCITY(FEET/SEC.) = 5.15 DEPTH*VELOCITY(FT*FT/SEC.) = 3.59
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1820.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1060.00 DOWNSTREAM(FEET) = 1055.00
FLOW LENGTH(FEET) = 1520.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.90
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 77.02
PIPE TRAVEL TIME(MIN.) = 3.67 Tc(MIN.) = 17.33
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 3340.00 FEET.

FLOW PROCESS FROM NODE 203.00 TO NODE 203.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 17.33
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.394
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	33.80	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.395
SUBAREA AREA(ACRES) = 45.90 SUBAREA RUNOFF(CFS) = 83.02
EFFECTIVE AREA(ACRES) = 80.90 AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
TOTAL AREA(ACRES) = 80.9 PEAK FLOW RATE(CFS) = 148.45

FLOW PROCESS FROM NODE 203.00 TO NODE 212.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1055.00 DOWNSTREAM(FEET) = 1045.00
FLOW LENGTH(FEET) = 600.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.93
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 148.45
PIPE TRAVEL TIME(MIN.) = 0.67 Tc(MIN.) = 18.00
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 212.00 = 3940.00 FEET.

FLOW PROCESS FROM NODE 212.00 TO NODE 212.00 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.) = 18.00
RAINFALL INTENSITY(INCH/HR) = 2.34
AREA-AVERAGED Fm(INCH/HR) = 0.36
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.36
EFFECTIVE STREAM AREA(ACRES) = 80.90
TOTAL STREAM AREA(ACRES) = 80.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 148.45

FLOW PROCESS FROM NODE 210.00 TO NODE 211.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 740.00
ELEVATION DATA: UPSTREAM(FEET) = 1060.00 DOWNSTREAM(FEET) = 1049.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.911
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.348
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.70	0.98	0.100	32	9.91
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	5.70	0.98	0.500	32	12.68

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.408
 SUBAREA RUNOFF(CFS) = 19.65
 TOTAL AREA(ACRES) = 7.40 PEAK FLOW RATE(CFS) = 19.65

 FLOW PROCESS FROM NODE 211.00 TO NODE 212.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====
 UPSTREAM ELEVATION(FEET) = 1049.00 DOWNSTREAM ELEVATION(FEET) = 1045.00
 STREET LENGTH(FEET) = 1080.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 34.72
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.68
 HALFSTREET FLOOD WIDTH(FEET) = 26.92
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.46
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.68
 STREET FLOW TRAVEL TIME(MIN.) = 7.30 Tc(MIN.) = 17.22
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.404

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.40	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	9.60	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.340
 SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 29.84
 EFFECTIVE AREA(ACRES) = 23.40 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 23.4 PEAK FLOW RATE(CFS) = 43.20

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.73 HALFSTREET FLOOD WIDTH(FEET) = 31.46

FLOW VELOCITY(FEET/SEC.) = 2.58 DEPTH*VELOCITY(FT*FT/SEC.) = 1.88
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1080.0 FT WITH ELEVATION-DROP = 4.0 FT, IS 32.5 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 212.00
 LONGEST FLOWPATH FROM NODE 210.00 TO NODE 212.00 = 1820.00 FEET.

 FLOW PROCESS FROM NODE 212.00 TO NODE 212.00 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.) = 17.22
 RAINFALL INTENSITY(INCH/HR) = 2.40
 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 23.40
 TOTAL STREAM AREA(ACRES) = 23.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 43.20

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	148.45	18.00	2.340	0.98(0.36)	0.36	80.9	200.00
2	43.20	17.22	2.404	0.98(0.35)	0.36	23.4	210.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	189.72	17.22	2.404	0.97(0.35)	0.36	100.8	210.00
2	190.32	18.00	2.340	0.98(0.35)	0.36	104.3	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 190.32 Tc(MIN.) = 18.00
 EFFECTIVE AREA(ACRES) = 104.30 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 104.3
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 212.00 = 3940.00 FEET.

 FLOW PROCESS FROM NODE 212.00 TO NODE 216.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1030.00
 FLOW LENGTH(FEET) = 820.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 39.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 16.36
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 190.32
 PIPE TRAVEL TIME(MIN.) = 0.84 Tc(MIN.) = 18.84
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 216.00 = 4760.00 FEET.

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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

 FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 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.) = 18.84
 RAINFALL INTENSITY(INCH/HR) = 2.28
 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 104.30
 TOTAL STREAM AREA(ACRES) = 104.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 190.32

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 39.64
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.58
 HALFSTREET FLOOD WIDTH(FEET) = 20.95
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.33
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.50
 STREET FLOW TRAVEL TIME(MIN.) = 3.08 Tc(MIN.) = 13.95
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.728
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.50	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.50	0.98	0.200	32
PUBLIC PARK	A	19.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.757
 SUBAREA AREA(ACRES) = 22.60 SUBAREA RUNOFF(CFS) = 40.47
 EFFECTIVE AREA(ACRES) = 31.50 AREA-AVERAGED Fm(INCH/HR) = 0.74
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.76
 TOTAL AREA(ACRES) = 31.5 PEAK FLOW RATE(CFS) = 56.25

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.64 HALFSTREET FLOOD WIDTH(FEET) = 24.06
 FLOW VELOCITY(FEET/SEC.) = 4.70 DEPTH*VELOCITY(FT*FT/SEC.) = 3.01
 LONGEST FLOWPATH FROM NODE 213.00 TO NODE 215.00 = 1660.00 FEET.

 FLOW PROCESS FROM NODE 215.00 TO NODE 216.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1038.00 DOWNSTREAM(FEET) = 1030.00
 FLOW LENGTH(FEET) = 1630.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.41
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 56.25
 PIPE TRAVEL TIME(MIN.) = 3.67 Tc(MIN.) = 17.61
 LONGEST FLOWPATH FROM NODE 213.00 TO NODE 216.00 = 3290.00 FEET.

 FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc(MIN.) = 17.61
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.371
 SUBAREA LOSS RATE DATA(AMC II):

 FLOW PROCESS FROM NODE 213.00 TO NODE 214.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 860.00
 ELEVATION DATA: UPSTREAM(FEET) = 1065.00 DOWNSTREAM(FEET) = 1050.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.865
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.168
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32	10.86
PUBLIC PARK	A	7.90	0.98	0.850	32	16.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.777
 SUBAREA RUNOFF(CFS) = 19.31
 TOTAL AREA(ACRES) = 8.90 PEAK FLOW RATE(CFS) = 19.31

 FLOW PROCESS FROM NODE 214.00 TO NODE 215.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1050.00 DOWNSTREAM ELEVATION(FEET) = 1038.00
 STREET LENGTH(FEET) = 800.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 3.70 0.98 0.100 32
 PUBLIC PARK A 22.80 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.745
 SUBAREA AREA (ACRES) = 26.50 SUBAREA RUNOFF (CFS) = 39.22
 EFFECTIVE AREA (ACRES) = 58.00 AREA-AVERAGED Fm (INCH/HR) = 0.74
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.75
 TOTAL AREA (ACRES) = 58.0 PEAK FLOW RATE (CFS) = 85.36

 FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 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.) = 17.61
 RAINFALL INTENSITY (INCH/HR) = 2.37
 AREA-AVERAGED Fm (INCH/HR) = 0.74
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.75
 EFFECTIVE STREAM AREA (ACRES) = 58.00
 TOTAL STREAM AREA (ACRES) = 58.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 85.36

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	189.72	18.05	2.336	0.97(0.35)	0.36	100.8	210.00
1	190.32	18.84	2.278	0.98(0.35)	0.36	104.3	200.00
2	85.36	17.61	2.371	0.97(0.74)	0.75	58.0	213.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	273.72	17.61	2.371	0.97(0.50)	0.51	156.3	213.00
2	273.27	18.05	2.336	0.98(0.49)	0.51	158.8	210.00
3	270.80	18.84	2.278	0.97(0.49)	0.50	162.3	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 273.72 Tc (MIN.) = 17.61
 EFFECTIVE AREA (ACRES) = 156.33 AREA-AVERAGED Fm (INCH/HR) = 0.50
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51
 TOTAL AREA (ACRES) = 162.3
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 216.00 = 4760.00 FEET.

 FLOW PROCESS FROM NODE 216.00 TO NODE 222.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1030.00 DOWNSTREAM(FEET) = 1018.00
 FLOW LENGTH(FEET) = 760.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 46.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.94
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 273.72
 PIPE TRAVEL TIME (MIN.) = 0.75 Tc (MIN.) = 18.36
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 222.00 = 5520.00 FEET.

 FLOW PROCESS FROM NODE 222.00 TO NODE 222.00 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.) = 18.36
 RAINFALL INTENSITY (INCH/HR) = 2.31
 AREA-AVERAGED Fm (INCH/HR) = 0.50
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.51
 EFFECTIVE STREAM AREA (ACRES) = 156.33
 TOTAL STREAM AREA (ACRES) = 162.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 273.72

 FLOW PROCESS FROM NODE 220.00 TO NODE 221.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

 INITIAL SUBAREA FLOW-LENGTH (FEET) = 770.00
 ELEVATION DATA: UPSTREAM (FEET) = 1035.00 DOWNSTREAM (FEET) = 1024.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.151
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.300
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.10	0.98	0.100	32	10.15
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	5.30	0.98	0.500	32	12.99

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA RUNOFF (CFS) = 19.47
 TOTAL AREA (ACRES) = 7.40 PEAK FLOW RATE (CFS) = 19.47

 FLOW PROCESS FROM NODE 221.00 TO NODE 222.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1024.00 DOWNSTREAM ELEVATION(FEET) = 1018.00
 STREET LENGTH(FEET) = 520.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 31.82
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.56
 HALFSTREET FLOOD WIDTH(FEET) = 20.27
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.70
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.09
 STREET FLOW TRAVEL TIME(MIN.) = 2.34 Tc(MIN.) = 12.49
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.914

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.40	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	8.50	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.412
 SUBAREA AREA(ACRES) = 10.90 SUBAREA RUNOFF(CFS) = 24.65
 EFFECTIVE AREA(ACRES) = 18.30 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 18.3 PEAK FLOW RATE(CFS) = 41.55

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 22.48
 FLOW VELOCITY(FEET/SEC.) = 3.96 DEPTH*VELOCITY(FT*FT/SEC.) = 2.41
 LONGEST FLOWPATH FROM NODE 220.00 TO NODE 222.00 = 1290.00 FEET.

 FLOW PROCESS FROM NODE 222.00 TO NODE 222.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 12.49
 RAINFALL INTENSITY(INCH/HR) = 2.91
 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.40
 EFFECTIVE STREAM AREA(ACRES) = 18.30
 TOTAL STREAM AREA(ACRES) = 18.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 41.55

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	273.72	18.36	2.313	0.97(0.50)	0.51	156.3	213.00
1	273.27	18.80	2.280	0.98(0.49)	0.51	158.8	210.00
1	270.80	19.58	2.225	0.97(0.49)	0.50	162.3	200.00
2	41.55	12.49	2.914	0.97(0.39)	0.40	18.3	220.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	289.40	12.49	2.914	0.97(0.48)	0.49	124.7	220.00
2	305.36	18.36	2.313	0.97(0.49)	0.50	174.6	213.00
3	304.38	18.80	2.280	0.98(0.48)	0.50	177.1	210.00
4	301.00	19.58	2.225	0.97(0.48)	0.49	180.6	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 305.36 Tc(MIN.) = 18.36
 EFFECTIVE AREA(ACRES) = 174.63 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.50
 TOTAL AREA(ACRES) = 180.6
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 222.00 = 5520.00 FEET.

 FLOW PROCESS FROM NODE 222.00 TO NODE 225.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1018.00 DOWNSTREAM(FEET) = 1008.00
 FLOW LENGTH(FEET) = 580.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 49.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 17.76
 ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 305.36
 PIPE TRAVEL TIME(MIN.) = 0.54 Tc(MIN.) = 18.91
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 225.00 = 6100.00 FEET.

 FLOW PROCESS FROM NODE 225.00 TO NODE 225.00 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.) = 18.91
 RAINFALL INTENSITY(INCH/HR) = 2.27
 AREA-AVERAGED Fm(INCH/HR) = 0.49
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 174.63
 TOTAL STREAM AREA(ACRES) = 180.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 305.36

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 225.00 = 6100.00 FEET.

FLOW PROCESS FROM NODE 225.00 TO NODE 229.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 1008.00 DOWNSTREAM(FEET) = 1000.00
FLOW LENGTH(FEET) = 540.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 49.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 17.43
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 331.64
PIPE TRAVEL TIME(MIN.) = 0.52 Tc(MIN.) = 19.42
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 229.00 = 6640.00 FEET.

FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 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.) = 19.42
RAINFALL INTENSITY(INCH/HR) = 2.24
AREA-AVERAGED Fm(INCH/HR) = 0.47
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.49
EFFECTIVE STREAM AREA(ACRES) = 189.83
TOTAL STREAM AREA(ACRES) = 195.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 331.64

FLOW PROCESS FROM NODE 226.00 TO NODE 227.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1060.00
ELEVATION DATA: UPSTREAM(FEET) = 1038.00 DOWNSTREAM(FEET) = 1020.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.143
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.121
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.60	0.98	0.100	32	11.14
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	5.00	0.98	0.500	32	14.26

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403
SUBAREA RUNOFF(CFS) = 16.20
TOTAL AREA(ACRES) = 6.60 PEAK FLOW RATE(CFS) = 16.20

FLOW PROCESS FROM NODE 227.00 TO NODE 228.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 1020.00 DOWNSTREAM ELEVATION(FEET) = 1015.00
STREET LENGTH(FEET) = 690.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 34.08
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.61
HALFSTREET FLOOD WIDTH(FEET) = 22.80
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.16
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.94
STREET FLOW TRAVEL TIME(MIN.) = 3.64 Tc(MIN.) = 14.78
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.634

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.70	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	11.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.369
SUBAREA AREA(ACRES) = 17.40 SUBAREA RUNOFF(CFS) = 35.62
EFFECTIVE AREA(ACRES) = 24.00 AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.38
TOTAL AREA(ACRES) = 24.0 PEAK FLOW RATE(CFS) = 48.94

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.68 HALFSTREET FLOOD WIDTH(FEET) = 27.03
FLOW VELOCITY(FEET/SEC.) = 3.46 DEPTH*VELOCITY(FT*FT/SEC.) = 2.36
LONGEST FLOWPATH FROM NODE 226.00 TO NODE 228.00 = 1750.00 FEET.

FLOW PROCESS FROM NODE 228.00 TO NODE 229.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 1000.00
FLOW LENGTH(FEET) = 1900.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.51
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 48.94
 PIPE TRAVEL TIME(MIN.) = 3.72 Tc(MIN.) = 18.50
 LONGEST FLOWPATH FROM NODE 226.00 TO NODE 229.00 = 3650.00 FEET.

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	399.65	13.57	2.773	0.98(0.45)	0.46	175.2 220.00
2	407.65	15.12	2.599	0.97(0.45)	0.46	194.3 223.00
3	417.77	18.50	2.302	0.98(0.45)	0.46	232.4 226.00
4	416.15	19.42	2.236	0.98(0.45)	0.46	240.2 213.00
5	413.39	19.86	2.206	0.98(0.45)	0.46	242.7 210.00
6	406.99	20.65	2.156	0.97(0.45)	0.46	246.2 200.00

 FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 18.50
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.302
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 7.50 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 18.90 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA AREA(ACRES) = 26.40 SUBAREA RUNOFF(CFS) = 45.75
 EFFECTIVE AREA(ACRES) = 50.40 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.38
 TOTAL AREA(ACRES) = 50.4 PEAK FLOW RATE(CFS) = 87.52

 FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 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.) = 18.50
 RAINFALL INTENSITY(INCH/HR) = 2.30
 AREA-AVERAGED Fm(INCH/HR) = 0.37
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.38
 EFFECTIVE STREAM AREA(ACRES) = 50.40
 TOTAL STREAM AREA(ACRES) = 50.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 87.52

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	319.80	13.57	2.773	0.97(0.47)	0.48	138.2	220.00
1	325.15	15.12	2.599	0.97(0.47)	0.48	153.2	223.00
1	331.64	19.42	2.236	0.98(0.47)	0.49	189.8	213.00
1	330.23	19.86	2.206	0.98(0.47)	0.49	192.3	210.00
1	326.13	20.65	2.156	0.97(0.47)	0.48	195.8	200.00
2	87.52	18.50	2.302	0.97(0.37)	0.38	50.4	226.00

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
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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 417.77 Tc(MIN.) = 18.50
 EFFECTIVE AREA(ACRES) = 232.37 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.46
 TOTAL AREA(ACRES) = 246.2
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 229.00 = 6640.00 FEET.

 FLOW PROCESS FROM NODE 229.00 TO NODE 234.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1000.00 DOWNSTREAM(FEET) = 995.00
 FLOW LENGTH(FEET) = 340.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 53.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.41
 ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 417.77
 PIPE TRAVEL TIME(MIN.) = 0.31 Tc(MIN.) = 18.81
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 234.00 = 6980.00 FEET.

 FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 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.) = 18.81
 RAINFALL INTENSITY(INCH/HR) = 2.28
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.46
 EFFECTIVE STREAM AREA(ACRES) = 232.37
 TOTAL STREAM AREA(ACRES) = 246.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 417.77

 FLOW PROCESS FROM NODE 230.00 TO NODE 231.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 720.00
 ELEVATION DATA: UPSTREAM(FEET) = 1042.00 DOWNSTREAM(FEET) = 1028.00
 $Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.291
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.480
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.90	0.98	0.100	32	9.29
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	5.80	0.98	0.500	32	11.89

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA RUNOFF(CFS) = 21.41
 TOTAL AREA(ACRES) = 7.70 PEAK FLOW RATE(CFS) = 21.41

 FLOW PROCESS FROM NODE 231.00 TO NODE 232.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1028.00 DOWNSTREAM ELEVATION(FEET) = 1014.00
 STREET LENGTH(FEET) = 820.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 34.35
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.54
 HALFSTREET FLOOD WIDTH(FEET) = 19.32
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.38
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.39
 STREET FLOW TRAVEL TIME(MIN.) = 3.12 Tc(MIN.) = 12.41

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.925
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
 SUBAREA AREA(ACRES) = 11.20 SUBAREA RUNOFF(CFS) = 25.80
 EFFECTIVE AREA(ACRES) = 18.90 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
 TOTAL AREA(ACRES) = 18.9 PEAK FLOW RATE(CFS) = 43.36

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.58 HALFSTREET FLOOD WIDTH(FEET) = 21.16
 FLOW VELOCITY(FEET/SEC.) = 4.64 DEPTH*VELOCITY(FT*FT/SEC.) = 2.70

LONGEST FLOWPATH FROM NODE 230.00 TO NODE 232.00 = 1540.00 FEET.

 FLOW PROCESS FROM NODE 232.00 TO NODE 233.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1014.00 DOWNSTREAM(FEET) = 1000.00
 FLOW LENGTH(FEET) = 850.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.88
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 43.36
 PIPE TRAVEL TIME(MIN.) = 1.30 Tc(MIN.) = 13.71
 LONGEST FLOWPATH FROM NODE 230.00 TO NODE 233.00 = 2390.00 FEET.

 FLOW PROCESS FROM NODE 233.00 TO NODE 233.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 13.71
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.755
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	5.60	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.294
 SUBAREA AREA(ACRES) = 18.80 SUBAREA RUNOFF(CFS) = 41.78
 EFFECTIVE AREA(ACRES) = 37.70 AREA-AVERAGED Fm(INCH/HR) = 0.33
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
 TOTAL AREA(ACRES) = 37.7 PEAK FLOW RATE(CFS) = 82.25

 FLOW PROCESS FROM NODE 233.00 TO NODE 234.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1000.00 DOWNSTREAM(FEET) = 995.00
 FLOW LENGTH(FEET) = 1780.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 39.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.62
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 82.25
 PIPE TRAVEL TIME(MIN.) = 4.48 Tc(MIN.) = 18.20
 LONGEST FLOWPATH FROM NODE 230.00 TO NODE 234.00 = 4170.00 FEET.

 FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====

MAINLINE Tc(MIN.) = 18.20
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.325
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 3.10 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 4.00 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 7.20 0.98 0.200 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.262
 SUBAREA AREA(ACRES) = 14.30 SUBAREA RUNOFF(CFS) = 26.64
 EFFECTIVE AREA(ACRES) = 52.00 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
 TOTAL AREA(ACRES) = 52.0 PEAK FLOW RATE(CFS) = 94.29

 FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 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.) = 18.20
 RAINFALL INTENSITY(INCH/HR) = 2.33
 AREA-AVERAGED Fm(INCH/HR) = 0.31
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.32
 EFFECTIVE STREAM AREA(ACRES) = 52.00
 TOTAL STREAM AREA(ACRES) = 52.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 94.29

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	399.65	13.88	2.735	0.98(0.45)	0.46	175.2	220.00
1	407.65	15.43	2.567	0.97(0.45)	0.46	194.3	223.00
1	417.77	18.81	2.280	0.98(0.45)	0.46	232.4	226.00
1	416.15	19.73	2.215	0.98(0.45)	0.46	240.2	213.00
1	413.39	20.17	2.186	0.98(0.45)	0.46	242.7	210.00
1	406.99	20.96	2.136	0.97(0.45)	0.46	246.2	200.00
2	94.29	18.20	2.325	0.98(0.31)	0.32	52.0	230.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	486.21	13.88	2.735	0.97(0.42)	0.43	214.8	220.00
2	497.21	15.43	2.567	0.97(0.42)	0.43	238.4	223.00

3	510.23	18.20	2.325	0.98(0.42)	0.44	277.5	230.00
4	509.92	18.81	2.280	0.97(0.43)	0.44	284.4	226.00
5	505.29	19.73	2.215	0.98(0.43)	0.44	292.2	213.00
6	501.17	20.17	2.186	0.98(0.43)	0.44	294.7	210.00
7	492.43	20.96	2.136	0.97(0.43)	0.44	298.2	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 510.23 Tc(MIN.) = 18.20
 EFFECTIVE AREA(ACRES) = 277.50 AREA-AVERAGED Fm(INCH/HR) = 0.42
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.44
 TOTAL AREA(ACRES) = 298.2
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 234.00 = 6980.00 FEET.

 FLOW PROCESS FROM NODE 234.00 TO NODE 242.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 995.00 DOWNSTREAM(FEET) = 988.00
 FLOW LENGTH(FEET) = 480.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 78.0 INCH PIPE IS 57.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 19.31
 ESTIMATED PIPE DIAMETER(INCH) = 78.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 510.23
 PIPE TRAVEL TIME(MIN.) = 0.41 Tc(MIN.) = 18.61
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 242.00 = 7460.00 FEET.

 FLOW PROCESS FROM NODE 242.00 TO NODE 242.00 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.) = 18.61
 RAINFALL INTENSITY(INCH/HR) = 2.29
 AREA-AVERAGED Fm(INCH/HR) = 0.42
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.44
 EFFECTIVE STREAM AREA(ACRES) = 277.50
 TOTAL STREAM AREA(ACRES) = 298.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 510.23

 FLOW PROCESS FROM NODE 240.00 TO NODE 241.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00
 ELEVATION DATA: UPSTREAM(FEET) = 1005.00 DOWNSTREAM(FEET) = 995.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.102
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.970

SUBAREA Tc AND LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 3.60 0.98 0.100 32 12.10
 COMMERCIAL A 6.80 0.98 0.100 32 12.10
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF (CFS) = 26.89
 TOTAL AREA (ACRES) = 10.40 PEAK FLOW RATE (CFS) = 26.89

 FLOW PROCESS FROM NODE 241.00 TO NODE 242.00 IS CODE = 62

>>>> COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <<<<<<
 >>>> (STREET TABLE SECTION # 2 USED) <<<<<<
 =====
 UPSTREAM ELEVATION (FEET) = 995.00 DOWNSTREAM ELEVATION (FEET) = 988.00
 STREET LENGTH (FEET) = 2080.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 44.63
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.74
 HALFSTREET FLOOD WIDTH (FEET) = 33.25
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.49
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.86
 STREET FLOW TRAVEL TIME (MIN.) = 13.90 Tc (MIN.) = 26.01
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.877

SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 5.30 0.98 0.100 32
 RESIDENTIAL "11+ DWELLINGS/ACRE" A 17.50 0.98 0.200 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.177
 SUBAREA AREA (ACRES) = 22.80 SUBAREA RUNOFF (CFS) = 34.98
 EFFECTIVE AREA (ACRES) = 33.20 AREA-AVERAGED Fm (INCH/HR) = 0.15
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.15
 TOTAL AREA (ACRES) = 33.2 PEAK FLOW RATE (CFS) = 51.63

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.78 HALFSTREET FLOOD WIDTH (FEET) = 36.52
 FLOW VELOCITY (FEET/SEC.) = 2.56 DEPTH*VELOCITY (FT*FT/SEC.) = 1.99
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 2080.0 FT WITH ELEVATION-DROP = 7.0 FT, IS 41.3 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 242.00

LONGEST FLOWPATH FROM NODE 240.00 TO NODE 242.00 = 3080.00 FEET.

 FLOW PROCESS FROM NODE 242.00 TO NODE 242.00 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.) = 26.01
 RAINFALL INTENSITY (INCH/HR) = 1.88
 AREA-AVERAGED Fm (INCH/HR) = 0.15
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.15
 EFFECTIVE STREAM AREA (ACRES) = 33.20
 TOTAL STREAM AREA (ACRES) = 33.20
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 51.63

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	486.21	14.30	2.687	0.97 (0.42)	0.43	214.8	220.00
1	497.21	15.85	2.526	0.97 (0.42)	0.43	238.4	223.00
1	510.23	18.61	2.294	0.98 (0.42)	0.44	277.5	230.00
1	509.92	19.23	2.250	0.97 (0.43)	0.44	284.4	226.00
1	505.29	20.15	2.187	0.98 (0.43)	0.44	292.2	213.00
1	501.17	20.59	2.159	0.98 (0.43)	0.44	294.7	210.00
1	492.43	21.38	2.111	0.97 (0.43)	0.44	298.2	200.00
2	51.63	26.01	1.877	0.98 (0.15)	0.15	33.2	240.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	527.92	14.30	2.687	0.97 (0.40)	0.41	233.1	220.00
2	540.51	15.85	2.526	0.97 (0.40)	0.41	258.7	223.00
3	556.10	18.61	2.294	0.98 (0.40)	0.41	301.3	230.00
4	556.33	19.23	2.250	0.97 (0.40)	0.41	308.9	226.00
5	552.48	20.15	2.187	0.98 (0.41)	0.42	318.0	213.00
6	548.73	20.59	2.159	0.98 (0.40)	0.41	321.0	210.00
7	540.63	21.38	2.111	0.97 (0.40)	0.41	325.5	200.00
8	475.68	26.01	1.877	0.97 (0.40)	0.41	331.4	240.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 556.33 Tc (MIN.) = 19.23
 EFFECTIVE AREA (ACRES) = 308.92 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.41
 TOTAL AREA (ACRES) = 331.4
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 242.00 = 7460.00 FEET.

 FLOW PROCESS FROM NODE 242.00 TO NODE 253.00 IS CODE = 31

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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 988.00 DOWNSTREAM(FEET) = 978.00
FLOW LENGTH(FEET) = 530.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 75.0 INCH PIPE IS 58.9 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 21.53
ESTIMATED PIPE DIAMETER(INCH) = 75.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 556.33
PIPE TRAVEL TIME (MIN.) = 0.41 Tc (MIN.) = 19.64
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 253.00 = 7990.00 FEET.

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FLOW PROCESS FROM NODE 253.00 TO NODE 253.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 19.64
RAINFALL INTENSITY (INCH/HR) = 2.22
AREA-AVERAGED Fm (INCH/HR) = 0.40
AREA-AVERAGED Fp (INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.41
EFFECTIVE STREAM AREA (ACRES) = 308.92
TOTAL STREAM AREA (ACRES) = 331.40
PEAK FLOW RATE (CFS) AT CONFLUENCE = 556.33

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FLOW PROCESS FROM NODE 250.00 TO NODE 251.00 IS CODE = 21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 930.00
ELEVATION DATA: UPSTREAM(FEET) = 996.00 DOWNSTREAM(FEET) = 986.00

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Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.587
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.049
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 7.50 0.98 0.100 32 11.59
COMMERCIAL A 1.50 0.98 0.100 32 11.59
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 23.90
TOTAL AREA (ACRES) = 9.00 PEAK FLOW RATE (CFS) = 23.90

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FLOW PROCESS FROM NODE 251.00 TO NODE 252.00 IS CODE = 62
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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<
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UPSTREAM ELEVATION(FEET) = 986.00 DOWNSTREAM ELEVATION(FEET) = 981.00
STREET LENGTH(FEET) = 940.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

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SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 34.56
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.64
HALFSTREET FLOOD WIDTH(FEET) = 24.33
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.83
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.82
STREET FLOW TRAVEL TIME (MIN.) = 5.54 Tc (MIN.) = 17.12
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.412

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SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.00 0.98 0.100 32
COMMERCIAL A 2.20 0.98 0.100 32

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SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 10.20 SUBAREA RUNOFF (CFS) = 21.24
EFFECTIVE AREA (ACRES) = 19.20 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 19.2 PEAK FLOW RATE (CFS) = 39.99

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END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 26.08
FLOW VELOCITY (FEET/SEC.) = 2.93 DEPTH*VELOCITY (FT*FT/SEC.) = 1.97
LONGEST FLOWPATH FROM NODE 250.00 TO NODE 252.00 = 1870.00 FEET.

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*****
FLOW PROCESS FROM NODE 252.00 TO NODE 253.00 IS CODE = 62
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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<
=====

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```

UPSTREAM ELEVATION(FEET) = 981.00 DOWNSTREAM ELEVATION(FEET) = 978.00
STREET LENGTH(FEET) = 1280.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

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SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 52.12
 STREET FLOWING FULL
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.82
 HALFSTREET FLOOD WIDTH(FEET) = 39.53
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.25
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.84
 STREET FLOW TRAVEL TIME(MIN.) = 9.50 Tc(MIN.) = 26.62
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.851
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 12.20 0.98 0.100 32
 COMMERCIAL A 3.10 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 15.30 SUBAREA RUNOFF(CFS) = 24.14
 EFFECTIVE AREA(ACRES) = 34.50 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 34.5 PEAK FLOW RATE(CFS) = 54.44

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.83 HALFSTREET FLOOD WIDTH(FEET) = 40.01
 FLOW VELOCITY(FEET/SEC.) = 2.27 DEPTH*VELOCITY(FT*FT/SEC.) = 1.88
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1280.0 FT WITH ELEVATION-DROP = 3.0 FT, IS 31.0 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 253.00
 LONGEST FLOWPATH FROM NODE 250.00 TO NODE 253.00 = 3150.00 FEET.

 FLOW PROCESS FROM NODE 253.00 TO NODE 253.00 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.) = 26.62
 RAINFALL INTENSITY(INCH/HR) = 1.85
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 34.50
 TOTAL STREAM AREA(ACRES) = 34.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 54.44

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	527.92	14.72	2.641	0.97(0.40)	0.41	233.1	220.00
1	540.51	16.27	2.487	0.97(0.40)	0.41	258.7	223.00
1	556.10	19.02	2.264	0.98(0.40)	0.41	301.3	230.00
1	556.33	19.64	2.221	0.97(0.40)	0.41	308.9	226.00
1	552.48	20.56	2.161	0.98(0.41)	0.42	318.0	213.00
1	548.73	21.00	2.134	0.98(0.40)	0.41	321.0	210.00

1	540.63	21.79	2.087	0.97(0.40)	0.41	325.5	200.00
1	475.68	26.43	1.859	0.97(0.40)	0.41	331.4	240.00
2	54.44	26.62	1.851	0.98(0.10)	0.10	34.5	250.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	571.58	14.72	2.641	0.97(0.38)	0.39	252.2	220.00
2	585.84	16.27	2.487	0.97(0.38)	0.39	279.8	223.00
3	604.17	19.02	2.264	0.98(0.38)	0.39	325.9	230.00
4	604.98	19.64	2.221	0.97(0.38)	0.39	334.4	226.00
5	601.97	20.56	2.161	0.98(0.38)	0.39	344.6	213.00
6	598.60	21.00	2.134	0.98(0.38)	0.39	348.2	210.00
7	591.19	21.79	2.087	0.97(0.38)	0.39	353.7	200.00
8	529.98	26.43	1.859	0.97(0.37)	0.38	365.7	240.00
9	527.49	26.62	1.851	0.97(0.37)	0.38	365.9	250.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 604.98 Tc(MIN.) = 19.64
 EFFECTIVE AREA(ACRES) = 334.37 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.39
 TOTAL AREA(ACRES) = 365.9
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 253.00 = 7990.00 FEET.

 FLOW PROCESS FROM NODE 253.00 TO NODE 264.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 978.00 DOWNSTREAM(FEET) = 970.00
 FLOW LENGTH(FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 66.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.62
 ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 604.98
 PIPE TRAVEL TIME(MIN.) = 0.59 Tc(MIN.) = 20.23
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 264.00 = 8650.00 FEET.

 FLOW PROCESS FROM NODE 264.00 TO NODE 264.00 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.) = 20.23
 RAINFALL INTENSITY(INCH/HR) = 2.18
 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.39
 EFFECTIVE STREAM AREA(ACRES) = 334.37
 TOTAL STREAM AREA(ACRES) = 365.90

PEAK FLOW RATE(CFS) AT CONFLUENCE = 604.98

FLOW PROCESS FROM NODE 260.00 TO NODE 261.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 880.00
ELEVATION DATA: UPSTREAM(FEET) = 990.00 DOWNSTREAM(FEET) = 980.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.209

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.110

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	5.80	0.98	0.100	32	11.21

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 15.72

TOTAL AREA(ACRES) = 5.80 PEAK FLOW RATE(CFS) = 15.72

FLOW PROCESS FROM NODE 261.00 TO NODE 262.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 980.00 DOWNSTREAM ELEVATION(FEET) = 975.00
STREET LENGTH(FEET) = 320.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 23.46

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.50

HALFSTREET FLOOD WIDTH(FEET) = 16.89

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.86

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.91

STREET FLOW TRAVEL TIME(MIN.) = 1.38 Tc(MIN.) = 12.59

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.900

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.50	0.98	0.100	32
PUBLIC PARK	A	7.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.804

SUBAREA AREA(ACRES) = 8.10 SUBAREA RUNOFF(CFS) = 15.43

EFFECTIVE AREA(ACRES) = 13.90 AREA-AVERAGED Fm(INCH/HR) = 0.50

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51

TOTAL AREA(ACRES) = 13.9 PEAK FLOW RATE(CFS) = 30.06

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.53 HALFSTREET FLOOD WIDTH(FEET) = 18.63

FLOW VELOCITY(FEET/SEC.) = 4.11 DEPTH*VELOCITY(FT*FT/SEC.) = 2.18

LONGEST FLOWPATH FROM NODE 260.00 TO NODE 262.00 = 1200.00 FEET.

FLOW PROCESS FROM NODE 262.00 TO NODE 263.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 975.00 DOWNSTREAM ELEVATION(FEET) = 970.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 42.27

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.69

HALFSTREET FLOOD WIDTH(FEET) = 27.87

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.89

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.00

STREET FLOW TRAVEL TIME(MIN.) = 5.76 Tc(MIN.) = 18.35

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.313

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.50	0.98	0.100	32
COMMERCIAL	A	6.40	0.98	0.100	32
PUBLIC PARK	A	7.90	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.500

SUBAREA AREA(ACRES) = 14.80 SUBAREA RUNOFF(CFS) = 24.32

EFFECTIVE AREA(ACRES) = 28.70 AREA-AVERAGED Fm(INCH/HR) = 0.49

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51

TOTAL AREA(ACRES) = 28.7 PEAK FLOW RATE(CFS) = 47.03

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 30.09

FLOW VELOCITY(FEET/SEC.) = 2.96 DEPTH*VELOCITY(FT*FT/SEC.) = 2.11

LONGEST FLOWPATH FROM NODE 260.00 TO NODE 263.00 = 2200.00 FEET.

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*****
FLOW PROCESS FROM NODE 263.00 TO NODE 264.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM( FEET) = 970.00 DOWNSTREAM( FEET) = 968.00
FLOW LENGTH( FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 37.0 INCHES
PIPE-FLOW VELOCITY( FEET/SEC.) = 4.52
ESTIMATED PIPE DIAMETER( INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW( CFS) = 47.03
PIPE TRAVEL TIME( MIN.) = 4.86 Tc( MIN.) = 23.22
LONGEST FLOWPATH FROM NODE 260.00 TO NODE 264.00 = 3520.00 FEET.

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*****
FLOW PROCESS FROM NODE 264.00 TO NODE 264.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc( MIN.) = 23.22
* 25 YEAR RAINFALL INTENSITY( INCH/HR) = 2.009
SUBAREA LOSS RATE DATA( AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap        SCS
LAND USE              GROUP   (ACRES)  (INCH/HR) (DECIMAL) CN
COMMERCIAL            A       1.00     0.98     0.100    32
COMMERCIAL            A       8.60     0.98     0.100    32
PUBLIC PARK           A       10.70    0.98     0.850    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp( INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.495
SUBAREA AREA( ACRES) = 20.30 SUBAREA RUNOFF( CFS) = 27.88
EFFECTIVE AREA( ACRES) = 49.00 AREA-AVERAGED Fm( INCH/HR) = 0.49
AREA-AVERAGED Fp( INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.50
TOTAL AREA( ACRES) = 49.0 PEAK FLOW RATE( CFS) = 67.06

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*****
FLOW PROCESS FROM NODE 264.00 TO NODE 264.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====

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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION( MIN.) = 23.22
RAINFALL INTENSITY( INCH/HR) = 2.01
AREA-AVERAGED Fm( INCH/HR) = 0.49
AREA-AVERAGED Fp( INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.50
EFFECTIVE STREAM AREA( ACRES) = 49.00
TOTAL STREAM AREA( ACRES) = 49.00
PEAK FLOW RATE( CFS) AT CONFLUENCE = 67.06

```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	571.58	15.31	2.579	0.97(0.38)	0.39	252.2	220.00

1	585.84	16.86	2.434	0.97(0.38)	0.39	279.8	223.00
1	604.17	19.61	2.223	0.98(0.38)	0.39	325.9	230.00
1	604.98	20.23	2.182	0.97(0.38)	0.39	334.4	226.00
1	601.97	21.15	2.124	0.98(0.38)	0.39	344.6	213.00
1	598.60	21.59	2.098	0.98(0.38)	0.39	348.2	210.00
1	591.19	22.39	2.053	0.97(0.38)	0.39	353.7	200.00
1	529.98	27.04	1.834	0.97(0.37)	0.38	365.7	240.00
1	527.49	27.23	1.826	0.97(0.37)	0.38	365.9	250.00
2	67.06	23.22	2.009	0.97(0.49)	0.50	49.0	260.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	632.38	15.31	2.579	0.97(0.39)	0.40	284.5	220.00
2	648.15	16.86	2.434	0.97(0.39)	0.40	315.3	223.00
3	668.79	19.61	2.223	0.98(0.39)	0.40	367.3	230.00
4	670.06	20.23	2.182	0.97(0.39)	0.40	377.1	226.00
5	667.70	21.15	2.124	0.98(0.39)	0.40	389.3	213.00
6	664.63	21.59	2.098	0.98(0.39)	0.40	393.8	210.00
7	657.74	22.39	2.053	0.97(0.39)	0.40	401.0	200.00
8	647.32	23.22	2.009	0.97(0.39)	0.40	404.9	260.00
9	589.29	27.04	1.834	0.97(0.38)	0.39	414.7	240.00
10	586.47	27.23	1.826	0.97(0.38)	0.39	414.9	250.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

```

PEAK FLOW RATE( CFS) = 670.06 Tc( MIN.) = 20.23
EFFECTIVE AREA( ACRES) = 377.07 AREA-AVERAGED Fm( INCH/HR) = 0.39
AREA-AVERAGED Fp( INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.40
TOTAL AREA( ACRES) = 414.9
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 264.00 = 8650.00 FEET.
=====

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END OF STUDY SUMMARY:

```

TOTAL AREA( ACRES) = 414.9 TC( MIN.) = 20.23
EFFECTIVE AREA( ACRES) = 377.07 AREA-AVERAGED Fm( INCH/HR) = 0.39
AREA-AVERAGED Fp( INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.403
PEAK FLOW RATE( CFS) = 670.06

```

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	632.38	15.31	2.579	0.97(0.39)	0.40	284.5	220.00
2	648.15	16.86	2.434	0.97(0.39)	0.40	315.3	223.00
3	668.79	19.61	2.223	0.98(0.39)	0.40	367.3	230.00
4	670.06	20.23	2.182	0.97(0.39)	0.40	377.1	226.00
5	667.70	21.15	2.124	0.98(0.39)	0.40	389.3	213.00
6	664.63	21.59	2.098	0.98(0.39)	0.40	393.8	210.00
7	657.74	22.39	2.053	0.97(0.39)	0.40	401.0	200.00
8	647.32	23.22	2.009	0.97(0.39)	0.40	404.9	260.00
9	589.29	27.04	1.834	0.97(0.38)	0.39	414.7	240.00
10	586.47	27.23	1.826	0.97(0.38)	0.39	414.9	250.00

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VI (AREA C) *
* 10-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: ONT6C10.DAT
TIME/DATE OF STUDY: 16:04 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIPI (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.70
2-YR 24-HR RAINFALL DEPTH(INCH) = 3.20
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.70
100-YR 24-HR RAINFALL DEPTH(INCH) = 8.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED
DURATION RAINFALL(INCH)

5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.63

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 920.00
ELEVATION DATA: UPSTREAM(FEET) = 1090.00 DOWNSTREAM(FEET) = 1074.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.479
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.849
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	10.48
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	5.00	0.98	0.200	32	11.17
COMMERCIAL	A	2.10	0.98	0.100	32	10.48

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.152

SUBAREA RUNOFF(CFS) = 23.33

TOTAL AREA(ACRES) = 9.60 PEAK FLOW RATE(CFS) = 23.33

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1074.00 DOWNSTREAM ELEVATION(FEET) = 1060.00

STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 46.77
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.60
 HALFSTREET FLOOD WIDTH(FEET) = 22.22
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.56
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.75
 STREET FLOW TRAVEL TIME(MIN.) = 3.29 Tc(MIN.) = 13.77
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.419

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.40	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	6.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.50	0.98	0.200	32
SCHOOL	A	9.30	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.391
 SUBAREA AREA(ACRES) = 25.40 SUBAREA RUNOFF(CFS) = 46.59
 EFFECTIVE AREA(ACRES) = 35.00 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.33
 TOTAL AREA(ACRES) = 35.0 PEAK FLOW RATE(CFS) = 66.20

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.45
 FLOW VELOCITY(FEET/SEC.) = 4.97 DEPTH*VELOCITY(FT*FT/SEC.) = 3.32
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1820.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1060.00 DOWNSTREAM(FEET) = 1055.00
 FLOW LENGTH(FEET) = 1520.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.63
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 66.20
 PIPE TRAVEL TIME(MIN.) = 3.82 Tc(MIN.) = 17.59
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 3340.00 FEET.

 FLOW PROCESS FROM NODE 203.00 TO NODE 203.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 17.59

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.088
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	33.80	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.395
 SUBAREA AREA(ACRES) = 45.90 SUBAREA RUNOFF(CFS) = 70.38
 EFFECTIVE AREA(ACRES) = 80.90 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 80.9 PEAK FLOW RATE(CFS) = 126.17

 FLOW PROCESS FROM NODE 203.00 TO NODE 212.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 1055.00 DOWNSTREAM(FEET) = 1045.00
 FLOW LENGTH(FEET) = 600.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.32
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 126.17
 PIPE TRAVEL TIME(MIN.) = 0.70 Tc(MIN.) = 18.28
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 212.00 = 3940.00 FEET.

 FLOW PROCESS FROM NODE 212.00 TO NODE 212.00 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.) = 18.28
 RAINFALL INTENSITY(INCH/HR) = 2.04
 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 80.90
 TOTAL STREAM AREA(ACRES) = 80.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 126.17

 FLOW PROCESS FROM NODE 210.00 TO NODE 211.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 740.00
 ELEVATION DATA: UPSTREAM(FEET) = 1060.00 DOWNSTREAM(FEET) = 1049.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.911

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.946
 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 A 1.70 0.98 0.100 32 9.91
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 5.70 0.98 0.500 32 12.68
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.408
 SUBAREA RUNOFF(CFS) = 16.97
 TOTAL AREA(ACRES) = 7.40 PEAK FLOW RATE(CFS) = 16.97

 FLOW PROCESS FROM NODE 211.00 TO NODE 212.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION(FEET) = 1049.00 DOWNSTREAM ELEVATION(FEET) = 1045.00
 STREET LENGTH(FEET) = 1080.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 29.83
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.65
 HALFSTREET FLOOD WIDTH(FEET) = 24.70
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.37
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.55
 STREET FLOW TRAVEL TIME(MIN.) = 7.59 Tc(MIN.) = 17.50

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.094
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 6.40 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 9.60 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.340
 SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 25.39
 EFFECTIVE AREA(ACRES) = 23.40 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 23.4 PEAK FLOW RATE(CFS) = 36.68

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.69 HALFSTREET FLOOD WIDTH(FEET) = 27.98
 FLOW VELOCITY(FEET/SEC.) = 2.50 DEPTH*VELOCITY(FT*FT/SEC.) = 1.73
 LONGEST FLOWPATH FROM NODE 210.00 TO NODE 212.00 = 1820.00 FEET.

 FLOW PROCESS FROM NODE 212.00 TO NODE 212.00 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.) = 17.50
 RAINFALL INTENSITY(INCH/HR) = 2.09
 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 23.40
 TOTAL STREAM AREA(ACRES) = 23.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 36.68

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	126.17	18.28	2.040	0.98(0.36)	0.36	80.9	200.00
2	36.68	17.50	2.094	0.98(0.35)	0.36	23.4	210.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	161.35	17.50	2.094	0.98(0.35)	0.36	100.8	210.00
2	161.72	18.28	2.040	0.98(0.35)	0.36	104.3	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 161.72 Tc(MIN.) = 18.28
 EFFECTIVE AREA(ACRES) = 104.30 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 104.3
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 212.00 = 3940.00 FEET.

 FLOW PROCESS FROM NODE 212.00 TO NODE 216.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1030.00
 FLOW LENGTH(FEET) = 820.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 36.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.71
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 161.72
 PIPE TRAVEL TIME(MIN.) = 0.87 Tc(MIN.) = 19.15
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 216.00 = 4760.00 FEET.

FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 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.) = 19.15
 RAINFALL INTENSITY (INCH/HR) = 1.98
 AREA-AVERAGED Fm (INCH/HR) = 0.35
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA (ACRES) = 104.30
 TOTAL STREAM AREA (ACRES) = 104.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 161.72

 FLOW PROCESS FROM NODE 213.00 TO NODE 214.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH (FEET) = 860.00
 ELEVATION DATA: UPSTREAM (FEET) = 1065.00 DOWNSTREAM (FEET) = 1050.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.865
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.788
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32	10.86
PUBLIC PARK	A	7.90	0.98	0.850	32	16.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.777
 SUBAREA RUNOFF (CFS) = 16.26
 TOTAL AREA (ACRES) = 8.90 PEAK FLOW RATE (CFS) = 16.26

 FLOW PROCESS FROM NODE 214.00 TO NODE 215.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1050.00 DOWNSTREAM ELEVATION (FEET) = 1038.00
 STREET LENGTH (FEET) = 800.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 33.11
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.55
 HALFSTREET FLOOD WIDTH (FEET) = 19.53
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.14
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.27
 STREET FLOW TRAVEL TIME (MIN.) = 3.22 Tc (MIN.) = 14.09
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.385
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.50	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.50	0.98	0.200	32
PUBLIC PARK	A	19.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.757
 SUBAREA AREA (ACRES) = 22.60 SUBAREA RUNOFF (CFS) = 33.50
 EFFECTIVE AREA (ACRES) = 31.50 AREA-AVERAGED Fm (INCH/HR) = 0.74
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.76
 TOTAL AREA (ACRES) = 31.5 PEAK FLOW RATE (CFS) = 46.54

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.60 HALFSTREET FLOOD WIDTH (FEET) = 22.32
 FLOW VELOCITY (FEET/SEC.) = 4.50 DEPTH*VELOCITY (FT*FT/SEC.) = 2.72
 LONGEST FLOWPATH FROM NODE 213.00 TO NODE 215.00 = 1660.00 FEET.

 FLOW PROCESS FROM NODE 215.00 TO NODE 216.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 1038.00 DOWNSTREAM (FEET) = 1030.00
 FLOW LENGTH (FEET) = 1630.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 7.06
 ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 46.54
 PIPE TRAVEL TIME (MIN.) = 3.85 Tc (MIN.) = 17.94
 LONGEST FLOWPATH FROM NODE 213.00 TO NODE 216.00 = 3290.00 FEET.

 FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 17.94
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.064
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.70	0.98	0.100	32
PUBLIC PARK	A	22.80	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.745
 SUBAREA AREA (ACRES) = 26.50 SUBAREA RUNOFF (CFS) = 31.89
 EFFECTIVE AREA (ACRES) = 58.00 AREA-AVERAGED Fm (INCH/HR) = 0.74
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.75
 TOTAL AREA (ACRES) = 58.0 PEAK FLOW RATE (CFS) = 69.31

PIPE-FLOW VELOCITY (FEET/SEC.) = 16.30
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 229.60
 PIPE TRAVEL TIME (MIN.) = 0.78 Tc (MIN.) = 18.72
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 222.00 = 5520.00 FEET.

 FLOW PROCESS FROM NODE 216.00 TO NODE 216.00 IS CODE = 1

 FLOW PROCESS FROM NODE 222.00 TO NODE 222.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION (MIN.) = 17.94
 RAINFALL INTENSITY (INCH/HR) = 2.06
 AREA-AVERAGED Fm (INCH/HR) = 0.74
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.75
 EFFECTIVE STREAM AREA (ACRES) = 58.00
 TOTAL STREAM AREA (ACRES) = 58.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 69.31

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 18.72
 RAINFALL INTENSITY (INCH/HR) = 2.01
 AREA-AVERAGED Fm (INCH/HR) = 0.50
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.51
 EFFECTIVE STREAM AREA (ACRES) = 156.46
 TOTAL STREAM AREA (ACRES) = 162.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 229.60

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	161.35	18.37	2.034	0.98 (0.35)	0.36	100.8	210.00
1	161.72	19.15	1.984	0.98 (0.35)	0.36	104.3	200.00
2	69.31	17.94	2.064	0.97 (0.74)	0.75	58.0	213.00

 FLOW PROCESS FROM NODE 220.00 TO NODE 221.00 IS CODE = 21

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	229.60	17.94	2.064	0.98 (0.50)	0.51	156.5	213.00
2	229.12	18.37	2.034	0.98 (0.49)	0.51	158.8	210.00
3	226.87	19.15	1.984	0.97 (0.49)	0.50	162.3	200.00

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 770.00
 ELEVATION DATA: UPSTREAM (FEET) = 1035.00 DOWNSTREAM (FEET) = 1024.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 229.60 Tc (MIN.) = 17.94
 EFFECTIVE AREA (ACRES) = 156.46 AREA-AVERAGED Fm (INCH/HR) = 0.50
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.51
 TOTAL AREA (ACRES) = 162.3
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 216.00 = 4760.00 FEET.

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.151
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.904
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.10	0.98	0.100	32	10.15
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	5.30	0.98	0.500	32	12.99

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA RUNOFF (CFS) = 16.83
 TOTAL AREA (ACRES) = 7.40 PEAK FLOW RATE (CFS) = 16.83

 FLOW PROCESS FROM NODE 216.00 TO NODE 222.00 IS CODE = 31

 FLOW PROCESS FROM NODE 221.00 TO NODE 222.00 IS CODE = 62

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1030.00 DOWNSTREAM (FEET) = 1018.00
 FLOW LENGTH (FEET) = 760.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.3 INCHES

=====

UPSTREAM ELEVATION (FEET) = 1024.00 DOWNSTREAM ELEVATION (FEET) = 1018.00
 STREET LENGTH (FEET) = 520.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 620.00
 ELEVATION DATA: UPSTREAM(FEET) = 1019.00 DOWNSTREAM(FEET) = 1009.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.085
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.104
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.30	0.98	0.100	32	9.08
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.90	0.98	0.500	32	11.62

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.372
 SUBAREA RUNOFF(CFS) = 17.76
 TOTAL AREA(ACRES) = 7.20 PEAK FLOW RATE(CFS) = 17.76

 FLOW PROCESS FROM NODE 224.00 TO NODE 225.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1009.00 DOWNSTREAM ELEVATION(FEET) = 1008.00
 STREET LENGTH(FEET) = 580.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 24.92
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.69
 HALFSTREET FLOOD WIDTH(FEET) = 27.98
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.70
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.18
 STREET FLOW TRAVEL TIME(MIN.) = 5.69 Tc(MIN.) = 14.77
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.318

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	5.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
 SUBAREA AREA(ACRES) = 8.00 SUBAREA RUNOFF(CFS) = 14.24
 EFFECTIVE AREA(ACRES) = 15.20 AREA-AVERAGED Fm(INCH/HR) = 0.35

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
 TOTAL AREA(ACRES) = 15.2 PEAK FLOW RATE(CFS) = 26.91

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 29.56
 FLOW VELOCITY(FEET/SEC.) = 1.73 DEPTH*VELOCITY(FT*FT/SEC.) = 1.22
 LONGEST FLOWPATH FROM NODE 223.00 TO NODE 225.00 = 1200.00 FEET.

 FLOW PROCESS FROM NODE 225.00 TO NODE 225.00 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.) = 14.77
 RAINFALL INTENSITY(INCH/HR) = 2.32
 AREA-AVERAGED Fm(INCH/HR) = 0.35
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.36
 EFFECTIVE STREAM AREA(ACRES) = 15.20
 TOTAL STREAM AREA(ACRES) = 15.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 26.91

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	245.06	13.14	2.487	0.98(0.48)	0.49	123.5	220.00
1	256.28	19.28	1.976	0.98(0.49)	0.50	174.8	213.00
1	255.36	19.71	1.950	0.98(0.48)	0.50	177.1	210.00
1	252.32	20.50	1.905	0.97(0.48)	0.49	180.6	200.00
2	26.91	14.77	2.318	0.98(0.35)	0.36	15.2	223.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	271.05	13.14	2.487	0.98(0.47)	0.48	137.0	220.00
2	274.95	14.77	2.318	0.98(0.47)	0.48	152.3	223.00
3	278.51	19.28	1.976	0.98(0.47)	0.49	190.0	213.00
4	277.22	19.71	1.950	0.98(0.47)	0.49	192.3	210.00
5	273.57	20.50	1.905	0.97(0.47)	0.48	195.8	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 278.51 Tc(MIN.) = 19.28
 EFFECTIVE AREA(ACRES) = 189.96 AREA-AVERAGED Fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.49
 TOTAL AREA(ACRES) = 195.8
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 225.00 = 6100.00 FEET.

 FLOW PROCESS FROM NODE 225.00 TO NODE 229.00 IS CODE = 31

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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1008.00 DOWNSTREAM(FEET) = 1000.00
FLOW LENGTH(FEET) = 540.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 48.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 16.46
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 278.51
PIPE TRAVEL TIME(MIN.) = 0.55 Tc(MIN.) = 19.83
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 229.00 = 6640.00 FEET.

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FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 19.83
RAINFALL INTENSITY(INCH/HR) = 1.94
AREA-AVERAGED Fm(INCH/HR) = 0.47
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.49
EFFECTIVE STREAM AREA(ACRES) = 189.96
TOTAL STREAM AREA(ACRES) = 195.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 278.51

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FLOW PROCESS FROM NODE 226.00 TO NODE 227.00 IS CODE = 21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1060.00
ELEVATION DATA: UPSTREAM(FEET) = 1038.00 DOWNSTREAM(FEET) = 1020.00

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Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.143
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.746
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.60 0.98 0.100 32 11.14
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 5.00 0.98 0.500 32 14.26
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403
SUBAREA RUNOFF(CFS) = 13.98
TOTAL AREA(ACRES) = 6.60 PEAK FLOW RATE(CFS) = 13.98

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FLOW PROCESS FROM NODE 227.00 TO NODE 228.00 IS CODE = 62
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>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

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=====
UPSTREAM ELEVATION(FEET) = 1020.00 DOWNSTREAM ELEVATION(FEET) = 1015.00
STREET LENGTH(FEET) = 690.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

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SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 29.27
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.59
HALFSTREET FLOOD WIDTH(FEET) = 21.48
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.05
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.79
STREET FLOW TRAVEL TIME(MIN.) = 3.77 Tc(MIN.) = 14.92
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.305
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 5.70 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 11.70 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.369
SUBAREA AREA(ACRES) = 17.40 SUBAREA RUNOFF(CFS) = 30.46
EFFECTIVE AREA(ACRES) = 24.00 AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.38
TOTAL AREA(ACRES) = 24.0 PEAK FLOW RATE(CFS) = 41.82

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END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 24.70
FLOW VELOCITY(FEET/SEC.) = 3.33 DEPTH*VELOCITY(FT*FT/SEC.) = 2.17
LONGEST FLOWPATH FROM NODE 226.00 TO NODE 228.00 = 1750.00 FEET.

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*****
FLOW PROCESS FROM NODE 228.00 TO NODE 229.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 1000.00
FLOW LENGTH(FEET) = 1900.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.07
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 41.82
PIPE TRAVEL TIME(MIN.) = 3.93 Tc(MIN.) = 18.84
LONGEST FLOWPATH FROM NODE 226.00 TO NODE 229.00 = 3650.00 FEET.

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FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 IS CODE = 81
 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc (MIN.) = 18.84
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.004
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 7.50 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 18.90 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.386
 SUBAREA AREA (ACRES) = 26.40 SUBAREA RUNOFF (CFS) = 38.65
 EFFECTIVE AREA (ACRES) = 50.40 AREA-AVERAGED Fm (INCH/HR) = 0.37
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.38
 TOTAL AREA (ACRES) = 50.4 PEAK FLOW RATE (CFS) = 73.96

 FLOW PROCESS FROM NODE 229.00 TO NODE 229.00 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.) = 18.84
 RAINFALL INTENSITY (INCH/HR) = 2.00
 AREA-AVERAGED Fm (INCH/HR) = 0.37
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.38
 EFFECTIVE STREAM AREA (ACRES) = 50.40
 TOTAL STREAM AREA (ACRES) = 50.40
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 73.96

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	271.05	13.69	2.427	0.98 (0.47)	0.48	137.0	220.00
1	274.95	15.32	2.268	0.98 (0.47)	0.48	152.3	223.00
1	278.51	19.83	1.943	0.98 (0.47)	0.49	190.0	213.00
1	277.22	20.26	1.918	0.98 (0.47)	0.49	192.3	210.00
1	273.57	21.04	1.875	0.97 (0.47)	0.48	195.8	200.00
2	73.96	18.84	2.004	0.97 (0.37)	0.38	50.4	226.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	338.74	13.69	2.427	0.98 (0.45)	0.46	173.6	220.00
2	344.86	15.32	2.268	0.97 (0.45)	0.46	193.3	223.00
3	351.70	18.84	2.004	0.98 (0.45)	0.46	232.1	226.00
4	349.74	19.83	1.943	0.97 (0.45)	0.46	240.4	213.00

5	347.32	20.26	1.918	0.98 (0.45)	0.46	242.7	210.00
6	341.71	21.04	1.875	0.97 (0.45)	0.46	246.2	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 351.70 Tc (MIN.) = 18.84
 EFFECTIVE AREA (ACRES) = 232.14 AREA-AVERAGED Fm (INCH/HR) = 0.45
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.46
 TOTAL AREA (ACRES) = 246.2
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 229.00 = 6640.00 FEET.

 FLOW PROCESS FROM NODE 229.00 TO NODE 234.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 ELEVATION DATA: UPSTREAM (FEET) = 1000.00 DOWNSTREAM (FEET) = 995.00
 FLOW LENGTH (FEET) = 340.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 52.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 17.46
 ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 351.70
 PIPE TRAVEL TIME (MIN.) = 0.32 Tc (MIN.) = 19.17
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 234.00 = 6980.00 FEET.

 FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 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.) = 19.17
 RAINFALL INTENSITY (INCH/HR) = 1.98
 AREA-AVERAGED Fm (INCH/HR) = 0.45
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.46
 EFFECTIVE STREAM AREA (ACRES) = 232.14
 TOTAL STREAM AREA (ACRES) = 246.20
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 351.70

 FLOW PROCESS FROM NODE 230.00 TO NODE 231.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 INITIAL SUBAREA FLOW-LENGTH (FEET) = 720.00
 ELEVATION DATA: UPSTREAM (FEET) = 1042.00 DOWNSTREAM (FEET) = 1028.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.291
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 3.062
 SUBAREA Tc AND LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)

COMMERCIAL A 1.90 0.98 0.100 32 9.29
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 5.80 0.98 0.500 32 11.89
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.401
 SUBAREA RUNOFF (CFS) = 18.51
 TOTAL AREA (ACRES) = 7.70 PEAK FLOW RATE (CFS) = 18.51

 FLOW PROCESS FROM NODE 231.00 TO NODE 232.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 1028.00 DOWNSTREAM ELEVATION (FEET) = 1014.00
 STREET LENGTH (FEET) = 820.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 29.60
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.52
 HALFSTREET FLOOD WIDTH (FEET) = 18.21
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.22
 PRODUCT OF DEPTH*VELOCITY (FT*FT/SEC.) = 2.21
 STREET FLOW TRAVEL TIME (MIN.) = 3.24 Tc (MIN.) = 12.53

* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.560
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
 SUBAREA AREA (ACRES) = 11.20 SUBAREA RUNOFF (CFS) = 22.12
 EFFECTIVE AREA (ACRES) = 18.90 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
 TOTAL AREA (ACRES) = 18.9 PEAK FLOW RATE (CFS) = 37.14

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.56 HALFSTREET FLOOD WIDTH (FEET) = 19.90
 FLOW VELOCITY (FEET/SEC.) = 4.48 DEPTH*VELOCITY (FT*FT/SEC.) = 2.49
 LONGEST FLOWPATH FROM NODE 230.00 TO NODE 232.00 = 1540.00 FEET.

 FLOW PROCESS FROM NODE 232.00 TO NODE 233.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1014.00 DOWNSTREAM (FEET) = 1000.00
 FLOW LENGTH (FEET) = 850.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.63
 ESTIMATED PIPE DIAMETER (INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 37.14
 PIPE TRAVEL TIME (MIN.) = 1.33 Tc (MIN.) = 13.86
 LONGEST FLOWPATH FROM NODE 230.00 TO NODE 233.00 = 2390.00 FEET.

 FLOW PROCESS FROM NODE 233.00 TO NODE 233.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 13.86
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.409
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	5.60	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.294
 SUBAREA AREA (ACRES) = 18.80 SUBAREA RUNOFF (CFS) = 35.92
 EFFECTIVE AREA (ACRES) = 37.70 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
 TOTAL AREA (ACRES) = 37.7 PEAK FLOW RATE (CFS) = 70.49

 FLOW PROCESS FROM NODE 233.00 TO NODE 234.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 1000.00 DOWNSTREAM (FEET) = 995.00
 FLOW LENGTH (FEET) = 1780.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 6.37
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 70.49
 PIPE TRAVEL TIME (MIN.) = 4.66 Tc (MIN.) = 18.52
 LONGEST FLOWPATH FROM NODE 230.00 TO NODE 234.00 = 4170.00 FEET.

 FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 18.52
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.024

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.10	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	4.00	0.98	0.500	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	7.20	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.262
 SUBAREA AREA (ACRES) = 14.30 SUBAREA RUNOFF (CFS) = 22.76
 EFFECTIVE AREA (ACRES) = 52.00 AREA-AVERAGED Fm (INCH/HR) = 0.31
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
 TOTAL AREA (ACRES) = 52.0 PEAK FLOW RATE (CFS) = 80.21

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 430.65 Tc (MIN.) = 18.52
 EFFECTIVE AREA (ACRES) = 276.99 AREA-AVERAGED Fm (INCH/HR) = 0.42
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.44
 TOTAL AREA (ACRES) = 298.2
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 234.00 = 6980.00 FEET.

FLOW PROCESS FROM NODE 234.00 TO NODE 242.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 995.00 DOWNSTREAM (FEET) = 988.00
 FLOW LENGTH (FEET) = 480.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 55.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 18.40
 ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 430.65
 PIPE TRAVEL TIME (MIN.) = 0.43 Tc (MIN.) = 18.95
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 242.00 = 7460.00 FEET.

FLOW PROCESS FROM NODE 242.00 TO NODE 242.00 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.) = 18.95
 RAINFALL INTENSITY (INCH/HR) = 2.00
 AREA-AVERAGED Fm (INCH/HR) = 0.42
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.44
 EFFECTIVE STREAM AREA (ACRES) = 276.99
 TOTAL STREAM AREA (ACRES) = 298.20
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 430.65

FLOW PROCESS FROM NODE 240.00 TO NODE 241.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1000.00
 ELEVATION DATA: UPSTREAM (FEET) = 1005.00 DOWNSTREAM (FEET) = 995.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.102
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.613
 SUBAREA Tc AND LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL A 3.60 0.98 0.100 32 12.10
 COMMERCIAL A 6.80 0.98 0.100 32 12.10

FLOW PROCESS FROM NODE 234.00 TO NODE 234.00 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.) = 18.52
 RAINFALL INTENSITY (INCH/HR) = 2.02
 AREA-AVERAGED Fm (INCH/HR) = 0.31
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.32
 EFFECTIVE STREAM AREA (ACRES) = 52.00
 TOTAL STREAM AREA (ACRES) = 52.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 80.21

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	338.74	14.02	2.393	0.98 (0.45)	0.46	173.6	220.00
1	344.86	15.65	2.240	0.97 (0.45)	0.46	193.3	223.00
1	351.70	19.17	1.983	0.98 (0.45)	0.46	232.1	226.00
1	349.74	20.15	1.924	0.97 (0.45)	0.46	240.4	213.00
1	347.32	20.58	1.900	0.98 (0.45)	0.46	242.7	210.00
1	341.71	21.37	1.858	0.97 (0.45)	0.46	246.2	200.00
2	80.21	18.52	2.024	0.98 (0.31)	0.32	52.0	230.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	412.50	14.02	2.393	0.97 (0.42)	0.43	213.0	220.00
2	421.15	15.65	2.240	0.97 (0.42)	0.43	237.2	223.00
3	430.65	18.52	2.024	0.98 (0.42)	0.44	277.0	230.00
4	429.98	19.17	1.983	0.98 (0.43)	0.44	284.1	226.00
5	425.28	20.15	1.924	0.98 (0.43)	0.44	292.4	213.00
6	421.71	20.58	1.900	0.98 (0.43)	0.44	294.7	210.00
7	414.13	21.37	1.858	0.97 (0.43)	0.44	298.2	200.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 23.55
 TOTAL AREA(ACRES) = 10.40 PEAK FLOW RATE(CFS) = 23.55

 FLOW PROCESS FROM NODE 241.00 TO NODE 242.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

 UPSTREAM ELEVATION(FEET) = 995.00 DOWNSTREAM ELEVATION(FEET) = 988.00
 STREET LENGTH(FEET) = 2080.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 38.83

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.71
 HALFSTREET FLOOD WIDTH(FEET) = 30.19
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.43
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.74

STREET FLOW TRAVEL TIME(MIN.) = 14.25 Tc(MIN.) = 26.35

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.638

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	5.30	0.98	0.100	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	17.50	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.177

SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 30.08

EFFECTIVE AREA(ACRES) = 33.20 AREA-AVERAGED Fm(INCH/HR) = 0.15

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.15

TOTAL AREA(ACRES) = 33.2 PEAK FLOW RATE(CFS) = 44.51

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 33.15
 FLOW VELOCITY(FEET/SEC.) = 2.50 DEPTH*VELOCITY(FT*FT/SEC.) = 1.86

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 2080.0 FT WITH ELEVATION-DROP = 7.0 FT, IS 35.9 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 242.00

LONGEST FLOWPATH FROM NODE 240.00 TO NODE 242.00 = 3080.00 FEET.

 FLOW PROCESS FROM NODE 242.00 TO NODE 242.00 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.) = 26.35
 RAINFALL INTENSITY(INCH/HR) = 1.64
 AREA-AVERAGED Fm(INCH/HR) = 0.15
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.15
 EFFECTIVE STREAM AREA(ACRES) = 33.20
 TOTAL STREAM AREA(ACRES) = 33.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 44.51

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	412.50	14.45	2.349	0.97(0.42)	0.43	213.0	220.00
1	421.15	16.08	2.203	0.97(0.42)	0.43	237.2	223.00
1	430.65	18.95	1.996	0.98(0.42)	0.44	277.0	230.00
1	429.98	19.60	1.957	0.98(0.43)	0.44	284.1	226.00
1	425.28	20.59	1.900	0.98(0.43)	0.44	292.4	213.00
1	421.71	21.02	1.876	0.98(0.43)	0.44	294.7	210.00
1	414.13	21.81	1.835	0.97(0.43)	0.44	298.2	200.00
2	44.51	26.35	1.638	0.98(0.15)	0.15	33.2	240.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	448.56	14.45	2.349	0.97(0.40)	0.41	231.2	220.00
2	458.61	16.08	2.203	0.98(0.40)	0.41	257.5	223.00
3	470.36	18.95	1.996	0.98(0.40)	0.41	300.9	230.00
4	470.16	19.60	1.957	0.98(0.40)	0.41	308.8	226.00
5	466.15	20.59	1.900	0.98(0.41)	0.42	318.3	213.00
6	462.89	21.02	1.876	0.98(0.40)	0.41	321.2	210.00
7	455.83	21.81	1.835	0.97(0.40)	0.41	325.7	200.00
8	400.70	26.35	1.638	0.97(0.40)	0.41	331.4	240.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 470.36 Tc(MIN.) = 18.95

EFFECTIVE AREA(ACRES) = 300.87 AREA-AVERAGED Fm(INCH/HR) = 0.40

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41

TOTAL AREA(ACRES) = 331.4

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 242.00 = 7460.00 FEET.

 FLOW PROCESS FROM NODE 242.00 TO NODE 253.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 988.00 DOWNSTREAM(FEET) = 978.00
 FLOW LENGTH(FEET) = 530.00 MANNING'S N = 0.013

AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.15
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.70
 STREET FLOW TRAVEL TIME (MIN.) = 9.90 Tc (MIN.) = 27.23
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.606
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.20	0.98	0.100	32
COMMERCIAL	A	3.10	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 15.30 SUBAREA RUNOFF (CFS) = 20.78
 EFFECTIVE AREA (ACRES) = 34.50 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 34.5 PEAK FLOW RATE (CFS) = 46.85

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.80 HALFSTREET FLOOD WIDTH (FEET) = 38.42
 FLOW VELOCITY (FEET/SEC.) = 2.17 DEPTH*VELOCITY (FT*FT/SEC.) = 1.73
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1280.0 FT WITH ELEVATION-DROP = 3.0 FT, IS 27.2 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 253.00
 LONGEST FLOWPATH FROM NODE 250.00 TO NODE 253.00 = 3150.00 FEET.

 FLOW PROCESS FROM NODE 253.00 TO NODE 253.00 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.) = 27.23
 RAINFALL INTENSITY (INCH/HR) = 1.61
 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA (ACRES) = 34.50
 TOTAL STREAM AREA (ACRES) = 34.50
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 46.85

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	448.56	14.89	2.308	0.97(0.40)	0.41	231.2	220.00
1	458.61	16.52	2.168	0.98(0.40)	0.41	257.5	223.00
1	470.36	19.38	1.970	0.98(0.40)	0.41	300.9	230.00
1	470.16	20.03	1.932	0.98(0.40)	0.41	308.8	226.00
1	466.15	21.01	1.877	0.98(0.41)	0.42	318.3	213.00
1	462.89	21.45	1.854	0.98(0.40)	0.41	321.2	210.00
1	455.83	22.24	1.814	0.97(0.40)	0.41	325.7	200.00
1	400.70	26.80	1.622	0.97(0.40)	0.41	331.4	240.00
2	46.85	27.23	1.606	0.98(0.10)	0.10	34.5	250.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	486.08	14.89	2.308	0.97(0.38)	0.39	250.0	220.00
2	497.61	16.52	2.168	0.98(0.38)	0.39	278.4	223.00
3	511.74	19.38	1.970	0.98(0.38)	0.39	325.4	230.00
4	512.04	20.03	1.932	0.98(0.38)	0.39	334.2	226.00
5	508.78	21.01	1.877	0.98(0.38)	0.39	344.9	213.00
6	505.85	21.45	1.854	0.98(0.38)	0.39	348.4	210.00
7	499.36	22.24	1.814	0.97(0.38)	0.39	353.8	200.00
8	447.28	26.80	1.622	0.97(0.37)	0.38	365.4	240.00
9	442.49	27.23	1.606	0.97(0.37)	0.38	365.9	250.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 512.04 Tc (MIN.) = 20.03
 EFFECTIVE AREA (ACRES) = 334.21 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.39
 TOTAL AREA (ACRES) = 365.9
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 253.00 = 7990.00 FEET.

 FLOW PROCESS FROM NODE 253.00 TO NODE 264.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

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ELEVATION DATA: UPSTREAM (FEET) = 978.00 DOWNSTREAM (FEET) = 970.00
 FLOW LENGTH (FEET) = 660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 78.0 INCH PIPE IS 63.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 17.74
 ESTIMATED PIPE DIAMETER (INCH) = 78.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 512.04
 PIPE TRAVEL TIME (MIN.) = 0.62 Tc (MIN.) = 20.65
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 264.00 = 8650.00 FEET.

 FLOW PROCESS FROM NODE 264.00 TO NODE 264.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

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TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 20.65
 RAINFALL INTENSITY (INCH/HR) = 1.90
 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.39
 EFFECTIVE STREAM AREA (ACRES) = 334.21
 TOTAL STREAM AREA (ACRES) = 365.90
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 512.04

 FLOW PROCESS FROM NODE 260.00 TO NODE 261.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 880.00
ELEVATION DATA: UPSTREAM (FEET) = 990.00 DOWNSTREAM (FEET) = 980.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.209
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.736

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	5.80	0.98	0.100	32	11.21

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.97

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF (CFS) = 13.77

TOTAL AREA (ACRES) = 5.80 PEAK FLOW RATE (CFS) = 13.77

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.51 HALFSTREET FLOOD WIDTH (FEET) = 17.47
FLOW VELOCITY (FEET/SEC.) = 3.95 DEPTH*VELOCITY (FT*FT/SEC.) = 2.01
LONGEST FLOWPATH FROM NODE 260.00 TO NODE 262.00 = 1200.00 FEET.

FLOW PROCESS FROM NODE 262.00 TO NODE 263.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION (FEET) = 975.00 DOWNSTREAM ELEVATION (FEET) = 970.00
STREET LENGTH (FEET) = 1000.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 35.87

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.66
HALFSTREET FLOOD WIDTH (FEET) = 25.01
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.78
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.83
STREET FLOW TRAVEL TIME (MIN.) = 5.99 Tc (MIN.) = 18.63
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.017

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.50	0.98	0.100	32
COMMERCIAL	A	6.40	0.98	0.100	32
PUBLIC PARK	A*	7.90	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.500
SUBAREA AREA (ACRES) = 14.80 SUBAREA RUNOFF (CFS) = 20.37
EFFECTIVE AREA (ACRES) = 28.70 AREA-AVERAGED Fm (INCH/HR) = 0.49
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51
TOTAL AREA (ACRES) = 28.7 PEAK FLOW RATE (CFS) = 39.38

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.68 HALFSTREET FLOOD WIDTH (FEET) = 26.40
FLOW VELOCITY (FEET/SEC.) = 2.85 DEPTH*VELOCITY (FT*FT/SEC.) = 1.93
LONGEST FLOWPATH FROM NODE 260.00 TO NODE 263.00 = 2200.00 FEET.

FLOW PROCESS FROM NODE 263.00 TO NODE 264.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

UPSTREAM ELEVATION (FEET) = 980.00 DOWNSTREAM ELEVATION (FEET) = 975.00
STREET LENGTH (FEET) = 320.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 20.22

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.48
HALFSTREET FLOOD WIDTH (FEET) = 15.89
AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.72
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.77
STREET FLOW TRAVEL TIME (MIN.) = 1.43 Tc (MIN.) = 12.64
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.546

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.50	0.98	0.100	32
PUBLIC PARK	A	7.60	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.804

SUBAREA AREA (ACRES) = 8.10 SUBAREA RUNOFF (CFS) = 12.85

EFFECTIVE AREA (ACRES) = 13.90 AREA-AVERAGED Fm (INCH/HR) = 0.50

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.51

TOTAL AREA (ACRES) = 13.9 PEAK FLOW RATE (CFS) = 25.63

ELEVATION DATA: UPSTREAM(FEET) = 970.00 DOWNSTREAM(FEET) = 968.00
 FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.33
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 39.38
 PIPE TRAVEL TIME(MIN.) = 5.08 Tc(MIN.) = 23.71
 LONGEST FLOWPATH FROM NODE 264.00 TO NODE 264.00 = 3520.00 FEET.

1	447.28	27.44	1.599	0.97(0.37)	0.38	365.4	240.00
1	442.49	27.87	1.584	0.97(0.37)	0.38	365.9	250.00
2	55.44	23.71	1.746	0.97(0.49)	0.50	49.0	260.00

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

**** PEAK FLOW RATE TABLE ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	536.95	15.51	2.252	0.97(0.39)	0.40	282.1	220.00
2	549.65	17.14	2.121	0.98(0.39)	0.40	313.8	223.00
3	565.49	20.00	1.933	0.98(0.39)	0.40	366.8	230.00
4	566.12	20.65	1.897	0.98(0.39)	0.40	376.9	226.00
5	563.33	21.63	1.844	0.98(0.39)	0.40	389.6	213.00
6	560.60	22.07	1.822	0.98(0.39)	0.40	394.0	210.00
7	554.45	22.86	1.784	0.97(0.39)	0.40	401.1	200.00
8	545.12	23.71	1.746	0.97(0.39)	0.40	405.0	260.00
9	496.26	27.44	1.599	0.97(0.38)	0.39	414.4	240.00
10	490.81	27.87	1.584	0.97(0.38)	0.39	414.9	250.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 566.12 Tc(MIN.) = 20.65
 EFFECTIVE AREA(ACRES) = 376.88 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.40
 TOTAL AREA(ACRES) = 414.9
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 264.00 = 8650.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 414.9 TC(MIN.) = 20.65
 EFFECTIVE AREA(ACRES) = 376.88 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.403
 PEAK FLOW RATE(CFS) = 566.12

**** PEAK FLOW RATE TABLE ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	536.95	15.51	2.252	0.97(0.39)	0.40	282.1	220.00
2	549.65	17.14	2.121	0.98(0.39)	0.40	313.8	223.00
3	565.49	20.00	1.933	0.98(0.39)	0.40	366.8	230.00
4	566.12	20.65	1.897	0.98(0.39)	0.40	376.9	226.00
5	563.33	21.63	1.844	0.98(0.39)	0.40	389.6	213.00
6	560.60	22.07	1.822	0.98(0.39)	0.40	394.0	210.00
7	554.45	22.86	1.784	0.97(0.39)	0.40	401.1	200.00
8	545.12	23.71	1.746	0.97(0.39)	0.40	405.0	260.00
9	496.26	27.44	1.599	0.97(0.38)	0.39	414.4	240.00
10	490.81	27.87	1.584	0.97(0.38)	0.39	414.9	250.00

END OF RATIONAL METHOD ANALYSIS

FLOW PROCESS FROM NODE 264.00 TO NODE 264.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 23.71

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.746

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.00	0.98	0.100	32
COMMERCIAL	A	8.60	0.98	0.100	32
PUBLIC PARK	A	10.70	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.495

SUBAREA AREA(ACRES) = 20.30 SUBAREA RUNOFF(CFS) = 23.07

EFFECTIVE AREA(ACRES) = 49.00 AREA-AVERAGED Fm(INCH/HR) = 0.49

AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.50

TOTAL AREA(ACRES) = 49.0 PEAK FLOW RATE(CFS) = 55.44

FLOW PROCESS FROM NODE 264.00 TO NODE 264.00 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.) = 23.71

RAINFALL INTENSITY(INCH/HR) = 1.75

AREA-AVERAGED Fm(INCH/HR) = 0.49

AREA-AVERAGED Fp(INCH/HR) = 0.97

AREA-AVERAGED Ap = 0.50

EFFECTIVE STREAM AREA(ACRES) = 49.00

TOTAL STREAM AREA(ACRES) = 49.00

PEAK FLOW RATE(CFS) AT CONFLUENCE = 55.44

**** CONFLUENCE DATA ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	486.08	15.51	2.252	0.97(0.38)	0.39	250.0	220.00
1	497.61	17.14	2.121	0.98(0.38)	0.39	278.4	223.00
1	511.74	20.00	1.933	0.98(0.38)	0.39	325.4	230.00
1	512.04	20.65	1.897	0.98(0.38)	0.39	334.2	226.00
1	508.78	21.63	1.844	0.98(0.38)	0.39	344.9	213.00
1	505.85	22.07	1.822	0.98(0.38)	0.39	348.4	210.00
1	499.36	22.86	1.784	0.97(0.38)	0.39	353.8	200.00

SECTION 7

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 37.42
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.56
HALFSTREET FLOOD WIDTH(FEET) = 20.06
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.44
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.48
STREET FLOW TRAVEL TIME(MIN.) = 2.48 Tc(MIN.) = 12.52
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.329
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.10 0.98 0.100 32
COMMERCIAL A 0.90 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 9.00 SUBAREA RUNOFF(CFS) = 26.17
EFFECTIVE AREA(ACRES) = 16.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 16.3 PEAK FLOW RATE(CFS) = 47.40

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.60 HALFSTREET FLOOD WIDTH(FEET) = 22.06
FLOW VELOCITY(FEET/SEC.) = 4.69 DEPTH*VELOCITY(FT*FT/SEC.) = 2.81
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1460.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 951.00 DOWNSTREAM ELEVATION(FEET) = 950.00
STREET LENGTH(FEET) = 650.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 71.80
STREET FLOWING FULL
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.94
HALFSTREET FLOOD WIDTH(FEET) = 45.45
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.16
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.02
STREET FLOW TRAVEL TIME(MIN.) = 5.02 Tc(MIN.) = 17.54

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.719
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 9.10 0.98 0.100 32
COMMERCIAL A 2.40 0.98 0.100 32
COMMERCIAL A 9.10 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 20.60 SUBAREA RUNOFF(CFS) = 48.60
EFFECTIVE AREA(ACRES) = 36.90 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 36.9 PEAK FLOW RATE(CFS) = 87.06

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.99 HALFSTREET FLOOD WIDTH(FEET) = 48.07
FLOW VELOCITY(FEET/SEC.) = 2.28 DEPTH*VELOCITY(FT*FT/SEC.) = 2.25
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 650.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 54.0 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2110.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 950.00 DOWNSTREAM(FEET) = 945.00
FLOW LENGTH(FEET) = 1370.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 39.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.32
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 87.06
PIPE TRAVEL TIME(MIN.) = 3.12 Tc(MIN.) = 20.66
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 3480.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 20.66
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.465
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 18.10 0.98 0.100 32
COMMERCIAL A 8.90 0.98 0.100 32
COMMERCIAL A 20.10 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 47.10 SUBAREA RUNOFF(CFS) = 100.35
EFFECTIVE AREA(ACRES) = 84.00 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 84.0 PEAK FLOW RATE(CFS) = 178.96

FLOW PROCESS FROM NODE 104.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 945.00 DOWNSTREAM(FEET) = 905.00
FLOW LENGTH(FEET) = 2730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.69
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 178.96
PIPE TRAVEL TIME(MIN.) = 3.10 Tc(MIN.) = 23.76
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6210.00 FEET.

FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 23.76
RAINFALL INTENSITY(INCH/HR) = 2.27
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 84.00
TOTAL STREAM AREA(ACRES) = 84.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 178.96

FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 950.00 DOWNSTREAM(FEET) = 938.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.207
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.763
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	10.21
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32	10.88
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	13.40	0.98	0.200	32	10.88

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.185
SUBAREA RUNOFF(CFS) = 54.48
TOTAL AREA(ACRES) = 16.90 PEAK FLOW RATE(CFS) = 54.48

FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 938.00 DOWNSTREAM ELEVATION(FEET) = 928.00
STREET LENGTH(FEET) = 640.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 76.09
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.69
HALFSTREET FLOOD WIDTH(FEET) = 28.19
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.15
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.57
STREET FLOW TRAVEL TIME(MIN.) = 2.07 Tc(MIN.) = 12.28
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.368
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.00	0.98	0.100	32
RESIDENTIAL					
"4 DWELLING/ACRE"	A	15.30	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.769
SUBAREA AREA(ACRES) = 18.30 SUBAREA RUNOFF(CFS) = 43.12
EFFECTIVE AREA(ACRES) = 35.20 AREA-AVERAGED Fm(INCH/HR) = 0.48
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.49
TOTAL AREA(ACRES) = 35.2 PEAK FLOW RATE(CFS) = 91.59

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.73 HALFSTREET FLOOD WIDTH(FEET) = 32.09
FLOW VELOCITY(FEET/SEC.) = 5.34 DEPTH*VELOCITY(FT*FT/SEC.) = 3.92
LONGEST FLOWPATH FROM NODE 105.00 TO NODE 107.00 = 1440.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 928.00 DOWNSTREAM(FEET) = 910.00
FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.55

ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 91.59
 PIPE TRAVEL TIME(MIN.) = 1.67 Tc(MIN.) = 13.95
 LONGEST FLOWPATH FROM NODE 105.00 TO NODE 108.00 = 2700.00 FEET.

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.725
 SUBAREA AREA(ACRES) = 96.90 SUBAREA RUNOFF(CFS) = 182.15
 EFFECTIVE AREA(ACRES) = 165.00 AREA-AVERAGED Fm(INCH/HR) = 0.66
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.67
 TOTAL AREA(ACRES) = 165.0 PEAK FLOW RATE(CFS) = 317.62

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 13.95
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.119
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.10	0.98	0.100	32
SCHOOL	A	14.20	0.98	0.600	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	16.60	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.719
 SUBAREA AREA(ACRES) = 32.90 SUBAREA RUNOFF(CFS) = 71.59
 EFFECTIVE AREA(ACRES) = 68.10 AREA-AVERAGED Fm(INCH/HR) = 0.59
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 68.1 PEAK FLOW RATE(CFS) = 155.31

 FLOW PROCESS FROM NODE 108.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 910.00 DOWNSTREAM(FEET) = 905.00
 FLOW LENGTH(FEET) = 1400.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 50.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.35
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 155.31
 PIPE TRAVEL TIME(MIN.) = 2.79 Tc(MIN.) = 16.75
 LONGEST FLOWPATH FROM NODE 105.00 TO NODE 110.00 = 4100.00 FEET.

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 16.75
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.796
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	16.80	0.98	0.200	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	73.60	0.98	0.900	32

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 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.) = 16.75
 RAINFALL INTENSITY(INCH/HR) = 2.80
 AREA-AVERAGED Fm(INCH/HR) = 0.66
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.67
 EFFECTIVE STREAM AREA(ACRES) = 165.00
 TOTAL STREAM AREA(ACRES) = 165.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 317.62

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	178.96	23.76	2.267	0.98(0.10)	0.10	84.0	100.00
2	317.62	16.75	2.796	0.98(0.66)	0.67	165.0	105.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	474.55	16.75	2.796	0.98(0.51)	0.52	224.2	105.00
2	418.03	23.76	2.267	0.98(0.47)	0.48	249.0	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 474.55 Tc(MIN.) = 16.75
 EFFECTIVE AREA(ACRES) = 224.22 AREA-AVERAGED Fm(INCH/HR) = 0.51
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.52
 TOTAL AREA(ACRES) = 249.0
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6210.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 249.0 TC(MIN.) = 16.75
 EFFECTIVE AREA(ACRES) = 224.22 AREA-AVERAGED Fm(INCH/HR) = 0.51
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.522
 PEAK FLOW RATE(CFS) = 474.55

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	474.55	16.75	2.796	0.98(0.51)	0.52	224.2	105.00

2 418.03 23.76 2.267 0.98 (0.47) 0.48 249.0 100.00

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN IX (AREA A) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 9-6-2011 *

FILE NAME: VIIA25.DAT
TIME/DATE OF STUDY: 16:26 12/16/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc

USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 975.00 DOWNSTREAM(FEET) = 962.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.045
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.035
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.20	0.98	0.100	32	10.04
COMMERCIAL	A	7.10	0.98	0.100	32	10.04

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 19.30
TOTAL AREA(ACRES) = 7.30 PEAK FLOW RATE(CFS) = 19.30

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 962.00 DOWNSTREAM ELEVATION(FEET) = 951.00
STREET LENGTH(FEET) = 660.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 29.61
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.52
 HALFSTREET FLOOD WIDTH(FEET) = 18.26
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.20
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.20
 STREET FLOW TRAVEL TIME(MIN.) = 2.62 Tc(MIN.) = 12.66
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.641
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.10	0.98	0.100	32
COMMERCIAL	A	0.90	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 9.00 SUBAREA RUNOFF(CFS) = 20.60
 EFFECTIVE AREA(ACRES) = 16.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 16.3 PEAK FLOW RATE(CFS) = 37.31

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.56 HALFSTREET FLOOD WIDTH(FEET) = 20.06
 FLOW VELOCITY(FEET/SEC.) = 4.43 DEPTH*VELOCITY(FT*FT/SEC.) = 2.48
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1460.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====
 UPSTREAM ELEVATION(FEET) = 951.00 DOWNSTREAM ELEVATION(FEET) = 950.00
 STREET LENGTH(FEET) = 650.00 CURB HEIGHT(INCHES) = 3.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 56.27
 STREET FLOWING FULL
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.88
 HALFSTREET FLOOD WIDTH(FEET) = 42.52
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.00

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.76
 STREET FLOW TRAVEL TIME(MIN.) = 5.41 Tc(MIN.) = 18.08
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.133
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.10	0.98	0.100	32
COMMERCIAL	A	2.40	0.98	0.100	32
COMMERCIAL	A	9.10	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 20.60 SUBAREA RUNOFF(CFS) = 37.74
 EFFECTIVE AREA(ACRES) = 36.90 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 36.9 PEAK FLOW RATE(CFS) = 67.61

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.92 HALFSTREET FLOOD WIDTH(FEET) = 44.71
 FLOW VELOCITY(FEET/SEC.) = 2.12 DEPTH*VELOCITY(FT*FT/SEC.) = 1.95
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 650.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 42.8 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2110.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 950.00 DOWNSTREAM(FEET) = 945.00
 FLOW LENGTH(FEET) = 1370.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.96
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 67.61
 PIPE TRAVEL TIME(MIN.) = 3.28 Tc(MIN.) = 21.36
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 3480.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc(MIN.) = 21.36
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.930
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.10	0.98	0.100	32
COMMERCIAL	A	8.90	0.98	0.100	32
COMMERCIAL	A	20.10	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 47.10 SUBAREA RUNOFF(CFS) = 77.68
 EFFECTIVE AREA(ACRES) = 84.00 AREA-AVERAGED Fm(INCH/HR) = 0.10

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 84.0 PEAK FLOW RATE (CFS) = 138.54

SUBAREA RUNOFF (CFS) = 42.97
 TOTAL AREA (ACRES) = 16.90 PEAK FLOW RATE (CFS) = 42.97

 FLOW PROCESS FROM NODE 104.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 945.00 DOWNSTREAM (FEET) = 905.00
 FLOW LENGTH (FEET) = 2730.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.99
 ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 138.54
 PIPE TRAVEL TIME (MIN.) = 3.25 Tc (MIN.) = 24.61
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6210.00 FEET.

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 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.) = 24.61
 RAINFALL INTENSITY (INCH/HR) = 1.77
 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA (ACRES) = 84.00
 TOTAL STREAM AREA (ACRES) = 84.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 138.54

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 800.00
 ELEVATION DATA: UPSTREAM (FEET) = 950.00 DOWNSTREAM (FEET) = 938.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20

SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.207

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.006

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	0.98	0.100	32	10.21
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32	10.88
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	13.40	0.98	0.200	32	10.88

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.185

 FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 938.00 DOWNSTREAM ELEVATION (FEET) = 928.00
 STREET LENGTH (FEET) = 640.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 58.87
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.64
 HALFSTREET FLOOD WIDTH (FEET) = 24.27
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.84
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.12
 STREET FLOW TRAVEL TIME (MIN.) = 2.20 Tc (MIN.) = 12.41

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.673

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.00	0.98	0.100	32
RESIDENTIAL					
".4 DWELLING/ACRE"	A	15.30	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.769

SUBAREA AREA (ACRES) = 18.30 SUBAREA RUNOFF (CFS) = 31.68

EFFECTIVE AREA (ACRES) = 35.20 AREA-AVERAGED Fm (INCH/HR) = 0.48

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.49

TOTAL AREA (ACRES) = 35.2 PEAK FLOW RATE (CFS) = 69.59

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.68 HALFSTREET FLOOD WIDTH (FEET) = 26.40

FLOW VELOCITY (FEET/SEC.) = 5.04 DEPTH*VELOCITY (FT*FT/SEC.) = 3.41

LONGEST FLOWPATH FROM NODE 105.00 TO NODE 107.00 = 1440.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 928.00 DOWNSTREAM (FEET) = 910.00
 FLOW LENGTH (FEET) = 1260.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 36.0 INCH PIPE IS 28.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.50
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 69.59
 PIPE TRAVEL TIME(MIN.) = 1.83 Tc(MIN.) = 14.24
 LONGEST FLOWPATH FROM NODE 105.00 TO NODE 108.00 = 2700.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 14.24
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.462
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 2.10 0.98 0.100 32
 SCHOOL A 14.20 0.98 0.600 32
 RESIDENTIAL
 ".4 DWELLING/ACRE" A 16.60 0.98 0.900 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.719
 SUBAREA AREA(ACRES) = 32.90 SUBAREA RUNOFF(CFS) = 52.12
 EFFECTIVE AREA(ACRES) = 68.10 AREA-AVERAGED Fm(INCH/HR) = 0.59
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 68.1 PEAK FLOW RATE(CFS) = 115.01

 FLOW PROCESS FROM NODE 108.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 910.00 DOWNSTREAM(FEET) = 905.00
 FLOW LENGTH(FEET) = 1400.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 44.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.80
 ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 115.01
 PIPE TRAVEL TIME(MIN.) = 2.99 Tc(MIN.) = 17.23
 LONGEST FLOWPATH FROM NODE 105.00 TO NODE 110.00 = 4100.00 FEET.

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.23
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.195
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 6.50 0.98 0.100 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 16.80 0.98 0.200 32

RESIDENTIAL
 ".4 DWELLING/ACRE" A 73.60 0.98 0.900 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.725
 SUBAREA AREA(ACRES) = 96.90 SUBAREA RUNOFF(CFS) = 129.81
 EFFECTIVE AREA(ACRES) = 165.00 AREA-AVERAGED Fm(INCH/HR) = 0.66
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.67
 TOTAL AREA(ACRES) = 165.0 PEAK FLOW RATE(CFS) = 228.50

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 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.) = 17.23
 RAINFALL INTENSITY(INCH/HR) = 2.20
 AREA-AVERAGED Fm(INCH/HR) = 0.66
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.67
 EFFECTIVE STREAM AREA(ACRES) = 165.00
 TOTAL STREAM AREA(ACRES) = 165.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 228.50

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	138.54	24.61	1.773	0.98(0.10)	0.10	84.0	100.00
2	228.50	17.23	2.195	0.98(0.66)	0.67	165.0	105.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	349.97	17.23	2.195	0.98(0.51)	0.52	223.8	105.00
2	304.27	24.61	1.773	0.98(0.47)	0.48	249.0	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 349.97 Tc(MIN.) = 17.23
 EFFECTIVE AREA(ACRES) = 223.81 AREA-AVERAGED Fm(INCH/HR) = 0.51
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.52
 TOTAL AREA(ACRES) = 249.0
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6210.00 FEET.

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 249.0 TC(MIN.) = 17.23
 EFFECTIVE AREA(ACRES) = 223.81 AREA-AVERAGED Fm(INCH/HR) = 0.51
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.523
 PEAK FLOW RATE(CFS) = 349.97

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Ap	Ae	HEADWATER
--------	---	----	-----------	--------	----	----	-----------

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	349.97	17.23	2.195	0.98 (0.51)	0.52	223.8	105.00
2	304.27	24.61	1.773	0.98 (0.47)	0.48	249.0	100.00

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN IX (AREA A) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 9-6-2011 *

FILE NAME: VIIA10.DAT
TIME/DATE OF STUDY: 16:26 12/16/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I; IN/HR) vs. LOG(Tc; MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
- (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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INITIAL SUBAREA FLOW-LENGTH (FEET) = 800.00
ELEVATION DATA: UPSTREAM (FEET) = 975.00 DOWNSTREAM (FEET) = 962.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.045
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.630

SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.20	1.33	0.100	17	10.04
COMMERCIAL	A	7.10	1.33	0.100	17	10.04

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 16.41
TOTAL AREA (ACRES) = 7.30 PEAK FLOW RATE (CFS) = 16.41

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 962.00 DOWNSTREAM ELEVATION (FEET) = 951.00
STREET LENGTH (FEET) = 660.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 25.11
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.50
HALFSTREET FLOOD WIDTH(FEET) = 17.10
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.03
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.02
STREET FLOW TRAVEL TIME(MIN.) = 2.73 Tc(MIN.) = 12.77
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.277
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.10 1.33 0.100 17
COMMERCIAL A 0.90 1.33 0.100 17
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 9.00 SUBAREA RUNOFF(CFS) = 17.37
EFFECTIVE AREA(ACRES) = 16.30 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 16.3 PEAK FLOW RATE(CFS) = 31.45

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.53 HALFSTREET FLOOD WIDTH(FEET) = 18.74
FLOW VELOCITY(FEET/SEC.) = 4.25 DEPTH*VELOCITY(FT*FT/SEC.) = 2.27
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1460.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 951.00 DOWNSTREAM ELEVATION(FEET) = 950.00
STREET LENGTH(FEET) = 650.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 47.20
STREET FLOWING FULL
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.84
HALFSTREET FLOOD WIDTH(FEET) = 40.62
AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.89
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.59
STREET FLOW TRAVEL TIME(MIN.) = 5.73 Tc(MIN.) = 18.50

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.823
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 9.10 1.33 0.100 17
COMMERCIAL A 2.40 1.33 0.100 17
COMMERCIAL A 9.10 1.33 0.100 17
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 20.60 SUBAREA RUNOFF(CFS) = 31.34
EFFECTIVE AREA(ACRES) = 36.90 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 36.9 PEAK FLOW RATE(CFS) = 56.13

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.88 HALFSTREET FLOOD WIDTH(FEET) = 42.52
FLOW VELOCITY(FEET/SEC.) = 2.00 DEPTH*VELOCITY(FT*FT/SEC.) = 1.75
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 650.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 36.2 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2110.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 950.00 DOWNSTREAM(FEET) = 945.00
FLOW LENGTH(FEET) = 1370.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.65
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 56.13
PIPE TRAVEL TIME(MIN.) = 3.43 Tc(MIN.) = 21.94
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 3480.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 21.94
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.646
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 18.10 1.33 0.100 17
COMMERCIAL A 8.90 1.33 0.100 17
COMMERCIAL A 20.10 1.33 0.100 17
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 47.10 SUBAREA RUNOFF(CFS) = 64.15
EFFECTIVE AREA(ACRES) = 84.00 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 84.0 PEAK FLOW RATE(CFS) = 114.40

FLOW PROCESS FROM NODE 104.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 945.00 DOWNSTREAM(FEET) = 905.00
FLOW LENGTH(FEET) = 2730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.36
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 114.40
PIPE TRAVEL TIME(MIN.) = 3.41 Tc(MIN.) = 25.34
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6210.00 FEET.

FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 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.) = 25.34
RAINFALL INTENSITY(INCH/HR) = 1.51
AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 84.00
TOTAL STREAM AREA(ACRES) = 84.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 114.40

FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 950.00 DOWNSTREAM(FEET) = 938.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.207
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.605
SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.50	1.33	0.100	17	10.21
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	1.00	1.33	0.200	17	10.88
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	13.40	1.33	0.200	17	10.88

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.185
SUBAREA RUNOFF(CFS) = 35.88
TOTAL AREA(ACRES) = 16.90 PEAK FLOW RATE(CFS) = 35.88

FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 938.00 DOWNSTREAM ELEVATION(FEET) = 928.00
STREET LENGTH(FEET) = 640.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 46.52
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.60
HALFSTREET FLOOD WIDTH(FEET) = 22.17
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.56
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.74
STREET FLOW TRAVEL TIME(MIN.) = 2.34 Tc(MIN.) = 12.55
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.302
SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.00	1.33	0.100	17
RESIDENTIAL "4 DWELLING/ACRE"	A	15.30	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.769
SUBAREA AREA(ACRES) = 18.30 SUBAREA RUNOFF(CFS) = 21.09
EFFECTIVE AREA(ACRES) = 35.20 AREA-AVERAGED Fm(INCH/HR) = 0.65
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.49
TOTAL AREA(ACRES) = 35.2 PEAK FLOW RATE(CFS) = 52.35

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 23.22
FLOW VELOCITY(FEET/SEC.) = 4.69 DEPTH*VELOCITY(FT*FT/SEC.) = 2.92
LONGEST FLOWPATH FROM NODE 105.00 TO NODE 107.00 = 1440.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 928.00 DOWNSTREAM(FEET) = 910.00
FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.81

ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 52.35
 PIPE TRAVEL TIME(MIN.) = 1.94 Tc(MIN.) = 14.49
 LONGEST FLOWPATH FROM NODE 105.00 TO NODE 108.00 = 2700.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 14.49
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.111
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.10	1.33	0.100	17
SCHOOL	A	14.20	1.33	0.600	17
RESIDENTIAL ".4 DWELLING/ACRE"	A	16.60	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.719
 SUBAREA AREA(ACRES) = 32.90 SUBAREA RUNOFF(CFS) = 34.22
 EFFECTIVE AREA(ACRES) = 68.10 AREA-AVERAGED Fm(INCH/HR) = 0.80
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.60
 TOTAL AREA(ACRES) = 68.1 PEAK FLOW RATE(CFS) = 80.54

 FLOW PROCESS FROM NODE 108.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 910.00 DOWNSTREAM(FEET) = 905.00
 FLOW LENGTH(FEET) = 1400.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.19
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 80.54
 PIPE TRAVEL TIME(MIN.) = 3.24 Tc(MIN.) = 17.73
 LONGEST FLOWPATH FROM NODE 105.00 TO NODE 110.00 = 4100.00 FEET.

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 17.73
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.870
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	1.33	0.100	17
RESIDENTIAL ".11+ DWELLINGS/ACRE"	A	16.80	1.33	0.200	17
RESIDENTIAL ".4 DWELLING/ACRE"	A	73.60	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.725
 SUBAREA AREA(ACRES) = 96.90 SUBAREA RUNOFF(CFS) = 79.12
 EFFECTIVE AREA(ACRES) = 165.00 AREA-AVERAGED Fm(INCH/HR) = 0.89
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.67
 TOTAL AREA(ACRES) = 165.0 PEAK FLOW RATE(CFS) = 144.89

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 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.) = 17.73
 RAINFALL INTENSITY(INCH/HR) = 1.87
 AREA-AVERAGED Fm(INCH/HR) = 0.89
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.67
 EFFECTIVE STREAM AREA(ACRES) = 165.00
 TOTAL STREAM AREA(ACRES) = 165.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 144.89

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	114.40	25.34	1.510	1.33(0.13)	0.10	84.0	100.00
2	144.89	17.73	1.870	1.33(0.89)	0.67	165.0	105.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	245.91	17.73	1.870	1.33(0.69)	0.52	223.8	105.00
2	205.75	25.34	1.510	1.33(0.64)	0.48	249.0	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 245.91 Tc(MIN.) = 17.73
 EFFECTIVE AREA(ACRES) = 223.78 AREA-AVERAGED Fm(INCH/HR) = 0.69
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.52
 TOTAL AREA(ACRES) = 249.0
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6210.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 249.0 Tc(MIN.) = 17.73
 EFFECTIVE AREA(ACRES) = 223.78 AREA-AVERAGED Fm(INCH/HR) = 0.69
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.523
 PEAK FLOW RATE(CFS) = 245.91

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	245.91	17.73	1.870	1.33(0.69)	0.52	223.8	105.00

2 205.75 25.34 1.510 1.33(0.64) 0.48 249.0 100.00

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN IX (AREA B) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-10-2011 *

FILE NAME: VIIB100.DAT
TIME/DATE OF STUDY: 16:27 12/16/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I; IN/HR) vs. LOG(Tc; MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-CROWN TO STREET-CROSSFALL:		CURB HEIGHT (FT)	GUTTER-GEOMETRIES:			MANNING FACTOR (n)
	WIDTH (FT)	CROSSFALL (FT)		WIDTH (FT)	LIP (FT)	HIKE (FT)	
1	30.0	20.0	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
- (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc

USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00

SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 850.00
ELEVATION DATA: UPSTREAM (FEET) = 913.00 DOWNSTREAM (FEET) = 902.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.771
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.643

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.80	0.98	0.100	32	10.77
RESIDENTIAL ".4 DWELLING/ACRE"	A	7.40	0.98	0.900	32	17.25

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.822

SUBAREA RUNOFF (CFS) = 20.97
TOTAL AREA (ACRES) = 8.20 PEAK FLOW RATE (CFS) = 20.97

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 902.00 DOWNSTREAM ELEVATION (FEET) = 888.00
STREET LENGTH (FEET) = 1050.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 36.56
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.57
 HALfstREET FLOOD WIDTH(FEET) = 20.79
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.05
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.33
 STREET FLOW TRAVEL TIME(MIN.) = 4.32 Tc(MIN.) = 15.09
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.976

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.60	0.98	0.100	32
RESIDENTIAL					
" .4 DWELLING/ACRE"	A	14.20	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.819
 SUBAREA AREA(ACRES) = 15.80 SUBAREA RUNOFF(CFS) = 30.96
 EFFECTIVE AREA(ACRES) = 24.00 AREA-AVERAGED Fm(INCH/HR) = 0.80
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.82
 TOTAL AREA(ACRES) = 24.0 PEAK FLOW RATE(CFS) = 47.01

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.62 HALfstREET FLOOD WIDTH(FEET) = 22.96
 FLOW VELOCITY(FEET/SEC.) = 4.31 DEPTH*VELOCITY(FT*FT/SEC.) = 2.66
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1900.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 888.00 DOWNSTREAM ELEVATION(FEET) = 870.00
 STREET LENGTH(FEET) = 1280.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 62.54
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.67
 HALfstREET FLOOD WIDTH(FEET) = 25.38
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.72
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.14

STREET FLOW TRAVEL TIME(MIN.) = 4.52 Tc(MIN.) = 19.62
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.543

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.40	0.98	0.100	32
SCHOOL	A	7.00	0.98	0.600	32
RESIDENTIAL					
" .4 DWELLING/ACRE"	A	10.40	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.729
 SUBAREA AREA(ACRES) = 18.80 SUBAREA RUNOFF(CFS) = 31.00
 EFFECTIVE AREA(ACRES) = 42.80 AREA-AVERAGED Fm(INCH/HR) = 0.76
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.78
 TOTAL AREA(ACRES) = 42.8 PEAK FLOW RATE(CFS) = 68.65

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.68 HALfstREET FLOOD WIDTH(FEET) = 27.24
 FLOW VELOCITY(FEET/SEC.) = 4.81 DEPTH*VELOCITY(FT*FT/SEC.) = 3.30
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 3180.00 FEET.

 FLOW PROCESS FROM NODE 203.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.42
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 68.65
 PIPE TRAVEL TIME(MIN.) = 1.22 Tc(MIN.) = 20.84
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 4530.00 FEET.

 FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 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.) = 20.84
 RAINFALL INTENSITY (INCH/HR) = 2.45
 AREA-AVERAGED Fm(INCH/HR) = 0.76
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.78
 EFFECTIVE STREAM AREA(ACRES) = 42.80
 TOTAL STREAM AREA(ACRES) = 42.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 68.65

 FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1070.00
ELEVATION DATA: UPSTREAM (FEET) = 910.00 DOWNSTREAM (FEET) = 891.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.085
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.581
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.10	0.98	0.100	32	11.09
RESIDENTIAL ".4 DWELLING/ACRE"	A	10.20	0.98	0.900	32	17.76

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.714
SUBAREA RUNOFF (CFS) = 34.53
TOTAL AREA (ACRES) = 13.30 PEAK FLOW RATE (CFS) = 34.53

FLOW PROCESS FROM NODE 205.00 TO NODE 206.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 891.00 DOWNSTREAM ELEVATION (FEET) = 885.00
STREET LENGTH (FEET) = 1050.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 68.66
STRETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.78
HALFSTREET FLOOD WIDTH (FEET) = 36.84
AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.36
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.63
STREET FLOW TRAVEL TIME (MIN.) = 5.20 Tc (MIN.) = 16.29
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.843
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.70	0.98	0.100	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	24.70	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.674
SUBAREA AREA (ACRES) = 34.40 SUBAREA RUNOFF (CFS) = 67.65
EFFECTIVE AREA (ACRES) = 47.70 AREA-AVERAGED Fm (INCH/HR) = 0.67

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.69
TOTAL AREA (ACRES) = 47.7 PEAK FLOW RATE (CFS) = 93.34

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.84 HALFSTREET FLOOD WIDTH (FEET) = 40.87
FLOW VELOCITY (FEET/SEC.) = 3.68 DEPTH*VELOCITY (FT*FT/SEC.) = 3.11
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1050.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 76.8 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 206.00
LONGEST FLOWPATH FROM NODE 204.00 TO NODE 206.00 = 2120.00 FEET.

FLOW PROCESS FROM NODE 206.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 885.00 DOWNSTREAM (FEET) = 865.00
FLOW LENGTH (FEET) = 1280.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.2 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 13.07
ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 93.34
PIPE TRAVEL TIME (MIN.) = 1.63 Tc (MIN.) = 17.92
LONGEST FLOWPATH FROM NODE 204.00 TO NODE 210.00 = 3400.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 17.92
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.684
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/
LAND USE

SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	
COMMERCIAL	A	8.70	0.98	0.100	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	31.40	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.726
SUBAREA AREA (ACRES) = 40.10 SUBAREA RUNOFF (CFS) = 71.31
EFFECTIVE AREA (ACRES) = 87.80 AREA-AVERAGED Fm (INCH/HR) = 0.69
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.70
TOTAL AREA (ACRES) = 87.8 PEAK FLOW RATE (CFS) = 157.86

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 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.) = 17.92
RAINFALL INTENSITY (INCH/HR) = 2.68

AREA-AVERAGED Fm(INCH/HR) = 0.69
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.70
 EFFECTIVE STREAM AREA(ACRES) = 87.80
 TOTAL STREAM AREA(ACRES) = 87.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 157.86

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	68.65	20.84	2.452	0.97(0.76)	0.78	42.8	200.00
2	157.86	17.92	2.684	0.97(0.69)	0.70	87.8	204.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	225.01	17.92	2.684	0.97(0.71)	0.73	124.6	204.00
2	208.16	20.84	2.452	0.97(0.71)	0.73	130.6	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 225.01 Tc(MIN.) = 17.92
 EFFECTIVE AREA(ACRES) = 124.61 AREA-AVERAGED Fm(INCH/HR) = 0.71
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.73
 TOTAL AREA(ACRES) = 130.6
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 4530.00 FEET.

 FLOW PROCESS FROM NODE 210.00 TO NODE 220.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 865.00 DOWNSTREAM(FEET) = 828.00
 FLOW LENGTH(FEET) = 2660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.37
 ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 225.01
 PIPE TRAVEL TIME(MIN.) = 2.88 Tc(MIN.) = 20.80
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 220.00 = 7190.00 FEET.

 FLOW PROCESS FROM NODE 220.00 TO NODE 220.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 20.80
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.454
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	19.20	0.98	0.100	32
COMMERCIAL	A	4.20	0.98	0.100	32

RESIDENTIAL
 ".4 DWELLING/ACRE" A 74.10 0.98 0.900 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.708
 SUBAREA AREA(ACRES) = 97.50 SUBAREA RUNOFF(CFS) = 154.80
 EFFECTIVE AREA(ACRES) = 222.11 AREA-AVERAGED Fm(INCH/HR) = 0.70
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.72
 TOTAL AREA(ACRES) = 228.1 PEAK FLOW RATE(CFS) = 350.61

 FLOW PROCESS FROM NODE 221.00 TO NODE 222.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

 INITIAL SUBAREA FLOW-LENGTH(FEET) = 810.00
 ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 855.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.754
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.900
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL ".4 DWELLING/ACRE"	A	7.80	0.98	0.900	32	15.75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.900
 SUBAREA RUNOFF(CFS) = 14.20
 TOTAL AREA(ACRES) = 7.80 PEAK FLOW RATE(CFS) = 14.20

 FLOW PROCESS FROM NODE 222.00 TO NODE 223.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<<

 UPSTREAM ELEVATION(FEET) = 855.00 DOWNSTREAM ELEVATION(FEET) = 850.00
 STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 28.25
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.60
 HALFSTREET FLOOD WIDTH(FEET) = 22.32
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.73
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.65

STREET FLOW TRAVEL TIME(MIN.) = 5.49 Tc(MIN.) = 21.25
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.424
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.30	0.98	0.100	32
RESIDENTIAL					
" .4 DWELLING/ACRE"	A	18.10	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.846
 SUBAREA AREA(ACRES) = 19.40 SUBAREA RUNOFF(CFS) = 27.91
 EFFECTIVE AREA(ACRES) = 27.20 AREA-AVERAGED Fm(INCH/HR) = 0.84
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.86
 TOTAL AREA(ACRES) = 27.2 PEAK FLOW RATE(CFS) = 38.76

SUBAREA AREA(ACRES) = 67.20 SUBAREA RUNOFF(CFS) = 77.83
 EFFECTIVE AREA(ACRES) = 94.40 AREA-AVERAGED Fm(INCH/HR) = 0.77
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.79
 TOTAL AREA(ACRES) = 94.4 PEAK FLOW RATE(CFS) = 106.84

=====
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 94.4 TC(MIN.) = 28.66
 EFFECTIVE AREA(ACRES) = 94.40 AREA-AVERAGED Fm(INCH/HR) = 0.77
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.787
 PEAK FLOW RATE(CFS) = 106.84
 =====

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 END OF RATIONAL METHOD ANALYSIS
 =====

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.66 HALFSTREET FLOOD WIDTH(FEET) = 25.22
 FLOW VELOCITY(FEET/SEC.) = 2.96 DEPTH*VELOCITY(FT*FT/SEC.) = 1.96
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 900.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 42.3 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 223.00
 LONGEST FLOWPATH FROM NODE 221.00 TO NODE 223.00 = 1710.00 FEET.

 FLOW PROCESS FROM NODE 223.00 TO NODE 224.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 850.00 DOWNSTREAM(FEET) = 830.00
 FLOW LENGTH(FEET) = 3280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 25.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.37
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 38.76
 PIPE TRAVEL TIME(MIN.) = 7.42 Tc(MIN.) = 28.66
 LONGEST FLOWPATH FROM NODE 221.00 TO NODE 224.00 = 4990.00 FEET.

 FLOW PROCESS FROM NODE 224.00 TO NODE 224.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 28.66
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.025
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.40	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	6.80	0.98	0.500	32
PUBLIC PARK	A	19.30	0.98	0.850	32
RESIDENTIAL					
" .4 DWELLING/ACRE"	A	33.70	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.757

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN IX (AREA B) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-10-2011 *

FILE NAME: VIIB25.DAT
TIME/DATE OF STUDY: 16:28 12/16/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED
DURATION RAINFALL (INCH)
5-MINUTES 0.38
30-MINUTES 0.79
1-HOUR 1.04
3-HOUR 1.87
6-HOUR 2.71
24-HOUR 5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<<<

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INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00
ELEVATION DATA: UPSTREAM(FEET) = 913.00 DOWNSTREAM(FEET) = 902.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.771
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.910
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.80	0.98	0.100	32	10.77
RESIDENTIAL ".4 DWELLING/ACRE"	A	7.40	0.98	0.900	32	17.25

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.822
SUBAREA RUNOFF(CFS) = 15.56
TOTAL AREA(ACRES) = 8.20 PEAK FLOW RATE(CFS) = 15.56

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION(FEET) = 902.00 DOWNSTREAM ELEVATION(FEET) = 888.00
STREET LENGTH(FEET) = 1050.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 26.66
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.52
 HALFSTREET FLOOD WIDTH(FEET) = 18.32
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.76
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.97
 STREET FLOW TRAVEL TIME(MIN.) = 4.65 Tc(MIN.) = 15.42
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.346
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.60	0.98	0.100	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	14.20	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.819
 SUBAREA AREA(ACRES) = 15.80 SUBAREA RUNOFF(CFS) = 22.01
 EFFECTIVE AREA(ACRES) = 24.00 AREA-AVERAGED Fm(INCH/HR) = 0.80
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.82
 TOTAL AREA(ACRES) = 24.0 PEAK FLOW RATE(CFS) = 33.41

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.56 HALFSTREET FLOOD WIDTH(FEET) = 20.06
 FLOW VELOCITY(FEET/SEC.) = 3.97 DEPTH*VELOCITY(FT*FT/SEC.) = 2.22
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1900.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 888.00 DOWNSTREAM ELEVATION(FEET) = 870.00
 STREET LENGTH(FEET) = 1280.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 44.23
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.60
 HALFSTREET FLOOD WIDTH(FEET) = 22.17

AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.33
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.61
 STREET FLOW TRAVEL TIME(MIN.) = 4.92 Tc(MIN.) = 20.35
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.987
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.40	0.98	0.100	32
SCHOOL	A	7.00	0.98	0.600	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	10.40	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.729
 SUBAREA AREA(ACRES) = 18.80 SUBAREA RUNOFF(CFS) = 21.60
 EFFECTIVE AREA(ACRES) = 42.80 AREA-AVERAGED Fm(INCH/HR) = 0.76
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.78
 TOTAL AREA(ACRES) = 42.8 PEAK FLOW RATE(CFS) = 47.25

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 22.75
 FLOW VELOCITY(FEET/SEC.) = 4.41 DEPTH*VELOCITY(FT*FT/SEC.) = 2.70
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 3180.00 FEET.

 FLOW PROCESS FROM NODE 203.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 17.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 16.89
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 47.25
 PIPE TRAVEL TIME(MIN.) = 1.33 Tc(MIN.) = 21.68
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 4530.00 FEET.

 FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 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.) = 21.68
 RAINFALL INTENSITY(INCH/HR) = 1.91
 AREA-AVERAGED Fm(INCH/HR) = 0.76
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.78
 EFFECTIVE STREAM AREA(ACRES) = 42.80
 TOTAL STREAM AREA(ACRES) = 42.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 47.25

 FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1070.00
 ELEVATION DATA: UPSTREAM (FEET) = 910.00 DOWNSTREAM (FEET) = 891.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.085
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.860
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.10	0.98	0.100	32	11.09
RESIDENTIAL ".4 DWELLING/ACRE"	A	10.20	0.98	0.900	32	17.76

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.714
 SUBAREA RUNOFF (CFS) = 25.91
 TOTAL AREA (ACRES) = 13.30 PEAK FLOW RATE (CFS) = 25.91

 FLOW PROCESS FROM NODE 205.00 TO NODE 206.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION (FEET) = 891.00 DOWNSTREAM ELEVATION (FEET) = 885.00
 STREET LENGTH (FEET) = 1050.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 50.69
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.71
 HALFSTREET FLOOD WIDTH (FEET) = 30.19
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.18
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.27
 STREET FLOW TRAVEL TIME (MIN.) = 5.51 Tc (MIN.) = 16.59
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.245

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.70	0.98	0.100	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	24.70	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.674

SUBAREA AREA (ACRES) = 34.40 SUBAREA RUNOFF (CFS) = 49.16
 EFFECTIVE AREA (ACRES) = 47.70 AREA-AVERAGED Fm (INCH/HR) = 0.67
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.69
 TOTAL AREA (ACRES) = 47.7 PEAK FLOW RATE (CFS) = 67.71

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.78 HALFSTREET FLOOD WIDTH (FEET) = 36.52
 FLOW VELOCITY (FEET/SEC.) = 3.36 DEPTH*VELOCITY (FT*FT/SEC.) = 2.61
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1050.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 57.3 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 206.00
 LONGEST FLOWPATH FROM NODE 204.00 TO NODE 206.00 = 2120.00 FEET.

 FLOW PROCESS FROM NODE 206.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 885.00 DOWNSTREAM (FEET) = 865.00
 FLOW LENGTH (FEET) = 1280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.95
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 67.71
 PIPE TRAVEL TIME (MIN.) = 1.78 Tc (MIN.) = 18.38
 LONGEST FLOWPATH FROM NODE 204.00 TO NODE 210.00 = 3400.00 FEET.

 FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 18.38
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.112
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.70	0.98	0.100	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	31.40	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.726
 SUBAREA AREA (ACRES) = 40.10 SUBAREA RUNOFF (CFS) = 50.66
 EFFECTIVE AREA (ACRES) = 87.80 AREA-AVERAGED Fm (INCH/HR) = 0.69
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.70
 TOTAL AREA (ACRES) = 87.8 PEAK FLOW RATE (CFS) = 112.64

 FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 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:

AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.51
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.36
 STREET FLOW TRAVEL TIME (MIN.) = 5.99 Tc (MIN.) = 21.74
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.910
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.30	0.98	0.100	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	18.10	0.98	0.900	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.846
 SUBAREA AREA (ACRES) = 19.40 SUBAREA RUNOFF (CFS) = 18.93
 EFFECTIVE AREA (ACRES) = 27.20 AREA-AVERAGED Fm (INCH/HR) = 0.84
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.86
 TOTAL AREA (ACRES) = 27.2 PEAK FLOW RATE (CFS) = 26.18

EFFECTIVE AREA (ACRES) = 94.40 AREA-AVERAGED Fm (INCH/HR) = 0.77
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.79
 TOTAL AREA (ACRES) = 94.4 PEAK FLOW RATE (CFS) = 68.51

=====
 END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 94.4 TC (MIN.) = 30.00
 EFFECTIVE AREA (ACRES) = 94.40 AREA-AVERAGED Fm (INCH/HR) = 0.77
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.787
 PEAK FLOW RATE (CFS) = 68.51
 =====

END OF RATIONAL METHOD ANALYSIS

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.59 HALFSTREET FLOOD WIDTH (FEET) = 21.64
 FLOW VELOCITY (FEET/SEC.) = 2.69 DEPTH*VELOCITY (FT*FT/SEC.) = 1.59
 LONGEST FLOWPATH FROM NODE 221.00 TO NODE 223.00 = 1710.00 FEET.

 FLOW PROCESS FROM NODE 223.00 TO NODE 224.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 850.00 DOWNSTREAM (FEET) = 830.00
 FLOW LENGTH (FEET) = 3280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 6.62
 ESTIMATED PIPE DIAMETER (INCH) = 30.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 26.18
 PIPE TRAVEL TIME (MIN.) = 8.26 Tc (MIN.) = 30.00
 LONGEST FLOWPATH FROM NODE 221.00 TO NODE 224.00 = 4990.00 FEET.

 FLOW PROCESS FROM NODE 224.00 TO NODE 224.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 30.00
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.574
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.40	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	6.80	0.98	0.500	32
PUBLIC PARK	A	19.30	0.98	0.850	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	33.70	0.98	0.900	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.757
 SUBAREA AREA (ACRES) = 67.20 SUBAREA RUNOFF (CFS) = 50.55

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASER PLAN OF DRAINAGE - BASIN IX (AREA B) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-10-2011 *

FILE NAME: VIIB10.DAT
TIME/DATE OF STUDY: 16:28 12/16/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I; IN/HR) vs. LOG(Tc; MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-CROWN TO		STREET-CROSSFALL:		CURB HEIGHT (FT)	GUTTER-GEOMETRIES:			MANNING FACTOR (n)
	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE	OUT- / SIDE		WIDTH (FT)	LIP (FT)	HIKE (FT)	
1	30.0	20.0	0.018/0.018	0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020	0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
- (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc

USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL (INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 850.00
ELEVATION DATA: UPSTREAM (FEET) = 913.00 DOWNSTREAM (FEET) = 902.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.771
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.522
SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.80	1.33	0.100	17	10.77
RESIDENTIAL ".4 DWELLING/ACRE"	A	7.40	1.33	0.900	17	17.25

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.822
SUBAREA RUNOFF (CFS) = 10.56
TOTAL AREA (ACRES) = 8.20 PEAK FLOW RATE (CFS) = 10.56

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION (FEET) = 902.00 DOWNSTREAM ELEVATION (FEET) = 888.00
STREET LENGTH (FEET) = 1050.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FBET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 17.11
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.46
 HALFSTREET FLOOD WIDTH(FEET) = 15.31
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.38
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.57
 STREET FLOW TRAVEL TIME(MIN.) = 5.18 Tc(MIN.) = 15.95
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.993
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.60	1.33	0.100	17
RESIDENTIAL ".4 DWELLING/ACRE"	A	14.20	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.819
 SUBAREA AREA(ACRES) = 15.80 SUBAREA RUNOFF(CFS) = 12.87
 EFFECTIVE AREA(ACRES) = 24.00 AREA-AVERAGED Fm(INCH/HR) = 1.09
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.82
 TOTAL AREA(ACRES) = 24.0 PEAK FLOW RATE(CFS) = 19.52

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.48 HALFSTREET FLOOD WIDTH(FEET) = 16.15
 FLOW VELOCITY(FEET/SEC.) = 3.49 DEPTH*VELOCITY(FT*FT/SEC.) = 1.68
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1900.00 FEET.

 FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 888.00 DOWNSTREAM ELEVATION(FEET) = 870.00
 STREET LENGTH(FEET) = 1280.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 25.43
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.51
 HALFSTREET FLOOD WIDTH(FEET) = 17.79
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.79
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.95

STREET FLOW TRAVEL TIME(MIN.) = 5.63 Tc(MIN.) = 21.58
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.662

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.40	1.33	0.100	17
SCHOOL	A	7.00	1.33	0.600	17
RESIDENTIAL ".4 DWELLING/ACRE"	A	10.40	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.729
 SUBAREA AREA(ACRES) = 18.80 SUBAREA RUNOFF(CFS) = 11.75
 EFFECTIVE AREA(ACRES) = 42.80 AREA-AVERAGED Fm(INCH/HR) = 1.04
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.78
 TOTAL AREA(ACRES) = 42.8 PEAK FLOW RATE(CFS) = 24.14

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.51 HALFSTREET FLOOD WIDTH(FEET) = 17.42
 FLOW VELOCITY(FEET/SEC.) = 3.74 DEPTH*VELOCITY(FT*FT/SEC.) = 1.90
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 3180.00 FEET.

 FLOW PROCESS FROM NODE 203.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 1350.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.29
 ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 24.14
 PIPE TRAVEL TIME(MIN.) = 1.58 Tc(MIN.) = 23.15
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 4530.00 FEET.

 FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 23.15
 RAINFALL INTENSITY(INCH/HR) = 1.59
 AREA-AVERAGED Fm(INCH/HR) = 1.04
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.78
 EFFECTIVE STREAM AREA(ACRES) = 42.80
 TOTAL STREAM AREA(ACRES) = 42.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 24.14

 FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1070.00
ELEVATION DATA: UPSTREAM (FEET) = 910.00 DOWNSTREAM (FEET) = 891.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.085
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.479
SUBAREA Tc AND LOSS RATE DATA (AMC I):

Table with 7 columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows include COMMERCIAL, RESIDENTIAL, and ".4 DWELLING/ACRE".

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.714
SUBAREA RUNOFF (CFS) = 18.33
TOTAL AREA (ACRES) = 13.30 PEAK FLOW RATE (CFS) = 18.33

FLOW PROCESS FROM NODE 205.00 TO NODE 206.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION (FEET) = 891.00 DOWNSTREAM ELEVATION (FEET) = 885.00
STREET LENGTH (FEET) = 1050.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 34.33
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.64
HALFSTREET FLOOD WIDTH (FEET) = 23.96
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.90
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.85
STREET FLOW TRAVEL TIME (MIN.) = 6.04 Tc (MIN.) = 17.13
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.909
SUBAREA LOSS RATE DATA (AMC I):

Table with 7 columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN. Rows include COMMERCIAL, RESIDENTIAL, and ".4 DWELLING/ACRE".

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.674
SUBAREA AREA (ACRES) = 34.40 SUBAREA RUNOFF (CFS) = 31.38
EFFECTIVE AREA (ACRES) = 47.70 AREA-AVERAGED Fm (INCH/HR) = 0.91

AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.69
TOTAL AREA (ACRES) = 47.7 PEAK FLOW RATE (CFS) = 42.90

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.68 HALFSTREET FLOOD WIDTH (FEET) = 26.82
FLOW VELOCITY (FEET/SEC.) = 3.06 DEPTH*VELOCITY (FT*FT/SEC.) = 2.08
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1050.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 39.6 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 206.00
LONGEST FLOWPATH FROM NODE 204.00 TO NODE 206.00 = 2120.00 FEET.

FLOW PROCESS FROM NODE 206.00 TO NODE 210.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM (FEET) = 885.00 DOWNSTREAM (FEET) = 865.00
FLOW LENGTH (FEET) = 1280.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 23.0 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 10.62
ESTIMATED PIPE DIAMETER (INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 42.90
PIPE TRAVEL TIME (MIN.) = 2.01 Tc (MIN.) = 19.14
LONGEST FLOWPATH FROM NODE 204.00 TO NODE 210.00 = 3400.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc (MIN.) = 19.14
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.786
SUBAREA LOSS RATE DATA (AMC I):
DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN
COMMERCIAL A 8.70 1.33 0.100 17
RESIDENTIAL
".4 DWELLING/ACRE" A 31.40 1.33 0.900 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.726
SUBAREA AREA (ACRES) = 40.10 SUBAREA RUNOFF (CFS) = 29.66
EFFECTIVE AREA (ACRES) = 87.80 AREA-AVERAGED Fm (INCH/HR) = 0.94
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.70
TOTAL AREA (ACRES) = 87.8 PEAK FLOW RATE (CFS) = 67.27

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 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.) = 19.14
RAINFALL INTENSITY (INCH/HR) = 1.79

AREA-AVERAGED Fm (INCH/HR) = 0.94
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.70
 EFFECTIVE STREAM AREA (ACRES) = 87.80
 TOTAL STREAM AREA (ACRES) = 87.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 67.27

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	24.14	23.15	1.594	1.33 (1.04)	0.78	42.8	200.00
2	67.27	19.14	1.786	1.33 (0.94)	0.70	87.8	204.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	91.41	19.14	1.786	1.33 (0.96)	0.73	123.2	204.00
2	76.18	23.15	1.594	1.33 (0.97)	0.73	130.6	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 91.41 Tc (MIN.) = 19.14
 EFFECTIVE AREA (ACRES) = 123.18 AREA-AVERAGED Fm (INCH/HR) = 0.96
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.73
 TOTAL AREA (ACRES) = 130.6
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 210.00 = 4530.00 FEET.

 FLOW PROCESS FROM NODE 210.00 TO NODE 220.00 IS CODE = 31

>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<<<
 >>>> USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

ELEVATION DATA: UPSTREAM (FEET) = 865.00 DOWNSTREAM (FEET) = 828.00
 FLOW LENGTH (FEET) = 2660.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.41
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 91.41
 PIPE TRAVEL TIME (MIN.) = 3.57 Tc (MIN.) = 22.71
 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 220.00 = 7190.00 FEET.

 FLOW PROCESS FROM NODE 220.00 TO NODE 220.00 IS CODE = 81

>>>> ADDITION OF SUBAREA TO MAINLINE PEAK FLOW <<<<<

MAINLINE Tc (MIN.) = 22.71
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.612
 SUBAREA LOSS RATE DATA (AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 19.20 1.33 0.100 17
 COMMERCIAL A 4.20 1.33 0.100 17

RESIDENTIAL
 ".4 DWELLING/ACRE" A 74.10 1.33 0.900 17
 SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.708
 SUBAREA AREA (ACRES) = 97.50 SUBAREA RUNOFF (CFS) = 58.95
 EFFECTIVE AREA (ACRES) = 220.68 AREA-AVERAGED Fm (INCH/HR) = 0.95
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.72
 TOTAL AREA (ACRES) = 228.1 PEAK FLOW RATE (CFS) = 130.80

 FLOW PROCESS FROM NODE 221.00 TO NODE 222.00 IS CODE = 21

>>>> RATIONAL METHOD INITIAL SUBAREA ANALYSIS <<<<<
 >> USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA <<

 INITIAL SUBAREA FLOW-LENGTH (FEET) = 810.00
 ELEVATION DATA: UPSTREAM (FEET) = 870.00 DOWNSTREAM (FEET) = 855.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 15.754
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.008
 SUBAREA Tc AND LOSS RATE DATA (AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE" A 7.80 1.33 0.900 17 15.75
 SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.900
 SUBAREA RUNOFF (CFS) = 5.70
 TOTAL AREA (ACRES) = 7.80 PEAK FLOW RATE (CFS) = 5.70

 FLOW PROCESS FROM NODE 222.00 TO NODE 223.00 IS CODE = 62

>>>> COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <<<<<
 >>>> (STREET TABLE SECTION # 2 USED) <<<<<

 UPSTREAM ELEVATION (FEET) = 855.00 DOWNSTREAM ELEVATION (FEET) = 850.00
 STREET LENGTH (FEET) = 900.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

** TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 10.08
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.45
 HALFSTREET FLOOD WIDTH (FEET) = 14.73
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.14
 PRODUCT OF DEPTH & VELOCITY (FT*FT/SEC.) = 0.97

STREET FLOW TRAVEL TIME(MIN.) = 7.02 Tc(MIN.) = 22.77
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.609
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.30	1.33	0.100	17
RESIDENTIAL					
"4 DWELLING/ACRE"	A	18.10	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.846
 SUBAREA AREA(ACRES) = 19.40 SUBAREA RUNOFF(CFS) = 8.48
 EFFECTIVE AREA(ACRES) = 27.20 AREA-AVERAGED Fm(INCH/HR) = 1.14
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.86
 TOTAL AREA(ACRES) = 27.2 PEAK FLOW RATE(CFS) = 11.38

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.47 HALFSTREET FLOOD WIDTH(FEET) = 15.52
 FLOW VELOCITY(FEET/SEC.) = 2.19 DEPTH*VELOCITY(FT*FT/SEC.) = 1.03
 LONGEST FLOWPATH FROM NODE 221.00 TO NODE 223.00 = 1710.00 FEET.

FLOW PROCESS FROM NODE 223.00 TO NODE 224.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 850.00 DOWNSTREAM(FEET) = 830.00
 FLOW LENGTH(FEET) = 3280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.47
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 11.38
 PIPE TRAVEL TIME(MIN.) = 9.99 Tc(MIN.) = 32.76
 LONGEST FLOWPATH FROM NODE 221.00 TO NODE 224.00 = 4990.00 FEET.

FLOW PROCESS FROM NODE 224.00 TO NODE 224.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

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MAINLINE Tc(MIN.) = 32.76
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.294
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.40	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	6.80	1.33	0.500	17
PUBLIC PARK	A	19.30	1.33	0.850	17
RESIDENTIAL					
"4 DWELLING/ACRE"	A	33.70	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.757
 * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
 * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
 SUBAREA AREA(ACRES) = 67.20 SUBAREA RUNOFF(CFS) = 19.01

EFFECTIVE AREA(ACRES) = 94.40 AREA-AVERAGED Fm(INCH/HR) = 1.05
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.79
 * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
 * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
 TOTAL AREA(ACRES) = 94.4 PEAK FLOW RATE(CFS) = 23.39

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 94.4 TC(MIN.) = 32.76
 EFFECTIVE AREA(ACRES) = 94.40 AREA-AVERAGED Fm(INCH/HR) = 1.05
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.787
 PEAK FLOW RATE(CFS) = 23.39

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA C) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-10-2011 *

FILE NAME: VIIC100.DAT
TIME/DATE OF STUDY: 15:07 11/18/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-/PARK-SIDE / SIDE/WAY, CURB HEIGHT (FT), GUTTER GEOMETRIES (FT), MANNING LIP HIKE FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL (INCH)
5-MINUTES 0.48
30-MINUTES 0.99
1-HOUR 1.30
3-HOUR 2.39
6-HOUR 3.50
24-HOUR 7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 760.00
ELEVATION DATA: UPSTREAM (FEET) = 975.00 DOWNSTREAM (FEET) = 961.00

Table with columns: DEVELOPMENT TYPE/LAND USE, GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.)
COMMERCIAL A 4.70 0.98 0.100 32 9.60
COMMERCIAL A 1.40 0.98 0.100 32 9.60
COMMERCIAL A 3.90 0.98 0.100 32 9.60

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 34.26
TOTAL AREA (ACRES) = 10.00 PEAK FLOW RATE (CFS) = 34.26

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 961.00 DOWNSTREAM ELEVATION (FEET) = 952.00
STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 60.35
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.67
 HALFSTREET FLOOD WIDTH(FEET) = 25.55
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.51
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.01
 STREET FLOW TRAVEL TIME(MIN.) = 2.59 Tc(MIN.) = 12.18
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.384

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.10	0.98	0.100	32
COMMERCIAL	A	4.70	0.98	0.100	32
COMMERCIAL	A	1.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 17.60 SUBAREA RUNOFF(CFS) = 52.05
 EFFECTIVE AREA(ACRES) = 27.60 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 27.6 PEAK FLOW RATE(CFS) = 81.63

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.73 HALFSTREET FLOOD WIDTH(FEET) = 31.78
 FLOW VELOCITY(FEET/SEC.) = 4.82 DEPTH*VELOCITY(FT*FT/SEC.) = 3.52
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1460.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 12.18
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.384
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.80	0.98	0.100	32
COMMERCIAL	A	7.60	0.98	0.100	32
COMMERCIAL	A	1.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 67.43
 EFFECTIVE AREA(ACRES) = 50.40 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 50.4 PEAK FLOW RATE(CFS) = 149.07

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 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.) = 12.18
 RAINFALL INTENSITY(INCH/HR) = 3.38
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 50.40
 TOTAL STREAM AREA(ACRES) = 50.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 149.07

 FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 960.00
 ELEVATION DATA: UPSTREAM(FEET) = 980.00 DOWNSTREAM(FEET) = 970.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.810
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.447
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.50	0.98	0.100	32	11.81
COMMERCIAL	A	4.40	0.98	0.100	32	11.81

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 14.77
 TOTAL AREA(ACRES) = 4.90 PEAK FLOW RATE(CFS) = 14.77

 FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 970.00 DOWNSTREAM ELEVATION(FEET) = 965.00
 STREET LENGTH(FEET) = 660.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 28.64
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.58
 HALFSTREET FLOOD WIDTH(FEET) = 21.11

AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.08
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.79
 STREET FLOW TRAVEL TIME (MIN.) = 3.57 Tc (MIN.) = 15.38
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.942
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.50	0.98	0.100	32
COMMERCIAL	A	10.30	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 10.80 SUBAREA RUNOFF (CFS) = 27.65
 EFFECTIVE AREA (ACRES) = 15.70 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 15.7 PEAK FLOW RATE (CFS) = 40.20

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.64 HALFSTREET FLOOD WIDTH (FEET) = 24.12
 FLOW VELOCITY (FEET/SEC.) = 3.35 DEPTH*VELOCITY (FT*FT/SEC.) = 2.14
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 1620.00 FEET.

 FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 62

>>>> COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>> (STREET TABLE SECTION # 2 USED) <<<<<

UPSTREAM ELEVATION (FEET) = 965.00 DOWNSTREAM ELEVATION (FEET) = 960.00
 STREET LENGTH (FEET) = 690.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 60.55

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.73
 HALFSTREET FLOOD WIDTH (FEET) = 31.46
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.62
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.63
 STREET FLOW TRAVEL TIME (MIN.) = 3.18 Tc (MIN.) = 18.56
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.629
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.40	0.98	0.100	32
COMMERCIAL	A	2.40	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	6.30	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.135
 SUBAREA AREA (ACRES) = 18.10 SUBAREA RUNOFF (CFS) = 40.68
 EFFECTIVE AREA (ACRES) = 33.80 AREA-AVERAGED Fm (INCH/HR) = 0.12
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.12
 TOTAL AREA (ACRES) = 33.8 PEAK FLOW RATE (CFS) = 76.44

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.78 HALFSTREET FLOOD WIDTH (FEET) = 36.63
 FLOW VELOCITY (FEET/SEC.) = 3.77 DEPTH*VELOCITY (FT*FT/SEC.) = 2.94
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 690.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 56.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 313.00
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 313.00 = 2310.00 FEET.

 FLOW PROCESS FROM NODE 313.00 TO NODE 302.00 IS CODE = 31

>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>> USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

ELEVATION DATA: UPSTREAM (FEET) = 960.00 DOWNSTREAM (FEET) = 952.00
 FLOW LENGTH (FEET) = 690.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.92
 ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 76.44
 PIPE TRAVEL TIME (MIN.) = 1.05 Tc (MIN.) = 19.61
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 302.00 = 3000.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 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.) = 19.61
 RAINFALL INTENSITY (INCH/HR) = 2.54
 AREA-AVERAGED Fm (INCH/HR) = 0.12
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.12
 EFFECTIVE STREAM AREA (ACRES) = 33.80
 TOTAL STREAM AREA (ACRES) = 33.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 76.44

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	149.07	12.18	3.384	0.98 (0.10)	0.10	50.4	300.00
2	76.44	19.61	2.543	0.97 (0.12)	0.12	33.8	310.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	213.00	12.18	3.384	0.98 (0.10)	0.11	71.4	300.00
2	187.37	19.61	2.543	0.98 (0.10)	0.11	84.2	310.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 213.00 Tc (MIN.) = 12.18
EFFECTIVE AREA (ACRES) = 71.40 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
TOTAL AREA (ACRES) = 84.2
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 302.00 = 3000.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 952.00 DOWNSTREAM (FEET) = 912.00
FLOW LENGTH (FEET) = 2500.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.3 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 15.93
ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 213.00
PIPE TRAVEL TIME (MIN.) = 2.62 Tc (MIN.) = 14.80
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 303.00 = 5500.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 14.80
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.011
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	24.10	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.20	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.60	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	30.80	0.98	0.200	32
COMMERCIAL	A	4.30	0.98	0.100	32
RESIDENTIAL					
".4 DWELLING/ACRE"	A	13.90	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.319
SUBAREA AREA (ACRES) = 84.90 SUBAREA RUNOFF (CFS) = 206.33
EFFECTIVE AREA (ACRES) = 156.30 AREA-AVERAGED Fm (INCH/HR) = 0.22
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22
TOTAL AREA (ACRES) = 169.1 PEAK FLOW RATE (CFS) = 393.20

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 14.80
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.011
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.70	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.80	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	35.00	0.98	0.200	32
COMMERCIAL	A	1.80	0.98	0.100	32
PUBLIC PARK	A	0.60	0.98	0.850	32
COMMERCIAL	A	1.10	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.188
SUBAREA AREA (ACRES) = 46.00 SUBAREA RUNOFF (CFS) = 117.08
EFFECTIVE AREA (ACRES) = 202.30 AREA-AVERAGED Fm (INCH/HR) = 0.21
AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
TOTAL AREA (ACRES) = 215.1 PEAK FLOW RATE (CFS) = 510.28

FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 911.00 DOWNSTREAM (FEET) = 875.00
FLOW LENGTH (FEET) = 2990.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 78.0 INCH PIPE IS 63.4 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 17.68
ESTIMATED PIPE DIAMETER (INCH) = 78.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 510.28
PIPE TRAVEL TIME (MIN.) = 2.82 Tc (MIN.) = 17.62
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 304.00 = 8490.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 17.62
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.712
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	31.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	49.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	7.70	0.98	0.200	32
COMMERCIAL	A	1.40	0.98	0.100	32
RESIDENTIAL					
".4 DWELLING/ACRE"	A	42.30	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.510
 SUBAREA AREA(ACRES) = 132.40 SUBAREA RUNOFF(CFS) = 263.89
 EFFECTIVE AREA(ACRES) = 334.70 AREA-AVERAGED Fm(INCH/HR) = 0.32
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.33
 TOTAL AREA(ACRES) = 347.5 PEAK FLOW RATE(CFS) = 719.71

"11+ DWELLINGS/ACRE" A 40.40 0.98 0.200 32
 RESIDENTIAL
 ".4 DWELLING/ACRE" A 7.20 0.98 0.900 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.312
 SUBAREA AREA(ACRES) = 84.00 SUBAREA RUNOFF(CFS) = 169.20
 EFFECTIVE AREA(ACRES) = 510.90 AREA-AVERAGED Fm(INCH/HR) = 0.33
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.34
 TOTAL AREA(ACRES) = 523.7 PEAK FLOW RATE(CFS) = 1017.77

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.62
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.712
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	26.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	65.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.385
 SUBAREA AREA(ACRES) = 92.20 SUBAREA RUNOFF(CFS) = 193.88
 EFFECTIVE AREA(ACRES) = 426.90 AREA-AVERAGED Fm(INCH/HR) = 0.33
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.34
 TOTAL AREA(ACRES) = 439.7 PEAK FLOW RATE(CFS) = 913.60

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 875.00 DOWNSTREAM(FEET) = 840.00
 FLOW LENGTH(FEET) = 2580.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 96.0 INCH PIPE IS 75.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 21.53
 ESTIMATED PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 913.60
 PIPE TRAVEL TIME(MIN.) = 2.00 Tc(MIN.) = 19.61
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 305.00 = 11070.00 FEET.

 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.61
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.543
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	16.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	20.10	0.98	0.500	32
RESIDENTIAL					

 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.61
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.543
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.40	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.40	0.98	0.200	32
PUBLIC PARK	A	4.70	0.98	0.850	32
SCHOOL	A	23.30	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.447
 SUBAREA AREA(ACRES) = 57.80 SUBAREA RUNOFF(CFS) = 109.58
 EFFECTIVE AREA(ACRES) = 568.70 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 581.5 PEAK FLOW RATE(CFS) = 1127.35

 FLOW PROCESS FROM NODE 305.00 TO NODE 400.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 840.00 DOWNSTREAM(FEET) = 825.00
 FLOW LENGTH(FEET) = 1150.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 108.0 INCH PIPE IS 78.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 22.64
 ESTIMATED PIPE DIAMETER(INCH) = 108.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1127.35
 PIPE TRAVEL TIME(MIN.) = 0.85 Tc(MIN.) = 20.46
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 400.00 = 12220.00 FEET.

 FLOW PROCESS FROM NODE 400.00 TO NODE 400.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 20.46
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.479

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.60	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32
SCHOOL	A	23.20	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.470
SUBAREA AREA(ACRES) = 49.60 SUBAREA RUNOFF(CFS) = 90.22
EFFECTIVE AREA(ACRES) = 618.30 AREA-AVERAGED Fm(INCH/HR) = 0.35
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.36
TOTAL AREA(ACRES) = 631.1 PEAK FLOW RATE(CFS) = 1184.98

FLOW PROCESS FROM NODE 400.00 TO NODE 500.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 825.00 DOWNSTREAM(FEET) = 813.00
FLOW LENGTH(FEET) = 2790.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 132.0 INCH PIPE IS 102.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.97
ESTIMATED PIPE DIAMETER(INCH) = 132.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1184.98
PIPE TRAVEL TIME(MIN.) = 3.11 Tc(MIN.) = 23.57
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 500.00 = 15010.00 FEET.

FLOW PROCESS FROM NODE 500.00 TO NODE 500.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 23.57
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.277
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.30	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	18.90	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.220
SUBAREA AREA(ACRES) = 46.80 SUBAREA RUNOFF(CFS) = 86.90
EFFECTIVE AREA(ACRES) = 665.10 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 677.9 PEAK FLOW RATE(CFS) = 1184.98
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 500.00 TO NODE 500.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:
RAINFALL(INCH): 5M= 0.48;30M= 0.99;1H= 1.30;3H= 2.39;6H= 3.50;24H= 7.00
S-GRAPH: VALLEY(DEV.)= 90.6%; VALLEY(UNDEV.)/DESERT= 9.4%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
Tc(HR) = 0.53; LAG(HR) = 0.42; Fm(INCH/HR) = 0.34; Ybar = 0.35
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
3HR = 1.00; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 677.9
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 500.00 = 15010.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0271; Lca/L=0.4,n=.0243; Lca/L=0.5,n=.0224;Lca/L=0.6,n=.0209
TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 265.81
UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 1015.67
TOTAL PEAK FLOW RATE(CFS) = 1015.67 (SOURCE FLOW INCLUDED)
RATIONAL METHOD PEAK FLOW RATE(CFS) = 1184.98
(UPSTREAM NODE PEAK FLOW RATE(CFS) = 1184.98)
PEAK FLOW RATE(CFS) USED = 1184.98

FLOW PROCESS FROM NODE 500.00 TO NODE 600.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 813.00 DOWNSTREAM(FEET) = 775.00
FLOW LENGTH(FEET) = 2640.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 108.0 INCH PIPE IS 78.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 23.78
ESTIMATED PIPE DIAMETER(INCH) = 108.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1184.98
PIPE TRAVEL TIME(MIN.) = 1.85 Tc(MIN.) = 33.40
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.

FLOW PROCESS FROM NODE 600.00 TO NODE 600.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 33.40
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.848
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	88.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.440
SUBAREA AREA(ACRES) = 103.70
UNIT-HYDROGRAPH DATA:
RAINFALL(INCH): 5M= 0.48;30M= 0.99;1H= 1.30;3H= 2.39;6H= 3.50;24H= 7.00

S-GRAPH: VALLEY (DEV.) = 91.9%; VALLEY (UNDEV.) / DESERT = 8.1%
MOUNTAIN = 0.0%; FOOTHILL = 0.0%; DESERT (UNDEV.) = 0.0%
Tc (HR) = 0.56; LAG (HR) = 0.45; Fm (INCH/HR) = 0.35; Ybar = 0.36
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
3HR = 0.99; 6HR = 1.00; 24HR = 1.00
UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 781.6
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3, n=.0256; Lca/L=0.4, n=.0230; Lca/L=0.5, n=.0211; Lca/L=0.6, n=.0197
TIME OF PEAK FLOW (HR) = 16.50 RUNOFF VOLUME (AF) = 301.36
UNIT-HYDROGRAPH PEAK FLOW RATE (CFS) = 1129.51
TOTAL AREA (ACRES) = 781.6 PEAK FLOW RATE (CFS) = 1184.98
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

FLOW PROCESS FROM NODE 600.00 TO NODE 600.00 IS CODE = 81

>>>> ADDITION OF SUBAREA TO MAINLINE PEAK FLOW <<<<<<
=====

MAINLINE Tc (MIN.) = 33.40
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 1.848
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 27.50 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 53.30 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.364
SUBAREA AREA (ACRES) = 80.80

UNIT-HYDROGRAPH DATA:
RAINFALL (INCH): 5M = 0.48; 30M = 0.99; 1H = 1.30; 3H = 2.39; 6H = 3.50; 24H = 7.00
S-GRAPH: VALLEY (DEV.) = 92.6%; VALLEY (UNDEV.) / DESERT = 7.4%
MOUNTAIN = 0.0%; FOOTHILL = 0.0%; DESERT (UNDEV.) = 0.0%
Tc (HR) = 0.56; LAG (HR) = 0.45; Fm (INCH/HR) = 0.35; Ybar = 0.36
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
3HR = 0.99; 6HR = 1.00; 24HR = 1.00
UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 862.4
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3, n=.0256; Lca/L=0.4, n=.0230; Lca/L=0.5, n=.0211; Lca/L=0.6, n=.0197
TIME OF PEAK FLOW (HR) = 16.50 RUNOFF VOLUME (AF) = 332.10
UNIT-HYDROGRAPH PEAK FLOW RATE (CFS) = 1242.34
TOTAL AREA (ACRES) = 862.4 PEAK FLOW RATE (CFS) = 1242.34
=====

END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 862.4 TC (MIN.) = 33.40
AREA-AVERAGED Fm (INCH/HR) = 0.35 Ybar = 0.36
PEAK FLOW RATE (CFS) = 1242.34
=====

=====

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

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

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***** DESCRIPTION OF STUDY *****

- * ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA C)
* 25-YEAR HYDROLOGY ANALYSIS
* P. PAGADUAN 8-19-2011

FILE NAME: VIIC25.DAT
TIME/DATE OF STUDY: 15:19 11/18/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY (INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY (INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., (FT), (FT), IN- / OUT- / PARK- SIDE / SIDE / WAY, HEIGHT (FT), WIDTH (FT), LIP (FT), HIKE (FT), FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, RAINFALL (INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 760.00
ELEVATION DATA: UPSTREAM (FEET) = 975.00 DOWNSTREAM (FEET) = 961.00

Table with columns: DEVELOPMENT TYPE/, SCS SOIL AREA, Fp, Ap, SCS, Tc. Rows: COMMERCIAL, LAND USE, COMMERCIAL, COMMERCIAL.

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 27.19
TOTAL AREA (ACRES) = 10.00 PEAK FLOW RATE (CFS) = 27.19

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====

UPSTREAM ELEVATION (FEET) = 961.00 DOWNSTREAM ELEVATION (FEET) = 952.00
STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 47.71
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.62
 HALFSTREET FLOOD WIDTH(FEET) = 23.27
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.26
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.65
 STREET FLOW TRAVEL TIME(MIN.) = 2.74 Tc(MIN.) = 12.34
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.682

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.10	0.98	0.100	32
COMMERCIAL	A	4.70	0.98	0.100	32
COMMERCIAL	A	1.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 17.60 SUBAREA RUNOFF(CFS) = 40.95
 EFFECTIVE AREA(ACRES) = 27.60 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 27.6 PEAK FLOW RATE(CFS) = 64.21

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.68 HALFSTREET FLOOD WIDTH(FEET) = 26.71
 FLOW VELOCITY(FEET/SEC.) = 4.59 DEPTH*VELOCITY(FT*FT/SEC.) = 3.12
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1460.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 12.34
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.682
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.80	0.98	0.100	32
COMMERCIAL	A	7.60	0.98	0.100	32
COMMERCIAL	A	1.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 53.04
 EFFECTIVE AREA(ACRES) = 50.40 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 50.4 PEAK FLOW RATE(CFS) = 117.25

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 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.) = 12.34
 RAINFALL INTENSITY(INCH/HR) = 2.68
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 50.40
 TOTAL STREAM AREA(ACRES) = 50.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 117.25

 FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 960.00
 ELEVATION DATA: UPSTREAM(FEET) = 980.00 DOWNSTREAM(FEET) = 970.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.810
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.754

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.50	0.98	0.100	32	11.81
COMMERCIAL	A	4.40	0.98	0.100	32	11.81

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 11.71
 TOTAL AREA(ACRES) = 4.90 PEAK FLOW RATE(CFS) = 11.71

 FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 970.00 DOWNSTREAM ELEVATION(FEET) = 965.00
 STREET LENGTH(FEET) = 660.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 22.60
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.54
 HALFSTREET FLOOD WIDTH (FEET) = 19.21
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.91
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.58
 STREET FLOW TRAVEL TIME (MIN.) = 3.78 Tc (MIN.) = 15.59
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.331
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.50	0.98	0.100	32
COMMERCIAL	A	10.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 10.80 SUBAREA RUNOFF (CFS) = 21.71
 EFFECTIVE AREA (ACRES) = 15.70 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 15.7 PEAK FLOW RATE (CFS) = 31.57

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.60 HALFSTREET FLOOD WIDTH (FEET) = 21.95
 FLOW VELOCITY (FEET/SEC.) = 3.15 DEPTH*VELOCITY (FT*FT/SEC.) = 1.88
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 1620.00 FEET.

 FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

 UPSTREAM ELEVATION (FEET) = 965.00 DOWNSTREAM ELEVATION (FEET) = 960.00
 STREET LENGTH (FEET) = 690.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 47.41
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.68
 HALFSTREET FLOOD WIDTH (FEET) = 26.40
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.43
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.32
 STREET FLOW TRAVEL TIME (MIN.) = 3.35 Tc (MIN.) = 18.94
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.074
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.40	0.98	0.100	32
COMMERCIAL	A	2.40	0.98	0.100	32
RESIDENTIAL					

"11+ DWELLINGS/ACRE"	A	6.30	0.98	0.200	32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97					
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.135					
SUBAREA AREA (ACRES) = 18.10					
SUBAREA RUNOFF (CFS) = 31.65					
EFFECTIVE AREA (ACRES) = 33.80					
AREA-AVERAGED Fm (INCH/HR) = 0.12					
AREA-AVERAGED Fp (INCH/HR) = 0.97					
AREA-AVERAGED Ap = 0.12					
TOTAL AREA (ACRES) = 33.8					
PEAK FLOW RATE (CFS) = 59.59					

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.72 HALFSTREET FLOOD WIDTH (FEET) = 31.14
 FLOW VELOCITY (FEET/SEC.) = 3.60 DEPTH*VELOCITY (FT*FT/SEC.) = 2.61
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 313.00 = 2310.00 FEET.

 FLOW PROCESS FROM NODE 313.00 TO NODE 302.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 960.00 DOWNSTREAM (FEET) = 952.00
 FLOW LENGTH (FEET) = 690.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.32
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 59.59
 PIPE TRAVEL TIME (MIN.) = 1.11 Tc (MIN.) = 20.05
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 302.00 = 3000.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 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.) = 20.05
 RAINFALL INTENSITY (INCH/HR) = 2.00
 AREA-AVERAGED Fm (INCH/HR) = 0.12
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.12
 EFFECTIVE STREAM AREA (ACRES) = 33.80
 TOTAL STREAM AREA (ACRES) = 33.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 59.59

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	117.25	12.34	2.682	0.98 (0.10)	0.10	50.4	300.00
2	59.59	20.05	2.004	0.97 (0.12)	0.12	33.8	310.00

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	167.08	12.34	2.682	0.98 (0.10)	0.11	71.2 300.00
2	146.09	20.05	2.004	0.98 (0.10)	0.11	84.2 310.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 167.08 Tc(MIN.) = 12.34
 EFFECTIVE AREA(ACRES) = 71.20 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
 TOTAL AREA(ACRES) = 84.2
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 302.00 = 3000.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 952.00 DOWNSTREAM(FEET) = 912.00
 FLOW LENGTH(FEET) = 2500.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.18
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 167.08
 PIPE TRAVEL TIME(MIN.) = 2.74 Tc(MIN.) = 15.08
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 303.00 = 5500.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 15.08
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.378
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	24.10	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.20	0.98	0.200	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.60	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	30.80	0.98	0.200	32
COMMERCIAL	A	4.30	0.98	0.100	32
RESIDENTIAL					
".4 DWELLING/ACRE"	A	13.90	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.319
 SUBAREA AREA(ACRES) = 84.90 SUBAREA RUNOFF(CFS) = 157.96
 EFFECTIVE AREA(ACRES) = 156.10 AREA-AVERAGED Fm(INCH/HR) = 0.22
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22
 TOTAL AREA(ACRES) = 169.1 PEAK FLOW RATE(CFS) = 303.74

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc(MIN.) = 15.08
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.378
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.70	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.80	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	35.00	0.98	0.200	32
COMMERCIAL	A	1.80	0.98	0.100	32
PUBLIC PARK	A	0.60	0.98	0.850	32
COMMERCIAL	A	1.10	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.188
 SUBAREA AREA(ACRES) = 46.00 SUBAREA RUNOFF(CFS) = 90.87
 EFFECTIVE AREA(ACRES) = 202.10 AREA-AVERAGED Fm(INCH/HR) = 0.21
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
 TOTAL AREA(ACRES) = 215.1 PEAK FLOW RATE(CFS) = 394.61

 FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 911.00 DOWNSTREAM(FEET) = 875.00
 FLOW LENGTH(FEET) = 2990.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 56.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 16.73
 ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 394.61
 PIPE TRAVEL TIME(MIN.) = 2.98 Tc(MIN.) = 18.06
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 304.00 = 8490.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 18.06
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.134
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	31.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	49.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	7.70	0.98	0.200	32
COMMERCIAL	A	1.40	0.98	0.100	32
RESIDENTIAL					
".4 DWELLING/ACRE"	A	42.30	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.510
 SUBAREA AREA (ACRES) = 132.40 SUBAREA RUNOFF (CFS) = 195.04
 EFFECTIVE AREA (ACRES) = 334.50 AREA-AVERAGED Fm (INCH/HR) = 0.32
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.33
 TOTAL AREA (ACRES) = 347.5 PEAK FLOW RATE (CFS) = 545.32

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 18.06
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.134
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	26.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	65.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.385
 SUBAREA AREA (ACRES) = 92.20 SUBAREA RUNOFF (CFS) = 145.94
 EFFECTIVE AREA (ACRES) = 426.70 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.34
 TOTAL AREA (ACRES) = 439.7 PEAK FLOW RATE (CFS) = 691.26

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 875.00 DOWNSTREAM (FEET) = 840.00
 FLOW LENGTH (FEET) = 2580.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 87.0 INCH PIPE IS 67.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 20.14
 ESTIMATED PIPE DIAMETER (INCH) = 87.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 691.26
 PIPE TRAVEL TIME (MIN.) = 2.14 Tc (MIN.) = 20.20
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 305.00 = 11070.00 FEET.

 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 20.20
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.996
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	16.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	20.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	40.40	0.98	0.200	32

RESIDENTIAL
 ".4 DWELLINGS/ACRE" A 7.20 0.98 0.900 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.312
 SUBAREA AREA (ACRES) = 84.00 SUBAREA RUNOFF (CFS) = 127.85
 EFFECTIVE AREA (ACRES) = 510.70 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.34
 TOTAL AREA (ACRES) = 523.7 PEAK FLOW RATE (CFS) = 765.97

 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 20.20
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.996
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.40	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.40	0.98	0.200	32
PUBLIC PARK	A	4.70	0.98	0.850	32
SCHOOL	A	23.30	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.447
 SUBAREA AREA (ACRES) = 57.80 SUBAREA RUNOFF (CFS) = 81.13
 EFFECTIVE AREA (ACRES) = 568.50 AREA-AVERAGED Fm (INCH/HR) = 0.34
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.35
 TOTAL AREA (ACRES) = 581.5 PEAK FLOW RATE (CFS) = 847.10

 FLOW PROCESS FROM NODE 305.00 TO NODE 400.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 840.00 DOWNSTREAM (FEET) = 825.00
 FLOW LENGTH (FEET) = 1150.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 93.0 INCH PIPE IS 75.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 20.69
 ESTIMATED PIPE DIAMETER (INCH) = 93.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 847.10
 PIPE TRAVEL TIME (MIN.) = 0.93 Tc (MIN.) = 21.12
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 400.00 = 12220.00 FEET.

 FLOW PROCESS FROM NODE 400.00 TO NODE 400.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 21.12
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.943
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	8.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.60	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32
SCHOOL	A	23.20	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.470
 SUBAREA AREA (ACRES) = 49.60 SUBAREA RUNOFF (CFS) = 66.28
 EFFECTIVE AREA (ACRES) = 618.10 AREA-AVERAGED Fm (INCH/HR) = 0.35
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 631.1 PEAK FLOW RATE (CFS) = 886.26

 FLOW PROCESS FROM NODE 400.00 TO NODE 500.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 825.00 DOWNSTREAM (FEET) = 813.00
 FLOW LENGTH (FEET) = 2790.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 120.0 INCH PIPE IS 90.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.00
 ESTIMATED PIPE DIAMETER (INCH) = 120.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 886.26
 PIPE TRAVEL TIME (MIN.) = 3.32 Tc (MIN.) = 24.45
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 500.00 = 15010.00 FEET.

 FLOW PROCESS FROM NODE 500.00 TO NODE 500.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 24.45
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.780
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.30	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	18.90	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.220
 SUBAREA AREA (ACRES) = 46.80 SUBAREA RUNOFF (CFS) = 65.94
 EFFECTIVE AREA (ACRES) = 664.90 AREA-AVERAGED Fm (INCH/HR) = 0.34
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.35
 TOTAL AREA (ACRES) = 677.9 PEAK FLOW RATE (CFS) = 886.26
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 FLOW PROCESS FROM NODE 500.00 TO NODE 500.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:
 RAINFALL (INCH): 5M= 0.39;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY (DEV.)= 90.6%;VALLEY (UNDEV.) /DESERT= 9.4%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT (UNDEV.)= 0.0%
 Tc (HR) = 0.55; LAG (HR) = 0.44; Fm (INCH/HR) = 0.34; Ybar = 0.37
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 677.9
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 500.00 = 15010.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3, n=.0282; Lca/L=0.4, n=.0253; Lca/L=0.5, n=.0233; Lca/L=0.6, n=.0217
 TIME OF PEAK FLOW (HR) = 16.50 RUNOFF VOLUME (AF) = 195.56
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE (CFS) = 775.96
 TOTAL PEAK FLOW RATE (CFS) = 775.96 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE (CFS) = 886.26
 (UPSTREAM NODE PEAK FLOW RATE (CFS) = 886.26)
 PEAK FLOW RATE (CFS) USED = 886.26

 FLOW PROCESS FROM NODE 500.00 TO NODE 600.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 813.00 DOWNSTREAM (FEET) = 775.00
 FLOW LENGTH (FEET) = 2640.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 93.0 INCH PIPE IS 75.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 21.73
 ESTIMATED PIPE DIAMETER (INCH) = 93.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 886.26
 PIPE TRAVEL TIME (MIN.) = 2.02 Tc (MIN.) = 34.84
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.

 FLOW PROCESS FROM NODE 600.00 TO NODE 600.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 34.84
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.439
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	88.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.440
 SUBAREA AREA (ACRES) = 103.70
 UNIT-HYDROGRAPH DATA:
 RAINFALL (INCH): 5M= 0.39;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY (DEV.)= 91.9%;VALLEY (UNDEV.) /DESERT= 8.1%

MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.58; LAG(HR) = 0.46; Fm(INCH/HR) = 0.35; Ybar = 0.38
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 781.6
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0267; Lca/L=0.4,n=.0240; Lca/L=0.5,n=.0220;Lca/L=0.6,n=.0205
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 221.48
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 851.87
 TOTAL AREA(ACRES) = 781.6 PEAK FLOW RATE(CFS) = 886.26
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 FLOW PROCESS FROM NODE 600.00 TO NODE 600.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc(MIN.) = 34.84
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.439
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	27.50	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	53.30	0.98	0.500	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.364
 SUBAREA AREA(ACRES) = 80.80
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.39;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY(DEV.)= 92.6%;VALLEY(UNDEV.)/DESERT= 7.4%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.58; LAG(HR) = 0.46; Fm(INCH/HR) = 0.35; Ybar = 0.38
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 862.4
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0267; Lca/L=0.4,n=.0240; Lca/L=0.5,n=.0220;Lca/L=0.6,n=.0205
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 244.06
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 936.72
 TOTAL AREA(ACRES) = 862.4 PEAK FLOW RATE(CFS) = 936.72

=====
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 862.4 TC(MIN.) = 34.84
 AREA-AVERAGED Fm(INCH/HR)= 0.35 Ybar = 0.38
 PEAK FLOW RATE(CFS) = 936.72
 =====

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 END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS
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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA C) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-19-2011 *

FILE NAME: VIIC10.DAT
TIME/DATE OF STUDY: 15:28 11/18/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0312 0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00 0.0312 0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
- 2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 760.00
ELEVATION DATA: UPSTREAM (FEET) = 975.00 DOWNSTREAM (FEET) = 961.00

Tc = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 9.597
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.703
SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	4.70	1.33	0.100	17	9.60
COMMERCIAL	A	1.40	1.33	0.100	17	9.60
COMMERCIAL	A	3.90	1.33	0.100	17	9.60

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 23.13
TOTAL AREA (ACRES) = 10.00 PEAK FLOW RATE (CFS) = 23.13

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION (FEET) = 961.00 DOWNSTREAM ELEVATION (FEET) = 952.00
STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 40.44
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.59
 HALfstREET FLOOD WIDTH(FEET) = 21.80
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.09
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.43
 STREET FLOW TRAVEL TIME(MIN.) = 2.85 Tc(MIN.) = 12.45
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.313

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.10	1.33	0.100	17
COMMERCIAL	A	4.70	1.33	0.100	17
COMMERCIAL	A	1.80	1.33	0.100	17

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 17.60 SUBAREA RUNOFF(CFS) = 34.53
 EFFECTIVE AREA(ACRES) = 27.60 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 27.6 PEAK FLOW RATE(CFS) = 54.14

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.65 HALfstREET FLOOD WIDTH(FEET) = 24.43
 FLOW VELOCITY(FEET/SEC.) = 4.40 DEPTH*VELOCITY(FT*FT/SEC.) = 2.84
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1460.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 12.45
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.313
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.80	1.33	0.100	17
COMMERCIAL	A	7.60	1.33	0.100	17
COMMERCIAL	A	1.40	1.33	0.100	17

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 44.73
 EFFECTIVE AREA(ACRES) = 50.40 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 50.4 PEAK FLOW RATE(CFS) = 98.87

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 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.) = 12.45
 RAINFALL INTENSITY(INCH/HR) = 2.31
 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 50.40
 TOTAL STREAM AREA(ACRES) = 50.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 98.87

 FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 960.00
 ELEVATION DATA: UPSTREAM(FEET) = 980.00 DOWNSTREAM(FEET) = 970.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.810
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.387
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.50	1.33	0.100	17	11.81
COMMERCIAL	A	4.40	1.33	0.100	17	11.81

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 9.94
 TOTAL AREA(ACRES) = 4.90 PEAK FLOW RATE(CFS) = 9.94

 FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 970.00 DOWNSTREAM ELEVATION(FEET) = 965.00
 STREET LENGTH(FEET) = 660.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 19.08
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.52
 HALfstREET FLOOD WIDTH(FEET) = 17.95

AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.80
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.45
 STREET FLOW TRAVEL TIME (MIN.) = 3.93 Tc (MIN.) = 15.74
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.009
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	0.50	1.33	0.100	17
COMMERCIAL	A	10.30	1.33	0.100	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 10.80 SUBAREA RUNOFF (CFS) = 18.23
 EFFECTIVE AREA (ACRES) = 15.70 AREA-AVERAGED Fm (INCH/HR) = 0.13
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 15.7 PEAK FLOW RATE (CFS) = 26.51

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.57 HALFSTREET FLOOD WIDTH (FEET) = 20.48
 FLOW VELOCITY (FEET/SEC.) = 3.02 DEPTH*VELOCITY (FT*FT/SEC.) = 1.72
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 312.00 = 1620.00 FEET.

 FLOW PROCESS FROM NODE 312.00 TO NODE 313.00 IS CODE = 62

>>>> COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA <<<<<
 >>>> (STREET TABLE SECTION # 2 USED) <<<<<

UPSTREAM ELEVATION (FEET) = 965.00 DOWNSTREAM ELEVATION (FEET) = 960.00
 STREET LENGTH (FEET) = 690.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 39.57
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.64
 HALFSTREET FLOOD WIDTH (FEET) = 24.17
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.28
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.10
 STREET FLOW TRAVEL TIME (MIN.) = 3.51 Tc (MIN.) = 19.25
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.780
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.40	1.33	0.100	17
COMMERCIAL	A	2.40	1.33	0.100	17
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	6.30	1.33	0.200	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.135
 SUBAREA AREA (ACRES) = 18.10 SUBAREA RUNOFF (CFS) = 26.09
 EFFECTIVE AREA (ACRES) = 33.80 AREA-AVERAGED Fm (INCH/HR) = 0.16
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.12
 TOTAL AREA (ACRES) = 33.8 PEAK FLOW RATE (CFS) = 49.37

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.68 HALFSTREET FLOOD WIDTH (FEET) = 27.24
 FLOW VELOCITY (FEET/SEC.) = 3.46 DEPTH*VELOCITY (FT*FT/SEC.) = 2.37
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 313.00 = 2310.00 FEET.

 FLOW PROCESS FROM NODE 313.00 TO NODE 302.00 IS CODE = 31

>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<<<
 >>>> USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

ELEVATION DATA: UPSTREAM (FEET) = 960.00 DOWNSTREAM (FEET) = 952.00
 FLOW LENGTH (FEET) = 690.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.77
 ESTIMATED PIPE DIAMETER (INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 49.37
 PIPE TRAVEL TIME (MIN.) = 1.18 Tc (MIN.) = 20.42
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 302.00 = 3000.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 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.) = 20.42
 RAINFALL INTENSITY (INCH/HR) = 1.72
 AREA-AVERAGED Fm (INCH/HR) = 0.16
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.12
 EFFECTIVE STREAM AREA (ACRES) = 33.80
 TOTAL STREAM AREA (ACRES) = 33.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 49.37

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	98.87	12.45	2.313	1.33 (0.13)	0.10	50.4	300.00
2	49.37	20.42	1.718	1.33 (0.16)	0.12	33.8	310.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	140.42	12.45	2.313	1.33 (0.14)	0.11	71.0	300.00

2 121.28 20.42 1.718 1.33(0.14) 0.11 84.2 310.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 140.42 Tc(MIN.) = 12.45
EFFECTIVE AREA(ACRES) = 71.00 AREA-AVERAGED Fm(INCH/HR) = 0.14
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.11
TOTAL AREA(ACRES) = 84.2
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 302.00 = 3000.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 952.00 DOWNSTREAM(FEET) = 912.00
FLOW LENGTH(FEET) = 2500.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.55
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 140.42
PIPE TRAVEL TIME(MIN.) = 2.86 Tc(MIN.) = 15.31
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 303.00 = 5500.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 15.31
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.042
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 24.10 1.33 0.100 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 1.20 1.33 0.200 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 10.60 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 30.80 1.33 0.200 17
COMMERCIAL A 4.30 1.33 0.100 17
RESIDENTIAL
".4 DWELLING/ACRE" A 13.90 1.33 0.900 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.319
SUBAREA AREA(ACRES) = 84.90 SUBAREA RUNOFF(CFS) = 123.73
EFFECTIVE AREA(ACRES) = 155.90 AREA-AVERAGED Fm(INCH/HR) = 0.29
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.22
TOTAL AREA(ACRES) = 169.1 PEAK FLOW RATE(CFS) = 245.29

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 15.31
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.042
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 6.70 1.33 0.100 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 0.80 1.33 0.200 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 35.00 1.33 0.200 17
COMMERCIAL A 1.80 1.33 0.100 17
PUBLIC PARK A 0.60 1.33 0.850 17
COMMERCIAL A 1.10 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.188
SUBAREA AREA(ACRES) = 46.00 SUBAREA RUNOFF(CFS) = 74.24
EFFECTIVE AREA(ACRES) = 201.90 AREA-AVERAGED Fm(INCH/HR) = 0.28
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.21
TOTAL AREA(ACRES) = 215.1 PEAK FLOW RATE(CFS) = 319.53

FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 911.00 DOWNSTREAM(FEET) = 875.00
FLOW LENGTH(FEET) = 2990.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 52.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.80
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 319.53
PIPE TRAVEL TIME(MIN.) = 3.15 Tc(MIN.) = 18.46
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 304.00 = 8490.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 18.46
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.825
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 31.80 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 49.20 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 7.70 1.33 0.200 17
COMMERCIAL A 1.40 1.33 0.100 17
RESIDENTIAL
".4 DWELLING/ACRE" A 42.30 1.33 0.900 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.510
SUBAREA AREA(ACRES) = 132.40 SUBAREA RUNOFF(CFS) = 136.80

EFFECTIVE AREA (ACRES) = 334.30 AREA-AVERAGED Fm (INCH/HR) = 0.44
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.33
TOTAL AREA (ACRES) = 347.5 PEAK FLOW RATE (CFS) = 416.89

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.312
SUBAREA AREA (ACRES) = 84.00 SUBAREA RUNOFF (CFS) = 97.27
EFFECTIVE AREA (ACRES) = 510.50 AREA-AVERAGED Fm (INCH/HR) = 0.45
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.34
TOTAL AREA (ACRES) = 523.7 PEAK FLOW RATE (CFS) = 575.66

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 18.46
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.825
SUBAREA LOSS RATE DATA (AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 26.50 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 65.70 1.33 0.500 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.385
SUBAREA AREA (ACRES) = 92.20 SUBAREA RUNOFF (CFS) = 109.04
EFFECTIVE AREA (ACRES) = 426.50 AREA-AVERAGED Fm (INCH/HR) = 0.46
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.34
TOTAL AREA (ACRES) = 439.7 PEAK FLOW RATE (CFS) = 525.93

FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 875.00 DOWNSTREAM (FEET) = 840.00
FLOW LENGTH (FEET) = 2580.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 78.0 INCH PIPE IS 61.5 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 18.75
ESTIMATED PIPE DIAMETER (INCH) = 78.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 525.93
PIPE TRAVEL TIME (MIN.) = 2.29 Tc (MIN.) = 20.76
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 305.00 = 11070.00 FEET.

FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 20.76
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.701
SUBAREA LOSS RATE DATA (AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 16.30 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 20.10 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 40.40 1.33 0.200 17
RESIDENTIAL
".4 DWELLING/ACRE" A 7.20 1.33 0.900 17

FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 20.76
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.701
SUBAREA LOSS RATE DATA (AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 9.00 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 9.40 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 11.40 1.33 0.200 17
PUBLIC PARK A 4.70 1.33 0.850 17
SCHOOL A 23.30 1.33 0.600 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.447
SUBAREA AREA (ACRES) = 57.80 SUBAREA RUNOFF (CFS) = 57.61
EFFECTIVE AREA (ACRES) = 568.30 AREA-AVERAGED Fm (INCH/HR) = 0.46
AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
TOTAL AREA (ACRES) = 581.5 PEAK FLOW RATE (CFS) = 633.27

FLOW PROCESS FROM NODE 305.00 TO NODE 400.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 840.00 DOWNSTREAM (FEET) = 825.00
FLOW LENGTH (FEET) = 1150.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 84.0 INCH PIPE IS 66.7 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 19.32
ESTIMATED PIPE DIAMETER (INCH) = 84.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 633.27
PIPE TRAVEL TIME (MIN.) = 0.99 Tc (MIN.) = 21.75
LONGEST FLOWPATH FROM NODE 310.00 TO NODE 400.00 = 12220.00 FEET.

FLOW PROCESS FROM NODE 400.00 TO NODE 400.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 21.75
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.654
SUBAREA LOSS RATE DATA (AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN

COMMERCIAL A 8.80 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 16.60 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 1.00 1.33 0.200 17
 SCHOOL A 23.20 1.33 0.600 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.470
 SUBAREA AREA (ACRES) = 49.60 SUBAREA RUNOFF(CFS) = 46.01
 EFFECTIVE AREA (ACRES) = 617.90 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.36
 TOTAL AREA (ACRES) = 631.1 PEAK FLOW RATE(CFS) = 655.24

 FLOW PROCESS FROM NODE 400.00 TO NODE 500.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 825.00 DOWNSTREAM(FEET) = 813.00
 FLOW LENGTH(FEET) = 2790.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 108.0 INCH PIPE IS 79.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.02
 ESTIMATED PIPE DIAMETER(INCH) = 108.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 655.24
 PIPE TRAVEL TIME(MIN.) = 3.57 Tc(MIN.) = 25.32
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 500.00 = 15010.00 FEET.

 FLOW PROCESS FROM NODE 500.00 TO NODE 500.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 25.32
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.510
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.60	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	9.30	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	18.90	1.33	0.200	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.220
 SUBAREA AREA (ACRES) = 46.80 SUBAREA RUNOFF(CFS) = 51.31
 EFFECTIVE AREA (ACRES) = 664.70 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
 TOTAL AREA (ACRES) = 677.9 PEAK FLOW RATE(CFS) = 655.24
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 FLOW PROCESS FROM NODE 500.00 TO NODE 500.00 IS CODE = 71

 >>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

===== UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.) = 90.6%; VALLEY(UNDEV.) / DESERT= 9.4%
 MOUNTAIN= 0.0%; FOOTHILL= 0.0%; DESERT(UNDEV.) = 0.0%
 Tc(HR) = 0.57; LAG(HR) = 0.45; Fm(INCH/HR) = 0.46; Ybar = 0.38
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR = 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA (ACRES) = 677.9
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 500.00 = 15010.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3, n=.0293; Lca/L=0.4, n=.0263; Lca/L=0.5, n=.0241; Lca/L=0.6, n=.0225
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 157.23
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 611.13
 TOTAL PEAK FLOW RATE(CFS) = 611.13 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) = 655.24
 (UPSTREAM NODE PEAK FLOW RATE(CFS) = 655.24)
 PEAK FLOW RATE(CFS) USED = 655.24

 FLOW PROCESS FROM NODE 500.00 TO NODE 600.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 813.00 DOWNSTREAM(FEET) = 775.00
 FLOW LENGTH(FEET) = 2640.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 65.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 20.28
 ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 655.24
 PIPE TRAVEL TIME(MIN.) = 2.17 Tc(MIN.) = 36.25
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.

 FLOW PROCESS FROM NODE 600.00 TO NODE 600.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 36.25
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.218
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.60	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	88.10	1.33	0.500	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.440
 * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
 * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
 SUBAREA AREA (ACRES) = 103.70
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.) = 91.9%; VALLEY(UNDEV.) / DESERT= 8.1%

MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.60; LAG(HR) = 0.48; Fm(INCH/HR) = 0.47; Ybar = 0.39
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 781.6
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0278; Lca/L=0.4,n=.0249; Lca/L=0.5,n=.0229;Lca/L=0.6,n=.0214
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 177.95
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 656.61
 TOTAL AREA(ACRES) = 781.6 PEAK FLOW RATE(CFS) = 656.61

 FLOW PROCESS FROM NODE 600.00 TO NODE 600.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 36.25
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.218
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	27.50	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	53.30	1.33	0.500	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.364
 * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
 * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
 SUBAREA AREA(ACRES) = 80.80
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.)= 92.6%;VALLEY(UNDEV.)/DESERT= 7.4%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.60; LAG(HR) = 0.48; Fm(INCH/HR) = 0.47; Ybar = 0.39
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.96; 30M = 0.96; 1HR = 0.96;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 862.4
 LONGEST FLOWPATH FROM NODE 310.00 TO NODE 600.00 = 17650.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0278; Lca/L=0.4,n=.0249; Lca/L=0.5,n=.0229;Lca/L=0.6,n=.0214
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 196.09
 UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 721.63
 TOTAL AREA(ACRES) = 862.4 PEAK FLOW RATE(CFS) = 721.63

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 862.4 TC(MIN.) = 36.25
 AREA-AVERAGED Fm(INCH/HR)= 0.47 Ybar = 0.39
 PEAK FLOW RATE(CFS) = 721.63

=====

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 18.0 Release Date: 07/01/2011 License ID 1239

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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA D) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-11-2011 *

FILE NAME: VIID100.DAT
TIME/DATE OF STUDY: 16:56 10/18/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-/PARK-SIDE / SIDE/ WAY, CURB HEIGHT (FT), GUTTER GEOMETRIES (FT), MANNING FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES (0.48), 30-MINUTES (0.99), 1-HOUR (1.30), 3-HOUR (2.39), 6-HOUR (3.50), 24-HOUR (7.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 780.00
ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 1004.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.229
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.758
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCSSOIL AREA Fp Ap SCSS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.40 0.98 0.100 32 10.23
COMMERCIAL A 5.30 0.98 0.100 32 10.23
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 22.07
TOTAL AREA(ACRES) = 6.70 PEAK FLOW RATE(CFS) = 22.07

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1004.00 DOWNSTREAM ELEVATION(FEET) = 1000.00
STREET LENGTH(FEET) = 850.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 41.36
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.69
 HALFSTREET FLOOD WIDTH(FEET) = 27.98
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.82
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.95
 STREET FLOW TRAVEL TIME(MIN.) = 5.02 Tc(MIN.) = 15.25
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.957

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.50	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.20	0.98	0.200	32
COMMERCIAL	A	10.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.115
 SUBAREA AREA(ACRES) = 15.00 SUBAREA RUNOFF(CFS) = 38.41
 EFFECTIVE AREA(ACRES) = 21.70 AREA-AVERAGED Fm(INCH/HR) = 0.11
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.11
 TOTAL AREA(ACRES) = 21.7 PEAK FLOW RATE(CFS) = 55.65

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.76 HALFSTREET FLOOD WIDTH(FEET) = 34.31
 FLOW VELOCITY(FEET/SEC.) = 2.99 DEPTH*VELOCITY(FT*FT/SEC.) = 2.26
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 850.0 FT WITH ELEVATION-DROP = 4.0 FT, IS 42.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 402.00
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 1630.00 FEET.

 FLOW PROCESS FROM NODE 402.00 TO NODE 403.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====
 UPSTREAM ELEVATION(FEET) = 1000.00 DOWNSTREAM ELEVATION(FEET) = 994.00
 STREET LENGTH(FEET) = 660.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 81.66

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.77
 HALFSTREET FLOOD WIDTH(FEET) = 35.57
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.19
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.22
 STREET FLOW TRAVEL TIME(MIN.) = 2.63 Tc(MIN.) = 17.88
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.688

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.40	0.98	0.100	32
COMMERCIAL	A	8.40	0.98	0.100	32
COMMERCIAL	A	7.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 22.30 SUBAREA RUNOFF(CFS) = 51.99
 EFFECTIVE AREA(ACRES) = 44.00 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 44.0 PEAK FLOW RATE(CFS) = 102.39

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.82 HALFSTREET FLOOD WIDTH(FEET) = 39.46
 FLOW VELOCITY(FEET/SEC.) = 4.43 DEPTH*VELOCITY(FT*FT/SEC.) = 3.62
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 660.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 72.5 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 403.00
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 403.00 = 2290.00 FEET.

 FLOW PROCESS FROM NODE 403.00 TO NODE 404.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 994.00 DOWNSTREAM(FEET) = 970.00
 FLOW LENGTH(FEET) = 1220.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 31.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.23
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 102.39
 PIPE TRAVEL TIME(MIN.) = 1.43 Tc(MIN.) = 19.31
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 404.00 = 3510.00 FEET.

 FLOW PROCESS FROM NODE 404.00 TO NODE 404.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 19.31
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.567
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.60	0.98	0.100	32
COMMERCIAL	A	25.50	0.98	0.100	32
RESIDENTIAL					

"5-7 DWELLINGS/ACRE" A 14.60 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 2.20 0.98 0.200 32
 PUBLIC PARK A 5.60 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.264
 SUBAREA AREA (ACRES) = 62.50 SUBAREA RUNOFF(CFS) = 129.89
 EFFECTIVE AREA(ACRES) = 106.50 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
 TOTAL AREA(ACRES) = 106.5 PEAK FLOW RATE(CFS) = 227.48

 FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 970.00 DOWNSTREAM(FEET) = 955.00
 FLOW LENGTH(FEET) = 840.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 16.84
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 227.48
 PIPE TRAVEL TIME(MIN.) = 0.83 Tc(MIN.) = 20.14
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 405.00 = 4350.00 FEET.

 FLOW PROCESS FROM NODE 405.00 TO NODE 405.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 20.14
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.503
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.40	0.98	0.100	32
COMMERCIAL	A	18.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	19.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.20	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.262
 SUBAREA AREA(ACRES) = 51.70 SUBAREA RUNOFF(CFS) = 104.56
 EFFECTIVE AREA(ACRES) = 158.20 AREA-AVERAGED Fm(INCH/HR) = 0.21
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22
 TOTAL AREA(ACRES) = 158.2 PEAK FLOW RATE(CFS) = 325.90

 FLOW PROCESS FROM NODE 405.00 TO NODE 420.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 955.00 DOWNSTREAM(FEET) = 922.00

FLOW LENGTH(FEET) = 2040.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 49.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 17.76
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 325.90
 PIPE TRAVEL TIME(MIN.) = 1.91 Tc(MIN.) = 22.05
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 420.00 = 6390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 22.05
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.370
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	29.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	64.40	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	23.10	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.40	0.98	0.200	32
COMMERCIAL	A	1.00	0.98	0.100	32
PUBLIC PARK	A	4.00	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.341
 SUBAREA AREA(ACRES) = 133.80 SUBAREA RUNOFF(CFS) = 245.38
 EFFECTIVE AREA(ACRES) = 292.00 AREA-AVERAGED Fm(INCH/HR) = 0.27
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.27
 TOTAL AREA(ACRES) = 292.0 PEAK FLOW RATE(CFS) = 552.38

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 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.) = 22.05
 RAINFALL INTENSITY(INCH/HR) = 2.37
 AREA-AVERAGED Fm(INCH/HR) = 0.27
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.27
 EFFECTIVE STREAM AREA(ACRES) = 292.00
 TOTAL STREAM AREA(ACRES) = 292.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 552.38

 FLOW PROCESS FROM NODE 406.00 TO NODE 407.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1430.00
 ELEVATION DATA: UPSTREAM (FEET) = 998.00 DOWNSTREAM (FEET) = 985.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 14.233

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.082

SUBAREA T_c AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	9.00	0.98	0.100	32	14.23
COMMERCIAL	A	5.00	0.98	0.100	32	14.23
COMMERCIAL	A	1.00	0.98	0.100	32	14.23

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.97

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF (CFS) = 40.29

TOTAL AREA (ACRES) = 15.00 PEAK FLOW RATE (CFS) = 40.29

EFFECTIVE AREA (ACRES) = 68.80 AREA-AVERAGED Fm (INCH/HR) = 0.26
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.27
 TOTAL AREA (ACRES) = 68.8 PEAK FLOW RATE (CFS) = 144.72

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.86 HALFSTREET FLOOD WIDTH (FEET) = 41.91

FLOW VELOCITY (FEET/SEC.) = 5.34 DEPTH*VELOCITY (FT*FT/SEC.) = 4.62

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1320.0 FT WITH ELEVATION-DROP = 15.0 FT, IS 141.2 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 408.00
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 408.00 = 2750.00 FEET.

FLOW PROCESS FROM NODE 408.00 TO NODE 409.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

ELEVATION DATA: UPSTREAM (FEET) = 970.00 DOWNSTREAM (FEET) = 955.00

FLOW LENGTH (FEET) = 1100.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 48.0 INCH PIPE IS 37.9 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 13.60

ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1

PIPE-FLOW (CFS) = 144.72

PIPE TRAVEL TIME (MIN.) = 1.35 T_c (MIN.) = 20.23

LONGEST FLOWPATH FROM NODE 406.00 TO NODE 409.00 = 3850.00 FEET.

FLOW PROCESS FROM NODE 409.00 TO NODE 409.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE T_c (MIN.) = 20.23

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.496

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.40	0.98	0.100	32
COMMERCIAL	A	19.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.40	0.98	0.500	32
COMMERCIAL	A	1.80	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.97

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.224

SUBAREA AREA (ACRES) = 46.50 SUBAREA RUNOFF (CFS) = 95.31

EFFECTIVE AREA (ACRES) = 115.30 AREA-AVERAGED Fm (INCH/HR) = 0.25

AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25

TOTAL AREA (ACRES) = 115.3 PEAK FLOW RATE (CFS) = 233.50

FLOW PROCESS FROM NODE 409.00 TO NODE 410.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

ELEVATION DATA: UPSTREAM (FEET) = 955.00 DOWNSTREAM (FEET) = 935.00

FLOW PROCESS FROM NODE 407.00 TO NODE 408.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED) <<<<<

UPSTREAM ELEVATION (FEET) = 985.00 DOWNSTREAM ELEVATION (FEET) = 970.00

STREET LENGTH (FEET) = 1320.00 CURB HEIGHT (INCHES) = 3.0

STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00

INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 96.14

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.78

HALFSTREET FLOOD WIDTH (FEET) = 36.73

AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.73

PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.69

STREET FLOW TRAVEL TIME (MIN.) = 4.65 T_c (MIN.) = 18.89

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.601

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	17.00	0.98	0.100	32
COMMERCIAL	A	13.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.60	0.98	0.500	32
COMMERCIAL	A	0.30	0.98	0.100	32
PUBLIC PARK	A	6.80	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.318

SUBAREA AREA (ACRES) = 53.80 SUBAREA RUNOFF (CFS) = 110.92

FLOW LENGTH(FEET) = 3070.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 52.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.62
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 233.50
 PIPE TRAVEL TIME(MIN.) = 4.40 Tc(MIN.) = 24.64
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 410.00 = 6920.00 FEET.

AREA-AVERAGED Ap = 0.31
 EFFECTIVE STREAM AREA(ACRES) = 188.10
 TOTAL STREAM AREA(ACRES) = 188.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 324.92

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	552.38	22.05	2.370	0.98 (0.27)	0.27	292.0	400.00
2	324.92	26.35	2.130	0.97 (0.30)	0.31	188.1	406.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	859.96	22.05	2.370	0.98 (0.28)	0.29	449.4	400.00
2	814.20	26.35	2.130	0.98 (0.28)	0.29	480.1	406.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 859.96 Tc(MIN.) = 22.05
 EFFECTIVE AREA(ACRES) = 449.42 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
 TOTAL AREA(ACRES) = 480.1
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 420.00 = 8390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 421.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 922.00 DOWNSTREAM(FEET) = 880.00
 FLOW LENGTH(FEET) = 3180.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 93.0 INCH PIPE IS 76.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 20.82
 ESTIMATED PIPE DIAMETER(INCH) = 93.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 859.96
 PIPE TRAVEL TIME(MIN.) = 2.55 Tc(MIN.) = 24.60
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 421.00 = 11570.00 FEET.

 FLOW PROCESS FROM NODE 421.00 TO NODE 421.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 24.60
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.220
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	38.40	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	76.50	0.98	0.500	32
COMMERCIAL	A	0.70	0.98	0.100	32

 FLOW PROCESS FROM NODE 410.00 TO NODE 410.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 24.64
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.218
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	20.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	47.10	0.98	0.500	32
SCHOOL	A	4.80	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
 SUBAREA AREA(ACRES) = 72.80 SUBAREA RUNOFF(CFS) = 120.27
 EFFECTIVE AREA(ACRES) = 188.10 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.31
 TOTAL AREA(ACRES) = 188.1 PEAK FLOW RATE(CFS) = 324.92

 FLOW PROCESS FROM NODE 410.00 TO NODE 420.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 935.00 DOWNSTREAM(FEET) = 922.00
 FLOW LENGTH(FEET) = 1470.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 54.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.28
 ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 324.92
 PIPE TRAVEL TIME(MIN.) = 1.72 Tc(MIN.) = 26.35
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 420.00 = 8390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 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.) = 26.35
 RAINFALL INTENSITY(INCH/HR) = 2.13
 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.97

RESIDENTIAL
 ".4 DWELLING/ACRE" A 5.10 0.98 0.900 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.387
 SUBAREA AREA (ACRES) = 120.70 SUBAREA RUNOFF(CFS) = 200.09
 EFFECTIVE AREA (ACRES) = 570.12 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
 TOTAL AREA(ACRES) = 600.8 PEAK FLOW RATE(CFS) = 985.16

 FLOW PROCESS FROM NODE 421.00 TO NODE 430.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 880.00 DOWNSTREAM(FEET) = 845.00
 FLOW LENGTH(FEET) = 2670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 102.0 INCH PIPE IS 75.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 21.89
 ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 985.16
 PIPE TRAVEL TIME(MIN.) = 2.03 Tc(MIN.) = 26.63
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 26.63
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.116
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	27.80	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	95.10	0.98	0.500	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	1.40	0.98	0.200	32
PUBLIC PARK	A	4.70	0.98	0.850	32
SCHOOL	A	22.10	0.98	0.600	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	8.70	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.474
 SUBAREA AREA(ACRES) = 159.80 SUBAREA RUNOFF(CFS) = 237.94
 EFFECTIVE AREA(ACRES) = 729.92 AREA-AVERAGED Fm(INCH/HR) = 0.34
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.34
 TOTAL AREA(ACRES) = 760.6 PEAK FLOW RATE(CFS) = 1170.11

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<<

UNIT-HYDROGRAPH DATA:

RAINFALL(INCH): 5M= 0.48;30M= 0.99;1H= 1.30;3H= 2.39;6H= 3.50;24H= 7.00
 S-GRAPH: VALLEY(DEV.)= 98.2%; VALLEY(UNDEV.)/DESERT= 1.8%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.52; LAG(HR) = 0.41; Fm(INCH/HR) = 0.33; Ybar = 0.35
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 760.6
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0276; Lca/L=0.4,n=.0247; Lca/L=0.5,n=.0227;Lca/L=0.6,n=.0212
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 298.95
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 1158.15
 TOTAL PEAK FLOW RATE(CFS) = 1158.15 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) = 1170.11
 (UPSTREAM NODE PEAK FLOW RATE(CFS) = 1170.11)
 PEAK FLOW RATE(CFS) USED = 1170.11

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<<

 FLOW PROCESS FROM NODE 422.00 TO NODE 423.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1030.00
 ELEVATION DATA: UPSTREAM(FEET) = 930.00 DOWNSTREAM(FEET) = 916.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.738
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.018
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	0.10	0.98	0.500	32	14.74
PUBLIC PARK	A	11.90	0.98	0.850	32	18.30

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.847
 SUBAREA RUNOFF(CFS) = 23.68
 TOTAL AREA(ACRES) = 12.00 PEAK FLOW RATE(CFS) = 23.68

 FLOW PROCESS FROM NODE 423.00 TO NODE 423.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 14.74
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.018
 SUBAREA LOSS RATE DATA(AMC II):

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DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR) (DECIMAL) CN
COMMERCIAL              A        6.10    0.98    0.100   32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        12.30   0.98    0.500   32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.367
SUBAREA AREA (ACRES) = 18.40      SUBAREA RUNOFF (CFS) = 44.05
EFFECTIVE AREA (ACRES) = 30.40    AREA-AVERAGED Fm (INCH/HR) = 0.54
AREA-AVERAGED Fp (INCH/HR) = 0.98  AREA-AVERAGED Ap = 0.56
TOTAL AREA (ACRES) = 30.4        PEAK FLOW RATE (CFS) = 67.73

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FLOW PROCESS FROM NODE 423.00 TO NODE 424.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
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ELEVATION DATA: UPSTREAM (FEET) = 916.00 DOWNSTREAM (FEET) = 885.00
FLOW LENGTH (FEET) = 2570.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.2 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 10.94
ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 67.73
PIPE TRAVEL TIME (MIN.) = 3.91 Tc (MIN.) = 18.65
LONGEST FLOWPATH FROM NODE 422.00 TO NODE 424.00 = 3600.00 FEET.

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*****
FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc (MIN.) = 18.65
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.621
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR) (DECIMAL) CN
COMMERCIAL              A        12.60   0.98    0.100   32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        50.70   0.98    0.500   32
RESIDENTIAL
"11+ DWELLINGS/ACRE"   A        1.20    0.98    0.200   32
PUBLIC PARK             A        4.00    0.98    0.850   32
RESIDENTIAL
".4 DWELLING/ACRE"     A        31.20   0.98    0.900   32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.585
SUBAREA AREA (ACRES) = 99.70      SUBAREA RUNOFF (CFS) = 183.96
EFFECTIVE AREA (ACRES) = 130.10   AREA-AVERAGED Fm (INCH/HR) = 0.56
AREA-AVERAGED Fp (INCH/HR) = 0.98  AREA-AVERAGED Ap = 0.58
TOTAL AREA (ACRES) = 130.1        PEAK FLOW RATE (CFS) = 240.81

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*****
FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

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=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 18.65
RAINFALL INTENSITY (INCH/HR) = 2.62
AREA-AVERAGED Fm (INCH/HR) = 0.56
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.58
EFFECTIVE STREAM AREA (ACRES) = 130.10
TOTAL STREAM AREA (ACRES) = 130.10
PEAK FLOW RATE (CFS) AT CONFLUENCE = 240.81

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*****
FLOW PROCESS FROM NODE 425.00 TO NODE 426.00 IS CODE = 21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
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INITIAL SUBAREA FLOW-LENGTH (FEET) = 870.00
ELEVATION DATA: UPSTREAM (FEET) = 930.00 DOWNSTREAM (FEET) = 916.00

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Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.408
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.719
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS  Tc
LAND USE                GROUP  (ACRES)  (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL              A        3.90    0.98    0.100   32  10.41
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        4.60    0.98    0.500   32  13.32
COMMERCIAL              A        0.30    0.98    0.100   32  10.41
PUBLIC PARK             A        4.60    0.98    0.850   32  16.54
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.495
SUBAREA RUNOFF (CFS) = 39.03
TOTAL AREA (ACRES) = 13.40      PEAK FLOW RATE (CFS) = 39.03

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*****
FLOW PROCESS FROM NODE 426.00 TO NODE 427.00 IS CODE = 62
-----

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```

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
-----

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```

UPSTREAM ELEVATION (FEET) = 916.00 DOWNSTREAM ELEVATION (FEET) = 886.00
STREET LENGTH (FEET) = 2520.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

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SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

```

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 91.43
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.76
 HALFSTREET FLOOD WIDTH(FEET) = 35.05
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.78
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.65
 STREET FLOW TRAVEL TIME(MIN.) = 8.78 Tc(MIN.) = 19.19
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.576
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.30	0.98	0.200	32
COMMERCIAL	A	8.00	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.229
 SUBAREA AREA(ACRES) = 48.90 SUBAREA RUNOFF(CFS) = 103.54
 EFFECTIVE AREA(ACRES) = 62.30 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
 TOTAL AREA(ACRES) = 62.3 PEAK FLOW RATE(CFS) = 128.79

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.84 HALFSTREET FLOOD WIDTH(FEET) = 40.44
 FLOW VELOCITY(FEET/SEC.) = 5.22 DEPTH*VELOCITY(FT*FT/SEC.) = 4.36
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 2520.0 FT WITH ELEVATION-DROP = 30.0 FT, IS 112.5 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 427.00
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 427.00 = 3390.00 FEET.

 FLOW PROCESS FROM NODE 427.00 TO NODE 424.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 886.00 DOWNSTREAM(FEET) = 885.00
 FLOW LENGTH(FEET) = 700.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 53.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.73
 ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 128.79
 PIPE TRAVEL TIME(MIN.) = 2.04 Tc(MIN.) = 21.23
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 424.00 = 4090.00 FEET.
 =====

 FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 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.) = 21.23
 RAINFALL INTENSITY(INCH/HR) = 2.42
 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.29
 EFFECTIVE STREAM AREA(ACRES) = 62.30
 TOTAL STREAM AREA(ACRES) = 62.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 128.79

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	240.81	18.65	2.621	0.98(0.56)	0.58	130.1	422.00
2	128.79	21.23	2.425	0.98(0.28)	0.29	62.3	425.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	364.29	18.65	2.621	0.98(0.48)	0.49	184.8	422.00
2	346.68	21.23	2.425	0.98(0.47)	0.48	192.4	425.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 364.29 Tc(MIN.) = 18.65
 EFFECTIVE AREA(ACRES) = 184.84 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.49
 TOTAL AREA(ACRES) = 192.4
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 424.00 = 4090.00 FEET.

 FLOW PROCESS FROM NODE 424.00 TO NODE 428.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 848.00
 FLOW LENGTH(FEET) = 2640.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 69.0 INCH PIPE IS 51.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 17.47
 ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 364.29
 PIPE TRAVEL TIME(MIN.) = 2.52 Tc(MIN.) = 21.17
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 428.00 = 6730.00 FEET.
 =====

 FLOW PROCESS FROM NODE 428.00 TO NODE 428.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc(MIN.) = 21.17
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.429
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.30	0.98	0.200	32
COMMERCIAL	A	8.00	0.98	0.100	32

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	11.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	44.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	16.40	0.98	0.200	32
COMMERCIAL	A	3.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.359
SUBAREA AREA (ACRES) = 75.80 SUBAREA RUNOFF (CFS) = 141.84
EFFECTIVE AREA (ACRES) = 260.64 AREA-AVERAGED Fm (INCH/HR) = 0.44
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.45
TOTAL AREA (ACRES) = 268.2 PEAK FLOW RATE (CFS) = 466.10

FLOW PROCESS FROM NODE 428.00 TO NODE 428.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 21.17
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.429
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	17.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.60	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.80	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	22.80	0.98	0.200	32
COMMERCIAL	A	7.10	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.232
SUBAREA AREA (ACRES) = 62.30 SUBAREA RUNOFF (CFS) = 123.52
EFFECTIVE AREA (ACRES) = 322.94 AREA-AVERAGED Fm (INCH/HR) = 0.40
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
TOTAL AREA (ACRES) = 330.5 PEAK FLOW RATE (CFS) = 589.63

FLOW PROCESS FROM NODE 428.00 TO NODE 430.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 848.00 DOWNSTREAM (FEET) = 845.00
FLOW LENGTH (FEET) = 1290.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 114.0 INCH PIPE IS 88.5 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 9.99
ESTIMATED PIPE DIAMETER (INCH) = 114.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 589.63
PIPE TRAVEL TIME (MIN.) = 2.15 Tc (MIN.) = 23.32
LONGEST FLOWPATH FROM NODE 425.00 TO NODE 430.00 = 8020.00 FEET.

FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	589.63	23.32	2.292	0.98 (0.40)	0.41	322.9	422.00
2	555.11	25.98	2.148	0.98 (0.40)	0.41	330.5	425.00

LONGEST FLOWPATH FROM NODE 425.00 TO NODE 430.00 = 8020.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
PEAK FLOW RATE (CFS) = 1170.11 Tc (MIN.) = 31.00
AREA-AVERAGED Fm (INCH/HR) = 0.33 Ybar = 0.35
TOTAL AREA (ACRES) = 760.6
LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
UNIT-HYDROGRAPH DATA:
RAINFALL (INCH): 5M= 0.48; 30M= 0.99; 1H= 1.30; 3H= 2.39; 6H= 3.50; 24H= 7.00
S-GRAPH: VALLEY (DEV.)= 95.9%; VALLEY (UNDEV.) / DESERT= 4.1%
MOUNTAIN= 0.0%; FOOTHILL= 0.0%; DESERT (UNDEV.)= 0.0%
Tc (HR) = 0.52; LAG (HR) = 0.41; Fm (INCH/HR) = 0.35; Ybar = 0.37
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.95; 30M = 0.95; 1HR = 0.95;
3HR = 0.99; 6HR = 1.00; 24HR = 1.00
UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 1091.1
LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3, n=.0276; Lca/L=0.4, n=.0247; Lca/L=0.5, n=.0227; Lca/L=0.6, n=.0212
TIME OF PEAK FLOW (HR) = 16.50 RUNOFF VOLUME (AF) = 417.31
PEAK FLOW RATE (CFS) = 1607.09

FLOW PROCESS FROM NODE 430.00 TO NODE 440.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 31.00
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 1.932
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	92.10	0.98	0.500	32
COMMERCIAL	A	10.30	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.460
SUBAREA AREA (ACRES) = 102.40
UNIT-HYDROGRAPH DATA:
RAINFALL (INCH): 5M= 0.48; 30M= 0.99; 1H= 1.30; 3H= 2.39; 6H= 3.50; 24H= 7.00
S-GRAPH: VALLEY (DEV.)= 96.2%; VALLEY (UNDEV.) / DESERT= 3.8%
MOUNTAIN= 0.0%; FOOTHILL= 0.0%; DESERT (UNDEV.)= 0.0%
Tc (HR) = 0.52; LAG (HR) = 0.41; Fm (INCH/HR) = 0.36; Ybar = 0.38
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.95; 30M = 0.95; 1HR = 0.95;

3HR = 0.99; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 1193.5
LONGEST FLOWPATH FROM NODE 406.00 TO NODE 440.00 = 14240.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0276; Lca/L=0.4,n=.0247; Lca/L=0.5,n=.0227;Lca/L=0.6,n=.0212
TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 451.21
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 1741.55
TOTAL AREA(ACRES) = 1193.5 PEAK FLOW RATE(CFS) = 1741.55

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1193.5 TC(MIN.) = 31.00
AREA-AVERAGED F_{in} (INCH/HR) = 0.36 Y_{bar} = 0.38
PEAK FLOW RATE(CFS) = 1741.55

=====

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA D) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-11-2011 *

FILE NAME: VIID25.DAT
TIME/DATE OF STUDY: 17:02 10/18/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.000
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0975
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK-SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 - (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL (INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

=====

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 780.00
ELEVATION DATA: UPSTREAM (FEET) = 1015.00 DOWNSTREAM (FEET) = 1004.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.229
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.172
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.40	0.98	0.100	32	10.23
COMMERCIAL	A	5.30	0.98	0.100	32	10.23

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 18.54
TOTAL AREA (ACRES) = 6.70 PEAK FLOW RATE (CFS) = 18.54

=====

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<

=====

UPSTREAM ELEVATION (FEET) = 1004.00 DOWNSTREAM ELEVATION (FEET) = 1000.00
STREET LENGTH (FEET) = 850.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 34.59
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.66
 HALFSTREET FLOOD WIDTH(FEET) = 24.96
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.69
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.77
 STREET FLOW TRAVEL TIME(MIN.) = 5.26 Tc(MIN.) = 15.49
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.473
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.50	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.20	0.98	0.200	32
COMMERCIAL	A	10.80	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.115
 SUBAREA AREA(ACRES) = 15.00 SUBAREA RUNOFF(CFS) = 31.88
 EFFECTIVE AREA(ACRES) = 21.70 AREA-AVERAGED Fm(INCH/HR) = 0.11
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.11
 TOTAL AREA(ACRES) = 21.7 PEAK FLOW RATE(CFS) = 46.21

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.72 HALFSTREET FLOOD WIDTH(FEET) = 30.30
 FLOW VELOCITY(FEET/SEC.) = 2.88 DEPTH*VELOCITY(FT*FT/SEC.) = 2.06
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 1630.00 FEET.

 FLOW PROCESS FROM NODE 402.00 TO NODE 403.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1000.00 DOWNSTREAM ELEVATION(FEET) = 994.00
 STREET LENGTH(FEET) = 660.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 67.76
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.73
 HALFSTREET FLOOD WIDTH(FEET) = 31.46
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.05
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.94
 STREET FLOW TRAVEL TIME(MIN.) = 2.72 Tc(MIN.) = 18.21
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.245
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.40	0.98	0.100	32
COMMERCIAL	A	8.40	0.98	0.100	32
COMMERCIAL	A	7.50	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 22.30 SUBAREA RUNOFF(CFS) = 43.10
 EFFECTIVE AREA(ACRES) = 44.00 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 44.0 PEAK FLOW RATE(CFS) = 84.84

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.78 HALFSTREET FLOOD WIDTH(FEET) = 36.42
 FLOW VELOCITY(FEET/SEC.) = 4.22 DEPTH*VELOCITY(FT*FT/SEC.) = 3.28
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 660.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 60.9 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 403.00
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 403.00 = 2290.00 FEET.

 FLOW PROCESS FROM NODE 403.00 TO NODE 404.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 994.00 DOWNSTREAM(FEET) = 970.00
 FLOW LENGTH(FEET) = 1220.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 26.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.93
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 84.84
 PIPE TRAVEL TIME(MIN.) = 1.46 Tc(MIN.) = 19.67
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 404.00 = 3510.00 FEET.

 FLOW PROCESS FROM NODE 404.00 TO NODE 404.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.67
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.143
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.60	0.98	0.100	32
COMMERCIAL	A	25.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.60	0.98	0.500	32

RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 2.20 0.98 0.200 32
 PUBLIC PARK A 5.60 0.98 0.850 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.264
 SUBAREA AREA (ACRES) = 62.50 SUBAREA RUNOFF (CFS) = 106.07
 EFFECTIVE AREA (ACRES) = 106.50 AREA-AVERAGED Fm (INCH/HR) = 0.19
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
 TOTAL AREA (ACRES) = 106.5 PEAK FLOW RATE (CFS) = 186.89

 FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 970.00 DOWNSTREAM (FEET) = 955.00
 FLOW LENGTH (FEET) = 840.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 38.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.15
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 186.89
 PIPE TRAVEL TIME (MIN.) = 0.87 Tc (MIN.) = 20.53
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 405.00 = 4350.00 FEET.

 FLOW PROCESS FROM NODE 405.00 TO NODE 405.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 20.53
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.089
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	9.40	0.98	0.100	32
COMMERCIAL	A	18.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	19.90	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	4.20	0.98	0.200	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.262
 SUBAREA AREA (ACRES) = 51.70 SUBAREA RUNOFF (CFS) = 85.29
 EFFECTIVE AREA (ACRES) = 158.20 AREA-AVERAGED Fm (INCH/HR) = 0.21
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 158.2 PEAK FLOW RATE (CFS) = 266.93

 FLOW PROCESS FROM NODE 405.00 TO NODE 420.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 955.00 DOWNSTREAM (FEET) = 922.00
 FLOW LENGTH (FEET) = 2040.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 60.0 INCH PIPE IS 44.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 17.08
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 266.93
 PIPE TRAVEL TIME (MIN.) = 1.99 Tc (MIN.) = 22.52
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 420.00 = 6390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 22.52
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.976
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	29.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	64.40	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	23.10	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.40	0.98	0.200	32
COMMERCIAL	A	1.00	0.98	0.100	32
PUBLIC PARK	A	4.00	0.98	0.850	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.341
 SUBAREA AREA (ACRES) = 133.80 SUBAREA RUNOFF (CFS) = 197.91
 EFFECTIVE AREA (ACRES) = 292.00 AREA-AVERAGED Fm (INCH/HR) = 0.27
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.27
 TOTAL AREA (ACRES) = 292.0 PEAK FLOW RATE (CFS) = 448.78

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 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.) = 22.52
 RAINFALL INTENSITY (INCH/HR) = 1.98
 AREA-AVERAGED Fm (INCH/HR) = 0.27
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.27
 EFFECTIVE STREAM AREA (ACRES) = 292.00
 TOTAL STREAM AREA (ACRES) = 292.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 448.78

 FLOW PROCESS FROM NODE 406.00 TO NODE 407.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1430.00

ELEVATION DATA: UPSTREAM(FEET) = 998.00 DOWNSTREAM(FEET) = 985.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.233

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.602

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	9.00	0.98	0.100	32	14.23
COMMERCIAL	A	5.00	0.98	0.100	32	14.23
COMMERCIAL	A	1.00	0.98	0.100	32	14.23

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 33.81

TOTAL AREA(ACRES) = 15.00 PEAK FLOW RATE(CFS) = 33.81

FLOW PROCESS FROM NODE 407.00 TO NODE 408.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<

UPSTREAM ELEVATION(FEET) = 985.00 DOWNSTREAM ELEVATION(FEET) = 970.00

STREET LENGTH(FEET) = 1320.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 79.44

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.74

HALFSTREET FLOOD WIDTH(FEET) = 32.51

AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.56

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.37

STREET FLOW TRAVEL TIME(MIN.) = 4.82 Tc(MIN.) = 19.05

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.184

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	17.00	0.98	0.100	32
COMMERCIAL	A	13.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.60	0.98	0.500	32
COMMERCIAL	A	0.30	0.98	0.100	32
PUBLIC PARK	A	6.80	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.318

SUBAREA AREA(ACRES) = 53.80 SUBAREA RUNOFF(CFS) = 90.74

EFFECTIVE AREA(ACRES) = 68.80 AREA-AVERAGED Fm(INCH/HR) = 0.26

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.27

TOTAL AREA(ACRES) = 68.8 PEAK FLOW RATE(CFS) = 118.91

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.82 HALFSTREET FLOOD WIDTH(FEET) = 39.83

FLOW VELOCITY(FEET/SEC.) = 5.02 DEPTH*VELOCITY(FT*FT/SEC.) = 4.13

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 1320.0 FT WITH ELEVATION-DROP = 15.0 FT, IS 116.9 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 408.00

LONGEST FLOWPATH FROM NODE 406.00 TO NODE 408.00 = 2750.00 FEET.

FLOW PROCESS FROM NODE 408.00 TO NODE 409.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 970.00 DOWNSTREAM(FEET) = 955.00

FLOW LENGTH(FEET) = 1100.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.7 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 13.00

ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 118.91

PIPE TRAVEL TIME(MIN.) = 1.41 Tc(MIN.) = 20.46

LONGEST FLOWPATH FROM NODE 406.00 TO NODE 409.00 = 3850.00 FEET.

FLOW PROCESS FROM NODE 409.00 TO NODE 409.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 20.46

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.093

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.40	0.98	0.100	32
COMMERCIAL	A	19.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.40	0.98	0.500	32
COMMERCIAL	A	1.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.224

SUBAREA AREA(ACRES) = 46.50 SUBAREA RUNOFF(CFS) = 78.44

EFFECTIVE AREA(ACRES) = 115.30 AREA-AVERAGED Fm(INCH/HR) = 0.25

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25

TOTAL AREA(ACRES) = 115.3 PEAK FLOW RATE(CFS) = 191.68

FLOW PROCESS FROM NODE 409.00 TO NODE 410.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 955.00 DOWNSTREAM(FEET) = 935.00

FLOW LENGTH(FEET) = 3070.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 63.0 INCH PIPE IS 46.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.19
 ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 191.68
 PIPE TRAVEL TIME (MIN.) = 4.57 Tc (MIN.) = 25.04
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 410.00 = 6920.00 FEET.

 FLOW PROCESS FROM NODE 410.00 TO NODE 410.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc (MIN.) = 25.04
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.854
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 20.90 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 47.10 0.98 0.500 32
 SCHOOL A 4.80 0.98 0.600 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
 SUBAREA AREA (ACRES) = 72.80 SUBAREA RUNOFF (CFS) = 96.45
 EFFECTIVE AREA (ACRES) = 188.10 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 188.1 PEAK FLOW RATE (CFS) = 263.38

 FLOW PROCESS FROM NODE 410.00 TO NODE 420.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<

ELEVATION DATA: UPSTREAM (FEET) = 935.00 DOWNSTREAM (FEET) = 922.00
 FLOW LENGTH (FEET) = 1470.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 50.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.51
 ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 263.38
 PIPE TRAVEL TIME (MIN.) = 1.81 Tc (MIN.) = 26.85
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 420.00 = 8390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 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.) = 26.85
 RAINFALL INTENSITY (INCH/HR) = 1.78
 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.31

EFFECTIVE STREAM AREA (ACRES) = 188.10
 TOTAL STREAM AREA (ACRES) = 188.10
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 263.38

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	448.78	22.52	1.976	0.98 (0.27)	0.27	292.0	400.00
2	263.38	26.85	1.778	0.97 (0.30)	0.31	188.1	406.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	699.22	22.52	1.976	0.98 (0.28)	0.29	449.8	400.00
2	660.17	26.85	1.778	0.98 (0.28)	0.29	480.1	406.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 699.22 Tc (MIN.) = 22.52
 EFFECTIVE AREA (ACRES) = 449.77 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 480.1
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 420.00 = 8390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 421.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<

ELEVATION DATA: UPSTREAM (FEET) = 922.00 DOWNSTREAM (FEET) = 880.00
 FLOW LENGTH (FEET) = 3180.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 87.0 INCH PIPE IS 69.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 19.90
 ESTIMATED PIPE DIAMETER (INCH) = 87.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 699.22
 PIPE TRAVEL TIME (MIN.) = 2.66 Tc (MIN.) = 25.19
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 421.00 = 11570.00 FEET.

 FLOW PROCESS FROM NODE 421.00 TO NODE 421.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc (MIN.) = 25.19
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.848
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 38.40 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 76.50 0.98 0.500 32
 COMMERCIAL A 0.70 0.98 0.100 32
 RESIDENTIAL

" .4 DWELLING/ACRE" A 5.10 0.98 0.900 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.387
 SUBAREA AREA (ACRES) = 120.70 SUBAREA RUNOFF (CFS) = 159.68
 EFFECTIVE AREA (ACRES) = 570.47 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 600.8 PEAK FLOW RATE (CFS) = 794.77

 FLOW PROCESS FROM NODE 421.00 TO NODE 430.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 880.00 DOWNSTREAM (FEET) = 845.00
 FLOW LENGTH (FEET) = 2670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 93.0 INCH PIPE IS 70.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 20.65
 ESTIMATED PIPE DIAMETER (INCH) = 93.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 794.77
 PIPE TRAVEL TIME (MIN.) = 2.15 Tc (MIN.) = 27.34
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 27.34
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.759
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	27.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	95.10	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.40	0.98	0.200	32
PUBLIC PARK	A	4.70	0.98	0.850	32
SCHOOL	A	22.10	0.98	0.600	32
RESIDENTIAL					
".4 DWELLING/ACRE"	A	8.70	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.474
 SUBAREA AREA (ACRES) = 159.80 SUBAREA RUNOFF (CFS) = 186.52
 EFFECTIVE AREA (ACRES) = 730.27 AREA-AVERAGED Fm (INCH/HR) = 0.34
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
 TOTAL AREA (ACRES) = 760.6 PEAK FLOW RATE (CFS) = 935.71

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<

UNIT-HYDROGRAPH DATA:

RAINFALL (INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY (DEV.)= 98.2%; VALLEY (UNDEV.) / DESERT= 1.8%
 MOUNTAIN= 0.0%; FOOTHILL= 0.0%; DESERT (UNDEV.)= 0.0%
 Tc (HR) = 0.53; LAG (HR) = 0.42; Fm (INCH/HR) = 0.33; Ybar = 0.37
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR = 1.00
 UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 760.6

LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:

Lca/L=0.3,n=.0282; Lca/L=0.4,n=.0253; Lca/L=0.5,n=.0232;Lca/L=0.6,n=.0217
 TIME OF PEAK FLOW (HR) = 16.50 RUNOFF VOLUME (AF) = 219.84
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE (CFS) = 888.71
 TOTAL PEAK FLOW RATE (CFS) = 888.71 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE (CFS) = 935.71
 (UPSTREAM NODE PEAK FLOW RATE (CFS) = 935.71)
 PEAK FLOW RATE (CFS) USED = 935.71

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 422.00 TO NODE 423.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1030.00
 ELEVATION DATA: UPSTREAM (FEET) = 930.00 DOWNSTREAM (FEET) = 916.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 14.738
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.548
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	0.10	0.98	0.500	32	14.74
PUBLIC PARK	A	11.90	0.98	0.850	32	18.30

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.847
 SUBAREA RUNOFF (CFS) = 18.60
 TOTAL AREA (ACRES) = 12.00 PEAK FLOW RATE (CFS) = 18.60

 FLOW PROCESS FROM NODE 423.00 TO NODE 423.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 14.74
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.548
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ SCS SOIL	AREA	Fp	Ap	SCS

LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 6.10 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 12.30 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.367
 SUBAREA AREA (ACRES) = 18.40 SUBAREA RUNOFF (CFS) = 36.27
 EFFECTIVE AREA (ACRES) = 30.40 AREA-AVERAGED Fm (INCH/HR) = 0.54
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.56
 TOTAL AREA (ACRES) = 30.4 PEAK FLOW RATE (CFS) = 54.87

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 18.86
 RAINFALL INTENSITY (INCH/HR) = 2.20
 AREA-AVERAGED Fm (INCH/HR) = 0.56
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.58
 EFFECTIVE STREAM AREA (ACRES) = 130.10
 TOTAL STREAM AREA (ACRES) = 130.10
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 191.26

 FLOW PROCESS FROM NODE 423.00 TO NODE 424.00 IS CODE = 31

 FLOW PROCESS FROM NODE 425.00 TO NODE 426.00 IS CODE = 21

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 916.00 DOWNSTREAM (FEET) = 885.00
 FLOW LENGTH (FEET) = 2570.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 25.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 10.38
 ESTIMATED PIPE DIAMETER (INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 54.87
 PIPE TRAVEL TIME (MIN.) = 4.13 Tc (MIN.) = 18.86
 LONGEST FLOWPATH FROM NODE 422.00 TO NODE 424.00 = 3600.00 FEET.

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 870.00
 ELEVATION DATA: UPSTREAM (FEET) = 930.00 DOWNSTREAM (FEET) = 916.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.408
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 3.140
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.90	0.98	0.100	32	10.41
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	4.60	0.98	0.500	32	13.32
COMMERCIAL	A	0.30	0.98	0.100	32	10.41
PUBLIC PARK	A	4.60	0.98	0.850	32	16.54

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.495
 SUBAREA RUNOFF (CFS) = 32.05
 TOTAL AREA (ACRES) = 13.40 PEAK FLOW RATE (CFS) = 32.05

 FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 IS CODE = 81

 FLOW PROCESS FROM NODE 426.00 TO NODE 427.00 IS CODE = 62

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 18.86
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.197
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.60	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	50.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.20	0.98	0.200	32
PUBLIC PARK	A	4.00	0.98	0.850	32
RESIDENTIAL					
".4 DWELLING/ACRE"	A	31.20	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.585
 SUBAREA AREA (ACRES) = 99.70 SUBAREA RUNOFF (CFS) = 145.99
 EFFECTIVE AREA (ACRES) = 130.10 AREA-AVERAGED Fm (INCH/HR) = 0.56
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.58
 TOTAL AREA (ACRES) = 130.1 PEAK FLOW RATE (CFS) = 191.26

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION (FEET) = 916.00 DOWNSTREAM ELEVATION (FEET) = 886.00
 STREET LENGTH (FEET) = 2520.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

 FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 IS CODE = 1

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 74.96

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 =====

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.72
 HALFSTREET FLOOD WIDTH(FEET) = 30.72
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.60
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.31
 STREET FLOW TRAVEL TIME(MIN.) = 9.12 Tc(MIN.) = 19.53
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.152
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	12.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.00	0.98	0.200	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.30	0.98	0.200	32
COMMERCIAL	A	8.00	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.229
 SUBAREA AREA(ACRES) = 48.90 SUBAREA RUNOFF(CFS) = 84.89
 EFFECTIVE AREA(ACRES) = 62.30 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
 TOTAL AREA(ACRES) = 62.3 PEAK FLOW RATE(CFS) = 105.03

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.79 HALFSTREET FLOOD WIDTH(FEET) = 38.21
 FLOW VELOCITY(FEET/SEC.) = 4.90 DEPTH*VELOCITY(FT*FT/SEC.) = 3.89
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 2520.0 FT WITH ELEVATION-DROP = 30.0 FT, IS 93.4 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 427.00
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 427.00 = 3390.00 FEET.

 FLOW PROCESS FROM NODE 427.00 TO NODE 424.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 886.00 DOWNSTREAM(FEET) = 885.00
 FLOW LENGTH(FEET) = 700.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 50.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.42
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 105.03
 PIPE TRAVEL TIME(MIN.) = 2.15 Tc(MIN.) = 21.68
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 424.00 = 4090.00 FEET.

 FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 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.) = 21.68
 RAINFALL INTENSITY(INCH/HR) = 2.02
 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.29
 EFFECTIVE STREAM AREA(ACRES) = 62.30
 TOTAL STREAM AREA(ACRES) = 62.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 105.03

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	191.26	18.86	2.197	0.98(0.56)	0.58	130.1	422.00
2	105.03	21.68	2.021	0.98(0.28)	0.29	62.3	425.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	291.87	18.86	2.197	0.98(0.48)	0.49	184.3	422.00
2	275.68	21.68	2.021	0.98(0.47)	0.48	192.4	425.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 291.87 Tc(MIN.) = 18.86
 EFFECTIVE AREA(ACRES) = 184.31 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.49
 TOTAL AREA(ACRES) = 192.4
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 424.00 = 4090.00 FEET.

 FLOW PROCESS FROM NODE 424.00 TO NODE 428.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 848.00
 FLOW LENGTH(FEET) = 2640.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 48.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 16.48
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 291.87
 PIPE TRAVEL TIME(MIN.) = 2.67 Tc(MIN.) = 21.53
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 428.00 = 6730.00 FEET.

 FLOW PROCESS FROM NODE 428.00 TO NODE 428.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 21.53
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.030
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
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COMMERCIAL A 11.20 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 44.90 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 16.40 0.98 0.200 32
 COMMERCIAL A 3.30 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.359
 SUBAREA AREA (ACRES) = 75.80 SUBAREA RUNOFF (CFS) = 114.61
 EFFECTIVE AREA (ACRES) = 260.11 AREA-AVERAGED Fm (INCH/HR) = 0.44
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.45
 TOTAL AREA (ACRES) = 268.2 PEAK FLOW RATE (CFS) = 371.63

 FLOW PROCESS FROM NODE 428.00 TO NODE 428.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 21.53
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.030
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 17.00 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 14.60 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 0.80 0.98 0.200 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 22.80 0.98 0.200 32
 COMMERCIAL A 7.10 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.232
 SUBAREA AREA (ACRES) = 62.30 SUBAREA RUNOFF (CFS) = 101.14
 EFFECTIVE AREA (ACRES) = 322.41 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
 TOTAL AREA (ACRES) = 330.5 PEAK FLOW RATE (CFS) = 472.76

 FLOW PROCESS FROM NODE 428.00 TO NODE 430.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 848.00 DOWNSTREAM (FEET) = 845.00
 FLOW LENGTH (FEET) = 1290.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 108.0 INCH PIPE IS 78.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 9.55
 ESTIMATED PIPE DIAMETER (INCH) = 108.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 472.76
 PIPE TRAVEL TIME (MIN.) = 2.25 Tc (MIN.) = 23.79
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 430.00 = 8020.00 FEET.

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 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
 1 472.76 23.79 1.912 0.97 (0.40) 0.41 322.4 422.00
 2 441.53 26.75 1.782 0.98 (0.40) 0.41 330.5 425.00
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 430.00 = 8020.00 FEET.

 ** MEMORY BANK # 1 CONFLUENCE DATA **
 PEAK FLOW RATE (CFS) = 935.71 Tc (MIN.) = 31.73
 AREA-AVERAGED Fm (INCH/HR) = 0.33 Ybar = 0.37
 TOTAL AREA (ACRES) = 760.6
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

UNIT-HYDROGRAPH DATA:
 RAINFALL (INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY (DEV.) = 95.9%; VALLEY (UNDEV.) / DESERT = 4.1%
 MOUNTAIN = 0.0%; FOOTHILL = 0.0%; DESERT (UNDEV.) = 0.0%
 Tc (HR) = 0.53; LAG (HR) = 0.42; Fm (INCH/HR) = 0.35; Ybar = 0.39
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.95; 30M = 0.95; 1HR = 0.95;
 3HR = 0.99; 6HR = 1.00; 24HR = 1.00
 UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 1091.1
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3, n=.0282; Lca/L=0.4, n=.0253; Lca/L=0.5, n=.0232; Lca/L=0.6, n=.0217
 TIME OF PEAK FLOW (HR) = 16.50 RUNOFF VOLUME (AF) = 306.38
 PEAK FLOW RATE (CFS) = 1231.11

 FLOW PROCESS FROM NODE 430.00 TO NODE 440.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 31.73
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.609
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 92.10 0.98 0.500 32
 COMMERCIAL A 10.30 0.98 0.100 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.460
 SUBAREA AREA (ACRES) = 102.40
 UNIT-HYDROGRAPH DATA:
 RAINFALL (INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
 S-GRAPH: VALLEY (DEV.) = 96.2%; VALLEY (UNDEV.) / DESERT = 3.8%
 MOUNTAIN = 0.0%; FOOTHILL = 0.0%; DESERT (UNDEV.) = 0.0%
 Tc (HR) = 0.53; LAG (HR) = 0.42; Fm (INCH/HR) = 0.36; Ybar = 0.40
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.95; 30M = 0.95; 1HR = 0.95;
 3HR = 0.99; 6HR = 1.00; 24HR = 1.00

UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 1193.5
LONGEST FLOWPATH FROM NODE 406.00 TO NODE 440.00 = 14240.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0282; Lca/L=0.4,n=.0253; Lca/L=0.5,n=.0232;Lca/L=0.6,n=.0217
TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 331.02
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 1332.91
TOTAL AREA(ACRES) = 1193.5 PEAK FLOW RATE(CFS) = 1332.91

=====
END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1193.5 TC(MIN.) = 31.73
AREA-AVERAGED Fm(INCH/HR)= 0.36 Ybar = 0.40
PEAK FLOW RATE(CFS) = 1332.91

=====
END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA D) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-11-2011 *

FILE NAME: VIID10.DAT
TIME/DATE OF STUDY: 17:05 10/18/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, STREET-CROSSFALL, CURB GUTTER-GEOMETRIES, MANNING FACTOR, WIDTH, CROSSFALL IN- / OUT- / PARK- SIDE / SIDE / WAY, HEIGHT, WIDTH, LIP, HIKE, FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 780.00
ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 1004.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.229
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.891
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.40 1.33 0.100 17 10.23
COMMERCIAL A 5.30 1.33 0.100 17 10.23
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 16.63
TOTAL AREA(ACRES) = 6.70 PEAK FLOW RATE(CFS) = 16.63

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1004.00 DOWNSTREAM ELEVATION(FEET) = 1000.00
STREET LENGTH(FEET) = 850.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 30.83
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.64
HALFSTREET FLOOD WIDTH(FEET) = 23.85
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.62
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.67
STREET FLOW TRAVEL TIME(MIN.) = 5.40 Tc(MIN.) = 15.63
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.241

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.50	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	0.50	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	0.20	1.33	0.200	17
COMMERCIAL	A	10.80	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.115
SUBAREA AREA(ACRES) = 15.00 SUBAREA RUNOFF(CFS) = 28.20
EFFECTIVE AREA(ACRES) = 21.70 AREA-AVERAGED Fm(INCH/HR) = 0.15
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.11
TOTAL AREA(ACRES) = 21.7 PEAK FLOW RATE(CFS) = 40.91

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.69 HALFSTREET FLOOD WIDTH(FEET) = 27.77
FLOW VELOCITY(FEET/SEC.) = 2.81 DEPTH*VELOCITY(FT*FT/SEC.) = 1.94
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 1630.00 FEET.

FLOW PROCESS FROM NODE 402.00 TO NODE 403.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 1000.00 DOWNSTREAM ELEVATION(FEET) = 994.00
STREET LENGTH(FEET) = 660.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 59.98
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.70
HALFSTREET FLOOD WIDTH(FEET) = 28.93

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.94
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.77
STREET FLOW TRAVEL TIME(MIN.) = 2.79 Tc(MIN.) = 18.42
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.031

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.40	1.33	0.100	17
COMMERCIAL	A	8.40	1.33	0.100	17
COMMERCIAL	A	7.50	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 22.30 SUBAREA RUNOFF(CFS) = 38.10
EFFECTIVE AREA(ACRES) = 44.00 AREA-AVERAGED Fm(INCH/HR) = 0.14
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 44.0 PEAK FLOW RATE(CFS) = 74.90

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.75 HALFSTREET FLOOD WIDTH(FEET) = 33.67
FLOW VELOCITY(FEET/SEC.) = 4.12 DEPTH*VELOCITY(FT*FT/SEC.) = 3.09
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 660.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 54.6 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 403.00
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 403.00 = 2290.00 FEET.

FLOW PROCESS FROM NODE 403.00 TO NODE 404.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 994.00 DOWNSTREAM(FEET) = 970.00
FLOW LENGTH(FEET) = 1220.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.39
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 74.90
PIPE TRAVEL TIME(MIN.) = 1.52 Tc(MIN.) = 19.94
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 404.00 = 3510.00 FEET.

FLOW PROCESS FROM NODE 404.00 TO NODE 404.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 19.94
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.937
SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.60	1.33	0.100	17
COMMERCIAL	A	25.50	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.60	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.20	1.33	0.200	17

PUBLIC PARK A 5.60 1.33 0.850 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.264
 SUBAREA AREA (ACRES) = 62.50 SUBAREA RUNOFF (CFS) = 89.20
 EFFECTIVE AREA (ACRES) = 106.50 AREA-AVERAGED Fm (INCH/HR) = 0.26
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.20
 TOTAL AREA (ACRES) = 106.5 PEAK FLOW RATE (CFS) = 160.38

 FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 970.00 DOWNSTREAM (FEET) = 955.00
 FLOW LENGTH (FEET) = 840.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 36.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.52
 ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 160.38
 PIPE TRAVEL TIME (MIN.) = 0.90 Tc (MIN.) = 20.84
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 405.00 = 4350.00 FEET.

 FLOW PROCESS FROM NODE 405.00 TO NODE 405.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 20.84
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.886
 SUBAREA LOSS RATE DATA (AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 9.40 1.33 0.100 17
 COMMERCIAL A 18.20 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 19.90 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 4.20 1.33 0.200 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.262
 SUBAREA AREA (ACRES) = 51.70 SUBAREA RUNOFF (CFS) = 71.56
 EFFECTIVE AREA (ACRES) = 158.20 AREA-AVERAGED Fm (INCH/HR) = 0.29
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 158.2 PEAK FLOW RATE (CFS) = 227.07

 FLOW PROCESS FROM NODE 405.00 TO NODE 420.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 955.00 DOWNSTREAM (FEET) = 922.00
 FLOW LENGTH (FEET) = 2040.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 41.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.45

ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 227.07
 PIPE TRAVEL TIME (MIN.) = 2.07 Tc (MIN.) = 22.91
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 420.00 = 6390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 22.91
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.782
 SUBAREA LOSS RATE DATA (AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 29.90 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 64.40 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 23.10 1.33 0.200 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 11.40 1.33 0.200 17
 COMMERCIAL A 1.00 1.33 0.100 17
 PUBLIC PARK A 4.00 1.33 0.850 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.341
 SUBAREA AREA (ACRES) = 133.80 SUBAREA RUNOFF (CFS) = 160.09
 EFFECTIVE AREA (ACRES) = 292.00 AREA-AVERAGED Fm (INCH/HR) = 0.37
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.27
 TOTAL AREA (ACRES) = 292.0 PEAK FLOW RATE (CFS) = 372.35

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 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.) = 22.91
 RAINFALL INTENSITY (INCH/HR) = 1.78
 AREA-AVERAGED Fm (INCH/HR) = 0.37
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.27
 EFFECTIVE STREAM AREA (ACRES) = 292.00
 TOTAL STREAM AREA (ACRES) = 292.00
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 372.35

 FLOW PROCESS FROM NODE 406.00 TO NODE 407.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1430.00
 ELEVATION DATA: UPSTREAM (FEET) = 998.00 DOWNSTREAM (FEET) = 985.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.233
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.371
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	9.00	1.33	0.100	17	14.23
COMMERCIAL	A	5.00	1.33	0.100	17	14.23
COMMERCIAL	A	1.00	1.33	0.100	17	14.23

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 30.21
 TOTAL AREA(ACRES) = 15.00 PEAK FLOW RATE(CFS) = 30.21

 FLOW PROCESS FROM NODE 407.00 TO NODE 408.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====
 UPSTREAM ELEVATION(FEET) = 985.00 DOWNSTREAM ELEVATION(FEET) = 970.00
 STREET LENGTH(FEET) = 1320.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 68.26
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.70
 HALFSTREET FLOOD WIDTH(FEET) = 29.25
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.43
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.13
 STREET FLOW TRAVEL TIME(MIN.) = 4.96 Tc(MIN.) = 19.19
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.981

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	17.00	1.33	0.100	17
COMMERCIAL	A	13.10	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.60	1.33	0.500	17
COMMERCIAL	A	0.30	1.33	0.100	17
PUBLIC PARK	A	6.80	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.318
 SUBAREA AREA(ACRES) = 53.80 SUBAREA RUNOFF(CFS) = 75.48
 EFFECTIVE AREA(ACRES) = 68.80 AREA-AVERAGED Fm(INCH/HR) = 0.36
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.27
 TOTAL AREA(ACRES) = 68.8 PEAK FLOW RATE(CFS) = 100.44

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.79 HALFSTREET FLOOD WIDTH(FEET) = 37.68
 FLOW VELOCITY(FEET/SEC.) = 4.77 DEPTH*VELOCITY(FT*FT/SEC.) = 3.77
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1320.0 FT WITH ELEVATION-DROP = 15.0 FT, IS 99.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 408.00
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 408.00 = 2750.00 FEET.

 FLOW PROCESS FROM NODE 408.00 TO NODE 409.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 970.00 DOWNSTREAM(FEET) = 955.00
 FLOW LENGTH(FEET) = 1100.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.43
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 100.44
 PIPE TRAVEL TIME(MIN.) = 1.47 Tc(MIN.) = 20.67
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 409.00 = 3850.00 FEET.

 FLOW PROCESS FROM NODE 409.00 TO NODE 409.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 20.67
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.895
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.40	1.33	0.100	17
COMMERCIAL	A	19.90	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	14.40	1.33	0.500	17
COMMERCIAL	A	1.80	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.224
 SUBAREA AREA(ACRES) = 46.50 SUBAREA RUNOFF(CFS) = 66.88
 EFFECTIVE AREA(ACRES) = 115.30 AREA-AVERAGED Fm(INCH/HR) = 0.33
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.25
 TOTAL AREA(ACRES) = 115.3 PEAK FLOW RATE(CFS) = 161.99

 FLOW PROCESS FROM NODE 409.00 TO NODE 410.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 955.00 DOWNSTREAM(FEET) = 935.00
 FLOW LENGTH(FEET) = 3070.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 46.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.55

ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 161.99
 PIPE TRAVEL TIME(MIN.) = 4.85 Tc(MIN.) = 25.52
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 410.00 = 6920.00 FEET.

 FLOW PROCESS FROM NODE 410.00 TO NODE 410.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 25.52
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.670
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	20.90	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	47.10	1.33	0.500	17
SCHOOL	A	4.80	1.33	0.600	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.392
 SUBAREA AREA(ACRES) = 72.80 SUBAREA RUNOFF(CFS) = 75.35
 EFFECTIVE AREA(ACRES) = 188.10 AREA-AVERAGED Fm(INCH/HR) = 0.41
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
 TOTAL AREA(ACRES) = 188.1 PEAK FLOW RATE(CFS) = 213.97

 FLOW PROCESS FROM NODE 410.00 TO NODE 420.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 935.00 DOWNSTREAM(FEET) = 922.00
 FLOW LENGTH(FEET) = 1470.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 48.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.72
 ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 213.97
 PIPE TRAVEL TIME(MIN.) = 1.93 Tc(MIN.) = 27.45
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 420.00 = 8390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 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.) = 27.45
 RAINFALL INTENSITY(INCH/HR) = 1.60
 AREA-AVERAGED Fm(INCH/HR) = 0.41
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.31
 EFFECTIVE STREAM AREA(ACRES) = 188.10
 TOTAL STREAM AREA(ACRES) = 188.10

PEAK FLOW RATE(CFS) AT CONFLUENCE = 213.97

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	372.35	22.91	1.782	1.33(0.37)	0.27	292.0	400.00
2	213.97	27.45	1.599	1.33(0.41)	0.31	188.1	406.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	578.37	22.91	1.782	1.33(0.38)	0.29	449.0	400.00
2	538.21	27.45	1.599	1.33(0.38)	0.29	480.1	406.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 578.37 Tc(MIN.) = 22.91
 EFFECTIVE AREA(ACRES) = 449.01 AREA-AVERAGED Fm(INCH/HR) = 0.38
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.29
 TOTAL AREA(ACRES) = 480.1
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 420.00 = 8390.00 FEET.

 FLOW PROCESS FROM NODE 420.00 TO NODE 421.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 922.00 DOWNSTREAM(FEET) = 880.00
 FLOW LENGTH(FEET) = 3180.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 81.0 INCH PIPE IS 64.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.98
 ESTIMATED PIPE DIAMETER(INCH) = 81.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 578.37
 PIPE TRAVEL TIME(MIN.) = 2.79 Tc(MIN.) = 25.70
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 421.00 = 11570.00 FEET.

 FLOW PROCESS FROM NODE 421.00 TO NODE 421.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc(MIN.) = 25.70
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.663
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	38.40	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	76.50	1.33	0.500	17
COMMERCIAL	A	0.70	1.33	0.100	17
RESIDENTIAL					
".4 DWELLING/ACRE"	A	5.10	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.387
 SUBAREA AREA (ACRES) = 120.70 SUBAREA RUNOFF (CFS) = 124.78
 EFFECTIVE AREA (ACRES) = 569.71 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 600.8 PEAK FLOW RATE (CFS) = 643.49

MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc (HR) = 0.54; LAG (HR) = 0.43; Fm (INCH/HR) = 0.45; Ybar = 0.38
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 0.99; 6HR = 1.00; 24HR = 1.00
 UNIT-INTERVAL (MIN) = 5.00 TOTAL AREA (ACRES) = 760.6
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3, n=.0290; Lca/L=0.4, n=.0260; Lca/L=0.5, n=.0239; Lca/L=0.6, n=.0223
 TIME OF PEAK FLOW (HR) = 16.50 RUNOFF VOLUME (AF) = 176.89
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE (CFS) = 710.87
 TOTAL PEAK FLOW RATE (CFS) = 710.87 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE (CFS) = 737.55
 (UPSTREAM NODE PEAK FLOW RATE (CFS) = 737.55)
 PEAK FLOW RATE (CFS) USED = 737.55

 FLOW PROCESS FROM NODE 421.00 TO NODE 430.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 880.00 DOWNSTREAM (FEET) = 845.00
 FLOW LENGTH (FEET) = 2670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 84.0 INCH PIPE IS 67.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 19.38
 ESTIMATED PIPE DIAMETER (INCH) = 84.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 643.49
 PIPE TRAVEL TIME (MIN.) = 2.30 Tc (MIN.) = 28.00
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 10

 >>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 81

 FLOW PROCESS FROM NODE 422.00 TO NODE 423.00 IS CODE = 21

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 28.00
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.580
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	27.80	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	95.10	1.33	0.500	17
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	1.40	1.33	0.200	17
PUBLIC PARK	A	4.70	1.33	0.850	17
SCHOOL	A	22.10	1.33	0.600	17
RESIDENTIAL ".4 DWELLING/ACRE"	A	8.70	1.33	0.900	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.474
 SUBAREA AREA (ACRES) = 159.80 SUBAREA RUNOFF (CFS) = 136.74
 EFFECTIVE AREA (ACRES) = 729.51 AREA-AVERAGED Fm (INCH/HR) = 0.46
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.34
 TOTAL AREA (ACRES) = 760.6 PEAK FLOW RATE (CFS) = 737.55

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH (FEET) = 1030.00
 ELEVATION DATA: UPSTREAM (FEET) = 930.00 DOWNSTREAM (FEET) = 916.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 14.738
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.322
 SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	0.10	1.33	0.500	17	14.74
PUBLIC PARK	A	11.90	1.33	0.850	17	18.30

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.847
 SUBAREA RUNOFF (CFS) = 12.93
 TOTAL AREA (ACRES) = 12.00 PEAK FLOW RATE (CFS) = 12.93

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 IS CODE = 71

 FLOW PROCESS FROM NODE 423.00 TO NODE 423.00 IS CODE = 81

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<
 =====
 UNIT-HYDROGRAPH DATA:
 RAINFALL (INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY (DEV.) = 98.2%;VALLEY (UNDEV.)/DESERT = 1.8%

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 14.74
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.322
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.10	1.33	0.100	17

RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 12.30 1.33 0.500 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.367
 SUBAREA AREA(ACRES) = 18.40 SUBAREA RUNOFF(CFS) = 30.37
 EFFECTIVE AREA(ACRES) = 30.40 AREA-AVERAGED Fm(INCH/HR) = 0.74
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.56
 TOTAL AREA(ACRES) = 30.4 PEAK FLOW RATE(CFS) = 43.30

TIME OF CONCENTRATION(MIN.) = 19.11
 RAINFALL INTENSITY(INCH/HR) = 1.99
 AREA-AVERAGED Fm(INCH/HR) = 0.77
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.58
 EFFECTIVE STREAM AREA(ACRES) = 130.10
 TOTAL STREAM AREA(ACRES) = 130.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 142.65

 FLOW PROCESS FROM NODE 423.00 TO NODE 424.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 916.00 DOWNSTREAM(FEET) = 885.00
 FLOW LENGTH(FEET) = 2570.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 23.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.79
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 43.30
 PIPE TRAVEL TIME(MIN.) = 4.38 Tc(MIN.) = 19.11
 LONGEST FLOWPATH FROM NODE 422.00 TO NODE 424.00 = 3600.00 FEET.

 FLOW PROCESS FROM NODE 425.00 TO NODE 426.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

 INITIAL SUBAREA FLOW-LENGTH(FEET) = 870.00
 ELEVATION DATA: UPSTREAM(FEET) = 930.00 DOWNSTREAM(FEET) = 916.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.408
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.861
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.90	1.33	0.100	17	10.41
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	4.60	1.33	0.500	17	13.32
COMMERCIAL	A	0.30	1.33	0.100	17	10.41
PUBLIC PARK	A	4.60	1.33	0.850	17	16.54

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.495
 SUBAREA RUNOFF(CFS) = 26.58
 TOTAL AREA(ACRES) = 13.40 PEAK FLOW RATE(CFS) = 26.58

 FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 19.11
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.986
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.60	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	50.70	1.33	0.500	17
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	1.20	1.33	0.200	17
PUBLIC PARK	A	4.00	1.33	0.850	17
RESIDENTIAL ".4 DWELLING/ACRE"	A	31.20	1.33	0.900	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.585
 SUBAREA AREA(ACRES) = 99.70 SUBAREA RUNOFF(CFS) = 108.53
 EFFECTIVE AREA(ACRES) = 130.10 AREA-AVERAGED Fm(INCH/HR) = 0.77
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.58
 TOTAL AREA(ACRES) = 130.1 PEAK FLOW RATE(CFS) = 142.65

 FLOW PROCESS FROM NODE 426.00 TO NODE 427.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

 UPSTREAM ELEVATION(FEET) = 916.00 DOWNSTREAM ELEVATION(FEET) = 886.00
 STREET LENGTH(FEET) = 2520.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

 FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 IS CODE = 1

 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 63.00
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.68

HALFSTREET FLOOD WIDTH (FEET) = 27.14
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.44
 PRODUCT OF DEPTH & VELOCITY (FT*FT/SEC.) = 3.03
 STREET FLOW TRAVEL TIME (MIN.) = 9.47 Tc (MIN.) = 19.88
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.940
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.90	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	12.70	1.33	0.500	17
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	1.00	1.33	0.200	17
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	11.30	1.33	0.200	17
COMMERCIAL	A	8.00	1.33	0.100	17

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.229
 SUBAREA AREA (ACRES) = 48.90 SUBAREA RUNOFF (CFS) = 72.01
 EFFECTIVE AREA (ACRES) = 62.30 AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 62.3 PEAK FLOW RATE (CFS) = 87.49

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.75 HALFSTREET FLOOD WIDTH (FEET) = 34.10
 FLOW VELOCITY (FEET/SEC.) = 4.74 DEPTH*VELOCITY (FT*FT/SEC.) = 3.57
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 2520.0 FT WITH ELEVATION-DROP = 30.0 FT, IS 80.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 427.00
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 427.00 = 3390.00 FEET.

 FLOW PROCESS FROM NODE 427.00 TO NODE 424.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 886.00 DOWNSTREAM (FEET) = 885.00
 FLOW LENGTH (FEET) = 700.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 48.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 5.11
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 87.49
 PIPE TRAVEL TIME (MIN.) = 2.28 Tc (MIN.) = 22.16
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 424.00 = 4090.00 FEET.

 FLOW PROCESS FROM NODE 424.00 TO NODE 424.00 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.) = 22.16
 RAINFALL INTENSITY (INCH/HR) = 1.82

AREA-AVERAGED Fm (INCH/HR) = 0.38
 AREA-AVERAGED Fp (INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.29
 EFFECTIVE STREAM AREA (ACRES) = 62.30
 TOTAL STREAM AREA (ACRES) = 62.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 87.49

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	142.65	19.11	1.986	1.33 (0.77)	0.58	130.1	422.00
2	87.49	22.16	1.818	1.33 (0.38)	0.29	62.3	425.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	226.96	19.11	1.986	1.33 (0.65)	0.49	183.8	422.00
2	210.39	22.16	1.818	1.33 (0.64)	0.48	192.4	425.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 226.96 Tc (MIN.) = 19.11
 EFFECTIVE AREA (ACRES) = 183.84 AREA-AVERAGED Fm (INCH/HR) = 0.65
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.49
 TOTAL AREA (ACRES) = 192.4
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 424.00 = 4090.00 FEET.

 FLOW PROCESS FROM NODE 424.00 TO NODE 428.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 885.00 DOWNSTREAM (FEET) = 848.00
 FLOW LENGTH (FEET) = 2640.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 44.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.44
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 226.96
 PIPE TRAVEL TIME (MIN.) = 2.85 Tc (MIN.) = 21.96
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 428.00 = 6730.00 FEET.

 FLOW PROCESS FROM NODE 428.00 TO NODE 428.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 21.96
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.828
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	11.20	1.33	0.100	17
RESIDENTIAL					

"5-7 DWELLINGS/ACRE" A 44.90 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 16.40 1.33 0.200 17
 COMMERCIAL A 3.30 1.33 0.100 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.359
 SUBAREA AREA(ACRES) = 75.80 SUBAREA RUNOFF(CFS) = 92.19
 EFFECTIVE AREA(ACRES) = 259.64 AREA-AVERAGED Fm(INCH/HR) = 0.60
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.45
 TOTAL AREA(ACRES) = 268.2 PEAK FLOW RATE(CFS) = 286.23

 FLOW PROCESS FROM NODE 428.00 TO NODE 428.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 21.96
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.828
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 17.00 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 14.60 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 0.80 1.33 0.200 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 22.80 1.33 0.200 17
 COMMERCIAL A 7.10 1.33 0.100 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.232
 SUBAREA AREA(ACRES) = 62.30 SUBAREA RUNOFF(CFS) = 85.22
 EFFECTIVE AREA(ACRES) = 321.94 AREA-AVERAGED Fm(INCH/HR) = 0.55
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 330.5 PEAK FLOW RATE(CFS) = 371.45

 FLOW PROCESS FROM NODE 428.00 TO NODE 430.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 845.00
 FLOW LENGTH(FEET) = 1290.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 96.0 INCH PIPE IS 74.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.90
 ESTIMATED PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 371.45
 PIPE TRAVEL TIME(MIN.) = 2.42 Tc(MIN.) = 24.38
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 430.00 = 8020.00 FEET.

 FLOW PROCESS FROM NODE 430.00 TO NODE 430.00 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
 1 371.45 24.38 1.717 1.33(0.55) 0.41 321.9 422.00
 2 341.56 27.50 1.597 1.33(0.54) 0.41 330.5 425.00
 LONGEST FLOWPATH FROM NODE 425.00 TO NODE 430.00 = 8020.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
 PEAK FLOW RATE(CFS) = 737.55 Tc(MIN.) = 32.62
 AREA-AVERAGED Fm(INCH/HR) = 0.45 Ybar = 0.38
 TOTAL AREA(ACRES) = 760.6
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.)= 95.9%;VALLEY(UNDEV.)/DESERT= 4.1%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.54; LAG(HR) = 0.43; Fm(INCH/HR) = 0.48; Ybar = 0.40
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.95; 30M = 0.95; 1HR = 0.95;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 1091.1
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 430.00 = 14240.00 FEET.
 EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 Lca/L=0.3,n=.0290; Lca/L=0.4,n=.0260; Lca/L=0.5,n=.0239;Lca/L=0.6,n=.0223
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 246.27
 PEAK FLOW RATE(CFS) = 980.59

 FLOW PROCESS FROM NODE 430.00 TO NODE 440.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 32.62
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.441
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 92.10 1.33 0.500 17
 COMMERCIAL A 10.30 1.33 0.100 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.460
 SUBAREA AREA(ACRES) = 102.40

UNIT-HYDROGRAPH DATA:
 RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.)= 96.2%;VALLEY(UNDEV.)/DESERT= 3.8%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.54; LAG(HR) = 0.43; Fm(INCH/HR) = 0.49; Ybar = 0.40
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.95; 30M = 0.95; 1HR = 0.95;
 3HR = 0.99; 6HR = 1.00; 24HR= 1.00
 UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 1193.5
 LONGEST FLOWPATH FROM NODE 406.00 TO NODE 440.00 = 14240.00 FEET.

EQUIVALENT BASIN FACTOR APPROXIMATIONS:

Lca/L=0.3,n=.0290; Lca/L=0.4,n=.0260; Lca/L=0.5,n=.0239;Lca/L=0.6,n=.0223
TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 265.97
UNIT-HYDROGRAPH PEAK FLOW RATE(CFS) = 1059.74
TOTAL AREA(ACRES) = 1193.5 PEAK FLOW RATE(CFS) = 1059.74

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1193.5 TC(MIN.) = 32.62
AREA-AVERAGED Fm(INCH/HR) = 0.49 Ybar = 0.40
PEAK FLOW RATE(CFS) = 1059.74

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END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA E) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-15-2011 *

FILE NAME: VIIE100.DAT
TIME/DATE OF STUDY: 15:53 08/15/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO STREET-CROSSFALL:		CURB GUTTER-GEOMETRIES: MANNING						
	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE	OUT- / SIDE	PARK- / WAY	HEIGHT (FT)	WIDTH (FT)	LIP HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018	0.020		0.67	2.00	0.0312	0.167 0.0150
2	32.0	27.0	0.020/0.020	0.020		0.67	2.00	0.0312	0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	RAINFALL(INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1180.00
ELEVATION DATA: UPSTREAM(FEET) = 995.00 DOWNSTREAM(FEET) = 986.00
Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.651
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.160
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.80	0.98	0.100	32	13.65
COMMERCIAL	A	1.30	0.98	0.100	32	13.65
COMMERCIAL	A	6.00	0.98	0.100	32	13.65
COMMERCIAL	A	0.10	0.98	0.100	32	13.65
PUBLIC PARK	A	2.50	0.98	0.850	32	21.69

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248
SUBAREA RUNOFF(CFS) = 33.36
TOTAL AREA(ACRES) = 12.70 PEAK FLOW RATE(CFS) = 33.36

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 986.00 DOWNSTREAM ELEVATION(FEET) = 980.00
STREET LENGTH(FEET) = 1060.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 52.74

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.72

HALFSTREET FLOOD WIDTH(FEET) = 31.14

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.19

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.31

STREET FLOW TRAVEL TIME(MIN.) = 5.54 Tc(MIN.) = 19.19

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.576

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.40	0.98	0.100	32
COMMERCIAL	A	11.10	0.98	0.100	32
PUBLIC PARK	A	2.60	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.208

SUBAREA AREA(ACRES) = 18.10 SUBAREA RUNOFF(CFS) = 38.67

EFFECTIVE AREA(ACRES) = 30.80 AREA-AVERAGED Fm(INCH/HR) = 0.22

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22

TOTAL AREA(ACRES) = 30.8 PEAK FLOW RATE(CFS) = 65.35

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.77 HALFSTREET FLOOD WIDTH(FEET) = 35.89

FLOW VELOCITY(FEET/SEC.) = 3.31 DEPTH*VELOCITY(FT*FT/SEC.) = 2.56

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 1060.0 FT WITH ELEVATION-DROP = 6.0 FT, IS 47.7 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 102.00
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 2240.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 980.00 DOWNSTREAM(FEET) = 966.00

FLOW LENGTH(FEET) = 780.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 36.0 INCH PIPE IS 24.8 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 12.61

ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 65.35

PIPE TRAVEL TIME(MIN.) = 1.03 Tc(MIN.) = 20.22

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 3020.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 20.22

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.497

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.40	0.98	0.100	32
COMMERCIAL	A	6.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.80	0.98	0.500	32
COMMERCIAL	A	1.00	0.98	0.100	32
PUBLIC PARK	A	1.00	0.98	0.850	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.260

SUBAREA AREA(ACRES) = 31.70 SUBAREA RUNOFF(CFS) = 64.00

EFFECTIVE AREA(ACRES) = 62.50 AREA-AVERAGED Fm(INCH/HR) = 0.24

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.24

TOTAL AREA(ACRES) = 62.5 PEAK FLOW RATE(CFS) = 127.14

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 966.00 DOWNSTREAM(FEET) = 948.00

FLOW LENGTH(FEET) = 1150.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.7 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 13.93

ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 127.14

PIPE TRAVEL TIME(MIN.) = 1.38 Tc(MIN.) = 21.60

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4170.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 21.60

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.400

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.60	0.98	0.100	32
COMMERCIAL	A	24.60	0.98	0.100	32
COMMERCIAL	A	4.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.70	0.98	0.500	32
COMMERCIAL	A	0.50	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.192

SUBAREA AREA(ACRES) = 46.70 SUBAREA RUNOFF(CFS) = 93.01

EFFECTIVE AREA(ACRES) = 109.20 AREA-AVERAGED Fm(INCH/HR) = 0.22

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22

TOTAL AREA(ACRES) = 109.2 PEAK FLOW RATE(CFS) = 214.72

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 948.00 DOWNSTREAM(FEET) = 928.00
FLOW LENGTH(FEET) = 1460.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.19
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 214.72
PIPE TRAVEL TIME(MIN.) = 1.60 Tc(MIN.) = 23.20
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 5630.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 23.20
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.299
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 11.20 0.98 0.100 32
COMMERCIAL A 17.30 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 31.50 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.310
SUBAREA AREA(ACRES) = 60.00 SUBAREA RUNOFF(CFS) = 107.83
EFFECTIVE AREA(ACRES) = 169.20 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
TOTAL AREA(ACRES) = 169.2 PEAK FLOW RATE(CFS) = 312.63

FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 928.00 DOWNSTREAM(FEET) = 885.00
FLOW LENGTH(FEET) = 3500.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 50.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.93
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 312.63
PIPE TRAVEL TIME(MIN.) = 3.66 Tc(MIN.) = 26.86
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 9130.00 FEET.

FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 26.86
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.106
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 19.90 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 98.50 0.98 0.500 32
SCHOOL A 19.10 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.456
SUBAREA AREA(ACRES) = 137.50 SUBAREA RUNOFF(CFS) = 205.54
EFFECTIVE AREA(ACRES) = 306.70 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
TOTAL AREA(ACRES) = 306.7 PEAK FLOW RATE(CFS) = 488.70

FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 848.00
FLOW LENGTH(FEET) = 1010.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 63.0 INCH PIPE IS 49.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 26.72
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 488.70
PIPE TRAVEL TIME(MIN.) = 0.63 Tc(MIN.) = 27.49
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 10140.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 27.49
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.076
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 24.30 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 66.60 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 3.20 0.98 0.200 32
SCHOOL A 8.00 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403
SUBAREA AREA(ACRES) = 102.10 SUBAREA RUNOFF(CFS) = 154.68
EFFECTIVE AREA(ACRES) = 408.80 AREA-AVERAGED Fm(INCH/HR) = 0.35
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
TOTAL AREA(ACRES) = 408.8 PEAK FLOW RATE(CFS) = 635.35

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
-----
ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 840.00
FLOW LENGTH(FEET) = 1040.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 93.0 INCH PIPE IS 73.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.88
ESTIMATED PIPE DIAMETER(INCH) = 93.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 635.35
PIPE TRAVEL TIME(MIN.) = 1.09 Tc(MIN.) = 28.58
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 11180.00 FEET.
*****
FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
-----
MAINLINE Tc(MIN.) = 28.58
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.028
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       5.30   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       7.90   0.98  0.500  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A      24.20   0.98  0.200  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       1.20   0.98  0.200  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248
SUBAREA AREA(ACRES) = 38.60 SUBAREA RUNOFF(CFS) = 62.08
EFFECTIVE AREA(ACRES) = 447.40 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 447.4 PEAK FLOW RATE(CFS) = 679.79
*****
FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
-----
ELEVATION DATA: UPSTREAM(FEET) = 840.00 DOWNSTREAM(FEET) = 818.00
FLOW LENGTH(FEET) = 1230.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 81.0 INCH PIPE IS 65.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 22.09
ESTIMATED PIPE DIAMETER(INCH) = 81.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 679.79
PIPE TRAVEL TIME(MIN.) = 0.93 Tc(MIN.) = 29.51
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 109.00 = 12410.00 FEET.
*****
FLOW PROCESS FROM NODE 109.00 TO NODE 109.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 29.51
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.990
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A      14.90   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      30.30   0.98  0.500  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       1.10   0.98  0.200  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.364
SUBAREA AREA(ACRES) = 46.30 SUBAREA RUNOFF(CFS) = 68.13
EFFECTIVE AREA(ACRES) = 493.70 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 493.7 PEAK FLOW RATE(CFS) = 732.40
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FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 818.00 DOWNSTREAM(FEET) = 810.00
FLOW LENGTH(FEET) = 1730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 108.0 INCH PIPE IS 85.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.60
ESTIMATED PIPE DIAMETER(INCH) = 108.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 732.40
PIPE TRAVEL TIME(MIN.) = 2.12 Tc(MIN.) = 31.63
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 14140.00 FEET.
*****
FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
-----
MAINLINE Tc(MIN.) = 31.63
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.909
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A       6.70   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      22.70   0.98  0.500  32
PUBLIC PARK         A       1.10   0.98  0.850  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.425
SUBAREA AREA(ACRES) = 30.50 SUBAREA RUNOFF(CFS) = 41.03
EFFECTIVE AREA(ACRES) = 524.20 AREA-AVERAGED Fm(INCH/HR) = 0.35
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 524.2 PEAK FLOW RATE(CFS) = 737.38
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FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 31.63
RAINFALL INTENSITY (INCH/HR) = 1.91
AREA-AVERAGED Fm (INCH/HR) = 0.35
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.35
EFFECTIVE STREAM AREA (ACRES) = 524.20
TOTAL STREAM AREA (ACRES) = 524.20
PEAK FLOW RATE (CFS) AT CONFLUENCE = 737.38

FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1100.00
ELEVATION DATA: UPSTREAM (FEET) = 850.00 DOWNSTREAM (FEET) = 835.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.817
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.446
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 15.10 0.98 0.100 32 11.82
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 45.51
TOTAL AREA (ACRES) = 15.10 PEAK FLOW RATE (CFS) = 45.51

FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 835.00 DOWNSTREAM ELEVATION (FEET) = 810.00
STREET LENGTH (FEET) = 2290.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 73.03
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.72
HALFSTREET FLOOD WIDTH (FEET) = 31.14
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.42
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.20
STREET FLOW TRAVEL TIME (MIN.) = 8.64 Tc (MIN.) = 20.46
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.479
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 14.80 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 0.60 0.98 0.500 32
COMMERCIAL A 10.20 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.109
SUBAREA AREA (ACRES) = 25.60 SUBAREA RUNOFF (CFS) = 54.66
EFFECTIVE AREA (ACRES) = 40.70 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
TOTAL AREA (ACRES) = 40.7 PEAK FLOW RATE (CFS) = 87.03

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.76 HALFSTREET FLOOD WIDTH (FEET) = 34.94
FLOW VELOCITY (FEET/SEC.) = 4.57 DEPTH*VELOCITY (FT*FT/SEC.) = 3.48
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 2290.0 FT WITH ELEVATION-DROP = 25.0 FT, IS 62.4 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 113.00
LONGEST FLOWPATH FROM NODE 111.00 TO NODE 113.00 = 3390.00 FEET.

FLOW PROCESS FROM NODE 113.00 TO NODE 110.00 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.) = 20.46
RAINFALL INTENSITY (INCH/HR) = 2.48
AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.11
EFFECTIVE STREAM AREA (ACRES) = 40.70
TOTAL STREAM AREA (ACRES) = 40.70
PEAK FLOW RATE (CFS) AT CONFLUENCE = 87.03

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	737.38	31.63	1.909	0.98 (0.35)	0.35	524.2	100.00
2	87.03	20.46	2.479	0.98 (0.10)	0.11	40.7	111.00

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
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NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	738.01	20.46	2.479	0.98 (0.32)	0.33	379.8 111.00
2	803.51	31.63	1.909	0.98 (0.33)	0.34	564.9 100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 803.51 Tc(MIN.) = 31.63
EFFECTIVE AREA(ACRES) = 564.90 AREA-AVERAGED Fm(INCH/HR) = 0.33
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
TOTAL AREA(ACRES) = 564.9
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 14140.00 FEET.

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN	(MIN.)
COMMERCIAL	A	6.50	0.98	0.100	32	12.03
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	1.70	0.98	0.500	32	15.39
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	3.90	0.98	0.200	32	12.82
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98						
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.188						
SUBAREA RUNOFF(CFS) = 35.13						
TOTAL AREA(ACRES) = 12.10 PEAK FLOW RATE(CFS) = 35.13						

FLOW PROCESS FROM NODE 110.00 TO NODE 120.00 IS CODE = 31

FLOW PROCESS FROM NODE 114.00 TO NODE 115.00 IS CODE = 62

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 810.00 DOWNSTREAM(FEET) = 805.00
FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 114.0 INCH PIPE IS 92.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.07
ESTIMATED PIPE DIAMETER(INCH) = 114.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 803.51
PIPE TRAVEL TIME(MIN.) = 1.61 Tc(MIN.) = 33.24
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.

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UPSTREAM ELEVATION(FEET) = 835.00 DOWNSTREAM ELEVATION(FEET) = 825.00
STREET LENGTH(FEET) = 400.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 33.24
RAINFALL INTENSITY(INCH/HR) = 1.85
AREA-AVERAGED Fm(INCH/HR) = 0.33
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.34
EFFECTIVE STREAM AREA(ACRES) = 564.90
TOTAL STREAM AREA(ACRES) = 564.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 803.51

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 61.34

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.61
HALFSTREET FLOOD WIDTH(FEET) = 22.53
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.82
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.55
STREET FLOW TRAVEL TIME(MIN.) = 1.15 Tc(MIN.) = 13.17
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.229

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.30	0.98	0.100	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.30	0.98	0.200	32
RESIDENTIAL					
".4 DWELLING/ACRE"	A	17.40	0.98	0.900	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.720
SUBAREA AREA(ACRES) = 23.00 SUBAREA RUNOFF(CFS) = 52.32
EFFECTIVE AREA(ACRES) = 35.10 AREA-AVERAGED Fm(INCH/HR) = 0.52
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.54
TOTAL AREA(ACRES) = 35.1 PEAK FLOW RATE(CFS) = 85.48

FLOW PROCESS FROM NODE 113.00 TO NODE 114.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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INITIAL SUBAREA FLOW-LENGTH(FEET) = 1080.00
ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 835.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.026
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.410
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL	AREA	Fp	Ap	SCS	Tc
COMMERCIAL					
RESIDENTIAL					
"11+ DWELLINGS/ACRE"					
RESIDENTIAL					
".4 DWELLING/ACRE"					

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.87
FLOW VELOCITY(FEET/SEC.) = 6.32 DEPTH*VELOCITY(FT*FT/SEC.) = 4.24

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 400.0 FT WITH ELEVATION-DROP = 10.0 FT, IS 83.3 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 115.00
 LONGEST FLOWPATH FROM NODE 113.00 TO NODE 115.00 = 1480.00 FEET.

AREA-AVERAGED A_p = 0.41
 EFFECTIVE STREAM AREA(ACRES) = 85.90
 TOTAL STREAM AREA(ACRES) = 85.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 178.97

 FLOW PROCESS FROM NODE 115.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

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ELEVATION DATA: UPSTREAM(FEET) = 825.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 2590.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.74
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 85.48
 PIPE TRAVEL TIME(MIN.) = 4.43 T_c (MIN.) = 17.60
 LONGEST FLOWPATH FROM NODE 113.00 TO NODE 120.00 = 4070.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

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MAINLINE T_c (MIN.) = 17.60
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.713
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	10.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	22.40	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.50	0.98	0.200	32
COMMERCIAL	A	7.30	0.98	0.100	32
PUBLIC PARK	A	1.80	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.320
 SUBAREA AREA(ACRES) = 50.80 SUBAREA RUNOFF(CFS) = 109.79
 EFFECTIVE AREA(ACRES) = 85.90 AREA-AVERAGED F_m (INCH/HR) = 0.40
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.41
 TOTAL AREA(ACRES) = 85.9 PEAK FLOW RATE(CFS) = 178.97

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 17.60
 RAINFALL INTENSITY(INCH/HR) = 2.71
 AREA-AVERAGED F_m (INCH/HR) = 0.40
 AREA-AVERAGED F_p (INCH/HR) = 0.98

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	F_p (F_m) (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	738.01	22.08	2.368	0.98(0.32)	0.33	379.8	111.00
1	803.51	33.24	1.853	0.98(0.33)	0.34	564.9	100.00
2	178.97	17.60	2.713	0.98(0.40)	0.41	85.9	113.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	F_p (F_m) (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	866.45	17.60	2.713	0.98(0.34)	0.35	388.7	113.00
2	890.34	22.08	2.368	0.97(0.33)	0.34	465.7	111.00
3	915.99	33.24	1.853	0.98(0.34)	0.35	650.8	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 915.99 T_c (MIN.) = 33.24
 EFFECTIVE AREA(ACRES) = 650.80 AREA-AVERAGED F_m (INCH/HR) = 0.34
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.35
 TOTAL AREA(ACRES) = 650.8
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<<

=====

UNIT-HYDROGRAPH DATA:

RAINFALL(INCH): 5M= 0.48;30M= 0.99;1H= 1.30;3H= 2.39;6H= 3.50;24H= 7.00
 S-GRAPH: VALLEY(DEV.)= 97.3%;VALLEY(UNDEV.)/DESERT= 2.7%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 T_c (HR) = 0.55; LAG(HR) = 0.44; F_m (INCH/HR) = 0.34; Y_{bar} = 0.35
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR= 1.00

UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 650.8
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.

EQUIVALENT BASIN FACTOR APPROXIMATIONS:
 $L_{ca}/L=0.3, n=.0286$; $L_{ca}/L=0.4, n=.0256$; $L_{ca}/L=0.5, n=.0236$; $L_{ca}/L=0.6, n=.0220$
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 254.62
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 964.28
 TOTAL PEAK FLOW RATE(CFS) = 964.28 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) = 915.99
 (UPSTREAM NODE PEAK FLOW RATE(CFS) = 915.99)
 PEAK FLOW RATE(CFS) USED = 964.28

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 650.8 T_c (MIN.) = 33.24

AREA-AVERAGED Fm(INCH/HR)= 0.34 Ybar = 0.35

PEAK FLOW RATE(CFS) = 964.28

=====
=====
END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 18.0 Release Date: 07/01/2011 License ID 1239

Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA E) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-15-2011 *

FILE NAME: VIIE25.DAT
TIME/DATE OF STUDY: 16:32 08/15/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), IN- / OUT- / PARK- SIDE / SIDE/ WAY, HEIGHT (FT), WIDTH (FT), LIP (FT), HIKE (FT), FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, RAINFALL(INCH), AREA-AVERAGED. Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1180.00
ELEVATION DATA: UPSTREAM(FEET) = 995.00 DOWNSTREAM(FEET) = 986.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.651
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.525
SUBAREA Tc AND LOSS RATE DATA(AMC II):

Table with columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL, PUBLIC PARK.

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248
SUBAREA RUNOFF(CFS) = 26.10
TOTAL AREA(ACRES) = 12.70 PEAK FLOW RATE(CFS) = 26.10

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 986.00 DOWNSTREAM ELEVATION(FEET) = 980.00
STREET LENGTH(FEET) = 1060.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 41.10
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.67
 HALFSTREET FLOOD WIDTH (FEET) = 26.08
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.01
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.03
 STREET FLOW TRAVEL TIME (MIN.) = 5.86 Tc (MIN.) = 19.52
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.037

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.40	0.98	0.100	32
COMMERCIAL	A	11.10	0.98	0.100	32
PUBLIC PARK	A	2.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.208
 SUBAREA AREA (ACRES) = 18.10 SUBAREA RUNOFF (CFS) = 29.89
 EFFECTIVE AREA (ACRES) = 30.80 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 30.8 PEAK FLOW RATE (CFS) = 50.42

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.71 HALFSTREET FLOOD WIDTH (FEET) = 30.19
 FLOW VELOCITY (FEET/SEC.) = 3.16 DEPTH*VELOCITY (FT*FT/SEC.) = 2.26
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 2240.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 980.00 DOWNSTREAM (FEET) = 966.00
 FLOW LENGTH (FEET) = 780.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.84
 ESTIMATED PIPE DIAMETER (INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 50.42
 PIPE TRAVEL TIME (MIN.) = 1.10 Tc (MIN.) = 20.61
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 3020.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 20.61

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.971
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.40	0.98	0.100	32
COMMERCIAL	A	6.50	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.80	0.98	0.500	32
COMMERCIAL	A	1.00	0.98	0.100	32
PUBLIC PARK	A	1.00	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.260
 SUBAREA AREA (ACRES) = 31.70 SUBAREA RUNOFF (CFS) = 49.02
 EFFECTIVE AREA (ACRES) = 62.50 AREA-AVERAGED Fm (INCH/HR) = 0.24
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.24
 TOTAL AREA (ACRES) = 62.5 PEAK FLOW RATE (CFS) = 97.61

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 966.00 DOWNSTREAM (FEET) = 948.00
 FLOW LENGTH (FEET) = 1150.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.18
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 97.61
 PIPE TRAVEL TIME (MIN.) = 1.45 Tc (MIN.) = 22.07
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4170.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc (MIN.) = 22.07

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.892
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.60	0.98	0.100	32
COMMERCIAL	A	24.60	0.98	0.100	32
COMMERCIAL	A	4.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.70	0.98	0.500	32
COMMERCIAL	A	0.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.192
 SUBAREA AREA (ACRES) = 46.70 SUBAREA RUNOFF (CFS) = 71.69
 EFFECTIVE AREA (ACRES) = 109.20 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.22
 TOTAL AREA (ACRES) = 109.2 PEAK FLOW RATE (CFS) = 164.85

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FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM( FEET) = 948.00 DOWNSTREAM( FEET) = 928.00
FLOW LENGTH( FEET) = 1460.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 39.0 INCHES
PIPE-FLOW VELOCITY( FEET/SEC.) = 14.16
ESTIMATED PIPE DIAMETER( INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW( CFS) = 164.85
PIPE TRAVEL TIME( MIN.) = 1.72 Tc( MIN.) = 23.79
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 5630.00 FEET.

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*****
FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc( MIN.) = 23.79
* 25 YEAR RAINFALL INTENSITY( INCH/HR) = 1.809
SUBAREA LOSS RATE DATA( AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 11.20 0.98 0.100 32
COMMERCIAL A 17.30 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 31.50 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp( INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.310
SUBAREA AREA( ACRES) = 60.00 SUBAREA RUNOFF( CFS) = 81.37
EFFECTIVE AREA( ACRES) = 169.20 AREA-AVERAGED Fm( INCH/HR) = 0.25
AREA-AVERAGED Fp( INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.25
TOTAL AREA( ACRES) = 169.2 PEAK FLOW RATE( CFS) = 238.04

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FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM( FEET) = 928.00 DOWNSTREAM( FEET) = 885.00
FLOW LENGTH( FEET) = 3500.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 45.4 INCHES
PIPE-FLOW VELOCITY( FEET/SEC.) = 14.92
ESTIMATED PIPE DIAMETER( INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW( CFS) = 238.04
PIPE TRAVEL TIME( MIN.) = 3.91 Tc( MIN.) = 27.70
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 9130.00 FEET.

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*****
FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc( MIN.) = 27.70

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* 25 YEAR RAINFALL INTENSITY( INCH/HR) = 1.651
SUBAREA LOSS RATE DATA( AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 19.90 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 98.50 0.98 0.500 32
SCHOOL A 19.10 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp( INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.456
SUBAREA AREA( ACRES) = 137.50 SUBAREA RUNOFF( CFS) = 149.33
EFFECTIVE AREA( ACRES) = 306.70 AREA-AVERAGED Fm( INCH/HR) = 0.34
AREA-AVERAGED Fp( INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
TOTAL AREA( ACRES) = 306.7 PEAK FLOW RATE( CFS) = 363.34

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*****
FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM( FEET) = 885.00 DOWNSTREAM( FEET) = 848.00
FLOW LENGTH( FEET) = 1010.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.7 INCHES
PIPE-FLOW VELOCITY( FEET/SEC.) = 24.94
ESTIMATED PIPE DIAMETER( INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW( CFS) = 363.34
PIPE TRAVEL TIME( MIN.) = 0.68 Tc( MIN.) = 28.37
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 10140.00 FEET.

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*****
FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc( MIN.) = 28.37
* 25 YEAR RAINFALL INTENSITY( INCH/HR) = 1.628
SUBAREA LOSS RATE DATA( AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 24.30 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 66.60 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 3.20 0.98 0.200 32
SCHOOL A 8.00 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp( INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403
SUBAREA AREA( ACRES) = 102.10 SUBAREA RUNOFF( CFS) = 113.44
EFFECTIVE AREA( ACRES) = 408.80 AREA-AVERAGED Fm( INCH/HR) = 0.35
AREA-AVERAGED Fp( INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.36
TOTAL AREA( ACRES) = 408.8 PEAK FLOW RATE( CFS) = 470.23

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*****
FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 840.00
FLOW LENGTH(FEET) = 1040.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 84.0 INCH PIPE IS 64.6 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 14.80
ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 470.23
PIPE TRAVEL TIME (MIN.) = 1.17 Tc (MIN.) = 29.54
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 11180.00 FEET.

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*****
FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc (MIN.) = 29.54
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.589
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/    SCS SOIL  AREA    Fp    Ap    SCS
  LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL            A      5.30    0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      7.90    0.98  0.500  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A     24.20    0.98  0.200  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A      1.20    0.98  0.200  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248
SUBAREA AREA (ACRES) = 38.60 SUBAREA RUNOFF (CFS) = 46.80
EFFECTIVE AREA (ACRES) = 447.40 AREA-AVERAGED Fm (INCH/HR) = 0.34
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA (ACRES) = 447.4 PEAK FLOW RATE (CFS) = 502.68

```

```

*****
FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 31
-----

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```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====

```

```

ELEVATION DATA: UPSTREAM(FEET) = 840.00 DOWNSTREAM(FEET) = 818.00
FLOW LENGTH(FEET) = 1230.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 72.0 INCH PIPE IS 58.5 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 20.43
ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 502.68
PIPE TRAVEL TIME (MIN.) = 1.00 Tc (MIN.) = 30.55
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 109.00 = 12410.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 109.00 TO NODE 109.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====

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MAINLINE Tc (MIN.) = 30.55
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.557
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/    SCS SOIL  AREA    Fp    Ap    SCS
  LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL            A     14.90    0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A     30.30    0.98  0.500  32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A      1.10    0.98  0.200  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.364
SUBAREA AREA (ACRES) = 46.30 SUBAREA RUNOFF (CFS) = 50.09
EFFECTIVE AREA (ACRES) = 493.70 AREA-AVERAGED Fm (INCH/HR) = 0.34
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA (ACRES) = 493.7 PEAK FLOW RATE (CFS) = 540.07

```

```

*****
FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 31
-----

```

```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====

```

```

ELEVATION DATA: UPSTREAM(FEET) = 818.00 DOWNSTREAM(FEET) = 810.00
FLOW LENGTH(FEET) = 1730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 96.0 INCH PIPE IS 76.5 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 12.58
ESTIMATED PIPE DIAMETER (INCH) = 96.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 540.07
PIPE TRAVEL TIME (MIN.) = 2.29 Tc (MIN.) = 32.84
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 14140.00 FEET.

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```

*****
FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81
-----

```

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====

```

```

MAINLINE Tc (MIN.) = 32.84
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.491
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/    SCS SOIL  AREA    Fp    Ap    SCS
  LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL            A      6.70    0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A     22.70    0.98  0.500  32
PUBLIC PARK           A      1.10    0.98  0.850  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.425
SUBAREA AREA (ACRES) = 30.50 SUBAREA RUNOFF (CFS) = 29.56
EFFECTIVE AREA (ACRES) = 524.20 AREA-AVERAGED Fm (INCH/HR) = 0.35
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA (ACRES) = 524.2 PEAK FLOW RATE (CFS) = 540.23

```

```

*****
FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 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.) = 32.84
RAINFALL INTENSITY (INCH/HR) = 1.49
AREA-AVERAGED Fm (INCH/HR) = 0.35
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.35
EFFECTIVE STREAM AREA (ACRES) = 524.20
TOTAL STREAM AREA (ACRES) = 524.20
PEAK FLOW RATE (CFS) AT CONFLUENCE = 540.23

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*****
FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 21
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```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

```

```

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1100.00
ELEVATION DATA: UPSTREAM (FEET) = 850.00 DOWNSTREAM (FEET) = 835.00

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```

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 11.817
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.753
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS   Tc
  LAND USE         GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL          A    15.10   0.98 0.100 32 11.82
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 36.09
TOTAL AREA (ACRES) = 15.10 PEAK FLOW RATE (CFS) = 36.09

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```

*****
FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 62
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```

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====

```

```

UPSTREAM ELEVATION (FEET) = 835.00 DOWNSTREAM ELEVATION (FEET) = 810.00
STREET LENGTH (FEET) = 2290.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

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```

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

```

```

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

```

```

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 57.56
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.67

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```

HALFSTREET FLOOD WIDTH (FEET) = 26.19
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.20
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.83
STREET FLOW TRAVEL TIME (MIN.) = 9.08 Tc (MIN.) = 20.90
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.955

```

```

SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
  LAND USE         GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          A    14.80   0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A    0.60   0.98 0.500 32
COMMERCIAL          A    10.20   0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.109
SUBAREA AREA (ACRES) = 25.60 SUBAREA RUNOFF (CFS) = 42.59
EFFECTIVE AREA (ACRES) = 40.70 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
TOTAL AREA (ACRES) = 40.7 PEAK FLOW RATE (CFS) = 67.84

```

```

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.71 HALFSTREET FLOOD WIDTH (FEET) = 29.56
FLOW VELOCITY (FEET/SEC.) = 4.35 DEPTH*VELOCITY (FT*FT/SEC.) = 3.08
LONGEST FLOWPATH FROM NODE 111.00 TO NODE 113.00 = 3390.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 113.00 TO NODE 110.00 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.) = 20.90
RAINFALL INTENSITY (INCH/HR) = 1.96
AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.11
EFFECTIVE STREAM AREA (ACRES) = 40.70
TOTAL STREAM AREA (ACRES) = 40.70
PEAK FLOW RATE (CFS) AT CONFLUENCE = 67.84

```

```

** CONFLUENCE DATA **

```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	540.23	32.84	1.491	0.98 (0.35)	0.35	524.2	100.00
2	67.84	20.90	1.955	0.98 (0.10)	0.11	40.7	111.00

```

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

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```

** PEAK FLOW RATE TABLE **

```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	551.08	20.90	1.955	0.98 (0.32)	0.33	374.3	111.00
2	591.06	32.84	1.491	0.98 (0.33)	0.34	564.9	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 591.06 Tc(MIN.) = 32.84
 EFFECTIVE AREA(ACRES) = 564.90 AREA-AVERAGED Fm(INCH/HR) = 0.33
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.34
 TOTAL AREA(ACRES) = 564.9
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 14140.00 FEET.

RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 3.90 0.98 0.200 32 12.82
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.188
 SUBAREA RUNOFF(CFS) = 27.66
 TOTAL AREA(ACRES) = 12.10 PEAK FLOW RATE(CFS) = 27.66

 FLOW PROCESS FROM NODE 110.00 TO NODE 120.00 IS CODE = 31

 FLOW PROCESS FROM NODE 114.00 TO NODE 115.00 IS CODE = 62

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 810.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 102.0 INCH PIPE IS 81.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.13
 ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 591.06
 PIPE TRAVEL TIME(MIN.) = 1.73 Tc(MIN.) = 34.57
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.

=====

UPSTREAM ELEVATION(FEET) = 835.00 DOWNSTREAM ELEVATION(FEET) = 825.00
 STREET LENGTH(FEET) = 400.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 34.57
 RAINFALL INTENSITY(INCH/HR) = 1.45
 AREA-AVERAGED Fm(INCH/HR) = 0.33
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.34
 EFFECTIVE STREAM AREA(ACRES) = 564.90
 TOTAL STREAM AREA(ACRES) = 564.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 591.06

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 47.05
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.56
 HALFSTREET FLOOD WIDTH(FEET) = 20.27
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.48
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.09
 STREET FLOW TRAVEL TIME(MIN.) = 1.22 Tc(MIN.) = 13.24
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.571

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.30	0.98	0.100	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	3.30	0.98	0.200	32
RESIDENTIAL ".4 DWELLING/ACRE"	A	17.40	0.98	0.900	32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98					
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.720					
SUBAREA AREA(ACRES) = 23.00 SUBAREA RUNOFF(CFS) = 38.69					
EFFECTIVE AREA(ACRES) = 35.10 AREA-AVERAGED Fm(INCH/HR) = 0.52					
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.54					
TOTAL AREA(ACRES) = 35.1 PEAK FLOW RATE(CFS) = 64.69					

 FLOW PROCESS FROM NODE 113.00 TO NODE 114.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1080.00
 ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 835.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.026
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.724

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	6.50	0.98	0.100	32	12.03
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	1.70	0.98	0.500	32	15.39

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.62 HALFSTREET FLOOD WIDTH(FEET) = 23.01
 FLOW VELOCITY(FEET/SEC.) = 5.90 DEPTH*VELOCITY(FT*FT/SEC.) = 3.65
 LONGEST FLOWPATH FROM NODE 113.00 TO NODE 115.00 = 1480.00 FEET.

 FLOW PROCESS FROM NODE 115.00 TO NODE 120.00 IS CODE = 31

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-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
-----

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```

ELEVATION DATA: UPSTREAM( FEET) = 825.00 DOWNSTREAM( FEET) = 805.00
FLOW LENGTH( FEET) = 2590.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 31.9 INCHES
PIPE-FLOW VELOCITY( FEET/SEC.) = 8.92
ESTIMATED PIPE DIAMETER( INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW( CFS) = 64.69
PIPE TRAVEL TIME( MIN.) = 4.84 Tc( MIN.) = 18.08
LONGEST FLOWPATH FROM NODE 113.00 TO NODE 120.00 = 4070.00 FEET.

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*****
FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81
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```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
-----

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```

MAINLINE Tc( MIN.) = 18.08
* 25 YEAR RAINFALL INTENSITY( INCH/HR) = 2.133
SUBAREA LOSS RATE DATA( AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL            A      10.80    0.98      0.100     32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      22.40    0.98      0.500     32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       8.50    0.98      0.200     32
COMMERCIAL            A       7.30    0.98      0.100     32
PUBLIC PARK           A       1.80    0.98      0.850     32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp( INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.320
SUBAREA AREA( ACRES) = 50.80 SUBAREA RUNOFF( CFS) = 83.25
EFFECTIVE AREA( ACRES) = 85.90 AREA-AVERAGED Fm( INCH/HR) = 0.40
AREA-AVERAGED Fp( INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.41
TOTAL AREA( ACRES) = 85.9 PEAK FLOW RATE( CFS) = 134.09

```

```

*****
FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1
-----

```

```

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
-----

```

```

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION( MIN.) = 18.08
RAINFALL INTENSITY( INCH/HR) = 2.13
AREA-AVERAGED Fm( INCH/HR) = 0.40
AREA-AVERAGED Fp( INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.41
EFFECTIVE STREAM AREA( ACRES) = 85.90
TOTAL STREAM AREA( ACRES) = 85.90
PEAK FLOW RATE( CFS) AT CONFLUENCE = 134.09

```

```

** CONFLUENCE DATA **
STREAM      Q      Tc      Intensity  Fp( Fm)  Ap      Ae      HEADWATER

```

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	551.08	22.64	1.864	0.98(0.32)	0.33	374.3 111.00
1	591.06	34.57	1.446	0.98(0.33)	0.34	564.9 100.00
2	134.09	18.08	2.133	0.98(0.40)	0.41	85.9 113.00

```

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

```

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	650.96	18.08	2.133	0.98(0.34)	0.35	384.9	113.00
2	664.39	22.64	1.864	0.98(0.33)	0.34	460.2	111.00
3	672.05	34.57	1.446	0.98(0.34)	0.35	650.8	100.00

```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE( CFS) = 672.05 Tc( MIN.) = 34.57
EFFECTIVE AREA( ACRES) = 650.80 AREA-AVERAGED Fm( INCH/HR) = 0.34
AREA-AVERAGED Fp( INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.35
TOTAL AREA( ACRES) = 650.8
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.

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```

*****
FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 71
-----

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>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<
>>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<
-----

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UNIT-HYDROGRAPH DATA:
RAINFALL( INCH): 5M= 0.38;30M= 0.79;1H= 1.04;3H= 1.87;6H= 2.71;24H= 5.30
S-GRAPH: VALLEY( DEV.)= 97.3%;VALLEY( UNDEV.) /DESERT= 2.7%
MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT( UNDEV.)= 0.0%
Tc( HR) = 0.58; LAG( HR) = 0.46; Fm( INCH/HR) = 0.34; Ybar = 0.37
USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC II CONDITION.
DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
3HR = 1.00; 6HR = 1.00; 24HR= 1.00
UNIT-INTERVAL( MIN) = 5.00 TOTAL AREA( ACRES) = 650.8
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.
EQUIVALENT BASIN FACTOR APPROXIMATIONS:
Lca/L=0.3,n=.0297; Lca/L=0.4,n=.0267; Lca/L=0.5,n=.0245;Lca/L=0.6,n=.0229
TIME OF PEAK FLOW( HR) = 16.50 RUNOFF VOLUME( AF) = 187.18
UNIT-HYDROGRAPH METHOD PEAK FLOW RATE( CFS) = 724.60
TOTAL PEAK FLOW RATE( CFS) = 724.60 (SOURCE FLOW INCLUDED)
RATIONAL METHOD PEAK FLOW RATE( CFS) = 672.05
(UPSTREAM NODE PEAK FLOW RATE( CFS) = 672.05)
PEAK FLOW RATE( CFS) USED = 724.60

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END OF STUDY SUMMARY:
TOTAL AREA( ACRES) = 650.8 TC( MIN.) = 34.57
AREA-AVERAGED Fm( INCH/HR) = 0.34 Ybar = 0.37
PEAK FLOW RATE( CFS) = 724.60
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END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS
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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA E) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-15-2011 *

FILE NAME: VIIE10.DAT
TIME/DATE OF STUDY: 16:34 08/15/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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---*TIME-OF-CONCENTRATION MODEL*---

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO		STREET-CROSSFALL:		CURB	GUTTER-GEOMETRIES:			MANNING
	WIDTH	CROSSFALL	IN-	OUT-/PARK-		HEIGHT	WIDTH	LIP	
	(FT)	(FT)	SIDE /	SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
1	30.0	20.0	0.018/0.018/0.020		0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020		0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN

OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1180.00
ELEVATION DATA: UPSTREAM(FEET) = 995.00 DOWNSTREAM(FEET) = 986.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.651
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.188

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.80	1.33	0.100	17	13.65
COMMERCIAL	A	1.30	1.33	0.100	17	13.65
COMMERCIAL	A	6.00	1.33	0.100	17	13.65
COMMERCIAL	A	0.10	1.33	0.100	17	13.65
PUBLIC PARK	A	2.50	1.33	0.850	17	21.69

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248

SUBAREA RUNOFF(CFS) = 21.25

TOTAL AREA(ACRES) = 12.70 PEAK FLOW RATE(CFS) = 21.25

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 986.00 DOWNSTREAM ELEVATION(FEET) = 980.00

STREET LENGTH(FEET) = 1060.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 33.31

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.63

HALFSTREET FLOOD WIDTH(FEET) = 23.69

AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.87

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.81

STREET FLOW TRAVEL TIME(MIN.) = 6.16 Tc(MIN.) = 19.81

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.750

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.40	1.33	0.100	17
COMMERCIAL	A	11.10	1.33	0.100	17
PUBLIC PARK	A	2.60	1.33	0.850	17

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33

SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.208

SUBAREA AREA(ACRES) = 18.10 SUBAREA RUNOFF(CFS) = 24.01

EFFECTIVE AREA(ACRES) = 30.80 AREA-AVERAGED Fm(INCH/HR) = 0.30

AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.22

TOTAL AREA(ACRES) = 30.8 PEAK FLOW RATE(CFS) = 40.26

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.66

FLOW VELOCITY(FEET/SEC.) = 3.00 DEPTH*VELOCITY(FT*FT/SEC.) = 2.01

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 2240.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 980.00 DOWNSTREAM(FEET) = 966.00

FLOW LENGTH(FEET) = 780.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.7 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 11.17

ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 40.26

PIPE TRAVEL TIME(MIN.) = 1.16 Tc(MIN.) = 20.97

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 3020.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 20.97

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.691

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.40	1.33	0.100	17
COMMERCIAL	A	6.50	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.80	1.33	0.500	17
COMMERCIAL	A	1.00	1.33	0.100	17
PUBLIC PARK	A	1.00	1.33	0.850	17

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.260
SUBAREA AREA(ACRES) = 31.70 SUBAREA RUNOFF(CFS) = 38.40
EFFECTIVE AREA(ACRES) = 62.50 AREA-AVERAGED Fm(INCH/HR) = 0.32
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.24
TOTAL AREA(ACRES) = 62.5 PEAK FLOW RATE(CFS) = 77.02

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 966.00 DOWNSTREAM(FEET) = 948.00

FLOW LENGTH(FEET) = 1150.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.2 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 12.46

ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 77.02

PIPE TRAVEL TIME(MIN.) = 1.54 Tc(MIN.) = 22.51

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 4170.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 22.51

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.621

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.60	1.33	0.100	17
COMMERCIAL	A	24.60	1.33	0.100	17
COMMERCIAL	A	4.30	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.70	1.33	0.500	17
COMMERCIAL	A	0.50	1.33	0.100	17

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.192
SUBAREA AREA(ACRES) = 46.70 SUBAREA RUNOFF(CFS) = 57.42
EFFECTIVE AREA(ACRES) = 109.20 AREA-AVERAGED Fm(INCH/HR) = 0.29
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.22
TOTAL AREA(ACRES) = 109.2 PEAK FLOW RATE(CFS) = 130.49

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 948.00 DOWNSTREAM(FEET) = 928.00
FLOW LENGTH(FEET) = 1460.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.47
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 130.49
PIPE TRAVEL TIME(MIN.) = 1.81 Tc(MIN.) = 24.31
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 5630.00 FEET.

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FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 24.31
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.547
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL            A      11.20    1.33    0.100    17
COMMERCIAL            A      17.30    1.33    0.100    17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      31.50    1.33    0.500    17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.310
SUBAREA AREA(ACRES) = 60.00 SUBAREA RUNOFF(CFS) = 61.33
EFFECTIVE AREA(ACRES) = 169.20 AREA-AVERAGED Fm(INCH/HR) = 0.34
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.25
TOTAL AREA(ACRES) = 169.2 PEAK FLOW RATE(CFS) = 184.62

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FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 928.00 DOWNSTREAM(FEET) = 885.00
FLOW LENGTH(FEET) = 3500.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.95
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 184.62
PIPE TRAVEL TIME(MIN.) = 4.18 Tc(MIN.) = 28.50
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 9130.00 FEET.

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FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 28.50
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.407
SUBAREA LOSS RATE DATA(AMC I ):

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DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL            A      19.90    1.33    0.100    17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      98.50    1.33    0.500    17
SCHOOL                A      19.10    1.33    0.600    17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.456
SUBAREA AREA(ACRES) = 137.50 SUBAREA RUNOFF(CFS) = 99.16
EFFECTIVE AREA(ACRES) = 306.70 AREA-AVERAGED Fm(INCH/HR) = 0.46
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.34
TOTAL AREA(ACRES) = 306.7 PEAK FLOW RATE(CFS) = 262.37

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FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 848.00
FLOW LENGTH(FEET) = 1010.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 38.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 23.08
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 262.37
PIPE TRAVEL TIME(MIN.) = 0.73 Tc(MIN.) = 29.23
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 10140.00 FEET.

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FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 29.23
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.386
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL            A      24.30    1.33    0.100    17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      66.60    1.33    0.500    17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A      3.20    1.33    0.200    17
SCHOOL                A      8.00    1.33    0.600    17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403
SUBAREA AREA(ACRES) = 102.10 SUBAREA RUNOFF(CFS) = 78.13
EFFECTIVE AREA(ACRES) = 408.80 AREA-AVERAGED Fm(INCH/HR) = 0.48
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.36
TOTAL AREA(ACRES) = 408.8 PEAK FLOW RATE(CFS) = 334.65

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FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

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ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 840.00
FLOW LENGTH(FEET) = 1040.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 75.0 INCH PIPE IS 55.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.67
ESTIMATED PIPE DIAMETER(INCH) = 75.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 334.65
PIPE TRAVEL TIME(MIN.) = 1.27 Tc(MIN.) = 30.49
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 11180.00 FEET.

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FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 30.49
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.351
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
  LAND USE         GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL           A       5.30   1.33  0.100  17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       7.90   1.33  0.500  17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A      24.20   1.33  0.200  17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       1.20   1.33  0.200  17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.248
SUBAREA AREA(ACRES) = 38.60 SUBAREA RUNOFF(CFS) = 35.50
EFFECTIVE AREA(ACRES) = 447.40 AREA-AVERAGED Fm(INCH/HR) = 0.46
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 447.4 PEAK FLOW RATE(CFS) = 357.33

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FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<
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ELEVATION DATA: UPSTREAM(FEET) = 840.00 DOWNSTREAM(FEET) = 818.00
FLOW LENGTH(FEET) = 1230.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 66.0 INCH PIPE IS 48.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 19.11
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 357.33
PIPE TRAVEL TIME(MIN.) = 1.07 Tc(MIN.) = 31.57
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 109.00 = 12410.00 FEET.

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FLOW PROCESS FROM NODE 109.00 TO NODE 109.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 31.57
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.323

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SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
  LAND USE         GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL           A      14.90   1.33  0.100  17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      30.30   1.33  0.500  17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A       1.10   1.33  0.200  17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.364
* RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
* IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
SUBAREA AREA(ACRES) = 46.30 SUBAREA RUNOFF(CFS) = 35.06
EFFECTIVE AREA(ACRES) = 493.70 AREA-AVERAGED Fm(INCH/HR) = 0.47
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
* RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
* IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
TOTAL AREA(ACRES) = 493.7 PEAK FLOW RATE(CFS) = 381.90

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FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<
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ELEVATION DATA: UPSTREAM(FEET) = 818.00 DOWNSTREAM(FEET) = 810.00
FLOW LENGTH(FEET) = 1730.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 84.0 INCH PIPE IS 67.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.51
ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 381.90
PIPE TRAVEL TIME(MIN.) = 2.51 Tc(MIN.) = 34.07
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 14140.00 FEET.

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FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
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MAINLINE Tc(MIN.) = 34.07
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.264
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
  LAND USE         GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL           A       6.70   1.33  0.100  17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A      22.70   1.33  0.500  17
PUBLIC PARK           A       1.10   1.33  0.850  17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.425
* RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
* IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
SUBAREA AREA(ACRES) = 30.50 SUBAREA RUNOFF(CFS) = 19.96
EFFECTIVE AREA(ACRES) = 524.20 AREA-AVERAGED Fm(INCH/HR) = 0.47
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
* RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;

```

* IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
 TOTAL AREA(ACRES) = 524.2 PEAK FLOW RATE(CFS) = 384.75

Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 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.) = 34.07
 RAINFALL INTENSITY(INCH/HR) = 1.26
 AREA-AVERAGED Fm(INCH/HR) = 0.47
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) = 524.20
 TOTAL STREAM AREA(ACRES) = 524.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 384.75

 FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1100.00
 ELEVATION DATA: UPSTREAM(FEET) = 850.00 DOWNSTREAM(FEET) = 835.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.817
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.386
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	15.10	1.33	0.100	17	11.82

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 30.62
 TOTAL AREA(ACRES) = 15.10 PEAK FLOW RATE(CFS) = 30.62

 FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<

=====

UPSTREAM ELEVATION(FEET) = 835.00 DOWNSTREAM ELEVATION(FEET) = 810.00
 STREET LENGTH(FEET) = 2290.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 48.44
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.64
 HALFSTREET FLOOD WIDTH(FEET) = 24.17
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.02
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.58
 STREET FLOW TRAVEL TIME(MIN.) = 9.50 Tc(MIN.) = 21.32
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.674
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.80	1.33	0.100	17
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	0.60	1.33	0.500	17
COMMERCIAL	A	10.20	1.33	0.100	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.109
 SUBAREA AREA(ACRES) = 25.60 SUBAREA RUNOFF(CFS) = 35.23
 EFFECTIVE AREA(ACRES) = 40.70 AREA-AVERAGED Fm(INCH/HR) = 0.14
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.11
 TOTAL AREA(ACRES) = 40.7 PEAK FLOW RATE(CFS) = 56.18

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.76
 FLOW VELOCITY(FEET/SEC.) = 4.17 DEPTH*VELOCITY(FT*FT/SEC.) = 2.79
 LONGEST FLOWPATH FROM NODE 111.00 TO NODE 113.00 = 3390.00 FEET.

 FLOW PROCESS FROM NODE 113.00 TO NODE 110.00 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.) = 21.32
 RAINFALL INTENSITY(INCH/HR) = 1.67
 AREA-AVERAGED Fm(INCH/HR) = 0.14
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.11
 EFFECTIVE STREAM AREA(ACRES) = 40.70
 TOTAL STREAM AREA(ACRES) = 40.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 56.18

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	384.75	34.07	1.264	1.33(0.47)	0.35	524.2	100.00
2	56.18	21.32	1.674	1.33(0.14)	0.11	40.7	111.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	411.42	21.32	1.674	1.33(0.43)	0.33	368.7	111.00
2	426.15	34.07	1.264	1.33(0.45)	0.34	564.9	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 426.15 Tc(MIN.) = 34.07
 EFFECTIVE AREA (ACRES) = 564.90 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.34
 TOTAL AREA(ACRES) = 564.9
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 14140.00 FEET.

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	6.50	1.33	0.100	17	12.03
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	1.70	1.33	0.500	17	15.39
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	3.90	1.33	0.200	17	12.82
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) =			1.33			
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap =			0.188			
SUBAREA RUNOFF(CFS) =			22.98			
TOTAL AREA(ACRES) =			12.10		PEAK FLOW RATE(CFS) = 22.98	

 FLOW PROCESS FROM NODE 110.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 810.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 90.0 INCH PIPE IS 72.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.16
 ESTIMATED PIPE DIAMETER(INCH) = 90.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 426.15
 PIPE TRAVEL TIME(MIN.) = 1.88 Tc(MIN.) = 35.95
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.

 FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 35.95
 RAINFALL INTENSITY(INCH/HR) = 1.22
 AREA-AVERAGED Fm(INCH/HR) = 0.45
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.34
 EFFECTIVE STREAM AREA(ACRES) = 564.90
 TOTAL STREAM AREA(ACRES) = 564.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 426.15

 FLOW PROCESS FROM NODE 113.00 TO NODE 114.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1080.00
 ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 835.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.026
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.361

 FLOW PROCESS FROM NODE 114.00 TO NODE 115.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 835.00 DOWNSTREAM ELEVATION(FEET) = 825.00
 STREET LENGTH(FEET) = 400.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 36.14
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.52
 HALFSTREET FLOOD WIDTH(FEET) = 18.26
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.13
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.68
 STREET FLOW TRAVEL TIME(MIN.) = 1.30 Tc(MIN.) = 13.33
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.220

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.30	1.33	0.100	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	3.30	1.33	0.200	17
RESIDENTIAL					
".4 DWELLING/ACRE"	A	17.40	1.33	0.900	17
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) =			1.33		
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap =			0.720		
SUBAREA AREA(ACRES) =			23.00		SUBAREA RUNOFF(CFS) = 26.17
EFFECTIVE AREA(ACRES) =			35.10		AREA-AVERAGED Fm(INCH/HR) = 0.71
AREA-AVERAGED Fp(INCH/HR) =			1.33		AREA-AVERAGED Ap = 0.54
TOTAL AREA(ACRES) =			35.1		PEAK FLOW RATE(CFS) = 47.61

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.57 HALFSTREET FLOOD WIDTH(FEET) = 20.37
 FLOW VELOCITY(FEET/SEC.) = 5.49 DEPTH*VELOCITY(FT*FT/SEC.) = 3.10
 LONGEST FLOWPATH FROM NODE 113.00 TO NODE 115.00 = 1480.00 FEET.

EFFECTIVE STREAM AREA(ACRES) = 85.90
 TOTAL STREAM AREA(ACRES) = 85.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 99.20

FLOW PROCESS FROM NODE 115.00 TO NODE 120.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 825.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 2590.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.40
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 47.61
 PIPE TRAVEL TIME(MIN.) = 5.14 Tc(MIN.) = 18.46
 LONGEST FLOWPATH FROM NODE 113.00 TO NODE 120.00 = 4070.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc(MIN.) = 18.46
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.825
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.80	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	22.40	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	8.50	1.33	0.200	17
COMMERCIAL	A	7.30	1.33	0.100	17
PUBLIC PARK	A	1.80	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.320
 SUBAREA AREA(ACRES) = 50.80 SUBAREA RUNOFF(CFS) = 64.04
 EFFECTIVE AREA(ACRES) = 85.90 AREA-AVERAGED Fm(INCH/HR) = 0.54
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.41
 TOTAL AREA(ACRES) = 85.9 PEAK FLOW RATE(CFS) = 99.20

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<<

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 18.46
 RAINFALL INTENSITY(INCH/HR) = 1.83
 AREA-AVERAGED Fm(INCH/HR) = 0.54
 AREA-AVERAGED Fp(INCH/HR) = 1.33
 AREA-AVERAGED Ap = 0.41

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	411.42	23.20	1.591	1.33(0.43)	0.33	368.7	111.00
1	426.15	35.95	1.224	1.33(0.45)	0.34	564.9	100.00
2	99.20	18.46	1.825	1.33(0.54)	0.41	85.9	113.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	492.75	18.46	1.825	1.33(0.46)	0.35	379.3	113.00
2	492.53	23.20	1.591	1.33(0.45)	0.34	454.6	111.00
3	482.13	35.95	1.224	1.33(0.46)	0.35	650.8	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 492.75 Tc(MIN.) = 18.46
 EFFECTIVE AREA(ACRES) = 379.29 AREA-AVERAGED Fm(INCH/HR) = 0.46
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 650.8
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 71

>>>>PEAK FLOW RATE ESTIMATOR CHANGED TO UNIT-HYDROGRAPH METHOD<<<<<<
 >>>>USING TIME-OF-CONCENTRATION OF LONGEST FLOWPATH<<<<<<

UNIT-HYDROGRAPH DATA:

RAINFALL(INCH): 5M= 0.33;30M= 0.68;1H= 0.90;3H= 1.60;6H= 2.31;24H= 4.36
 S-GRAPH: VALLEY(DEV.)= 97.3%;VALLEY(UNDEV.)/DESERT= 2.7%
 MOUNTAIN= 0.0%;FOOTHILL= 0.0%;DESERT(UNDEV.)= 0.0%
 Tc(HR) = 0.60; LAG(HR) = 0.48; Fm(INCH/HR) = 0.46; Ybar = 0.38
 USED SIERRA MADRE DEPTH-AREA CURVES WITH AMC I CONDITION.
 DEPTH-AREA FACTORS: 5M = 0.97; 30M = 0.97; 1HR = 0.97;
 3HR = 1.00; 6HR = 1.00; 24HR = 1.00

UNIT-INTERVAL(MIN) = 5.00 TOTAL AREA(ACRES) = 650.8
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 120.00 = 15400.00 FEET.

EQUIVALENT BASIN FACTOR APPROXIMATIONS:

Lca/L=0.3,n=.0309; Lca/L=0.4,n=.0277; Lca/L=0.5,n=.0255;Lca/L=0.6,n=.0238
 TIME OF PEAK FLOW(HR) = 16.50 RUNOFF VOLUME(AF) = 150.57
 UNIT-HYDROGRAPH METHOD PEAK FLOW RATE(CFS) = 564.59
 TOTAL PEAK FLOW RATE(CFS) = 564.59 (SOURCE FLOW INCLUDED)
 RATIONAL METHOD PEAK FLOW RATE(CFS) = 492.75
 (UPSTREAM NODE PEAK FLOW RATE(CFS) = 492.75)
 PEAK FLOW RATE(CFS) USED = 564.59

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 650.8 TC(MIN.) = 35.95
 AREA-AVERAGED Fm(INCH/HR) = 0.46 Ybar = 0.38

PEAK FLOW RATE (CFS) = 564.59

=====

END OF INTEGRATED RATIONAL/UNIT-HYDROGRAPH METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA G) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 12-1-2011 *

FILE NAME: VIIG100.DAT
TIME/DATE OF STUDY: 09:17 12/01/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:
2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 950.00
ELEVATION DATA: UPSTREAM (FEET) = 810.00 DOWNSTREAM (FEET) = 795.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.822
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.633
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	4.40	0.98	0.100	32	10.82

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 14.00
TOTAL AREA (ACRES) = 4.40 PEAK FLOW RATE (CFS) = 14.00

FLOW PROCESS FROM NODE 2.00 TO NODE 10.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 795.00 DOWNSTREAM ELEVATION (FEET) = 785.00
STREET LENGTH (FEET) = 1960.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL (DECIMAL) = 0.020

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 790.00 DOWNSTREAM ELEVATION(FEET) = 785.00
STREET LENGTH(FEET) = 640.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 65.04
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.73
HALFSTREET FLOOD WIDTH(FEET) = 32.20
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.78
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.78
STREET FLOW TRAVEL TIME(MIN.) = 2.82 Tc(MIN.) = 17.19

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.752
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 13.00 0.98 0.100 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 5.00 0.98 0.200 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.128
SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 42.57
EFFECTIVE AREA(ACRES) = 35.30 AREA-AVERAGED Fm(INCH/HR) = 0.19
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.19
TOTAL AREA(ACRES) = 35.3 PEAK FLOW RATE(CFS) = 81.45

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.78 HALFSTREET FLOOD WIDTH(FEET) = 37.16
FLOW VELOCITY(FEET/SEC.) = 3.94 DEPTH*VELOCITY(FT*FT/SEC.) = 3.09
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 640.0 FT WITH ELEVATION-DROP = 5.0 FT, IS 57.4 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 10.00
LONGEST FLOWPATH FROM NODE 3.00 TO NODE 10.00 = 2170.00 FEET.

FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 17.19
RAINFALL INTENSITY(INCH/HR) = 2.75
AREA-AVERAGED Fm(INCH/HR) = 0.19
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 0.19
EFFECTIVE STREAM AREA(ACRES) = 35.30
TOTAL STREAM AREA(ACRES) = 35.30
PEAK FLOW RATE(CFS) AT CONFLUENCE = 81.45

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows for stream numbers 1 and 2.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows for stream numbers 1 and 2.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 99.95 Tc(MIN.) = 17.19
EFFECTIVE AREA(ACRES) = 43.04 AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 46.2
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 2910.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 46.2 TC(MIN.) = 17.19
EFFECTIVE AREA(ACRES) = 43.04 AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.176
PEAK FLOW RATE(CFS) = 99.95

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows for stream numbers 1 and 2.

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****

- * ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA G) *
- * 25-YEAR HYDROLOGY ANALYSIS *
- * P. PAGADUAN 12-1-2011 *

FILE NAME: VIIG25.DAT
TIME/DATE OF STUDY: 10:34 12/01/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO STREET-CROSSFALL:		STREET-CROSSFALL:		CURB GUTTER-GEOMETRIES:		MANNING	
	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE	OUT-/PARK- / SIDE/ WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE FACTOR (n)
1	30.0	20.0	0.018/0.018	0.020	0.67	2.00	0.0312	0.167 0.0150
2	32.0	27.0	0.020/0.020	0.020	0.67	2.00	0.0312	0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00

SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL (INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
ELEVATION DATA: UPSTREAM(FEET) = 810.00 DOWNSTREAM(FEET) = 795.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.822
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.902
SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	4.40	0.98	0.100	32	10.82

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 11.11
TOTAL AREA(ACRES) = 4.40 PEAK FLOW RATE(CFS) = 11.11

FLOW PROCESS FROM NODE 2.00 TO NODE 10.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 795.00 DOWNSTREAM ELEVATION(FEET) = 785.00
STREET LENGTH(FEET) = 1960.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 16.04
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.52
 HALfstREET FLOOD WIDTH(FEET) = 18.16
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.30
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.20
 STREET FLOW TRAVEL TIME(MIN.) = 14.20 Tc(MIN.) = 25.02

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.755
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.50	0.98	0.100	32

SUBAREA AVERAGE PervIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PervIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 6.50 SUBAREA RUNOFF(CFS) = 9.70
 EFFECTIVE AREA(ACRES) = 10.90 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 10.9 PEAK FLOW RATE(CFS) = 16.26

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.52 HALfstREET FLOOD WIDTH(FEET) = 18.21
 FLOW VELOCITY(FEET/SEC.) = 2.32 DEPTH*VELOCITY(FT*FT/SEC.) = 1.21
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 2910.00 FEET.

 FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 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.) = 25.02
 RAINFALL INTENSITY(INCH/HR) = 1.75
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 10.90
 TOTAL STREAM AREA(ACRES) = 10.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.26

 FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 680.00
 ELEVATION DATA: UPSTREAM(FEET) = 810.00 DOWNSTREAM(FEET) = 805.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.030

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.869
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.00	0.98	0.100	32	11.03
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	2.90	0.98	0.500	32	14.11

SUBAREA AVERAGE PervIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PervIOUS AREA FRACTION, Ap = 0.397
 SUBAREA RUNOFF(CFS) = 8.71
 TOTAL AREA(ACRES) = 3.90 PEAK FLOW RATE(CFS) = 8.71

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====
 UPSTREAM ELEVATION(FEET) = 805.00 DOWNSTREAM ELEVATION(FEET) = 790.00
 STREET LENGTH(FEET) = 850.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 22.07
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.48
 HALfstREET FLOOD WIDTH(FEET) = 16.05
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.99
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.91
 STREET FLOW TRAVEL TIME(MIN.) = 3.55 Tc(MIN.) = 14.58
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.427

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	1.30	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	11.10	0.98	0.200	32

SUBAREA AVERAGE PervIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PervIOUS AREA FRACTION, Ap = 0.222
 SUBAREA AREA(ACRES) = 13.40 SUBAREA RUNOFF(CFS) = 26.66
 EFFECTIVE AREA(ACRES) = 17.30 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.26
 TOTAL AREA(ACRES) = 17.3 PEAK FLOW RATE(CFS) = 33.82

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.54 HALfstREET FLOOD WIDTH(FEET) = 19.05

FLOW VELOCITY (FEET/SEC.) = 4.43 DEPTH*VELOCITY (FT*FT/SEC.) = 2.39
 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 5.00 = 1530.00 FEET.

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 790.00 DOWNSTREAM ELEVATION (FEET) = 785.00
 STREET LENGTH (FEET) = 640.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 50.40
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.68
 HALFSTREET FLOOD WIDTH (FEET) = 26.92
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 3.58
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.44
 STREET FLOW TRAVEL TIME (MIN.) = 2.98 Tc (MIN.) = 17.56

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.170
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.00	0.98	0.100	32
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	5.00	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.128
 SUBAREA AREA (ACRES) = 18.00 SUBAREA RUNOFF (CFS) = 33.14
 EFFECTIVE AREA (ACRES) = 35.30 AREA-AVERAGED Fm (INCH/HR) = 0.19
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.19
 TOTAL AREA (ACRES) = 35.3 PEAK FLOW RATE (CFS) = 62.97

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.73 HALFSTREET FLOOD WIDTH (FEET) = 31.57
 FLOW VELOCITY (FEET/SEC.) = 3.75 DEPTH*VELOCITY (FT*FT/SEC.) = 2.73
 LONGEST FLOWPATH FROM NODE 3.00 TO NODE 10.00 = 2170.00 FEET.

 FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1

 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION (MIN.) = 17.56
 RAINFALL INTENSITY (INCH/HR) = 2.17
 AREA-AVERAGED Fm (INCH/HR) = 0.19
 AREA-AVERAGED Fp (INCH/HR) = 0.97
 AREA-AVERAGED Ap = 0.19
 EFFECTIVE STREAM AREA (ACRES) = 35.30
 TOTAL STREAM AREA (ACRES) = 35.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 62.97

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	16.26	25.02	1.755	0.97(0.10)	0.10	10.9	1.00
2	62.97	17.56	2.170	0.97(0.19)	0.19	35.3	3.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	77.24	17.56	2.170	0.98(0.17)	0.18	42.9	3.00
2	66.03	25.02	1.755	0.97(0.17)	0.17	46.2	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE (CFS) = 77.24 Tc (MIN.) = 17.56
 EFFECTIVE AREA (ACRES) = 42.95 AREA-AVERAGED Fm (INCH/HR) = 0.17
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.18
 TOTAL AREA (ACRES) = 46.2
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 2910.00 FEET.

=====

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 46.2 TC (MIN.) = 17.56
 EFFECTIVE AREA (ACRES) = 42.95 AREA-AVERAGED Fm (INCH/HR) = 0.17
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.177
 PEAK FLOW RATE (CFS) = 77.24

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	77.24	17.56	2.170	0.98(0.17)	0.18	42.9	3.00
2	66.03	25.02	1.755	0.97(0.17)	0.17	46.2	1.00

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VII (AREA G) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 12-1-2011 *

FILE NAME: VIIG10.DAT
TIME/DATE OF STUDY: 10:39 12/01/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0312 0.167 0.0150	
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00 0.0312 0.167 0.0150	

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL (INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

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

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 950.00
ELEVATION DATA: UPSTREAM (FEET) = 810.00 DOWNSTREAM (FEET) = 795.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.822
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.515
SUBAREA Tc AND LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	4.40	1.33	0.100	17	10.82

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 9.43
TOTAL AREA (ACRES) = 4.40 PEAK FLOW RATE (CFS) = 9.43

FLOW PROCESS FROM NODE 2.00 TO NODE 10.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 795.00 DOWNSTREAM ELEVATION (FEET) = 785.00
STREET LENGTH (FEET) = 1960.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL (DECIMAL) = 0.020

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 790.00 DOWNSTREAM ELEVATION(FEET) = 785.00
STREET LENGTH(FEET) = 640.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 40.76

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.64
HALFSTREET FLOOD WIDTH(FEET) = 24.12
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.39
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.17

STREET FLOW TRAVEL TIME(MIN.) = 3.14 Tc(MIN.) = 17.92

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.858

SUBAREA LOSS RATE DATA(AMC I):

Table with 6 columns: DEVELOPMENT TYPE/ LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN. Rows include COMMERCIAL, RESIDENTIAL, and '11+ DWELLINGS/ACRE'.

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.128
SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 27.35
EFFECTIVE AREA(ACRES) = 35.30 AREA-AVERAGED Fm(INCH/HR) = 0.26
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.19
TOTAL AREA(ACRES) = 35.3 PEAK FLOW RATE(CFS) = 50.88

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.68 HALFSTREET FLOOD WIDTH(FEET) = 27.14
FLOW VELOCITY(FEET/SEC.) = 3.58 DEPTH*VELOCITY(FT*FT/SEC.) = 2.45
LONGEST FLOWPATH FROM NODE 3.00 TO NODE 10.00 = 2170.00 FEET.

FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 17.92
RAINFALL INTENSITY(INCH/HR) = 1.86

AREA-AVERAGED Fm(INCH/HR) = 0.26
AREA-AVERAGED Fp(INCH/HR) = 1.33
AREA-AVERAGED Ap = 0.19
EFFECTIVE STREAM AREA(ACRES) = 35.30
TOTAL STREAM AREA(ACRES) = 35.30
PEAK FLOW RATE(CFS) AT CONFLUENCE = 50.88

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 and 2.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 and 2.

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 62.72 Tc(MIN.) = 17.92
EFFECTIVE AREA(ACRES) = 42.92 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 46.2
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 10.00 = 2910.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 46.2 TC(MIN.) = 17.92
EFFECTIVE AREA(ACRES) = 42.92 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.177
PEAK FLOW RATE(CFS) = 62.72

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Rows 1 and 2.

END OF RATIONAL METHOD ANALYSIS

SECTION 8

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

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA A) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-16-2011 *

FILE NAME: VIIIA100.DAT
TIME/DATE OF STUDY: 17:01 11/01/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/ SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP (FT) (FT)	MANNING HIKE (FT) (n)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 960.00
ELEVATION DATA: UPSTREAM(FEET) = 995.00 DOWNSTREAM(FEET) = 875.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.185
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.645
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.20	0.98	0.100	32	7.18
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	6.80	0.98	0.200	32	7.66
SCHOOL	A	1.60	0.98	0.600	32	9.74

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.240
SUBAREA RUNOFF(CFS) = 42.09
TOTAL AREA(ACRES) = 10.60 PEAK FLOW RATE(CFS) = 42.09

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

=====

UPSTREAM ELEVATION(FEET) = 875.00 DOWNSTREAM ELEVATION(FEET) = 865.00
STREET LENGTH(FEET) = 690.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 62.06
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.66
 HALFSTREET FLOOD WIDTH(FEET) = 25.17
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.76
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.15
 STREET FLOW TRAVEL TIME(MIN.) = 2.42 Tc(MIN.) = 9.60
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.903
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 2.50 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 1.60 0.98 0.500 32
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 7.90 0.98 0.200 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.219
 SUBAREA AREA(ACRES) = 12.00 SUBAREA RUNOFF(CFS) = 39.84
 EFFECTIVE AREA(ACRES) = 22.60 AREA-AVERAGED Fm(INCH/HR) = 0.22
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 22.6 PEAK FLOW RATE(CFS) = 74.85

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.70 HALFSTREET FLOOD WIDTH(FEET) = 28.61
 FLOW VELOCITY(FEET/SEC.) = 4.98 DEPTH*VELOCITY(FT*FT/SEC.) = 3.48
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1650.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 107.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

 UPSTREAM ELEVATION(FEET) = 865.00 DOWNSTREAM ELEVATION(FEET) = 850.00
 STREET LENGTH(FEET) = 1330.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 104.51
 STREET FLOWING FULL
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.80
 HALFSTREET FLOOD WIDTH(FEET) = 38.61
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.80
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.83
 STREET FLOW TRAVEL TIME(MIN.) = 4.62 Tc(MIN.) = 14.22
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.084
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 8.90 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 15.00 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.351
 SUBAREA AREA(ACRES) = 23.90 SUBAREA RUNOFF(CFS) = 58.97
 EFFECTIVE AREA(ACRES) = 46.50 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
 TOTAL AREA(ACRES) = 46.5 PEAK FLOW RATE(CFS) = 117.16

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.82 HALFSTREET FLOOD WIDTH(FEET) = 39.77
 FLOW VELOCITY(FEET/SEC.) = 4.97 DEPTH*VELOCITY(FT*FT/SEC.) = 4.08
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1330.0 FT WITH ELEVATION-DROP = 15.0 FT, IS 61.9 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 107.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 2980.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 850.00 DOWNSTREAM(FEET) = 842.00
 FLOW LENGTH(FEET) = 1120.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 38.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.21
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 117.16
 PIPE TRAVEL TIME(MIN.) = 1.83 Tc(MIN.) = 16.05
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 4100.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 16.05
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.868
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 7.60 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 10.90 0.98 0.500 32
 RESIDENTIAL

"11+ DWELLINGS/ACRE" A 1.70 0.98 0.200 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.324
 SUBAREA AREA (ACRES) = 20.20 SUBAREA RUNOFF (CFS) = 46.39
 EFFECTIVE AREA (ACRES) = 66.70 AREA-AVERAGED Fm (INCH/HR) = 0.29
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.30
 TOTAL AREA (ACRES) = 66.7 PEAK FLOW RATE (CFS) = 154.51

 FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 842.00 DOWNSTREAM (FEET) = 818.00
 FLOW LENGTH (FEET) = 1520.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 37.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.63
 ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 154.51
 PIPE TRAVEL TIME (MIN.) = 1.73 Tc (MIN.) = 17.78
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 109.00 = 5620.00 FEET.

 FLOW PROCESS FROM NODE 109.00 TO NODE 109.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 17.78
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.697
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	13.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.40	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.319
 SUBAREA AREA (ACRES) = 24.70 SUBAREA RUNOFF (CFS) = 53.03
 EFFECTIVE AREA (ACRES) = 91.40 AREA-AVERAGED Fm (INCH/HR) = 0.30
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 91.4 PEAK FLOW RATE (CFS) = 197.27

 FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 818.00 DOWNSTREAM (FEET) = 800.00
 FLOW LENGTH (FEET) = 1290.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.87
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1

PIPE-FLOW (CFS) = 197.27
 PIPE TRAVEL TIME (MIN.) = 1.45 Tc (MIN.) = 19.23
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6910.00 FEET.

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 19.23
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.573
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.327
 SUBAREA AREA (ACRES) = 43.50 SUBAREA RUNOFF (CFS) = 88.25
 EFFECTIVE AREA (ACRES) = 134.90 AREA-AVERAGED Fm (INCH/HR) = 0.31
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 134.9 PEAK FLOW RATE (CFS) = 275.35

 FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 800.00 DOWNSTREAM (FEET) = 785.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 50.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.89
 ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 275.35
 PIPE TRAVEL TIME (MIN.) = 1.48 Tc (MIN.) = 20.71
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 111.00 = 8230.00 FEET.

 FLOW PROCESS FROM NODE 111.00 TO NODE 111.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 20.71
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.461
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.70	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	18.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	27.50	0.98	0.200	32
PUBLIC PARK	A	4.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.322$
SUBAREA AREA (ACRES) = 61.50 SUBAREA RUNOFF (CFS) = 118.84
EFFECTIVE AREA (ACRES) = 196.40 AREA-AVERAGED F_m (INCH/HR) = 0.31
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.32$
TOTAL AREA (ACRES) = 196.4 PEAK FLOW RATE (CFS) = 380.61

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 196.4 TC (MIN.) = 20.71
EFFECTIVE AREA (ACRES) = 196.40 AREA-AVERAGED F_m (INCH/HR) = 0.31
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.316$
PEAK FLOW RATE (CFS) = 380.61
=====

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA A) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-16-2011 *

FILE NAME: VIIIA25.DAT
TIME/DATE OF STUDY: 17:13 11/01/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET IN- / OUT- / PARK- SIDE / SIDE/ WAY	STREET-CROSSFALL: CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES: LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 960.00
ELEVATION DATA: UPSTREAM(FEET) = 995.00 DOWNSTREAM(FEET) = 875.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.185
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.711
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	2.20	0.98	0.100	32	7.18
RESIDENTIAL						
"11+ DWELLINGS/ACRE"	A	6.80	0.98	0.200	32	7.66
SCHOOL	A	1.60	0.98	0.600	32	9.74

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.240
SUBAREA RUNOFF(CFS) = 33.17
TOTAL AREA(ACRES) = 10.60 PEAK FLOW RATE(CFS) = 33.17

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 875.00 DOWNSTREAM ELEVATION(FEET) = 865.00
STREET LENGTH(FEET) = 690.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 48.74
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.62
HALFSTREET FLOOD WIDTH(FEET) = 22.90
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.48
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.76
STREET FLOW TRAVEL TIME(MIN.) = 2.56 Tc(MIN.) = 9.75
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.090
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.50 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 1.60 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 7.90 0.98 0.200 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.219
SUBAREA AREA(ACRES) = 12.00 SUBAREA RUNOFF(CFS) = 31.06
EFFECTIVE AREA(ACRES) = 22.60 AREA-AVERAGED Fm(INCH/HR) = 0.22
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.23
TOTAL AREA(ACRES) = 22.6 PEAK FLOW RATE(CFS) = 58.31

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.65 HALFSTREET FLOOD WIDTH(FEET) = 24.54
FLOW VELOCITY(FEET/SEC.) = 4.69 DEPTH*VELOCITY(FT*FT/SEC.) = 3.05
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1650.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 107.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 865.00 DOWNSTREAM ELEVATION(FEET) = 850.00
STREET LENGTH(FEET) = 1330.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 80.79

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.74
HALFSTREET FLOOD WIDTH(FEET) = 32.94
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.57
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.39
STREET FLOW TRAVEL TIME(MIN.) = 4.85 Tc(MIN.) = 14.60
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.424

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.90 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 15.00 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.351
SUBAREA AREA(ACRES) = 23.90 SUBAREA RUNOFF(CFS) = 44.79
EFFECTIVE AREA(ACRES) = 46.50 AREA-AVERAGED Fm(INCH/HR) = 0.28
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.29
TOTAL AREA(ACRES) = 46.5 PEAK FLOW RATE(CFS) = 89.57

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.77 HALFSTREET FLOOD WIDTH(FEET) = 35.26
FLOW VELOCITY(FEET/SEC.) = 4.65 DEPTH*VELOCITY(FT*FT/SEC.) = 3.56
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 2980.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 850.00 DOWNSTREAM(FEET) = 842.00
FLOW LENGTH(FEET) = 1120.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.43
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 89.57
PIPE TRAVEL TIME(MIN.) = 1.98 Tc(MIN.) = 16.58
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 4100.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 16.58
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.247
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 7.60 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 10.90 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 1.70 0.98 0.200 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.324$
 SUBAREA AREA (ACRES) = 20.20 SUBAREA RUNOFF (CFS) = 35.09
 EFFECTIVE AREA (ACRES) = 66.70 AREA-AVERAGED F_m (INCH/HR) = 0.29
 AREA-AVERAGED F_p (INCH/HR) = 0.97 AREA-AVERAGED $A_p = 0.30$
 TOTAL AREA (ACRES) = 66.7 PEAK FLOW RATE (CFS) = 117.21

 FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 842.00 DOWNSTREAM (FEET) = 818.00
 FLOW LENGTH (FEET) = 1520.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.84
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 117.21
 PIPE TRAVEL TIME (MIN.) = 1.83 T_c (MIN.) = 18.41
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 109.00 = 5620.00 FEET.

 FLOW PROCESS FROM NODE 109.00 TO NODE 109.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE T_c (MIN.) = 18.41
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.110
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	10.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	13.20	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.40	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.319$
 SUBAREA AREA (ACRES) = 24.70 SUBAREA RUNOFF (CFS) = 39.98
 EFFECTIVE AREA (ACRES) = 91.40 AREA-AVERAGED F_m (INCH/HR) = 0.30
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.31$
 TOTAL AREA (ACRES) = 91.4 PEAK FLOW RATE (CFS) = 148.98

 FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 818.00 DOWNSTREAM (FEET) = 800.00
 FLOW LENGTH (FEET) = 1290.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.77
 ESTIMATED PIPE DIAMETER (INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 148.98
 PIPE TRAVEL TIME (MIN.) = 1.56 T_c (MIN.) = 19.97

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6910.00 FEET.

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE T_c (MIN.) = 19.97
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.009
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	18.80	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.70	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.327$
 SUBAREA AREA (ACRES) = 43.50 SUBAREA RUNOFF (CFS) = 66.17
 EFFECTIVE AREA (ACRES) = 134.90 AREA-AVERAGED F_m (INCH/HR) = 0.31
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.31$
 TOTAL AREA (ACRES) = 134.9 PEAK FLOW RATE (CFS) = 206.88

 FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 800.00 DOWNSTREAM (FEET) = 785.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 44.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.91
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 206.88
 PIPE TRAVEL TIME (MIN.) = 1.58 T_c (MIN.) = 21.55
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 111.00 = 8230.00 FEET.

 FLOW PROCESS FROM NODE 111.00 TO NODE 111.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE T_c (MIN.) = 21.55
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.919
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	10.70	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	18.70	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	27.50	0.98	0.200	32
PUBLIC PARK	A	4.60	0.98	0.850	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.322$
 SUBAREA AREA (ACRES) = 61.50 SUBAREA RUNOFF (CFS) = 88.84

EFFECTIVE AREA (ACRES) = 196.40 AREA-AVERAGED Fm (INCH/HR) = 0.31
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.32
TOTAL AREA (ACRES) = 196.4 PEAK FLOW RATE (CFS) = 284.81

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 196.4 TC (MIN.) = 21.55
EFFECTIVE AREA (ACRES) = 196.40 AREA-AVERAGED Fm (INCH/HR) = 0.31
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.316
PEAK FLOW RATE (CFS) = 284.81
=====

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA A) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-16-2011 *

FILE NAME: VIIIA10.DAT
TIME/DATE OF STUDY: 09:02 11/02/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-SIDE, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH)
5-MINUTES 0.33
30-MINUTES 0.68
1-HOUR 0.90
3-HOUR 1.60
6-HOUR 2.31
24-HOUR 4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 960.00
ELEVATION DATA: UPSTREAM(FEET) = 995.00 DOWNSTREAM(FEET) = 875.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.185
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.216
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ LAND USE SCS SOIL GROUP AREA (ACRES) Fp (INCH/HR) Ap (DECIMAL) SCS CN Tc (MIN.)
COMMERCIAL A 2.20 1.33 0.100 17 7.18
RESIDENTIAL "11+ DWELLINGS/ACRE" A 6.80 1.33 0.200 17 7.66
SCHOOL A 1.60 1.33 0.600 17 9.74
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.240
SUBAREA RUNOFF(CFS) = 27.64
TOTAL AREA(ACRES) = 10.60 PEAK FLOW RATE(CFS) = 27.64

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 875.00 DOWNSTREAM ELEVATION(FEET) = 865.00
STREET LENGTH(FEET) = 690.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 40.47
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.58
 HALFSTREET FLOOD WIDTH(FEET) = 21.27
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.29
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.51
 STREET FLOW TRAVEL TIME(MIN.) = 2.68 Tc(MIN.) = 9.86
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.659
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 2.50 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 1.60 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 7.90 1.33 0.200 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.219
 SUBAREA AREA(ACRES) = 12.00 SUBAREA RUNOFF(CFS) = 25.57
 EFFECTIVE AREA(ACRES) = 22.60 AREA-AVERAGED Fm(INCH/HR) = 0.30
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.23
 TOTAL AREA(ACRES) = 22.6 PEAK FLOW RATE(CFS) = 47.91

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.61 HALFSTREET FLOOD WIDTH(FEET) = 22.75
 FLOW VELOCITY(FEET/SEC.) = 4.47 DEPTH*VELOCITY(FT*FT/SEC.) = 2.74
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1650.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 107.00 IS CODE = 62

 >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 865.00 DOWNSTREAM ELEVATION(FEET) = 850.00
 STREET LENGTH(FEET) = 1330.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curb) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 65.30
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.70

HALFSTREET FLOOD WIDTH(FEET) = 28.40
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.38
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.05
 STREET FLOW TRAVEL TIME(MIN.) = 5.06 Tc(MIN.) = 14.92
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.074
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 8.90 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 15.00 1.33 0.500 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.351
 SUBAREA AREA(ACRES) = 23.90 SUBAREA RUNOFF(CFS) = 34.58
 EFFECTIVE AREA(ACRES) = 46.50 AREA-AVERAGED Fm(INCH/HR) = 0.39
 AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.29
 TOTAL AREA(ACRES) = 46.5 PEAK FLOW RATE(CFS) = 70.59

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71 HALFSTREET FLOOD WIDTH(FEET) = 30.09
 FLOW VELOCITY(FEET/SEC.) = 4.44 DEPTH*VELOCITY(FT*FT/SEC.) = 3.17
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 2980.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 850.00 DOWNSTREAM(FEET) = 842.00
 FLOW LENGTH(FEET) = 1120.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.98
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 70.59
 PIPE TRAVEL TIME(MIN.) = 2.08 Tc(MIN.) = 17.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 4100.00 FEET.

 FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc(MIN.) = 17.00
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.918
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 7.60 1.33 0.100 17
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 10.90 1.33 0.500 17
 RESIDENTIAL
 "11+ DWELLINGS/ACRE" A 1.70 1.33 0.200 17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.324
 SUBAREA AREA(ACRES) = 20.20 SUBAREA RUNOFF(CFS) = 27.04

EFFECTIVE AREA (ACRES) = 66.70 AREA-AVERAGED Fm (INCH/HR) = 0.40
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.30
 TOTAL AREA (ACRES) = 66.7 PEAK FLOW RATE (CFS) = 91.09

 FLOW PROCESS FROM NODE 110.00 TO NODE 110.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 20.63
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.708
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	18.80	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	24.70	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.327
 SUBAREA AREA (ACRES) = 43.50 SUBAREA RUNOFF (CFS) = 49.84
 EFFECTIVE AREA (ACRES) = 134.90 AREA-AVERAGED Fm (INCH/HR) = 0.42
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 134.9 PEAK FLOW RATE (CFS) = 156.85

 FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 800.00 DOWNSTREAM (FEET) = 785.00
 FLOW LENGTH (FEET) = 1320.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.93
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 156.85
 PIPE TRAVEL TIME (MIN.) = 1.70 Tc (MIN.) = 22.33
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 111.00 = 8230.00 FEET.

 FLOW PROCESS FROM NODE 111.00 TO NODE 111.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 22.33
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.628
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.70	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	18.70	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	27.50	1.33	0.200	17
PUBLIC PARK	A	4.60	1.33	0.850	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.322
 SUBAREA AREA (ACRES) = 61.50 SUBAREA RUNOFF (CFS) = 66.43
 EFFECTIVE AREA (ACRES) = 196.40 AREA-AVERAGED Fm (INCH/HR) = 0.42
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.32

 FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 842.00 DOWNSTREAM (FEET) = 818.00
 FLOW LENGTH (FEET) = 1520.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 39.0 INCH PIPE IS 31.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.75
 ESTIMATED PIPE DIAMETER (INCH) = 39.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 91.09
 PIPE TRAVEL TIME (MIN.) = 1.99 Tc (MIN.) = 18.99
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 109.00 = 5620.00 FEET.

 FLOW PROCESS FROM NODE 109.00 TO NODE 109.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 18.99
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.795
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	10.10	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	13.20	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	1.40	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.319
 SUBAREA AREA (ACRES) = 24.70 SUBAREA RUNOFF (CFS) = 30.47
 EFFECTIVE AREA (ACRES) = 91.40 AREA-AVERAGED Fm (INCH/HR) = 0.41
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.31
 TOTAL AREA (ACRES) = 91.4 PEAK FLOW RATE (CFS) = 114.18

 FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 818.00 DOWNSTREAM (FEET) = 800.00
 FLOW LENGTH (FEET) = 1290.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.08
 ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 114.18
 PIPE TRAVEL TIME (MIN.) = 1.64 Tc (MIN.) = 20.63
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6910.00 FEET.

TOTAL AREA (ACRES) = 196.4 PEAK FLOW RATE (CFS) = 213.65

=====
END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 196.4 TC (MIN.) = 22.33
EFFECTIVE AREA (ACRES) = 196.40 AREA-AVERAGED F_m (INCH/HR) = 0.42
AREA-AVERAGED F_p (INCH/HR) = 1.33 AREA-AVERAGED A_p = 0.316
PEAK FLOW RATE (CFS) = 213.65
=====

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END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B) *
* 100-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-17-2011 *

FILE NAME: VIIIB100.DAT
TIME/DATE OF STUDY: 13:45 08/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.48
30-MINUTES	0.99
1-HOUR	1.30
3-HOUR	2.39
6-HOUR	3.50
24-HOUR	7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1080.00
ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 874.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.435
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.342
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.30	0.98	0.100	32	12.44
COMMERCIAL	A	10.80	0.98	0.100	32	12.44

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 35.34
TOTAL AREA(ACRES) = 12.10 PEAK FLOW RATE(CFS) = 35.34

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 874.00 DOWNSTREAM ELEVATION(FEET) = 866.00
STREET LENGTH(FEET) = 650.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 57.42
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.66
HALFSTREET FLOOD WIDTH(FEET) = 25.22
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.38
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.90
STREET FLOW TRAVEL TIME(MIN.) = 2.47 Tc(MIN.) = 14.91
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.998

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.50 0.98 0.100 32
COMMERCIAL A 14.40 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 16.90 SUBAREA RUNOFF(CFS) = 44.11
EFFECTIVE AREA(ACRES) = 29.00 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 29.0 PEAK FLOW RATE(CFS) = 75.70

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.72 HALFSTREET FLOOD WIDTH(FEET) = 30.62
FLOW VELOCITY(FEET/SEC.) = 4.67 DEPTH*VELOCITY(FT*FT/SEC.) = 3.35
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1730.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 866.00 DOWNSTREAM ELEVATION(FEET) = 856.00
STREET LENGTH(FEET) = 710.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 113.66
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.79
HALFSTREET FLOOD WIDTH(FEET) = 38.10
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.32
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 4.22
STREET FLOW TRAVEL TIME(MIN.) = 2.22 Tc(MIN.) = 17.13
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.758

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.70 0.98 0.100 32
COMMERCIAL A 27.00 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 31.70 SUBAREA RUNOFF(CFS) = 75.90
EFFECTIVE AREA(ACRES) = 60.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 60.7 PEAK FLOW RATE(CFS) = 145.33

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.84 HALFSTREET FLOOD WIDTH(FEET) = 40.81
FLOW VELOCITY(FEET/SEC.) = 5.75 DEPTH*VELOCITY(FT*FT/SEC.) = 4.85
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 710.0 FT WITH ELEVATION-DROP = 10.0 FT, IS 106.9 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2440.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 856.00 DOWNSTREAM(FEET) = 845.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 40.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.51
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 145.33
PIPE TRAVEL TIME(MIN.) = 1.88 Tc(MIN.) = 19.01
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 3740.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.01
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.591
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 12.20 0.98 0.100 32
COMMERCIAL A 4.00 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 18.60 0.98 0.500 32
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 10.60 0.98 0.200 32
PUBLIC PARK A 4.80 0.98 0.850 32
SCHOOL A 8.70 0.98 0.600 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.379
SUBAREA AREA(ACRES) = 58.90 SUBAREA RUNOFF(CFS) = 117.72

EFFECTIVE AREA(ACRES) = 119.60 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.24
TOTAL AREA(ACRES) = 119.6 PEAK FLOW RATE(CFS) = 253.92

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	845.00	DOWNSTREAM(FEET) =	835.00
FLOW LENGTH(FEET) =	1080.00	MANNING'S N =	0.013
DEPTH OF FLOW IN	63.0 INCH PIPE IS	51.3 INCHES	
PIPE-FLOW VELOCITY(FEET/SEC.) =	13.44		
ESTIMATED PIPE DIAMETER(INCH) =	63.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	253.92		
PIPE TRAVEL TIME(MIN.) =	1.34	Tc(MIN.) =	20.35
LONGEST FLOWPATH FROM NODE	100.00 TO NODE	105.00 =	4820.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc(MIN.) =	20.35				
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =	2.487				
SUBAREA LOSS RATE DATA(AMC II):					
DEVELOPMENT TYPE/	SCS SOIL	AREA	Fp	Ap	SCS
LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	12.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	30.00	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.50	0.98	0.200	32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =	0.98				
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =	0.375				
SUBAREA AREA(ACRES) =	44.60	SUBAREA RUNOFF(CFS) =	85.16		
EFFECTIVE AREA(ACRES) =	164.20	AREA-AVERAGED Fm(INCH/HR) =	0.27		
AREA-AVERAGED Fp(INCH/HR) =	0.98	AREA-AVERAGED Ap =	0.27		
TOTAL AREA(ACRES) =	164.2	PEAK FLOW RATE(CFS) =	327.92		

FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	835.00	DOWNSTREAM(FEET) =	812.00
FLOW LENGTH(FEET) =	1560.00	MANNING'S N =	0.013
DEPTH OF FLOW IN	66.0 INCH PIPE IS	48.9 INCHES	
PIPE-FLOW VELOCITY(FEET/SEC.) =	17.37		
ESTIMATED PIPE DIAMETER(INCH) =	66.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	327.92		
PIPE TRAVEL TIME(MIN.) =	1.50	Tc(MIN.) =	21.85
LONGEST FLOWPATH FROM NODE	100.00 TO NODE	106.00 =	6380.00 FEET.

FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) =	21.85				
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =	2.383				
SUBAREA LOSS RATE DATA(AMC II):					
DEVELOPMENT TYPE/	SCS SOIL	AREA	Fp	Ap	SCS
LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	13.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	28.50	0.98	0.500	32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =	0.98				
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =	0.373				
SUBAREA AREA(ACRES) =	41.80	SUBAREA RUNOFF(CFS) =	75.99		
EFFECTIVE AREA(ACRES) =	206.00	AREA-AVERAGED Fm(INCH/HR) =	0.29		
AREA-AVERAGED Fp(INCH/HR) =	0.98	AREA-AVERAGED Ap =	0.29		
TOTAL AREA(ACRES) =	206.0	PEAK FLOW RATE(CFS) =	388.59		

FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	812.00	DOWNSTREAM(FEET) =	798.00
FLOW LENGTH(FEET) =	1280.00	MANNING'S N =	0.013
DEPTH OF FLOW IN	72.0 INCH PIPE IS	57.8 INCHES	
PIPE-FLOW VELOCITY(FEET/SEC.) =	15.97		
ESTIMATED PIPE DIAMETER(INCH) =	72.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	388.59		
PIPE TRAVEL TIME(MIN.) =	1.34	Tc(MIN.) =	23.19
LONGEST FLOWPATH FROM NODE	100.00 TO NODE	107.00 =	7660.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc(MIN.) =	23.19				
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =	2.300				
SUBAREA LOSS RATE DATA(AMC II):					
DEVELOPMENT TYPE/	SCS SOIL	AREA	Fp	Ap	SCS
LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	7.20	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	21.80	0.98	0.500	32
PUBLIC PARK	A	7.10	0.98	0.850	32
SCHOOL	A	20.50	0.98	0.600	32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =	0.97				
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =	0.529				
SUBAREA AREA(ACRES) =	56.60	SUBAREA RUNOFF(CFS) =	90.87		
EFFECTIVE AREA(ACRES) =	262.60	AREA-AVERAGED Fm(INCH/HR) =	0.34		
AREA-AVERAGED Fp(INCH/HR) =	0.98	AREA-AVERAGED Ap =	0.35		
TOTAL AREA(ACRES) =	262.6	PEAK FLOW RATE(CFS) =	464.01		

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	798.00	DOWNSTREAM(FEET) =	785.00
FLOW LENGTH(FEET) =	1320.00	MANNING'S N =	0.013
DEPTH OF FLOW IN	78.0 INCH PIPE IS	63.7 INCHES	
PIPE-FLOW VELOCITY(FEET/SEC.) =	15.99		
ESTIMATED PIPE DIAMETER(INCH) =	78.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	464.01		
PIPE TRAVEL TIME(MIN.) =	1.38	Tc(MIN.) =	24.56
LONGEST FLOWPATH FROM NODE	100.00 TO NODE	108.00 =	8980.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc(MIN.) =	24.56				
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =	2.222				
SUBAREA LOSS RATE DATA(AMC II):					
DEVELOPMENT TYPE/	SCS SOIL	AREA	Fp	Ap	SCS
LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	8.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.80	0.98	0.500	32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =		0.97			
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =		0.368			
SUBAREA AREA(ACRES) =		25.10	SUBAREA RUNOFF(CFS) =		42.09
EFFECTIVE AREA(ACRES) =		287.70	AREA-AVERAGED Fm(INCH/HR) =		0.34
AREA-AVERAGED Fp(INCH/HR) =		0.98	AREA-AVERAGED Ap =		0.35
TOTAL AREA(ACRES) =		287.7	PEAK FLOW RATE(CFS) =		487.61

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) =	287.7	TC(MIN.) =	24.56
EFFECTIVE AREA(ACRES) =	287.70	AREA-AVERAGED Fm(INCH/HR) =	0.34
AREA-AVERAGED Fp(INCH/HR) =	0.98	AREA-AVERAGED Ap =	0.347
PEAK FLOW RATE(CFS) =	487.61		

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****
* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B) *
* 25-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 9-17-2011 *

FILE NAME: VIIIB25.DAT
TIME/DATE OF STUDY: 14:19 08/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO		STREET-CROSSFALL:		CURB GUTTER-GEOMETRIES:		MANNING	
	WIDTH (FT)	CROSSFALL (FT)	IN- / SIDE	OUT- / PARK- / SIDE/ WAY	HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE FACTOR (n)
1	30.0	20.0	0.018/0.018	0.020	0.67	2.00	0.0313	0.167 0.0150
2	32.0	27.0	0.020/0.020	0.020	0.67	2.00	0.0313	0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
- (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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL (INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1080.00
ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 874.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.435
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.670

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.30	0.98	0.100	32	12.44
COMMERCIAL	A	10.80	0.98	0.100	32	12.44

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF (CFS) = 28.01

TOTAL AREA (ACRES) = 12.10 PEAK FLOW RATE (CFS) = 28.01

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 874.00 DOWNSTREAM ELEVATION (FEET) = 866.00
STREET LENGTH (FEET) = 650.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00

INSIDE STREET CROSSFALL (DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 45.40

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.62
 HALFSTREET FLOOD WIDTH(FEET) = 23.01
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.14
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.56
 STREET FLOW TRAVEL TIME(MIN.) = 2.62 Tc(MIN.) = 15.05
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.381

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.50	0.98	0.100	32
COMMERCIAL	A	14.40	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 16.90 SUBAREA RUNOFF(CFS) = 34.73
 EFFECTIVE AREA(ACRES) = 29.00 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 29.0 PEAK FLOW RATE(CFS) = 59.59

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.66
 FLOW VELOCITY(FEET/SEC.) = 4.44 DEPTH*VELOCITY(FT*FT/SEC.) = 2.97
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1730.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 866.00 DOWNSTREAM ELEVATION(FEET) = 856.00
 STREET LENGTH(FEET) = 710.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 89.38
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.74
 HALFSTREET FLOOD WIDTH(FEET) = 32.73
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.09
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.77

STREET FLOW TRAVEL TIME(MIN.) = 2.32 Tc(MIN.) = 17.38
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.184

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.70	0.98	0.100	32
COMMERCIAL	A	27.00	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 31.70 SUBAREA RUNOFF(CFS) = 59.54
 EFFECTIVE AREA(ACRES) = 60.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 60.7 PEAK FLOW RATE(CFS) = 114.00

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.79 HALFSTREET FLOOD WIDTH(FEET) = 38.10
 FLOW VELOCITY(FEET/SEC.) = 5.34 DEPTH*VELOCITY(FT*FT/SEC.) = 4.23
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 710.0 FT WITH ELEVATION-DROP = 10.0 FT, IS 84.8 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2440.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 856.00 DOWNSTREAM(FEET) = 845.00
 FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 37.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.71
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 114.00
 PIPE TRAVEL TIME(MIN.) = 2.02 Tc(MIN.) = 19.40
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 3740.00 FEET.

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 19.40
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.045
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.20	0.98	0.100	32
COMMERCIAL	A	4.00	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	18.60	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	10.60	0.98	0.200	32
PUBLIC PARK	A	4.80	0.98	0.850	32
SCHOOL	A	8.70	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.379$
 SUBAREA AREA (ACRES) = 58.90 SUBAREA RUNOFF (CFS) = 88.79
 EFFECTIVE AREA (ACRES) = 119.60 AREA-AVERAGED F_m (INCH/HR) = 0.23
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.24$
 TOTAL AREA (ACRES) = 119.6 PEAK FLOW RATE (CFS) = 195.16

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 6380.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE T_c (MIN.) = 22.43
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.874
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA F_p A_p SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 13.30 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 28.50 0.98 0.500 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.373$
 SUBAREA AREA (ACRES) = 41.80 SUBAREA RUNOFF (CFS) = 56.83
 EFFECTIVE AREA (ACRES) = 206.00 AREA-AVERAGED F_m (INCH/HR) = 0.29
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.29$
 TOTAL AREA (ACRES) = 206.0 PEAK FLOW RATE (CFS) = 294.21

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 845.00 DOWNSTREAM (FEET) = 835.00
 FLOW LENGTH (FEET) = 1080.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 46.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.58
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 195.16
 PIPE TRAVEL TIME (MIN.) = 1.43 T_c (MIN.) = 20.83
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 4820.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 812.00 DOWNSTREAM (FEET) = 798.00
 FLOW LENGTH (FEET) = 1280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 50.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.03
 ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 294.21
 PIPE TRAVEL TIME (MIN.) = 1.42 T_c (MIN.) = 23.85
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 7660.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE T_c (MIN.) = 20.83

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.959

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	12.10	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	30.00	0.98	0.500	32
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.50	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.375$
 SUBAREA AREA (ACRES) = 44.60 SUBAREA RUNOFF (CFS) = 63.98
 EFFECTIVE AREA (ACRES) = 164.20 AREA-AVERAGED F_m (INCH/HR) = 0.27
 AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED $A_p = 0.27$
 TOTAL AREA (ACRES) = 164.2 PEAK FLOW RATE (CFS) = 249.94

 FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE T_c (MIN.) = 23.85
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.806
 SUBAREA LOSS RATE DATA (AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA F_p A_p SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 7.20 0.98 0.100 32
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" A 21.80 0.98 0.500 32
 PUBLIC PARK A 7.10 0.98 0.850 32
 SCHOOL A 20.50 0.98 0.600 32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.529$
 SUBAREA AREA (ACRES) = 56.60 SUBAREA RUNOFF (CFS) = 65.73
 EFFECTIVE AREA (ACRES) = 262.60 AREA-AVERAGED F_m (INCH/HR) = 0.34

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM (FEET) = 835.00 DOWNSTREAM (FEET) = 812.00
 FLOW LENGTH (FEET) = 1560.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 43.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.26
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 249.94
 PIPE TRAVEL TIME (MIN.) = 1.60 T_c (MIN.) = 22.43

AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.35
TOTAL AREA (ACRES) = 262.6 PEAK FLOW RATE (CFS) = 347.38

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

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ELEVATION DATA: UPSTREAM (FEET) =	798.00	DOWNSTREAM (FEET) =	785.00
FLOW LENGTH (FEET) =	1320.00	MANNING'S N =	0.013
DEPTH OF FLOW IN 72.0 INCH PIPE IS	54.6	INCHES	
PIPE-FLOW VELOCITY (FEET/SEC.) =	15.09		
ESTIMATED PIPE DIAMETER (INCH) =	72.00	NUMBER OF PIPES =	1
PIPE-FLOW (CFS) =	347.38		
PIPE TRAVEL TIME (MIN.) =	1.46	T_c (MIN.) =	25.31
LONGEST FLOWPATH FROM NODE	100.00	TO NODE	108.00 = 8980.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE T_c (MIN.) = 25.31
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.743
SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	A	8.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	16.80	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.368
SUBAREA AREA (ACRES) = 25.10 SUBAREA RUNOFF (CFS) = 31.28
EFFECTIVE AREA (ACRES) = 287.70 AREA-AVERAGED F_m (INCH/HR) = 0.34
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.35
TOTAL AREA (ACRES) = 287.7 PEAK FLOW RATE (CFS) = 363.73

END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 287.7 T_c (MIN.) = 25.31
EFFECTIVE AREA (ACRES) = 287.70 AREA-AVERAGED F_m (INCH/HR) = 0.34
AREA-AVERAGED F_p (INCH/HR) = 0.98 AREA-AVERAGED A_p = 0.347
PEAK FLOW RATE (CFS) = 363.73

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B) *
* 10-YEAR HYDROLOGY ANALYSIS *
* P. PAGADUAN 8-17-2011 *

FILE NAME: VIIIB10.DAT
TIME/DATE OF STUDY: 14:44 08/17/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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---*TIME-OF-CONCENTRATION MODEL*---

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0312 0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00 0.0312 0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

DURATION	RAINFALL(INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1080.00
ELEVATION DATA: UPSTREAM(FEET) = 885.00 DOWNSTREAM(FEET) = 874.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.435
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.314
SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.30	1.33	0.100	17	12.44
COMMERCIAL	A	10.80	1.33	0.100	17	12.44

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 23.75
TOTAL AREA(ACRES) = 12.10 PEAK FLOW RATE(CFS) = 23.75

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 874.00 DOWNSTREAM ELEVATION(FEET) = 866.00
STREET LENGTH(FEET) = 650.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 38.39
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.59
HALFSTREET FLOOD WIDTH(FEET) = 21.53
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.98
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.34
STREET FLOW TRAVEL TIME(MIN.) = 2.72 Tc(MIN.) = 15.16
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.055

SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.50 1.33 0.100 17
COMMERCIAL A 14.40 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 16.90 SUBAREA RUNOFF(CFS) = 29.23
EFFECTIVE AREA(ACRES) = 29.00 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 29.0 PEAK FLOW RATE(CFS) = 50.16

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.64 HALFSTREET FLOOD WIDTH(FEET) = 23.91
FLOW VELOCITY(FEET/SEC.) = 4.25 DEPTH*VELOCITY(FT*FT/SEC.) = 2.70
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1730.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 866.00 DOWNSTREAM ELEVATION(FEET) = 856.00
STREET LENGTH(FEET) = 710.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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 = 0.0150

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 75.11
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.70
HALFSTREET FLOOD WIDTH(FEET) = 29.03
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.92
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.46
STREET FLOW TRAVEL TIME(MIN.) = 2.41 Tc(MIN.) = 17.56
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.881

SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 4.70 1.33 0.100 17
COMMERCIAL A 27.00 1.33 0.100 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 31.70 SUBAREA RUNOFF(CFS) = 49.87
EFFECTIVE AREA(ACRES) = 60.70 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 60.7 PEAK FLOW RATE(CFS) = 95.49

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.75 HALFSTREET FLOOD WIDTH(FEET) = 34.20
FLOW VELOCITY(FEET/SEC.) = 5.15 DEPTH*VELOCITY(FT*FT/SEC.) = 3.89
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 710.0 FT WITH ELEVATION-DROP = 10.0 FT, IS 72.1 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 103.00
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 2440.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 856.00 DOWNSTREAM(FEET) = 845.00
FLOW LENGTH(FEET) = 1300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 35.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.26
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 95.49
PIPE TRAVEL TIME(MIN.) = 2.11 Tc(MIN.) = 19.68
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 3740.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.68
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.757
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 12.20 1.33 0.100 17
COMMERCIAL A 4.00 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 18.60 1.33 0.500 17
RESIDENTIAL
"11+ DWELLINGS/ACRE" A 10.60 1.33 0.200 17
PUBLIC PARK A 4.80 1.33 0.850 17
SCHOOL A 8.70 1.33 0.600 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.379
SUBAREA AREA(ACRES) = 58.90 SUBAREA RUNOFF(CFS) = 66.44

EFFECTIVE AREA (ACRES) = 119.60 AREA-AVERAGED Fm (INCH/HR) = 0.32
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.24
 TOTAL AREA (ACRES) = 119.6 PEAK FLOW RATE (CFS) = 155.16

 FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 845.00 DOWNSTREAM (FEET) = 835.00
 FLOW LENGTH (FEET) = 1080.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 40.7 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.07
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 155.16
 PIPE TRAVEL TIME (MIN.) = 1.49 Tc (MIN.) = 21.17
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 4820.00 FEET.

 FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 21.17
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.682
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.10	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	30.00	1.33	0.500	17
RESIDENTIAL					
"11+ DWELLINGS/ACRE"	A	2.50	1.33	0.200	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.375
 SUBAREA AREA (ACRES) = 44.60 SUBAREA RUNOFF (CFS) = 47.53
 EFFECTIVE AREA (ACRES) = 164.20 AREA-AVERAGED Fm (INCH/HR) = 0.36
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.27
 TOTAL AREA (ACRES) = 164.2 PEAK FLOW RATE (CFS) = 194.58

 FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 835.00 DOWNSTREAM (FEET) = 812.00
 FLOW LENGTH (FEET) = 1560.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 40.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.22
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 194.58
 PIPE TRAVEL TIME (MIN.) = 1.71 Tc (MIN.) = 22.88
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 6380.00 FEET.

 FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 22.88
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.605
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	13.30	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	28.50	1.33	0.500	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.373
 SUBAREA AREA (ACRES) = 41.80 SUBAREA RUNOFF (CFS) = 41.76
 EFFECTIVE AREA (ACRES) = 206.00 AREA-AVERAGED Fm (INCH/HR) = 0.39
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.29
 TOTAL AREA (ACRES) = 206.0 PEAK FLOW RATE (CFS) = 225.03

 FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 812.00 DOWNSTREAM (FEET) = 798.00
 FLOW LENGTH (FEET) = 1280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 45.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.08
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 225.03
 PIPE TRAVEL TIME (MIN.) = 1.51 Tc (MIN.) = 24.39
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 7660.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 24.39
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.545
 SUBAREA LOSS RATE DATA (AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.20	1.33	0.100	17
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	21.80	1.33	0.500	17
PUBLIC PARK	A	7.10	1.33	0.850	17
SCHOOL	A	20.50	1.33	0.600	17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 1.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.529
 SUBAREA AREA (ACRES) = 56.60 SUBAREA RUNOFF (CFS) = 42.88
 EFFECTIVE AREA (ACRES) = 262.60 AREA-AVERAGED Fm (INCH/HR) = 0.46
 AREA-AVERAGED Fp (INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
 TOTAL AREA (ACRES) = 262.6 PEAK FLOW RATE (CFS) = 256.68

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 798.00 DOWNSTREAM(FEET) = 785.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 63.0 INCH PIPE IS 50.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.86
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 256.68
PIPE TRAVEL TIME(MIN.) = 1.59 Tc(MIN.) = 25.98
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 8980.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 25.98
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.487
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 8.30 1.33 0.100 17
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 16.80 1.33 0.500 17
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 1.33
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.368
SUBAREA AREA(ACRES) = 25.10 SUBAREA RUNOFF(CFS) = 22.56
EFFECTIVE AREA(ACRES) = 287.70 AREA-AVERAGED Fm(INCH/HR) = 0.46
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 287.7 PEAK FLOW RATE(CFS) = 265.69

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 287.7 Tc(MIN.) = 25.98
EFFECTIVE AREA(ACRES) = 287.70 AREA-AVERAGED Fm(INCH/HR) = 0.46
AREA-AVERAGED Fp(INCH/HR) = 1.33 AREA-AVERAGED Ap = 0.347
PEAK FLOW RATE(CFS) = 265.69

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B40) *
* 100-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: O8B40100.DAT
TIME/DATE OF STUDY: 16:37 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-/PARK-SIDE / SIDE/WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), STREETFLOW MODEL FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH)
5-MINUTES 0.48
30-MINUTES 0.99
1-HOUR 1.30
3-HOUR 2.39
6-HOUR 3.50
24-HOUR 7.00

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 830.00
ELEVATION DATA: UPSTREAM(FEET) = 875.00 DOWNSTREAM(FEET) = 865.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.822
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.633
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 8.00 0.98 0.100 32 10.82
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 25.45
TOTAL AREA(ACRES) = 8.00 PEAK FLOW RATE(CFS) = 25.45

FLOW PROCESS FROM NODE 301.00 TO NODE 301.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 10.82
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.633
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 0.70 0.98 0.100 32
COMMERCIAL A 8.10 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 8.80 SUBAREA RUNOFF(CFS) = 28.00
EFFECTIVE AREA(ACRES) = 16.80 AREA-AVERAGED Fm(INCH/HR) = 0.10

AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 16.8 PEAK FLOW RATE (CFS) = 53.45

ELEVATION DATA: UPSTREAM (FEET) = 858.00 DOWNSTREAM (FEET) = 843.00
FLOW LENGTH (FEET) = 1270.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.9 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 12.02
ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 104.06
PIPE TRAVEL TIME (MIN.) = 1.76 Tc (MIN.) = 15.27
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2800.00 FEET.

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION (FEET) = 865.00 DOWNSTREAM ELEVATION (FEET) = 858.00
STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 3.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 82.21
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.76
HALFSTREET FLOOD WIDTH (FEET) = 34.73
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.35
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.30
STREET FLOW TRAVEL TIME (MIN.) = 2.68 Tc (MIN.) = 13.50

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.181
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.50 0.98 0.100 32
COMMERCIAL A 18.20 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 20.70 SUBAREA RUNOFF (CFS) = 57.44
EFFECTIVE AREA (ACRES) = 37.50 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 37.5 PEAK FLOW RATE (CFS) = 104.06

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.81 HALFSTREET FLOOD WIDTH (FEET) = 39.22
FLOW VELOCITY (FEET/SEC.) = 4.58 DEPTH*VELOCITY (FT*FT/SEC.) = 3.71
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 700.0 FT WITH ELEVATION-DROP = 7.0 FT, IS 67.1 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 302.00
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1530.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 15.27
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.955
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.20 0.98 0.100 32
COMMERCIAL A 35.80 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 39.00 SUBAREA RUNOFF (CFS) = 100.31
EFFECTIVE AREA (ACRES) = 76.50 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 76.5 PEAK FLOW RATE (CFS) = 196.76

FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 843.00 DOWNSTREAM (FEET) = 830.00
FLOW LENGTH (FEET) = 1140.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.5 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 13.87
ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 196.76
PIPE TRAVEL TIME (MIN.) = 1.37 Tc (MIN.) = 16.64
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 3940.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc (MIN.) = 16.64
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.807
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 1.00 0.98 0.100 32
COMMERCIAL D 2.00 0.47 0.100 75
COMMERCIAL A 7.50 0.98 0.100 32

COMMERCIAL D 22.20 0.47 0.100 75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.60
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 32.70 SUBAREA RUNOFF (CFS) = 80.83
 EFFECTIVE AREA (ACRES) = 109.20 AREA-AVERAGED Fm (INCH/HR) = 0.09
 AREA-AVERAGED Fp (INCH/HR) = 0.86 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 109.2 PEAK FLOW RATE (CFS) = 267.37

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 830.00 DOWNSTREAM (FEET) = 805.00
 FLOW LENGTH (FEET) = 1570.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 44.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.96
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 267.37
 PIPE TRAVEL TIME (MIN.) = 1.54 Tc (MIN.) = 18.18
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 305.00 = 5510.00 FEET.

 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 18.18
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.661
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
COMMERCIAL	D	10.50	0.47	0.100	75
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	28.20	0.98	0.500	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	D	9.50	0.47	0.500	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.83
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.374
 SUBAREA AREA (ACRES) = 55.10 SUBAREA RUNOFF (CFS) = 116.54
 EFFECTIVE AREA (ACRES) = 164.30 AREA-AVERAGED Fm (INCH/HR) = 0.16
 AREA-AVERAGED Fp (INCH/HR) = 0.84 AREA-AVERAGED Ap = 0.19
 TOTAL AREA (ACRES) = 164.3 PEAK FLOW RATE (CFS) = 369.62

 FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 805.00 DOWNSTREAM (FEET) = 788.00
 FLOW LENGTH (FEET) = 1700.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 57.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.27

ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 369.62
 PIPE TRAVEL TIME (MIN.) = 1.86 Tc (MIN.) = 20.03
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 306.00 = 7210.00 FEET.

 FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 20.03
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.511
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	41.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA AREA (ACRES) = 54.00 SUBAREA RUNOFF (CFS) = 102.85
 EFFECTIVE AREA (ACRES) = 218.30 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.90 AREA-AVERAGED Ap = 0.24
 TOTAL AREA (ACRES) = 218.3 PEAK FLOW RATE (CFS) = 450.17

 FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM (FEET) = 788.00 DOWNSTREAM (FEET) = 786.00
 FLOW LENGTH (FEET) = 200.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 78.0 INCH PIPE IS 61.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 16.09
 ESTIMATED PIPE DIAMETER (INCH) = 78.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 450.17
 PIPE TRAVEL TIME (MIN.) = 0.21 Tc (MIN.) = 20.24
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 307.00 = 7410.00 FEET.

 FLOW PROCESS FROM NODE 307.00 TO NODE 307.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 20.24
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.495
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	10.90	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.407
 SUBAREA AREA (ACRES) = 14.20 SUBAREA RUNOFF (CFS) = 26.82

EFFECTIVE AREA (ACRES) = 232.50 AREA-AVERAGED Fm (INCH/HR) = 0.23
 AREA-AVERAGED Fp (INCH/HR) = 0.90 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 232.5 PEAK FLOW RATE (CFS) = 473.96

TOTAL AREA (ACRES) = 8.40 PEAK FLOW RATE (CFS) = 24.21

 FLOW PROCESS FROM NODE 307.00 TO NODE 310.00 IS CODE = 31

 FLOW PROCESS FROM NODE 309.00 TO NODE 310.00 IS CODE = 62

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 786.00 DOWNSTREAM (FEET) = 780.00
 FLOW LENGTH (FEET) = 880.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 87.0 INCH PIPE IS 65.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.23
 ESTIMATED PIPE DIAMETER (INCH) = 87.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 473.96
 PIPE TRAVEL TIME (MIN.) = 1.03 Tc (MIN.) = 21.27
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 8290.00 FEET.

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION (FEET) = 782.00 DOWNSTREAM ELEVATION (FEET) = 780.00
 STREET LENGTH (FEET) = 630.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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

 FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 1

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 37.86

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 =====
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION (MIN.) = 21.27
 RAINFALL INTENSITY (INCH/HR) = 2.42
 AREA-AVERAGED Fm (INCH/HR) = 0.23
 AREA-AVERAGED Fp (INCH/HR) = 0.90
 AREA-AVERAGED Ap = 0.25
 EFFECTIVE STREAM AREA (ACRES) = 232.50
 TOTAL STREAM AREA (ACRES) = 232.50
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 473.96

STREET FLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.72
 HALFSTREET FLOOD WIDTH (FEET) = 30.30
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.36
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.69
 STREET FLOW TRAVEL TIME (MIN.) = 4.44 Tc (MIN.) = 15.42
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.937

 FLOW PROCESS FROM NODE 308.00 TO NODE 309.00 IS CODE = 21

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.50	0.98	0.100	32
COMMERCIAL	D	1.50	0.47	0.100	75
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.20	0.98	0.500	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	D	4.20	0.47	0.500	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.395
 SUBAREA AREA (ACRES) = 11.40 SUBAREA RUNOFF (CFS) = 27.21
 EFFECTIVE AREA (ACRES) = 19.80 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 0.83 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 19.8 PEAK FLOW RATE (CFS) = 46.40

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.76 HALFSTREET FLOOD WIDTH (FEET) = 34.73
 FLOW VELOCITY (FEET/SEC.) = 2.45 DEPTH*VELOCITY (FT*FT/SEC.) = 1.86
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 630.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 31.0 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 310.00
 LONGEST FLOWPATH FROM NODE 308.00 TO NODE 310.00 = 1480.00 FEET.

INITIAL SUBAREA FLOW-LENGTH (FEET) = 850.00
 ELEVATION DATA: UPSTREAM (FEET) = 792.00 DOWNSTREAM (FEET) = 782.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.978
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.602
 SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.90	0.98	0.100	32	10.98
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	6.50	0.98	0.500	32	14.05

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.410
 SUBAREA RUNOFF (CFS) = 24.21

 FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

MAINLINE Tc (MIN.) = 15.42
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.937
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.20	0.98	0.100	32
CONDOMINIUMS	A	2.30	0.98	0.350	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.00	0.98	0.500	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	D	7.00	0.47	0.500	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.434
 SUBAREA AREA (ACRES) = 18.50 SUBAREA RUNOFF (CFS) = 43.46
 EFFECTIVE AREA (ACRES) = 38.30 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 0.79 AREA-AVERAGED Ap = 0.42
 TOTAL AREA (ACRES) = 38.3 PEAK FLOW RATE (CFS) = 89.85

TOTAL AREA (ACRES) = 270.8
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 8290.00 FEET.

=====

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 270.8 TC (MIN.) = 21.27
 EFFECTIVE AREA (ACRES) = 270.80 AREA-AVERAGED Fm (INCH/HR) = 0.24
 AREA-AVERAGED Fp (INCH/HR) = 0.88 AREA-AVERAGED Ap = 0.277
 PEAK FLOW RATE (CFS) = 546.04

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	514.28	15.42	2.937	0.87 (0.25)	0.28	206.9	308.00
2	546.04	21.27	2.422	0.88 (0.24)	0.28	270.8	300.00

=====

END OF RATIONAL METHOD ANALYSIS

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 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.) = 15.42
 RAINFALL INTENSITY (INCH/HR) = 2.94
 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 0.79
 AREA-AVERAGED Ap = 0.42
 EFFECTIVE STREAM AREA (ACRES) = 38.30
 TOTAL STREAM AREA (ACRES) = 38.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 89.85

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	473.96	21.27	2.422	0.90 (0.23)	0.25	232.5	300.00
2	89.85	15.42	2.937	0.79 (0.33)	0.42	38.3	308.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	514.28	15.42	2.937	0.87 (0.25)	0.28	206.9	308.00
2	546.04	21.27	2.422	0.88 (0.24)	0.28	270.8	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 546.04 Tc (MIN.) = 21.27
 EFFECTIVE AREA (ACRES) = 270.80 AREA-AVERAGED Fm (INCH/HR) = 0.24
 AREA-AVERAGED Fp (INCH/HR) = 0.88 AREA-AVERAGED Ap = 0.28

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B40) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: O8B4025.DAT
TIME/DATE OF STUDY: 16:42 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), IN- / OUT- / PARK- SIDE / SIDE/ WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), LIP HIKE (FT), GEOMETRIES (FT), MANNING FACTOR (n)

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, RAINFALL(INCH)
5-MINUTES 0.38
30-MINUTES 0.79
1-HOUR 1.04
3-HOUR 1.87
6-HOUR 2.71
24-HOUR 5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 830.00
ELEVATION DATA: UPSTREAM(FEET) = 875.00 DOWNSTREAM(FEET) = 865.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.822
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.902
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 8.00 0.98 0.100 32 10.82
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 20.19
TOTAL AREA(ACRES) = 8.00 PEAK FLOW RATE(CFS) = 20.19

FLOW PROCESS FROM NODE 301.00 TO NODE 301.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====
MAINLINE Tc(MIN.) = 10.82
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.902
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 0.70 0.98 0.100 32
COMMERCIAL A 8.10 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA (ACRES) = 8.80 SUBAREA RUNOFF (CFS) = 22.21
 EFFECTIVE AREA (ACRES) = 16.80 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 16.8 PEAK FLOW RATE (CFS) = 42.40

 FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 865.00 DOWNSTREAM ELEVATION (FEET) = 858.00
 STREET LENGTH (FEET) = 700.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 65.07
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH (FEET) = 0.71
 HALFSTREET FLOOD WIDTH (FEET) = 29.56
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.18
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.96
 STREET FLOW TRAVEL TIME (MIN.) = 2.79 Tc (MIN.) = 13.62
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.528

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	2.50	0.98	0.100	32
COMMERCIAL	A	18.20	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 20.70 SUBAREA RUNOFF (CFS) = 45.29
 EFFECTIVE AREA (ACRES) = 37.50 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 37.5 PEAK FLOW RATE (CFS) = 82.05

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH (FEET) = 0.76 HALFSTREET FLOOD WIDTH (FEET) = 34.62
 FLOW VELOCITY (FEET/SEC.) = 4.36 DEPTH*VELOCITY (FT*FT/SEC.) = 3.31
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 700.0 FT WITH ELEVATION-DROP = 7.0 FT, IS 53.3 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 302.00
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1530.00 FEET.

 FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 858.00 DOWNSTREAM (FEET) = 843.00
 FLOW LENGTH (FEET) = 1270.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.4 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.39
 ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 82.05
 PIPE TRAVEL TIME (MIN.) = 1.86 Tc (MIN.) = 15.47
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2800.00 FEET.

 FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 15.47
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.342
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.20	0.98	0.100	32
COMMERCIAL	A	35.80	0.98	0.100	32

SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 39.00 SUBAREA RUNOFF (CFS) = 78.77
 EFFECTIVE AREA (ACRES) = 76.50 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 76.5 PEAK FLOW RATE (CFS) = 154.51

 FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 843.00 DOWNSTREAM (FEET) = 830.00
 FLOW LENGTH (FEET) = 1140.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.94
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 154.51
 PIPE TRAVEL TIME (MIN.) = 1.47 Tc (MIN.) = 16.94
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 3940.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 16.94
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.218
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.00	0.98	0.100	32

COMMERCIAL D 2.00 0.47 0.100 75
 COMMERCIAL A 7.50 0.98 0.100 32
 COMMERCIAL D 22.20 0.47 0.100 75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.60
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA (ACRES) = 32.70 SUBAREA RUNOFF (CFS) = 63.50
 EFFECTIVE AREA (ACRES) = 109.20 AREA-AVERAGED Fm (INCH/HR) = 0.09
 AREA-AVERAGED Fp (INCH/HR) = 0.86 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 109.2 PEAK FLOW RATE (CFS) = 209.47

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 830.00 DOWNSTREAM (FEET) = 805.00
 FLOW LENGTH (FEET) = 1570.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.8 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.87
 ESTIMATED PIPE DIAMETER (INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 209.47
 PIPE TRAVEL TIME (MIN.) = 1.65 Tc (MIN.) = 18.59
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 305.00 = 5510.00 FEET.

 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 18.59
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.097
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
COMMERCIAL	D	10.50	0.47	0.100	75
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	28.20	0.98	0.500	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	D	9.50	0.47	0.500	75

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.83
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.374
 SUBAREA AREA (ACRES) = 55.10 SUBAREA RUNOFF (CFS) = 88.58
 EFFECTIVE AREA (ACRES) = 164.30 AREA-AVERAGED Fm (INCH/HR) = 0.16
 AREA-AVERAGED Fp (INCH/HR) = 0.84 AREA-AVERAGED Ap = 0.19
 TOTAL AREA (ACRES) = 164.3 PEAK FLOW RATE (CFS) = 286.24

 FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 805.00 DOWNSTREAM (FEET) = 788.00
 FLOW LENGTH (FEET) = 1700.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 66.0 INCH PIPE IS 51.5 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.39
 ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 286.24
 PIPE TRAVEL TIME (MIN.) = 1.97 Tc (MIN.) = 20.56
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 306.00 = 7210.00 FEET.

 FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 20.56
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.975
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.90	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	41.10	0.98	0.500	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA AREA (ACRES) = 54.00 SUBAREA RUNOFF (CFS) = 76.80
 EFFECTIVE AREA (ACRES) = 218.30 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.90 AREA-AVERAGED Ap = 0.24
 TOTAL AREA (ACRES) = 218.3 PEAK FLOW RATE (CFS) = 344.86

 FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 788.00 DOWNSTREAM (FEET) = 786.00
 FLOW LENGTH (FEET) = 200.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 53.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.18
 ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 344.86
 PIPE TRAVEL TIME (MIN.) = 0.22 Tc (MIN.) = 20.78
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 307.00 = 7410.00 FEET.

 FLOW PROCESS FROM NODE 307.00 TO NODE 307.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====

MAINLINE Tc (MIN.) = 20.78
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.962
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	10.90	0.98	0.500	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.407
 SUBAREA AREA (ACRES) = 14.20 SUBAREA RUNOFF (CFS) = 20.00
 EFFECTIVE AREA (ACRES) = 232.50 AREA-AVERAGED Fm (INCH/HR) = 0.23
 AREA-AVERAGED Fp (INCH/HR) = 0.90 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 232.5 PEAK FLOW RATE (CFS) = 362.40

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.410
 SUBAREA RUNOFF (CFS) = 18.73
 TOTAL AREA (ACRES) = 8.40 PEAK FLOW RATE (CFS) = 18.73

 FLOW PROCESS FROM NODE 309.00 TO NODE 310.00 IS CODE = 62

FLOW PROCESS FROM NODE 307.00 TO NODE 310.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM (FEET) = 786.00 DOWNSTREAM (FEET) = 780.00
 FLOW LENGTH (FEET) = 880.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 78.0 INCH PIPE IS 59.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.26
 ESTIMATED PIPE DIAMETER (INCH) = 78.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 362.40
 PIPE TRAVEL TIME (MIN.) = 1.11 Tc (MIN.) = 21.89
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 8290.00 FEET.

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<<
 =====

UPSTREAM ELEVATION (FEET) = 782.00 DOWNSTREAM ELEVATION (FEET) = 780.00
 STREET LENGTH (FEET) = 630.00 CURB HEIGHT (INCHES) = 8.0
 STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
 INSIDE STREET CROSSFALL (DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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

 FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 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.) = 21.89
 RAINFALL INTENSITY (INCH/HR) = 1.90
 AREA-AVERAGED Fm (INCH/HR) = 0.23
 AREA-AVERAGED Fp (INCH/HR) = 0.90
 AREA-AVERAGED Ap = 0.25
 EFFECTIVE STREAM AREA (ACRES) = 232.50
 TOTAL STREAM AREA (ACRES) = 232.50
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 362.40

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 29.22

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.66
 HALFSTREET FLOOD WIDTH (FEET) = 25.22
 AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.23
 PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.48
 STREET FLOW TRAVEL TIME (MIN.) = 4.71 Tc (MIN.) = 15.69
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.323

SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	1.50	0.98	0.100	32
COMMERCIAL	D	1.50	0.47	0.100	75
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.20	0.98	0.500	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	D	4.20	0.47	0.500	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.395
 SUBAREA AREA (ACRES) = 11.40 SUBAREA RUNOFF (CFS) = 20.90
 EFFECTIVE AREA (ACRES) = 19.80 AREA-AVERAGED Fm (INCH/HR) = 0.33
 AREA-AVERAGED Fp (INCH/HR) = 0.83 AREA-AVERAGED Ap = 0.40
 TOTAL AREA (ACRES) = 19.8 PEAK FLOW RATE (CFS) = 35.44

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.70 HALFSTREET FLOOD WIDTH (FEET) = 28.93
 FLOW VELOCITY (FEET/SEC.) = 2.33 DEPTH*VELOCITY (FT*FT/SEC.) = 1.64
 LONGEST FLOWPATH FROM NODE 308.00 TO NODE 310.00 = 1480.00 FEET.

 FLOW PROCESS FROM NODE 308.00 TO NODE 309.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH (FEET) = 850.00
 ELEVATION DATA: UPSTREAM (FEET) = 792.00 DOWNSTREAM (FEET) = 782.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.978
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.877

SUBAREA Tc AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.90	0.98	0.100	32	10.98
RESIDENTIAL						
"5-7 DWELLINGS/ACRE"	A	6.50	0.98	0.500	32	14.05

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98

 FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

```

=====
MAINLINE Tc (MIN.) = 15.69
* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.323
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR)  (DECIMAL) CN
COMMERCIAL              A      2.20     0.98       0.100    32
CONDOMINIUMS           A      2.30     0.98       0.350    32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"  A      7.00     0.98       0.500    32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"  D      7.00     0.47       0.500    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.75
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.434
SUBAREA AREA (ACRES) = 18.50      SUBAREA RUNOFF (CFS) = 33.22
EFFECTIVE AREA (ACRES) = 38.30    AREA-AVERAGED Fm (INCH/HR) = 0.33
AREA-AVERAGED Fp (INCH/HR) = 0.79  AREA-AVERAGED Ap = 0.42
TOTAL AREA (ACRES) = 38.3        PEAK FLOW RATE (CFS) = 68.66

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*****
FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 15.69
RAINFALL INTENSITY (INCH/HR) = 2.32
AREA-AVERAGED Fm (INCH/HR) = 0.33
AREA-AVERAGED Fp (INCH/HR) = 0.79
AREA-AVERAGED Ap = 0.42
EFFECTIVE STREAM AREA (ACRES) = 38.30
TOTAL STREAM AREA (ACRES) = 38.30
PEAK FLOW RATE (CFS) AT CONFLUENCE = 68.66

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** CONFLUENCE DATA **
STREAM      Q      Tc  Intensity  Fp(Fm)  Ap      Ae  HEADWATER
NUMBER     (CFS) (MIN.) (INCH/HR) (INCH/HR) (INCH/HR) (ACRES)  NODE
1         362.40  21.89  1.902  0.90( 0.23) 0.25  232.5  300.00
2          68.66  15.69  2.323  0.79( 0.33) 0.42   38.3  308.00

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

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** PEAK FLOW RATE TABLE **
STREAM      Q      Tc  Intensity  Fp(Fm)  Ap      Ae  HEADWATER
NUMBER     (CFS) (MIN.) (INCH/HR) (INCH/HR) (INCH/HR) (ACRES)  NODE
1         393.77  15.69  2.323  0.87( 0.25) 0.28  204.9  308.00
2         416.56  21.89  1.902  0.88( 0.24) 0.28  270.8  300.00

```

```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 416.56    Tc (MIN.) = 21.89
EFFECTIVE AREA (ACRES) = 270.80    AREA-AVERAGED Fm (INCH/HR) = 0.24
AREA-AVERAGED Fp (INCH/HR) = 0.88    AREA-AVERAGED Ap = 0.28
TOTAL AREA (ACRES) = 270.8

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LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 8290.00 FEET.
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END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 270.8    TC (MIN.) = 21.89
EFFECTIVE AREA (ACRES) = 270.80    AREA-AVERAGED Fm (INCH/HR) = 0.24
AREA-AVERAGED Fp (INCH/HR) = 0.88    AREA-AVERAGED Ap = 0.277
PEAK FLOW RATE (CFS) = 416.56

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** PEAK FLOW RATE TABLE **
STREAM      Q      Tc  Intensity  Fp(Fm)  Ap      Ae  HEADWATER
NUMBER     (CFS) (MIN.) (INCH/HR) (INCH/HR) (INCH/HR) (ACRES)  NODE
1         393.77  15.69  2.323  0.87( 0.25) 0.28  204.9  308.00
2         416.56  21.89  1.902  0.88( 0.24) 0.28  270.8  300.00

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END OF RATIONAL METHOD ANALYSIS
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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B40) *
* 10-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: O8B4010.DAT
TIME/DATE OF STUDY: 16:43 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO STREET-CROSSFALL, STREET-CROSSFALL, CURB GUTTER-GEOMETRIES, MANNING FACTOR. Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES, 30-MINUTES, 1-HOUR, 3-HOUR, 6-HOUR, 24-HOUR.

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 830.00
ELEVATION DATA: UPSTREAM(FEET) = 875.00 DOWNSTREAM(FEET) = 865.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.822
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.515
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 8.00 0.98 0.100 32 10.82
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 17.41
TOTAL AREA(ACRES) = 8.00 PEAK FLOW RATE(CFS) = 17.41

FLOW PROCESS FROM NODE 301.00 TO NODE 301.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 10.82
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.515
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 0.70 0.98 0.100 32
COMMERCIAL A 8.10 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 8.80 SUBAREA RUNOFF(CFS) = 19.15
EFFECTIVE AREA(ACRES) = 16.80 AREA-AVERAGED Fm(INCH/HR) = 0.10

AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 16.8 PEAK FLOW RATE(CFS) = 36.55

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 865.00 DOWNSTREAM ELEVATION(FEET) = 858.00
STREET LENGTH(FEET) = 700.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 56.00

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.68
HALFSTREET FLOOD WIDTH(FEET) = 26.50
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.04
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.74
STREET FLOW TRAVEL TIME(MIN.) = 2.89 Tc(MIN.) = 13.71
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.182

SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 2.50 0.98 0.100 32
COMMERCIAL A 18.20 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 20.70 SUBAREA RUNOFF(CFS) = 38.84
EFFECTIVE AREA(ACRES) = 37.50 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 37.5 PEAK FLOW RATE(CFS) = 70.36

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.72 HALFSTREET FLOOD WIDTH(FEET) = 31.25
FLOW VELOCITY(FEET/SEC.) = 4.24 DEPTH*VELOCITY(FT*FT/SEC.) = 3.07
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1530.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 858.00 DOWNSTREAM(FEET) = 843.00
FLOW LENGTH(FEET) = 1270.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.3 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 10.91
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 70.36
PIPE TRAVEL TIME(MIN.) = 1.94 Tc(MIN.) = 15.65
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2800.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 15.65
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.016
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.20 0.98 0.100 32
COMMERCIAL A 35.80 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 39.00 SUBAREA RUNOFF(CFS) = 67.33
EFFECTIVE AREA(ACRES) = 76.50 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 76.5 PEAK FLOW RATE(CFS) = 132.06

FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 843.00 DOWNSTREAM(FEET) = 830.00
FLOW LENGTH(FEET) = 1140.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 37.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.43
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 132.06
PIPE TRAVEL TIME(MIN.) = 1.53 Tc(MIN.) = 17.18
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 = 3940.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 17.18
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.906
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 1.00 0.98 0.100 32
COMMERCIAL D 2.00 0.47 0.100 75
COMMERCIAL A 7.50 0.98 0.100 32
COMMERCIAL D 22.20 0.47 0.100 75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.60
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA (ACRES) = 32.70 SUBAREA RUNOFF (CFS) = 54.33
 EFFECTIVE AREA (ACRES) = 109.20 AREA-AVERAGED Fm (INCH/HR) = 0.09
 AREA-AVERAGED Fp (INCH/HR) = 0.86 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 109.2 PEAK FLOW RATE (CFS) = 178.84

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 306.00 = 7210.00 FEET.

 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 830.00 DOWNSTREAM (FEET) = 805.00
 FLOW LENGTH (FEET) = 1570.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 39.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 15.27
 ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 178.84
 PIPE TRAVEL TIME (MIN.) = 1.71 Tc (MIN.) = 18.89
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 305.00 = 5510.00 FEET.

 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 18.89
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.800
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
COMMERCIAL	D	10.50	0.47	0.100	75
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	28.20	0.98	0.500	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	D	9.50	0.47	0.500	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.83
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.374
 SUBAREA AREA (ACRES) = 55.10 SUBAREA RUNOFF (CFS) = 73.85
 EFFECTIVE AREA (ACRES) = 164.30 AREA-AVERAGED Fm (INCH/HR) = 0.16
 AREA-AVERAGED Fp (INCH/HR) = 0.84 AREA-AVERAGED Ap = 0.19
 TOTAL AREA (ACRES) = 164.3 PEAK FLOW RATE (CFS) = 242.30

 FLOW PROCESS FROM NODE 305.00 TO NODE 306.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 805.00 DOWNSTREAM (FEET) = 788.00
 FLOW LENGTH (FEET) = 1700.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 47.3 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.89
 ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 242.30
 PIPE TRAVEL TIME (MIN.) = 2.04 Tc (MIN.) = 20.93

 FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 20.93
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.693
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.90	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	41.10	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.404
 SUBAREA AREA (ACRES) = 54.00 SUBAREA RUNOFF (CFS) = 63.11
 EFFECTIVE AREA (ACRES) = 218.30 AREA-AVERAGED Fm (INCH/HR) = 0.22
 AREA-AVERAGED Fp (INCH/HR) = 0.90 AREA-AVERAGED Ap = 0.24
 TOTAL AREA (ACRES) = 218.3 PEAK FLOW RATE (CFS) = 289.54

 FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 788.00 DOWNSTREAM (FEET) = 786.00
 FLOW LENGTH (FEET) = 200.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 52.1 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.40
 ESTIMATED PIPE DIAMETER (INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 289.54
 PIPE TRAVEL TIME (MIN.) = 0.23 Tc (MIN.) = 21.16
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 307.00 = 7410.00 FEET.

 FLOW PROCESS FROM NODE 307.00 TO NODE 307.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 21.16
 * 10 YEAR RAINFALL INTENSITY (INCH/HR) = 1.682
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.30	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	10.90	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.407
 SUBAREA AREA (ACRES) = 14.20 SUBAREA RUNOFF (CFS) = 16.42
 EFFECTIVE AREA (ACRES) = 232.50 AREA-AVERAGED Fm (INCH/HR) = 0.23
 AREA-AVERAGED Fp (INCH/HR) = 0.90 AREA-AVERAGED Ap = 0.25
 TOTAL AREA (ACRES) = 232.5 PEAK FLOW RATE (CFS) = 303.77

FLOW PROCESS FROM NODE 307.00 TO NODE 310.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 786.00 DOWNSTREAM(FEET) = 780.00
FLOW LENGTH(FEET) = 880.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 72.0 INCH PIPE IS 57.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.61
ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 303.77
PIPE TRAVEL TIME(MIN.) = 1.16 Tc(MIN.) = 22.33
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 8290.00 FEET.

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 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.) = 22.33
RAINFALL INTENSITY(INCH/HR) = 1.63
AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.90
AREA-AVERAGED Ap = 0.25
EFFECTIVE STREAM AREA(ACRES) = 232.50
TOTAL STREAM AREA(ACRES) = 232.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 303.77

FLOW PROCESS FROM NODE 308.00 TO NODE 309.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00
ELEVATION DATA: UPSTREAM(FEET) = 792.00 DOWNSTREAM(FEET) = 782.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.978
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.494
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.90 0.98 0.100 32 10.98
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 6.50 0.98 0.500 32 14.05
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.410
SUBAREA RUNOFF(CFS) = 15.83
TOTAL AREA(ACRES) = 8.40 PEAK FLOW RATE(CFS) = 15.83

FLOW PROCESS FROM NODE 309.00 TO NODE 310.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 782.00 DOWNSTREAM ELEVATION(FEET) = 780.00
STREET LENGTH(FEET) = 630.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 24.65

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.63
HALFSTREET FLOOD WIDTH(FEET) = 23.59
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.14
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.35
STREET FLOW TRAVEL TIME(MIN.) = 4.90 Tc(MIN.) = 15.88
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.998

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 1.50 0.98 0.100 32
COMMERCIAL D 1.50 0.47 0.100 75
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 4.20 0.98 0.500 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" D 4.20 0.47 0.500 75
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.72
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.395
SUBAREA AREA(ACRES) = 11.40 SUBAREA RUNOFF(CFS) = 17.57
EFFECTIVE AREA(ACRES) = 19.80 AREA-AVERAGED Fm(INCH/HR) = 0.33
AREA-AVERAGED Fp(INCH/HR) = 0.83 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 19.8 PEAK FLOW RATE(CFS) = 29.66

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.67 HALFSTREET FLOOD WIDTH(FEET) = 25.38
FLOW VELOCITY(FEET/SEC.) = 2.24 DEPTH*VELOCITY(FT*FT/SEC.) = 1.49
LONGEST FLOWPATH FROM NODE 308.00 TO NODE 310.00 = 1480.00 FEET.

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 15.88
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.998

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN
COMMERCIAL	A	2.20	0.98	0.100	32
CONDOMINIUMS	A	2.30	0.98	0.350	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	7.00	0.98	0.500	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	D	7.00	0.47	0.500	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.434
 SUBAREA AREA (ACRES) = 18.50 SUBAREA RUNOFF (CFS) = 27.82
 EFFECTIVE AREA (ACRES) = 38.30 AREA-AVERAGED F_m (INCH/HR) = 0.33
 AREA-AVERAGED F_p (INCH/HR) = 0.79 AREA-AVERAGED A_p = 0.42
 TOTAL AREA (ACRES) = 38.3 PEAK FLOW RATE (CFS) = 57.48

AREA-AVERAGED F_p (INCH/HR) = 0.88 AREA-AVERAGED A_p = 0.277
 PEAK FLOW RATE (CFS) = 348.52

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	F_p (Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	330.61	15.88	1.998	0.87(0.25)	0.28	203.7	308.00
2	348.52	22.33	1.629	0.88(0.24)	0.28	270.8	300.00

=====
 END OF RATIONAL METHOD ANALYSIS
 =====

FLOW PROCESS FROM NODE 310.00 TO NODE 310.00 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.) = 15.88
 RAINFALL INTENSITY (INCH/HR) = 2.00
 AREA-AVERAGED F_m (INCH/HR) = 0.33
 AREA-AVERAGED F_p (INCH/HR) = 0.79
 AREA-AVERAGED A_p = 0.42
 EFFECTIVE STREAM AREA (ACRES) = 38.30
 TOTAL STREAM AREA (ACRES) = 38.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 57.48

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	F_p (Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	303.77	22.33	1.629	0.90(0.23)	0.25	232.5	300.00
2	57.48	15.88	1.998	0.79(0.33)	0.42	38.3	308.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	F_p (Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	330.61	15.88	1.998	0.87(0.25)	0.28	203.7	308.00
2	348.52	22.33	1.629	0.88(0.24)	0.28	270.8	300.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 348.52 Tc (MIN.) = 22.33
 EFFECTIVE AREA (ACRES) = 270.80 AREA-AVERAGED F_m (INCH/HR) = 0.24
 AREA-AVERAGED F_p (INCH/HR) = 0.88 AREA-AVERAGED A_p = 0.28
 TOTAL AREA (ACRES) = 270.8
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 310.00 = 8290.00 FEET.

 END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 270.8 TC (MIN.) = 22.33
 EFFECTIVE AREA (ACRES) = 270.80 AREA-AVERAGED F_m (INCH/HR) = 0.24

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B50) *
* 100-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: O8B50100.DAT
TIME/DATE OF STUDY: 16:53 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL (IN- / OUT- / PARK- SIDE / SIDE / WAY), CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES (LIP (FT), HIKE (FT)), MANNING FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL (INCH). Rows: 5-MINUTES (0.48), 30-MINUTES (0.99), 1-HOUR (1.30), 3-HOUR (2.39), 6-HOUR (3.50), 24-HOUR (7.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 800.00
ELEVATION DATA: UPSTREAM (FEET) = 870.00 DOWNSTREAM (FEET) = 866.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.715
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.298
SUBAREA Tc AND LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 6.60 0.98 0.100 32 12.71
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF (CFS) = 19.01
TOTAL AREA (ACRES) = 6.60 PEAK FLOW RATE (CFS) = 19.01

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 866.00 DOWNSTREAM ELEVATION (FEET) = 865.00
STREET LENGTH (FEET) = 370.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 39.83
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.74
HALFSTREET FLOOD WIDTH (FEET) = 33.15
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.23
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.66
STREET FLOW TRAVEL TIME (MIN.) = 2.76 Tc (MIN.) = 15.48
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.931
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 14.50 0.98 0.100 32
COMMERCIAL A 1.80 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 16.30 SUBAREA RUNOFF (CFS) = 41.57
EFFECTIVE AREA (ACRES) = 22.90 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 22.9 PEAK FLOW RATE (CFS) = 58.40

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.83 HALFSTREET FLOOD WIDTH (FEET) = 39.95
FLOW VELOCITY (FEET/SEC.) = 2.45 DEPTH*VELOCITY (FT*FT/SEC.) = 2.02
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 370.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 52.6 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 402.00
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 1170.00 FEET.

FLOW PROCESS FROM NODE 402.00 TO NODE 403.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 865.00 DOWNSTREAM ELEVATION (FEET) = 855.00
STREET LENGTH (FEET) = 870.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 89.96
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.76
HALFSTREET FLOOD WIDTH (FEET) = 35.15
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.69
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 3.58

STREET FLOW TRAVEL TIME (MIN.) = 3.09 Tc (MIN.) = 18.57
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.628
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 24.90 0.98 0.100 32
COMMERCIAL A 2.80 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 27.70 SUBAREA RUNOFF (CFS) = 63.07
EFFECTIVE AREA (ACRES) = 50.60 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 50.6 PEAK FLOW RATE (CFS) = 115.22

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.82 HALFSTREET FLOOD WIDTH (FEET) = 39.53
FLOW VELOCITY (FEET/SEC.) = 4.97 DEPTH*VELOCITY (FT*FT/SEC.) = 4.06
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 870.0 FT WITH ELEVATION-DROP = 10.0 FT, IS 86.6 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 403.00
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 403.00 = 2040.00 FEET.

FLOW PROCESS FROM NODE 403.00 TO NODE 410.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPE SIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 855.00 DOWNSTREAM (FEET) = 830.00
FLOW LENGTH (FEET) = 1950.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.7 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 12.61
ESTIMATED PIPE DIAMETER (INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 115.22
PIPE TRAVEL TIME (MIN.) = 2.58 Tc (MIN.) = 21.15
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 410.00 = 3990.00 FEET.

FLOW PROCESS FROM NODE 410.00 TO NODE 410.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc (MIN.) = 21.15
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.430
SUBAREA LOSS RATE DATA (AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 15.70 0.98 0.100 32
COMMERCIAL A 17.40 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA (ACRES) = 33.10 SUBAREA RUNOFF (CFS) = 69.50
EFFECTIVE AREA (ACRES) = 83.70 AREA-AVERAGED Fm (INCH/HR) = 0.10
AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 83.7 PEAK FLOW RATE (CFS) = 175.74

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FLOW PROCESS FROM NODE 410.00 TO NODE 411.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 830.00 DOWNSTREAM(FEET) = 820.00
FLOW LENGTH(FEET) = 650.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 39.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.01
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 175.74
PIPE TRAVEL TIME(MIN.) = 0.72 Tc(MIN.) = 21.87
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 411.00 = 4640.00 FEET.

*****
FLOW PROCESS FROM NODE 411.00 TO NODE 411.00 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.) = 21.87
RAINFALL INTENSITY(INCH/HR) = 2.38
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 83.70
TOTAL STREAM AREA(ACRES) = 83.70
PEAK FLOW RATE(CFS) AT CONFLUENCE = 175.74

*****
FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00
ELEVATION DATA: UPSTREAM(FEET) = 855.00 DOWNSTREAM(FEET) = 848.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.790
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.451
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 8.30 0.98 0.100 32 11.79
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 25.05
TOTAL AREA(ACRES) = 8.30 PEAK FLOW RATE(CFS) = 25.05

*****
FLOW PROCESS FROM NODE 405.00 TO NODE 406.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

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>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 835.00
FLOW LENGTH(FEET) = 1450.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 27.0 INCH PIPE IS 21.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.51
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 25.05
PIPE TRAVEL TIME(MIN.) = 3.22 Tc(MIN.) = 15.01
LONGEST FLOWPATH FROM NODE 404.00 TO NODE 406.00 = 2300.00 FEET.

*****
FLOW PROCESS FROM NODE 406.00 TO NODE 406.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 15.01
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.986
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 20.00 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 51.99
EFFECTIVE AREA(ACRES) = 28.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 28.3 PEAK FLOW RATE(CFS) = 73.56

*****
FLOW PROCESS FROM NODE 406.00 TO NODE 411.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 835.00 DOWNSTREAM(FEET) = 820.00
FLOW LENGTH(FEET) = 900.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 28.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.40
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 73.56
PIPE TRAVEL TIME(MIN.) = 1.21 Tc(MIN.) = 16.22
LONGEST FLOWPATH FROM NODE 404.00 TO NODE 411.00 = 3200.00 FEET.

*****
FLOW PROCESS FROM NODE 411.00 TO NODE 411.00 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.) = 16.22
RAINFALL INTENSITY(INCH/HR) = 2.85
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98

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AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 28.30
 TOTAL STREAM AREA(ACRES) = 28.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 73.56

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	175.74	21.87	2.382	0.98(0.10)	0.10	83.7	400.00
2	73.56	16.22	2.850	0.98(0.10)	0.10	28.3	404.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	230.58	16.22	2.850	0.98(0.10)	0.10	90.4	404.00
2	236.79	21.87	2.382	0.98(0.10)	0.10	112.0	400.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 236.79 Tc(MIN.) = 21.87
 EFFECTIVE AREA(ACRES) = 112.00 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 112.0
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 411.00 = 4640.00 FEET.

FLOW PROCESS FROM NODE 411.00 TO NODE 412.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 820.00 DOWNSTREAM(FEET) = 810.00
 FLOW LENGTH(FEET) = 1080.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 48.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.39
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 236.79
 PIPE TRAVEL TIME(MIN.) = 1.34 Tc(MIN.) = 23.21
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 412.00 = 5720.00 FEET.

FLOW PROCESS FROM NODE 412.00 TO NODE 412.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 23.21
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.298

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	2.70	0.98	0.500	32
COMMERCIAL	A	17.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.139
 SUBAREA AREA(ACRES) = 27.40 SUBAREA RUNOFF(CFS) = 53.32
 EFFECTIVE AREA(ACRES) = 139.40 AREA-AVERAGED Fm(INCH/HR) = 0.11
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
 TOTAL AREA(ACRES) = 139.4 PEAK FLOW RATE(CFS) = 275.16

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	276.67	17.57	2.717	0.98(0.11)	0.11	117.8	404.00
2	275.16	23.21	2.298	0.98(0.11)	0.11	139.4	400.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 276.67 Tc(MIN.) = 17.57
 AREA-AVERAGED Fm(INCH/HR) = 0.11 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.11 EFFECTIVE AREA(ACRES) = 117.77

FLOW PROCESS FROM NODE 412.00 TO NODE 413.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 810.00 DOWNSTREAM(FEET) = 796.00
 FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 51.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.73
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 276.67
 PIPE TRAVEL TIME(MIN.) = 1.43 Tc(MIN.) = 18.99
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 413.00 = 6980.00 FEET.

FLOW PROCESS FROM NODE 413.00 TO NODE 413.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 18.99
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.592
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.298
 SUBAREA AREA(ACRES) = 8.50 SUBAREA RUNOFF(CFS) = 17.61
 EFFECTIVE AREA(ACRES) = 126.27 AREA-AVERAGED Fm(INCH/HR) = 0.12
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.12
 TOTAL AREA(ACRES) = 147.9 PEAK FLOW RATE(CFS) = 281.10

FLOW PROCESS FROM NODE 413.00 TO NODE 420.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

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>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 796.00 DOWNSTREAM(FEET) = 780.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 63.0 INCH PIPE IS 49.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.37
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 281.10
PIPE TRAVEL TIME(MIN.) = 1.43 Tc(MIN.) = 20.42
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 420.00 = 8300.00 FEET.

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*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 20.42
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.482
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA    Fp      Ap      SCS
LAND USE                GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              A        3.10    0.98    0.100    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 3.10 SUBAREA RUNOFF(CFS) = 6.65
EFFECTIVE AREA(ACRES) = 129.37 AREA-AVERAGED Fm(INCH/HR) = 0.12
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.12
TOTAL AREA(ACRES) = 151.0 PEAK FLOW RATE(CFS) = 281.10
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

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*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 20.42
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.482
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA    Fp      Ap      SCS
LAND USE                GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              A        6.40    0.98    0.100    32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        24.40   0.98    0.500    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.417
SUBAREA AREA(ACRES) = 30.80 SUBAREA RUNOFF(CFS) = 57.53
EFFECTIVE AREA(ACRES) = 160.17 AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 181.8 PEAK FLOW RATE(CFS) = 332.72

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*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 20.42

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* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.482
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA    Fp      Ap      SCS
LAND USE                GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              A        3.30    0.98    0.100    32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        10.80   0.98    0.500    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.406
SUBAREA AREA(ACRES) = 14.10 SUBAREA RUNOFF(CFS) = 26.47
EFFECTIVE AREA(ACRES) = 174.27 AREA-AVERAGED Fm(INCH/HR) = 0.19
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 195.9 PEAK FLOW RATE(CFS) = 359.18

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*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 20.42
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.482
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA    Fp      Ap      SCS
LAND USE                GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              A        1.20    0.98    0.100    32
RESIDENTIAL
"5-7 DWELLINGS/ACRE"   A        2.70    0.98    0.500    32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.377
SUBAREA AREA(ACRES) = 3.90 SUBAREA RUNOFF(CFS) = 7.42
EFFECTIVE AREA(ACRES) = 178.17 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 199.8 PEAK FLOW RATE(CFS) = 366.60

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=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 199.8 TC(MIN.) = 20.42
EFFECTIVE AREA(ACRES) = 178.17 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.201
PEAK FLOW RATE(CFS) = 366.60

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** PEAK FLOW RATE TABLE **

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STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	366.60	20.42	2.482	0.97(0.20)	0.20	178.2	404.00
2	352.20	26.07	2.144	0.97(0.18)	0.19	199.8	400.00

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=====
END OF RATIONAL METHOD ANALYSIS

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B50) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: O8B5025.DAT
TIME/DATE OF STUDY: 16:54 10/17/2011

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / SIDE (FT)	STREET-CROSSFALL OUT- / PARK- WAY (FT)	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF
2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.38
30-MINUTES	0.79
1-HOUR	1.04
3-HOUR	1.87
6-HOUR	2.71
24-HOUR	5.30

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 866.00

Tc = K * [(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.715
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.634
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	6.60	0.98	0.100	32	12.71

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 15.07
TOTAL AREA(ACRES) = 6.60 PEAK FLOW RATE(CFS) = 15.07

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 866.00 DOWNSTREAM ELEVATION(FEET) = 865.00
STREET LENGTH(FEET) = 370.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 31.47
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.69
 HALFSTREET FLOOD WIDTH(FEET) = 28.09
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.14
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.48
 STREET FLOW TRAVEL TIME(MIN.) = 2.89 Tc(MIN.) = 15.60
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.330
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.50	0.98	0.100	32
COMMERCIAL	A	1.80	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 16.30 SUBAREA RUNOFF(CFS) = 32.75
 EFFECTIVE AREA(ACRES) = 22.90 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 22.9 PEAK FLOW RATE(CFS) = 46.02

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.78 HALFSTREET FLOOD WIDTH(FEET) = 36.31
 FLOW VELOCITY(FEET/SEC.) = 2.30 DEPTH*VELOCITY(FT*FT/SEC.) = 1.78
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 370.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 41.8 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 402.00
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 1170.00 FEET.

 FLOW PROCESS FROM NODE 402.00 TO NODE 403.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>(STREET TABLE SECTION # 2 USED)<<<<
 =====

UPSTREAM ELEVATION(FEET) = 865.00 DOWNSTREAM ELEVATION(FEET) = 855.00
 STREET LENGTH(FEET) = 870.00 CURB HEIGHT(INCHES) = 8.0
 STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 70.76
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.71
 HALFSTREET FLOOD WIDTH(FEET) = 29.88

AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.49
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.19
 STREET FLOW TRAVEL TIME(MIN.) = 3.23 Tc(MIN.) = 18.83
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.081
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	24.90	0.98	0.100	32
COMMERCIAL	A	2.80	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 27.70 SUBAREA RUNOFF(CFS) = 49.46
 EFFECTIVE AREA(ACRES) = 50.60 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 50.6 PEAK FLOW RATE(CFS) = 90.34

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.77 HALFSTREET FLOOD WIDTH(FEET) = 35.26
 FLOW VELOCITY(FEET/SEC.) = 4.69 DEPTH*VELOCITY(FT*FT/SEC.) = 3.59
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 870.0 FT WITH ELEVATION-DROP = 10.0 FT, IS 68.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 403.00
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 403.00 = 2040.00 FEET.

 FLOW PROCESS FROM NODE 403.00 TO NODE 410.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 855.00 DOWNSTREAM(FEET) = 830.00
 FLOW LENGTH(FEET) = 1950.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.96
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 90.34
 PIPE TRAVEL TIME(MIN.) = 2.72 Tc(MIN.) = 21.55
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 410.00 = 3990.00 FEET.

 FLOW PROCESS FROM NODE 410.00 TO NODE 410.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====

MAINLINE Tc(MIN.) = 21.55
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.920
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	15.70	0.98	0.100	32
COMMERCIAL	A	17.40	0.98	0.100	32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 33.10 SUBAREA RUNOFF(CFS) = 54.28
 EFFECTIVE AREA(ACRES) = 83.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 83.7 PEAK FLOW RATE(CFS) = 137.26

 FLOW PROCESS FROM NODE 410.00 TO NODE 411.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 830.00 DOWNSTREAM(FEET) = 820.00
 FLOW LENGTH(FEET) = 650.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.26
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 137.26
 PIPE TRAVEL TIME(MIN.) = 0.76 Tc(MIN.) = 22.31
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 411.00 = 4640.00 FEET.

 FLOW PROCESS FROM NODE 411.00 TO NODE 411.00 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.) = 22.31
 RAINFALL INTENSITY(INCH/HR) = 1.88
 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 83.70
 TOTAL STREAM AREA(ACRES) = 83.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 137.26

 FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00
 ELEVATION DATA: UPSTREAM(FEET) = 855.00 DOWNSTREAM(FEET) = 848.00

 $T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.790
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.757
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	8.30	0.98	0.100	32	11.79

 SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 19.86
 TOTAL AREA(ACRES) = 8.30 PEAK FLOW RATE(CFS) = 19.86

 FLOW PROCESS FROM NODE 405.00 TO NODE 406.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 835.00
 FLOW LENGTH(FEET) = 1450.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 17.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.25
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 19.86
 PIPE TRAVEL TIME(MIN.) = 3.33 Tc(MIN.) = 15.12
 LONGEST FLOWPATH FROM NODE 404.00 TO NODE 406.00 = 2300.00 FEET.

 FLOW PROCESS FROM NODE 406.00 TO NODE 406.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<
 =====
 MAINLINE Tc(MIN.) = 15.12
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.374
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	20.00	0.98	0.100	32

 SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 40.98
 EFFECTIVE AREA(ACRES) = 28.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 28.3 PEAK FLOW RATE(CFS) = 57.99

 FLOW PROCESS FROM NODE 406.00 TO NODE 411.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 835.00 DOWNSTREAM(FEET) = 820.00
 FLOW LENGTH(FEET) = 900.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.70
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 57.99
 PIPE TRAVEL TIME(MIN.) = 1.28 Tc(MIN.) = 16.40
 LONGEST FLOWPATH FROM NODE 404.00 TO NODE 411.00 = 3200.00 FEET.

 FLOW PROCESS FROM NODE 411.00 TO NODE 411.00 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.) = 16.40
 RAINFALL INTENSITY(INCH/HR) = 2.26

AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA (ACRES) = 28.30
 TOTAL STREAM AREA (ACRES) = 28.30
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 57.99

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	137.26	22.31	1.880	0.98 (0.10)	0.10	83.7	400.00
2	57.99	16.40	2.261	0.98 (0.10)	0.10	28.3	404.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	180.49	16.40	2.261	0.98 (0.10)	0.10	89.8	404.00
2	185.04	22.31	1.880	0.98 (0.10)	0.10	112.0	400.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 185.04 Tc (MIN.) = 22.31
 EFFECTIVE AREA (ACRES) = 112.00 AREA-AVERAGED Fm (INCH/HR) = 0.10
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 112.0
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 411.00 = 4640.00 FEET.

 FLOW PROCESS FROM NODE 411.00 TO NODE 412.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 820.00 DOWNSTREAM (FEET) = 810.00
 FLOW LENGTH (FEET) = 1080.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 44.2 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 12.55
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 185.04
 PIPE TRAVEL TIME (MIN.) = 1.43 Tc (MIN.) = 23.74
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 412.00 = 5720.00 FEET.

 FLOW PROCESS FROM NODE 412.00 TO NODE 412.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc (MIN.) = 23.74
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.811
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
RESIDENTIAL					

"5-7 DWELLINGS/ACRE"	A	2.70	0.98	0.500	32
COMMERCIAL	A	17.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.139
 SUBAREA AREA (ACRES) = 27.40 SUBAREA RUNOFF (CFS) = 41.31
 EFFECTIVE AREA (ACRES) = 139.40 AREA-AVERAGED Fm (INCH/HR) = 0.11
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
 TOTAL AREA (ACRES) = 139.4 PEAK FLOW RATE (CFS) = 214.05

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp (Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	215.63	17.84	2.150	0.98 (0.11)	0.11	117.2	404.00
2	214.05	23.74	1.811	0.98 (0.11)	0.11	139.4	400.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE (CFS) = 215.63 Tc (MIN.) = 17.84
 AREA-AVERAGED Fm (INCH/HR) = 0.11 AREA-AVERAGED Fp (INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.11 EFFECTIVE AREA (ACRES) = 117.25

 FLOW PROCESS FROM NODE 412.00 TO NODE 413.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<<

ELEVATION DATA: UPSTREAM (FEET) = 810.00 DOWNSTREAM (FEET) = 796.00
 FLOW LENGTH (FEET) = 1260.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 43.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.11
 ESTIMATED PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 215.63
 PIPE TRAVEL TIME (MIN.) = 1.49 Tc (MIN.) = 19.33
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 413.00 = 6980.00 FEET.

 FLOW PROCESS FROM NODE 413.00 TO NODE 413.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<<

MAINLINE Tc (MIN.) = 19.33
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.049
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.30	0.98	0.100	32
RESIDENTIAL					

"5-7 DWELLINGS/ACRE"
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.298
 SUBAREA AREA (ACRES) = 8.50 SUBAREA RUNOFF (CFS) = 13.45
 EFFECTIVE AREA (ACRES) = 125.75 AREA-AVERAGED Fm (INCH/HR) = 0.12
 AREA-AVERAGED Fp (INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.12
 TOTAL AREA (ACRES) = 147.9 PEAK FLOW RATE (CFS) = 218.43

 FLOW PROCESS FROM NODE 413.00 TO NODE 420.00 IS CODE = 31

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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
-----
ELEVATION DATA: UPSTREAM(FEET) = 796.00 DOWNSTREAM(FEET) = 780.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 45.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.39
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 218.43
PIPE TRAVEL TIME(MIN.) = 1.53 Tc(MIN.) = 20.86
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 420.00 = 8300.00 FEET.

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FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
-----
MAINLINE Tc(MIN.) = 20.86
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.957
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE           GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A       3.10   0.98  0.100  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 3.10 SUBAREA RUNOFF(CFS) = 5.19
EFFECTIVE AREA(ACRES) = 128.85 AREA-AVERAGED Fm(INCH/HR) = 0.12
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.12
TOTAL AREA(ACRES) = 151.0 PEAK FLOW RATE(CFS) = 218.43
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

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FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
-----
MAINLINE Tc(MIN.) = 20.86
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.957
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE           GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A       6.40   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       24.40  0.98  0.500  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.417
SUBAREA AREA(ACRES) = 30.80 SUBAREA RUNOFF(CFS) = 42.99
EFFECTIVE AREA(ACRES) = 159.65 AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 181.8 PEAK FLOW RATE(CFS) = 256.26

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FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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=====
MAINLINE Tc(MIN.) = 20.86
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.957
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE           GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A       3.30   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       10.80  0.98  0.500  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.406
SUBAREA AREA(ACRES) = 14.10 SUBAREA RUNOFF(CFS) = 19.81
EFFECTIVE AREA(ACRES) = 173.75 AREA-AVERAGED Fm(INCH/HR) = 0.19
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 195.9 PEAK FLOW RATE(CFS) = 276.07

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*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 20.86
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 1.957
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE           GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A       1.20   0.98  0.100  32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A       2.70   0.98  0.500  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.377
SUBAREA AREA(ACRES) = 3.90 SUBAREA RUNOFF(CFS) = 5.58
EFFECTIVE AREA(ACRES) = 177.65 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 199.8 PEAK FLOW RATE(CFS) = 281.66

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END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 199.8 TC(MIN.) = 20.86
EFFECTIVE AREA(ACRES) = 177.65 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.201
PEAK FLOW RATE(CFS) = 281.66

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** PEAK FLOW RATE TABLE **
STREAM   Q      Tc  Intensity  Fp(Fm)  Ap  Ae  HEADWATER
NUMBER  (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1      281.66  20.86  1.957  0.97( 0.20)  0.20  177.6  404.00
2      269.62  26.80  1.684  0.97( 0.18)  0.19  199.8  400.00

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END OF RATIONAL METHOD ANALYSIS

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B50) *
* 10-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: O8B5010.DAT
TIME/DATE OF STUDY: 16:55 10/17/2011

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIPI (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150
2	32.0	27.0	0.020/0.020/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

DURATION	AREA-AVERAGED RAINFALL(INCH)
5-MINUTES	0.33
30-MINUTES	0.68
1-HOUR	0.90
3-HOUR	1.60
6-HOUR	2.31
24-HOUR	4.36

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

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INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 866.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.715
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.283
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	6.60	0.98	0.100	32	12.71

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 12.98
TOTAL AREA(ACRES) = 6.60 PEAK FLOW RATE(CFS) = 12.98

FLOW PROCESS FROM NODE 401.00 TO NODE 402.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<<

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UPSTREAM ELEVATION(FEET) = 866.00 DOWNSTREAM ELEVATION(FEET) = 865.00
STREET LENGTH(FEET) = 370.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 27.05
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.66
HALFSTREET FLOOD WIDTH(FEET) = 25.28
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.06
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.36
STREET FLOW TRAVEL TIME(MIN.) = 3.00 Tc(MIN.) = 15.71
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.011
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 14.50 0.98 0.100 32
COMMERCIAL A 1.80 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 16.30 SUBAREA RUNOFF(CFS) = 28.07
EFFECTIVE AREA(ACRES) = 22.90 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 22.9 PEAK FLOW RATE(CFS) = 39.43

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.74 HALFSTREET FLOOD WIDTH(FEET) = 32.94
FLOW VELOCITY(FEET/SEC.) = 2.23 DEPTH*VELOCITY(FT*FT/SEC.) = 1.65
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 370.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 36.0 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 402.00
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 402.00 = 1170.00 FEET.

FLOW PROCESS FROM NODE 402.00 TO NODE 403.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<
=====

UPSTREAM ELEVATION(FEET) = 865.00 DOWNSTREAM ELEVATION(FEET) = 855.00
STREET LENGTH(FEET) = 870.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
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) = 60.57
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.68
HALFSTREET FLOOD WIDTH(FEET) = 26.71
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.33
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.94

STREET FLOW TRAVEL TIME(MIN.) = 3.35 Tc(MIN.) = 19.06
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.791
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 24.90 0.98 0.100 32
COMMERCIAL A 2.80 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 27.70 SUBAREA RUNOFF(CFS) = 42.21
EFFECTIVE AREA(ACRES) = 50.60 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 50.6 PEAK FLOW RATE(CFS) = 77.11

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.73 HALFSTREET FLOOD WIDTH(FEET) = 31.78
FLOW VELOCITY(FEET/SEC.) = 4.55 DEPTH*VELOCITY(FT*FT/SEC.) = 3.32
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
AND L = 870.0 FT WITH ELEVATION-DROP = 10.0 FT, IS 59.2 CFS,
WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 403.00
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 403.00 = 2040.00 FEET.

FLOW PROCESS FROM NODE 403.00 TO NODE 410.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
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ELEVATION DATA: UPSTREAM(FEET) = 855.00 DOWNSTREAM(FEET) = 830.00
FLOW LENGTH(FEET) = 1950.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 39.0 INCH PIPE IS 29.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.44
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 77.11
PIPE TRAVEL TIME(MIN.) = 2.84 Tc(MIN.) = 21.90
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 410.00 = 3990.00 FEET.

FLOW PROCESS FROM NODE 410.00 TO NODE 410.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
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MAINLINE Tc(MIN.) = 21.90
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.648
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 15.70 0.98 0.100 32
COMMERCIAL A 17.40 0.98 0.100 32
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 33.10 SUBAREA RUNOFF(CFS) = 46.18
EFFECTIVE AREA(ACRES) = 83.70 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 83.7 PEAK FLOW RATE(CFS) = 116.77

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FLOW PROCESS FROM NODE 410.00 TO NODE 411.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 830.00 DOWNSTREAM(FEET) = 820.00
FLOW LENGTH(FEET) = 650.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.68
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 116.77
PIPE TRAVEL TIME(MIN.) = 0.79 Tc(MIN.) = 22.69
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 411.00 = 4640.00 FEET.

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FLOW PROCESS FROM NODE 411.00 TO NODE 411.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
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TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 22.69
RAINFALL INTENSITY(INCH/HR) = 1.61
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 83.70
TOTAL STREAM AREA(ACRES) = 83.70
PEAK FLOW RATE(CFS) AT CONFLUENCE = 116.77

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FLOW PROCESS FROM NODE 404.00 TO NODE 405.00 IS CODE = 21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00
ELEVATION DATA: UPSTREAM(FEET) = 855.00 DOWNSTREAM(FEET) = 848.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.790
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.389
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL  AREA   Fp   Ap   SCS  Tc
LAND USE           GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL         A      8.30   0.98  0.100  32  11.79
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 17.12
TOTAL AREA(ACRES) = 8.30 PEAK FLOW RATE(CFS) = 17.12

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FLOW PROCESS FROM NODE 405.00 TO NODE 406.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

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>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 848.00 DOWNSTREAM(FEET) = 835.00
FLOW LENGTH(FEET) = 1450.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.89
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 17.12
PIPE TRAVEL TIME(MIN.) = 3.51 Tc(MIN.) = 15.30
LONGEST FLOWPATH FROM NODE 404.00 TO NODE 406.00 = 2300.00 FEET.

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FLOW PROCESS FROM NODE 406.00 TO NODE 406.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 15.30
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.044
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL  AREA   Fp   Ap   SCS
LAND USE           GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         A      20.00   0.98  0.100  32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 35.03
EFFECTIVE AREA(ACRES) = 28.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 28.3 PEAK FLOW RATE(CFS) = 49.57

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FLOW PROCESS FROM NODE 406.00 TO NODE 411.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 835.00 DOWNSTREAM(FEET) = 820.00
FLOW LENGTH(FEET) = 900.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.45
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 49.57
PIPE TRAVEL TIME(MIN.) = 1.31 Tc(MIN.) = 16.61
LONGEST FLOWPATH FROM NODE 404.00 TO NODE 411.00 = 3200.00 FEET.

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FLOW PROCESS FROM NODE 411.00 TO NODE 411.00 IS CODE = 1
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>>>>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.) = 16.61
RAINFALL INTENSITY(INCH/HR) = 1.95
AREA-AVERAGED Fm(INCH/HR) = 0.10
AREA-AVERAGED Fp(INCH/HR) = 0.98

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AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 28.30
 TOTAL STREAM AREA(ACRES) = 28.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 49.57

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	116.77	22.69	1.613	0.98(0.10)	0.10	83.7	400.00
2	49.57	16.61	1.945	0.98(0.10)	0.10	28.3	404.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	153.75	16.61	1.945	0.98(0.10)	0.10	89.5	404.00
2	157.41	22.69	1.613	0.98(0.10)	0.10	112.0	400.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 157.41 Tc(MIN.) = 22.69
 EFFECTIVE AREA(ACRES) = 112.00 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 112.0
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 411.00 = 4640.00 FEET.

FLOW PROCESS FROM NODE 411.00 TO NODE 412.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 820.00 DOWNSTREAM(FEET) = 810.00
 FLOW LENGTH(FEET) = 1080.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.09
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 157.41
 PIPE TRAVEL TIME(MIN.) = 1.49 Tc(MIN.) = 24.18
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 412.00 = 5720.00 FEET.

FLOW PROCESS FROM NODE 412.00 TO NODE 412.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 24.18
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.552
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	6.90	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	2.70	0.98	0.500	32
COMMERCIAL	A	17.80	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.139
 SUBAREA AREA(ACRES) = 27.40 SUBAREA RUNOFF(CFS) = 34.93
 EFFECTIVE AREA(ACRES) = 139.40 AREA-AVERAGED Fm(INCH/HR) = 0.11
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.11
 TOTAL AREA(ACRES) = 139.4 PEAK FLOW RATE(CFS) = 181.59

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	183.22	18.10	1.847	0.98(0.11)	0.11	116.9	404.00
2	181.59	24.18	1.552	0.98(0.11)	0.11	139.4	400.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 183.22 Tc(MIN.) = 18.10
 AREA-AVERAGED Fm(INCH/HR) = 0.11 AREA-AVERAGED Fp(INCH/HR) = 0.98
 AREA-AVERAGED Ap = 0.11 EFFECTIVE AREA(ACRES) = 116.94

FLOW PROCESS FROM NODE 412.00 TO NODE 413.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 810.00 DOWNSTREAM(FEET) = 796.00
 FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 43.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.29
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 183.22
 PIPE TRAVEL TIME(MIN.) = 1.58 Tc(MIN.) = 19.68
 LONGEST FLOWPATH FROM NODE 400.00 TO NODE 413.00 = 6980.00 FEET.

FLOW PROCESS FROM NODE 413.00 TO NODE 413.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE Tc(MIN.) = 19.68
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.757
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.30	0.98	0.100	32
RESIDENTIAL					
"5-7 DWELLINGS/ACRE"	A	4.20	0.98	0.500	32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97					
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.298					
SUBAREA AREA(ACRES) = 8.50					
SUBAREA RUNOFF(CFS) = 11.22					
EFFECTIVE AREA(ACRES) = 125.44					
AREA-AVERAGED Fm(INCH/HR) = 0.12					
AREA-AVERAGED Fp(INCH/HR) = 0.98					
AREA-AVERAGED Ap = 0.12					
TOTAL AREA(ACRES) = 147.9					
PEAK FLOW RATE(CFS) = 184.92					

FLOW PROCESS FROM NODE 413.00 TO NODE 420.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

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>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 796.00 DOWNSTREAM(FEET) = 780.00
FLOW LENGTH(FEET) = 1320.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.86
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 184.92
PIPE TRAVEL TIME(MIN.) = 1.59 Tc(MIN.) = 21.27
LONGEST FLOWPATH FROM NODE 400.00 TO NODE 420.00 = 8300.00 FEET.
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*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
-----
```

```
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
```

```
MAINLINE Tc(MIN.) = 21.27
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.677
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.10 0.98 0.100 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 3.10 SUBAREA RUNOFF(CFS) = 4.41
EFFECTIVE AREA(ACRES) = 128.54 AREA-AVERAGED Fm(INCH/HR) = 0.12
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.12
TOTAL AREA(ACRES) = 151.0 PEAK FLOW RATE(CFS) = 184.92
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
```

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*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
-----
```

```
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
```

```
MAINLINE Tc(MIN.) = 21.27
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.677
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 6.40 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 24.40 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.97
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.417
SUBAREA AREA(ACRES) = 30.80 SUBAREA RUNOFF(CFS) = 35.22
EFFECTIVE AREA(ACRES) = 159.34 AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 181.8 PEAK FLOW RATE(CFS) = 215.53
```

```
*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
-----
```

```
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
```

```
MAINLINE Tc(MIN.) = 21.27
```

```
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.677
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 3.30 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 10.80 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.406
SUBAREA AREA(ACRES) = 14.10 SUBAREA RUNOFF(CFS) = 16.25
EFFECTIVE AREA(ACRES) = 173.44 AREA-AVERAGED Fm(INCH/HR) = 0.19
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 195.9 PEAK FLOW RATE(CFS) = 231.78
```

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*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.00 IS CODE = 81
-----
```

```
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
```

```
MAINLINE Tc(MIN.) = 21.27
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.677
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL A 1.20 0.98 0.100 32
RESIDENTIAL
"5-7 DWELLINGS/ACRE" A 2.70 0.98 0.500 32
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.377
SUBAREA AREA(ACRES) = 3.90 SUBAREA RUNOFF(CFS) = 4.60
EFFECTIVE AREA(ACRES) = 177.34 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 199.8 PEAK FLOW RATE(CFS) = 236.37
```

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=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 199.8 TC(MIN.) = 21.27
EFFECTIVE AREA(ACRES) = 177.34 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.201
PEAK FLOW RATE(CFS) = 236.37
```

```
** PEAK FLOW RATE TABLE **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 236.37 21.27 1.677 0.98(0.20) 0.20 177.3 404.00
2 226.03 27.35 1.442 0.97(0.18) 0.19 199.8 400.00
=====
```

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END OF RATIONAL METHOD ANALYSIS
```

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B60) *
* 100-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: O8B60100.DAT
TIME/DATE OF STUDY: 17:00 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF-CROWN TO WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY, CURB HEIGHT (FT), GUTTER-GEOMETRIES: WIDTH (FT), LIP (FT), HIKE (FT), MANNING FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

AREA-AVERAGED

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES (0.48), 30-MINUTES (0.99), 1-HOUR (1.30), 3-HOUR (2.39), 6-HOUR (3.50), 24-HOUR (7.00).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00
ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 860.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.978

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.602

SUBAREA Tc AND LOSS RATE DATA(AMC II):

Table with columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL A (1.30, 7.70, 0.80), COMMERCIAL A (1.30, 7.70, 0.80), COMMERCIAL A (0.80).

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 30.91

TOTAL AREA(ACRES) = 9.80 PEAK FLOW RATE(CFS) = 30.91

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION(FEET) = 860.00 DOWNSTREAM ELEVATION(FEET) = 844.00
STREET LENGTH(FEET) = 1240.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 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) = 74.83
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.71
 HALFSTREET FLOOD WIDTH(FEET) = 29.88
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.75
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.38
 STREET FLOW TRAVEL TIME(MIN.) = 4.35 Tc(MIN.) = 15.33
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.948

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.40	0.98	0.100	32
COMMERCIAL	A	29.70	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 34.10 SUBAREA RUNOFF(CFS) = 87.47
 EFFECTIVE AREA(ACRES) = 43.90 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 43.9 PEAK FLOW RATE(CFS) = 112.60

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.80 HALFSTREET FLOOD WIDTH(FEET) = 38.73
 FLOW VELOCITY(FEET/SEC.) = 5.13 DEPTH*VELOCITY(FT*FT/SEC.) = 4.11
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1240.0 FT WITH ELEVATION-DROP = 16.0 FT, IS 99.1 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 502.00
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 2090.00 FEET.

 FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 844.00 DOWNSTREAM(FEET) = 840.00
 FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.37
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 112.60
 PIPE TRAVEL TIME(MIN.) = 1.19 Tc(MIN.) = 16.52
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 2760.00 FEET.

 FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 16.52
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.818
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.90	0.98	0.100	32
COMMERCIAL	A	22.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 26.40 SUBAREA RUNOFF(CFS) = 64.64
 EFFECTIVE AREA(ACRES) = 70.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 70.3 PEAK FLOW RATE(CFS) = 172.13

 FLOW PROCESS FROM NODE 503.00 TO NODE 504.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 840.00 DOWNSTREAM(FEET) = 820.00
 FLOW LENGTH(FEET) = 1090.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.79
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 172.13
 PIPE TRAVEL TIME(MIN.) = 1.15 Tc(MIN.) = 17.68
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 504.00 = 3850.00 FEET.

 FLOW PROCESS FROM NODE 504.00 TO NODE 504.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

 MAINLINE Tc(MIN.) = 17.68
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.707
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	40.00	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 90.42
 EFFECTIVE AREA(ACRES) = 110.30 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.14
 TOTAL AREA(ACRES) = 110.3 PEAK FLOW RATE(CFS) = 255.49

 FLOW PROCESS FROM NODE 504.00 TO NODE 505.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 820.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 1560.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 50.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.70
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 255.49
 PIPE TRAVEL TIME(MIN.) = 1.90 Tc(MIN.) = 19.57
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 505.00 = 5410.00 FEET.

AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
 TOTAL AREA(ACRES) = 211.2 PEAK FLOW RATE(CFS) = 416.97

 FLOW PROCESS FROM NODE 505.00 TO NODE 505.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 19.57
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.546
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.60	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	33.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.378
 SUBAREA AREA(ACRES) = 47.80 SUBAREA RUNOFF(CFS) = 93.68
 EFFECTIVE AREA(ACRES) = 158.10 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
 TOTAL AREA(ACRES) = 158.1 PEAK FLOW RATE(CFS) = 333.21

 FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 805.00 DOWNSTREAM(FEET) = 792.00
 FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 69.0 INCH PIPE IS 54.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.07
 ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 333.21
 PIPE TRAVEL TIME(MIN.) = 1.39 Tc(MIN.) = 20.97
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 506.00 = 6670.00 FEET.

 FLOW PROCESS FROM NODE 506.00 TO NODE 506.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 20.97
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.443
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.10	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	39.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394
 SUBAREA AREA(ACRES) = 53.10 SUBAREA RUNOFF(CFS) = 98.40
 EFFECTIVE AREA(ACRES) = 211.20 AREA-AVERAGED Fm(INCH/HR) = 0.25

 FLOW PROCESS FROM NODE 506.00 TO NODE 507.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 792.00 DOWNSTREAM(FEET) = 782.00
 FLOW LENGTH(FEET) = 1280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 81.0 INCH PIPE IS 60.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.51
 ESTIMATED PIPE DIAMETER(INCH) = 81.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 416.97
 PIPE TRAVEL TIME(MIN.) = 1.47 Tc(MIN.) = 22.44
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 507.00 = 7950.00 FEET.

 FLOW PROCESS FROM NODE 507.00 TO NODE 507.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 22.44
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.346
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.00	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	19.20	0.98	0.500	32
SCHOOL	A	9.50	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.448
 SUBAREA AREA(ACRES) = 35.70 SUBAREA RUNOFF(CFS) = 61.33
 EFFECTIVE AREA(ACRES) = 246.90 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.28
 TOTAL AREA(ACRES) = 246.9 PEAK FLOW RATE(CFS) = 459.80

=====

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 246.9 TC(MIN.) = 22.44
 EFFECTIVE AREA(ACRES) = 246.90 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.284
 PEAK FLOW RATE(CFS) = 459.80

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B60) *
* 25-YEAR HYDROLOGY ANALYSIS *
* *

FILE NAME: O8B6025.DAT
TIME/DATE OF STUDY: 17:01 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.900
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.300
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.0385
SLOPE OF INTENSITY DURATION CURVE = 0.6000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., WIDTH (FT), CROSSFALL (FT), IN- / OUT- / PARK- SIDE / SIDE/ WAY, HEIGHT (FT), CURB GUTTER-GEOMETRIES: MANNING, LIP HIKE (FT), FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.

USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH(INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH(INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH(INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH(INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, RAINFALL(INCH). Rows: 5-MINUTES (0.38), 30-MINUTES (0.79), 1-HOUR (1.04), 3-HOUR (1.87), 6-HOUR (2.71), 24-HOUR (5.30).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00
ELEVATION DATA: UPSTREAM(FEET) = 870.00 DOWNSTREAM(FEET) = 860.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.978
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.877

Table with columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL A 1.30 0.98 0.100 32 10.98, COMMERCIAL A 7.70 0.98 0.100 32 10.98, COMMERCIAL A 0.80 0.98 0.100 32 10.98.

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 24.52

TOTAL AREA(ACRES) = 9.80 PEAK FLOW RATE(CFS) = 24.52

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

=====
UPSTREAM ELEVATION(FEET) = 860.00 DOWNSTREAM ELEVATION(FEET) = 844.00
STREET LENGTH(FEET) = 1240.00 CURB HEIGHT(INCHES) = 8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 27.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 59.00

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.66

HALFSTREET FLOOD WIDTH(FEET) = 25.22

AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.50

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.98

STREET FLOW TRAVEL TIME(MIN.) = 4.59 Tc(MIN.) = 15.57

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.333

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.40	0.98	0.100	32
COMMERCIAL	A	29.70	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 34.10 SUBAREA RUNOFF(CFS) = 68.61

EFFECTIVE AREA(ACRES) = 43.90 AREA-AVERAGED Fm(INCH/HR) = 0.10

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 43.9 PEAK FLOW RATE(CFS) = 88.33

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.75 HALFSTREET FLOOD WIDTH(FEET) = 33.46

FLOW VELOCITY(FEET/SEC.) = 4.90 DEPTH*VELOCITY(FT*FT/SEC.) = 3.66

*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,

AND L = 1240.0 FT WITH ELEVATION-DROP = 16.0 FT, IS 78.6 CFS,

WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 502.00

LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 2090.00 FEET.

FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 844.00 DOWNSTREAM(FEET) = 840.00

FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.3 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 8.93

ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 88.33

PIPE TRAVEL TIME(MIN.) = 1.25 Tc(MIN.) = 16.82

LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 2760.00 FEET.

FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 16.82

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.227

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.90	0.98	0.100	32
COMMERCIAL	A	22.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 26.40 SUBAREA RUNOFF(CFS) = 50.61

EFFECTIVE AREA(ACRES) = 70.30 AREA-AVERAGED Fm(INCH/HR) = 0.10

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 70.3 PEAK FLOW RATE(CFS) = 134.76

FLOW PROCESS FROM NODE 503.00 TO NODE 504.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 840.00 DOWNSTREAM(FEET) = 820.00

FLOW LENGTH(FEET) = 1090.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.0 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 15.05

ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 134.76

PIPE TRAVEL TIME(MIN.) = 1.21 Tc(MIN.) = 18.03

LONGEST FLOWPATH FROM NODE 500.00 TO NODE 504.00 = 3850.00 FEET.

FLOW PROCESS FROM NODE 504.00 TO NODE 504.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

MAINLINE Tc(MIN.) = 18.03

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.137

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
RESIDENTIAL	A	40.00	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200

SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 69.90

EFFECTIVE AREA(ACRES) = 110.30 AREA-AVERAGED Fm(INCH/HR) = 0.13

AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.14

TOTAL AREA(ACRES) = 110.3 PEAK FLOW RATE(CFS) = 198.93

FLOW PROCESS FROM NODE 504.00 TO NODE 505.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 820.00 DOWNSTREAM(FEET) = 805.00

FLOW LENGTH(FEET) = 1560.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 57.0 INCH PIPE IS 46.6 INCHES

PIPE-FLOW VELOCITY (FEET/SEC.) = 12.82
 ESTIMATED PIPE DIAMETER (INCH) = 57.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 198.93
 PIPE TRAVEL TIME (MIN.) = 2.03 Tc (MIN.) = 20.05
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 505.00 = 5410.00 FEET.

SUBAREA AREA (ACRES) = 53.10 SUBAREA RUNOFF (CFS) = 73.42
 EFFECTIVE AREA (ACRES) = 211.20 AREA-AVERAGED Fm (INCH/HR) = 0.25
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
 TOTAL AREA (ACRES) = 211.2 PEAK FLOW RATE (CFS) = 317.63

 FLOW PROCESS FROM NODE 505.00 TO NODE 505.00 IS CODE = 81

>>>> ADDITION OF SUBAREA TO MAINLINE PEAK FLOW <<<<<

=====

MAINLINE Tc (MIN.) = 20.05
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 2.004
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.60	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	33.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.378
 SUBAREA AREA (ACRES) = 47.80 SUBAREA RUNOFF (CFS) = 70.38
 EFFECTIVE AREA (ACRES) = 158.10 AREA-AVERAGED Fm (INCH/HR) = 0.20
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
 TOTAL AREA (ACRES) = 158.1 PEAK FLOW RATE (CFS) = 256.15

 FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 31

>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<<<
 >>>> USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 805.00 DOWNSTREAM (FEET) = 792.00
 FLOW LENGTH (FEET) = 1260.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 49.0 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 14.17
 ESTIMATED PIPE DIAMETER (INCH) = 63.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 256.15
 PIPE TRAVEL TIME (MIN.) = 1.48 Tc (MIN.) = 21.54
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 506.00 = 6670.00 FEET.

 FLOW PROCESS FROM NODE 506.00 TO NODE 506.00 IS CODE = 81

>>>> ADDITION OF SUBAREA TO MAINLINE PEAK FLOW <<<<<

=====

MAINLINE Tc (MIN.) = 21.54
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.920
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.10	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	39.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394

 FLOW PROCESS FROM NODE 506.00 TO NODE 507.00 IS CODE = 31

>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<<<
 >>>> USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 792.00 DOWNSTREAM (FEET) = 782.00
 FLOW LENGTH (FEET) = 1280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 72.0 INCH PIPE IS 55.9 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 13.47
 ESTIMATED PIPE DIAMETER (INCH) = 72.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 317.63
 PIPE TRAVEL TIME (MIN.) = 1.58 Tc (MIN.) = 23.12
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 507.00 = 7950.00 FEET.

 FLOW PROCESS FROM NODE 507.00 TO NODE 507.00 IS CODE = 81

>>>> ADDITION OF SUBAREA TO MAINLINE PEAK FLOW <<<<<

=====

MAINLINE Tc (MIN.) = 23.12
 * 25 YEAR RAINFALL INTENSITY (INCH/HR) = 1.840
 SUBAREA LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.00	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	19.20	0.98	0.500	32
SCHOOL	A	9.50	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.448
 SUBAREA AREA (ACRES) = 35.70 SUBAREA RUNOFF (CFS) = 45.09
 EFFECTIVE AREA (ACRES) = 246.90 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.28
 TOTAL AREA (ACRES) = 246.9 PEAK FLOW RATE (CFS) = 347.51

=====

END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 246.9 TC (MIN.) = 23.12
 EFFECTIVE AREA (ACRES) = 246.90 AREA-AVERAGED Fm (INCH/HR) = 0.28
 AREA-AVERAGED Fp (INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.284
 PEAK FLOW RATE (CFS) = 347.51

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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***** DESCRIPTION OF STUDY *****

* ONTARIO MASTER PLAN OF DRAINAGE - BASIN VIII (AREA B60) *
* 10-YEAR HYDROLOGY ANALYSIS *
*

FILE NAME: O8B6010.DAT
TIME/DATE OF STUDY: 17:02 10/17/2011

=====
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT (YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE (INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.80
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE (LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY (INCH/HOUR) = 0.9000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

Table with columns: NO., HALF WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-/OUT-SIDE, CURB HEIGHT (FT), GUTTER WIDTH (FT), GEOMETRIES LIP (FT), MANNING HIKE (FT), FACTOR (n). Rows 1 and 2.

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

UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:

WATERSHED LAG = 0.80 * Tc
USED "VALLEY UNDEVELOPED" S-GRAPH FOR DEVELOPMENTS OF

2 UNITS/ACRE AND LESS; AND "VALLEY DEVELOPED" S-GRAPH
FOR DEVELOPMENTS OF 3-4 UNITS/ACRE AND MORE.
USER SPECIFIED RAINFALL VALUES:

2-YR 6-HR RAINFALL DEPTH (INCH) = 1.40
2-YR 24-HR RAINFALL DEPTH (INCH) = 2.50
100-YR 6-HR RAINFALL DEPTH (INCH) = 3.50
100-YR 24-HR RAINFALL DEPTH (INCH) = 7.00
SIERRA MADRE DEPTH-AREA FACTORS USED.

Table with columns: DURATION, AREA-AVERAGED RAINFALL (INCH). Rows: 5-MINUTES (0.33), 30-MINUTES (0.68), 1-HOUR (0.90), 3-HOUR (1.60), 6-HOUR (2.31), 24-HOUR (4.36).

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR UNIT HYDROGRAPH METHOD

FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH (FEET) = 850.00
ELEVATION DATA: UPSTREAM (FEET) = 870.00 DOWNSTREAM (FEET) = 860.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 10.978
* 10 YEAR RAINFALL INTENSITY (INCH/HR) = 2.494

Table with columns: DEVELOPMENT TYPE/LAND USE, SCS SOIL GROUP, AREA (ACRES), Fp (INCH/HR), Ap (DECIMAL), SCS CN, Tc (MIN.). Rows: COMMERCIAL (1.30, 7.70, 0.80), SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (0.98), SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap (0.100), SUBAREA RUNOFF (CFS) = 21.13, TOTAL AREA (ACRES) = 9.80, PEAK FLOW RATE (CFS) = 21.13.

FLOW PROCESS FROM NODE 501.00 TO NODE 502.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STREET TABLE SECTION # 2 USED)<<<<<

UPSTREAM ELEVATION (FEET) = 860.00 DOWNSTREAM ELEVATION (FEET) = 844.00
STREET LENGTH (FEET) = 1240.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 27.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALfstREETS CARRYING RUNOFF = 2
 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) = 50.63
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.63
 HALfstREET FLOOD WIDTH(FEET) = 23.80
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.32
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.74
 STREET FLOW TRAVEL TIME(MIN.) = 4.78 Tc(MIN.) = 15.76
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.007

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	4.40	0.98	0.100	32
COMMERCIAL	A	29.70	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 34.10 SUBAREA RUNOFF(CFS) = 58.62
 EFFECTIVE AREA(ACRES) = 43.90 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 43.9 PEAK FLOW RATE(CFS) = 75.46

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71 HALfstREET FLOOD WIDTH(FEET) = 30.09
 FLOW VELOCITY(FEET/SEC.) = 4.75 DEPTH*VELOCITY(FT*FT/SEC.) = 3.39
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
 AND L = 1240.0 FT WITH ELEVATION-DROP = 16.0 FT, IS 67.7 CFS,
 WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE 502.00
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 2090.00 FEET.

 FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 844.00 DOWNSTREAM(FEET) = 840.00
 FLOW LENGTH(FEET) = 670.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.57
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 75.46
 PIPE TRAVEL TIME(MIN.) = 1.30 Tc(MIN.) = 17.06
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 2760.00 FEET.

 FLOW PROCESS FROM NODE 503.00 TO NODE 503.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====
 MAINLINE Tc(MIN.) = 17.06
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.914
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	3.90	0.98	0.100	32
COMMERCIAL	A	22.50	0.98	0.100	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 26.40 SUBAREA RUNOFF(CFS) = 43.16
 EFFECTIVE AREA(ACRES) = 70.30 AREA-AVERAGED Fm(INCH/HR) = 0.10
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 70.3 PEAK FLOW RATE(CFS) = 114.93

 FLOW PROCESS FROM NODE 503.00 TO NODE 504.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 840.00 DOWNSTREAM(FEET) = 820.00
 FLOW LENGTH(FEET) = 1090.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.41
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 114.93
 PIPE TRAVEL TIME(MIN.) = 1.26 Tc(MIN.) = 18.32
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 504.00 = 3850.00 FEET.

 FLOW PROCESS FROM NODE 504.00 TO NODE 504.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====
 MAINLINE Tc(MIN.) = 18.32
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.834
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
RESIDENTIAL "11+ DWELLINGS/ACRE"	A	40.00	0.98	0.200	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.200
 SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 59.00
 EFFECTIVE AREA(ACRES) = 110.30 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.14
 TOTAL AREA(ACRES) = 110.3 PEAK FLOW RATE(CFS) = 168.86

 FLOW PROCESS FROM NODE 504.00 TO NODE 505.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 ELEVATION DATA: UPSTREAM(FEET) = 820.00 DOWNSTREAM(FEET) = 805.00
 FLOW LENGTH(FEET) = 1560.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 54.0 INCH PIPE IS 43.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.36
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 168.86
 PIPE TRAVEL TIME(MIN.) = 2.10 Tc(MIN.) = 20.42
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 505.00 = 5410.00 FEET.

AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.26
 TOTAL AREA(ACRES) = 211.2 PEAK FLOW RATE(CFS) = 265.27

 FLOW PROCESS FROM NODE 505.00 TO NODE 505.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc(MIN.) = 20.42
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.718
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.60	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	33.20	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.378
 SUBAREA AREA(ACRES) = 47.80 SUBAREA RUNOFF(CFS) = 58.06
 EFFECTIVE AREA(ACRES) = 158.10 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.21
 TOTAL AREA(ACRES) = 158.1 PEAK FLOW RATE(CFS) = 215.43

 FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

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ELEVATION DATA: UPSTREAM(FEET) = 805.00 DOWNSTREAM(FEET) = 792.00
 FLOW LENGTH(FEET) = 1260.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 44.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.66
 ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 215.43
 PIPE TRAVEL TIME(MIN.) = 1.54 Tc(MIN.) = 21.96
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 506.00 = 6670.00 FEET.

 FLOW PROCESS FROM NODE 506.00 TO NODE 506.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc(MIN.) = 21.96
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.645
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	14.10	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	39.00	0.98	0.500	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.394
 SUBAREA AREA(ACRES) = 53.10 SUBAREA RUNOFF(CFS) = 60.26
 EFFECTIVE AREA(ACRES) = 211.20 AREA-AVERAGED Fm(INCH/HR) = 0.25

 FLOW PROCESS FROM NODE 506.00 TO NODE 507.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<<<

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ELEVATION DATA: UPSTREAM(FEET) = 792.00 DOWNSTREAM(FEET) = 782.00
 FLOW LENGTH(FEET) = 1280.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 54.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.74
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 265.27
 PIPE TRAVEL TIME(MIN.) = 1.67 Tc(MIN.) = 23.64
 LONGEST FLOWPATH FROM NODE 500.00 TO NODE 507.00 = 7950.00 FEET.

 FLOW PROCESS FROM NODE 507.00 TO NODE 507.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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MAINLINE Tc(MIN.) = 23.64
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.574
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	7.00	0.98	0.100	32
RESIDENTIAL "5-7 DWELLINGS/ACRE"	A	19.20	0.98	0.500	32
SCHOOL	A	9.50	0.98	0.600	32

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.448
 SUBAREA AREA(ACRES) = 35.70 SUBAREA RUNOFF(CFS) = 36.53
 EFFECTIVE AREA(ACRES) = 246.90 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.28
 TOTAL AREA(ACRES) = 246.9 PEAK FLOW RATE(CFS) = 288.31

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END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 246.9 TC(MIN.) = 23.64
 EFFECTIVE AREA(ACRES) = 246.90 AREA-AVERAGED Fm(INCH/HR) = 0.28
 AREA-AVERAGED Fp(INCH/HR) = 0.97 AREA-AVERAGED Ap = 0.284
 PEAK FLOW RATE(CFS) = 288.31

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END OF RATIONAL METHOD ANALYSIS