



*Hall & Foreman, Inc.*

CIVIL ENGINEERING • LAND PLANNING • LAND SURVEYING

MASTER STORM DRAIN  
HYDROLOGY CALCS.

FOR  
THE CITY OF FONTANA

VOL. II

BY  
HALL & FOREMAN, INC.  
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MAY, 1992

JOB #4042  
HYDRCALC

**MASTER STORM DRAINAGE PLAN  
REFERENCE INDEX  
(ALL VOLUMES)**

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**Volume III**

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\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
Copyright 1983,86,87 Advanced Engineering Software (aes)  
Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* FONTANA MASTER STORM DRAIN PLAN, HAWKER 1 LINE, LINE "A"  
\* Q 100-YEAR  
\* JN3547  
\*\*\*\*\*

FILE NAME: HAWKER1.DAT

TIME/DATE OF STUDY: 1: 4 1/ 1/1980

=====

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 =  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.500  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.5000  
SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*  
FLOW PROCESS FROM NODE 501.00 TO NODE 501.10 IS CODE = 2  
-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1985.00  
DOWNSTREAM ELEVATION = 1955.00  
ELEVATION DIFFERENCE = 30.00  
TC = .412\*[( 1000.00\*\* 3.00)/( 30.00)]\*\* .20 = 13.167  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.726  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA RUNOFF(CFS) = 28.30  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 28.30

\*\*\*\*\*  
FLOW PROCESS FROM NODE 501.10 TO NODE 501.20 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

DEPTH OF FLOW IN	21.0 INCH PIPE IS	16.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	14.0
UPSTREAM NODE ELEVATION	=	1955.00
DOWNSTREAM NODE ELEVATION	=	1944.00
FLOWLENGTH(FEET)	=	300.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	21.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	28.30
TRAVEL TIME(MIN.)	=	.36
TC(MIN.)	=	13.52

\*\*\*\*\*  
FLOW PROCESS FROM NODE 502.00 TO NODE 501.20 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.667
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	10.00
SUBAREA RUNOFF(CFS)	=	27.77
EFFECTIVE AREA(ACRES)	=	20.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	20.00
PEAK FLOW RATE(CFS)	=	55.53
TC(MIN)	=	13.52

\*\*\*\*\*  
FLOW PROCESS FROM NODE 501.20 TO NODE 501.30 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

DEPTH OF FLOW IN	30.0 INCH PIPE IS	21.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	14.8
UPSTREAM NODE ELEVATION	=	1944.00
DOWNSTREAM NODE ELEVATION	=	1931.00
FLOWLENGTH(FEET)	=	500.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	30.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	55.53
TRAVEL TIME(MIN.)	=	.56
TC(MIN.)	=	14.09

\*\*\*\*\*  
FLOW PROCESS FROM NODE 503.00 TO NODE 501.30 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.578
SOIL CLASSIFICATION IS	"A"	

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 53.93  
 EFFECTIVE AREA(ACRES) = 40.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 40.00  
 PEAK FLOW RATE(CFS) = 107.87  
 TC(MIN) = 14.09

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 501.30 TO NODE 501.40 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 39.0 INCH PIPE IS 26.9 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 17.7  
 UPSTREAM NODE ELEVATION = 1931.00  
 DOWNSTREAM NODE ELEVATION = 1923.00  
 FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 107.87  
 TRAVEL TIME(MIN.) = .28 TC(MIN.) = 14.37

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 504.00 TO NODE 501.40 IS CODE = 8  
 -----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.536  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 36.00 SUBAREA RUNOFF(CFS) = 95.71  
 EFFECTIVE AREA(ACRES) = 76.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 76.00  
 PEAK FLOW RATE(CFS) = 202.04  
 TC(MIN) = 14.37

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 501.40 TO NODE 501.50 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.1 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 21.3  
 UPSTREAM NODE ELEVATION = 1923.00  
 DOWNSTREAM NODE ELEVATION = 1900.00  
 FLOWLENGTH(FEET) = 750.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 202.04  
 TRAVEL TIME(MIN.) = .59 TC(MIN.) = 14.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 505.00 TO NODE 501.50 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.452  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 31.00 SUBAREA RUNOFF(CFS) = 80.07  
EFFECTIVE AREA(ACRES) = 107.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 107.00  
PEAK FLOW RATE(CFS) = 276.38  
TC(MIN) = 14.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 506.00 TO NODE 501.50 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.452  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 22.00 SUBAREA RUNOFF(CFS) = 56.83  
EFFECTIVE AREA(ACRES) = 129.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 129.00  
PEAK FLOW RATE(CFS) = 333.20  
TC(MIN) = 14.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 501.50 TO NODE 501.60 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 25.0  
UPSTREAM NODE ELEVATION = 1900.00  
DOWNSTREAM NODE ELEVATION = 1857.00  
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 333.20  
TRAVEL TIME(MIN.) = .87 TC(MIN.) = 15.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 507.00 TO NODE 501.60 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.337  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 99.18  
 EFFECTIVE AREA(ACRES) = 169.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 169.00  
 PEAK FLOW RATE(CFS) = 419.04  
 TC(MIN) = 15.83

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 508.00 TO NODE 501.60 IS CODE = 8  
 -----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.337  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 99.18  
 EFFECTIVE AREA(ACRES) = 209.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 209.00  
 PEAK FLOW RATE(CFS) = 518.22  
 TC(MIN) = 15.83

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 501.60 TO NODE 501.80 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 66.0 INCH PIPE IS 49.4 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 27.2  
 UPSTREAM NODE ELEVATION = 1857.00  
 DOWNSTREAM NODE ELEVATION = 1817.00  
 FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 518.22  
 TRAVEL TIME(MIN.) = .81 TC(MIN.) = 16.64

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 509.00 TO NODE 501.80 IS CODE = 8  
 -----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.239  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 43.00 SUBAREA RUNOFF(CFS) = 102.81  
 EFFECTIVE AREA(ACRES) = 252.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 252.00

PEAK FLOW RATE(CFS) = 602.53  
TC(MIN) = 16.64

\*\*\*\*\*  
FLOW PROCESS FROM NODE 501.80 TO NODE 510.10 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

PIPEFLOW VELOCITY(FEET/SEC.)	=	10.6
UPSTREAM NODE ELEVATION	=	1817.00
DOWNSTREAM NODE ELEVATION	=	1815.00
FLOWLENGTH(FEET)	=	1300.00
MANNINGS N	=	.013
GIVEN PIPE DIAMETER(INCH)	=	102.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	602.53
TRAVEL TIME(MIN.)	=	2.04
TC(MIN.)	=	18.68

\*\*\*\*\*  
FLOW PROCESS FROM NODE 510.00 TO NODE 510.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.021
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	40.00
SUBAREA RUNOFF(CFS)	=	87.82
EFFECTIVE AREA(ACRES)	=	292.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	292.00
PEAK FLOW RATE(CFS)	=	641.08
TC(MIN)	=	18.68

\*\*\*\*\*  
FLOW PROCESS FROM NODE 510.10 TO NODE 510.20 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

PIPEFLOW VELOCITY(FEET/SEC.)	=	11.3
UPSTREAM NODE ELEVATION	=	1815.00
DOWNSTREAM NODE ELEVATION	=	1811.00
FLOWLENGTH(FEET)	=	1280.00
MANNINGS N	=	.013
GIVEN PIPE DIAMETER(INCH)	=	102.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	641.08
TRAVEL TIME(MIN.)	=	1.89
TC(MIN.)	=	20.56

\*\*\*\*\*  
FLOW PROCESS FROM NODE 510.20 TO NODE 510.20 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 20.56  
RAINFALL INTENSITY (INCH./HOUR) = 2.85  
EFFECTIVE STREAM AREA(ACRES) = 292.00  
TOTAL STREAM AREA(ACRES) = 292.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 641.08

\*\*\*\*\*

FLOW PROCESS FROM NODE 511.00 TO NODE 511.00 IS CODE = 2

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<  
=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1980.00  
DOWNSTREAM ELEVATION = 1950.00  
ELEVATION DIFFERENCE = 30.00  
TC =  $.412 * [(1000.00 ** 3.00) / (30.00)] ** .20 = 13.167$   
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.726  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA RUNOFF(CFS) = 28.30  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 28.30

\*\*\*\*\*

FLOW PROCESS FROM NODE 511.00 TO NODE 511.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 15.0  
UPSTREAM NODE ELEVATION = 1950.00  
DOWNSTREAM NODE ELEVATION = 1920.00  
FLOWLENGTH(FEET) = 700.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 28.30  
TRAVEL TIME(MIN.) = .78 TC(MIN.) = 13.94

\*\*\*\*\*

FLOW PROCESS FROM NODE 512.00 TO NODE 511.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.600  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 27.17  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 54.33  
TC(MIN) = 13.94

\*\*\*\*\*  
FLOW PROCESS FROM NODE 511.10 TO NODE 513.10 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

DEPTH OF FLOW IN	33.0 INCH PIPE IS	25.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	11.0
UPSTREAM NODE ELEVATION	=	1920.00
DOWNSTREAM NODE ELEVATION	=	1915.00
FLOWLENGTH(FEET)	=	400.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	33.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	54.33
TRAVEL TIME(MIN.)	=	.60
TC(MIN.)	=	14.55

\*\*\*\*\*  
FLOW PROCESS FROM NODE 513.00 TO NODE 513.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.510
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	12.00
SUBAREA RUNOFF(CFS)	=	31.62
EFFECTIVE AREA(ACRES)	=	32.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	32.00
PEAK FLOW RATE(CFS)	=	84.33
TC(MIN)	=	14.55

\*\*\*\*\*  
FLOW PROCESS FROM NODE 513.10 TO NODE 514.10 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

DEPTH OF FLOW IN	33.0 INCH PIPE IS	23.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	18.5
UPSTREAM NODE ELEVATION	=	1915.00
DOWNSTREAM NODE ELEVATION	=	1890.00
FLOWLENGTH(FEET)	=	700.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	33.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	84.33
TRAVEL TIME(MIN.)	=	.63
TC(MIN.)	=	15.18

\*\*\*\*\*  
FLOW PROCESS FROM NODE 514.00 TO NODE 514.10 IS CODE = 8



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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.422  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 51.11  
EFFECTIVE AREA(ACRES) = 52.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 52.00  
PEAK FLOW RATE(CFS) = 132.89  
TC(MIN) = 15.18

\*\*\*\*\*  
FLOW PROCESS FROM NODE 519.00 TO NODE 514.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.422  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 37.00 SUBAREA RUNOFF(CFS) = 94.56  
EFFECTIVE AREA(ACRES) = 89.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 89.00  
PEAK FLOW RATE(CFS) = 227.45  
TC(MIN) = 15.18

\*\*\*\*\*  
FLOW PROCESS FROM NODE 514.10 TO NODE 515.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 48.0 INCH PIPE IS 36.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 22.2  
UPSTREAM NODE ELEVATION = 1890.00  
DOWNSTREAM NODE ELEVATION = 1850.00  
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 227.45  
TRAVEL TIME(MIN.) = .98 TC(MIN.) = 16.16

\*\*\*\*\*  
FLOW PROCESS FROM NODE 515.00 TO NODE 515.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.296  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 97.70

EFFECTIVE AREA(ACRES) = 129.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 129.00  
 PEAK FLOW RATE(CFS) = 315.09  
 TC(MIN) = 16.16

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 515.10 TO NODE 510.20 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.0 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 23.8  
 UPSTREAM NODE ELEVATION = 1850.00  
 DOWNSTREAM NODE ELEVATION = 1811.00  
 FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 315.09  
 TRAVEL TIME(MIN.) = .91 TC(MIN.) = 17.07

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 516.00 TO NODE 510.20 IS CODE = 8  
 -----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.189  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 93.85  
 EFFECTIVE AREA(ACRES) = 169.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 169.00  
 PEAK FLOW RATE(CFS) = 396.54  
 TC(MIN) = 17.07

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 510.20 TO NODE 510.20 IS CODE = 1  
 -----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 17.07  
 RAINFALL INTENSITY (INCH./HOUR) = 3.19  
 EFFECTIVE STREAM AREA(ACRES) = 169.00  
 TOTAL STREAM AREA(ACRES) = 169.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 396.54

#### CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
------------------	------------------------	----------------	--------------------------	---------------	--------------------------

1	641.08	20.56	2.852	.58	292.00
2	396.54	17.07	3.189	.58	169.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	986.32	461.00
2	1007.72	411.36

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1007.72 TIME(MINUTES) = 17.068  
EFFECTIVE AREA(ACRES) = 411.36  
TOTAL AREA(ACRES) = 461.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 510.20 TO NODE 517.10 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<<

=====

DEPTH OF FLOW IN 102.0 INCH PIPE IS 58.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 30.1  
UPSTREAM NODE ELEVATION = 1811.00  
DOWNSTREAM NODE ELEVATION = 1775.00  
FLOWLENGTH(FEET) = 1500.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 1007.72  
TRAVEL TIME(MIN.) = .83 TC(MIN.) = 17.90

\*\*\*\*\*  
FLOW PROCESS FROM NODE 517.00 TO NODE 517.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.099  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 90.63  
EFFECTIVE AREA(ACRES) = 451.36  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 501.00  
PEAK FLOW RATE(CFS) = 1022.62  
TC(MIN) = 17.90

\*\*\*\*\*  
FLOW PROCESS FROM NODE 517.10 TO NODE 518.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```

=====
DEPTH OF FLOW IN 102.0 INCH PIPE IS 72.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 23.6
UPSTREAM NODE ELEVATION = 1795.00
DOWNSTREAM NODE ELEVATION = 1782.00
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 1022.62
TRAVEL TIME(MIN.) = .71 TC(MIN.) = 18.61
=====

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*****
FLOW PROCESS FROM NODE 518.00 TO NODE 518.10 IS CODE = 8
-----

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

```

```

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.028
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 94.00 SUBAREA RUNOFF(CFS) = 206.95
EFFECTIVE AREA(ACRES) = 545.36
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 595.00
PEAK FLOW RATE(CFS) = 1200.69
TC(MIN) = 18.61

```

```

*****
FLOW PROCESS FROM NODE 518.10 TO NODE 518.10 IS CODE = 1
-----

```

```

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

```

```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 18.61
RAINFALL INTENSITY (INCH./HOUR) = 3.03
EFFECTIVE STREAM AREA(ACRES) = 545.36
TOTAL STREAM AREA(ACRES) = 595.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1200.69

```

```

*****
FLOW PROCESS FROM NODE 520.00 TO NODE 520.10 IS CODE = 2
-----

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```

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

```

```

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

```

```

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 950.00
UPSTREAM ELEVATION = 1872.00
DOWNSTREAM ELEVATION = 1843.00
ELEVATION DIFFERENCE = 29.00
TC = .412*[( 950.00** 3.00)/( 29.00)]** .20 = 12.854
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.781
SOIL CLASSIFICATION IS "A"

```

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA RUNOFF(CFS) = 28.79  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 28.79

\*\*\*\*\*  
FLOW PROCESS FROM NODE 520.10 TO NODE 520.20 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

DEPTH OF FLOW IN	24.0 INCH PIPE IS	17.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	12.1
UPSTREAM NODE ELEVATION	=	1843.00
DOWNSTREAM NODE ELEVATION	=	1830.00
FLOWLENGTH(FEET)	=	550.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH)	=	24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS)	=	28.79
TRAVEL TIME(MIN.)	=	.76 TC(MIN.) = 13.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 521.00 TO NODE 520.20 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HR)	=	3.653
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	10.00 SUBAREA RUNOFF(CFS) = 27.64
EFFECTIVE AREA(ACRES)	=	20.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	20.00
PEAK FLOW RATE(CFS)	=	55.28
TC(MIN)	=	13.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 520.20 TO NODE 520.30 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

DEPTH OF FLOW IN	30.0 INCH PIPE IS	20.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	15.7
UPSTREAM NODE ELEVATION	=	1830.00
DOWNSTREAM NODE ELEVATION	=	1800.00
FLOWLENGTH(FEET)	=	1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH)	=	30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS)	=	55.28
TRAVEL TIME(MIN.)	=	1.06 TC(MIN.) = 14.68

\*\*\*\*\*  
FLOW PROCESS FROM NODE 522.00 TO NODE 520.30 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.492  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 52.37  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 104.75  
TC(MIN) = 14.68

\*\*\*\*\*  
FLOW PROCESS FROM NODE 520.30 TO NODE 520.40 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 39.0 INCH PIPE IS 31.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.6  
UPSTREAM NODE ELEVATION = 1800.00  
DOWNSTREAM NODE ELEVATION = 1793.00  
FLOWLENGTH(FEET) = 400.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 104.75  
TRAVEL TIME(MIN.) = .46 TC(MIN.) = 15.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 523.00 TO NODE 520.40 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.428  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 17.00 SUBAREA RUNOFF(CFS) = 43.55  
EFFECTIVE AREA(ACRES) = 57.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 57.00  
PEAK FLOW RATE(CFS) = 146.01  
TC(MIN) = 15.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 520.40 TO NODE 518.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 16.4  
UPSTREAM NODE ELEVATION = 1793.00

DOWNSTREAM NODE ELEVATION = 1782.00  
 FLOWLENGTH(FEET) = 600.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 146.01  
 TRAVEL TIME(MIN.) = .61 TC(MIN.) = 15.74

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 518.10 TO NODE 518.10 IS CODE = 1

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 15.74  
 RAINFALL INTENSITY (INCH./HOUR) = 3.35  
 EFFECTIVE STREAM AREA(ACRES) = 57.00  
 TOTAL STREAM AREA(ACRES) = 57.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 146.01

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1200.69	18.61	3.028	.58	545.36
2	146.01	15.74	3.348	.58	57.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	1329.83	602.36
2	1294.52	518.39

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1329.83 TIME(MINUTES) = 18.606  
 EFFECTIVE AREA(ACRES) = 602.36  
 TOTAL AREA(ACRES) = 652.00

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 518.10 TO NODE 518.20 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 102.0 INCH PIPE IS 76.8 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 29.0

UPSTREAM NODE ELEVATION = 1782.00

DOWNSTREAM NODE ELEVATION = 1755.00

FLOWLENGTH(FEET) = 1400.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 1329.83

TRAVEL TIME(MIN.) = .80 TC(MIN.) = 19.41

```

*****
FLOW PROCESS FROM NODE    524.00 TO NODE    518.20 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.952
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 28.00 SUBAREA RUNOFF(CFS) = 59.73
EFFECTIVE AREA(ACRES) = 630.36
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 680.00
PEAK FLOW RATE(CFS) = 1344.74
TC(MIN) = 19.41

*****
FLOW PROCESS FROM NODE    518.20 TO NODE    518.20 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 19.41
RAINFALL INTENSITY (INCH./HOUR) = 2.95
EFFECTIVE STREAM AREA(ACRES) = 630.36
TOTAL STREAM AREA(ACRES) = 680.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1344.74

*****
FLOW PROCESS FROM NODE    518.20 TO NODE    518.20 IS CODE =    7
-----
>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 21.50 RAIN INTENSITY(INCH/HOUR) = 2.78
EFFECTIVE AREA(ACRES) = 472.15
TOTAL AREA(ACRES) = 587.00 PEAK FLOW RATE(CFS) = 1129.54
AVERAGED LOSS RATE, Fm(IN/HR) = .600

*****
FLOW PROCESS FROM NODE    518.20 TO NODE    518.20 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 21.50
RAINFALL INTENSITY (INCH./HOUR) = 2.78
EFFECTIVE STREAM AREA(ACRES) = 472.15
TOTAL STREAM AREA(ACRES) = 587.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1129.54

```



CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA (ACRES)
1	1344.74	19.41	2.952	.58	630.36
2	1129.54	21.50	2.777	.60	472.15

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q (CFS)	EFFECTIVE AREA (ACRES)
1	2446.80	1056.62
2	2374.62	1102.51

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 2446.80 TIME (MINUTES) = 19.410

EFFECTIVE AREA (ACRES) = 1056.62

TOTAL AREA (ACRES) = 1267.00

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 1267.00

EFFECTIVE AREA (ACRES) = 1056.62

PEAK FLOW RATE (CFS) = 2446.80

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
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Ver. 4.1C Release Date: 5/11/87 Serial # 100908

Especially prepared for:

HALL & FOREMAN

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* SAN SEVAINE MODEL, FULLY DEVELOPED CONDITION \*  
\* HAWKER1 .25 YR , (CALCS FOR HAWKER2.DAT) LINE 'A' ALONG DUNCAN CANYON ROAD \*  
\* V.N./J.M., JN 3814-023, 11/14/1988 REF: CRAWFORD \*  
\*\*\*\*\*

FILE NAME: HAWKER1.DAT

TIME/DATE OF STUDY: 10:36 11/14/1988

=====

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 = .95  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.500  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.2050  
% OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 501.00 TO NODE 501.10 IS CODE = 2

-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1985.00  
DOWNSTREAM ELEVATION = 1955.00  
ELEVATION DIFFERENCE = 30.00  
TC =  $.412 * [(1000.00 ** 3.00) / (30.00)] ** .20 = 13.167$   
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.994  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 21.71  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 21.71

\*\*\*\*\*

FLOW PROCESS FROM NODE 501.10 TO NODE 501.20 IS CODE = 3

-----

>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.4 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 13.4

UPSTREAM NODE ELEVATION = 1955.00  
DOWNSTREAM NODE ELEVATION = 1944.00  
FLOWLENGTH(Feet) = 300.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1  
FLOW THRU SUBAREA(CFS) = 21.71  
TRAVEL TIME(MIN.) = .37 TC(MIN.) = 13.54

\*\*\*\*\*

FLOW PROCESS FROM NODE 502.00 TO NODE 501.20 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.944  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 21.26  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 42.52  
TC(MIN) = 13.54

\*\*\*\*\*

FLOW PROCESS FROM NODE 501.20 TO NODE 501.30 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.5 INCHES  
FLOW VELOCITY(Feet/Sec.) = 13.8  
UPSTREAM NODE ELEVATION = 1944.00  
DOWNSTREAM NODE ELEVATION = 1931.00  
FLOWLENGTH(Feet) = 500.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 42.52  
TRAVEL TIME(MIN.) = .60 TC(MIN.) = 14.14

\*\*\*\*\*

FLOW PROCESS FROM NODE 503.00 TO NODE 501.30 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.868  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 41.15  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 82.29  
TC(MIN) = 14.14

\*\*\*\*\*

FLOW PROCESS FROM NODE 501.30 TO NODE 501.40 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.4 INCHES

```

PIPEFLOW VELOCITY(FEET/SEC.) = 16.2
UPSTREAM NODE ELEVATION = 1931.00
DOWNSTREAM NODE ELEVATION = 1923.00
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 82.29
TRAVEL TIME(MIN.) = .31 TC(MIN.) = 14.45

*****
FLOW PROCESS FROM NODE 504.00 TO NODE 501.40 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.831
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 36.00 SUBAREA RUNOFF(CFS) = 72.87
EFFECTIVE AREA(ACRES) = 76.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 76.00
PEAK FLOW RATE(CFS) = 153.83
TC(MIN) = 14.45

*****
FLOW PROCESS FROM NODE 501.40 TO NODE 501.50 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
TH OF FLOW IN 42.0 INCH PIPE IS 31.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 20.2
UPSTREAM NODE ELEVATION = 1923.00
DOWNSTREAM NODE ELEVATION = 1900.00
FLOWLENGTH(FEET) = 750.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 153.83
TRAVEL TIME(MIN.) = .62 TC(MIN.) = 15.07

*****
FLOW PROCESS FROM NODE 505.00 TO NODE 501.50 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.761
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 31.00 SUBAREA RUNOFF(CFS) = 60.78
EFFECTIVE AREA(ACRES) = 107.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 107.00
PEAK FLOW RATE(CFS) = 209.80
TC(MIN) = 15.07

*****
FLOW PROCESS FROM NODE 506.00 TO NODE 501.50 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.761

```

SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 22.00 SUBAREA RUNOFF(CFS) = 43.14  
EFFECTIVE AREA(ACRES) = 129.00  
AGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 129.00  
PEAK FLOW RATE(CFS) = 252.93  
TC(MIN) = 15.07

\*\*\*\*\*  
FLOW PROCESS FROM NODE 501.50 TO NODE 501.60 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 48.0 INCH PIPE IS 39.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 23.1  
UPSTREAM NODE ELEVATION = 1900.00  
DOWNSTREAM NODE ELEVATION = 1857.00  
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 252.93  
TRAVEL TIME(MIN.) = .94 TC(MIN.) = 16.01

\*\*\*\*\*  
FLOW PROCESS FROM NODE 507.00 TO NODE 501.60 IS CODE = 8

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

5 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.662  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 74.89  
EFFECTIVE AREA(ACRES) = 169.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 169.00  
PEAK FLOW RATE(CFS) = 316.42  
TC(MIN) = 16.01

\*\*\*\*\*  
FLOW PROCESS FROM NODE 508.00 TO NODE 501.60 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.662  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 74.89  
EFFECTIVE AREA(ACRES) = 209.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 209.00  
PEAK FLOW RATE(CFS) = 391.32  
TC(MIN) = 16.01

\*\*\*\*\*  
FLOW PROCESS FROM NODE 501.60 TO NODE 501.80 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

```
=====
DEPTH OF FLOW IN 60.0 INCH PIPE IS 43.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 25.4
UPSTREAM NODE ELEVATION = 1857.00
DOWNSTREAM NODE ELEVATION = 1817.00
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 391.32
TRAVEL TIME(MIN.) = .87 TC(MIN.) = 16.88
=====
```

```
*****
FLOW PROCESS FROM NODE 509.00 TO NODE 501.80 IS CODE = 8
=====
```

```
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.580
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 43.00 SUBAREA RUNOFF(CFS) = 77.31
EFFECTIVE AREA(ACRES) = 252.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 252.00
PEAK FLOW RATE(CFS) = 453.05
TC(MIN) = 16.88
=====
```

```
*****
FLOW PROCESS FROM NODE 501.80 TO NODE 510.10 IS CODE = 3
=====
```

```
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 108.0 INCH PIPE IS 84.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 8.5
UPSTREAM NODE ELEVATION = 1817.00
DOWNSTREAM NODE ELEVATION = 1815.00
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 108.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 453.05
TRAVEL TIME(MIN.) = 2.54 TC(MIN.) = 19.41
=====
```

```
*****
FLOW PROCESS FROM NODE 510.00 TO NODE 510.10 IS CODE = 8
=====
```

```
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.372
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 64.43
EFFECTIVE AREA(ACRES) = 292.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 292.00
PEAK FLOW RATE(CFS) = 470.31
TC(MIN) = 19.41
=====
```

```
*****
FLOW PROCESS FROM NODE 510.10 TO NODE 510.20 IS CODE = 3
=====
```

```
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
```

```

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 96.0 INCH PIPE IS 74.4 INCHES
PIPEFLOW VELOCITY(Feet/Sec.) = 11.2
STREAM NODE ELEVATION = 1815.00
DOWNSTREAM NODE ELEVATION = 1811.00
FLOWLENGTH(Feet) = 1280.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 470.31
TRAVEL TIME(Min.) = 1.90 TC(Min.) = 21.31

*****
FLOW PROCESS FROM NODE 510.20 TO NODE 510.20 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(Minutes) = 21.31
RAINFALL INTENSITY (INCH./Hour) = 2.24
EFFECTIVE STREAM AREA(ACRES) = 292.00
TOTAL STREAM AREA(ACRES) = 292.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 470.31

*****
FLOW PROCESS FROM NODE 511.00 TO NODE 511.00 IS CODE = 2
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

L = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1980.00
DOWNSTREAM ELEVATION = 1950.00
ELEVATION DIFFERENCE = 30.00
TC = .412*[(1000.00** 3.00)/(30.00)]** .20 = 13.167
25 YEAR RAINFALL INTENSITY(INCH/Hour) = 2.994
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 21.71
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 21.71

*****
FLOW PROCESS FROM NODE 511.00 TO NODE 511.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 21.0 INCH PIPE IS 12.7 INCHES
PIPEFLOW VELOCITY(Feet/Sec.) = 14.3
UPSTREAM NODE ELEVATION = 1950.00
DOWNSTREAM NODE ELEVATION = 1920.00
FLOWLENGTH(Feet) = 700.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 21.71
VEL TIME(Min.) = .82 TC(Min.) = 13.98

*****
FLOW PROCESS FROM NODE 512.00 TO NODE 511.10 IS CODE = 8

```

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.888

L CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 20.75

EFFECTIVE AREA(ACRES) = 20.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 20.00

PEAK FLOW RATE(CFS) = 41.50

TC(MIN) = 13.98

\*\*\*\*\*

FLOW PROCESS FROM NODE 511.10 TO NODE 513.10 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.9 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 10.3

UPSTREAM NODE ELEVATION = 1920.00

DOWNSTREAM NODE ELEVATION = 1915.00

FLOWLENGTH(FEET) = 400.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 41.50

TRAVEL TIME(MIN.) = .64 TC(MIN.) = 14.63

\*\*\*\*\*

FW PROCESS FROM NODE 513.00 TO NODE 513.10 IS CODE = 8

-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.811

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 12.00 SUBAREA RUNOFF(CFS) = 24.07

EFFECTIVE AREA(ACRES) = 32.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 32.00

PEAK FLOW RATE(CFS) = 64.18

TC(MIN) = 14.63

\*\*\*\*\*

FLOW PROCESS FROM NODE 513.10 TO NODE 514.10 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.2 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 17.3

UPSTREAM NODE ELEVATION = 1915.00

DOWNSTREAM NODE ELEVATION = 1890.00

FLOWLENGTH(FEET) = 700.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PEFLOW THRU SUBAREA(CFS) = 64.18

TRAVEL TIME(MIN.) = .68 TC(MIN.) = 15.30

\*\*\*\*\*



```

FLOW PROCESS FROM NODE 514.00 TO NODE 514.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
5 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.735
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 38.76
EFFECTIVE AREA(ACRES) = 52.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 52.00
PEAK FLOW RATE(CFS) = 100.78
TC(MIN) = 15.30

*****
FLOW PROCESS FROM NODE 519.00 TO NODE 514.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.735
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 37.00 SUBAREA RUNOFF(CFS) = 71.71
EFFECTIVE AREA(ACRES) = 89.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 89.00
PEAK FLOW RATE(CFS) = 172.49
TC(MIN) = 15.30

*****
FLOW PROCESS FROM NODE 514.10 TO NODE 515.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 45.0 INCH PIPE IS 31.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 21.0
UPSTREAM NODE ELEVATION = 1890.00
DOWNSTREAM NODE ELEVATION = 1850.00
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 172.49
TRAVEL TIME(MIN.) = 1.03 TC(MIN.) = 16.34

*****
FLOW PROCESS FROM NODE 515.00 TO NODE 515.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.630
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 73.73
EFFECTIVE AREA(ACRES) = 129.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 129.00
PEAK FLOW RATE(CFS) = 237.79
TC(MIN) = 16.34

```

```

*****
FLOW PROCESS FROM NODE 515.10 TO NODE 510.20 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.5 INCHES
PIPEFLOW VELOCITY(Feet/sec.) = 22.0
UPSTREAM NODE ELEVATION = 1850.00
DOWNSTREAM NODE ELEVATION = 1811.00
FLOWLENGTH(Feet) = 1300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 237.79
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 17.32

```

```

*****
FLOW PROCESS FROM NODE 516.00 TO NODE 510.20 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.539
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 70.47
EFFECTIVE AREA(ACRES) = 169.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 169.00
PEAK FLOW RATE(CFS) = 297.72
TC(MIN) = 17.32

```

```

*****
FLOW PROCESS FROM NODE 510.20 TO NODE 510.20 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 17.32
RAINFALL INTENSITY (INCH./HOUR) = 2.54
EFFECTIVE STREAM AREA(ACRES) = 169.00
TOTAL STREAM AREA(ACRES) = 169.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 297.72

```

```

CONFLUENCE INFORMATION:
STREAM PEAK FLOW TIME INTENSITY FM EFFECTIVE
NUMBER RATE(CFS) (MIN.) (INCH/HOUR) (IN/HR) AREA(ACRES)
-----
1 470.31 21.31 2.243 .58 292.00
2 297.72 17.32 2.539 .58 169.00

```

```

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

```

```

STREAM CONFLUENCE EFFECTIVE
NUMBER Q(CFS) AREA(ACRES)
-----
1 722.88 461.00
2 748.36 406.37

```

```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 748.36 TIME(MINUTES) = 17.322
EFFECTIVE AREA(ACRES) = 406.37

```

TOTAL AREA(ACRES) = 461.00

\*\*\*\*\*

W PROCESS FROM NODE 510.20 TO NODE 517.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 78.0 INCH PIPE IS 60.4 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 27.1

UPSTREAM NODE ELEVATION = 1811.00

DOWNSTREAM NODE ELEVATION = 1775.00

FLOWLENGTH(FEET) = 1500.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 78.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 748.36

TRAVEL TIME(MIN.) = .92 TC(MIN.) = 18.24

\*\*\*\*\*

FLOW PROCESS FROM NODE 517.00 TO NODE 517.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.462

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 67.67

EFFECTIVE AREA(ACRES) = 446.37

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 501.00

1K FLOW RATE(CFS) = 755.11

IC(MIN) = 18.24

\*\*\*\*\*

FLOW PROCESS FROM NODE 517.10 TO NODE 518.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 87.0 INCH PIPE IS 69.0 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 21.5

UPSTREAM NODE ELEVATION = 1795.00

DOWNSTREAM NODE ELEVATION = 1782.00

FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 87.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 755.11

TRAVEL TIME(MIN.) = .77 TC(MIN.) = 19.02

\*\*\*\*\*

FLOW PROCESS FROM NODE 518.00 TO NODE 518.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.401

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 94.00 SUBAREA RUNOFF(CFS) = 153.89

EFFECTIVE AREA(ACRES) = 540.37

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 595.00

PEAK FLOW RATE(CFS) = 884.63  
TC(MIN) = 19.02

\*\*\*\*\*  
FLOW PROCESS FROM NODE 518.10 TO NODE 518.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 19.02

RAINFALL INTENSITY (INCH./HOUR) = 2.40

EFFECTIVE STREAM AREA(ACRES) = 540.37

TOTAL STREAM AREA(ACRES) = 595.00

PEAK FLOW RATE(CFS) AT CONFLUENCE = 884.63

\*\*\*\*\*  
FLOW PROCESS FROM NODE 520.00 TO NODE 520.10 IS CODE = 2

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$

INITIAL SUBAREA FLOW-LENGTH = 950.00

UPSTREAM ELEVATION = 1872.00

DOWNSTREAM ELEVATION = 1843.00

ELEVATION DIFFERENCE = 29.00

TC =  $.412 * [(950.00 ** 3.00) / (29.00)] ** .20 = 12.854$

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.037

IL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA RUNOFF(CFS) = 22.10

TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 22.10

\*\*\*\*\*  
FLOW PROCESS FROM NODE 520.10 TO NODE 520.20 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.0 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 11.2

UPSTREAM NODE ELEVATION = 1843.00

DOWNSTREAM NODE ELEVATION = 1830.00

FLOWLENGTH(Feet) = 550.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 22.10

TRAVEL TIME(MIN.) = .82 TC(MIN.) = 13.67

\*\*\*\*\*  
FLOW PROCESS FROM NODE 521.00 TO NODE 520.20 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.927

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 21.10

EFFECTIVE AREA(ACRES) = 20.00

AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 42.21  
TC(MIN) = 13.67

\*\*\*\*\*

FLOW PROCESS FROM NODE 520.20 TO NODE 520.30 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.6  
UPSTREAM NODE ELEVATION = 1830.00  
DOWNSTREAM NODE ELEVATION = 1800.00  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 42.21  
TRAVEL TIME(MIN.) = 1.14 TC(MIN.) = 14.81

\*\*\*\*\*

FLOW PROCESS FROM NODE 522.00 TO NODE 520.30 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.790  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 39.74  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 79.47  
TC(MIN) = 14.81

\*\*\*\*\*

FLOW PROCESS FROM NODE 520.30 TO NODE 520.40 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 13.8  
UPSTREAM NODE ELEVATION = 1800.00  
DOWNSTREAM NODE ELEVATION = 1793.00  
FLOWLENGTH(FEET) = 400.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 79.47  
TRAVEL TIME(MIN.) = .48 TC(MIN.) = 15.29

\*\*\*\*\*

FLOW PROCESS FROM NODE 523.00 TO NODE 520.40 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.736  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 17.00 SUBAREA RUNOFF(CFS) = 32.96

EFFECTIVE AREA(ACRES) = 57.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 57.00  
PEAK FLOW RATE(CFS) = 110.52  
MIN) = 15.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 520.40 TO NODE 518.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.3 INCHES

PIPEFLOW VELOCITY(Feet/sec.) = 15.4

UPSTREAM NODE ELEVATION = 1793.00

DOWNSTREAM NODE ELEVATION = 1782.00

FLOWLENGTH(Feet) = 600.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 110.52

TRAVEL TIME(MIN.) = .65 TC(MIN.) = 15.94

\*\*\*\*\*  
FLOW PROCESS FROM NODE 518.10 TO NODE 518.10 IS CODE = 1  
-----

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 15.94

RAINFALL INTENSITY (INCH./HOUR) = 2.67

EFFECTIVE STREAM AREA(ACRES) = 57.00

TOTAL STREAM AREA(ACRES) = 57.00

PEAK FLOW RATE(CFS) AT CONFLUENCE = 110.52

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	884.63	19.02	2.401	.58	540.37
2	110.52	15.94	2.669	.58	57.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	980.95	597.37
---	--------	--------

2	961.36	509.95
---	--------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 980.95 TIME(MINUTES) = 19.018

EFFECTIVE AREA(ACRES) = 597.37

TOTAL AREA(ACRES) = 652.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 518.10 TO NODE 518.20 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 93.0 INCH PIPE IS 70.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 25.5  
UPSTREAM NODE ELEVATION = 1782.00  
DOWNSTREAM NODE ELEVATION = 1755.00  
LENGTH(FEET) = 1600.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 93.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 980.95  
TRAVEL TIME(MIN.) = 1.04 TC(MIN.) = 20.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 524.00 TO NODE 518.20 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.325  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 28.00 SUBAREA RUNOFF(CFS) = 43.93  
EFFECTIVE AREA(ACRES) = 625.37  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 680.00  
PEAK FLOW RATE(CFS) = 981.13  
TC(MIN) = 20.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 518.20 TO NODE 518.20 IS CODE = 1

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 20.06  
RAINFALL INTENSITY (INCH./HOUR) = 2.33  
EFFECTIVE STREAM AREA(ACRES) = 625.37  
TOTAL STREAM AREA(ACRES) = 680.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 981.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 518.20 TO NODE 518.20 IS CODE = 7

-----  
>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 22.28 RAIN INTENSITY(INCH/HOUR) = 2.18  
EFFECTIVE AREA(ACRES) = 467.88  
TOTAL AREA(ACRES) = 587.00 PEAK FLOW RATE(CFS) = 823.39  
AVERAGED LOSS RATE, Fm(IN/HR) = .600

FROM 'CRAWFORD'  
SEE CRAWFORD FILE

\*\*\*\*\*  
FLOW PROCESS FROM NODE 518.20 TO NODE 518.20 IS CODE = 1

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MINUTES) = 22.28  
RAINFALL INTENSITY (INCH./HOUR) = 2.18  
EFFECTIVE STREAM AREA(ACRES) = 467.88  
TOTAL STREAM AREA(ACRES) = 587.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 823.39

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	981.13	20.06	2.325	.58	625.37
2	823.39	22.28	2.184	.60	467.88

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1788.96	1046.72
2	1724.81	1093.25

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1788.96 TIME(MINUTES) = 20.063  
 EFFECTIVE AREA(ACRES) = 1046.72  
 TOTAL AREA(ACRES) = 1267.00

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1267.00  
 EFFECTIVE AREA(ACRES) = 1046.72  
 PEAK FLOW RATE(CFS) = 1788.96

END OF RATIONAL METHOD ANALYSIS



```

*****
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
Copyright 1983,86,87 Advanced Engineering Software (aes)
Ver. 4.1C Release Date: 5/11/87 Serial # I00908

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Especially prepared for:

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HALL & FOREMAN
***** DESCRIPTION OF STUDY *****
* NORTH FONTANA MASTER STORM DRAIN PLAN, HAWKER 2 LINE, LINE "A"
* Q 100-YEAR
* JN3547
*****

```

```

FILE NAME: HAWKER2.100
TIME/DATE OF STUDY: 3:42 1/ 1/1980

```

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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 =
*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.150
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.660
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.6600
SLOPE OF INTENSITY DURATION CURVE = .6000

```

```

*****
FLOW PROCESS FROM NODE 518.20 TO NODE 518.20 IS CODE = 7

```

```

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

```

```

=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:

```

```

TC(MIN) = 19.41 RAIN INTENSITY(INCH/HOUR) = 3.27 FROM
EFFECTIVE AREA(ACRES) = 1056.62 HAWKER 1
TOTAL AREA(ACRES) = 1267.00 PEAK FLOW RATE(CFS) = 2446.80,
AVERAGED LOSS RATE, Fm(IN/HR) = .580
***ERROR; SPECIFIED LOSS RATE, FM IS LESS THAN MINIMUM SEE LINE A
POSSIBLE VALUE OF .69(INCHES/HOUR) (HAWKER 1 FILE)

```

```

*****
FLOW PROCESS FROM NODE 518.20 TO NODE 525.10 IS CODE = 5

```

```

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

```

```

>>>>TRAVELTIME THRU SUBAREA<<<<
=====

```

UPSTREAM NODE ELEVATION = 1755.00  
 DOWNSTREAM NODE ELEVATION = 1740.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 500.00  
 CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = .000  
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.50  
 CHANNEL FLOW THRU SUBAREA(CFS) = 2446.80  
 FLOW VELOCITY(FEET/SEC) = 34.98 FLOW DEPTH(FEET) = 7.00  
 TRAVEL TIME(MIN.) = .24 TC(MIN.) = 19.65

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 525.00 TO NODE 525.10 IS CODE = 8  
 -----

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

=====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.243  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 21.00 SUBAREA RUNOFF(CFS) = 50.30  
 EFFECTIVE AREA(ACRES) = 1077.62  
 AVERAGED Fm(INCH/HR) = .580  
 TOTAL AREA(ACRES) = 1288.00  
 PEAK FLOW RATE(CFS) = 2583.11  
 TC(MIN) = 19.65

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 525.10 TO NODE 804.10 IS CODE = 5  
 -----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====  
 UPSTREAM NODE ELEVATION = 1740.00  
 DOWNSTREAM NODE ELEVATION = 1700.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1450.00  
 CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = .000  
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.50  
 CHANNEL FLOW THRU SUBAREA(CFS) = 2583.11  
 FLOW VELOCITY(FEET/SEC) = 34.21 FLOW DEPTH(FEET) = 7.55  
 TRAVEL TIME(MIN.) = .71 TC(MIN.) = 20.35

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 804.10 TO NODE 804.10 IS CODE = 1  
 -----

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

=====  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 20.35  
 RAINFALL INTENSITY (INCH./HOUR) = 3.18  
 EFFECTIVE STREAM AREA(ACRES) = 1077.62  
 TOTAL STREAM AREA(ACRES) = 1288.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2583.11

```
*****
FLOW PROCESS FROM NODE 701.00 TO NODE 701.10 IS CODE = 2
-----
```

```
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
```

```
NATURAL AVERAGE COVER
```

```
TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1100.00
UPSTREAM ELEVATION = 3700.00
DOWNSTREAM ELEVATION = 3120.00
ELEVATION DIFFERENCE = 580.00
TC = .706*[(1100.00** 3.00)/(580.00)]** .20 = 13.212
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.116
SOIL CLASSIFICATION IS "B"
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600
SUBAREA RUNOFF(CFS) = 32.00
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 32.00
```

```
*****
FLOW PROCESS FROM NODE 701.10 TO NODE 702.10 IS CODE = 5
-----
```

```
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
```

```
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
```

```
UPSTREAM NODE ELEVATION = 3120.00
DOWNSTREAM NODE ELEVATION = 3040.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 400.00
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 2.00
CHANNEL FLOW THRU SUBAREA(CFS) = 32.00
FLOW VELOCITY(FEET/SEC) = 8.93 FLOW DEPTH(FEET) = .17
TRAVEL TIME(MIN.) = .75 TC(MIN.) = 13.96
```

```
*****
FLOW PROCESS FROM NODE 702.00 TO NODE 702.10 IS CODE = 8
-----
```

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

```
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.982
SOIL CLASSIFICATION IS "B"
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 30.80
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .560
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 61.60
TC(MIN) = 13.96
```

```
*****
FLOW PROCESS FROM NODE 702.10 TO NODE 703.10 IS CODE = 5
-----
```

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION	=	3040.00
DOWNSTREAM NODE ELEVATION	=	2820.00
CHANNEL LENGTH THRU SUBAREA(FEET)	=	700.00
CHANNEL BASE(FEET)	=	20.00
"Z" FACTOR	=	5.000
MANNINGS FACTOR	=	.022
MAXIMUM DEPTH(FEET)	=	2.00
CHANNEL FLOW THRU SUBAREA(CFS)	=	61.60
FLOW VELOCITY(FEET/SEC)	=	12.41
FLOW DEPTH(FEET)	=	.23
TRAVEL TIME(MIN.)	=	.94
TC(MIN.)	=	14.90

\*\*\*\*\*

FLOW PROCESS FROM NODE	703.00	TO NODE	703.10	IS CODE =	8
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.829
SOIL CLASSIFICATION IS	"B"	
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5600
SUBAREA AREA(ACRES)	=	20.00
SUBAREA RUNOFF(CFS)	=	58.85
EFFECTIVE AREA(ACRES)	=	40.00
AVERAGED Fm(INCH/HR)	=	.560
TOTAL AREA(ACRES)	=	40.00
PEAK FLOW RATE(CFS)	=	117.69
TC(MIN)	=	14.90

\*\*\*\*\*

FLOW PROCESS FROM NODE	703.10	TO NODE	704.10	IS CODE =	5
------------------------	--------	---------	--------	-----------	---

-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION	=	2820.00
DOWNSTREAM NODE ELEVATION	=	2520.00
CHANNEL LENGTH THRU SUBAREA(FEET)	=	1050.00
CHANNEL BASE(FEET)	=	20.00
"Z" FACTOR	=	5.000
MANNINGS FACTOR	=	.022
MAXIMUM DEPTH(FEET)	=	2.00
CHANNEL FLOW THRU SUBAREA(CFS)	=	117.69
FLOW VELOCITY(FEET/SEC)	=	16.57
FLOW DEPTH(FEET)	=	.33
TRAVEL TIME(MIN.)	=	1.06
TC(MIN.)	=	15.95

\*\*\*\*\*

FLOW PROCESS FROM NODE	704.00	TO NODE	704.10	IS CODE =	8
------------------------	--------	---------	--------	-----------	---

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.675
SOIL CLASSIFICATION IS	"B"	
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5600
SUBAREA AREA(ACRES)	=	38.00
SUBAREA RUNOFF(CFS)	=	106.54
EFFECTIVE AREA(ACRES)	=	78.00

AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 78.00  
PEAK FLOW RATE(CFS) = 218.68  
TC(MIN) = 15.95

\*\*\*\*\*  
FLOW PROCESS FROM NODE 704.10 TO NODE 705.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 2520.00  
DOWNSTREAM NODE ELEVATION = 2300.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00  
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 2.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 218.68  
FLOW VELOCITY(FEET/SEC) = 14.71 FLOW DEPTH(FEET) = .64  
TRAVEL TIME(MIN.) = 2.27 TC(MIN.) = 18.22

\*\*\*\*\*  
FLOW PROCESS FROM NODE 706.00 TO NODE 705.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.394  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 70.00 SUBAREA RUNOFF(CFS) = 178.52  
EFFECTIVE AREA(ACRES) = 148.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 148.00  
PEAK FLOW RATE(CFS) = 377.45  
TC(MIN) = 18.22

\*\*\*\*\*  
FLOW PROCESS FROM NODE 705.00 TO NODE 705.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.394  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 106.00 SUBAREA RUNOFF(CFS) = 270.33  
EFFECTIVE AREA(ACRES) = 254.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 254.00  
PEAK FLOW RATE(CFS) = 647.78  
TC(MIN) = 18.22

\*\*\*\*\*

FLOW PROCESS FROM NODE 705.10 TO NODE 708.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 2300.00  
DOWNSTREAM NODE ELEVATION = 1950.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 3000.00  
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 2.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 647.78  
FLOW VELOCITY(FEET/SEC) = 22.10 FLOW DEPTH(FEET) = 1.14  
TRAVEL TIME(MIN.) = 2.26 TC(MIN.) = 20.48

\*\*\*\*\*

FLOW PROCESS FROM NODE 707.00 TO NODE 708.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.163  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 108.00 SUBAREA RUNOFF(CFS) = 253.06  
EFFECTIVE AREA(ACRES) = 362.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 362.00  
PEAK FLOW RATE(CFS) = 848.21  
TC(MIN) = 20.48

\*\*\*\*\*

FLOW PROCESS FROM NODE 708.00 TO NODE 708.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.163  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 74.00 SUBAREA RUNOFF(CFS) = 173.39  
EFFECTIVE AREA(ACRES) = 436.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 436.00  
PEAK FLOW RATE(CFS) = 1021.60  
TC(MIN) = 20.48

\*\*\*\*\*

FLOW PROCESS FROM NODE 708.10 TO NODE 801.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1950.00  
DOWNSTREAM NODE ELEVATION = 1840.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00  
 CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000  
 MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 2.50  
 CHANNEL FLOW THRU SUBAREA(CFS) = 1021.60  
 FLOW VELOCITY(FEET/SEC) = 19.34 FLOW DEPTH(FEET) = 1.82  
 TRAVEL TIME(MIN.) = 1.72 TC(MIN.) = 22.21

\*\*\*\*\*

FLOW PROCESS FROM NODE 801.00 TO NODE 801.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.014  
 SOIL CLASSIFICATION IS "B"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .4  
 SUBAREA AREA(ACRES) = 161.00 SUBAREA RUNOFF(CFS) = 371.49  
 EFFECTIVE AREA(ACRES) = 597.00  
 AVERAGED Fm(INCH/HR) = .530  
 TOTAL AREA(ACRES) = 597.00  
 PEAK FLOW RATE(CFS) = 1334.35  
 TC(MIN) = 22.21

\*\*\*\*\*

FLOW PROCESS FROM NODE 801.10 TO NODE 802.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1840.00  
 DOWNSTREAM NODE ELEVATION = 1790.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00  
 CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000  
 MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 3.00  
 CHANNEL FLOW THRU SUBAREA(CFS) = 1334.35  
 FLOW VELOCITY(FEET/SEC) = 18.58 FLOW DEPTH(FEET) = 2.29  
 TRAVEL TIME(MIN.) = 1.17 TC(MIN.) = 23.37

\*\*\*\*\*

FLOW PROCESS FROM NODE 802.00 TO NODE 802.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.923  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 124.00 SUBAREA RUNOFF(CFS) = 261.22  
 EFFECTIVE AREA(ACRES) = 721.00  
 AVERAGED Fm(INCH/HR) = .539  
 TOTAL AREA(ACRES) = 721.00  
 PEAK FLOW RATE(CFS) = 1546.60  
 TC(MIN) = 23.37

\*\*\*\*\*  
FLOW PROCESS FROM NODE 802.10 TO NODE 803.10 IS CODE = 5

-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 1790.00  
DOWNSTREAM NODE ELEVATION = 1740.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1600.00  
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 3.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 1546.60  
FLOW VELOCITY(FEET/SEC) = 17.90 FLOW DEPTH(FEET) = 2.61  
TRAVEL TIME(MIN.) = 1.49 TC(MIN.) = 24.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 803.00 TO NODE 803.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.816  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 114.00 SUBAREA RUNOFF(CFS) = 229.23  
EFFECTIVE AREA(ACRES) = 835.00  
AVERAGED Fm(INCH/HR) = .545  
TOTAL AREA(ACRES) = 835.00  
PEAK FLOW RATE(CFS) = 1706.80  
TC(MIN) = 24.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 803.10 TO NODE 804.10 IS CODE = 5

-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 1740.00  
DOWNSTREAM NODE ELEVATION = 1700.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1700.00  
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 3.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 1706.80  
FLOW VELOCITY(FEET/SEC) = 16.73 FLOW DEPTH(FEET) = 2.94  
TRAVEL TIME(MIN.) = 1.69 TC(MIN.) = 26.56

\*\*\*\*\*  
FLOW PROCESS FROM NODE 804.00 TO NODE 804.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.707



SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5

SUBAREA AREA(ACRES) = 151.00 SUBAREA RUNOFF(CFS) = 288.80

EFFECTIVE AREA(ACRES) = 986.00

AVERAGED Fm(INCH/HR) = .551

TOTAL AREA(ACRES) = 986.00

PEAK FLOW RATE(CFS) = 1913.58

TC(MIN) = 26.56

\*\*\*\*\*  
FLOW PROCESS FROM NODE 804.10 TO NODE 804.10 IS CODE = 1  
-----

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 26.56

RAINFALL INTENSITY (INCH./HOUR) = 2.71

EFFECTIVE STREAM AREA(ACRES) = 986.00

TOTAL STREAM AREA(ACRES) = 986.00

PEAK FLOW RATE(CFS) AT CONFLUENCE = 1913.58

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
------------------	------------------------	----------------	--------------------------	---------------	--------------------------

1	2583.11	20.35	3.175	.58	1077.62
---	---------	-------	-------	-----	---------

2	1913.58	26.56	2.707	.55	986.00
---	---------	-------	-------	-----	--------

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	4368.40	1833.39
---	---------	---------

2	4030.60	2063.62
---	---------	---------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 4368.40 TIME(MINUTES) = 20.355

EFFECTIVE AREA(ACRES) = 1833.39

TOTAL AREA(ACRES) = 2274.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 804.10 TO NODE 805.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1700.00

DOWNSTREAM NODE ELEVATION = 1650.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1600.00

CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.500

MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 4.50

CHANNEL FLOW THRU SUBAREA(CFS) = 4368.40  
FLOW VELOCITY(FEET/SEC) = 23.51 FLOW DEPTH(FEET) = 4.27  
TRAVEL TIME(MIN.) = 1.13 TC(MIN.) = 21.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 805.00 TO NODE 805.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.074  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 174.00 SUBAREA RUNOFF(CFS) = 390.21  
EFFECTIVE AREA(ACRES) = 2007.39  
AVERAGED Fm(INCH/HR) = .569  
TOTAL AREA(ACRES) = 2448.00  
PEAK FLOW RATE(CFS) = 4524.93  
TC(MIN) = 21.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 805.10 TO NODE 808.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1650.00  
DOWNSTREAM NODE ELEVATION = 1600.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00  
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.500  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 4.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 4524.93

==>>ERROR: FLOW IN CHANNEL EXCEEDS CHANNEL  
CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM  
ALLOWABLE DEPTH).  
AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM  
ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

FLOW VELOCITY(FEET/SEC) = 22.47 FLOW DEPTH(FEET) = 4.50  
TRAVEL TIME(MIN.) = 1.48 TC(MIN.) = 22.97

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

\*\*\*\*\*  
FLOW PROCESS FROM NODE 806.00 TO NODE 808.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.953  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5

SUBAREA AREA(ACRES) = 118.00 SUBAREA RUNOFF(CFS) = 251.81  
 EFFECTIVE AREA(ACRES) = 2125.39  
 AVERAGED Fm(INCH/HR) = .570  
 TOTAL AREA(ACRES) = 2566.00  
 PEAK FLOW RATE(CFS) = 4558.71  
 TC(MIN) = 22.97

\*\*\*\*\*

FLOW PROCESS FROM NODE 807.00 TO NODE 808.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.953  
 SOIL CLASSIFICATION IS "A"  
 NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .8200  
 SUBAREA AREA(ACRES) = 625.00 SUBAREA RUNOFF(CFS) = 1199.86  
 EFFECTIVE AREA(ACRES) = 2750.39  
 AVERAGED Fm(INCH/HR) = .627  
 TOTAL AREA(ACRES) = 3191.00  
 PEAK FLOW RATE(CFS) = 5758.57  
 TC(MIN) = 22.97

\*\*\*\*\*

FLOW PROCESS FROM NODE 808.10 TO NODE 808.10 IS CODE = 1

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 22.97  
 RAINFALL INTENSITY (INCH./HOUR) = 2.95  
 EFFECTIVE STREAM AREA(ACRES) = 2750.39  
 TOTAL STREAM AREA(ACRES) = 3191.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 5758.57

#### CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	5758.57	22.97	2.953	.63	2750.39

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
 CONFLUENCE FORMULA USED FOR 1 STREAMS.

#### SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	5758.57	2750.39
---	---------	---------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 PEAK FLOW RATE(CFS) = 5758.57 TIME(MINUTES) = 22.972  
 EFFECTIVE AREA(ACRES) = 2750.39  
 TOTAL AREA(ACRES) = 3191.00

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 3191.00

EFFECTIVE AREA(ACRES) = 2750.39

PEAK FLOW RATE(CFS) = 5758.57

=====

END OF RATIONAL METHOD ANALYSIS

# HALL & FOREMAN

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

\* N. FONTANA MASTER STORM DRAIN PLAN, HAWKER 2 LINE. \*

\* 0 25-YR. \*

\* I 3547, T. ARROYO, 11/30/89. \*

\*\*\*\*\*

FILE NAME: HAWKER2.025

TIME/DATE OF STUDY: 12: 9 11/30/1989

=====

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 = .95

\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.150

100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.660

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.3265

SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 518.20 TO NODE 518.20 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:

T(MIN) = 20.06 RAIN INTENSITY(INCH/HOUR) = 2.56

EFFECTIVE AREA(ACRES) = 1046.72

TOTAL AREA(ACRES) = 1267.00 PEAK FLOW RATE(CFS) = 1788.96

AVERAGED LOSS RATE, Fm(IN/HR) = .580

\*\*\*ERROR; SPECIFIED LOSS RATE, FM IS LESS THAN MINIMUM  
POSSIBLE VALUE OF .66(INCHES/HOUR)

FROM  
HAWKER 1

SEE 'LINE A'  
(HAWKER 1 FILE)

\*\*\*\*\*

FLOW PROCESS FROM NODE 518.20 TO NODE 525.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1755.00

DOWNSTREAM NODE ELEVATION = 1740.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1000.00

CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = .000

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.50

CHANNEL FLOW THRU SUBAREA(CFS) = 1788.96

FLOW VELOCITY(FEET/SEC) = 24.91 FLOW DEPTH(FEET) = 7.18

TRAVEL TIME(MIN.) = .67 TC(MIN.) = 20.73

\*\*\*\*\*

FLOW PROCESS FROM NODE 525.00 TO NODE 525.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.510

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 21.00 SUBAREA RUNOFF(CFS) = 36.43

EFFECTIVE AREA(ACRES) = 1067.72  
AVERAGED Fm(INCH/HR) = .580  
TOTAL AREA(ACRES) = 1288.00  
PEAK FLOW RATE(CFS) = 1854.26  
TC(MIN) = 20.73

\*\*\*\*\*  
FLOW PROCESS FROM NODE 525.10 TO NODE 804.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1740.00  
DOWNSTREAM NODE ELEVATION = 1700.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1450.00  
CHANNEL BASE( FEET) = 10.00 "Z" FACTOR = .000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH( FEET) = 9.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 1854.26  
FLOW VELOCITY( FEET/SEC) = 31.93 FLOW DEPTH( FEET) = 5.81  
TRAVEL TIME(MIN.) = .76 TC(MIN.) = 21.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 804.10 TO NODE 804.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 21.49  
RAINFALL INTENSITY (INCH./HOUR) = 2.46  
EFFECTIVE STREAM AREA(ACRES) = 1067.72  
TOTAL STREAM AREA(ACRES) = 1288.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1854.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 701.00 TO NODE 701.10 IS CODE = 2  
-----

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

=====

NATURAL AVERAGE COVER

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 1100.00  
UPSTREAM ELEVATION = 3700.00  
DOWNSTREAM ELEVATION = 3120.00  
ELEVATION DIFFERENCE = 580.00  
TC = .706\*[( 1100.00\*\* 3.00)/( 580.00)]\*\* .20 = 13.212  
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.289  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA RUNOFF(CFS) = 24.56  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 24.56

\*\*\*\*\*  
FLOW PROCESS FROM NODE 701.10 TO NODE 702.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 3120.00  
DOWNSTREAM NODE ELEVATION = 3040.00  
CHANNEL LENGTH THRU SUBAREA( FEET) = 400.00  
CHANNEL BASE( FEET) = 20.00 "Z" FACTOR = 5.000

MANNINGS FACTOR = .022    MAXIMUM DEPTH(FEET) = 2.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 24.56  
FLOW VELOCITY(FEET/SEC) = 8.44    FLOW DEPTH(FEET) = .14  
TRAVEL TIME(MIN.) = .79    TC(MIN.) = 14.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 702.00 TO NODE 702.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.176  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 10.00    SUBAREA RUNOFF(CFS) = 23.54  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 47.09  
TC(MIN) = 14.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 702.10 TO NODE 703.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 3040.00  
DOWNSTREAM NODE ELEVATION = 2820.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 700.00  
CHANNEL BASE(FEET) = 20.00    "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022    MAXIMUM DEPTH(FEET) = 2.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 47.09  
FLOW VELOCITY(FEET/SEC) = 13.13    FLOW DEPTH(FEET) = .17  
TRAVEL TIME(MIN.) = .89    TC(MIN.) = 14.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 703.00 TO NODE 703.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.061  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 20.00    SUBAREA RUNOFF(CFS) = 45.02  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 90.03  
TC(MIN) = 14.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 703.10 TO NODE 704.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 2820.00  
DOWNSTREAM NODE ELEVATION = 2520.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1050.00  
CHANNEL BASE(FEET) = 20.00    "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022    MAXIMUM DEPTH(FEET) = 2.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 90.03

FLOW VELOCITY(FEET/SEC) = 14.12 FLOW DEPTH(FEET) = .30  
TRAVEL TIME(MIN.) = 1.24 TC(MIN.) = 16.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 704.00 TO NODE 704.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.918  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 38.00 SUBAREA RUNOFF(CFS) = 80.63  
EFFECTIVE AREA(ACRES) = 78.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 78.00  
PEAK FLOW RATE(CFS) = 165.50  
TC(MIN) = 16.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 704.10 TO NODE 705.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 2520.00  
DOWNSTREAM NODE ELEVATION = 2300.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00  
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 2.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 165.50  
FLOW VELOCITY(FEET/SEC) = 13.31 FLOW DEPTH(FEET) = .55  
TRAVEL TIME(MIN.) = 2.50 TC(MIN.) = 18.63

\*\*\*\*\*  
FLOW PROCESS FROM NODE 706.00 TO NODE 705.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.676  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 70.00 SUBAREA RUNOFF(CFS) = 133.28  
EFFECTIVE AREA(ACRES) = 148.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 148.00  
PEAK FLOW RATE(CFS) = 281.79  
TC(MIN) = 18.63

\*\*\*\*\*  
FLOW PROCESS FROM NODE 705.00 TO NODE 705.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.676  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 106.00 SUBAREA RUNOFF(CFS) = 201.82  
EFFECTIVE AREA(ACRES) = 254.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 254.00  
PEAK FLOW RATE(CFS) = 483.62  
TC(MIN) = 18.63



```

*****
FLOW PROCESS FROM NODE    705.10 TO NODE    708.10 IS CODE =    5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION =    2300.00
DOWNSTREAM NODE ELEVATION =    1950.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    3000.00
CHANNEL BASE(FEET) =    20.00    "Z" FACTOR =    5.000
MANNINGS FACTOR =    .022    MAXIMUM DEPTH(FEET) =    2.00
CHANNEL FLOW THRU SUBAREA(CFS) =    483.62
FLOW VELOCITY(FEET/SEC) =    19.71    FLOW DEPTH(FEET) =    .98
TRAVEL TIME(MIN.) =    2.54    TC(MIN.) =    21.17

*****
FLOW PROCESS FROM NODE    707.00 TO NODE    708.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
    25 YEAR RAINFALL INTENSITY(INCH/HR) =    2.478
    SOIL CLASSIFICATION IS "B"
    NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) =    .5600
    SUBAREA AREA(ACRES) =    108.00    SUBAREA RUNOFF(CFS) =    186.46
    EFFECTIVE AREA(ACRES) =    362.00
    AVERAGED Fm(INCH/HR) =    .560
    TOTAL AREA(ACRES) =    362.00
    PEAK FLOW RATE(CFS) =    625.00
    TC(MIN) =    21.17

*****
FLOW PROCESS FROM NODE    708.00 TO NODE    708.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
    25 YEAR RAINFALL INTENSITY(INCH/HR) =    2.478
    SOIL CLASSIFICATION IS "B"
    NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) =    .5600
    SUBAREA AREA(ACRES) =    74.00    SUBAREA RUNOFF(CFS) =    127.76
    EFFECTIVE AREA(ACRES) =    436.00
    AVERAGED Fm(INCH/HR) =    .560
    TOTAL AREA(ACRES) =    436.00
    PEAK FLOW RATE(CFS) =    752.76
    TC(MIN) =    21.17

*****
FLOW PROCESS FROM NODE    708.10 TO NODE    801.10 IS CODE =    5
-----
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION =    1950.00
DOWNSTREAM NODE ELEVATION =    1840.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    2000.00
CHANNEL BASE(FEET) =    20.00    "Z" FACTOR =    5.000
MANNINGS FACTOR =    .022    MAXIMUM DEPTH(FEET) =    2.50
CHANNEL FLOW THRU SUBAREA(CFS) =    752.76
FLOW VELOCITY(FEET/SEC) =    17.60    FLOW DEPTH(FEET) =    1.54
TRAVEL TIME(MIN.) =    1.89    TC(MIN.) =    23.06

```

```

*****
FLOW PROCESS FROM NODE      801.00 TO NODE      801.10 IS CODE =      8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.354
SOIL CLASSIFICATION IS "B"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .4500
SUBAREA AREA(ACRES) = 161.00 SUBAREA RUNOFF(CFS) = 275.91
EFFECTIVE AREA(ACRES) = 597.00
AVERAGED Fm(INCH/HR) = .530
TOTAL AREA(ACRES) = 597.00
PEAK FLOW RATE(CFS) = 979.95
TC(MIN) = 23.06

*****
FLOW PROCESS FROM NODE      801.10 TO NODE      802.10 IS CODE =      5
-----
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1840.00
DOWNSTREAM NODE ELEVATION = 1790.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 3.00
CHANNEL FLOW THRU SUBAREA(CFS) = 979.95
FLOW VELOCITY(FEET/SEC) = 17.08 FLOW DEPTH(FEET) = 1.93
TRAVEL TIME(MIN.) = 1.27 TC(MIN.) = 24.33

*****
FLOW PROCESS FROM NODE      802.00 TO NODE      802.10 IS CODE =      8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.280
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 124.00 SUBAREA RUNOFF(CFS) = 189.47
EFFECTIVE AREA(ACRES) = 721.00
AVERAGED Fm(INCH/HR) = .539
TOTAL AREA(ACRES) = 721.00
PEAK FLOW RATE(CFS) = 1129.43
TC(MIN) = 24.33

*****
FLOW PROCESS FROM NODE      802.10 TO NODE      803.10 IS CODE =      5
-----
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1790.00
DOWNSTREAM NODE ELEVATION = 1740.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1600.00
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 3.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1129.43
FLOW VELOCITY(FEET/SEC) = 16.41 FLOW DEPTH(FEET) = 2.21
TRAVEL TIME(MIN.) = 1.62 TC(MIN.) = 25.96

*****
FLOW PROCESS FROM NODE      803.00 TO NODE      803.10 IS CODE =      8

```

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.193  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 114.00 SUBAREA RUNOFF(CFS) = 165.29  
EFFECTIVE AREA(ACRES) = 835.00  
AVERAGED Fm(INCH/HR) = .545  
TOTAL AREA(ACRES) = 835.00  
PEAK FLOW RATE(CFS) = 1238.44  
TC(MIN) = 25.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 803.10 TO NODE 804.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 1740.00  
DOWNSTREAM NODE ELEVATION = 1700.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1700.00  
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 3.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 1238.44  
FLOW VELOCITY(FEET/SEC) = 15.23 FLOW DEPTH(FEET) = 2.50  
TRAVEL TIME(MIN.) = 1.86 TC(MIN.) = 27.82

\*\*\*\*\*  
FLOW PROCESS FROM NODE 804.00 TO NODE 804.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.104  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 151.00 SUBAREA RUNOFF(CFS) = 206.81  
EFFECTIVE AREA(ACRES) = 986.00  
AVERAGED Fm(INCH/HR) = .551  
TOTAL AREA(ACRES) = 986.00  
PEAK FLOW RATE(CFS) = 1378.19  
TC(MIN) = 27.82

\*\*\*\*\*  
FLOW PROCESS FROM NODE 804.10 TO NODE 804.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 27.82  
RAINFALL INTENSITY (INCH./HOUR) = 2.10  
EFFECTIVE STREAM AREA(ACRES) = 986.00  
TOTAL STREAM AREA(ACRES) = 986.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1378.19

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1854.26	21.49	2.456	.58	1067.72
2	1378.19	27.82	2.104	.55	986.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q (CFS)	EFFECTIVE AREA (ACRES)
------------------	-----------------------	---------------------------

1	3160.48	1829.38
2	2884.11	2053.72

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 3160.48 TIME (MINUTES) = 21.489

EFFECTIVE AREA (ACRES) = 1829.38

TOTAL AREA (ACRES) = 2274.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 804.10 TO NODE 805.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1700.00
DOWNSTREAM NODE ELEVATION =	1650.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	1600.00
CHANNEL BASE (FEET) =	20.00
"Z" FACTOR =	5.500
MANNINGS FACTOR =	.022
MAXIMUM DEPTH (FEET) =	4.50
CHANNEL FLOW THRU SUBAREA (CFS) =	3160.48
FLOW VELOCITY (FEET/SEC) =	21.40
FLOW DEPTH (FEET) =	3.67
TRAVEL TIME (MIN.) =	1.25
TC (MIN.) =	22.74

\*\*\*\*\*  
FLOW PROCESS FROM NODE 805.00 TO NODE 805.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY (INCH/HR) =	2.375
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm (INCH/HR) =	.5820
SUBAREA AREA (ACRES) =	174.00
SUBAREA RUNOFF (CFS) =	280.71
EFFECTIVE AREA (ACRES) =	2003.38
AVERAGED Fm (INCH/HR) =	.569
TOTAL AREA (ACRES) =	2448.00
PEAK FLOW RATE (CFS) =	3255.35
TC (MIN) =	22.74

\*\*\*\*\*  
FLOW PROCESS FROM NODE 805.10 TO NODE 808.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1650.00
DOWNSTREAM NODE ELEVATION =	1600.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	2000.00
CHANNEL BASE (FEET) =	20.00
"Z" FACTOR =	5.500
MANNINGS FACTOR =	.022
MAXIMUM DEPTH (FEET) =	4.50
CHANNEL FLOW THRU SUBAREA (CFS) =	3255.35
FLOW VELOCITY (FEET/SEC) =	19.98
FLOW DEPTH (FEET) =	3.92
TRAVEL TIME (MIN.) =	1.67
TC (MIN.) =	24.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 806.00 TO NODE 808.10 IS CODE = 8  
-----

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

```

=====
25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.276
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 118.00 SUBAREA RUNOFF(CFS) = 179.88
EFFECTIVE AREA(ACRES) = 2121.38
AVERAGED Fm(INCH/HR) = .570
TOTAL AREA(ACRES) = 2566.00
PEAK FLOW RATE(CFS) = 3257.15
TC(MIN) = 24.40

*****
FLOW PROCESS FROM NODE 807.00 TO NODE 808.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.276
SOIL CLASSIFICATION IS "A"
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .8200
SUBAREA AREA(ACRES) = 625.00 SUBAREA RUNOFF(CFS) = 818.87
EFFECTIVE AREA(ACRES) = 2746.38
AVERAGED Fm(INCH/HR) = .627
TOTAL AREA(ACRES) = 3191.00
PEAK FLOW RATE(CFS) = 4076.02
TC(MIN) = 24.40

*****
FLOW PROCESS FROM NODE 808.10 TO NODE 808.10 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
-----
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 24.40
RAINFALL INTENSITY (INCH./HR) = 2.28
EFFECTIVE STREAM AREA(ACRES) = 2746.38
TOTAL STREAM AREA(ACRES) = 3191.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4076.02

CONFLUENCE INFORMATION:
STREAM PEAK FLOW TIME INTENSITY FM EFFECTIVE
NUMBER RATE(CFS) (MIN.) (INCH/HR) (IN/HR) AREA(ACRES)
-----
1 4076.02 24.40 2.276 .63 2746.38

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 1 STREAMS.
SUMMARY RESULTS:
STREAM CONFLUENCE EFFECTIVE
NUMBER Q(CFS) AREA(ACRES)
-----
1 4076.02 2746.38
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 4076.02 TIME(MINUTES) = 24.403
EFFECTIVE AREA(ACRES) = 2746.38
TOTAL AREA(ACRES) = 3191.00
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 3191.00
EFFECTIVE AREA(ACRES) = 2746.38
PEAK FLOW RATE(CFS) = 4076.02
=====
END OF RATIONAL METHOD ANALYSIS

```

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
Copyright 1983,86,87 Advanced Engineering Software (aes)  
Ver. 4.1C Release Date: 5/11/87 Serial # I00908  
\*\*\*\*\*

Especially prepared for:

HALL & FOREMAN

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* MASTER S.D PLAN, FOR CITY OF FONTANA, CRAWFORD CHANNEL, DATA FOR LINE A \*  
\* SEE 25 YR FOR CHANNEL DESIGN, Q 100 YR, TRAP. CHANNEL \*  
\* VENKI.N , JN 3547, 5/19/89 \*  
\*\*\*\*\*

FILE NAME: CRAWFORD.DAT

TIME/DATE OF STUDY: 15: 4 5/19/1989

=====

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 = .95  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.150  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.660  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.6600  
SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*  
FLOW PROCESS FROM NODE 600.00 TO NODE 600.10 IS CODE = 2  
-----

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

=====

NATURAL AVERAGE COVER

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 3160.00  
DOWNSTREAM ELEVATION = 2700.00  
ELEVATION DIFFERENCE = 460.00  
TC =  $.706 * [(1000.00 ** 3.00) / (460.00)] ** .20 = 13.069$   
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.142  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA RUNOFF(CFS) = 32.24  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 32.24

\*\*\*\*\*  
FLOW PROCESS FROM NODE 600.10 TO NODE 601.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 2700.00  
DOWNSTREAM NODE ELEVATION = 2580.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 650.00  
CHANNEL BASE(FEET) = 4.00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .022    MAXIMUM DEPTH(FEET) = 1.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 32.24  
FLOW VELOCITY(FEET/SEC) = 14.50    FLOW DEPTH(FEET) = .45  
TRAVEL TIME(MIN.) = .75    TC(MIN.) = 13.82

\*\*\*\*\*  
FLOW PROCESS FROM NODE 601.00 TO NODE 601.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.006  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 10.00    SUBAREA RUNOFF(CFS) = 31.02  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 62.04  
TC(MIN) = 13.82

\*\*\*\*\*  
FLOW PROCESS FROM NODE 601.10 TO NODE 602.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 2580.00  
DOWNSTREAM NODE ELEVATION = 2420.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 700.00  
CHANNEL BASE(FEET) = 4.00    "Z" FACTOR = 2.000  
MANNINGS FACTOR = .022    MAXIMUM DEPTH(FEET) = 1.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 62.04  
FLOW VELOCITY(FEET/SEC) = 19.51    FLOW DEPTH(FEET) = .61  
TRAVEL TIME(MIN.) = .60    TC(MIN.) = 14.41

\*\*\*\*\*  
FLOW PROCESS FROM NODE 602.00 TO NODE 602.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.906  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 20.00    SUBAREA RUNOFF(CFS) = 60.23  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 120.45  
TC(MIN) = 14.41

\*\*\*\*\*  
FLOW PROCESS FROM NODE 602.10 TO NODE 603.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 2420.00  
DOWNSTREAM NODE ELEVATION = 2360.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 500.00  
CHANNEL BASE(FEET) = 7.00    "Z" FACTOR = 4.000  
MANNINGS FACTOR = .022    MAXIMUM DEPTH(FEET) = 1.00

CHANNEL FLOW THRU SUBAREA(CFS) = 120.45  
FLOW VELOCITY(FEET/SEC) = 16.51 FLOW DEPTH(FEET) = .73  
TRAVEL TIME(MIN.) = .50 TC(MIN.) = 14.92

\*\*\*\*\*  
FLOW PROCESS FROM NODE 603.00 TO NODE 603.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.826  
SOIL CLASSIFICATION IS "A"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .8200  
SUBAREA AREA(ACRES) = 38.00 SUBAREA RUNOFF(CFS) = 102.81  
EFFECTIVE AREA(ACRES) = 78.00  
AVERAGED Fm(INCH/HR) = .687  
TOTAL AREA(ACRES) = 78.00  
PEAK FLOW RATE(CFS) = 220.38  
TC(MIN) = 14.92

\*\*\*\*\*  
FLOW PROCESS FROM NODE 603.10 TO NODE 604.10 IS CODE = 5  
-----

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
>>>>>TRAVELTIME THRU SUBAREA<<<<<  
=====

UPSTREAM NODE ELEVATION = 2360.00  
DOWNSTREAM NODE ELEVATION = 1908.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 4000.00  
CHANNEL BASE(FEET) = 9.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 1.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 220.38  
FLOW VELOCITY(FEET/SEC) = 17.57 FLOW DEPTH(FEET) = .92  
TRAVEL TIME(MIN.) = 3.80 TC(MIN.) = 18.71

\*\*\*\*\*  
FLOW PROCESS FROM NODE 604.00 TO NODE 604.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.340  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 57.00 SUBAREA RUNOFF(CFS) = 142.59  
EFFECTIVE AREA(ACRES) = 135.00  
AVERAGED Fm(INCH/HR) = .633  
TOTAL AREA(ACRES) = 135.00  
PEAK FLOW RATE(CFS) = 328.83  
TC(MIN) = 18.71

\*\*\*\*\*  
FLOW PROCESS FROM NODE 604.10 TO NODE 604.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 18.71  
RAINFALL INTENSITY (INCH./HOUR) = 3.34  
EFFECTIVE STREAM AREA(ACRES) = 135.00  
TOTAL STREAM AREA(ACRES) = 135.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 328.83



```

*****
FLOW PROCESS FROM NODE    605.00 TO NODE    605.11 IS CODE =    2
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
NATURAL AVERAGE COVER

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1200.00
UPSTREAM ELEVATION = 3000.00
DOWNSTREAM ELEVATION = 2520.00
ELEVATION DIFFERENCE = 480.00
TC = .706*[(1200.00** 3.00)/(480.00)]** .20 = 14.457
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.899
SOIL CLASSIFICATION IS "B"
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600
SUBAREA RUNOFF(CFS) = 30.05
TOTAL AREA(ACRES) = 10.00    PEAK FLOW RATE(CFS) = 30.05

*****
FLOW PROCESS FROM NODE    605.11 TO NODE    605.12 IS CODE =    5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 2520.00
DOWNSTREAM NODE ELEVATION = 2360.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 600.00
CHANNEL BASE(FEET) = 5.00    "Z" FACTOR = 4.000
MANNINGS FACTOR = .022    MAXIMUM DEPTH(FEET) = 1.00
CHANNEL FLOW THRU SUBAREA(CFS) = 30.05
FLOW VELOCITY(FEET/SEC) = 14.51    FLOW DEPTH(FEET) = .33
TRAVEL TIME(MIN.) = .69    TC(MIN.) = 15.15

*****
FLOW PROCESS FROM NODE    605.10 TO NODE    605.12 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.792
SOIL CLASSIFICATION IS "B"
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600
SUBAREA AREA(ACRES) = 10.00    SUBAREA RUNOFF(CFS) = 29.08
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .560
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 58.17
TC(MIN) = 15.15

*****
FLOW PROCESS FROM NODE    605.12 TO NODE    605.13 IS CODE =    5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 2360.00
DOWNSTREAM NODE ELEVATION = 2207.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1050.00
CHANNEL BASE(FEET) = 5.00    "Z" FACTOR = 4.000
MANNINGS FACTOR = .022    MAXIMUM DEPTH(FEET) = 1.00
CHANNEL FLOW THRU SUBAREA(CFS) = 58.17

```

FLOW VELOCITY(FEET/SEC) = 14.80 FLOW DEPTH(FEET) = .55  
TRAVEL TIME(MIN.) = 1.18 TC(MIN.) = 16.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.20 TO NODE 605.13 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.624  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 55.16  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 110.32  
TC(MIN) = 16.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.30 TO NODE 605.13 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.624  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 110.32  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 220.64  
TC(MIN) = 16.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.13 TO NODE 605.10 IS CODE = 5

-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 2207.00  
DOWNSTREAM NODE ELEVATION = 2100.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1450.00  
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .021 MAXIMUM DEPTH(FEET) = 1.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 220.64  
FLOW VELOCITY(FEET/SEC) = 15.68 FLOW DEPTH(FEET) = .95  
TRAVEL TIME(MIN.) = 1.54 TC(MIN.) = 17.87

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.40 TO NODE 605.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.433  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 46.55  
EFFECTIVE AREA(ACRES) = 98.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 98.00  
PEAK FLOW RATE(CFS) = 253.44

TC(MIN) = 17.87

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.10 TO NODE 606.10 IS CODE = 5  
-----

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

UPSTREAM NODE ELEVATION	=	2100.00
DOWNSTREAM NODE ELEVATION	=	1990.00
CHANNEL LENGTH THRU SUBAREA(FEET)	=	4000.00
CHANNEL BASE(FEET)	=	10.00 "Z" FACTOR = 5.000
MANNINGS FACTOR	=	.021 MAXIMUM DEPTH(FEET) = 1.50
CHANNEL FLOW THRU SUBAREA(CFS)	=	253.44
FLOW VELOCITY(FEET/SEC)	=	11.24 FLOW DEPTH(FEET) = 1.35
TRAVEL TIME(MIN.)	=	5.93 TC(MIN.) = 23.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 606.00 TO NODE 606.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.891
SOIL CLASSIFICATION IS	"B"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.4500
SUBAREA AREA(ACRES)	=	151.00 SUBAREA RUNOFF(CFS) = 331.70
EFFECTIVE AREA(ACRES)	=	249.00
AVERAGED Fm(INCH/HR)	=	.493
TOTAL AREA(ACRES)	=	249.00
PEAK FLOW RATE(CFS)	=	537.27
TC(MIN)	=	23.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 606.10 TO NODE 604.10 IS CODE = 5  
-----

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

UPSTREAM NODE ELEVATION	=	1990.00
DOWNSTREAM NODE ELEVATION	=	1908.00
CHANNEL LENGTH THRU SUBAREA(FEET)	=	3300.00
CHANNEL BASE(FEET)	=	6.00 "Z" FACTOR = 1.500
MANNINGS FACTOR	=	.015 MAXIMUM DEPTH(FEET) = 2.75
CHANNEL FLOW THRU SUBAREA(CFS)	=	537.27
FLOW VELOCITY(FEET/SEC)	=	21.75 FLOW DEPTH(FEET) = 2.52
TRAVEL TIME(MIN.)	=	2.53 TC(MIN.) = 26.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 607.00 TO NODE 604.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.721
SOIL CLASSIFICATION IS	"A"	
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR)	=	.8200
SUBAREA AREA(ACRES)	=	148.00 SUBAREA RUNOFF(CFS) = 253.19
EFFECTIVE AREA(ACRES)	=	397.00
AVERAGED Fm(INCH/HR)	=	.615
TOTAL AREA(ACRES)	=	397.00
PEAK FLOW RATE(CFS)	=	752.38
TC(MIN)	=	26.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 604.10 TO NODE 604.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 26.33  
RAINFALL INTENSITY (INCH./HOUR) = 2.72  
EFFECTIVE STREAM AREA(ACRES) = 397.00  
TOTAL STREAM AREA(ACRES) = 397.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 752.38

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	328.83	18.71	3.340	.63	135.00
2	752.38	26.33	2.721	.62	397.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1020.66	417.15
2	1006.03	532.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1020.66 TIME(MINUTES) = 18.715  
EFFECTIVE AREA(ACRES) = 417.15  
TOTAL AREA(ACRES) = 532.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 604.10 TO NODE 608.10 IS CODE = 5

-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<<  
=====

UPSTREAM NODE ELEVATION = 1908.00  
DOWNSTREAM NODE ELEVATION = 1868.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00  
CHANNEL BASE(FEET) = 6.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 3.75  
CHANNEL FLOW THRU SUBAREA(CFS) = 1020.66  
FLOW VELOCITY(FEET/SEC) = 27.94 FLOW DEPTH(FEET) = 3.33  
TRAVEL TIME(MIN.) = .78 TC(MIN.) = 19.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 608.00 TO NODE 608.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.259  
SOIL CLASSIFICATION IS "B"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .4500  
SUBAREA AREA(ACRES) = 55.00 SUBAREA RUNOFF(CFS) = 139.06  
EFFECTIVE AREA(ACRES) = 472.15  
AVERAGED Fm(INCH/HR) = .601  
TOTAL AREA(ACRES) = 587.00  
PEAK FLOW RATE(CFS) = 1129.54

TC(MIN) = 19.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 608.10 TO NODE 518.20 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION	=	1868.00
DOWNSTREAM NODE ELEVATION	=	1755.00
CHANNEL LENGTH THRU SUBAREA(Feet)	=	3500.00
CHANNEL BASE(Feet)	=	6.00
"Z" FACTOR	=	1.500
MANNINGS FACTOR	=	.015
MAXIMUM DEPTH(Feet)	=	3.75
CHANNEL FLOW THRU SUBAREA(CFS)	=	1129.54
FLOW VELOCITY(Feet/Sec)	=	29.03
FLOW DEPTH(Feet)	=	3.47
TRAVEL TIME(Min.)	=	2.01
TC(Min.)	=	21.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 518.20 TO NODE 518.20 IS CODE = 1  
-----

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES)	=	21.50
RAINFALL INTENSITY (INCH./HOUR)	=	3.07
EFFECTIVE STREAM AREA(ACRES)	=	472.15
TOTAL STREAM AREA(ACRES)	=	587.00
PEAK FLOW RATE(CFS) AT CONFLUENCE	=	1129.54

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
------------------	------------------------	----------------	--------------------------	---------------	--------------------------

1	1129.54	21.50	3.073	.60	472.15
---	---------	-------	-------	-----	--------

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1129.54	472.15
---	---------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS)	=	1129.54	TIME(MINUTES)	=	21.500
EFFECTIVE AREA(ACRES)	=	472.15			
TOTAL AREA(ACRES)	=	587.00			

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	587.00
EFFECTIVE AREA(ACRES)	=	472.15
PEAK FLOW RATE(CFS)	=	1129.54

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
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Ver. 4.1C Release Date: 5/11/87 Serial # 100908

Especially prepared for:

HALL & FOREMAN

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

\* Q 25 YR, ~~WALCS FOR~~ *MASTER S.D.* \*  
\* *CITY OF MONTANA* \*  
\* V.N./J.M., JN 3814-023, 11/14/1988 \*  
\*\*\*\*\*

FILE NAME: CRAWFORD.DAT

TIME/DATE OF STUDY: 9:53 11/14/1988

=====

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 = .95  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.150  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.660  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.3265  
SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 600.00 TO NODE 600.10 IS CODE = 2

-----

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

=====

NATURAL AVERAGE COVER

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 3160.00  
DOWNSTREAM ELEVATION = 2700.00  
ELEVATION DIFFERENCE = 460.00  
 $TC = .706 * [(1000.00 ** 3.00) / (460.00)] ** .20 = 13.069$   
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.310  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5600  
SUBAREA RUNOFF(CFS) = 24.75  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 24.75

\*\*\*\*\*

FLOW PROCESS FROM NODE 600.10 TO NODE 601.10 IS CODE = 5

-----

>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

UPSTREAM NODE ELEVATION = 2700.00  
DOWNSTREAM NODE ELEVATION = 2580.00

DOWNSTREAM NODE ELEVATION = 2360.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 500.00  
CHANNEL BASE(FEET) = 7.00 "Z" FACTOR = 4.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 1.00  
INEL FLOW THRU SUBAREA(CFS) = 91.69  
FLOW VELOCITY(FEET/SEC) = 14.97 FLOW DEPTH(FEET) = .64  
TRAVEL TIME(MIN.) = .56 TC(MIN.) = 15.08

\*\*\*\*\*  
FLOW PROCESS FROM NODE 603.00 TO NODE 603.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.037  
SOIL CLASSIFICATION IS "A"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .8200  
SUBAREA AREA(ACRES) = 38.00 SUBAREA RUNOFF(CFS) = 75.84  
EFFECTIVE AREA(ACRES) = 78.00  
AVERAGED Fm(INCH/HR) = .687  
TOTAL AREA(ACRES) = 78.00  
PEAK FLOW RATE(CFS) = 165.03  
TC(MIN) = 15.08

\*\*\*\*\*  
FLOW PROCESS FROM NODE 603.10 TO NODE 604.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
-----

>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 2360.00  
DOWNSTREAM NODE ELEVATION = 1908.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 4000.00  
CHANNEL BASE(FEET) = 9.00 "Z" FACTOR = 5.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 1.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 165.03  
FLOW VELOCITY(FEET/SEC) = 15.95 FLOW DEPTH(FEET) = .80  
TRAVEL TIME(MIN.) = 4.18 TC(MIN.) = 19.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 604.00 TO NODE 604.10 IS CODE = 8 ✓  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.623  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 57.00 SUBAREA RUNOFF(CFS) = 105.82  
EFFECTIVE AREA(ACRES) = 135.00  
AVERAGED Fm(INCH/HR) = .633  
TOTAL AREA(ACRES) = 135.00  
PEAK FLOW RATE(CFS) = 241.74  
TC(MIN) = 19.26

\*\*\*\*\*  
J PROCESS FROM NODE 604.10 TO NODE 604.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 19.26  
RAINFALL INTENSITY (INCH./HOUR) = 2.62  
EFFECTIVE STREAM AREA(ACRES) = 135.00  
TOTAL STREAM AREA(ACRES) = 135.00  
FLOW RATE(CFS) AT CONFLUENCE = 241.74

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.00 TO NODE 605.11 IS CODE = 2  
-----

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

NATURAL AVERAGE COVER

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION \text{ CHANGE})] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1200.00  
UPSTREAM ELEVATION = 3000.00  
DOWNSTREAM ELEVATION = 2520.00  
ELEVATION DIFFERENCE = 480.00  
TC =  $.706 * [(1200.00 ** 3.00) / (480.00)] ** .20 = 14.457$   
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.116  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA RUNOFF(CFS) = 23.00  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 23.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.11 TO NODE 605.12 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 2520.00  
DOWNSTREAM NODE ELEVATION = 2360.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 600.00  
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 4.000  
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 1.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 23.00  
FLOW VELOCITY(FEET/SEC) = 12.52 FLOW DEPTH(FEET) = .30  
TRAVEL TIME(MIN.) = .80 TC(MIN.) = 15.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.10 TO NODE 605.12 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.017  
SOIL CLASSIFICATION IS "B"  
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 22.11  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .560  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 44.22  
TC(MIN) = 15.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.12 TO NODE 605.13 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<



```

>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 2360.00
DOWNSTREAM NODE ELEVATION = 2207.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1050.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 4.000
MANNINGS FACTOR = .022 MAXIMUM DEPTH(FEET) = 1.00
CHANNEL FLOW THRU SUBAREA(CFS) = 44.22
FLOW VELOCITY(FEET/SEC) = 13.16 FLOW DEPTH(FEET) = .48
TRAVEL TIME(MIN.) = 1.33 TC(MIN.) = 16.58

*****
FLOW PROCESS FROM NODE 605.20 TO NODE 605.13 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.869
SOIL CLASSIFICATION IS "B"
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 41.57
EFFECTIVE AREA(ACRES) = 40.00
AVERAGED Fm(INCH/HR) = .560
TOTAL AREA(ACRES) = 40.00
PEAK FLOW RATE(CFS) = 83.13
TC(MIN) = 16.58

*****
FLOW PROCESS FROM NODE 605.30 TO NODE 605.13 IS CODE = 8
-----
>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.869
SOIL CLASSIFICATION IS "B"
NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 83.13
EFFECTIVE AREA(ACRES) = 80.00
AVERAGED Fm(INCH/HR) = .560
TOTAL AREA(ACRES) = 80.00
PEAK FLOW RATE(CFS) = 166.27
TC(MIN) = 16.58

*****
FLOW PROCESS FROM NODE 605.13 TO NODE 605.10 IS CODE = 5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 2207.00
DOWNSTREAM NODE ELEVATION = 2100.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1450.00
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 5.000
MANNINGS FACTOR = .021 MAXIMUM DEPTH(FEET) = 1.00
CHANNEL FLOW THRU SUBAREA(CFS) = 166.27
FLOW VELOCITY(FEET/SEC) = 14.20 FLOW DEPTH(FEET) = .83
TRAVEL TIME(MIN.) = 1.70 TC(MIN.) = 18.29

*****
FLOW PROCESS FROM NODE 605.40 TO NODE 605.10 IS CODE = 8
-----

```

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.706

SOIL CLASSIFICATION IS "B"

RESIDENTIAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .5600

SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 34.76

EFFECTIVE AREA(ACRES) = 98.00

AVERAGED Fm(INCH/HR) = .560

TOTAL AREA(ACRES) = 98.00

PEAK FLOW RATE(CFS) = 189.27

TC(MIN) = 18.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 605.10 TO NODE 606.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 2100.00

DOWNSTREAM NODE ELEVATION = 1990.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 4000.00

CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 5.000

MANNINGS FACTOR = .021 MAXIMUM DEPTH(FEET) = 1.50

CHANNEL FLOW THRU SUBAREA(CFS) = 189.27

FLOW VELOCITY(FEET/SEC) = 10.32 FLOW DEPTH(FEET) = 1.16

TRAVEL TIME(MIN.) = 6.46 TC(MIN.) = 24.74

\*\*\*\*\*  
FLOW PROCESS FROM NODE 606.00 TO NODE 606.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.257

SOIL CLASSIFICATION IS "B"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .4500

SUBAREA AREA(ACRES) = 151.00 SUBAREA RUNOFF(CFS) = 245.56

EFFECTIVE AREA(ACRES) = 249.00

AVERAGED Fm(INCH/HR) = .493

TOTAL AREA(ACRES) = 249.00

PEAK FLOW RATE(CFS) = 395.23

TC(MIN) = 24.74

\*\*\*\*\*  
FLOW PROCESS FROM NODE 606.10 TO NODE 604.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1990.00

DOWNSTREAM NODE ELEVATION = 1908.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 3300.00

CHANNEL BASE(FEET) = 6.00 "Z" FACTOR = 1.500

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 2.75

CHANNEL FLOW THRU SUBAREA(CFS) = 395.23

FLOW VELOCITY(FEET/SEC) = 19.81 FLOW DEPTH(FEET) = 2.16

TRAVEL TIME(MIN.) = 2.78 TC(MIN.) = 27.52

\*\*\*\*\*  
FLOW PROCESS FROM NODE 607.00 TO NODE 604.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.117

CLASSIFICATION IS "A"

NATURAL AVERAGE COVER "GRASS" SUBAREA LOSS RATE, Fm(INCH/HR) = .8200

SUBAREA AREA(ACRES) = 148.00 SUBAREA RUNOFF(CFS) = 172.82

EFFECTIVE AREA(ACRES) = 397.00

AVERAGED Fm(INCH/HR) = .615

TOTAL AREA(ACRES) = 397.00

PEAK FLOW RATE(CFS) = 536.79

TC(MIN) = 27.52

\*\*\*\*\*

FLOW PROCESS FROM NODE 604.10 TO NODE 604.10 IS CODE = 1

-----

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

-----

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 27.52

RAINFALL INTENSITY (INCH./HOUR) = 2.12

EFFECTIVE STREAM AREA(ACRES) = 397.00

TOTAL STREAM AREA(ACRES) = 397.00

PEAK FLOW RATE(CFS) AT CONFLUENCE = 536.79

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
	241.74	19.26	2.623	.63	135.00
2	536.79	27.52	2.117	.62	397.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

-----

1	743.86	412.88
---	--------	--------

2	717.12	532.00
---	--------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 743.86 TIME(MINUTES) = 19.262

EFFECTIVE AREA(ACRES) = 412.88

TOTAL AREA(ACRES) = 532.00

\*\*\*\*\*

FLOW PROCESS FROM NODE 604.10 TO NODE 608.10 IS CODE = 5

-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1908.00

DOWNSTREAM NODE ELEVATION = 1868.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00

CHANNEL BASE(FEET) = 6.00 "Z" FACTOR = 1.500

MANNING'S FACTOR = .015 MAXIMUM DEPTH(FEET) = 3.75

CHANNEL FLOW THRU SUBAREA(CFS) = 743.86

FLOW VELOCITY(FEET/SEC) = 25.69 FLOW DEPTH(FEET) = 2.83

TRAVEL TIME(MIN.) = .84 TC(MIN.) = 20.11

```

*****
FLOW PROCESS FROM NODE 608.00 TO NODE 608.10 IS CODE = 8
-----
>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.556
SOIL CLASSIFICATION IS "B"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .4500
SUBAREA AREA(ACRES) = 55.00 SUBAREA RUNOFF(CFS) = 104.26
EFFECTIVE AREA(ACRES) = 467.88
AVERAGED Fm(INCH/HR) = .601
TOTAL AREA(ACRES) = 587.00
PEAK FLOW RATE(CFS) = 823.39
TC(MIN) = 20.11

*****
FLOW PROCESS FROM NODE 608.10 TO NODE 518.20 IS CODE = 5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 1868.00
DOWNSTREAM NODE ELEVATION = 1755.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 3500.00
CHANNEL BASE(FEET) = 6.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 3.75
CHANNEL FLOW THRU SUBAREA(CFS) = 823.39
FLOW VELOCITY(FEET/SEC) = 26.85 FLOW DEPTH(FEET) = 2.94
TRAVEL TIME(MIN.) = 2.17 TC(MIN.) = 22.28

*****
FLOW PROCESS FROM NODE 518.20 TO NODE 518.20 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 22.28
RAINFALL INTENSITY (INCH./HOUR) = 2.40
EFFECTIVE STREAM AREA(ACRES) = 467.88
TOTAL STREAM AREA(ACRES) = 587.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 823.39

CONFLUENCE INFORMATION:
STREAM PEAK FLOW TIME INTENSITY FM EFFECTIVE
NUMBER RATE(CFS) (MIN.) (INCH/HOUR) (IN/HR) AREA(ACRES)
-----
1 823.39 22.28 2.404 .60 467.88

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 1 STREAMS.
SUMMARY RESULTS:
STREAM CONFLUENCE EFFECTIVE
NUMBER Q(CFS) AREA(ACRES)
-----
823.39 467.88

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 823.39 TIME(MINUTES) = 22.278
EFFECTIVE AREA(ACRES) = 467.88
TOTAL AREA(ACRES) = 587.00

```

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 587.00

EFFECTIVE AREA(ACRES) = 467.88

Q FLOW RATE(CFS) = 823.39

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
Copyright 1983,86,87 Advanced Engineering Software (aes)  
Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* N. FONTANA MASTER STORM DRAIN LINE B. \*  
\* Q 100-YR. STORM. DESIGN Q. \*  
\* JN 3547, T. ARROYO, 11/29/89. \*  
\*\*\*\*\*

FILE NAME: A:LINEB.100

TIME/DATE OF STUDY: 16: 1 11/27/1989

=====

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 = .95  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.530  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.5300  
SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*  
FLOW PROCESS FROM NODE 400.00 TO NODE 400.10 IS CODE = 2  
-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$

INITIAL SUBAREA FLOW-LENGTH = 1000.00

UPSTREAM ELEVATION = 1815.00

DOWNSTREAM ELEVATION = 1805.00

ELEVATION DIFFERENCE = 10.00

TC =  $.412 * [(1000.00 ** 3.00) / (10.00)] ** .20 = 16.402$

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.332

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA RUNOFF(CFS) = 24.75

TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 24.75

\*\*\*\*\*

FLOW PROCESS FROM NODE 400.10 TO NODE 402.11 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 21.0 INCH PIPE IS 17.2 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 11.7

UPSTREAM NODE ELEVATION = 1805.00

DOWNSTREAM NODE ELEVATION = 1796.00

FLOWLENGTH(FEET) = 350.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 24.75

TRAVEL TIME(MIN.) = .50 TC(MIN.) = 16.90

\*\*\*\*\*  
FLOW PROCESS FROM NODE 402.00 TO NODE 402.11 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.272

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 24.21

EFFECTIVE AREA(ACRES) = 20.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 20.00

PEAK FLOW RATE(CFS) = 48.43

TC(MIN) = 16.90

\*\*\*\*\*  
FLOW PROCESS FROM NODE 401.00 TO NODE 402.11 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.272

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 43.58

EFFECTIVE AREA(ACRES) = 38.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 38.00

PEAK FLOW RATE(CFS) = 92.01

TC(MIN) = 16.90

\*\*\*\*\*  
FLOW PROCESS FROM NODE 402.11 TO NODE 402.21 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 36.0 INCH PIPE IS 24.6 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 17.8

UPSTREAM NODE ELEVATION = 1796.00

DOWNSTREAM NODE ELEVATION = 1776.00

FLOWLENGTH(FEET) = 660.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 92.01

TRAVEL TIME(MIN.) = .62 TC(MIN.) = 17.52

\*\*\*\*\*  
FLOW PROCESS FROM NODE 402.20 TO NODE 402.21 IS CODE = 8

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.203
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 47.17
EFFECTIVE AREA(ACRES) = 58.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 58.00
PEAK FLOW RATE(CFS) = 136.80
TC(MIN) = 17.52

*****
FLOW PROCESS FROM NODE 402.21 TO NODE 402.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 39.0 INCH PIPE IS 31.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 19.2
UPSTREAM NODE ELEVATION = 1776.00
DOWNSTREAM NODE ELEVATION = 1767.00
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 136.80
TRAVEL TIME(MIN.) = .26 TC(MIN.) = 17.78

*****
FLOW PROCESS FROM NODE 404.00 TO NODE 402.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.174
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 33.50 SUBAREA RUNOFF(CFS) = 78.16
EFFECTIVE AREA(ACRES) = 91.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 91.50
PEAK FLOW RATE(CFS) = 213.49
TC(MIN) = 17.78

*****
FLOW PROCESS FROM NODE 402.10 TO NODE 403.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 21.8
UPSTREAM NODE ELEVATION = 1767.00
DOWNSTREAM NODE ELEVATION = 1742.00
FLOWLENGTH(FEET) = 830.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 213.49
TRAVEL TIME(MIN.) = .63 TC(MIN.) = 18.41

*****
FLOW PROCESS FROM NODE 405.00 TO NODE 403.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====

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100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.108
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 34.00 SUBAREA RUNOFF(CFS) = 77.31
EFFECTIVE AREA(ACRES) = 125.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 125.50
PEAK FLOW RATE(CFS) = 285.36
TC(MIN) = 18.41

*****
FLOW PROCESS FROM NODE 403.10 TO NODE 403.20 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 54.0 INCH PIPE IS 39.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 22.7
UPSTREAM NODE ELEVATION = 1742.00
DOWNSTREAM NODE ELEVATION = 1737.00
FLOWLENGTH(FEET) = 180.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 285.36
TRAVEL TIME(MIN.) = .13 TC(MIN.) = 18.54

*****
FLOW PROCESS FROM NODE 403.00 TO NODE 403.20 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.095
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 43.00 SUBAREA RUNOFF(CFS) = 97.26
EFFECTIVE AREA(ACRES) = 168.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 168.50
PEAK FLOW RATE(CFS) = 381.11
TC(MIN) = 18.54

*****
FLOW PROCESS FROM NODE 403.20 TO NODE 406.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 60.0 INCH PIPE IS 44.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 24.5
UPSTREAM NODE ELEVATION = 1737.00
DOWNSTREAM NODE ELEVATION = 1699.00
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 381.11
TRAVEL TIME(MIN.) = .92 TC(MIN.) = 19.46

*****
FLOW PROCESS FROM NODE 406.00 TO NODE 406.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.007
SOIL CLASSIFICATION IS "A"

```

```

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 87.29
EFFECTIVE AREA(ACRES) = 208.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 208.50
PEAK FLOW RATE(CFS) = 455.00
TC(MIN) = 19.46

*****
FLOW PROCESS FROM NODE 407.00 TO NODE 406.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.007
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 46.00 SUBAREA RUNOFF(CFS) = 100.38
EFFECTIVE AREA(ACRES) = 254.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 254.50
PEAK FLOW RATE(CFS) = 555.38
TC(MIN) = 19.46

*****
FLOW PROCESS FROM NODE 406.10 TO NODE 408.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 69.0 INCH PIPE IS 53.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 25.7
UPSTREAM NODE ELEVATION = 1699.00
DOWNSTREAM NODE ELEVATION = 1666.00
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 555.38
TRAVEL TIME(MIN.) = .84 TC(MIN.) = 20.30

*****
FLOW PROCESS FROM NODE 408.00 TO NODE 408.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.931
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 84.57
EFFECTIVE AREA(ACRES) = 294.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 294.50
PEAK FLOW RATE(CFS) = 622.67
TC(MIN) = 20.30

*****
FLOW PROCESS FROM NODE 408.10 TO NODE 409.11 IS CODE = 5
-----
>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 1666.00
DOWNSTREAM NODE ELEVATION = 1665.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 900.00

```

CHANNEL BASE( FEET) = 9.00 "Z" FACTOR = .000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH( FEET) = 8.00  
CHANNEL FLOW THRU SUBAREA( CFS) = 622.67

==>>ERROR: FLOW IN CHANNEL EXCEEDS CHANNEL  
CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM  
ALLOWABLE DEPTH).  
AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM  
ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

FLOW VELOCITY( FEET/SEC) = 8.65 FLOW DEPTH( FEET) = 8.00  
TRAVEL TIME( MIN.) = 1.73 TC( MIN.) = 22.04

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

\*\*\*\*\*

FLOW PROCESS FROM NODE 409.00 TO NODE 409.11 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY( INCH/ HOUR) = 2.791  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ ACRE SUBAREA LOSS RATE, Fm( INCH/ HR) = .5820  
SUBAREA AREA( ACRES) = 27.00 SUBAREA RUNOFF( CFS) = 53.67  
EFFECTIVE AREA( ACRES) = 321.50  
AVERAGED Fm( INCH/ HR) = .582  
TOTAL AREA( ACRES) = 321.50  
PEAK FLOW RATE( CFS) = 639.04  
TC( MIN) = 22.04

\* .. \*\*\*\*\*

FLOW PROCESS FROM NODE 409.11 TO NODE 409.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1665.00  
DOWNSTREAM NODE ELEVATION = 1664.00  
CHANNEL LENGTH THRU SUBAREA( FEET) = 820.00  
CHANNEL BASE( FEET) = 9.00 "Z" FACTOR = .000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH( FEET) = 8.00  
CHANNEL FLOW THRU SUBAREA( CFS) = 639.04

==>>ERROR: FLOW IN CHANNEL EXCEEDS CHANNEL  
CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM  
ALLOWABLE DEPTH).  
AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM  
ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

FLOW VELOCITY( FEET/SEC) = 8.88 FLOW DEPTH( FEET) = 8.00  
TRAVEL TIME( MIN.) = 1.54 TC( MIN.) = 23.58

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

\*\*\*\*\*

FLOW PROCESS FROM NODE 410.00 TO NODE 409.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY( INCH/ HOUR) = 2.680  
SOIL CLASSIFICATION IS "A"

```

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 26.00 SUBAREA RUNOFF(CFS) = 49.09
EFFECTIVE AREA(ACRES) = 347.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 347.50
PEAK FLOW RATE(CFS) = 656.06
TC(MIN) = 23.58

*****
FLOW PROCESS FROM NODE 409.10 TO NODE 411.10 IS CODE = 5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 1664.00
DOWNSTREAM NODE ELEVATION = 1662.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 850.00
CHANNEL BASE(FEET) = 9.00 "Z" FACTOR = .000
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) = 656.06
FLOW VELOCITY(FEET/SEC) = 9.62 FLOW DEPTH(FEET) = 7.58
TRAVEL TIME(MIN.) = 1.47 TC(MIN.) = 25.05

*****
FLOW PROCESS FROM NODE 411.00 TO NODE 411.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.584
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 26.00 SUBAREA RUNOFF(CFS) = 46.85
EFFECTIVE AREA(ACRES) = 373.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 373.50
PEAK FLOW RATE(CFS) = 672.99
TC(MIN) = 25.05

*****
FLOW PROCESS FROM NODE 411.10 TO NODE 411.10 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 25.05
RAINFALL INTENSITY (INCH./HOUR) = 2.58
EFFECTIVE STREAM AREA(ACRES) = 373.50
TOTAL STREAM AREA(ACRES) = 373.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 672.99

*****
FLOW PROCESS FROM NODE 415.00 TO NODE 415.11 IS CODE = 2
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

= K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 900.00
UPSTREAM ELEVATION = 1740.00
DOWNSTREAM ELEVATION = 1720.00
ELEVATION DIFFERENCE = 20.00

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```

TC = .412*[( 900.00** 3.00)/( 20.00)]** .20 = 13.404
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.760
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 14.30
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.30

*****
FLOW PROCESS FROM NODE 415.11 TO NODE 415.12 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 18.0 INCH PIPE IS 13.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 10.3
UPSTREAM NODE ELEVATION = 1720.00
DOWNSTREAM NODE ELEVATION = 1700.00
FLOWLENGTH(FEET) = 800.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 14.30
TRAVEL TIME(MIN.) = 1.29 TC(MIN.) = 14.69

*****
FLOW PROCESS FROM NODE 415.10 TO NODE 415.12 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.559
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 13.40
EFFECTIVE AREA(ACRES) = 10.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 10.00
PEAK FLOW RATE(CFS) = 26.79
TC(MIN) = 14.69

*****
FLOW PROCESS FROM NODE 415.12 TO NODE 415.21 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 10.3
UPSTREAM NODE ELEVATION = 1700.00
DOWNSTREAM NODE ELEVATION = 1696.00
FLOWLENGTH(FEET) = 240.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 26.79
TRAVEL TIME(MIN.) = .39 TC(MIN.) = 15.08

*****
FLOW PROCESS FROM NODE 415.20 TO NODE 415.21 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.504
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 26.29
EFFECTIVE AREA(ACRES) = 20.00

```

AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 52.59  
TC(MIN) = 15.08

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.21 TO NODE 415.31 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	36.0 INCH PIPE IS	24.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	10.2
UPSTREAM NODE ELEVATION	=	1696.00
DOWNSTREAM NODE ELEVATION	=	1692.00
FLOWLENGTH(FEET)	=	400.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	36.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	52.59
TRAVEL TIME(MIN.)	=	.65
TC(MIN.)	=	15.73

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.30 TO NODE 415.31 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.416
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	18.00
SUBAREA RUNOFF(CFS)	=	45.91
EFFECTIVE AREA(ACRES)	=	38.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	38.00
PEAK FLOW RATE(CFS)	=	96.92
TC(MIN)	=	15.73

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.31 TO NODE 415.41 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	42.0 INCH PIPE IS	29.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	13.6
UPSTREAM NODE ELEVATION	=	1692.00
DOWNSTREAM NODE ELEVATION	=	1687.00
FLOWLENGTH(FEET)	=	350.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	42.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	96.92
TRAVEL TIME(MIN.)	=	.43
TC(MIN.)	=	16.16

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.40 TO NODE 415.41 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.361
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	17.00
SUBAREA RUNOFF(CFS)	=	42.52
EFFECTIVE AREA(ACRES)	=	55.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	55.00

PEAK FLOW RATE(CFS) = 137.57  
TC(MIN) = 16.16

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.41 TO NODE 411.10 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<  
=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 31.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 16.5  
UPSTREAM NODE ELEVATION = 1687.00  
DOWNSTREAM NODE ELEVATION = 1662.00  
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 137.57  
TRAVEL TIME(MIN.) = 1.33 TC(MIN.) = 17.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 411.10 TO NODE 411.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MINUTES) = 17.50  
RAINFALL INTENSITY (INCH./HOUR) = 3.20  
EFFECTIVE STREAM AREA(ACRES) = 55.00  
TOTAL STREAM AREA(ACRES) = 55.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 137.57

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	672.99	25.05	2.584	.58	373.50
2	137.57	17.50	3.205	.58	55.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	778.00	428.50
2	753.40	315.88

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 778.00 TIME(MINUTES) = 25.050  
EFFECTIVE AREA(ACRES) = 428.50  
TOTAL AREA(ACRES) = 428.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 411.10 TO NODE 416.10 IS CODE = 5

-----  
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
>>>>>TRAVELTIME THRU SUBAREA<<<<<  
=====

STREAM NODE ELEVATION = 1662.00  
DOWNSTREAM NODE ELEVATION = 1660.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 800.00  
CHANNEL BASE(FEET) = 9.00 "Z" FACTOR = .000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 778.00

==>>ERROR: FLOW IN CHANNEL EXCEEDS CHANNEL  
CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM  
ALLOWABLE DEPTH).  
AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM  
ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

FLOW VELOCITY(FEET/SEC) = 10.81 FLOW DEPTH(FEET) = 8.00  
TRAVEL TIME(MIN.) = 1.23 TC(MIN.) = 26.28

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

\*\*\*\*\*  
FLOW PROCESS FROM NODE 416.00 TO NODE 416.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.511  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 22.00 SUBAREA RUNOFF(CFS) = 38.19  
EFFECTIVE AREA(ACRES) = 450.50  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 450.50  
PEAK FLOW RATE(CFS) = 781.94  
TC(MIN) = 26.28

\*\*\*\*\*  
FLOW PROCESS FROM NODE 416.10 TO NODE 417.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 1660.00  
DOWNSTREAM NODE ELEVATION = 1638.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00  
CHANNEL BASE(FEET) = 9.00 "Z" FACTOR = .000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 781.94  
FLOW VELOCITY(FEET/SEC) = 18.23 FLOW DEPTH(FEET) = 4.77  
TRAVEL TIME(MIN.) = 1.83 TC(MIN.) = 28.11

\*\*\*\*\*  
FLOW PROCESS FROM NODE 417.00 TO NODE 417.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.411  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 60.00 SUBAREA RUNOFF(CFS) = 98.78  
EFFECTIVE AREA(ACRES) = 510.50  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 510.50  
PEAK FLOW RATE(CFS) = 840.46  
TC(MIN) = 28.11

\*\*\*\*\*  
FLOW PROCESS FROM NODE 417.10 TO NODE 417.10 IS CODE = 1  
-----

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



>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 28.11  
RAINFALL INTENSITY (INCH./HOUR) = 2.41  
EFFECTIVE STREAM AREA(ACRES) = 510.50  
TOTAL STREAM AREA(ACRES) = 510.50  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 840.46

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
------------------	------------------------	----------------	--------------------------	---------------	--------------------------

1	840.46	28.11	2.411	.58	510.50
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RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	840.46	510.50
---	--------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 840.46 TIME(MINUTES) = 28.112  
EFFECTIVE AREA(ACRES) = 510.50  
TOTAL AREA(ACRES) = 510.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 417.10 TO NODE 417.10 IS CODE = 7

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 20.55 RAIN INTENSITY(INCH/HOUR) = 2.91  
EFFECTIVE AREA(ACRES) = 356.84  
TOTAL AREA(ACRES) = 374.00 PEAK FLOW RATE(CFS) = 789.09  
AVERAGED LOSS RATE, Fm(IN/HR) = .580

\*\*\*\*\*  
FLOW PROCESS FROM NODE 417.10 TO NODE 417.10 IS CODE = 1

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

>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 20.55  
RAINFALL INTENSITY (INCH./HOUR) = 2.91  
EFFECTIVE STREAM AREA(ACRES) = 356.84  
TOTAL STREAM AREA(ACRES) = 374.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 789.09

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
------------------	------------------------	----------------	--------------------------	---------------	--------------------------

1	840.46	28.11	2.411	.58	510.50
2	789.09	20.55	2.910	.58	356.84

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

```

1      1460.65      867.34
2      1570.98      730.02
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 1570.98 TIME(MINUTES) = 20.550
EFFECTIVE AREA(ACRES) = 730.02
TOTAL AREA(ACRES) = 884.50

*****
FLOW PROCESS FROM NODE 417.10 TO NODE 426.10 IS CODE = 5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 1638.00
DOWNSTREAM NODE ELEVATION = 1629.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1320.00
CHANNEL BASE(FEET) = 9.50 "Z" FACTOR = .000
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1570.98

==>>ERROR: FLOW IN CHANNEL EXCEEDS CHANNEL
CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
ALLOWABLE DEPTH).
AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

FLOW VELOCITY(FEET/SEC) = 18.37 FLOW DEPTH(FEET) = 9.00
TRAVEL TIME(MIN.) = 1.20 TC(MIN.) = 21.75

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

*****
FLOW PROCESS FROM NODE 426.00 TO NODE 426.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.813
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 42.00 SUBAREA RUNOFF(CFS) = 84.32
EFFECTIVE AREA(ACRES) = 772.02
AVERAGED Fm(INCH/HR) = .581
TOTAL AREA(ACRES) = 926.50
PEAK FLOW RATE(CFS) = 1570.98
TC(MIN) = 21.75

*****
FLOW PROCESS FROM NODE 426.10 TO NODE 427.10 IS CODE = 5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 1629.00
DOWNSTREAM NODE ELEVATION = 1614.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1320.00
CHANNEL BASE(FEET) = 9.50 "Z" FACTOR = .000
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1570.98
FLOW VELOCITY(FEET/SEC) = 21.63 FLOW DEPTH(FEET) = 7.65
TRAVEL TIME(MIN.) = 1.02 TC(MIN.) = 22.76

```

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*****
FLOW PROCESS FROM NODE    427.00 TO NODE    427.10 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.737
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =  42.00    SUBAREA RUNOFF(CFS) =  81.45
EFFECTIVE AREA(ACRES) =  814.02
AVERAGED Fm(INCH/HR) =  .581
TOTAL AREA(ACRES) =  968.50
PEAK FLOW RATE(CFS) = 1579.21
TC(MIN) =  22.76

*****
FLOW PROCESS FROM NODE    427.10 TO NODE    428.10 IS CODE =    5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION =  1614.00
DOWNSTREAM NODE ELEVATION =  1597.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1220.00
CHANNEL BASE(FEET) =  10.00    "Z" FACTOR =  .000
MANNINGS FACTOR =  .015    MAXIMUM DEPTH(FEET) =  9.00
CHANNEL FLOW THRU SUBAREA(CFS) =  1579.21
FLOW VELOCITY(FEET/SEC) =  23.58    FLOW DEPTH(FEET) =  6.70
TRAVEL TIME(MIN.) =  .86    TC(MIN.) =  23.63

*****
FLOW PROCESS FROM NODE    428.00 TO NODE    428.10 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.676
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =  38.00    SUBAREA RUNOFF(CFS) =  71.63
EFFECTIVE AREA(ACRES) =  852.02
AVERAGED Fm(INCH/HR) =  .581
TOTAL AREA(ACRES) = 1006.50
PEAK FLOW RATE(CFS) = 1606.60
TC(MIN) =  23.63

*****
FLOW PROCESS FROM NODE    428.10 TO NODE    428.10 IS CODE =    1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MINUTES) =  23.63
RAINFALL INTENSITY (INCH./HOUR) =  2.68
EFFECTIVE STREAM AREA(ACRES) =  852.02
TOTAL STREAM AREA(ACRES) = 1006.50
PEAK FLOW RATE(CFS) AT CONFLUENCE =  1606.60

*****
FLOW PROCESS FROM NODE    428.10 TO NODE    428.10 IS CODE =    7
-----
>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====

```

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 18.55 RAIN INTENSITY(INCH/HOUR) = 3.09  
 EFFECTIVE AREA(ACRES) = 255.27  
 TOTAL AREA(ACRES) = 260.00 PEAK FLOW RATE(CFS) = 622.25  
 AVERAGED LOSS RATE, Fm(IN/HR) = .580

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 428.10 TO NODE 428.10 IS CODE = 1  
 -----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 18.55  
 RAINFALL INTENSITY (INCH./HOUR) = 3.09  
 EFFECTIVE STREAM AREA(ACRES) = 255.27  
 TOTAL STREAM AREA(ACRES) = 260.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 622.25

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1606.60	23.63	2.676	.58	852.02
2	622.25	18.55	3.094	.58	255.27

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	2125.37	1107.29
2	2135.30	924.17

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 2135.30 TIME(MINUTES) = 18.549  
 EFFECTIVE AREA(ACRES) = 924.17  
 TOTAL AREA(ACRES) = 1266.50

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 428.10 TO NODE 428.20 IS CODE = 5  
 -----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
 >>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1597.00  
 DOWNSTREAM NODE ELEVATION = 1536.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 3800.00  
 CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = .000  
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.00  
 CHANNEL FLOW THRU SUBAREA(CFS) = 2135.30  
 FLOW VELOCITY(FEET/SEC) = 26.58 FLOW DEPTH(FEET) = 8.03  
 TRAVEL TIME(MIN.) = 2.38 TC(MIN.) = 20.93

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 444.00 TO NODE 428.20 IS CODE = 8  
 -----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.878  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
 SUBAREA AREA(ACRES) = 156.00 SUBAREA RUNOFF(CFS) = 322.37

EFFECTIVE AREA(ACRES) = 1080.17  
AVERAGED Fm(INCH/HR) = .581  
TOTAL AREA(ACRES) = 1422.50  
PEAK FLOW RATE(CFS) = 2233.09  
TIME(MIN) = 20.93

\*\*\*\*\*  
FLOW PROCESS FROM NODE 428.20 TO NODE 428.30 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

UPSTREAM NODE ELEVATION =	1536.00
DOWNSTREAM NODE ELEVATION =	1527.00
CHANNEL LENGTH THRU SUBAREA(Feet) =	600.00
CHANNEL BASE(Feet) =	10.00
"Z" FACTOR =	.000
MANNINGS FACTOR =	.015
MAXIMUM DEPTH(Feet) =	9.00
CHANNEL FLOW THRU SUBAREA(CFS) =	2233.09
FLOW VELOCITY(Feet/Sec) =	26.09
FLOW DEPTH(Feet) =	8.56
TRAVEL TIME(Min.) =	.38
TC(Min.) =	21.32

\*\*\*\*\*  
FLOW PROCESS FROM NODE 428.30 TO NODE 428.30 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) =	21.32
RAINFALL INTENSITY (INCH./HOUR) =	2.85
EFFECTIVE STREAM AREA(ACRES) =	1080.17
TOTAL STREAM AREA(ACRES) =	1422.50
PEAK FLOW RATE(CFS) AT CONFLUENCE =	2233.09

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2233.09	21.32	2.847	.58	1080.17

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

-----

1	2233.09	1080.17
---	---------	---------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) =	2233.09	TIME(MINUTES) =	21.315
EFFECTIVE AREA(ACRES) =	1080.17		
TOTAL AREA(ACRES) =	1422.50		

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	1422.50
EFFECTIVE AREA(ACRES)	=	1080.17
PEAK FLOW RATE(CFS)	=	2233.09

=====

END OF RATIONAL METHOD ANALYSIS

Especially prepared for:

HALL & FOREMAN

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

\* N. FONTANA MASTER STORM DRAIN LINE B.

\* Q 25-YR., NOT DESIGN Q.

\* JN 3547, T. ARROYO, 11/27/89.

\*\*\*\*\*

FILE NAME: A:LINEB.25

TIME/DATE OF STUDY: 16: 5 11/27/1989

=====

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 = .95

\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050

100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.530

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.2167

SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 400.00 TO NODE 400.10 IS CODE = 2

-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20

INITIAL SUBAREA FLOW-LENGTH = 1000.00

UPSTREAM ELEVATION = 1815.00

DOWNSTREAM ELEVATION = 1805.00

ELEVATION DIFFERENCE = 10.00

TC = .412\*[( 1000.00\*\* 3.00)/( 10.00)]\*\* .20 = 16.402

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.649

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA RUNOFF(CFS) = 18.61

TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 18.61

\*\*\*\*\*

FLOW PROCESS FROM NODE 400.10 TO NODE 402.11 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.6 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 11.3

UPSTREAM NODE ELEVATION = 1805.00

DOWNSTREAM NODE ELEVATION = 1796.00

FLOWLENGTH(FEET) = 350.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 18.61

TRAVEL TIME(MIN.) = .52 TC(MIN.) = 16.92

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*****
FLOW PROCESS FROM NODE 402.00 TO NODE 402.11 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.601
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 18.17
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 36.34
TC(MIN) = 16.92

*****
FLOW PROCESS FROM NODE 401.00 TO NODE 402.11 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.601
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 32.70
EFFECTIVE AREA(ACRES) = 38.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 38.00
PEAK FLOW RATE(CFS) = 69.04
TC(MIN) = 16.92

*****
FLOW PROCESS FROM NODE 402.11 TO NODE 402.21 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 30.0 INCH PIPE IS 24.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.2
UPSTREAM NODE ELEVATION = 1796.00
DOWNSTREAM NODE ELEVATION = 1776.00
FLOWLENGTH(FEET) = 660.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 69.04
TRAVEL TIME(MIN.) = .68 TC(MIN.) = 17.60

*****
FLOW PROCESS FROM NODE 402.20 TO NODE 402.21 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.540
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 35.24
EFFECTIVE AREA(ACRES) = 58.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 58.00
PEAK FLOW RATE(CFS) = 102.20
TC(MIN) = 17.60

*****

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FLOW PROCESS FROM NODE 402.21 TO NODE 402.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 18.0  
UPSTREAM NODE ELEVATION = 1776.00  
DOWNSTREAM NODE ELEVATION = 1767.00  
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 102.20  
TRAVEL TIME(MIN.) = .28 TC(MIN.) = 17.88

\*\*\*\*\*  
FLOW PROCESS FROM NODE 404.00 TO NODE 402.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.516  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 33.50 SUBAREA RUNOFF(CFS) = 58.31  
EFFECTIVE AREA(ACRES) = 91.50  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 91.50  
PEAK FLOW RATE(CFS) = 159.28  
TC(MIN) = 17.88

\*\*\*\*\*  
FLOW PROCESS FROM NODE 402.10 TO NODE 403.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.2 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 20.1  
UPSTREAM NODE ELEVATION = 1767.00  
DOWNSTREAM NODE ELEVATION = 1742.00  
FLOWLENGTH(FEET) = 830.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 159.28  
TRAVEL TIME(MIN.) = .69 TC(MIN.) = 18.56

\*\*\*\*\*  
FLOW PROCESS FROM NODE 405.00 TO NODE 403.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.460  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 34.00 SUBAREA RUNOFF(CFS) = 57.46  
EFFECTIVE AREA(ACRES) = 125.50  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 125.50  
PEAK FLOW RATE(CFS) = 212.09  
TC(MIN) = 18.56

\*\*\*\*\*  
FLOW PROCESS FROM NODE 403.10 TO NODE 403.20 IS CODE = 3



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>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 21.0
UPSTREAM NODE ELEVATION = 1742.00
DOWNSTREAM NODE ELEVATION = 1737.00
FLOWLENGTH(FEET) = 180.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 212.09
TRAVEL TIME(MIN.) = .14 TC(MIN.) = 18.71

*****
FLOW PROCESS FROM NODE 403.00 TO NODE 403.20 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.448
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 43.00 SUBAREA RUNOFF(CFS) = 72.23
EFFECTIVE AREA(ACRES) = 168.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 168.50
PEAK FLOW RATE(CFS) = 283.05
TC(MIN) = 18.71

*****
FLOW PROCESS FROM NODE 403.20 TO NODE 406.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 54.0 INCH PIPE IS 39.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 22.8
UPSTREAM NODE ELEVATION = 1737.00
DOWNSTREAM NODE ELEVATION = 1699.00
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 283.05
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 19.69

*****
FLOW PROCESS FROM NODE 406.00 TO NODE 406.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.374
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 64.52
EFFECTIVE AREA(ACRES) = 208.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 208.50
PEAK FLOW RATE(CFS) = 336.30
TC(MIN) = 19.69

*****
FLOW PROCESS FROM NODE 407.00 TO NODE 406.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

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25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.374
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 46.00 SUBAREA RUNOFF(CFS) = 74.20
EFFECTIVE AREA(ACRES) = 254.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 254.50
PEAK FLOW RATE(CFS) = 410.49
TC(MIN) = 19.69

*****
FLOW PROCESS FROM NODE 406.10 TO NODE 408.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 63.0 INCH PIPE IS 46.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 24.1
UPSTREAM NODE ELEVATION = 1699.00
DOWNSTREAM NODE ELEVATION = 1666.00
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 410.49
TRAVEL TIME(MIN.) = .90 TC(MIN.) = 20.59

*****
FLOW PROCESS FROM NODE 408.00 TO NODE 408.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.311
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 62.25
EFFECTIVE AREA(ACRES) = 294.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 294.50
PEAK FLOW RATE(CFS) = 458.35
TC(MIN) = 20.59

*****
FLOW PROCESS FROM NODE 408.10 TO NODE 409.11 IS CODE = 5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 1666.00
DOWNSTREAM NODE ELEVATION = 1665.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 900.00
CHANNEL BASE(FEET) = 9.00 "Z" FACTOR = .000
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) = 458.35
FLOW VELOCITY(FEET/SEC) = 6.61 FLOW DEPTH(FEET) = 7.70
TRAVEL TIME(MIN.) = 2.27 TC(MIN.) = 22.86

*****
FLOW PROCESS FROM NODE 409.00 TO NODE 409.11 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.171
SOIL CLASSIFICATION IS "A"

```

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 27.00 SUBAREA RUNOFF(CFS) = 38.61  
EFFECTIVE AREA(ACRES) = 321.50  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 321.50  
PEAK FLOW RATE(CFS) = 459.72  
TC(MIN) = 22.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 409.11 TO NODE 409.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1665.00
DOWNSTREAM NODE ELEVATION =	1664.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	820.00
CHANNEL BASE(FEET) =	9.00 "Z" FACTOR = .000
MANNINGS FACTOR =	.015 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) =	459.72
FLOW VELOCITY(FEET/SEC) =	6.88 FLOW DEPTH(FEET) = 7.42
TRAVEL TIME(MIN.) =	1.99 TC(MIN.) = 24.85

\*\*\*\*\*  
FLOW PROCESS FROM NODE 410.00 TO NODE 409.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) =	2.065
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5820
SUBAREA AREA(ACRES) =	26.00 SUBAREA RUNOFF(CFS) = 34.70
EFFECTIVE AREA(ACRES) =	347.50
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	347.50
PEAK FLOW RATE(CFS) =	463.80
TC(MIN) =	24.85

\*\*\*\*\*  
FLOW PROCESS FROM NODE 409.10 TO NODE 411.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1664.00
DOWNSTREAM NODE ELEVATION =	1662.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	850.00
CHANNEL BASE(FEET) =	9.00 "Z" FACTOR = .000
MANNINGS FACTOR =	.015 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) =	463.80
FLOW VELOCITY(FEET/SEC) =	8.94 FLOW DEPTH(FEET) = 5.77
TRAVEL TIME(MIN.) =	1.58 TC(MIN.) = 26.43

\*\*\*\*\*  
FLOW PROCESS FROM NODE 411.00 TO NODE 411.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) =	1.990
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5820
SUBAREA AREA(ACRES) =	26.00 SUBAREA RUNOFF(CFS) = 32.94

EFFECTIVE AREA(ACRES) = 373.50  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 373.50  
PEAK FLOW RATE(CFS) = 473.22  
T(MIN) = 26.43

\*\*\*\*\*  
FLOW PROCESS FROM NODE 411.10 TO NODE 411.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 26.43  
RAINFALL INTENSITY (INCH./HOUR) = 1.99  
EFFECTIVE STREAM AREA(ACRES) = 373.50  
TOTAL STREAM AREA(ACRES) = 373.50  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 473.22

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.00 TO NODE 415.11 IS CODE = 2  
-----

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 900.00  
UPSTREAM ELEVATION = 1740.00  
DOWNSTREAM ELEVATION = 1720.00  
ELEVATION DIFFERENCE = 20.00  
T = .412\*[( 900.00\*\* 3.00)/( 20.00)]\*\* .20 = 13.404  
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.991

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA RUNOFF(CFS) = 10.84  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 10.84

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.11 TO NODE 415.12 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 9.8  
UPSTREAM NODE ELEVATION = 1720.00  
DOWNSTREAM NODE ELEVATION = 1700.00  
FLOWLENGTH(FEET) = 800.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 10.84  
TRAVEL TIME(MIN.) = 1.36 TC(MIN.) = 14.76

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.10 TO NODE 415.12 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.822  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 10.08  
EFFECTIVE AREA(ACRES) = 10.00

AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 20.16  
TC(MIN) = 14.76

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.12 TO NODE 415.21 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 24.0 INCH PIPE IS 14.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 9.8  
UPSTREAM NODE ELEVATION = 1700.00  
DOWNSTREAM NODE ELEVATION = 1696.00  
FLOWLENGTH(FEET) = 240.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 20.16  
TRAVEL TIME(MIN.) = .41 TC(MIN.) = 15.17

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.20 TO NODE 415.21 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.777  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.75  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 39.50  
TC(MIN) = 15.17

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.21 TO NODE 415.31 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 24.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 9.3  
UPSTREAM NODE ELEVATION = 1696.00  
DOWNSTREAM NODE ELEVATION = 1692.00  
FLOWLENGTH(FEET) = 400.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 39.50  
TRAVEL TIME(MIN.) = .72 TC(MIN.) = 15.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.30 TO NODE 415.31 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.701  
L CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 34.32  
EFFECTIVE AREA(ACRES) = 38.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 38.00

PEAK FLOW RATE(CFS) = 72.46  
TC(MIN) = 15.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.31 TO NODE 415.41 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 12.5  
UPSTREAM NODE ELEVATION = 1692.00  
DOWNSTREAM NODE ELEVATION = 1687.00  
FLOWLENGTH(FEET) = 350.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 72.46  
TRAVEL TIME(MIN.) = .47 TC(MIN.) = 16.35

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.40 TO NODE 415.41 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.654  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 17.00 SUBAREA RUNOFF(CFS) = 31.70  
EFFECTIVE AREA(ACRES) = 55.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 55.00  
PEAK FLOW RATE(CFS) = 102.57  
TC(MIN) = 16.35

\*\*\*\*\*  
FLOW PROCESS FROM NODE 415.41 TO NODE 411.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 39.0 INCH PIPE IS 29.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 15.2  
UPSTREAM NODE ELEVATION = 1687.00  
DOWNSTREAM NODE ELEVATION = 1662.00  
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 102.57  
TRAVEL TIME(MIN.) = 1.45 TC(MIN.) = 17.81

\*\*\*\*\*  
FLOW PROCESS FROM NODE 411.10 TO NODE 411.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MINUTES) = 17.81  
RAINFALL INTENSITY (INCH./HOUR) = 2.52  
EFFECTIVE STREAM AREA(ACRES) = 55.00  
TOTAL STREAM AREA(ACRES) = 55.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 102.57

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	473.22	26.43	1.990	.58	373.50
2	102.57	17.81	2.522	.58	55.00

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

#### SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	547.65	428.50
2	541.87	306.59

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 547.65 TIME(MINUTES) = 26.433

EFFECTIVE AREA(ACRES) = 428.50

TOTAL AREA(ACRES) = 428.50

\*\*\*\*\*

FLOW PROCESS FROM NODE 411.10 TO NODE 416.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1662.00

DOWNSTREAM NODE ELEVATION = 1660.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 800.00

CHANNEL BASE(FEET) = 9.00 "Z" FACTOR = .000

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00

CHANNEL FLOW THRU SUBAREA(CFS) = 547.65

LOW VELOCITY(FEET/SEC) = 9.48 FLOW DEPTH(FEET) = 6.42

RAVEL TIME(MIN.) = 1.41 TC(MIN.) = 27.84

\*\*\*\*\*

FLOW PROCESS FROM NODE 416.00 TO NODE 416.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.929

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 22.00 SUBAREA RUNOFF(CFS) = 26.67

EFFECTIVE AREA(ACRES) = 450.50

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 450.50

PEAK FLOW RATE(CFS) = 547.65

TC(MIN) = 27.84

\*\*\*\*\*

FLOW PROCESS FROM NODE 416.10 TO NODE 417.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1660.00

DOWNSTREAM NODE ELEVATION = 1638.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00

CHANNEL BASE(FEET) = 9.00 "Z" FACTOR = .000

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00

CHANNEL FLOW THRU SUBAREA(CFS) = 547.65

FLOW VELOCITY(FEET/SEC) = 16.57 FLOW DEPTH(FEET) = 3.67

TRAVEL TIME(MIN.) = 2.01 TC(MIN.) = 29.85

```

*****
FLOW PROCESS FROM NODE 417.00 TO NODE 417.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.850
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 60.00 SUBAREA RUNOFF(CFS) = 68.46
EFFECTIVE AREA(ACRES) = 510.50
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 510.50
PEAK FLOW RATE(CFS) = 582.46
TC(MIN) = 29.85

*****
FLOW PROCESS FROM NODE 417.10 TO NODE 417.10 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 29.85
RAINFALL INTENSITY (INCH./HOUR) = 1.85
EFFECTIVE STREAM AREA(ACRES) = 510.50
TOTAL STREAM AREA(ACRES) = 510.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 582.46

CONFLUENCE INFORMATION:
  STREAM    PEAK FLOW    TIME    INTENSITY    FM    EFFECTIVE
  NUMBER    RATE(CFS)    (MIN.) (INCH/HOUR) (IN/HR) AREA(ACRES)
-----
    1      582.46      29.85      1.850      .58      510.50

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 1 STREAMS.
SUMMARY RESULTS:
  STREAM    CONFLUENCE    EFFECTIVE
  NUMBER      Q(CFS)      AREA(ACRES)
-----
    1      582.46      510.50

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 582.46 TIME(MINUTES) = 29.852
EFFECTIVE AREA(ACRES) = 510.50
TOTAL AREA(ACRES) = 510.50

*****
FLOW PROCESS FROM NODE 417.10 TO NODE 417.10 IS CODE = 7
-----
>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 21.09 RAIN INTENSITY(INCH/HOUR) = 2.28
EFFECTIVE AREA(ACRES) = 357.47
TOTAL AREA(ACRES) = 374.00 PEAK FLOW RATE(CFS) = 579.97
AVERAGED LOSS RATE, Fm(IN/HR) = .580

*****
FLOW PROCESS FROM NODE 417.10 TO NODE 417.10 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

```



>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 21.09  
RAINFALL INTENSITY (INCH./HOUR) = 2.28  
EFFECTIVE STREAM AREA(ACRES) = 357.47  
TOTAL STREAM AREA(ACRES) = 374.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 579.97

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	582.46	29.85	1.850	.58	510.50
2	579.97	21.09	2.279	.58	357.47

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1015.98	867.97
2	1130.63	718.08

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1130.63 TIME(MINUTES) = 21.087  
EFFECTIVE AREA(ACRES) = 718.08  
TOTAL AREA(ACRES) = 884.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 417.10 TO NODE 426.10 IS CODE = 5

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

UPSTREAM NODE ELEVATION = 1638.00  
DOWNSTREAM NODE ELEVATION = 1629.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1320.00  
CHANNEL BASE(FEET) = 9.50 "Z" FACTOR = .000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 1130.63  
FLOW VELOCITY(FEET/SEC) = 16.47 FLOW DEPTH(FEET) = 7.22  
TRAVEL TIME(MIN.) = 1.34 TC(MIN.) = 22.42

\*\*\*\*\*  
FLOW PROCESS FROM NODE 426.00 TO NODE 426.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.196  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 42.00 SUBAREA RUNOFF(CFS) = 61.02  
EFFECTIVE AREA(ACRES) = 760.08  
AVERAGED Fm(INCH/HR) = .581  
TOTAL AREA(ACRES) = 926.50  
PEAK FLOW RATE(CFS) = 1130.63  
TC(MIN) = 22.42

\*\*\*\*\*  
FLOW PROCESS FROM NODE 426.10 TO NODE 427.10 IS CODE = 5

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<

```

>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 1629.00
DOWNSTREAM NODE ELEVATION = 1614.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1320.00
CHANNEL BASE( FEET) = 9.50 "Z" FACTOR = .000
MANNINGS FACTOR = .015 MAXIMUM DEPTH( FEET) = 9.00
CHANNEL FLOW THRU SUBAREA( CFS) = 1130.63
FLOW VELOCITY( FEET/SEC) = 20.09 FLOW DEPTH( FEET) = 5.92
TRAVEL TIME( MIN.) = 1.10 TC( MIN.) = 23.52

*****
FLOW PROCESS FROM NODE 427.00 TO NODE 427.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY( INCH/ HOUR) = 2.134
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ ACRE SUBAREA LOSS RATE, Fm( INCH/ HR) = .5820
SUBAREA AREA( ACRES) = 42.00 SUBAREA RUNOFF( CFS) = 58.68
EFFECTIVE AREA( ACRES) = 802.08
AVERAGED Fm( INCH/ HR) = .581
TOTAL AREA( ACRES) = 968.50
PEAK FLOW RATE( CFS) = 1130.63
TC( MIN) = 23.52

*****
FLOW PROCESS FROM NODE 427.10 TO NODE 428.10 IS CODE = 5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 1614.00
DOWNSTREAM NODE ELEVATION = 1597.00
CHANNEL LENGTH THRU SUBAREA( FEET) = 1220.00
CHANNEL BASE( FEET) = 10.00 "Z" FACTOR = .000
MANNINGS FACTOR = .015 MAXIMUM DEPTH( FEET) = 9.00
CHANNEL FLOW THRU SUBAREA( CFS) = 1130.63
FLOW VELOCITY( FEET/SEC) = 21.80 FLOW DEPTH( FEET) = 5.19
TRAVEL TIME( MIN.) = .93 TC( MIN.) = 24.45

*****
FLOW PROCESS FROM NODE 428.00 TO NODE 428.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY( INCH/ HOUR) = 2.085
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ ACRE SUBAREA LOSS RATE, Fm( INCH/ HR) = .5820
SUBAREA AREA( ACRES) = 38.00 SUBAREA RUNOFF( CFS) = 51.41
EFFECTIVE AREA( ACRES) = 840.08
AVERAGED Fm( INCH/ HR) = .581
TOTAL AREA( ACRES) = 1006.50
PEAK FLOW RATE( CFS) = 1137.09
TC( MIN) = 24.45

*****
FLOW PROCESS FROM NODE 428.10 TO NODE 428.10 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

```

TIME OF CONCENTRATION(MINUTES) = 24.45  
RAINFALL INTENSITY (INCH./HOUR) = 2.09  
EFFECTIVE STREAM AREA(ACRES) = 840.08  
TOTAL STREAM AREA(ACRES) = 1006.50  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1137.09

\*\*\*\*\*  
FLOW PROCESS FROM NODE 428.10 TO NODE 428.10 IS CODE = 7  
-----

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<  
=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 18.98 RAIN INTENSITY(INCH/HOUR) = 2.43  
EFFECTIVE AREA(ACRES) = 255.27  
TOTAL AREA(ACRES) = 260.00 PEAK FLOW RATE(CFS) = 461.00  
AVERAGED LOSS RATE, Fm(IN/HR) = .580

\*\*\*\*\*  
FLOW PROCESS FROM NODE 428.10 TO NODE 428.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 18.98  
RAINFALL INTENSITY (INCH./HOUR) = 2.43  
EFFECTIVE STREAM AREA(ACRES) = 255.27  
TOTAL STREAM AREA(ACRES) = 260.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 461.00

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1137.09	24.45	2.085	.58	840.08
2	461.00	18.98	2.427	.58	255.27

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1512.68	1095.35
2	1544.51	907.37

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1544.51 TIME(MINUTES) = 18.979  
EFFECTIVE AREA(ACRES) = 907.37  
TOTAL AREA(ACRES) = 1266.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 428.10 TO NODE 428.20 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 1597.00

DOWNSTREAM NODE ELEVATION = 1536.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 3800.00

CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = .000

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.00

CHANNEL FLOW THRU SUBAREA(CFS) = 1544.51

FLOW VELOCITY(FEET/SEC) = 24.75 FLOW DEPTH(FEET) = 6.24

TRAVEL TIME(MIN.) = 2.56 TC(MIN.) = 21.54

\*\*\*\*\*  
LOW PROCESS FROM NODE 444.00 TO NODE 428.20 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.250  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 156.00 SUBAREA RUNOFF(CFS) = 234.18  
EFFECTIVE AREA(ACRES) = 1063.37  
AVERAGED Fm(INCH/HR) = .581  
TOTAL AREA(ACRES) = 1422.50  
PEAK FLOW RATE(CFS) = 1597.23  
TC(MIN) = 21.54

\*\*\*\*\*  
FLOW PROCESS FROM NODE 428.20 TO NODE 428.30 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 1536.00  
DOWNSTREAM NODE ELEVATION = 1527.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 600.00  
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = .000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 9.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 1597.23  
FLOW VELOCITY(FEET/SEC) = 24.36 FLOW DEPTH(FEET) = 6.56  
RAVEL TIME(MIN.) = .41 TC(MIN.) = 21.95

\*\*\*\*\*  
FLOW PROCESS FROM NODE 428.30 TO NODE 428.30 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 21.95  
RAINFALL INTENSITY (INCH./HOUR) = 2.22  
EFFECTIVE STREAM AREA(ACRES) = 1063.37  
TOTAL STREAM AREA(ACRES) = 1422.50  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1597.23

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1597.23	21.95	2.225	.58	1063.37

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1597.23	1063.37
---	---------	---------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1597.23 TIME(MINUTES) = 21.948  
EFFECTIVE AREA(ACRES) = 1063.37  
TOTAL AREA(ACRES) = 1422.50  
=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	1422.50
EFFECTIVE AREA(ACRES)	=	1063.37
PEAK FLOW RATE(CFS)	=	1597.23

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
Copyright 1983,86,87 Advanced Engineering Software (aes)  
Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* N.FONTANA MASTER S.D , LATERAL LINE B3 \*  
\* Q 100 YR, DESIGN Q \*

\*

\*\*\*\*\*

FILE NAME: C:\TEMP\LINEB1.100

TIME/DATE OF STUDY: 11:59 4/21/1989

=====

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 = .95

\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050

100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.530

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.5300

SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 412.00 TO NODE 412.10 IS CODE = 2

-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$

INITIAL SUBAREA FLOW-LENGTH = 1000.00

UPSTREAM ELEVATION = 1815.00

DOWNSTREAM ELEVATION = 1801.00

ELEVATION DIFFERENCE = 14.00

TC =  $.412 * [(1000.00 ** 3.00) / (14.00)] ** .20 = 15.335$

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.469

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5820

SUBAREA RUNOFF(CFS) = 25.98

TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 25.98

\*\*\*\*\*

FLOW PROCESS FROM NODE 412.10 TO NODE 412.11 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.3 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 12.3

UPSTREAM NODE ELEVATION = 1801.00

DOWNSTREAM NODE ELEVATION = 1792.00

FLOWLENGTH(FEET) = 350.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 25.98

TRAVEL TIME(MIN.) = .47 TC(MIN.) = 15.81

\*\*\*\*\*

FLOW PROCESS FROM NODE 412.20 TO NODE 412.11 IS CODE = 8

-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.406  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 25.42  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 50.83  
TC(MIN) = 15.81

\*\*\*\*\*  
FLOW PROCESS FROM NODE 412.11 TO NODE 413.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	27.0 INCH PIPE IS	20.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	15.4
UPSTREAM NODE ELEVATION	=	1792.00
DOWNSTREAM NODE ELEVATION	=	1780.00
FLOWLENGTH(FEET)	=	375.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	27.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	50.83
TRAVEL TIME(MIN.)	=	.40
TC(MIN.)	=	16.21

\*\*\*\*\*  
FLOW PROCESS FROM NODE 413.00 TO NODE 413.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.355
SOIL CLASSIFICATION IS	=	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	12.00
SUBAREA RUNOFF(CFS)	=	29.95
EFFECTIVE AREA(ACRES)	=	32.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	32.00
PEAK FLOW RATE(CFS)	=	79.85
TC(MIN)	=	16.21

\*\*\*\*\*  
FLOW PROCESS FROM NODE 413.10 TO NODE 414.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	33.0 INCH PIPE IS	25.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	16.0
UPSTREAM NODE ELEVATION	=	1780.00
DOWNSTREAM NODE ELEVATION	=	1755.00
FLOWLENGTH(FEET)	=	950.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	33.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	79.85
TRAVEL TIME(MIN.)	=	.99
TC(MIN.)	=	17.20

\*\*\*\*\*  
FLOW PROCESS FROM NODE 414.00 TO NODE 414.10 IS CODE = 8  
-----

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



```

=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.238
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 22.00 SUBAREA RUNOFF(CFS) = 52.58
EFFECTIVE AREA(ACRES) = 54.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 54.00
PEAK FLOW RATE(CFS) = 129.07
TC(MIN) = 17.20

*****
FLOW PROCESS FROM NODE 414.10 TO NODE 418.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 14.2
UPSTREAM NODE ELEVATION = 1755.00
DOWNSTREAM NODE ELEVATION = 1752.00
FLOWLENGTH(FEET) = 220.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 129.07
TRAVEL TIME(MIN.) = .26 TC(MIN.) = 17.46

*****
FLOW PROCESS FROM NODE 418.00 TO NODE 418.10 IS CODE = 8
-----
>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.209
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 23.64
EFFECTIVE AREA(ACRES) = 64.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 64.00
PEAK FLOW RATE(CFS) = 151.31
TC(MIN) = 17.46

*****
FLOW PROCESS FROM NODE 418.10 TO NODE 419.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 51.0 INCH PIPE IS 38.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.2
UPSTREAM NODE ELEVATION = 1752.00
DOWNSTREAM NODE ELEVATION = 1750.00
FLOWLENGTH(FEET) = 200.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 151.31
TRAVEL TIME(MIN.) = .25 TC(MIN.) = 17.71

*****
FLOW PROCESS FROM NODE 419.00 TO NODE 419.10 IS CODE = 8
-----

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```

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.181
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 23.39
EFFECTIVE AREA(ACRES) = 74.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 74.00
PEAK FLOW RATE(CFS) = 173.11
TC(MIN) = 17.71

*****
FLOW PROCESS FROM NODE 419.10 TO NODE 420.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 14.3
UPSTREAM NODE ELEVATION = 1750.00
DOWNSTREAM NODE ELEVATION = 1745.00
FLOWLENGTH(FEET) = 430.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 173.11
TRAVEL TIME(MIN.) = .50 TC(MIN.) = 18.22

*****
FLOW PROCESS FROM NODE 419.50 TO NODE 420.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.128
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 45.83
EFFECTIVE AREA(ACRES) = 94.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 94.00
PEAK FLOW RATE(CFS) = 215.42
TC(MIN) = 18.22

*****
FLOW PROCESS FROM NODE 420.10 TO NODE 420.20 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 60.0 INCH PIPE IS 46.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.2
UPSTREAM NODE ELEVATION = 1745.00
DOWNSTREAM NODE ELEVATION = 1741.00
FLOWLENGTH(FEET) = 500.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 215.42
TRAVEL TIME(MIN.) = .63 TC(MIN.) = 18.85

*****
FLOW PROCESS FROM NODE 420.00 TO NODE 420.20 IS CODE = 8

```

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.065

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 23.00 SUBAREA RUNOFF(CFS) = 51.39

EFFECTIVE AREA(ACRES) = 117.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 117.00

PEAK FLOW RATE(CFS) = 261.44

TC(MIN) = 18.85

\*\*\*\*\*  
FLOW PROCESS FROM NODE 420.20 TO NODE 421.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 60.0 INCH PIPE IS 46.5 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 16.0

UPSTREAM NODE ELEVATION = 1741.00

DOWNSTREAM NODE ELEVATION = 1725.00

FLOWLENGTH(Feet) = 1350.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 261.44

TRAVEL TIME(MIN.) = 1.41 TC(MIN.) = 20.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 421.00 TO NODE 421.20 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.935

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 62.00 SUBAREA RUNOFF(CFS) = 131.32

EFFECTIVE AREA(ACRES) = 179.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 179.00

PEAK FLOW RATE(CFS) = 379.13

TC(MIN) = 20.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 421.10 TO NODE 421.20 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.935

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 42.36

EFFECTIVE AREA(ACRES) = 199.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 199.00

PEAK FLOW RATE(CFS) = 421.49

TC(MIN) = 20.25

\*\*\*\*\*

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FLOW PROCESS FROM NODE    421.20 TO NODE    425.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  63.0 INCH PIPE IS  48.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  23.5
UPSTREAM NODE ELEVATION =  1725.00
DOWNSTREAM NODE ELEVATION =  1677.00
FLOWLENGTH(FEET) =  2000.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  63.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    421.49
TRAVEL TIME(MIN.) =    1.42    TC(MIN.) =  21.67

*****
FLOW PROCESS FROM NODE    425.10 TO NODE    425.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MINUTES) =  21.67
RAINFALL INTENSITY (INCH./HOUR) =    2.82
EFFECTIVE STREAM AREA(ACRES) =  199.00
TOTAL STREAM AREA(ACRES) =  199.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =    421.49

*****
FLOW PROCESS FROM NODE    422.00 TO NODE    422.11 IS CODE =    2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
DEVELOPMENT IS  SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH =  1000.00
UPSTREAM ELEVATION =  1755.00
DOWNSTREAM ELEVATION =  1720.00
ELEVATION DIFFERENCE =    35.00
TC = .412*[( 1000.00** 3.00)/((    35.00))]** .20 =   12.767
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.872
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA RUNOFF(CFS) =    14.80
TOTAL AREA(ACRES) =    5.00    PEAK FLOW RATE(CFS) =    14.80

*****
FLOW PROCESS FROM NODE    422.11 TO NODE    422.12 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.2 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  11.6
UPSTREAM NODE ELEVATION =  1720.00
DOWNSTREAM NODE ELEVATION =  1686.00
FLOWLENGTH(FEET) =  1050.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    14.80
TRAVEL TIME(MIN.) =    1.51    TC(MIN.) =  14.28

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*****
FLOW PROCESS FROM NODE    422.10 TO NODE    422.12 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.621
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =    5.00    SUBAREA RUNOFF(CFS) =   13.67
EFFECTIVE AREA(ACRES) =   10.00
AVERAGED Fm(INCH/HR) =  .582
TOTAL AREA(ACRES) =   10.00
PEAK FLOW RATE(CFS) =   27.35
TC(MIN) =   14.28

*****
FLOW PROCESS FROM NODE    422.12 TO NODE    423.10 IS CODE =    3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =    6.1
UPSTREAM NODE ELEVATION =  1686.00
DOWNSTREAM NODE ELEVATION =  1685.00
FLOWLENGTH(FEET) =   250.00    MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    27.35
TRAVEL TIME(MIN.) =    .68    TC(MIN.) =   14.95

*****
FLOW PROCESS FROM NODE    422.20 TO NODE    423.10 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.521
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =   10.00    SUBAREA RUNOFF(CFS) =   26.46
EFFECTIVE AREA(ACRES) =   20.00
AVERAGED Fm(INCH/HR) =  .582
TOTAL AREA(ACRES) =   20.00
PEAK FLOW RATE(CFS) =   52.91
TC(MIN) =   14.95

*****
FLOW PROCESS FROM NODE    423.10 TO NODE    423.20 IS CODE =    3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN  45.0 INCH PIPE IS  34.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =    5.9
UPSTREAM NODE ELEVATION =  1685.00
DOWNSTREAM NODE ELEVATION =  1684.00
FLOWLENGTH(FEET) =   420.00    MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =   52.91
TRAVEL TIME(MIN.) =    1.18    TC(MIN.) =   16.14

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*****
FLOW PROCESS FROM NODE    423.00 TO NODE    423.20 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.364
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =  20.00    SUBAREA RUNOFF(CFS) =  50.08
EFFECTIVE AREA(ACRES) =  40.00
AVERAGED Fm(INCH/HR) =  .582
TOTAL AREA(ACRES) =  40.00
PEAK FLOW RATE(CFS) =  100.15
TC(MIN) =  16.14

*****
FLOW PROCESS FROM NODE    423.20 TO NODE    424.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN  60.0 INCH PIPE IS  43.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  6.5
UPSTREAM NODE ELEVATION =  1684.00
DOWNSTREAM NODE ELEVATION =  1683.00
FLOWLENGTH(FEET) =  500.00    MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =  1
PIPEFLOW THRU SUBAREA(CFS) =  100.15
TRAVEL TIME(MIN.) =  1.28    TC(MIN.) =  17.42

*****
FLOW PROCESS FROM NODE    424.00 TO NODE    424.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.214
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =  23.00    SUBAREA RUNOFF(CFS) =  54.48
EFFECTIVE AREA(ACRES) =  63.00
AVERAGED Fm(INCH/HR) =  .582
TOTAL AREA(ACRES) =  63.00
PEAK FLOW RATE(CFS) =  149.22
TC(MIN) =  17.42

*****
FLOW PROCESS FROM NODE    424.10 TO NODE    425.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN  60.0 INCH PIPE IS  44.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  9.6
UPSTREAM NODE ELEVATION =  1683.00
DOWNSTREAM NODE ELEVATION =  1677.00
FLOWLENGTH(FEET) =  1380.00    MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =  1
PIPEFLOW THRU SUBAREA(CFS) =  149.22

```

TRAVEL TIME(MIN.) = 2.39 TC(MIN.) = 19.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 425.00 TO NODE 425.10 IS CODE = 8  
\*\*\*\*\*

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.975  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 62.00 SUBAREA RUNOFF(CFS) = 133.55  
EFFECTIVE AREA(ACRES) = 125.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 125.00  
PEAK FLOW RATE(CFS) = 269.26  
TC(MIN) = 19.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 429.00 TO NODE 425.10 IS CODE = 8  
\*\*\*\*\*

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.975  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 50.00 SUBAREA RUNOFF(CFS) = 107.70  
EFFECTIVE AREA(ACRES) = 175.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 175.00  
PEAK FLOW RATE(CFS) = 376.96  
TC(MIN) = 19.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 425.10 TO NODE 425.10 IS CODE = 1  
\*\*\*\*\*

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 19.80  
RAINFALL INTENSITY (INCH./HR) = 2.98  
EFFECTIVE STREAM AREA(ACRES) = 175.00  
TOTAL STREAM AREA(ACRES) = 175.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 376.96

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	421.49	21.67	2.819	.58	199.00
2	376.96	19.80	2.975	.58	175.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	773.77	374.00
2	789.09	356.84

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 789.09 TIME(MINUTES) = 19.803

EFFECTIVE AREA(ACRES) = 356.84

TOTAL AREA(ACRES) = 374.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 425.10 TO NODE 417.10 IS CODE = 3  
-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

=====

DEPTH OF FLOW IN 75.0 INCH PIPE IS 61.3 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 29.4

UPSTREAM NODE ELEVATION = 1677.00

DOWNSTREAM NODE ELEVATION = 1638.00

FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 75.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 789.09

TRAVEL TIME(MIN.) = .75 TC(MIN.) = 20.55

\*\*\*\*\*  
FLOW PROCESS FROM NODE 417.10 TO NODE 417.10 IS CODE = 1  
-----

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

>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 20.55

RAINFALL INTENSITY (INCH./HOUR) = 2.91

EFFECTIVE STREAM AREA(ACRES) = 356.84

TOTAL STREAM AREA(ACRES) = 374.00

PEAK FLOW RATE(CFS) AT CONFLUENCE = 789.09

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
------------------	------------------------	----------------	--------------------------	---------------	--------------------------

1	789.09	20.55	2.910	.58	356.84
---	--------	-------	-------	-----	--------

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	789.09	356.84
---	--------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 789.09 TIME(MINUTES) = 20.551

EFFECTIVE AREA(ACRES) = 356.84

TOTAL AREA(ACRES) = 374.00

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 374.00

EFFECTIVE AREA(ACRES) = 356.84

PEAK FLOW RATE(CFS) = 789.09

=====

D OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
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Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* N.FONTANA MASTER S.D PLAN, LINE / B3 (SEE PLAN & PROFILE REPORT FOR B3 LINE) \*  
\* Q 25 YR, DATA FOR LINEB \*  
\* VENKI.N, JN 3547, 4/21/89 \*  
\*\*\*\*\*

FILE NAME: C:\TEMP\LINEB1.25  
TIME/DATE OF STUDY: 12: 2 4/21/1989

=====

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 = .95  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.530  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.2167  
SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 412.00 TO NODE 412.10 IS CODE = 2

-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1815.00  
DOWNSTREAM ELEVATION = 1801.00  
ELEVATION DIFFERENCE = 14.00  
TC =  $.412 * [(1000.00 ** 3.00) / (14.00)] ** .20 = 15.335$   
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.759  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 19.59  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 19.59

\*\*\*\*\*

FLOW PROCESS FROM NODE 412.10 TO NODE 412.11 IS CODE = 3

-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

DEPTH OF FLOW IN 21.0 INCH PIPE IS 14.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.4  
UPSTREAM NODE ELEVATION = 1801.00  
DOWNSTREAM NODE ELEVATION = 1792.00

```

FLOWLENGTH(FEET) = 350.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 19.59
TRAVEL TIME(MIN.) = .51 TC(MIN.) = 15.85

*****
FLOW PROCESS FROM NODE 412.20 TO NODE 412.11 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.705
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.11
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 38.21
TC(MIN) = 15.85

*****
FLOW PROCESS FROM NODE 412.11 TO NODE 413.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 19.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 14.3
UPSTREAM NODE ELEVATION = 1792.00
DOWNSTREAM NODE ELEVATION = 1780.00
FLOWLENGTH(FEET) = 375.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 38.21
TRAVEL TIME(MIN.) = .44 TC(MIN.) = 16.28

*****
FLOW PROCESS FROM NODE 413.00 TO NODE 413.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.661
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 12.00 SUBAREA RUNOFF(CFS) = 22.45
EFFECTIVE AREA(ACRES) = 32.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 32.00
PEAK FLOW RATE(CFS) = 59.88
TC(MIN) = 16.28

*****
FLOW PROCESS FROM NODE 413.10 TO NODE 414.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 15.0
UPSTREAM NODE ELEVATION = 1780.00

```

```

DOWNSTREAM NODE ELEVATION = 1755.00
FLOWLENGTH(FEET) = 950.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 59.88
TRAVEL TIME(MIN.) = 1.06 TC(MIN.) = 17.34

*****
FLOW PROCESS FROM NODE 414.00 TO NODE 414.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.563
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 22.00 SUBAREA RUNOFF(CFS) = 39.22
EFFECTIVE AREA(ACRES) = 54.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 54.00
PEAK FLOW RATE(CFS) = 96.26
TC(MIN) = 17.34

*****
FLOW PROCESS FROM NODE 414.10 TO NODE 418.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.3
DOWNSTREAM NODE ELEVATION = 1755.00
DOWNSTREAM NODE ELEVATION = 1752.00
FLOWLENGTH(FEET) = 220.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 96.26
TRAVEL TIME(MIN.) = .27 TC(MIN.) = 17.61

*****
FLOW PROCESS FROM NODE 418.00 TO NODE 418.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.539
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 17.61
EFFECTIVE AREA(ACRES) = 64.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 64.00
PEAK FLOW RATE(CFS) = 112.70
TC(MIN) = 17.61

*****
FLOW PROCESS FROM NODE 418.10 TO NODE 419.10 IS CODE = 3
-----
>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 45.0 INCH PIPE IS 35.2 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 12.2

```

```

UPSTREAM NODE ELEVATION = 1752.00
DOWNSTREAM NODE ELEVATION = 1750.00
FLOWLENGTH(Feet) = 200.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 112.70
AVERAGE TIME(MIN.) = .27 TC(MIN.) = 17.89

*****
FLOW PROCESS FROM NODE 419.00 TO NODE 419.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.515
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 17.40
EFFECTIVE AREA(ACRES) = 74.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 74.00
PEAK FLOW RATE(CFS) = 128.75
TC(MIN) = 17.89

*****
FLOW PROCESS FROM NODE 419.10 TO NODE 420.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.1 INCHES
PIPEFLOW VELOCITY(Feet/Sec.) = 13.5
UPSTREAM NODE ELEVATION = 1750.00
DOWNSTREAM NODE ELEVATION = 1745.00
FLOWLENGTH(Feet) = 430.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 128.75
TRAVEL TIME(MIN.) = .53 TC(MIN.) = 18.42

*****
FLOW PROCESS FROM NODE 419.50 TO NODE 420.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.471
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 34.01
EFFECTIVE AREA(ACRES) = 94.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 94.00
PEAK FLOW RATE(CFS) = 159.84
TC(MIN) = 18.42

*****
FLOW PROCESS FROM NODE 420.10 TO NODE 420.20 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.3 INCHES

```

PIPEFLOW VELOCITY(FEET/SEC.) = 12.2  
UPSTREAM NODE ELEVATION = 1745.00  
DOWNSTREAM NODE ELEVATION = 1741.00  
FLOWLENGTH(FEET) = 500.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 159.84  
TRAVEL TIME(MIN.) = .68 TC(MIN.) = 19.10

\*\*\*\*\*  
FLOW PROCESS FROM NODE 420.00 TO NODE 420.20 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.418  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 23.00 SUBAREA RUNOFF(CFS) = 38.01  
EFFECTIVE AREA(ACRES) = 117.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 117.00  
PEAK FLOW RATE(CFS) = 193.35  
TC(MIN) = 19.10

\*\*\*\*\*  
FLOW PROCESS FROM NODE 420.20 TO NODE 421.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.9  
UPSTREAM NODE ELEVATION = 1741.00  
DOWNSTREAM NODE ELEVATION = 1725.00  
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 193.35  
TRAVEL TIME(MIN.) = 1.51 TC(MIN.) = 20.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 421.00 TO NODE 421.20 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.310  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 62.00 SUBAREA RUNOFF(CFS) = 96.43  
EFFECTIVE AREA(ACRES) = 179.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 179.00  
PEAK FLOW RATE(CFS) = 278.41  
TC(MIN) = 20.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 421.10 TO NODE 421.20 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.310

SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 31.11  
EFFECTIVE AREA(ACRES) = 199.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 199.00  
PEAK FLOW RATE(CFS) = 309.52  
TC(MIN) = 20.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 421.20 TO NODE 425.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 21.9  
UPSTREAM NODE ELEVATION = 1725.00  
DOWNSTREAM NODE ELEVATION = 1677.00  
FLOWLENGTH(FEET) = 2000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 309.52  
TRAVEL TIME(MIN.) = 1.52 TC(MIN.) = 22.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 425.10 TO NODE 425.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 22.13  
RAINFALL INTENSITY (INCH./HOUR) = 2.21  
EFFECTIVE STREAM AREA(ACRES) = 199.00  
TOTAL STREAM AREA(ACRES) = 199.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 309.52

\*\*\*\*\*  
FLOW PROCESS FROM NODE 422.00 TO NODE 422.11 IS CODE = 2  
-----

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1755.00  
DOWNSTREAM ELEVATION = 1720.00  
ELEVATION DIFFERENCE = 35.00  
TC = .412\*[( 1000.00\*\* 3.00)/( 35.00)]\*\* .20 = 12.767  
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.079  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 11.24  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 11.24

\*\*\*\*\*  
FLOW PROCESS FROM NODE 422.11 TO NODE 422.12 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

```

>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.2 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 10.9
UPSTREAM NODE ELEVATION = 1720.00
DOWNSTREAM NODE ELEVATION = 1686.00
FLOWLENGTH(FEET) = 1050.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 11.24
TRAVEL TIME(MIN.) = 1.60 TC(MIN.) = 14.37

*****
FLOW PROCESS FROM NODE 422.10 TO NODE 422.12 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.869
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 10.29
EFFECTIVE AREA(ACRES) = 10.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 10.00
PEAK FLOW RATE(CFS) = 20.58
TC(MIN) = 14.37

*****
FLOW PROCESS FROM NODE 422.12 TO NODE 423.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 5.7
UPSTREAM NODE ELEVATION = 1686.00
DOWNSTREAM NODE ELEVATION = 1685.00
FLOWLENGTH(FEET) = 250.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 20.58
TRAVEL TIME(MIN.) = .73 TC(MIN.) = 15.09

*****
FLOW PROCESS FROM NODE 422.20 TO NODE 423.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.785
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.83
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 39.65
(MIN) = 15.09

*****
FLOW PROCESS FROM NODE 423.10 TO NODE 423.20 IS CODE = 3

```

```

-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.2 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 5.6
UPSTREAM NODE ELEVATION = 1685.00
DOWNSTREAM NODE ELEVATION = 1684.00
FLOWLENGTH(FEET) = 420.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 39.65
TRAVEL TIME(MIN.) = 1.26 TC(MIN.) = 16.35

*****
FLOW PROCESS FROM NODE 423.00 TO NODE 423.20 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.654
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 37.30
EFFECTIVE AREA(ACRES) = 40.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 40.00
PEAK FLOW RATE(CFS) = 74.60
TC(MIN) = 16.35

*****
FLOW PROCESS FROM NODE 423.20 TO NODE 424.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 54.0 INCH PIPE IS 39.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 6.1
UPSTREAM NODE ELEVATION = 1684.00
DOWNSTREAM NODE ELEVATION = 1683.00
FLOWLENGTH(FEET) = 500.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 74.60
TRAVEL TIME(MIN.) = 1.37 TC(MIN.) = 17.72

*****
FLOW PROCESS FROM NODE 424.00 TO NODE 424.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.529
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 23.00 SUBAREA RUNOFF(CFS) = 40.30
EFFECTIVE AREA(ACRES) = 63.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 63.00
PEAK FLOW RATE(CFS) = 110.40
TC(MIN) = 17.72

*****

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```

FLOW PROCESS FROM NODE    424.10 TO NODE    425.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
    PTH OF FLOW IN  54.0 INCH PIPE IS  39.1 INCHES
    PIPEFLOW VELOCITY(FEET/SEC.) =    9.0
    UPSTREAM NODE ELEVATION =  1683.00
    DOWNSTREAM NODE ELEVATION =  1677.00
    FLOWLENGTH(FEET) =  1380.00    MANNINGS N =    .013
    ESTIMATED PIPE DIAMETER(INCH) =  54.00    NUMBER OF PIPES =    1
    PIPEFLOW THRU SUBAREA(CFS) =   110.40
    TRAVEL TIME(MIN.) =    2.57    TC(MIN.) =   20.29

*****
FLOW PROCESS FROM NODE    425.00 TO NODE    425.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.332
    SOIL CLASSIFICATION IS "A"
    RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =    .5820
    SUBAREA AREA(ACRES) =    62.00    SUBAREA RUNOFF(CFS) =    97.64
    EFFECTIVE AREA(ACRES) =   125.00
    AVERAGED Fm(INCH/HR) =    .582
    TOTAL AREA(ACRES) =   125.00
    PEAK FLOW RATE(CFS) =   196.85
    TC(MIN) =    20.29

*****
FLOW PROCESS FROM NODE    429.00 TO NODE    425.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.332
    SOIL CLASSIFICATION IS "A"
    RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =    .5820
    SUBAREA AREA(ACRES) =    50.00    SUBAREA RUNOFF(CFS) =    78.74
    EFFECTIVE AREA(ACRES) =   175.00
    AVERAGED Fm(INCH/HR) =    .582
    TOTAL AREA(ACRES) =   175.00
    PEAK FLOW RATE(CFS) =   275.60
    TC(MIN) =    20.29

*****
FLOW PROCESS FROM NODE    425.10 TO NODE    425.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
    TIME OF CONCENTRATION(MINUTES) =   20.29
    RAINFALL INTENSITY (INCH./HOUR) =    2.33
    EFFECTIVE STREAM AREA(ACRES) =   175.00
    TOTAL STREAM AREA(ACRES) =   175.00
    AK FLOW RATE(CFS) AT CONFLUENCE =   275.60

CONFLUENCE INFORMATION:
    STREAM    PEAK FLOW    TIME    INTENSITY    FM    EFFECTIVE
    NUMBER    RATE(CFS)    (MIN.) (INCH/HOUR) (IN/HR) AREA(ACRES)

```

1	309.52	22.13	2.214	.58	199.00
2	275.60	20.29	2.332	.58	175.00

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

# SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	566.49	374.00
2	579.97	357.47

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 579.97 TIME(MINUTES) = 20.292  
EFFECTIVE AREA(ACRES) = 357.47  
TOTAL AREA(ACRES) = 374.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 425.10 TO NODE 417.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 69.0 INCH PIPE IS 51.9 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 27.7

UPSTREAM NODE ELEVATION = 1677.00

DOWNSTREAM NODE ELEVATION = 1638.00

FLOWLENGTH(Feet) = 1320.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 579.97

TRAVEL TIME(MIN.) = .80 TC(MIN.) = 21.09

\*\*\*\*\*  
FLOW PROCESS FROM NODE 417.10 TO NODE 417.10 IS CODE = 1

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 21.09

RAINFALL INTENSITY (INCH./HOUR) = 2.28

EFFECTIVE STREAM AREA(ACRES) = 357.47

TOTAL STREAM AREA(ACRES) = 374.00

PEAK FLOW RATE(CFS) AT CONFLUENCE = 579.97

# CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
------------------	------------------------	----------------	--------------------------	---------------	--------------------------

1	579.97	21.09	2.279	.58	357.47
---	--------	-------	-------	-----	--------

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

# SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	579.97	357.47
---	--------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 579.97 TIME(MINUTES) = 21.087

EFFECTIVE AREA(ACRES) = 357.47

```

***** DESCRIPTION OF STUDY *****
N. FONTANA MASTER STORM DRAIN PLAN, LINE B-5.
* Q 100-YR.
JN 3547, T. ARROYO, 11/30/89.
*****
FILE NAME: LINEB2.100
TIME/DATE OF STUDY: 11: 8 11/30/1989
=====
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 = .95
*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.530
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.5300
SLOPE OF INTENSITY DURATION CURVE = .6000

*****
FLOW PROCESS FROM NODE 442.00 TO NODE 442.10 IS CODE = 2
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1782.00
DOWNSTREAM ELEVATION = 1748.00
ELEVATION DIFFERENCE = 34.00
TC = .412*[(1000.00** 3.00)/(34.00)]** .20 = 12.841
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.859
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 29.49
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 29.49

*****
FLOW PROCESS FROM NODE 442.10 TO NODE 441.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.6 INCHES
PIPEFLOW VELOCITY(Feet/Sec.) = 11.3
UPSTREAM NODE ELEVATION = 1745.00
DOWNSTREAM NODE ELEVATION = 1733.00
FLOWLENGTH(Feet) = 600.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 29.49
TRAVEL TIME(MIN.) = .89 TC(MIN.) = 13.73

*****
FLOW PROCESS FROM NODE 441.00 TO NODE 441.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.707
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 28.13
EFFECTIVE AREA(ACRES) = 20.00

```

AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 56.25  
TC(MIN) = 13.73

\*\*\*\*\*  
FLOW PROCESS FROM NODE 441.10 TO NODE 440.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 16.6  
UPSTREAM NODE ELEVATION = 1733.00  
DOWNSTREAM NODE ELEVATION = 1692.00  
FLOWLENGTH(FEET) = 1200.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 56.25  
TRAVEL TIME(MIN.) = 1.21 TC(MIN.) = 14.93

\*\*\*\*\*  
FLOW PROCESS FROM NODE 440.00 TO NODE 440.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.524  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 52.96  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 105.93  
TC(MIN) = 14.93

\*\*\*\*\*  
FLOW PROCESS FROM NODE 440.10 TO NODE 439.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.2 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.9  
UPSTREAM NODE ELEVATION = 1692.00  
DOWNSTREAM NODE ELEVATION = 1675.00  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 105.93  
TRAVEL TIME(MIN.) = 1.12 TC(MIN.) = 16.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 439.00 TO NODE 439.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.374  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 40.21  
EFFECTIVE AREA(ACRES) = 56.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 56.00

PEAK FLOW RATE(CFS) = 140.74  
TC(MIN) = 16.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 443.00 TO NODE 439.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.374  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 11.00 SUBAREA RUNOFF(CFS) = 27.65  
EFFECTIVE AREA(ACRES) = 67.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 67.00  
PEAK FLOW RATE(CFS) = 168.39  
TC(MIN) = 16.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 439.10 TO NODE 434.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 20.0  
UPSTREAM NODE ELEVATION = 1675.00  
DOWNSTREAM NODE ELEVATION = 1650.00  
FLOWLENGTH(FEET) = 900.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 168.39  
TRAVEL TIME(MIN.) = .75 TC(MIN.) = 16.81

\*\*\*\*\*  
FLOW PROCESS FROM NODE 434.10 TO NODE 434.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 16.81  
RAINFALL INTENSITY (INCH./HOUR) = 3.28  
EFFECTIVE STREAM AREA(ACRES) = 67.00  
TOTAL STREAM AREA(ACRES) = 67.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 168.39

\*\*\*\*\*  
FLOW PROCESS FROM NODE 438.00 TO NODE 438.10 IS CODE = 2  
-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1758.00  
DOWNSTREAM ELEVATION = 1720.00  
ELEVATION DIFFERENCE = 38.00  
TC = .412\*[(1000.00\*\* 3.00)/(38.00)]\*\* .20 = 12.559  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.910  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 29.96

TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 29.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 438.10 TO NODE 437.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS	21.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =	7.9
UPSTREAM NODE ELEVATION =	1720.00
DOWNSTREAM NODE ELEVATION =	1717.00
FLOWLENGTH(FEET) =	400.00
MANNINGS N =	.013
ESTIMATED PIPE DIAMETER(INCH) =	30.00
NUMBER OF PIPES =	1
PIPEFLOW THRU SUBAREA(CFS) =	29.96
TRAVEL TIME(MIN.) =	.84
TC(MIN.) =	13.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 437.00 TO NODE 437.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.761
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5820
SUBAREA AREA(ACRES) =	10.00
SUBAREA RUNOFF(CFS) =	28.61
EFFECTIVE AREA(ACRES) =	20.00
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	20.00
PEAK FLOW RATE(CFS) =	57.23
TC(MIN) =	13.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 437.10 TO NODE 436.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS	19.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =	16.5
UPSTREAM NODE ELEVATION =	1717.00
DOWNSTREAM NODE ELEVATION =	1690.00
FLOWLENGTH(FEET) =	800.00
MANNINGS N =	.013
ESTIMATED PIPE DIAMETER(INCH) =	30.00
NUMBER OF PIPES =	1
PIPEFLOW THRU SUBAREA(CFS) =	57.23
TRAVEL TIME(MIN.) =	.81
TC(MIN.) =	14.20

\*\*\*\*\*  
FLOW PROCESS FROM NODE 436.00 TO NODE 436.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.632
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5820
SUBAREA AREA(ACRES) =	20.00
SUBAREA RUNOFF(CFS) =	54.90
EFFECTIVE AREA(ACRES) =	40.00
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	40.00
PEAK FLOW RATE(CFS) =	109.80
TC(MIN) =	14.20

```

*****
FLOW PROCESS FROM NODE    436.10 TO NODE    435.10 IS CODE =    3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN  42.0 INCH PIPE IS  31.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  14.2
UPSTREAM NODE ELEVATION =  1690.00
DOWNSTREAM NODE ELEVATION =  1675.00
FLOWLENGTH(FEET) =  1000.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  42.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    109.80
TRAVEL TIME(MIN.) =    1.18  TC(MIN.) =  15.38

*****
FLOW PROCESS FROM NODE    435.00 TO NODE    435.10 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.462
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =    27.00  SUBAREA RUNOFF(CFS) =    69.99
EFFECTIVE AREA(ACRES) =    67.00
AVERAGED Fm(INCH/HR) =    .582
TOTAL AREA(ACRES) =    67.00
PEAK FLOW RATE(CFS) =    173.69
TC(MIN) =    15.38

*****
FLOW PROCESS FROM NODE    435.10 TO NODE    434.10 IS CODE =    3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN  48.0 INCH PIPE IS  35.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  17.5
UPSTREAM NODE ELEVATION =  1675.00
DOWNSTREAM NODE ELEVATION =  1650.00
FLOWLENGTH(FEET) =  1300.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  48.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    173.69
TRAVEL TIME(MIN.) =    1.24  TC(MIN.) =  16.62

*****
FLOW PROCESS FROM NODE    434.00 TO NODE    434.10 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.305
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =    34.00  SUBAREA RUNOFF(CFS) =    83.32
EFFECTIVE AREA(ACRES) =   101.00
AVERAGED Fm(INCH/HR) =    .582
TOTAL AREA(ACRES) =   101.00
PEAK FLOW RATE(CFS) =   247.52
TC(MIN) =   16.62

*****

```

```

FLOW PROCESS FROM NODE 434.10 TO NODE 434.10 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 16.62
RAINFALL INTENSITY (INCH./HOUR) = 3.30
EFFECTIVE STREAM AREA(ACRES) = 101.00
TOTAL STREAM AREA(ACRES) = 101.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 247.52

CONFLUENCE INFORMATION:
STREAM PEAK FLOW TIME INTENSITY FM EFFECTIVE
NUMBER RATE(CFS) (MIN.) (INCH/HOUR) (IN/HR) AREA(ACRES)
-----
1 168.39 16.81 3.283 .58 67.00
2 247.52 16.62 3.305 .58 101.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.
SUMMARY RESULTS:
STREAM CONFLUENCE EFFECTIVE
NUMBER Q(CFS) AREA(ACRES)
-----
1 413.93 168.00
2 415.40 167.27
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 415.40 TIME(MINUTES) = 16.622
EFFECTIVE AREA(ACRES) = 167.27
TOTAL AREA(ACRES) = 168.00

*****
FLOW PROCESS FROM NODE 434.10 TO NODE 433.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 63.0 INCH PIPE IS 50.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 22.2
UPSTREAM NODE ELEVATION = 1650.00
DOWNSTREAM NODE ELEVATION = 1622.00
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 415.40
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 17.61

*****
FLOW PROCESS FROM NODE 433.10 TO NODE 433.10 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 17.61
RAINFALL INTENSITY (INCH./HOUR) = 3.19
EFFECTIVE STREAM AREA(ACRES) = 167.27
TOTAL STREAM AREA(ACRES) = 168.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 415.40

*****
FLOW PROCESS FROM NODE 430.00 TO NODE 430.11 IS CODE = 2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

```



```

=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1717.00
DOWNSTREAM ELEVATION = 1690.00
ELEVATION DIFFERENCE = 27.00
TC = .412*[(1000.00** 3.00)/(27.00)]** .20 = 13.447
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.753
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 14.27
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.27

*****
FLOW PROCESS FROM NODE 430.11 TO NODE 430.12 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 10.7
UPSTREAM NODE ELEVATION = 1690.00
DOWNSTREAM NODE ELEVATION = 1663.00
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 14.27
TRAVEL TIME(MIN.) = 1.56 TC(MIN.) = 15.01

*****
FLOW PROCESS FROM NODE 430.10 TO NODE 430.12 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.514
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 13.19
EFFECTIVE AREA(ACRES) = 10.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 10.00
PEAK FLOW RATE(CFS) = 26.39
TC(MIN) = 15.01

*****
FLOW PROCESS FROM NODE 430.12 TO NODE 431.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 8.6
UPSTREAM NODE ELEVATION = 1663.00
DOWNSTREAM NODE ELEVATION = 1660.00
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 26.39
TRAVEL TIME(MIN.) = .58 TC(MIN.) = 15.59

*****
FLOW PROCESS FROM NODE 431.00 TO NODE 431.10 IS CODE = 8

```

```

-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.434
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 25.67
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 51.34
TC(MIN) = 15.59
=====
*****
FLOW PROCESS FROM NODE 431.10 TO NODE 432.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 12.0
UPSTREAM NODE ELEVATION = 1660.00
DOWNSTREAM NODE ELEVATION = 1643.00
FLOWLENGTH(FEET) = 1100.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 51.34
TRAVEL TIME(MIN.) = 1.53 TC(MIN.) = 17.12
=====
*****
FLOW PROCESS FROM NODE 432.00 TO NODE 432.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.247
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 38.37
EFFECTIVE AREA(ACRES) = 36.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 36.00
PEAK FLOW RATE(CFS) = 86.34
TC(MIN) = 17.12
=====
*****
FLOW PROCESS FROM NODE 432.10 TO NODE 433.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 39.0 INCH PIPE IS 26.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 14.3
UPSTREAM NODE ELEVATION = 1643.00
DOWNSTREAM NODE ELEVATION = 1622.00
FLOWLENGTH(FEET) = 1200.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 86.34
TRAVEL TIME(MIN.) = 1.40 TC(MIN.) = 18.52
=====
*****
FLOW PROCESS FROM NODE 433.00 TO NODE 433.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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```
=====
100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.097
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 56.00 SUBAREA RUNOFF(CFS) = 126.78
EFFECTIVE AREA(ACRES) = 92.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 92.00
PEAK FLOW RATE(CFS) = 208.28
TC(MIN) = 18.52
=====
```

```
*****
FLOW PROCESS FROM NODE 433.10 TO NODE 433.10 IS CODE = 1
=====
```

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

```
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 18.52
RAINFALL INTENSITY (INCH./HR) = 3.10
EFFECTIVE STREAM AREA(ACRES) = 92.00
TOTAL STREAM AREA(ACRES) = 92.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 208.28
```

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	415.40	17.61	3.192	.58	167.27
2	208.28	18.52	3.097	.58	92.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	620.95	254.77
2	608.63	259.27

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 620.95 TIME(MINUTES) = 17.614
EFFECTIVE AREA(ACRES) = 254.77
TOTAL AREA(ACRES) = 260.00
```

```
*****
FLOW PROCESS FROM NODE 433.10 TO NODE 428.10 IS CODE = 3
=====
```

```
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
```

```
DEPTH OF FLOW IN 75.0 INCH PIPE IS 60.2 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 23.5
UPSTREAM NODE ELEVATION = 1622.00
DOWNSTREAM NODE ELEVATION = 1597.00
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 75.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 620.95
TRAVEL TIME(MIN.) = .93 TC(MIN.) = 18.55
```

```
*****
FLOW PROCESS FROM NODE 428.10 TO NODE 428.10 IS CODE = 1
=====
```

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

>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 18.55  
RAINFALL INTENSITY (INCH./HOUR) = 3.09  
EFFECTIVE STREAM AREA(ACRES) = 254.77  
TOTAL STREAM AREA(ACRES) = 260.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 620.95

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	620.95	18.55	3.094	.58	254.77

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	620.95	254.77
---	--------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 620.95 TIME(MINUTES) = 18.549  
EFFECTIVE AREA(ACRES) = 254.77  
TOTAL AREA(ACRES) = 260.00

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 260.00  
EFFECTIVE AREA(ACRES) = 254.77  
PEAK FLOW RATE(CFS) = 620.95

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
Copyright 1983,86,87 Advanced Engineering Software (aes)  
Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* N. FONTANA MASTER STORM DRAIN PLAN, LINE B-5 \*  
\* Q 25-YR. \*  
\* JN 3547, T. ARROYO, 11/29/89. \*  
\*\*\*\*\*

FILE NAME: LINEB2.25

TIME/DATE OF STUDY: 11: 4 11/30/1989

=====

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 = .95  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.530  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.2167  
SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 442.00 TO NODE 442.10 IS CODE = 2

-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1782.00  
DOWNSTREAM ELEVATION = 1748.00  
ELEVATION DIFFERENCE = 34.00  
TC =  $.412 * [(1000.00 ** 3.00) / (34.00)] ** .20 = 12.841$   
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.069  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 22.38  
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 22.38

\*\*\*\*\*

FLOW PROCESS FROM NODE 442.10 TO NODE 441.10 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.0 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 10.8

UPSTREAM NODE ELEVATION = 1745.00

DOWNSTREAM NODE ELEVATION = 1733.00

FLOWLENGTH(FEET) = 600.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 22.38  
TRAVEL TIME(MIN.) = .93 TC(MIN.) = 13.77

\*\*\*\*\*  
FLOW PROCESS FROM NODE 441.00 TO NODE 441.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.943  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 21.25  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 42.50  
TC(MIN) = 13.77

\*\*\*\*\*  
FLOW PROCESS FROM NODE 441.10 TO NODE 440.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 27.0 INCH PIPE IS 17.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 15.4  
UPSTREAM NODE ELEVATION = 1733.00  
DOWNSTREAM NODE ELEVATION = 1692.00  
FLOWLENGTH(FEET) = 1200.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
PEFLOW THRU SUBAREA(CFS) = 42.50  
TRAVEL TIME(MIN.) = 1.29 TC(MIN.) = 15.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 440.00 TO NODE 440.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.788  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 39.72  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 79.43  
TC(MIN) = 15.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 440.10 TO NODE 439.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.7 INCHES  
PEFLOW VELOCITY(FEET/SEC.) = 13.6  
STREAM NODE ELEVATION = 1692.00  
DOWNSTREAM NODE ELEVATION = 1675.00  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 79.43  
TRAVEL TIME(MIN.) = 1.22 TC(MIN.) = 16.28

\*\*\*\*\*  
FLOW PROCESS FROM NODE 439.00 TO NODE 439.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.661  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 29.94  
EFFECTIVE AREA(ACRES) = 56.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 56.00  
PEAK FLOW RATE(CFS) = 104.77  
TC(MIN) = 16.28

\*\*\*\*\*  
FLOW PROCESS FROM NODE 443.00 TO NODE 439.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.661  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 11.00 SUBAREA RUNOFF(CFS) = 20.58  
EFFECTIVE AREA(ACRES) = 67.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 67.00  
PEAK FLOW RATE(CFS) = 125.36  
TC(MIN) = 16.28

\*\*\*\*\*  
FLOW PROCESS FROM NODE 439.10 TO NODE 434.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 39.0 INCH PIPE IS 29.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 18.4  
UPSTREAM NODE ELEVATION = 1675.00  
DOWNSTREAM NODE ELEVATION = 1650.00  
FLOWLENGTH(FEET) = 900.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 125.36  
TRAVEL TIME(MIN.) = .82 TC(MIN.) = 17.10

\*\*\*\*\*  
FLOW PROCESS FROM NODE 434.10 TO NODE 434.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 17.10  
RAINFALL INTENSITY (INCH./HR) = 2.58  
EFFECTIVE STREAM AREA(ACRES) = 67.00  
TOTAL STREAM AREA(ACRES) = 67.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 125.36

\*\*\*\*\*

```

FLOW PROCESS FROM NODE    438.00 TO NODE    438.10 IS CODE =    2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
DEVELOPMENT IS    SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

      = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1758.00
DOWNSTREAM ELEVATION = 1720.00
ELEVATION DIFFERENCE = 38.00
TC = .412*[(1000.00** 3.00)/(38.00)]** .20 = 12.559
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.110
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 22.75
TOTAL AREA(ACRES) = 10.00    PEAK FLOW RATE(CFS) = 22.75

*****
FLOW PROCESS FROM NODE    438.10 TO NODE    437.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 7.4
UPSTREAM NODE ELEVATION = 1720.00
DOWNSTREAM NODE ELEVATION = 1717.00
FLOWLENGTH(FEET) = 400.00    MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 27.00    NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 22.75
TRAVEL TIME(MIN.) = .90    TC(MIN.) = 13.46

*****
FLOW PROCESS FROM NODE    437.00 TO NODE    437.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.983
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00    SUBAREA RUNOFF(CFS) = 21.61
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 43.22
TC(MIN) = 13.46

*****
FLOW PROCESS FROM NODE    437.10 TO NODE    436.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 27.0 INCH PIPE IS 17.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 15.4
UPSTREAM NODE ELEVATION = 1717.00
DOWNSTREAM NODE ELEVATION = 1690.00
FLOWLENGTH(FEET) = 800.00    MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 27.00    NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 43.22
TRAVEL TIME(MIN.) = .86    TC(MIN.) = 14.32

```



```

*****
FLOW PROCESS FROM NODE    436.00 TO NODE    436.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HR) =    2.874
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =    .5820
SUBAREA AREA(ACRES) =    20.00 SUBAREA RUNOFF(CFS) =    41.25
EFFECTIVE AREA(ACRES) =    40.00
AVERAGED Fm(INCH/HR) =    .582
TOTAL AREA(ACRES) =    40.00
PEAK FLOW RATE(CFS) =    82.51
TC(MIN) =    14.32

*****
FLOW PROCESS FROM NODE    436.10 TO NODE    435.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.3
UPSTREAM NODE ELEVATION = 1690.00
DOWNSTREAM NODE ELEVATION = 1675.00
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 82.51
TRAVEL TIME(MIN.) = 1.25 TC(MIN.) = 15.58

*****
FLOW PROCESS FROM NODE    435.00 TO NODE    435.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HR) =    2.733
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =    .5820
SUBAREA AREA(ACRES) =    27.00 SUBAREA RUNOFF(CFS) =    52.27
EFFECTIVE AREA(ACRES) =    67.00
AVERAGED Fm(INCH/HR) =    .582
TOTAL AREA(ACRES) =    67.00
PEAK FLOW RATE(CFS) =    129.70
TC(MIN) =    15.58

*****
FLOW PROCESS FROM NODE    435.10 TO NODE    434.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.1
UPSTREAM NODE ELEVATION = 1675.00
DOWNSTREAM NODE ELEVATION = 1650.00
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 129.70
TRAVEL TIME(MIN.) = 1.35 TC(MIN.) = 16.92

*****

```

```

FLOW PROCESS FROM NODE    434.00 TO NODE    434.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.600
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =  34.00  SUBAREA RUNOFF(CFS) =  61.76
EFFECTIVE AREA(ACRES) =  101.00
AVERAGED Fm(INCH/HR) =  .582
TOTAL AREA(ACRES) =  101.00
PEAK FLOW RATE(CFS) =  183.45
TC(MIN) =  16.92

*****
FLOW PROCESS FROM NODE    434.10 TO NODE    434.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MINUTES) =  16.92
RAINFALL INTENSITY (INCH./HR) =  2.60
EFFECTIVE STREAM AREA(ACRES) =  101.00
TOTAL STREAM AREA(ACRES) =  101.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =  183.45

CONFLUENCE INFORMATION:
STREAM  PEAK FLOW  TIME  INTENSITY  FM  EFFECTIVE
NUMBER  RATE(CFS)  (MIN.) (INCH/HR) (IN/HR) AREA(ACRES)
-----
1      125.36    17.10    2.584    .58    67.00
2      183.45    16.92    2.600    .58   101.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.
SUMMARY RESULTS:
STREAM  CONFLUENCE  EFFECTIVE
NUMBER   Q(CFS)    AREA(ACRES)
-----
1      307.33    168.00
2      308.51    167.30

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =  308.51  TIME(MINUTES) =  16.923
EFFECTIVE AREA(ACRES) =  167.30
TOTAL AREA(ACRES) =  168.00

*****
FLOW PROCESS FROM NODE    434.10 TO NODE    433.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  57.0 INCH PIPE IS  44.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  20.7
UPSTREAM NODE ELEVATION =  1650.00
DOWNSTREAM NODE ELEVATION =  1622.00
FLOWLENGTH(FEET) =  1320.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  57.00  NUMBER OF PIPES =  1
PIPEFLOW THRU SUBAREA(CFS) =  308.51
TRAVEL TIME(MIN.) =  1.06  TC(MIN.) =  17.98

*****

```

```

FLOW PROCESS FROM NODE 433.10 TO NODE 433.10 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 17.98
INFALL INTENSITY (INCH./HOUR) = 2.51
EFFECTIVE STREAM AREA(ACRES) = 167.30
TOTAL STREAM AREA(ACRES) = 168.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 308.51

*****
FLOW PROCESS FROM NODE 430.00 TO NODE 430.11 IS CODE = 2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1717.00
DOWNSTREAM ELEVATION = 1690.00
ELEVATION DIFFERENCE = 27.00
TC = .412*[(1000.00** 3.00)/(27.00)]** .20 = 13.447
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.985
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 10.81
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 10.81

*****
FLOW PROCESS FROM NODE 430.11 TO NODE 430.12 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 10.1
UPSTREAM NODE ELEVATION = 1690.00
DOWNSTREAM NODE ELEVATION = 1663.00
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 10.81
TRAVEL TIME(MIN.) = 1.65 TC(MIN.) = 15.10

*****
FLOW PROCESS FROM NODE 430.10 TO NODE 430.12 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.785
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 9.91
EFFECTIVE AREA(ACRES) = 10.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 10.00
PEAK FLOW RATE(CFS) = 19.82
'(MIN) = 15.10

*****
FLOW PROCESS FROM NODE 430.12 TO NODE 431.10 IS CODE = 3

```

```

-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 7.9
UPSTREAM NODE ELEVATION = 1663.00
DOWNSTREAM NODE ELEVATION = 1660.00
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 19.82
TRAVEL TIME(MIN.) = .63 TC(MIN.) = 15.73

*****
FLOW PROCESS FROM NODE 431.00 TO NODE 431.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.717
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.22
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 38.44
TC(MIN) = 15.73

*****
FLOW PROCESS FROM NODE 431.10 TO NODE 432.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 11.2
UPSTREAM NODE ELEVATION = 1660.00
DOWNSTREAM NODE ELEVATION = 1643.00
FLOWLENGTH(FEET) = 1100.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 38.44
TRAVEL TIME(MIN.) = 1.64 TC(MIN.) = 17.37

*****
FLOW PROCESS FROM NODE 432.00 TO NODE 432.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.560
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 16.00 SUBAREA RUNOFF(CFS) = 28.49
EFFECTIVE AREA(ACRES) = 36.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 36.00
PEAK FLOW RATE(CFS) = 64.10
TC(MIN) = 17.37

*****
FLOW PROCESS FROM NODE 432.10 TO NODE 433.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

```

```

>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.1
UPSTREAM NODE ELEVATION = 1643.00
DOWNSTREAM NODE ELEVATION = 1622.00
FLOWLENGTH(FEET) = 1200.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 64.10
TRAVEL TIME(MIN.) = 1.53 TC(MIN.) = 18.90

*****
FLOW PROCESS FROM NODE 433.00 TO NODE 433.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.434
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 56.00 SUBAREA RUNOFF(CFS) = 93.32
EFFECTIVE AREA(ACRES) = 92.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 92.00
PEAK FLOW RATE(CFS) = 153.31
TC(MIN) = 18.90

*****
FLOW PROCESS FROM NODE 433.10 TO NODE 433.10 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 18.90
RAINFALL INTENSITY (INCH./HOUR) = 2.43
EFFECTIVE STREAM AREA(ACRES) = 92.00
TOTAL STREAM AREA(ACRES) = 92.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 153.31

CONFLUENCE INFORMATION:
STREAM PEAK FLOW TIME INTENSITY FM EFFECTIVE
NUMBER RATE(CFS) (MIN.) (INCH/HOUR) (IN/HR) AREA(ACRES)
-----
1 308.51 17.98 2.507 .58 167.30
2 153.31 18.90 2.434 .58 92.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.
SUMMARY RESULTS:
STREAM CONFLUENCE EFFECTIVE
NUMBER Q(CFS) AREA(ACRES)
-----
1 460.20 254.86
2 450.07 259.30
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 460.20 TIME(MINUTES) = 17.985
EFFECTIVE AREA(ACRES) = 254.86
TOTAL AREA(ACRES) = 260.00

*****
FLOW PROCESS FROM NODE 433.10 TO NODE 428.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

```

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

=====

DEPTH OF FLOW IN 69.0 INCH PIPE IS 51.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 22.1  
UPSTREAM NODE ELEVATION = 1622.00  
DOWNSTREAM NODE ELEVATION = 1597.00  
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 460.20  
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 18.98

\*\*\*\*\*

FLOW PROCESS FROM NODE 428.10 TO NODE 428.10 IS CODE = 1

=====

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 18.98  
RAINFALL INTENSITY (INCH./HOUR) = 2.43  
EFFECTIVE STREAM AREA(ACRES) = 254.86  
TOTAL STREAM AREA(ACRES) = 260.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 460.20

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	460.20	18.98	2.427	.58	254.86

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	460.20	254.86

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 460.20 TIME(MINUTES) = 18.979  
EFFECTIVE AREA(ACRES) = 254.86  
TOTAL AREA(ACRES) = 260.00

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 260.00  
EFFECTIVE AREA(ACRES) = 254.86  
PEAK FLOW RATE(CFS) = 460.20

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
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Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN

10/14/93

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* N. FONTANA MASTER S.D. PLAN: LINE C WITH LATERALS - ALONG HIGHLAND AVE. \*  
\* Q 25-YEAR, DESIGN FOR LATERAL LINES - CALC'S REVISED 10/14/93 \*  
\* B. EVERSON - J.N. 3547 - LINEC.25 (INPUT), LINEC.OUT (OUTPUT) \*  
\*\*\*\*\*

FILE NAME: LINEC.25

TIME/DATE OF STUDY: 11:31 10/14/1993

=====

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 = .95  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.550  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.2246  
SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*  
FLOW PROCESS FROM NODE 300.00 TO NODE 300.11 IS CODE = 2

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1665.00  
DOWNSTREAM ELEVATION = 1630.00  
ELEVATION DIFFERENCE = 35.00  
TC = .412\*[(1000.00\*\* 3.00)/(35.00)]\*\* .20 = 12.767  
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.099  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 11.33  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 11.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 300.11 TO NODE 300.12 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000  
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.2  
UPSTREAM NODE ELEVATION = 1630.00  
DOWNSTREAM NODE ELEVATION = 1595.40

FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 11.33  
TRAVEL TIME(MIN.) = 1.48 TC(MIN.) = 14.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 300.10 TO NODE 300.12 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.901  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 10.44  
EFFECTIVE AREA(ACRES) = 10.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 20.87  
TC(MIN) = 14.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 300.12 TO NODE 301.10 IS CODE = 3  
-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<  
=====

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000  
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 33.3  
UPSTREAM NODE ELEVATION = 1665.50  
DOWNSTREAM NODE ELEVATION = 1595.00  
FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 20.87  
TRAVEL TIME(MIN.) = .08 TC(MIN.) = 14.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 301.00 TO NODE 301.11 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.891  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 20.78  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 41.56  
TC(MIN) = 14.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 301.11 TO NODE 302.10 IS CODE = 3  
-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<  
=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 4.7  
UPSTREAM NODE ELEVATION = 1595.00  
DOWNSTREAM NODE ELEVATION = 1594.50  
FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013



ESTIMATED PIPE DIAMETER(INCH) = 45.00      NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 41.56  
TRAVEL TIME(MIN.) = 1.17      TC(MIN.) = 15.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 302.00 TO NODE 302.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.758  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00      SUBAREA RUNOFF(CFS) = 39.17  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 78.34  
TC(MIN) = 15.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 302.10 TO NODE 303.10 IS CODE = 3  
-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<  
=====

DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.7 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 6.5  
UPSTREAM NODE ELEVATION = 1594.50  
DOWNSTREAM NODE ELEVATION = 1593.00  
FLOWLENGTH(FEET) = 630.00      MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 51.00      NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 78.34  
TRAVEL TIME(MIN.) = 1.63      TC(MIN.) = 17.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 303.00 TO NODE 303.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.598  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 40.00      SUBAREA RUNOFF(CFS) = 72.57  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 145.14  
TC(MIN) = 17.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 303.10 TO NODE 303.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 17.13  
RAINFALL INTENSITY (INCH./HOUR) = 2.60  
EFFECTIVE STREAM AREA(ACRES) = 80.00  
TOTAL STREAM AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 145.14

```

*****
FLOW PROCESS FROM NODE 304.00 TO NODE 304.10 IS CODE = 2
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1668.00
DOWNSTREAM ELEVATION = 1657.00
ELEVATION DIFFERENCE = 11.00
TC = .412*[(1000.00** 3.00)/(11.00)]** .20 = 16.092
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.697
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 19.04
TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 19.04

*****
FLOW PROCESS FROM NODE 304.10 TO NODE 305.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 21.0 INCH PIPE IS 12.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 12.6
UPSTREAM NODE ELEVATION = 1657.00
DOWNSTREAM NODE ELEVATION = 1647.00
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 19.04
TRAVEL TIME(MIN.) = .40 TC(MIN.) = 16.49

*****
FLOW PROCESS FROM NODE 305.00 TO NODE 305.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.658
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 18.68
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 37.37
TC(MIN) = 16.49

*****
FLOW PROCESS FROM NODE 305.10 TO NODE 306.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.2
UPSTREAM NODE ELEVATION = 1647.00
DOWNSTREAM NODE ELEVATION = 1631.00
FLOWLENGTH(FEET) = 650.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 37.37
TRAVEL TIME(MIN.) = .82 TC(MIN.) = 17.31

```

```

*****
FLOW PROCESS FROM NODE 306.00 TO NODE 306.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.582
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 35.99
EFFECTIVE AREA(ACRES) = 40.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 40.00
PEAK FLOW RATE(CFS) = 71.98
TC(MIN) = 17.31

*****
FLOW PROCESS FROM NODE 306.10 TO NODE 303.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 33.0 INCH PIPE IS 23.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 15.8
UPSTREAM NODE ELEVATION = 1631.00
DOWNSTREAM NODE ELEVATION = 1593.00
FLOWLENGTH(FEET) = 1450.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 71.98
TRAVEL TIME(MIN.) = 1.53 TC(MIN.) = 18.84

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 303.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.454
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 42.00 SUBAREA RUNOFF(CFS) = 70.75
EFFECTIVE AREA(ACRES) = 82.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 82.00
PEAK FLOW RATE(CFS) = 138.14
TC(MIN) = 18.84

*****
FLOW PROCESS FROM NODE 306.10 TO NODE 303.10 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 18.84
RAINFALL INTENSITY (INCH./HOUR) = 2.45
EFFECTIVE STREAM AREA(ACRES) = 82.00
TOTAL STREAM AREA(ACRES) = 82.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 138.14

CONFLUENCE INFORMATION:
STREAM PEAK FLOW TIME INTENSITY FM EFFECTIVE
NUMBER RATE(CFS) (MIN.) (INCH/HOUR) (IN/HR) AREA(ACRES)

```

1	145.14	17.13	2.598	.58	80.00
2	138.14	18.84	2.454	.58	82.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	280.41	154.56
2	272.90	162.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 280.41 TIME(MINUTES) = 17.130

EFFECTIVE AREA(ACRES) = 154.56

TOTAL AREA(ACRES) = 162.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 303.10 TO NODE 308.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.1 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 20.0

UPSTREAM NODE ELEVATION = 1593.00

DOWNSTREAM NODE ELEVATION = 1587.00

FLOWLENGTH(Feet) = 300.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 280.41

TRAVEL TIME(Min.) = .25 TC(Min.) = 17.38

\*\*\*\*\*  
FLOW PROCESS FROM NODE 308.00 TO NODE 308.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.575

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 17.94

EFFECTIVE AREA(ACRES) = 164.56

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 172.00

PEAK FLOW RATE(CFS) = 295.22

TC(Min) = 17.38

\*\*\*\*\*  
FLOW PROCESS FROM NODE 308.10 TO NODE 309.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 57.0 INCH PIPE IS 41.2 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 21.5

UPSTREAM NODE ELEVATION = 1587.00

DOWNSTREAM NODE ELEVATION = 1580.00

FLOWLENGTH(Feet) = 300.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 295.22

TRAVEL TIME(Min.) = .23 TC(Min.) = 17.61

```

*****
FLOW PROCESS FROM NODE 309.00 TO NODE 309.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.555
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 17.76
EFFECTIVE AREA(ACRES) = 174.56
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 182.00
PEAK FLOW RATE(CFS) = 309.95
TC(MIN) = 17.61

*****
FLOW PROCESS FROM NODE 309.10 TO NODE 310.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 57.0 INCH PIPE IS 41.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 22.3
UPSTREAM NODE ELEVATION = 1580.00
DOWNSTREAM NODE ELEVATION = 1565.00
FLOWLENGTH(FEET) = 600.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 309.95
TRAVEL TIME(MIN.) = .45 TC(MIN.) = 18.06

*****
FLOW PROCESS FROM NODE 310.00 TO NODE 310.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.517
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 34.82
EFFECTIVE AREA(ACRES) = 194.56
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 202.00
PEAK FLOW RATE(CFS) = 338.77
TC(MIN) = 18.06

*****
FLOW PROCESS FROM NODE 310.10 TO NODE 311.10 IS CODE = 3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 57.0 INCH PIPE IS 46.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 22.1
UPSTREAM NODE ELEVATION = 1565.00
DOWNSTREAM NODE ELEVATION = 1530.10
FLOWLENGTH(FEET) = 1450.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 338.77
TRAVEL TIME(MIN.) = 1.09 TC(MIN.) = 19.15

*****
FLOW PROCESS FROM NODE 311.00 TO NODE 311.10 IS CODE = 8

```

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.429  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 44.00 SUBAREA RUNOFF(CFS) = 73.16  
EFFECTIVE AREA(ACRES) = 238.56  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 246.00  
PEAK FLOW RATE(CFS) = 396.65  
TC(MIN) = 19.15

\*\*\*\*\*  
FLOW PROCESS FROM NODE 311.10 TO NODE 312.10 IS CODE = 5  
=====

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 1530.10  
DOWNSTREAM NODE ELEVATION = 1528.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1250.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 5.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 396.65  
FLOW VELOCITY(FEET/SEC) = 7.34 FLOW DEPTH(FEET) = 3.90  
TRAVEL TIME(MIN.) = 2.84 TC(MIN.) = 21.99

\*\*\*\*\*  
FLOW PROCESS FROM NODE 312.00 TO NODE 312.10 IS CODE = 8  
=====

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.236  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 76.00 SUBAREA RUNOFF(CFS) = 113.15  
EFFECTIVE AREA(ACRES) = 314.56  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 322.00  
PEAK FLOW RATE(CFS) = 468.33  
TC(MIN) = 21.99

\*\*\*\*\*  
FLOW PROCESS FROM NODE 312.10 TO NODE 313.10 IS CODE = 5  
=====

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM NODE ELEVATION = 1529.00  
DOWNSTREAM NODE ELEVATION = 1525.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1400.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 5.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 468.33  
FLOW VELOCITY(FEET/SEC) = 9.32 FLOW DEPTH(FEET) = 3.71  
TRAVEL TIME(MIN.) = 2.50 TC(MIN.) = 24.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 313.00 TO NODE 313.10 IS CODE = 8  
=====

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

```

=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.096
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 85.00 SUBAREA RUNOFF(CFS) = 115.83
EFFECTIVE AREA(ACRES) = 399.56
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 407.00
PEAK FLOW RATE(CFS) = 544.50
TC(MIN) = 24.49

*****
FLOW PROCESS FROM NODE 313.10 TO NODE 314.10 IS CODE = 5
=====
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1526.00
DOWNSTREAM NODE ELEVATION = 1518.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1270.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 5.50
CHANNEL FLOW THRU SUBAREA(CFS) = 544.50
FLOW VELOCITY(FEET/SEC) = 12.99 FLOW DEPTH(FEET) = 3.25
TRAVEL TIME(MIN.) = 1.63 TC(MIN.) = 26.12

*****
FLOW PROCESS FROM NODE 314.00 TO NODE 314.10 IS CODE = 8
=====
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.017
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 76.00 SUBAREA RUNOFF(CFS) = 98.13
EFFECTIVE AREA(ACRES) = 475.56
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 483.00
PEAK FLOW RATE(CFS) = 614.05
TC(MIN) = 26.12

*****
FLOW PROCESS FROM NODE 314.10 TO NODE 315.10 IS CODE = 5
=====
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1518.00
DOWNSTREAM NODE ELEVATION = 1511.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1420.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 5.50
CHANNEL FLOW THRU SUBAREA(CFS) = 614.05
FLOW VELOCITY(FEET/SEC) = 12.32 FLOW DEPTH(FEET) = 3.68
TRAVEL TIME(MIN.) = 1.92 TC(MIN.) = 28.05

*****
FLOW PROCESS FROM NODE 315.00 TO NODE 315.10 IS CODE = 8
=====
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.933

```

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m(\text{INCH/HR}) = .5820$   
SUBAREA AREA(ACRES) = 85.00 SUBAREA RUNOFF(CFS) = 103.32  
EFFECTIVE AREA(ACRES) = 560.56  
AVERAGED  $F_m(\text{INCH/HR}) = .582$   
TOTAL AREA(ACRES) = 568.00  
PEAK FLOW RATE(CFS) = 681.40  
TC(MIN) = 28.05

\*\*\*\*\*  
FLOW PROCESS FROM NODE 315.10 TO NODE 315.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 28.05  
RAINFALL INTENSITY (INCH./HOUR) = 1.93  
EFFECTIVE STREAM AREA(ACRES) = 560.56  
TOTAL STREAM AREA(ACRES) = 568.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 681.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 316.00 TO NODE 316.11 IS CODE = 2  
-----

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

$TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
PSTREAM ELEVATION = 1664.50  
DOWNSTREAM ELEVATION = 1611.50  
ELEVATION DIFFERENCE = 53.00  
 $TC = .412 * [(1000.00 ** 3.00) / (53.00)] ** .20 = 11.750$   
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.257

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m(\text{INCH/HR}) = .5820$   
SUBAREA RUNOFF(CFS) = 12.04  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 12.04

\*\*\*\*\*  
FLOW PROCESS FROM NODE 316.11 TO NODE 316.12 IS CODE = 3  
-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 18.0 INCH PIPE IS 13.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 8.3  
UPSTREAM NODE ELEVATION = 1611.50  
DOWNSTREAM NODE ELEVATION = 1595.80  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 12.04  
TRAVEL TIME(MIN.) = 2.02 TC(MIN.) = 13.77

\*\*\*\*\*  
FLOW PROCESS FROM NODE 316.10 TO NODE 316.12 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.962  
SOIL CLASSIFICATION IS "A"



RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 10.71  
EFFECTIVE AREA(ACRES) = 10.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 21.42  
TC(MIN) = 13.77

\*\*\*\*\*  
FLOW PROCESS FROM NODE 316.12 TO NODE 317.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 4.2  
UPSTREAM NODE ELEVATION = 1595.80  
DOWNSTREAM NODE ELEVATION = 1595.50  
FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 21.42  
TRAVEL TIME(MIN.) = .66 TC(MIN.) = 14.43

\*\*\*\*\*  
FLOW PROCESS FROM NODE 317.00 TO NODE 317.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.879  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 20.67  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 41.35  
TC(MIN) = 14.43

\*\*\*\*\*  
FLOW PROCESS FROM NODE 317.10 TO NODE 318.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 4.7  
UPSTREAM NODE ELEVATION = 1595.50  
DOWNSTREAM NODE ELEVATION = 1595.00  
FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 41.35  
TRAVEL TIME(MIN.) = 1.17 TC(MIN.) = 15.60

\*\*\*\*\*  
FLOW PROCESS FROM NODE 318.00 TO NODE 318.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.748  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 38.98

EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 77.96  
C(MIN) = 15.60

\*\*\*\*\*  
FLOW PROCESS FROM NODE 318.10 TO NODE 319.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.7 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 5.5  
UPSTREAM NODE ELEVATION = 1595.00  
DOWNSTREAM NODE ELEVATION = 1594.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 77.96  
TRAVEL TIME(MIN.) = 2.04 TC(MIN.) = 17.64

\*\*\*\*\*  
FLOW PROCESS FROM NODE 319.00 TO NODE 319.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.552  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 70.92  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 141.85  
TC(MIN) = 17.64

\*\*\*\*\*  
FLOW PROCESS FROM NODE 319.10 TO NODE 320.10 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<  
=====

DEPTH OF FLOW IN 57.0 INCH PIPE IS 36.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.9  
UPSTREAM NODE ELEVATION = 1594.00  
DOWNSTREAM NODE ELEVATION = 1584.00  
FLOWLENGTH(FEET) = 1330.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 141.85  
TRAVEL TIME(MIN.) = 1.87 TC(MIN.) = 19.51

\*\*\*\*\*  
FLOW PROCESS FROM NODE 320.00 TO NODE 320.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.402  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 131.07  
EFFECTIVE AREA(ACRES) = 160.00  
AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 160.00  
PEAK FLOW RATE(CFS) = 262.15  
TC(MIN) = 19.51

\*\*\*\*\*  
FLOW PROCESS FROM NODE 320.10 TO NODE 321.10 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

PIPEFLOW VELOCITY(FEET/SEC.) = 12.1  
UPSTREAM NODE ELEVATION = 1584.00  
DOWNSTREAM NODE ELEVATION = 1574.00  
FLOWLENGTH(FEET) = 1430.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 262.15  
TRAVEL TIME(MIN.) = 1.97 TC(MIN.) = 21.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 321.00 TO NODE 321.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.268  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 86.00 SUBAREA RUNOFF(CFS) = 130.49  
EFFECTIVE AREA(ACRES) = 246.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 246.00  
PEAK FLOW RATE(CFS) = 373.25  
TC(MIN) = 21.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 321.10 TO NODE 315.10 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

DEPTH OF FLOW IN 63.0 INCH PIPE IS 44.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 23.1  
UPSTREAM NODE ELEVATION = 1574.00  
DOWNSTREAM NODE ELEVATION = 1511.00  
FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 373.25  
TRAVEL TIME(MIN.) = 1.92 TC(MIN.) = 23.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 315.10 TO NODE 315.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 23.40  
RAINFALL INTENSITY (INCH./HOUR) = 2.15  
EFFECTIVE STREAM AREA(ACRES) = 246.00  
TOTAL STREAM AREA(ACRES) = 246.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 373.25

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	681.40	28.05	1.933	.58	560.56
2	373.25	23.40	2.155	.58	246.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	1001.97	806.56
2	1035.14	713.66

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1035.14 TIME(MINUTES) = 23.398  
EFFECTIVE AREA(ACRES) = 713.66  
TOTAL AREA(ACRES) = 814.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 315.10 TO NODE 322.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1511.00  
DOWNSTREAM NODE ELEVATION = 1503.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 6.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 1035.14  
LOW VELOCITY(FEET/SEC) = 15.31 FLOW DEPTH(FEET) = 4.56  
TRAVEL TIME(MIN.) = 1.42 TC(MIN.) = 24.81

\*\*\*\*\*  
FLOW PROCESS FROM NODE 322.00 TO NODE 322.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.080  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 107.85  
EFFECTIVE AREA(ACRES) = 793.66  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 894.00  
PEAK FLOW RATE(CFS) = 1070.00  
TC(MIN) = 24.81

\*\*\*\*\*  
FLOW PROCESS FROM NODE 322.10 TO NODE 323.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1503.00  
DOWNSTREAM NODE ELEVATION = 1491.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1330.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 6.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 1070.00  
FLOW VELOCITY(FEET/SEC) = 17.80 FLOW DEPTH(FEET) = 4.20  
TRAVEL TIME(MIN.) = 1.25 TC(MIN.) = 26.06

```

*****
FLOW PROCESS FROM NODE 323.00 TO NODE 323.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.020
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 84.00 SUBAREA RUNOFF(CFS) = 108.69
EFFECTIVE AREA(ACRES) = 877.66
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 978.00
PEAK FLOW RATE(CFS) = 1135.68
TC(MIN) = 26.06

*****
FLOW PROCESS FROM NODE 323.10 TO NODE 323.10 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 26.06
RAINFALL INTENSITY (INCH./HR) = 2.02
EFFECTIVE STREAM AREA(ACRES) = 877.66
TOTAL STREAM AREA(ACRES) = 978.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1135.68

*****
LOW PROCESS FROM NODE 324.00 TO NODE 324.11 IS CODE = 2
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1638.00
DOWNSTREAM ELEVATION = 1605.25
ELEVATION DIFFERENCE = 32.75
TC = .412*[( 1000.00** 3.00)/( 32.75)]** .20 = 12.938
25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.074
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 11.22
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 11.22

*****
FLOW PROCESS FROM NODE 324.11 TO NODE 324.12 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 18.0 INCH PIPE IS 11.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 9.9
UPSTREAM NODE ELEVATION = 1605.25
DOWNSTREAM NODE ELEVATION = 1572.25
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 11.22
TRAVEL TIME(MIN.) = 2.18 TC(MIN.) = 15.12

```

```

*****
FLOW PROCESS FROM NODE 324.10 TO NODE 324.12 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.800
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 9.98
EFFECTIVE AREA(ACRES) = 10.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 10.00
PEAK FLOW RATE(CFS) = 19.97
TC(MIN) = 15.12

*****
FLOW PROCESS FROM NODE 324.12 TO NODE 325.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 7.6
UPSTREAM NODE ELEVATION = 1572.50
DOWNSTREAM NODE ELEVATION = 1571.00
FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 19.97
TRAVEL TIME(MIN.) = .37 TC(MIN.) = 15.48

*****
FLOW PROCESS FROM NODE 325.00 TO NODE 325.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.760
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.60
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 39.21
TC(MIN) = 15.48

*****
FLOW PROCESS FROM NODE 325.10 TO NODE 326.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 9.2
UPSTREAM NODE ELEVATION = 1571.00
DOWNSTREAM NODE ELEVATION = 1568.00
FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 39.21
TRAVEL TIME(MIN.) = .60 TC(MIN.) = 16.08

*****

```

FLOW PROCESS FROM NODE 326.00 TO NODE 326.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.698  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 38.09  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 76.18  
TC(MIN) = 16.08

\*\*\*\*\*

FLOW PROCESS FROM NODE 326.10 TO NODE 327.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.0  
UPSTREAM NODE ELEVATION = 1568.00  
DOWNSTREAM NODE ELEVATION = 1563.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 76.18  
TRAVEL TIME(MIN.) = 1.12 TC(MIN.) = 17.20

\*\*\*\*\*

FLOW PROCESS FROM NODE 327.00 TO NODE 327.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.591  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 72.33  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 144.67  
TC(MIN) = 17.20

\*\*\*\*\*

FLOW PROCESS FROM NODE 327.10 TO NODE 328.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.7 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 12.9  
UPSTREAM NODE ELEVATION = 1563.00  
DOWNSTREAM NODE ELEVATION = 1550.00  
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 144.67  
TRAVEL TIME(MIN.) = 1.75 TC(MIN.) = 18.95

\*\*\*\*\*

FLOW PROCESS FROM NODE 328.00 TO NODE 328.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.445  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 134.14  
EFFECTIVE AREA(ACRES) = 160.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 160.00  
PEAK FLOW RATE(CFS) = 268.29  
TC(MIN) = 18.95

\*\*\*\*\*

FLOW PROCESS FROM NODE 328.10 TO NODE 323.10 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.5 INCHES  
PIPEFLOW VELOCITY(Feet/Sec.) = 20.4  
UPSTREAM NODE ELEVATION = 1550.00  
DOWNSTREAM NODE ELEVATION = 1491.00  
FLOWLENGTH(Feet) = 2650.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 268.29  
TRAVEL TIME(MIN.) = 2.16 TC(MIN.) = 21.11

\*\*\*\*\*

FLOW PROCESS FROM NODE 323.10 TO NODE 323.10 IS CODE = 1

-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MINUTES) = 21.11  
RAINFALL INTENSITY (INCH./HOUR) = 2.29  
EFFECTIVE STREAM AREA(ACRES) = 160.00  
TOTAL STREAM AREA(ACRES) = 160.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 268.29

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1135.68	26.06	2.020	.58	877.66
2	268.29	21.11	2.292	.58	160.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1361.29	1037.66
2	1362.39	871.03

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1362.39 TIME(MINUTES) = 21.111  
EFFECTIVE AREA(ACRES) = 871.03  
TOTAL AREA(ACRES) = 1138.00

\*\*\*\*\*

FLOW PROCESS FROM NODE 323.10 TO NODE 329.10 IS CODE = 5

-----



```

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1491.00
DOWNSTREAM NODE ELEVATION = 1478.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1362.39
FLOW VELOCITY(FEET/SEC) = 19.66 FLOW DEPTH(FEET) = 4.63
TRAVEL TIME(MIN.) = 1.10 TC(MIN.) = 22.21

*****
FLOW PROCESS FROM NODE 329.00 TO NODE 329.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.223
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 118.14
EFFECTIVE AREA(ACRES) = 951.03
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 1218.00
PEAK FLOW RATE(CFS) = 1404.42
TC(MIN) = 22.21

*****
FLOW PROCESS FROM NODE 329.10 TO NODE 330.10 IS CODE = 5
-----
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1478.00
DOWNSTREAM NODE ELEVATION = 1463.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1330.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1404.42
FLOW VELOCITY(FEET/SEC) = 20.80 FLOW DEPTH(FEET) = 4.55
TRAVEL TIME(MIN.) = 1.07 TC(MIN.) = 23.28

*****
FLOW PROCESS FROM NODE 330.00 TO NODE 330.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.161
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 81.00 SUBAREA RUNOFF(CFS) = 115.12
EFFECTIVE AREA(ACRES) = 1032.03
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 1299.00
PEAK FLOW RATE(CFS) = 1466.80
TC(MIN) = 23.28

*****
FLOW PROCESS FROM NODE 330.10 TO NODE 330.10 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====

```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 23.28  
RAINFALL INTENSITY (INCH./HOUR) = 2.16  
EFFECTIVE STREAM AREA(ACRES) = 1032.03  
TOTAL STREAM AREA(ACRES) = 1299.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1466.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 331.00 TO NODE 331.11 IS CODE = 2

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1614.00  
DOWNSTREAM ELEVATION = 1581.00  
ELEVATION DIFFERENCE = 33.00  
TC =  $.412 * [(1000.00 ** 3.00) / (33.00)] ** .20 = 12.918$   
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.077  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 11.23  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 11.23

\*\*\*\*\*  
FLOW PROCESS FROM NODE 331.11 TO NODE 331.12 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

=====

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000  
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.0  
UPSTREAM NODE ELEVATION = 1581.00  
DOWNSTREAM NODE ELEVATION = 1548.00  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 11.23  
TRAVEL TIME(MIN.) = 1.51 TC(MIN.) = 14.43

\*\*\*\*\*  
FLOW PROCESS FROM NODE 331.10 TO NODE 331.12 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.879  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 10.34  
EFFECTIVE AREA(ACRES) = 10.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 20.68  
TC(MIN) = 14.43

\*\*\*\*\*  
FLOW PROCESS FROM NODE 331.12 TO NODE 332.10 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

```
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 8.7
UPSTREAM NODE ELEVATION = 1548.00
DOWNSTREAM NODE ELEVATION = 1546.00
FLOWLENGTH(FEET) = 165.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 20.68
TRAVEL TIME(MIN.) = .32 TC(MIN.) = 14.75
=====
```

```
*****
FLOW PROCESS FROM NODE 332.00 TO NODE 332.10 IS CODE = 8
=====
```

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

```
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.842
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 20.34
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 40.68
TC(MIN) = 14.75
=====
```

```
*****
FLOW PROCESS FROM NODE 332.10 TO NODE 333.10 IS CODE = 3
=====
```

```
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
```

```
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 9.2
UPSTREAM NODE ELEVATION = 1546.00
DOWNSTREAM NODE ELEVATION = 1543.00
FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 40.68
TRAVEL TIME(MIN.) = .59 TC(MIN.) = 15.34
=====
```

```
*****
FLOW PROCESS FROM NODE 333.00 TO NODE 333.10 IS CODE = 8
=====
```

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

```
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.775
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 39.48
EFFECTIVE AREA(ACRES) = 40.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 40.00
PEAK FLOW RATE(CFS) = 78.97
TC(MIN) = 15.34
=====
```

```
*****
FLOW PROCESS FROM NODE 333.10 TO NODE 334.10 IS CODE = 3
=====
```

```
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
```

```
DEPTH OF FLOW IN 39.0 INCH PIPE IS 30.6 INCHES
```

PIPEFLOW VELOCITY(FEET/SEC.) = 11.3  
UPSTREAM NODE ELEVATION = 1543.00  
DOWNSTREAM NODE ELEVATION = 1536.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 78.97  
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 16.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 334.00 TO NODE 334.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.673  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 36.00 SUBAREA RUNOFF(CFS) = 67.76  
EFFECTIVE AREA(ACRES) = 76.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 76.00  
PEAK FLOW RATE(CFS) = 143.05  
TC(MIN) = 16.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 334.10 TO NODE 335.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.6  
UPSTREAM NODE ELEVATION = 1536.00  
DOWNSTREAM NODE ELEVATION = 1518.00  
FLOWLENGTH(FEET) = 1330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 143.05  
TRAVEL TIME(MIN.) = 1.52 TC(MIN.) = 17.85

\*\*\*\*\*  
FLOW PROCESS FROM NODE 335.00 TO NODE 335.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.535  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 140.60  
EFFECTIVE AREA(ACRES) = 156.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 156.00  
PEAK FLOW RATE(CFS) = 274.16  
TC(MIN) = 17.85

\*\*\*\*\*  
FLOW PROCESS FROM NODE 335.10 TO NODE 330.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 54.0 INCH PIPE IS 43.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 19.8  
UPSTREAM NODE ELEVATION = 1518.00

DOWNSTREAM NODE ELEVATION = 1463.00  
FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 274.16  
RAVEL TIME(MIN.) = 2.23 TC(MIN.) = 20.08

\*\*\*\*\*  
FLOW PROCESS FROM NODE 330.10 TO NODE 330.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 20.08  
RAINFALL INTENSITY (INCH./HOUR) = 2.36  
EFFECTIVE STREAM AREA(ACRES) = 156.00  
TOTAL STREAM AREA(ACRES) = 156.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 274.16

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1466.80	23.28	2.161	.58	1032.03
2	274.16	20.08	2.362	.58	156.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1710.07	1188.03
2	1699.97	1046.16

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1710.07 TIME(MINUTES) = 23.279  
EFFECTIVE AREA(ACRES) = 1188.03  
TOTAL AREA(ACRES) = 1455.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 330.10 TO NODE 336.10 IS CODE = 5  
-----

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
>>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

UPSTREAM NODE ELEVATION = 1463.00  
DOWNSTREAM NODE ELEVATION = 1447.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1330.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 7.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 1710.07  
FLOW VELOCITY(FEET/SEC) = 22.31 FLOW DEPTH(FEET) = 4.96  
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 24.27

\*\*\*\*\*  
FLOW PROCESS FROM NODE 336.00 TO NODE 336.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.108  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 109.85

EFFECTIVE AREA(ACRES) = 1268.03  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 1535.00  
PEAK FLOW RATE(CFS) = 1741.14  
C(MIN) = 24.27

\*\*\*\*\*  
FLOW PROCESS FROM NODE 336.10 TO NODE 337.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1447.00
DOWNSTREAM NODE ELEVATION =	1431.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	1330.00
CHANNEL BASE(FEET) =	8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR =	.015 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) =	1741.14
FLOW VELOCITY(FEET/SEC) =	22.53 FLOW DEPTH(FEET) = 4.99
TRAVEL TIME(MIN.) =	.98 TC(MIN.) = 25.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 337.00 TO NODE 337.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) =	2.058
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5820
SUBAREA AREA(ACRES) =	82.00 SUBAREA RUNOFF(CFS) = 108.93
EFFECTIVE AREA(ACRES) =	1350.03
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	1617.00
PEAK FLOW RATE(CFS) =	1793.41
TC(MIN) =	25.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 337.10 TO NODE 337.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:	
TIME OF CONCENTRATION(MINUTES) =	25.26
RAINFALL INTENSITY (INCH./HOUR) =	2.06
EFFECTIVE STREAM AREA(ACRES) =	1350.03
TOTAL STREAM AREA(ACRES) =	1617.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =	1793.41

\*\*\*\*\*  
FLOW PROCESS FROM NODE 338.00 TO NODE 338.11 IS CODE = 2  
-----

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

=====

DEVELOPMENT IS	SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE
----------------	---

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20	
INITIAL SUBAREA FLOW-LENGTH =	1000.00
UPSTREAM ELEVATION =	1574.00
DOWNSTREAM ELEVATION =	1544.50
ELEVATION DIFFERENCE =	29.50
TC = .412*[(1000.00** 3.00)/(29.50)]** .20 =	13.211
25 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.036

SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 11.04  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 11.04

\*\*\*\*\*  
FLOW PROCESS FROM NODE 338.11 TO NODE 338.12 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	18.0 INCH PIPE IS	10.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	10.5
UPSTREAM NODE ELEVATION	=	1544.50
DOWNSTREAM NODE ELEVATION	=	1515.00
FLOWLENGTH(FEET)	=	1000.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	18.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	11.04
TRAVEL TIME(MIN.)	=	1.59
TC(MIN.)	=	14.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 338.10 TO NODE 338.12 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.836
SOIL CLASSIFICATION IS	=	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	5.00
SUBAREA RUNOFF(CFS)	=	10.14
EFFECTIVE AREA(ACRES)	=	10.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	10.00
PEAK FLOW RATE(CFS)	=	20.29
TC(MIN)	=	14.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 338.12 TO NODE 339.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	24.0 INCH PIPE IS	16.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	8.6
UPSTREAM NODE ELEVATION	=	1515.00
DOWNSTREAM NODE ELEVATION	=	1513.00
FLOWLENGTH(FEET)	=	167.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	24.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	20.29
TRAVEL TIME(MIN.)	=	.32
TC(MIN.)	=	15.12

\*\*\*\*\*  
FLOW PROCESS FROM NODE 339.00 TO NODE 339.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.800
SOIL CLASSIFICATION IS	=	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	10.00
SUBAREA RUNOFF(CFS)	=	19.96
EFFECTIVE AREA(ACRES)	=	20.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	20.00

PEAK FLOW RATE(CFS) = 39.92  
TC(MIN) = 15.12

\*\*\*\*\*  
FLOW PROCESS FROM NODE 339.10 TO NODE 340.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	27.0 INCH PIPE IS	17.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	14.5
UPSTREAM NODE ELEVATION	=	1513.00
DOWNSTREAM NODE ELEVATION	=	1508.00
FLOWLENGTH(FEET)	=	167.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	27.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	39.92
TRAVEL TIME(MIN.)	=	.19
TC(MIN.)	=	15.31

\*\*\*\*\*  
FLOW PROCESS FROM NODE 340.00 TO NODE 340.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.779
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	20.00
SUBAREA RUNOFF(CFS)	=	39.54
EFFECTIVE AREA(ACRES)	=	40.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	40.00
PEAK FLOW RATE(CFS)	=	79.08
TC(MIN)	=	15.31

\*\*\*\*\*  
FLOW PROCESS FROM NODE 340.10 TO NODE 341.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	30.0 INCH PIPE IS	22.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	20.2
UPSTREAM NODE ELEVATION	=	1508.00
DOWNSTREAM NODE ELEVATION	=	1500.00
FLOWLENGTH(FEET)	=	167.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	30.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	79.08
TRAVEL TIME(MIN.)	=	.14
TC(MIN.)	=	15.45

\*\*\*\*\*  
FLOW PROCESS FROM NODE 341.00 TO NODE 341.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.764
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	40.00
SUBAREA RUNOFF(CFS)	=	78.55
EFFECTIVE AREA(ACRES)	=	80.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	80.00
PEAK FLOW RATE(CFS)	=	157.09
TC(MIN)	=	15.45



```

*****
FLOW PROCESS FROM NODE    341.10 TO NODE    342.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  48.0 INCH PIPE IS  39.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  14.4
UPSTREAM NODE ELEVATION =  1500.00
DOWNSTREAM NODE ELEVATION =  1483.00
FLOWLENGTH(FEET) =  1330.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  48.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =  157.09
TRAVEL TIME(MIN.) =  1.54  TC(MIN.) =  16.99

*****
FLOW PROCESS FROM NODE    342.00 TO NODE    342.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.610
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =  80.00  SUBAREA RUNOFF(CFS) =  146.04
EFFECTIVE AREA(ACRES) =  160.00
AVERAGED Fm(INCH/HR) =  .582
TOTAL AREA(ACRES) =  160.00
PEAK FLOW RATE(CFS) =  292.08
TC(MIN) =  16.99

*****
FLOW PROCESS FROM NODE    342.10 TO NODE    337.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  57.0 INCH PIPE IS  44.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  19.9
UPSTREAM NODE ELEVATION =  1483.00
DOWNSTREAM NODE ELEVATION =  1431.00
FLOWLENGTH(FEET) =  2650.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  57.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =  292.08
TRAVEL TIME(MIN.) =  2.22  TC(MIN.) =  19.21

*****
FLOW PROCESS FROM NODE    337.10 TO NODE    337.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MINUTES) =  19.21
RAINFALL INTENSITY (INCH./HOUR) =  2.42
EFFECTIVE STREAM AREA(ACRES) =  160.00
TOTAL STREAM AREA(ACRES) =  160.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =  292.08

CONFLUENCE INFORMATION:
STREAM  PEAK FLOW  TIME  INTENSITY  FM  EFFECTIVE
NUMBER  RATE(CFS)  (MIN.)  (INCH/HOUR)  (IN/HR)  AREA(ACRES)

```

1	1793.41	25.26	2.058	.58	1350.03
2	292.08	19.21	2.425	.58	160.00

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

# SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	2027.33	1510.03
2	1995.58	1187.01

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 2027.33 TIME(MINUTES) = 25.256  
EFFECTIVE AREA(ACRES) = 1510.03  
TOTAL AREA(ACRES) = 1777.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 337.10 TO NODE 343.10 IS CODE = 5  
\*\*\*\*\*

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1431.00
DOWNSTREAM NODE ELEVATION =	1417.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	1370.00
CHANNEL BASE(FEET) =	8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR =	.015 MAXIMUM DEPTH(FEET) = 7.50
CHANNEL FLOW THRU SUBAREA(CFS) =	2027.33
FLOW VELOCITY(FEET/SEC) =	22.01 FLOW DEPTH(FEET) = 5.61
TRAVEL TIME(MIN.) =	1.04 TC(MIN.) = 26.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 343.00 TO NODE 343.10 IS CODE = 8  
\*\*\*\*\*

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HR) =	2.009
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5820
SUBAREA AREA(ACRES) =	83.00 SUBAREA RUNOFF(CFS) = 106.59
EFFECTIVE AREA(ACRES) =	1593.03
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	1860.00
PEAK FLOW RATE(CFS) =	2045.81
TC(MIN) =	26.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 343.10 TO NODE 344.10 IS CODE = 5  
\*\*\*\*\*

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1417.00
DOWNSTREAM NODE ELEVATION =	1405.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	1300.00
CHANNEL BASE(FEET) =	8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR =	.015 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) =	2045.81
FLOW VELOCITY(FEET/SEC) =	21.31 FLOW DEPTH(FEET) = 5.77
TRAVEL TIME(MIN.) =	1.02 TC(MIN.) = 27.31

```

*****
FLOW PROCESS FROM NODE 344.00 TO NODE 344.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.964
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 99.48
EFFECTIVE AREA(ACRES) = 1673.03
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 1940.00
PEAK FLOW RATE(CFS) = 2080.48
TC(MIN) = 27.31

*****
FLOW PROCESS FROM NODE 344.10 TO NODE 345.10 IS CODE = 5
-----
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1405.00
DOWNSTREAM NODE ELEVATION = 1394.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) = 2080.48
FLOW VELOCITY(FEET/SEC) = 20.64 FLOW DEPTH(FEET) = 5.95
TRAVEL TIME(MIN.) = 1.05 TC(MIN.) = 28.36

* *****
LOW PROCESS FROM NODE 345.00 TO NODE 345.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.920
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 64.00 SUBAREA RUNOFF(CFS) = 77.06
EFFECTIVE AREA(ACRES) = 1737.03
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 2004.00
PEAK FLOW RATE(CFS) = 2091.38
TC(MIN) = 28.36

*****
FLOW PROCESS FROM NODE 345.10 TO NODE 435.10 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 28.36
RAINFALL INTENSITY (INCH./HOUR) = 1.92
EFFECTIVE STREAM AREA(ACRES) = 1737.03
TOTAL STREAM AREA(ACRES) = 2004.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2091.38

*****
FLOW PROCESS FROM NODE 346.00 TO NODE 346.11 IS CODE = 2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====

```

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

$TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$

INITIAL SUBAREA FLOW-LENGTH = 1000.00

PSTREAM ELEVATION = 1536.00

DOWNSTREAM ELEVATION = 1508.00

ELEVATION DIFFERENCE = 28.00

$TC = .412 * [(1000.00 ** 3.00) / (28.00)] ** .20 = 13.350$

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.017

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5820

SUBAREA RUNOFF(CFS) = 10.96

TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 10.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 346.11 TO NODE 346.12 IS CODE = 3  
-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.5 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 10.3

UPSTREAM NODE ELEVATION = 1508.00

DOWNSTREAM NODE ELEVATION = 1480.00

FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 10.96

TRAVEL TIME(MIN.) = 1.62 TC(MIN.) = 14.97

\*\*\*\*\*  
FLOW PROCESS FROM NODE 346.10 TO NODE 346.12 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.817

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5820

SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 10.06

EFFECTIVE AREA(ACRES) = 10.00

AVERAGED  $F_m$ (INCH/HR) = .582

TOTAL AREA(ACRES) = 10.00

PEAK FLOW RATE(CFS) = 20.11

TC(MIN) = 14.97

\*\*\*\*\*  
FLOW PROCESS FROM NODE 346.12 TO NODE 347.10 IS CODE = 3  
-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.6 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 9.9

UPSTREAM NODE ELEVATION = 1480.00

DOWNSTREAM NODE ELEVATION = 1477.00

FLOWLENGTH(FEET) = 165.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 20.11

TRAVEL TIME(MIN.) = .28 TC(MIN.) = 15.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 347.00 TO NODE 347.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.786

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.83

EFFECTIVE AREA(ACRES) = 20.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 20.00

PEAK FLOW RATE(CFS) = 39.66

TC(MIN) = 15.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 347.10 TO NODE 348.10 IS CODE = 3

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.6 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 9.2

UPSTREAM NODE ELEVATION = 1477.00

DOWNSTREAM NODE ELEVATION = 1471.00

FLOWLENGTH(Feet) = 670.00 MANNINGS N = .013

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

PIPEFLOW THRU SUBAREA(CFS) = 39.66

TRAVEL TIME(MIN.) = 1.22 TC(MIN.) = 16.47

\*\*\*\*\*  
FLOW PROCESS FROM NODE 348.00 TO NODE 348.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.660

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 37.40

EFFECTIVE AREA(ACRES) = 40.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 40.00

PEAK FLOW RATE(CFS) = 74.80

TC(MIN) = 16.47

\*\*\*\*\*  
FLOW PROCESS FROM NODE 348.10 TO NODE 349.10 IS CODE = 3

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.4 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 11.5

UPSTREAM NODE ELEVATION = 1471.00

DOWNSTREAM NODE ELEVATION = 1456.00

FLOWLENGTH(Feet) = 1350.00 MANNINGS N = .013

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

PIPEFLOW THRU SUBAREA(CFS) = 74.80

TRAVEL TIME(MIN.) = 1.95 TC(MIN.) = 18.42

\*\*\*\*\*  
FLOW PROCESS FROM NODE 349.00 TO NODE 349.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.487  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 31.00 SUBAREA RUNOFF(CFS) = 53.15  
EFFECTIVE AREA(ACRES) = 71.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 71.00  
PEAK FLOW RATE(CFS) = 121.74  
TC(MIN) = 18.42

\*\*\*\*\*  
FLOW PROCESS FROM NODE 349.10 TO NODE 345.10 IS CODE = 5  
-----

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
>>>>>TRAVELTIME THRU SUBAREA<<<<<  
=====

UPSTREAM NODE ELEVATION = 1456.00  
DOWNSTREAM NODE ELEVATION = 1394.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 3200.00  
CHANNEL BASE(FEET) = 4.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 2.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 121.74  
FLOW VELOCITY(FEET/SEC) = 13.41 FLOW DEPTH(FEET) = 1.46  
TRAVEL TIME(MIN.) = 3.98 TC(MIN.) = 22.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 345.10 TO NODE 345.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MINUTES) = 22.40  
RAINFALL INTENSITY (INCH./HOUR) = 2.21  
EFFECTIVE STREAM AREA(ACRES) = 71.00  
TOTAL STREAM AREA(ACRES) = 71.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 121.74

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2091.38	28.36	1.920	.58	1737.03
2	121.74	22.40	2.212	.58	71.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	2191.30	1808.03
2	2134.01	1442.78

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 2191.30 TIME(MINUTES) = 28.359  
EFFECTIVE AREA(ACRES) = 1808.03  
TOTAL AREA(ACRES) = 2075.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 345.10 TO NODE 350.00 IS CODE = 5  
-----

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
>>>>>TRAVELTIME THRU SUBAREA<<<<<

```
=====
UPSTREAM NODE ELEVATION = 1394.00
DOWNSTREAM NODE ELEVATION = 1375.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1500.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) = 2191.30
FLOW VELOCITY(FEET/SEC) = 24.41 FLOW DEPTH(FEET) = 5.52
TRAVEL TIME(MIN.) = 1.02 TC(MIN.) = 29.38
=====
```

```
*****
FLOW PROCESS FROM NODE 350.00 TO NODE 252.10 IS CODE = 5
=====
```

```
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
```

```
UPSTREAM NODE ELEVATION = 1375.00
DOWNSTREAM NODE ELEVATION = 1320.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 3000.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) = 2191.30
FLOW VELOCITY(FEET/SEC) = 27.89 FLOW DEPTH(FEET) = 5.05
TRAVEL TIME(MIN.) = 1.79 TC(MIN.) = 31.18
=====
```

```
*****
FLOW PROCESS FROM NODE 252.10 TO NODE 252.10 IS CODE = 1
=====
```

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

```
TIME OF CONCENTRATION(MINUTES) = 31.18
RAINFALL INTENSITY (INCH./HOUR) = 1.81
EFFECTIVE STREAM AREA(ACRES) = 1808.03
TOTAL STREAM AREA(ACRES) = 2075.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2191.30
```

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2191.30	31.18	1.814	.58	1808.03

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	2191.30	1808.03
---	---------	---------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

```
PEAK FLOW RATE(CFS) = 2191.30 TIME(MINUTES) = 31.176
EFFECTIVE AREA(ACRES) = 1808.03
TOTAL AREA(ACRES) = 2075.00
=====
```

END OF STUDY SUMMARY:

```
TOTAL AREA(ACRES) = 2075.00
EFFECTIVE AREA(ACRES) = 1808.03
PEAK FLOW RATE(CFS) = 2191.30
=====
```

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
Copyright 1983,86,87 Advanced Engineering Software (aes)  
Ver. 4.1C Release Date: 5/11/87 Serial # I00908  
\*\*\*\*\*

Especially prepared for:

HALL & FOREMAN

10/14/93

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

\* N. FONTANA MASTER S.D. PLAN: LINE C WITH LATERALS - ALONG HIGHLAND AVE. \*  
\* Q 100-YEAR, DESIGN Q FOR LINE C (HIGHLAND AVE.) REISSUED WITHOUT CHANGES \*  
\* B. EVERSON - J.N. 3547 - LINEC.100 (INPUT), LINEC.10T (OUTPUT) \*  
\*\*\*\*\*

FILE NAME: LINEC.100

TIME/DATE OF STUDY: 13:28 10/14/1993

=====

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 = .95  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.050  
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.550  
COMPUTED RAINFALL INTENSITY DATA:  
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.5500  
SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 300.00 TO NODE 300.11 IS CODE = 2

-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1665.00  
DOWNSTREAM ELEVATION = 1630.00  
ELEVATION DIFFERENCE = 35.00  
 $TC = .412 * [(1000.00 ** 3.00) / (35.00)] ** .20 = 12.767$   
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.923  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 15.03  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 15.03

\*\*\*\*\*

FLOW PROCESS FROM NODE 300.11 TO NODE 300.12 IS CODE = 3

-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

=====

DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.9  
UPSTREAM NODE ELEVATION = 1630.00  
DOWNSTREAM NODE ELEVATION = 1595.40  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013



ESTIMATED PIPE DIAMETER(INCH) = 18.00      NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 15.03  
TRAVEL TIME(MIN.) = 1.40      TC(MIN.) = 14.16

\*\*\*\*\*  
FLOW PROCESS FROM NODE 300.10 TO NODE 300.12 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.686  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 5.00      SUBAREA RUNOFF(CFS) = 13.97  
EFFECTIVE AREA(ACRES) = 10.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 27.94  
TC(MIN) = 14.16

\*\*\*\*\*  
FLOW PROCESS FROM NODE 300.12 TO NODE 301.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000  
DEPTH OF FLOW IN 18.0 INCH PIPE IS 8.1 INCHES  
PIPEFLOW VELOCITY(Feet/Sec.) = 36.0  
UPSTREAM NODE ELEVATION = 1665.50  
DOWNSTREAM NODE ELEVATION = 1595.00  
FLOWLENGTH(Feet) = 167.00      MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00      NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 27.94  
TRAVEL TIME(MIN.) = .08      TC(MIN.) = 14.24

\*\*\*\*\*  
FLOW PROCESS FROM NODE 301.00 TO NODE 301.11 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.674  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00      SUBAREA RUNOFF(CFS) = 27.83  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 55.65  
TC(MIN) = 14.24

\*\*\*\*\*  
FLOW PROCESS FROM NODE 301.11 TO NODE 302.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.7 INCHES  
PIPEFLOW VELOCITY(Feet/Sec.) = 5.1  
UPSTREAM NODE ELEVATION = 1595.00  
DOWNSTREAM NODE ELEVATION = 1594.50  
FLOWLENGTH(Feet) = 330.00      MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 51.00      NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 55.65  
TRAVEL TIME(MIN.) = 1.08 TC(MIN.) = 15.32

\*\*\*\*\*  
FLOW PROCESS FROM NODE 302.00 TO NODE 302.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.516  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 52.81  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 105.62  
TC(MIN) = 15.32

\*\*\*\*\*  
FLOW PROCESS FROM NODE 302.10 TO NODE 303.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 57.0 INCH PIPE IS 45.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 6.9  
UPSTREAM NODE ELEVATION = 1594.50  
DOWNSTREAM NODE ELEVATION = 1593.00  
FLOWLENGTH(FEET) = 630.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 105.62  
TRAVEL TIME(MIN.) = 1.51 TC(MIN.) = 16.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 303.00 TO NODE 303.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.323  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 98.68  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 197.36  
TC(MIN) = 16.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 303.10 TO NODE 303.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 16.83  
RAINFALL INTENSITY (INCH./HOUR) = 3.32  
EFFECTIVE STREAM AREA(ACRES) = 80.00  
TOTAL STREAM AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 197.36

\*\*\*\*\*

FLOW PROCESS FROM NODE 304.00 TO NODE 304.10 IS CODE = 2

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

$TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$

INITIAL SUBAREA FLOW-LENGTH = 1000.00

UPSTREAM ELEVATION = 1668.00

DOWNSTREAM ELEVATION = 1657.00

ELEVATION DIFFERENCE = 11.00

$TC = .412 * [(1000.00 ** 3.00) / (11.00)] ** .20 = 16.092$

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.414

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5820

SUBAREA RUNOFF(CFS) = 25.49

TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 25.49

\*\*\*\*\*

FLOW PROCESS FROM NODE 304.10 TO NODE 305.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.6 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 13.3

UPSTREAM NODE ELEVATION = 1657.00

DOWNSTREAM NODE ELEVATION = 1647.00

FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 25.49

TRAVEL TIME(MIN.) = .38 TC(MIN.) = 16.47

\*\*\*\*\*

FLOW PROCESS FROM NODE 305.00 TO NODE 305.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.367

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5820

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 25.06

EFFECTIVE AREA(ACRES) = 20.00

AVERAGED  $F_m$ (INCH/HR) = .582

TOTAL AREA(ACRES) = 20.00

PEAK FLOW RATE(CFS) = 50.13

TC(MIN) = 16.47

\*\*\*\*\*

FLOW PROCESS FROM NODE 305.10 TO NODE 306.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.3 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 14.2

UPSTREAM NODE ELEVATION = 1647.00

DOWNSTREAM NODE ELEVATION = 1631.00

FLOWLENGTH(FEET) = 650.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 50.13

TRAVEL TIME(MIN.) = .76 TC(MIN.) = 17.23

```

*****
FLOW PROCESS FROM NODE 306.00 TO NODE 306.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.277
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 48.50
EFFECTIVE AREA(ACRES) = 40.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 40.00
PEAK FLOW RATE(CFS) = 97.00
TC(MIN) = 17.23

*****
FLOW PROCESS FROM NODE 306.10 TO NODE 303.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.9
UPSTREAM NODE ELEVATION = 1631.00
DOWNSTREAM NODE ELEVATION = 1593.00
FLOWLENGTH(FEET) = 1450.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 97.00
TRAVEL TIME(MIN.) = 1.43 TC(MIN.) = 18.66

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 303.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.123
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 42.00 SUBAREA RUNOFF(CFS) = 96.07
EFFECTIVE AREA(ACRES) = 82.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 82.00
PEAK FLOW RATE(CFS) = 187.56
TC(MIN) = 18.66

*****
FLOW PROCESS FROM NODE 306.10 TO NODE 303.10 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 18.66
RAINFALL INTENSITY (INCH./HOUR) = 3.12
EFFECTIVE STREAM AREA(ACRES) = 82.00
TOTAL STREAM AREA(ACRES) = 82.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 187.56

CONFLUENCE INFORMATION:
STREAM PEAK FLOW TIME INTENSITY FM EFFECTIVE
NUMBER RATE(CFS) (MIN.) (INCH/HOUR) (IN/HR) AREA(ACRES)
-----

```

1	197.36	16.83	3.323	.58	80.00
2	187.56	18.66	3.123	.58	82.00

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

#### SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	379.81	153.96
2	370.55	162.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 379.81 TIME(MINUTES) = 16.832

EFFECTIVE AREA(ACRES) = 153.96

TOTAL AREA(ACRES) = 162.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 303.10 TO NODE 308.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 63.0 INCH PIPE IS 48.0 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 21.5

UPSTREAM NODE ELEVATION = 1593.00

DOWNSTREAM NODE ELEVATION = 1587.00

FLOWLENGTH(Feet) = 300.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 379.81

TRAVEL TIME(MIN.) = .23 TC(MIN.) = 17.07

\*\*\*\*\*  
FLOW PROCESS FROM NODE 308.00 TO NODE 308.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.296

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 24.42

EFFECTIVE AREA(ACRES) = 163.96

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 172.00

PEAK FLOW RATE(CFS) = 400.45

TC(MIN) = 17.07

\*\*\*\*\*  
FLOW PROCESS FROM NODE 308.10 TO NODE 309.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 63.0 INCH PIPE IS 47.0 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 23.1

UPSTREAM NODE ELEVATION = 1587.00

DOWNSTREAM NODE ELEVATION = 1580.00

FLOWLENGTH(Feet) = 300.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 400.45

TRAVEL TIME(MIN.) = .22 TC(MIN.) = 17.28

\*\*\*\*\*

FLOW PROCESS FROM NODE 309.00 TO NODE 309.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.271  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 24.20  
EFFECTIVE AREA(ACRES) = 173.96  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 182.00  
PEAK FLOW RATE(CFS) = 420.98  
TC(MIN) = 17.28

\*\*\*\*\*  
FLOW PROCESS FROM NODE 309.10 TO NODE 310.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 63.0 INCH PIPE IS 47.7 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 24.0  
UPSTREAM NODE ELEVATION = 1580.00  
DOWNSTREAM NODE ELEVATION = 1565.00  
FLOWLENGTH(FEET) = 600.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 420.98  
TRAVEL TIME(MIN.) = .42 TC(MIN.) = 17.70

\*\*\*\*\*  
FLOW PROCESS FROM NODE 310.00 TO NODE 310.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.224  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 47.56  
EFFECTIVE AREA(ACRES) = 193.96  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 202.00  
PEAK FLOW RATE(CFS) = 461.27  
TC(MIN) = 17.70

\*\*\*\*\*  
FLOW PROCESS FROM NODE 310.10 TO NODE 311.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 66.0 INCH PIPE IS 49.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 24.2  
UPSTREAM NODE ELEVATION = 1565.00  
DOWNSTREAM NODE ELEVATION = 1530.10  
FLOWLENGTH(FEET) = 1450.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 461.27  
TRAVEL TIME(MIN.) = 1.00 TC(MIN.) = 18.70

\*\*\*\*\*  
FLOW PROCESS FROM NODE 311.00 TO NODE 311.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.120

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 44.00 SUBAREA RUNOFF(CFS) = 100.51

EFFECTIVE AREA(ACRES) = 237.96

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 246.00

PEAK FLOW RATE(CFS) = 543.55

TC(MIN) = 18.70

\*\*\*\*\*  
FLOW PROCESS FROM NODE 311.10 TO NODE 312.10 IS CODE = 5  
-----

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

UPSTREAM NODE ELEVATION = 1530.10

DOWNSTREAM NODE ELEVATION = 1528.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1250.00

CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 5.50

CHANNEL FLOW THRU SUBAREA(CFS) = 543.55

FLOW VELOCITY(FEET/SEC) = 8.02 FLOW DEPTH(FEET) = 4.57

TRAVEL TIME(MIN.) = 2.60 TC(MIN.) = 21.30

\*\*\*\*\*  
FLOW PROCESS FROM NODE 312.00 TO NODE 312.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.886

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 76.00 SUBAREA RUNOFF(CFS) = 157.57

EFFECTIVE AREA(ACRES) = 313.96

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 322.00

PEAK FLOW RATE(CFS) = 650.94

TC(MIN) = 21.30

\*\*\*\*\*  
FLOW PROCESS FROM NODE 312.10 TO NODE 313.10 IS CODE = 5  
-----

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

UPSTREAM NODE ELEVATION = 1528.00

DOWNSTREAM NODE ELEVATION = 1525.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1400.00

CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 5.50

CHANNEL FLOW THRU SUBAREA(CFS) = 650.94

FLOW VELOCITY(FEET/SEC) = 9.22 FLOW DEPTH(FEET) = 4.69

TRAVEL TIME(MIN.) = 2.53 TC(MIN.) = 23.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 313.00 TO NODE 313.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.698  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 85.00 SUBAREA RUNOFF(CFS) = 161.85  
EFFECTIVE AREA(ACRES) = 398.96  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 407.00  
PEAK FLOW RATE(CFS) = 759.66  
TC(MIN) = 23.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 313.10 TO NODE 314.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1525.00
DOWNSTREAM NODE ELEVATION =	1518.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	1270.00
CHANNEL BASE(FEET) =	8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR =	.015 MAXIMUM DEPTH(FEET) = 5.50
CHANNEL FLOW THRU SUBAREA(CFS) =	759.66
FLOW VELOCITY(FEET/SEC) =	13.53 FLOW DEPTH(FEET) = 4.01
TRAVEL TIME(MIN.) =	1.56 TC(MIN.) = 25.39

\*\*\*\*\*  
FLOW PROCESS FROM NODE 314.00 TO NODE 314.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	2.597
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5820
SUBAREA AREA(ACRES) =	76.00 SUBAREA RUNOFF(CFS) = 137.81
EFFECTIVE AREA(ACRES) =	474.96
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	483.00
PEAK FLOW RATE(CFS) =	861.21
TC(MIN) =	25.39

\*\*\*\*\*  
FLOW PROCESS FROM NODE 314.10 TO NODE 315.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1518.00
DOWNSTREAM NODE ELEVATION =	1511.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	1420.00
CHANNEL BASE(FEET) =	8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR =	.015 MAXIMUM DEPTH(FEET) = 5.50
CHANNEL FLOW THRU SUBAREA(CFS) =	861.21
FLOW VELOCITY(FEET/SEC) =	13.43 FLOW DEPTH(FEET) = 4.39
TRAVEL TIME(MIN.) =	1.76 TC(MIN.) = 27.15

\*\*\*\*\*  
FLOW PROCESS FROM NODE 315.00 TO NODE 315.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	2.494
SOIL CLASSIFICATION IS	"A"



RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 85.00 SUBAREA RUNOFF(CFS) = 146.29  
EFFECTIVE AREA(ACRES) = 559.96  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 568.00  
PEAK FLOW RATE(CFS) = 963.71  
TC(MIN) = 27.15

\*\*\*\*\*  
FLOW PROCESS FROM NODE 315.10 TO NODE 315.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 27.15  
RAINFALL INTENSITY (INCH./HOUR) = 2.49  
EFFECTIVE STREAM AREA(ACRES) = 559.96  
TOTAL STREAM AREA(ACRES) = 568.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 963.71

\*\*\*\*\*  
FLOW PROCESS FROM NODE 316.00 TO NODE 316.11 IS CODE = 2  
-----

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1664.50  
DOWNSTREAM ELEVATION = 1611.50  
ELEVATION DIFFERENCE = 53.00  
TC = .412\*[(1000.00\*\* 3.00)/(53.00)]\*\* .20 = 11.750  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.123  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 15.93  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 15.93

\*\*\*\*\*  
FLOW PROCESS FROM NODE 316.11 TO NODE 316.12 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 21.0 INCH PIPE IS 14.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 9.0  
UPSTREAM NODE ELEVATION = 1611.50  
DOWNSTREAM NODE ELEVATION = 1595.80  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 15.93  
TRAVEL TIME(MIN.) = 1.86 TC(MIN.) = 13.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 316.10 TO NODE 316.12 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.776  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 14.37  
EFFECTIVE AREA(ACRES) = 10.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 28.74  
TC(MIN) = 13.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 316.12 TO NODE 317.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.4 INCHES  
PIPEFLOW VELOCITY(Feet/sec.) = 4.6  
UPSTREAM NODE ELEVATION = 1595.80  
DOWNSTREAM NODE ELEVATION = 1595.50  
FLOWLENGTH(Feet) = 167.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 28.74  
TRAVEL TIME(MIN.) = .60 TC(MIN.) = 14.21

\*\*\*\*\*  
FLOW PROCESS FROM NODE 317.00 TO NODE 317.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.679  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 27.87  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 55.74  
TC(MIN) = 14.21

\*\*\*\*\*  
FLOW PROCESS FROM NODE 317.10 TO NODE 318.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.8 INCHES  
PIPEFLOW VELOCITY(Feet/sec.) = 5.1  
UPSTREAM NODE ELEVATION = 1595.50  
DOWNSTREAM NODE ELEVATION = 1595.00  
FLOWLENGTH(Feet) = 330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 55.74  
TRAVEL TIME(MIN.) = 1.08 TC(MIN.) = 15.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 318.00 TO NODE 318.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.520  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 52.89  
EFFECTIVE AREA(ACRES) = 40.00

AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 105.78  
TC(MIN) = 15.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 318.10 TO NODE 319.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	63.0 INCH PIPE IS	48.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	5.9
UPSTREAM NODE ELEVATION	=	1595.00
DOWNSTREAM NODE ELEVATION	=	1594.00
FLOWLENGTH(FEET)	=	670.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	63.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	105.78
TRAVEL TIME(MIN.)	=	1.90
TC(MIN.)	=	17.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 319.00 TO NODE 319.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.281
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	40.00
SUBAREA RUNOFF(CFS)	=	97.17
EFFECTIVE AREA(ACRES)	=	80.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	80.00
PEAK FLOW RATE(CFS)	=	194.34
TC(MIN)	=	17.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 319.10 TO NODE 320.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	60.0 INCH PIPE IS	43.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	12.7
UPSTREAM NODE ELEVATION	=	1594.00
DOWNSTREAM NODE ELEVATION	=	1584.00
FLOWLENGTH(FEET)	=	1330.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	60.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	194.34
TRAVEL TIME(MIN.)	=	1.75
TC(MIN.)	=	18.94

\*\*\*\*\*  
FLOW PROCESS FROM NODE 320.00 TO NODE 320.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.096
OIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5820
SUBAREA AREA(ACRES)	=	80.00
SUBAREA RUNOFF(CFS)	=	180.98
EFFECTIVE AREA(ACRES)	=	160.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	160.00

PEAK FLOW RATE(CFS) = 361.95  
TC(MIN) = 18.94

\*\*\*\*\*  
FLOW PROCESS FROM NODE 320.10 TO NODE 321.10 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<  
=====

DEPTH OF FLOW IN 75.0 INCH PIPE IS 57.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.3  
UPSTREAM NODE ELEVATION = 1584.00  
DOWNSTREAM NODE ELEVATION = 1574.00  
FLOWLENGTH(FEET) = 1430.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 75.00 \ NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 361.95  
TRAVEL TIME(MIN.) = 1.67 TC(MIN.) = 20.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 321.00 TO NODE 321.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.942  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 86.00 SUBAREA RUNOFF(CFS) = 182.70  
EFFECTIVE AREA(ACRES) = 246.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 246.00  
PEAK FLOW RATE(CFS) = 522.61  
TC(MIN) = 20.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 321.10 TO NODE 315.10 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<  
=====

DEPTH OF FLOW IN 69.0 INCH PIPE IS 52.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 24.8  
UPSTREAM NODE ELEVATION = 1574.00  
DOWNSTREAM NODE ELEVATION = 1511.00  
FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 522.61  
TRAVEL TIME(MIN.) = 1.78 TC(MIN.) = 22.39

\*\*\*\*\*  
FLOW PROCESS FROM NODE 315.10 TO NODE 315.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MINUTES) = 22.39  
RAINFALL INTENSITY (INCH./HOUR) = 2.80  
EFFECTIVE STREAM AREA(ACRES) = 246.00  
TOTAL STREAM AREA(ACRES) = 246.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 522.61

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	963.71	27.15	2.494	.58	559.96
2	522.61	22.39	2.800	.58	246.00

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

# SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1414.30	805.96
2	1444.49	707.83

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1444.49 TIME(MINUTES) = 22.394

EFFECTIVE AREA(ACRES) = 707.83

TOTAL AREA(ACRES) = 814.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 315.10 TO NODE 322.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1511.00  
DOWNSTREAM NODE ELEVATION = 1503.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 6.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 1444.49  
FLOW VELOCITY(FEET/SEC) = 16.75 FLOW DEPTH(FEET) = 5.37  
TRAVEL TIME(MIN.) = 1.29 TC(MIN.) = 23.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 322.00 TO NODE 322.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.707  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 153.01  
EFFECTIVE AREA(ACRES) = 787.83  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 894.00  
PEAK FLOW RATE(CFS) = 1506.85  
TC(MIN) = 23.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 322.10 TO NODE 323.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1503.00  
DOWNSTREAM NODE ELEVATION = 1491.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1330.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 6.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 1506.85  
FLOW VELOCITY(FEET/SEC) = 19.51 FLOW DEPTH(FEET) = 4.99  
TRAVEL TIME(MIN.) = 1.14 TC(MIN.) = 24.82

```

*****
FLOW PROCESS FROM NODE    323.00 TO NODE    323.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.632
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 84.00 SUBAREA RUNOFF(CFS) = 154.99
EFFECTIVE AREA(ACRES) = 871.83
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 978.00
PEAK FLOW RATE(CFS) = 1608.61
TC(MIN) = 24.82

*****
FLOW PROCESS FROM NODE    323.10 TO NODE    323.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 24.82
RAINFALL INTENSITY (INCH./HOUR) = 2.63
EFFECTIVE STREAM AREA(ACRES) = 871.83
TOTAL STREAM AREA(ACRES) = 978.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1608.61

*****
FLOW PROCESS FROM NODE    324.00 TO NODE    324.11 IS CODE =    2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1638.00
DOWNSTREAM ELEVATION = 1605.25
ELEVATION DIFFERENCE = 32.75
TC = .412*[(1000.00** 3.00)/(32.75)]** .20 = 12.938
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.891
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 14.89
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.89

*****
FLOW PROCESS FROM NODE    324.11 TO NODE    324.12 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.2 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 11.7
UPSTREAM NODE ELEVATION = 1605.25
DOWNSTREAM NODE ELEVATION = 1572.50
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 14.89
TRAVEL TIME(MIN.) = 1.43 TC(MIN.) = 14.37

```

```

*****
FLOW PROCESS FROM NODE 324.10 TO NODE 324.12 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.654
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 13.82
EFFECTIVE AREA(ACRES) = 10.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 10.00
PEAK FLOW RATE(CFS) = 27.65
TC(MIN) = 14.37

*****
FLOW PROCESS FROM NODE 324.12 TO NODE 325.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 27.0 INCH PIPE IS 21.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 8.2
UPSTREAM NODE ELEVATION = 1572.50
DOWNSTREAM NODE ELEVATION = 1571.00
FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 27.65
TRAVEL TIME(MIN.) = .34 TC(MIN.) = 14.71

* *****
FLOW PROCESS FROM NODE 325.00 TO NODE 325.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.603
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 27.19
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 54.38
TC(MIN) = 14.71

*****
FLOW PROCESS FROM NODE 325.10 TO NODE 326.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 9.9
UPSTREAM NODE ELEVATION = 1571.00
DOWNSTREAM NODE ELEVATION = 1568.00
FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 54.38
TRAVEL TIME(MIN.) = .56 TC(MIN.) = 15.26

*****

```

FLOW PROCESS FROM NODE 326.00 TO NODE 326.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.524  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 52.96  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 105.91  
TC(MIN) = 15.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 326.10 TO NODE 327.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 48.0 INCH PIPE IS 34.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.9  
UPSTREAM NODE ELEVATION = 1568.00  
DOWNSTREAM NODE ELEVATION = 1563.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 105.91  
TRAVEL TIME(MIN.) = 1.03 TC(MIN.) = 16.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 327.00 TO NODE 327.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.389  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 101.04  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 202.08  
TC(MIN) = 16.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 327.10 TO NODE 328.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 57.0 INCH PIPE IS 43.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 13.9  
UPSTREAM NODE ELEVATION = 1563.00  
DOWNSTREAM NODE ELEVATION = 1550.00  
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 202.08  
TRAVEL TIME(MIN.) = 1.62 TC(MIN.) = 17.91

\*\*\*\*\*  
FLOW PROCESS FROM NODE 328.00 TO NODE 328.10 IS CODE = 8



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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.202  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 188.63  
EFFECTIVE AREA(ACRES) = 160.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 160.00  
PEAK FLOW RATE(CFS) = 377.25  
TC(MIN) = 17.91

\*\*\*\*\*  
FLOW PROCESS FROM NODE 328.10 TO NODE 323.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 60.0 INCH PIPE IS 49.0 INCHES  
PIPEFLOW VELOCITY(Feet/Sec.) = 22.0  
UPSTREAM NODE ELEVATION = 1550.00  
DOWNSTREAM NODE ELEVATION = 1491.00  
FLOWLENGTH(Feet) = 2650.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 377.25  
TRAVEL TIME(MIN.) = 2.01 TC(MIN.) = 19.92

\*\*\*\*\*  
FLOW PROCESS FROM NODE 323.10 TO NODE 323.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 19.92  
RAINFALL INTENSITY (INCH./HOUR) = 3.00  
EFFECTIVE STREAM AREA(ACRES) = 160.00  
TOTAL STREAM AREA(ACRES) = 160.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 377.25

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1608.61	24.82	2.632	.58	871.83
2	377.25	19.92	3.004	.58	160.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1927.94	1031.83
2	1901.97	859.48

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1927.94 TIME(MINUTES) = 24.824  
EFFECTIVE AREA(ACRES) = 1031.83  
TOTAL AREA(ACRES) = 1138.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 323.10 TO NODE 329.10 IS CODE = 5

```

>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1491.00
DOWNSTREAM NODE ELEVATION = 1478.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1927.94
FLOW VELOCITY(FEET/SEC) = 21.51 FLOW DEPTH(FEET) = 5.51
TRAVEL TIME(MIN.) = 1.01 TC(MIN.) = 25.83

*****
FLOW PROCESS FROM NODE 329.00 TO NODE 329.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.570
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 143.14
EFFECTIVE AREA(ACRES) = 1111.83
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 1218.00
PEAK FLOW RATE(CFS) = 1989.33
TC(MIN) = 25.83

*****
FLOW PROCESS FROM NODE 329.10 TO NODE 330.10 IS CODE = 5
-----
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION = 1478.00
DOWNSTREAM NODE ELEVATION = 1463.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1330.00
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1989.33
FLOW VELOCITY(FEET/SEC) = 22.71 FLOW DEPTH(FEET) = 5.43
TRAVEL TIME(MIN.) = .98 TC(MIN.) = 26.81

*****
FLOW PROCESS FROM NODE 330.00 TO NODE 330.10 IS CODE = 8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.513
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 81.00 SUBAREA RUNOFF(CFS) = 140.80
EFFECTIVE AREA(ACRES) = 1192.83
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 1299.00
PEAK FLOW RATE(CFS) = 2073.53
TC(MIN) = 26.81

*****
FLOW PROCESS FROM NODE 330.10 TO NODE 330.10 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====

```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 26.81  
RAINFALL INTENSITY (INCH./HOUR) = 2.51  
EFFECTIVE STREAM AREA(ACRES) = 1192.83  
TOTAL STREAM AREA(ACRES) = 1299.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2073.53

\*\*\*\*\*  
FLOW PROCESS FROM NODE 331.00 TO NODE 331.11 IS CODE = 2

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1614.00  
DOWNSTREAM ELEVATION = 1581.00  
ELEVATION DIFFERENCE = 33.00  
TC =  $.412 * [(1000.00 ** 3.00) / (33.00)] ** .20 = 12.918$   
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.895  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 14.91  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.91

\*\*\*\*\*  
FLOW PROCESS FROM NODE 331.11 TO NODE 331.12 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

=====

DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.2 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.7  
UPSTREAM NODE ELEVATION = 1581.00  
DOWNSTREAM NODE ELEVATION = 1548.00  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 14.91  
TRAVEL TIME(MIN.) = 1.42 TC(MIN.) = 14.34

\*\*\*\*\*  
FLOW PROCESS FROM NODE 331.10 TO NODE 331.12 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.658  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 13.84  
EFFECTIVE AREA(ACRES) = 10.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 27.68  
TC(MIN) = 14.34

\*\*\*\*\*  
FLOW PROCESS FROM NODE 331.12 TO NODE 332.10 IS CODE = 3

-----  
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.8 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 9.4

UPSTREAM NODE ELEVATION = 1548.00

DOWNSTREAM NODE ELEVATION = 1546.00

LOWLENGTH(FEET) = 165.00 MANNINGS N = .013

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

PIPEFLOW THRU SUBAREA(CFS) = 27.68

TRAVEL TIME(MIN.) = .29 TC(MIN.) = 14.64

\*\*\*\*\*  
FLOW PROCESS FROM NODE 332.00 TO NODE 332.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.614

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 27.29

EFFECTIVE AREA(ACRES) = 20.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 20.00

PEAK FLOW RATE(CFS) = 54.57

TC(MIN) = 14.64

\*\*\*\*\*  
FLOW PROCESS FROM NODE 332.10 TO NODE 333.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.2 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 9.9

UPSTREAM NODE ELEVATION = 1546.00

DOWNSTREAM NODE ELEVATION = 1543.00

FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 54.57

TRAVEL TIME(MIN.) = .56 TC(MIN.) = 15.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 333.00 TO NODE 333.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.534

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 53.13

EFFECTIVE AREA(ACRES) = 40.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 40.00

PEAK FLOW RATE(CFS) = 106.27

TC(MIN) = 15.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 333.10 TO NODE 334.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.8 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 12.3

UPSTREAM NODE ELEVATION = 1543.00  
DOWNSTREAM NODE ELEVATION = 1536.00  
FLOWLENGTH(Feet) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 106.27  
TRAVEL TIME(MIN.) = .91 TC(MIN.) = 16.10

\*\*\*\*\*  
FLOW PROCESS FROM NODE 334.00 TO NODE 334.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.413  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 36.00 SUBAREA RUNOFF(CFS) = 91.72  
EFFECTIVE AREA(ACRES) = 76.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 76.00  
PEAK FLOW RATE(CFS) = 193.64  
TC(MIN) = 16.10

\*\*\*\*\*  
FLOW PROCESS FROM NODE 334.10 TO NODE 335.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 54.0 INCH PIPE IS 38.9 INCHES  
PIPEFLOW VELOCITY(Feet/Sec.) = 15.8  
UPSTREAM NODE ELEVATION = 1536.00  
DOWNSTREAM NODE ELEVATION = 1518.00  
FLOWLENGTH(Feet) = 1330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 193.64  
TRAVEL TIME(MIN.) = 1.40 TC(MIN.) = 17.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 335.00 TO NODE 335.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.246  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 191.81  
EFFECTIVE AREA(ACRES) = 156.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 156.00  
PEAK FLOW RATE(CFS) = 374.02  
TC(MIN) = 17.50

\*\*\*\*\*  
FLOW PROCESS FROM NODE 335.10 TO NODE 330.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 63.0 INCH PIPE IS 46.6 INCHES  
PIPEFLOW VELOCITY(Feet/Sec.) = 21.8  
UPSTREAM NODE ELEVATION = 1518.00  
DOWNSTREAM NODE ELEVATION = 1463.00

FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 374.02  
TRAVEL TIME(MIN.) = 2.03 TC(MIN.) = 19.53

\*\*\*\*\*  
FLOW PROCESS FROM NODE 330.10 TO NODE 330.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 19.53  
RAINFALL INTENSITY (INCH./HOUR) = 3.04  
EFFECTIVE STREAM AREA(ACRES) = 156.00  
TOTAL STREAM AREA(ACRES) = 156.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 374.02

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2073.53	26.81	2.513	.58	1192.83
2	374.02	19.53	3.039	.58	156.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	2367.52	1348.83
2	2296.15	1025.13

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 2367.52 TIME(MINUTES) = 26.807  
EFFECTIVE AREA(ACRES) = 1348.83  
TOTAL AREA(ACRES) = 1455.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 330.10 TO NODE 336.10 IS CODE = 5

-----  
>>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
>>>>>TRAVELTIME THRU SUBAREA<<<<<  
=====

UPSTREAM NODE ELEVATION = 1463.00  
DOWNSTREAM NODE ELEVATION = 1447.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1330.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 7.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 2367.52  
FLOW VELOCITY(FEET/SEC) = 24.38 FLOW DEPTH(FEET) = 5.81  
TRAVEL TIME(MIN.) = .91 TC(MIN.) = 27.72

\*\*\*\*\*  
FLOW PROCESS FROM NODE 336.00 TO NODE 336.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.464  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 135.48  
EFFECTIVE AREA(ACRES) = 1428.83

AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 1535.00  
PEAK FLOW RATE(CFS) = 2419.72  
TC(MIN) = 27.72

\*\*\*\*\*  
FLOW PROCESS FROM NODE 336.10 TO NODE 337.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1447.00  
DOWNSTREAM NODE ELEVATION = 1431.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1330.00  
CHANNEL BASE( FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH( FEET) = 7.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 2419.72  
FLOW VELOCITY( FEET/SEC) = 24.56 FLOW DEPTH( FEET) = 5.87  
TRAVEL TIME(MIN.) = .90 TC(MIN.) = 28.62

\*\*\*\*\*  
FLOW PROCESS FROM NODE 337.00 TO NODE 337.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.417  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 82.00 SUBAREA RUNOFF(CFS) = 135.40  
EFFECTIVE AREA(ACRES) = 1510.83  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 1617.00  
PEAK FLOW RATE(CFS) = 2494.79  
TC(MIN) = 28.62

\*\*\*\*\*  
FLOW PROCESS FROM NODE 337.10 TO NODE 337.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 28.62  
RAINFALL INTENSITY (INCH./HOUR) = 2.42  
EFFECTIVE STREAM AREA(ACRES) = 1510.83  
TOTAL STREAM AREA(ACRES) = 1617.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2494.79

\*\*\*\*\*  
FLOW PROCESS FROM NODE 338.00 TO NODE 338.11 IS CODE = 2  
-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1574.00  
DOWNSTREAM ELEVATION = 1544.50  
ELEVATION DIFFERENCE = 29.50  
TC = .412\*[( 1000.00\*\* 3.00)/( 29.50)]\*\* .20 = 13.211  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.843  
SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA RUNOFF(CFS) = 14.67  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.67

\*\*\*\*\*  
FLOW PROCESS FROM NODE 338.11 TO NODE 338.12 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 18.0 INCH PIPE IS	12.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	= 11.1
UPSTREAM NODE ELEVATION	= 1544.50
DOWNSTREAM NODE ELEVATION	= 1515.00
FLOWLENGTH(FEET)	= 1000.00
MANNINGS N	= .013
ESTIMATED PIPE DIAMETER(INCH)	= 18.00
NUMBER OF PIPES	= 1
PIPEFLOW THRU SUBAREA(CFS)	= 14.67
TRAVEL TIME(MIN.)	= 1.50
TC(MIN.)	= 14.71

\*\*\*\*\*  
FLOW PROCESS FROM NODE 338.10 TO NODE 338.12 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	= 3.603
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	= .5820
SUBAREA AREA(ACRES)	= 5.00
SUBAREA RUNOFF(CFS)	= 13.60
EFFECTIVE AREA(ACRES)	= 10.00
AVERAGED Fm(INCH/HR)	= .582
TOTAL AREA(ACRES)	= 10.00
PEAK FLOW RATE(CFS)	= 27.19
TC(MIN)	= 14.71

\*\*\*\*\*  
FLOW PROCESS FROM NODE 338.12 TO NODE 339.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 27.0 INCH PIPE IS	18.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	= 9.3
UPSTREAM NODE ELEVATION	= 1515.00
DOWNSTREAM NODE ELEVATION	= 1513.00
FLOWLENGTH(FEET)	= 167.00
MANNINGS N	= .013
ESTIMATED PIPE DIAMETER(INCH)	= 27.00
NUMBER OF PIPES	= 1
PIPEFLOW THRU SUBAREA(CFS)	= 27.19
TRAVEL TIME(MIN.)	= .30
TC(MIN.)	= 15.01

\*\*\*\*\*  
FLOW PROCESS FROM NODE 339.00 TO NODE 339.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	= 3.560
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	= .5820
SUBAREA AREA(ACRES)	= 10.00
SUBAREA RUNOFF(CFS)	= 26.80
EFFECTIVE AREA(ACRES)	= 20.00
AVERAGED Fm(INCH/HR)	= .582
TOTAL AREA(ACRES)	= 20.00
PEAK FLOW RATE(CFS)	= 53.60



TC(MIN) = 15.01

\*\*\*\*\*  
LOW PROCESS FROM NODE 339.10 TO NODE 340.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.8 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 15.6

UPSTREAM NODE ELEVATION = 1513.00

DOWNSTREAM NODE ELEVATION = 1508.00

FLOWLENGTH(Feet) = 167.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 53.60

TRAVEL TIME(MIN.) = .18 TC(MIN.) = 15.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 340.00 TO NODE 340.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.535

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 53.15

EFFECTIVE AREA(ACRES) = 40.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 40.00

PEAK FLOW RATE(CFS) = 106.30

TC(MIN) = 15.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 340.10 TO NODE 341.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.5 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 21.6

UPSTREAM NODE ELEVATION = 1508.00

DOWNSTREAM NODE ELEVATION = 1500.00

FLOWLENGTH(Feet) = 167.00 MANNINGS N = .013

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

PIPEFLOW THRU SUBAREA(CFS) = 106.30

TRAVEL TIME(MIN.) = .13 TC(MIN.) = 15.32

\*\*\*\*\*  
FLOW PROCESS FROM NODE 341.00 TO NODE 341.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.517

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820

SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 105.65

EFFECTIVE AREA(ACRES) = 80.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 80.00

PEAK FLOW RATE(CFS) = 211.31

TC(MIN) = 15.32

```

*****
FLOW PROCESS FROM NODE    341.10 TO NODE    342.10 IS CODE =    3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
/>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN  54.0 INCH PIPE IS  43.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  15.5
UPSTREAM NODE ELEVATION =  1500.00
DOWNSTREAM NODE ELEVATION =  1483.00
FLOWLENGTH(FEET) =  1330.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  54.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =  211.31
TRAVEL TIME(MIN.) =  1.43  TC(MIN.) =  16.74

*****
FLOW PROCESS FROM NODE    342.00 TO NODE    342.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.334
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5820
SUBAREA AREA(ACRES) =  80.00  SUBAREA RUNOFF(CFS) =  198.12
EFFECTIVE AREA(ACRES) =  160.00
AVERAGED Fm(INCH/HR) =  .582
TOTAL AREA(ACRES) =  160.00
PEAK FLOW RATE(CFS) =  396.24
TC(MIN) =  16.74

*****
FLOW PROCESS FROM NODE    342.10 TO NODE    337.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
/>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN  63.0 INCH PIPE IS  50.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  21.3
UPSTREAM NODE ELEVATION =  1483.00
DOWNSTREAM NODE ELEVATION =  1431.00
FLOWLENGTH(FEET) =  2650.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  63.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =  396.24
TRAVEL TIME(MIN.) =  2.07  TC(MIN.) =  18.81

*****
FLOW PROCESS FROM NODE    337.10 TO NODE    337.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MINUTES) =  18.81
RAINFALL INTENSITY (INCH./HOUR) =  3.11
EFFECTIVE STREAM AREA(ACRES) =  160.00
TOTAL STREAM AREA(ACRES) =  160.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =  396.24

CONFLUENCE INFORMATION:
STREAM  PEAK FLOW  TIME  INTENSITY  FM  EFFECTIVE
NUMBER  RATE(CFS)  (MIN.)  (INCH/HOUR)  (IN/HR)  AREA(ACRES)
-----

```

1	2494.79	28.62	2.417	.58	1510.83
2	396.24	18.81	3.108	.58	160.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	2782.56	1670.83
2	2654.56	1153.22

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 2782.56 TIME(MINUTES) = 28.619

EFFECTIVE AREA(ACRES) = 1670.83

TOTAL AREA(ACRES) = 1777.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 337.10 TO NODE 343.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1431.00  
DOWNSTREAM NODE ELEVATION = 1417.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1370.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 7.50  
CHANNEL FLOW THRU SUBAREA(CFS) = 2782.56  
FLOW VELOCITY(FEET/SEC) = 23.84 FLOW DEPTH(FEET) = 6.55  
TRAVEL TIME(MIN.) = .96 TC(MIN.) = 29.58

\*\*\*\*\*  
FLOW PROCESS FROM NODE 343.00 TO NODE 343.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.369  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 83.00 SUBAREA RUNOFF(CFS) = 133.53  
EFFECTIVE AREA(ACRES) = 1753.83  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 1860.00  
PEAK FLOW RATE(CFS) = 2821.46  
TC(MIN) = 29.58

\*\*\*\*\*  
FLOW PROCESS FROM NODE 343.10 TO NODE 344.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1417.00  
DOWNSTREAM NODE ELEVATION = 1405.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 2821.46  
FLOW VELOCITY(FEET/SEC) = 23.15 FLOW DEPTH(FEET) = 6.73  
TRAVEL TIME(MIN.) = .94 TC(MIN.) = 30.51

\*\*\*\*\*

FLOW PROCESS FROM NODE 344.00 TO NODE 344.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.326  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 125.54  
EFFECTIVE AREA(ACRES) = 1833.83  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 1940.00  
PEAK FLOW RATE(CFS) = 2877.72  
TC(MIN) = 30.51

\*\*\*\*\*

FLOW PROCESS FROM NODE 344.10 TO NODE 345.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1405.00  
DOWNSTREAM NODE ELEVATION = 1394.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00  
CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 2877.72  
FLOW VELOCITY(FEET/SEC) = 22.46 FLOW DEPTH(FEET) = 6.95  
TRAVEL TIME(MIN.) = .96 TC(MIN.) = 31.48

\*\*\*\*\*

FLOW PROCESS FROM NODE 345.00 TO NODE 345.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.283  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820  
SUBAREA AREA(ACRES) = 64.00 SUBAREA RUNOFF(CFS) = 97.95  
EFFECTIVE AREA(ACRES) = 1897.83  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 2004.00  
PEAK FLOW RATE(CFS) = 2904.65  
TC(MIN) = 31.48

\*\*\*\*\*

FLOW PROCESS FROM NODE 345.10 TO NODE 435.10 IS CODE = 1

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 31.48  
RAINFALL INTENSITY (INCH./HOUR) = 2.28  
EFFECTIVE STREAM AREA(ACRES) = 1897.83  
TOTAL STREAM AREA(ACRES) = 2004.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2904.65

\*\*\*\*\*

FLOW PROCESS FROM NODE 346.00 TO NODE 346.11 IS CODE = 2

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

```

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1536.00
DOWNSTREAM ELEVATION = 1508.00
ELEVATION DIFFERENCE = 28.00
TC = .412*[(1000.00** 3.00)/(28.00)]** .20 = 13.350
100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.819
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA RUNOFF(CFS) = 14.57
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.57

*****
FLOW PROCESS FROM NODE 346.11 TO NODE 346.12 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 10.9
UPSTREAM NODE ELEVATION = 1508.00
DOWNSTREAM NODE ELEVATION = 1480.00
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 14.57
TRAVEL TIME(MIN.) = 1.53 TC(MIN.) = 14.88

*****
FLOW PROCESS FROM NODE 346.10 TO NODE 346.12 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.578
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 13.48
EFFECTIVE AREA(ACRES) = 10.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 10.00
PEAK FLOW RATE(CFS) = 26.96
TC(MIN) = 14.88

*****
FLOW PROCESS FROM NODE 346.12 TO NODE 347.10 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 10.7
UPSTREAM NODE ELEVATION = 1480.00
DOWNSTREAM NODE ELEVATION = 1477.00
FLOWLENGTH(FEET) = 165.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 26.96
TRAVEL TIME(MIN.) = .26 TC(MIN.) = 15.14

*****
FLOW PROCESS FROM NODE 347.00 TO NODE 347.10 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

```

```
=====
100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.542
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 26.64
EFFECTIVE AREA(ACRES) = 20.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) = 53.27
TC(MIN) = 15.14
=====
```

```
*****
FLOW PROCESS FROM NODE 347.10 TO NODE 348.10 IS CODE = 3
=====
```

```
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
```

```
DEPTH OF FLOW IN 36.0 INCH PIPE IS 25.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 9.8
UPSTREAM NODE ELEVATION = 1477.00
DOWNSTREAM NODE ELEVATION = 1471.00
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 53.27
TRAVEL TIME(MIN.) = 1.14 TC(MIN.) = 16.28
=====
```

```
*****
FLOW PROCESS FROM NODE 348.00 TO NODE 348.10 IS CODE = 8
=====
```

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

```
100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.391
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5820
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 50.55
EFFECTIVE AREA(ACRES) = 40.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 40.00
PEAK FLOW RATE(CFS) = 101.11
TC(MIN) = 16.28
=====
```

```
*****
FLOW PROCESS FROM NODE 348.10 TO NODE 349.10 IS CODE = 3
=====
```

```
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
```

```
DEPTH OF FLOW IN 42.0 INCH PIPE IS 33.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 12.2
UPSTREAM NODE ELEVATION = 1471.00
DOWNSTREAM NODE ELEVATION = 1456.00
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 101.11
TRAVEL TIME(MIN.) = 1.84 TC(MIN.) = 18.11
=====
```

```
*****
FLOW PROCESS FROM NODE 349.00 TO NODE 349.10 IS CODE = 8
=====
```

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

```
100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.180
=====
```

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m(\text{INCH/HR}) = .5820$

SUBAREA AREA(ACRES) = 31.00 SUBAREA RUNOFF(CFS) = 72.48

EFFECTIVE AREA(ACRES) = 71.00

AVERAGED  $F_m(\text{INCH/HR}) = .582$

TOTAL AREA(ACRES) = 71.00

PEAK FLOW RATE(CFS) = 166.00

TC(MIN) = 18.11

\*\*\*\*\*  
FLOW PROCESS FROM NODE 349.10 TO NODE 345.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1456.00

DOWNSTREAM NODE ELEVATION = 1394.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 3200.00

CHANNEL BASE(FEET) = 4.00 "Z" FACTOR = 1.500

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 2.50

CHANNEL FLOW THRU SUBAREA(CFS) = 166.00

FLOW VELOCITY(FEET/SEC) = 14.92 FLOW DEPTH(FEET) = 1.70

TRAVEL TIME(MIN.) = 3.58 TC(MIN.) = 21.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 345.10 TO NODE 345.10 IS CODE = 1

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 21.69

RAINFALL INTENSITY (INCH./HOUR) = 2.85

EFFECTIVE STREAM AREA(ACRES) = 71.00

TOTAL STREAM AREA(ACRES) = 71.00

PEAK FLOW RATE(CFS) AT CONFLUENCE = 166.00

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2904.65	31.48	2.283	.58	1897.83
2	166.00	21.69	2.854	.58	71.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	3028.89	1968.83
---	---------	---------

2	2840.15	1378.73
---	---------	---------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 3028.89 TIME(MINUTES) = 31.477

EFFECTIVE AREA(ACRES) = 1968.83

TOTAL AREA(ACRES) = 2075.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 345.10 TO NODE 350.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1394.00  
 DOWNSTREAM NODE ELEVATION = 1375.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1500.00  
 CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00  
 CHANNEL FLOW THRU SUBAREA(CFS) = 3028.89  
 FLOW VELOCITY(FEET/SEC) = 26.55 FLOW DEPTH(FEET) = 6.45  
 TRAVEL TIME(MIN.) = .94 TC(MIN.) = 32.42

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 350.00 TO NODE 252.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<  
 >>>>TRAVELTIME THRU SUBAREA<<<<<

UPSTREAM NODE ELEVATION = 1375.00  
 DOWNSTREAM NODE ELEVATION = 1320.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 3000.00  
 CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500  
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00  
 CHANNEL FLOW THRU SUBAREA(CFS) = 3028.89  
 FLOW VELOCITY(FEET/SEC) = 30.30 FLOW DEPTH(FEET) = 5.92  
 TRAVEL TIME(MIN.) = 1.65 TC(MIN.) = 34.07

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 252.10 TO NODE 252.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 34.07  
 RAINFALL INTENSITY (INCH./HOUR) = 2.18  
 EFFECTIVE STREAM AREA(ACRES) = 1968.83  
 TOTAL STREAM AREA(ACRES) = 2075.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3028.89

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	3028.89	34.07	2.177	.58	1968.83

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
 CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	3028.89	1968.83

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 3028.89 TIME(MINUTES) = 34.069  
 EFFECTIVE AREA(ACRES) = 1968.83  
 TOTAL AREA(ACRES) = 2075.00

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 2075.00  
 EFFECTIVE AREA(ACRES) = 1968.83  
 PEAK FLOW RATE(CFS) = 3028.89

END OF RATIONAL METHOD ANALYSIS



\*\*\*\*\*  
 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
 (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
 Copyright 1983,86,87 Advanced Engineering Software (aes)  
 Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN  
 \*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* NORTH FONTANA MASTER STORM DRAIN, LINE D  
 \* Q 25-YEAR, DESIGN Q  
 \* JN 3547  
 \*\*\*\*\*

FILE NAME: LINED.25  
 TIME/DATE OF STUDY: 1: 5 1/ 1/1980

=====

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 =  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
 10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.040  
 100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.520  
 COMPUTED RAINFALL INTENSITY DATA:  
 STORM EVENT = 25.00 1-HOUR INTENSITY(INCH/HOUR) = 1.2069  
 SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*

FLOW PROCESS FROM NODE 200.00 TO NODE 200.10 IS CODE = 2

-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
 INITIAL SUBAREA FLOW-LENGTH = 1000.00  
 UPSTREAM ELEVATION = 1530.10  
 DOWNSTREAM ELEVATION = 1508.10  
 ELEVATION DIFFERENCE = 22.00  
 TC = .412\*[( 1000.00\*\* 3.00)/( 22.00)]\*\* .20 = 14.009  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.889  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 20.68  
 TOTAL AREA(ACRES) = 9.96 PEAK FLOW RATE(CFS) = 20.68

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 200.10 TO NODE 202.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.8 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 10.6  
 UPSTREAM NODE ELEVATION = 1508.10  
 DOWNSTREAM NODE ELEVATION = 1503.00  
 FLOWLENGTH(FEET) = 240.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 20.68  
 TRAVEL TIME(MIN.) = .38 TC(MIN.) = 14.39

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 202.10 TO NODE 202.10 IS CODE = 1  
 -----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 14.39  
 RAINFALL INTENSITY (INCH./HOUR) = 2.84  
 EFFECTIVE STREAM AREA(ACRES) = 9.96  
 TOTAL STREAM AREA(ACRES) = 9.96  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 20.68

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 201.00 TO NODE 202.10 IS CODE = 2  
 -----

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

$TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
 INITIAL SUBAREA FLOW-LENGTH = 1100.00  
 UPSTREAM ELEVATION = 1529.90  
 DOWNSTREAM ELEVATION = 1503.00  
 ELEVATION DIFFERENCE = 26.90  
 $TC = .412 * [(1100.00 ** 3.00) / (26.90)] ** .20 = 14.249$   
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.860  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 13.61  
 TOTAL AREA(ACRES) = 6.64 PEAK FLOW RATE(CFS) = 13.61

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 202.10 TO NODE 202.10 IS CODE = 1  
 -----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 14.25  
 RAINFALL INTENSITY (INCH./HOUR) = 2.86  
 EFFECTIVE STREAM AREA(ACRES) = 6.64  
 TOTAL STREAM AREA(ACRES) = 6.64  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 13.61

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 202.00 TO NODE 202.10 IS CODE = 2

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
 INITIAL SUBAREA FLOW-LENGTH = 750.00  
 UPSTREAM ELEVATION = 1512.90  
 DOWNSTREAM ELEVATION = 1503.00  
 ELEVATION DIFFERENCE = 9.90  
 TC = .412\*[( 750.00\*\* 3.00)/( 9.90)]\*\* .20 = 13.830  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.911  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 6.23  
 TOTAL AREA(ACRES) = 2.97 PEAK FLOW RATE(CFS) = 6.23

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 202.10 TO NODE 202.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:

TIME OF CONCENTRATION(MINUTES) = 13.83  
 RAINFALL INTENSITY (INCH./HOUR) = 2.91  
 EFFECTIVE STREAM AREA(ACRES) = 2.97  
 TOTAL STREAM AREA(ACRES) = 2.97  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.23

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	20.68	14.39	2.843	.58	9.96
2	13.61	14.25	2.860	.58	6.64
3	6.23	13.83	2.911	.58	2.97

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	40.24	19.57

2	40.33	19.48
3	40.21	18.99

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 PEAK FLOW RATE(CFS) = 40.33 TIME(MINUTES) = 14.249  
 EFFECTIVE AREA(ACRES) = 19.48  
 TOTAL AREA(ACRES) = 19.57

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 202.10 TO NODE 204.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.6 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 13.0  
 UPSTREAM NODE ELEVATION = 1503.00  
 DOWNSTREAM NODE ELEVATION = 1490.50  
 FLOWLENGTH(FEET) = 540.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 40.33  
 TRAVEL TIME(MIN.) = .69 TC(MIN.) = 14.94

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 203.00 TO NODE 204.10 IS CODE = 8  
 -----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.780  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 13.51 SUBAREA RUNOFF(CFS) = 26.72  
 EFFECTIVE AREA(ACRES) = 32.99  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 33.08  
 PEAK FLOW RATE(CFS) = 65.24  
 TC(MIN) = 14.94

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 204.00 TO NODE 204.10 IS CODE = 8  
 -----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.780  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 5.75 SUBAREA RUNOFF(CFS) = 11.37  
 EFFECTIVE AREA(ACRES) = 38.74  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 38.83  
 PEAK FLOW RATE(CFS) = 76.61  
 TC(MIN) = 14.94

```
*****
FLOW PROCESS FROM NODE    204.10 TO NODE    206.10 IS CODE =    3
-----
```

```
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
```

```
DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 15.4
UPSTREAM NODE ELEVATION = 1490.50
DOWNSTREAM NODE ELEVATION = 1474.60
FLOWLENGTH(FEET) = 650.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 76.61
TRAVEL TIME(MIN.) = .70 TC(MIN.) = 15.64
```

```
*****
FLOW PROCESS FROM NODE    205.00 TO NODE    206.10 IS CODE =    8
-----
```

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

```
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.704
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 11.62 SUBAREA RUNOFF(CFS) = 22.19
EFFECTIVE AREA(ACRES) = 50.36
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 50.45
PEAK FLOW RATE(CFS) = 96.17
TC(MIN) = 15.64
```

```
*****
FLOW PROCESS FROM NODE    206.00 TO NODE    206.10 IS CODE =    8
-----
```

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

```
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.704
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 11.36 SUBAREA RUNOFF(CFS) = 21.70
EFFECTIVE AREA(ACRES) = 61.72
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 61.81
PEAK FLOW RATE(CFS) = 117.87
TC(MIN) = 15.64
```

```
*****
FLOW PROCESS FROM NODE    206.10 TO NODE    208.10 IS CODE =    3
-----
```

```
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
```

DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.2 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 16.5  
 UPSTREAM NODE ELEVATION = 1474.60  
 DOWNSTREAM NODE ELEVATION = 1468.00  
 FLOWLENGTH(FEET) = 315.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 117.87  
 TRAVEL TIME(MIN.) = .32 TC(MIN.) = 15.96

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 208.10 TO NODE 208.10 IS CODE = 1  
 -----

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

=====  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 15.96  
 RAINFALL INTENSITY (INCH./HOUR) = 2.67  
 EFFECTIVE STREAM AREA(ACRES) = 61.72  
 TOTAL STREAM AREA(ACRES) = 61.81  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 117.87

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 208.00 TO NODE 208.10 IS CODE = 2  
 -----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE  
  
 $TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
 INITIAL SUBAREA FLOW-LENGTH = 820.00  
 UPSTREAM ELEVATION = 1478.90  
 DOWNSTREAM ELEVATION = 1468.00  
 ELEVATION DIFFERENCE = 10.90  
 $TC = .412 * [(820.00 ** 3.00) / (10.90)] ** .20 = 14.312$   
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.852  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 12.54  
 TOTAL AREA(ACRES) = 6.14 PEAK FLOW RATE(CFS) = 12.54

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 208.10 TO NODE 208.10 IS CODE = 1  
 -----

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

=====  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 14.31  
 RAINFALL INTENSITY (INCH./HOUR) = 2.85  
 EFFECTIVE STREAM AREA(ACRES) = 6.14  
 TOTAL STREAM AREA(ACRES) = 6.14  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 12.54

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA (ACRES)
1	117.87	15.96	2.672	.58	61.72
2	12.54	14.31	2.852	.58	6.14

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q (CFS)	EFFECTIVE AREA (ACRES)
1	129.41	67.86
2	127.37	61.48

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 129.41 TIME (MINUTES) = 15.959  
EFFECTIVE AREA (ACRES) = 67.86  
TOTAL AREA (ACRES) = 67.95

\*\*\*\*\*

FLOW PROCESS FROM NODE 208.10 TO NODE 208.20 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

PIPEFLOW VELOCITY (FEET/SEC.) = 13.5  
UPSTREAM NODE ELEVATION = 1462.00  
DOWNSTREAM NODE ELEVATION = 1460.00  
FLOWLENGTH (FEET) = 620.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA (CFS) = 129.41  
TRAVEL TIME (MIN.) = .77 TC (MIN.) = 16.73

\*\*\*\*\*

FLOW PROCESS FROM NODE 208.20 TO NODE 208.20 IS CODE = 1

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION (MINUTES) = 16.73  
RAINFALL INTENSITY (INCH./HOUR) = 2.60  
EFFECTIVE STREAM AREA (ACRES) = 67.86  
TOTAL STREAM AREA (ACRES) = 67.95  
PEAK FLOW RATE (CFS) AT CONFLUENCE = 129.41

\*\*\*\*\*

FLOW PROCESS FROM NODE 207.00 TO NODE 208.20 IS CODE = 2

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

$TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$

INITIAL SUBAREA FLOW-LENGTH = 900.00

UPSTREAM ELEVATION = 1488.00

DOWNSTEAM ELEVATION = 1467.00

ELEVATION DIFFERENCE = 21.00

$TC = .412 * [(900.00 ** 3.00) / (21.00)] ** .20 = 13.274$

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.984

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5

SUBAREA RUNOFF(CFS) = 18.85

TOTAL AREA(ACRES) = 8.72 PEAK FLOW RATE(CFS) = 18.85

\*\*\*\*\*  
FLOW PROCESS FROM NODE 208.20 TO NODE 208.20 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 13.27

RAINFALL INTENSITY (INCH./HOUR) = 2.98

EFFECTIVE STREAM AREA(ACRES) = 8.72

TOTAL STREAM AREA(ACRES) = 8.72

PEAK FLOW RATE(CFS) AT CONFLUENCE = 18.85

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	129.41	16.73	2.597	.58	67.86
2	18.85	13.27	2.984	.58	8.72

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	145.23	76.58
2	141.24	62.57

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 145.23 TIME(MINUTES) = 16.728

EFFECTIVE AREA(ACRES) = 76.58

TOTAL AREA(ACRES) = 76.67

\*\*\*\*\*  
FLOW PROCESS FROM NODE 208.20 TO NODE 209.10 IS CODE = 3  
-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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



DEPTH OF FLOW IN 42.0 INCH PIPE IS 33.2 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 17.8  
 UPSTREAM NODE ELEVATION = 1460.00  
 DOWNSTREAM NODE ELEVATION = 1433.00  
 FLOWLENGTH(FEET) = 1150.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 145.23  
 TRAVEL TIME(MIN.) = 1.08 TC(MIN.) = 17.80

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 209.00 TO NODE 209.10 IS CODE = 8  
 -----

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

=====  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.502  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 22.04 SUBAREA RUNOFF(CFS) = 38.08  
 EFFECTIVE AREA(ACRES) = 98.62  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 98.71  
 PEAK FLOW RATE(CFS) = 170.39  
 TC(MIN) = 17.80

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 209.00 TO NODE 210.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====  
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 33.9 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 18.0  
 UPSTREAM NODE ELEVATION = 1433.00  
 DOWNSTREAM NODE ELEVATION = 1413.00  
 FLOWLENGTH(FEET) = 965.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 170.39  
 TRAVEL TIME(MIN.) = .89 TC(MIN.) = 18.70

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 210.00 TO NODE 210.10 IS CODE = 8  
 -----

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

=====  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.429  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 25.47 SUBAREA RUNOFF(CFS) = 42.35  
 EFFECTIVE AREA(ACRES) = 124.09  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 124.18  
 PEAK FLOW RATE(CFS) = 206.31

TC(MIN) = 18.70

\*\*\*\*\*  
FLOW PROCESS FROM NODE 210.10 TO NODE 211.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	51.0 INCH PIPE IS	37.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	18.5
UPSTREAM NODE ELEVATION	=	1413.00
DOWNSTREAM NODE ELEVATION	=	1404.00
FLOWLENGTH(FEET)	=	450.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	51.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	206.31
TRAVEL TIME(MIN.)	=	.40
TC(MIN.)	=	19.10

\*\*\*\*\*  
FLOW PROCESS FROM NODE 211.00 TO NODE 211.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.398
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	27.71
SUBAREA RUNOFF(CFS)	=	45.30
EFFECTIVE AREA(ACRES)	=	151.80
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	151.89
PEAK FLOW RATE(CFS)	=	248.14
TC(MIN)	=	19.10

\*\*\*\*\*  
FLOW PROCESS FROM NODE 211.10 TO NODE 211.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:	
TIME OF CONCENTRATION(MINUTES)	= 19.10
RAINFALL INTENSITY (INCH./HOUR)	= 2.40
EFFECTIVE STREAM AREA(ACRES)	= 151.80
TOTAL STREAM AREA(ACRES)	= 151.89
PEAK FLOW RATE(CFS) AT CONFLUENCE	= 248.14

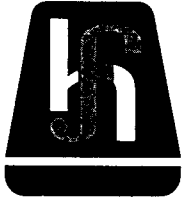
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PAGE

\*\*\*\*\*  
FLOW PROCESS FROM NODE 211.10 TO NODE 211.10 IS CODE = 7  
-----

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:	
TC(MIN)	= 32.74
RAIN INTENSITY(INCH/HOUR)	= 1.74



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①

$$Q_{100} = 340$$

$$Q_{25} = 248$$

92.0 CFS

## OVERFLOW

DRAINS ALONG JUNIPER ST.  
TOWARDS SOUTH

$$\frac{92.0}{340} \times 151.8 \text{ AC} = 41. \text{ AC}$$

$$T_c = 19.1$$

$$F_m = .582$$

EFFECTIVE AREA(ACRES) = 320.00  
 TOTAL AREA(ACRES) = 320.00 PEAK FLOW RATE(CFS) = 513.52  
 AVERAGED LOSS RATE, Fm(IN/HR) = .580

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 211.10 TO NODE 211.10 IS CODE = 1  
 -----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 32.74  
 RAINFALL INTENSITY (INCH./HOUR) = 1.74  
 EFFECTIVE STREAM AREA(ACRES) = 320.00  
 TOTAL STREAM AREA(ACRES) = 320.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 513.52

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	248.14	19.10	2.398	.58	151.80
2	513.52	32.74	1.736	.58	320.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	719.48	338.51
2	671.16	471.80

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 719.48 TIME(MINUTES) = 19.104  
 EFFECTIVE AREA(ACRES) = 338.51  
 TOTAL AREA(ACRES) = 471.89

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 211.10 TO NODE 212.10 IS CODE = 4  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
 >>>>USING USER-SPECIFIED PIPESIZE<<<<<  
 =====

PIPEFLOW VELOCITY(FEET/SEC.) = 12.7  
 UPSTREAM NODE ELEVATION = 1404.00  
 DOWNSTREAM NODE ELEVATION = 1398.00  
 FLOWLENGTH(FEET) = 1315.00 MANNINGS N = .013  
 GIVEN PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 719.48  
 TRAVEL TIME(MIN.) = 1.73 TC(MIN.) = 20.83

\*\*\*\*\*

FLOW PROCESS FROM NODE 212.00 TO NODE 212.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.277  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5  
SUBAREA AREA(ACRES) = 78.90 SUBAREA RUNOFF(CFS) = 120.35  
EFFECTIVE AREA(ACRES) = 417.41  
AVERAGED  $F_m$ (INCH/HR) = .581  
TOTAL AREA(ACRES) = 550.79  
PEAK FLOW RATE(CFS) = 719.48  
TC(MIN) = 20.83

=====

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\*\*\*\*\*

FLOW PROCESS FROM NODE 212.10 TO NODE 213.10 IS CODE = 4

=====

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

PIPEFLOW VELOCITY(FEET/SEC.) = 12.7  
UPSTREAM NODE ELEVATION = 1398.00  
DOWNSTREAM NODE ELEVATION = 1392.00  
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 719.48  
TRAVEL TIME(MIN.) = 1.74 TC(MIN.) = 22.57

=====

\*\*\*\*\*

FLOW PROCESS FROM NODE 213.00 TO NODE 213.10 IS CODE = 8

=====

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.170  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5  
SUBAREA AREA(ACRES) = 78.75 SUBAREA RUNOFF(CFS) = 112.56  
EFFECTIVE AREA(ACRES) = 496.16  
AVERAGED  $F_m$ (INCH/HR) = .581  
TOTAL AREA(ACRES) = 629.54  
PEAK FLOW RATE(CFS) = 719.48  
TC(MIN) = 22.57

=====

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\*\*\*\*\*

FLOW PROCESS FROM NODE 213.10 TO NODE 214.10 IS CODE = 3

=====

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 102.0 INCH PIPE IS 76.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 15.8  
UPSTREAM NODE ELEVATION = 1392.00

=====



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			3547	12A	

OVERFLOW

①  $Q_{100} = 167.3$  DRAINS ALONG CYPRESS  
 $Q_{25} = \frac{120.3}{47.0 \text{ CFS}}$  TOWARDS SOUTH

$\frac{47.0}{167.3} \times 78.9 = 22.2 \text{ AC}$

$T_c = 18.6$   
 $F_m = .58$

②  $Q_{100} = 159.4$   
 $Q_{25} = \frac{112.6}{46.8 \text{ CFS}}$

$\frac{46.8}{159.4} \times 78.75 = 23.1 \text{ AC}$

$T_c = 18.6$   
 $F_m = .58$

DOWNSTREAM NODE ELEVATION = 1384.00  
 FLOWLENGTH(Feet) = 1400.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 719.48  
 TRAVEL TIME(MIN.) = 1.48 TC(MIN.) = 24.05

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 214.00 TO NODE 214.10 IS CODE = 8  
 -----

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

=====  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.089  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 82.69 SUBAREA RUNOFF(CFS) = 112.16  
 EFFECTIVE AREA(ACRES) = 578.85  
 AVERAGED Fm(INCH/HR) = .581  
 TOTAL AREA(ACRES) = 712.23  
 PEAK FLOW RATE(CFS) = 785.46  
 TC(MIN) = 24.05

①  
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\*\*\*\*\*  
 FLOW PROCESS FROM NODE 214.10 TO NODE 214.10 IS CODE = 1  
 -----

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

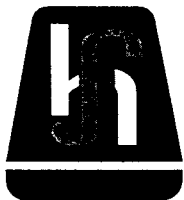
=====  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 24.05  
 RAINFALL INTENSITY (INCH./HOUR) = 2.09  
 EFFECTIVE STREAM AREA(ACRES) = 578.85  
 TOTAL STREAM AREA(ACRES) = 712.23  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 785.46

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 215.00 TO NODE 215.11 IS CODE = 2  
 -----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE  
  
 $TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
 INITIAL SUBAREA FLOW-LENGTH = 1000.00  
 UPSTREAM ELEVATION = 1528.00  
 DOWNSTREAM ELEVATION = 1495.00  
 ELEVATION DIFFERENCE = 33.00  
 $TC = .412 * [(1000.00 ** 3.00) / (33.00)] ** .20 = 12.918$   
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.033  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 11.03  
 TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 11.03



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			3547	13A

OVERFLOW

①  $Q_{100} = 159.7$

$Q_{25} = \frac{112.2}{47.5 \text{ CFS}}$

$\frac{47.5}{159.7} \times 82.7 = 24.6 \text{ AC}$

$T_c = 18.6$

$F_m = .582$

DRAIN ALONG CITRUS  
TOWARDS SOUTH



```

*****
FLOW PROCESS FROM NODE    215.11 TO NODE    215.12 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  10.4
UPSTREAM NODE ELEVATION =  1495.00
DOWNSTREAM NODE ELEVATION =  1466.50
FLOWLENGTH(FEET) =  1000.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  18.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    11.03
TRAVEL TIME(MIN.) =    1.61  TC(MIN.) =  14.53

*****
FLOW PROCESS FROM NODE    215.10 TO NODE    215.12 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.827
    SOIL CLASSIFICATION IS "A"
    RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5
    SUBAREA AREA(ACRES) =    5.00  SUBAREA RUNOFF(CFS) =  10.10
    EFFECTIVE AREA(ACRES) =  10.00
    AVERAGED Fm(INCH/HR) =  .582
    TOTAL AREA(ACRES) =  10.00
    PEAK FLOW RATE(CFS) =  20.20
    TC(MIN) =  14.53

*****
FLOW PROCESS FROM NODE    215.12 TO NODE    216.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  5.1
UPSTREAM NODE ELEVATION =  1466.50
DOWNSTREAM NODE ELEVATION =  1466.00
FLOWLENGTH(FEET) =  167.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  30.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    20.20
TRAVEL TIME(MIN.) =    .55  TC(MIN.) =  15.08

*****
FLOW PROCESS FROM NODE    216.00 TO NODE    216.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.764

```

SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.64  
 EFFECTIVE AREA(ACRES) = 20.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 20.00  
 PEAK FLOW RATE(CFS) = 39.28  
 TC(MIN) = 15.08

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 216.10 TO NODE 217.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.6 INCHES  
 PIPEFLOW VELOCITY(Feet/Sec.) = 6.0  
 UPSTREAM NODE ELEVATION = 1466.00  
 DOWNSTREAM NODE ELEVATION = 1465.00  
 FLOWLENGTH(Feet) = 330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 39.28  
 TRAVEL TIME(MIN.) = .91 TC(MIN.) = 15.99

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 217.00 TO NODE 217.10 IS CODE = 8  
 -----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.669  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 37.56  
 EFFECTIVE AREA(ACRES) = 40.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 40.00  
 PEAK FLOW RATE(CFS) = 75.12  
 TC(MIN) = 15.99

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 217.10 TO NODE 218.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.6 INCHES  
 PIPEFLOW VELOCITY(Feet/Sec.) = 6.9  
 UPSTREAM NODE ELEVATION = 1465.00  
 DOWNSTREAM NODE ELEVATION = 1463.00  
 FLOWLENGTH(Feet) = 670.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 75.12

TRAVEL TIME(MIN.) = 1.61 TC(MIN.) = 17.60

\*\*\*\*\*  
FLOW PROCESS FROM NODE 218.00 TO NODE 218.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.519  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 69.75  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 139.50  
TC(MIN) = 17.60

①  
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\*\*\*\*\*  
FLOW PROCESS FROM NODE 218.10 TO NODE 219.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 60.0 INCH PIPE IS 45.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 8.8  
UPSTREAM NODE ELEVATION = 1463.00  
DOWNSTREAM NODE ELEVATION = 1458.00  
FLOWLENGTH(FEET) = 1400.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 139.50  
TRAVEL TIME(MIN.) = 2.66 TC(MIN.) = 20.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 219.00 TO NODE 219.10 IS CODE = 8  
-----

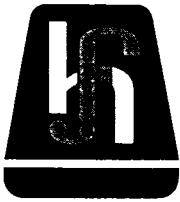
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.315  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 124.80  
EFFECTIVE AREA(ACRES) = 160.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 160.00  
PEAK FLOW RATE(CFS) = 249.59  
TC(MIN) = 20.26

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\*\*\*\*\*  
FLOW PROCESS FROM NODE 219.10 TO NODE 220.10 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<



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SUBJECT	BY	DATE	JOB NO.	SHEET OF
			3597	16A

OVERFLOW

①  $Q_{100} = 188.9$  DRAINS ALONG CYPRESS  
 $Q_{25} = \frac{139.5}{49.4 \text{ CFS}}$  TOWARDS SOUTH

$\frac{49.4}{188.9} \times 80 \text{ AC} = 20.9 \text{ AC}$

$T_c = 18.6 \text{ MIN}$   
 $F_m = .582$

②  $Q_{100} = 171.0$  DRAINS ALONG OLEANDER  
 $Q_{25} = \frac{124.8}{46.2 \text{ CFS}}$  TOWARDS SOUTH

$\frac{46.2}{171.0} \times 80 \text{ AC} = 21.6 \text{ AC}$

$T_c = 18.6 \text{ MIN}$   
 $F_m = .582$

>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

PIPEFLOW VELOCITY(FEET/SEC.)	=	12.7
UPSTREAM NODE ELEVATION	=	1458.00
DOWNSTREAM NODE ELEVATION	=	1451.00
FLOWLENGTH(FEET)	=	1400.00
MANNINGS N	=	.013
GIVEN PIPE DIAMETER(INCH)	=	60.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	249.59
TRAVEL TIME(MIN.)	=	1.84
TC(MIN.)	=	22.09

\*\*\*\*\*

FLOW PROCESS FROM NODE	220.00	TO NODE	220.10	IS CODE =	8
------------------------	--------	---------	--------	-----------	---

-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.198
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE	SUBAREA LOSS RATE, Fm(INCH/HR)	= .5
SUBAREA AREA(ACRES)	=	83.00
SUBAREA RUNOFF(CFS)	=	120.71
EFFECTIVE AREA(ACRES)	=	243.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	243.00
PEAK FLOW RATE(CFS)	=	353.39
TC(MIN)	=	22.09

1  
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FLOW PROCESS FROM NODE	220.10	TO NODE	214.10	IS CODE =	3
------------------------	--------	---------	--------	-----------	---

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 60.0 INCH PIPE IS	46.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	= 21.6
UPSTREAM NODE ELEVATION	= 1451.00
DOWNSTREAM NODE ELEVATION	= 1395.00
FLOWLENGTH(FEET)	= 2600.00
MANNINGS N	= .013
ESTIMATED PIPE DIAMETER(INCH)	= 60.00
NUMBER OF PIPES	= 1
PIPEFLOW THRU SUBAREA(CFS)	= 353.39
TRAVEL TIME(MIN.)	= 2.01
TC(MIN.)	= 24.10

\*\*\*\*\*

FLOW PROCESS FROM NODE	214.10	TO NODE	214.10	IS CODE =	1
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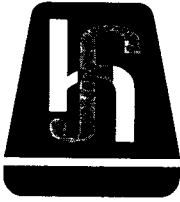
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM	2 ARE:
TIME OF CONCENTRATION(MINUTES)	= 24.10
RAINFALL INTENSITY (INCH./HOUR)	= 2.09
EFFECTIVE STREAM AREA(ACRES)	= 243.00
TOTAL STREAM AREA(ACRES)	= 243.00
PEAK FLOW RATE(CFS) AT CONFLUENCE	= 353.39



# Hall & Foreman, Inc.

CIVIL ENGINEERING

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SUBJECT

BY

DATE

JOB NO.

SHEET

OF

3547

17A

## OVERFLOW

①

$Q_{100} \ 168.9$

$Q_{25} = \frac{120.7}{48.2 \text{ CFS}}$

$\frac{48.2}{168.9} \times 83 = 23.7 \text{ AC}$

$T_c = .18.6$

$F_m = .582$

DRAINS ALONG CITRUS  
TOWARDS SOUTH

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA (ACRES)
1	785.46	24.05	2.089	.58	578.85
2	353.39	24.10	2.086	.58	243.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q (CFS)	EFFECTIVE AREA (ACRES)
1	1138.72	821.29
2	1137.35	821.85

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 1138.72 TIME (MINUTES) = 24.046

EFFECTIVE AREA (ACRES) = 821.29

TOTAL AREA (ACRES) = 955.23

\*\*\*\*\*

FLOW PROCESS FROM NODE 214.10 TO NODE 221.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1395.00

DOWNSTREAM NODE ELEVATION = 1380.00

CHANNEL LENGTH THRU SUBAREA (FEET) = 2600.00

CHANNEL BASE (FEET) = 16.00 "Z" FACTOR = .000

MANNINGS FACTOR = .015 MAXIMUM DEPTH (FEET) = 6.00

CHANNEL FLOW THRU SUBAREA (CFS) = 1138.72

FLOW VELOCITY (FEET/SEC) = 15.38 FLOW DEPTH (FEET) = 4.63

TRAVEL TIME (MIN.) = 2.82 TC (MIN.) = 26.86

\*\*\*\*\*

FLOW PROCESS FROM NODE 221.00 TO NODE 221.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY (INCH/HOUR) = 1.955

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm (INCH/HR) = .5

SUBAREA AREA (ACRES) = 156.00 SUBAREA RUNOFF (CFS) = 192.72

EFFECTIVE AREA (ACRES) = 977.29

AVERAGED Fm (INCH/HR) = .582

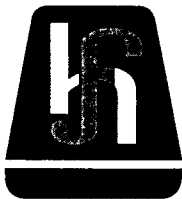
TOTAL AREA (ACRES) = 1111.23

PEAK FLOW RATE (CFS) = 1207.67

TC (MIN) = 26.86

1  
SEE  
NEXT  
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# Hall & Foreman, Inc.

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
			3547	18A

OVERFLOW

①  $Q_{100} = 277.5$   
 $Q_{25} = 192.7$   
84.8 CFS

DRAINS ALONG ALMERIA  
TOWARDS SOUTH

$\frac{84.8}{277.5} \times 156 = 47.7 \text{ AC}$

$T_c = 18.6$   
 $F_m = .582$



```

FLOW PROCESS FROM NODE    221.10 TO NODE    221.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM    1 ARE:
TIME OF CONCENTRATION(MINUTES) =    26.86
RAINFALL INTENSITY (INCH./HOUR) =     1.95
EFFECTIVE STREAM AREA(ACRES) =    977.29
TOTAL STREAM AREA(ACRES) =    1111.23
PEAK FLOW RATE(CFS) AT CONFLUENCE =    1207.67

*****
FLOW PROCESS FROM NODE    222.00 TO NODE    222.11 IS CODE =    2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
DEVELOPMENT IS    SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH =    1000.00
UPSTREAM ELEVATION =    1511.00
DOWNSTREAM ELEVATION =    1481.00
ELEVATION DIFFERENCE =     30.00
TC = .412*[( 1000.00** 3.00)/(    30.00)]** .20 =    13.167
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =     2.998
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA RUNOFF(CFS) =     10.87
TOTAL AREA(ACRES) =     5.00    PEAK FLOW RATE(CFS) =     10.87

*****
FLOW PROCESS FROM NODE    222.11 TO NODE    222.12 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =    10.7
UPSTREAM NODE ELEVATION =    1481.00
DOWNSTREAM NODE ELEVATION =    1450.00
FLOWLENGTH(FEET) =    1000.00    MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) =    18.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =     10.87
TRAVEL TIME(MIN.) =     1.56    TC(MIN.) =    14.73

*****
FLOW PROCESS FROM NODE    222.10 TO NODE    222.12 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =     2.803

```

SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 10.00  
 EFFECTIVE AREA(ACRES) = 10.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 10.00  
 PEAK FLOW RATE(CFS) = 19.99  
 TC(MIN) = 14.73

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 222.12 TO NODE 223.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.2 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 6.6  
 UPSTREAM NODE ELEVATION = 1450.00  
 DOWNSTREAM NODE ELEVATION = 1449.00  
 FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 19.99  
 TRAVEL TIME(MIN.) = .42 TC(MIN.) = 15.15

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 223.00 TO NODE 223.10 IS CODE = 8  
 -----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.756  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.57  
 EFFECTIVE AREA(ACRES) = 20.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 20.00  
 PEAK FLOW RATE(CFS) = 39.14  
 TC(MIN) = 15.15

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 223.10 TO NODE 224.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.2 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 8.0  
 UPSTREAM NODE ELEVATION = 1449.00  
 DOWNSTREAM NODE ELEVATION = 1446.80  
 FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 39.14

TRAVEL TIME(MIN.) = .68 TC(MIN.) = 15.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 224.00 TO NODE 224.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.684  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 37.84  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 75.68  
TC(MIN) = 15.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 224.10 TO NODE 225.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 8.5  
UPSTREAM NODE ELEVATION = 1446.80  
DOWNSTREAM NODE ELEVATION = 1443.50  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 75.68  
TRAVEL TIME(MIN.) = 1.31 TC(MIN.) = 17.15

\*\*\*\*\*  
FLOW PROCESS FROM NODE 225.00 TO NODE 225.10 IS CODE = 8  
-----

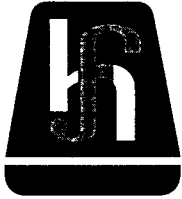
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.559  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 71.17  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 142.34  
TC(MIN) = 17.15

①  
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\*\*\*\*\*  
FLOW PROCESS FROM NODE 225.10 TO NODE 226.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<



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SUBJECT

BY

DATE

JOB NO.

3547

SHEET

OF

21A

## OVERFLOW

①

$$Q_{100} = 192.3$$

DRAINS ALONG ALMERIA

$$Q_{25} = \frac{142.3}{50 \text{ CFS}}$$

TOWARDS SOUTH

$$\frac{50}{192.3} \times 80 = 20.8 \text{ AC}$$

$$T_c = 17.2$$

$$F_m = .582$$

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

=====

DEPTH OF FLOW IN	54.0 INCH PIPE IS	39.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	11.3
UPSTREAM NODE ELEVATION	=	1443.50
DOWNSTREAM NODE ELEVATION	=	1435.00
FLOWLENGTH(FEET)	=	1225.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	54.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	142.34
TRAVEL TIME(MIN.)	=	1.80
TC(MIN.)	=	18.95

\*\*\*\*\*

FLOW PROCESS FROM NODE	226.00	TO NODE	226.10	IS CODE =	8
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>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	2.410
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	74.00
SUBAREA RUNOFF(CFS)	=	121.76
EFFECTIVE AREA(ACRES)	=	154.00
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	154.00
PEAK FLOW RATE(CFS)	=	253.39
TC(MIN)	=	18.95

1  
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FLOW PROCESS FROM NODE	226.10	TO NODE	221.10	IS CODE =	3
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-----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

=====

DEPTH OF FLOW IN	54.0 INCH PIPE IS	40.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	19.9
UPSTREAM NODE ELEVATION	=	1435.00
DOWNSTREAM NODE ELEVATION	=	1380.00
FLOWLENGTH(FEET)	=	2600.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	54.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	253.39
TRAVEL TIME(MIN.)	=	2.18
TC(MIN.)	=	21.13

\*\*\*\*\*

FLOW PROCESS FROM NODE	221.10	TO NODE	221.10	IS CODE =	1
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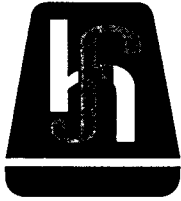
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>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM	2 ARE:	
TIME OF CONCENTRATION(MINUTES)	=	21.13
RAINFALL INTENSITY (INCH./HOUR)	=	2.26
EFFECTIVE STREAM AREA(ACRES)	=	154.00
TOTAL STREAM AREA(ACRES)	=	154.00



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SUBJECT	BY	DATE	JOB NO.	SHEET OF
			3547	22A
<u>OVERFLOW</u>				
<p>① <math>Q_{100} = 165.9</math></p> <p><math>Q_{25} = \frac{121.8}{44.1}</math></p> <p><math>\frac{44.1}{165.9} \times 74 = 19.7 \text{ AC}</math></p> <p><math>T_c = 18.6</math></p> <p><math>F_m = .582</math></p> <p>DRAINS ALONG KNOX TOWARDS SOUTH</p>				

PEAK FLOW RATE(CFS) AT CONFLUENCE = 253.39

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1207.67	26.86	1.955	.58	977.29
2	253.39	21.13	2.258	.58	154.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	1415.24	1131.29
2	1412.80	922.64

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1415.24 TIME(MINUTES) = 26.865

EFFECTIVE AREA(ACRES) = 1131.29

TOTAL AREA(ACRES) = 1265.23

\*\*\*\*\*  
FLOW PROCESS FROM NODE 221.10 TO NODE 227.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1380.00
DOWNSTREAM NODE ELEVATION =	1362.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	2670.00
CHANNEL BASE(FEET) =	16.00
"Z" FACTOR =	.000
MANNINGS FACTOR =	.015
MAXIMUM DEPTH(FEET) =	6.00
CHANNEL FLOW THRU SUBAREA(CFS) =	1415.24
FLOW VELOCITY(FEET/SEC) =	17.35
FLOW DEPTH(FEET) =	5.10
TRAVEL TIME(MIN.) =	2.56
TC(MIN.) =	29.43

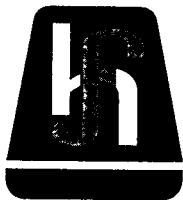
\*\*\*\*\*  
FLOW PROCESS FROM NODE 227.00 TO NODE 227.10 IS CODE = 8

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) =	1.851
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5
SUBAREA AREA(ACRES) =	160.25
SUBAREA RUNOFF(CFS) =	182.96
EFFECTIVE AREA(ACRES) =	1291.54
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	1425.48
PEAK FLOW RATE(CFS) =	1474.93
TC(MIN) =	29.43

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
			3547	23A

①  $Q_{100} = 267.6$  DRAINS ALONG SULTANA  
 $Q_{25} = \underline{183.0}$  TOWARDS SOUTH  
 $84.6 \text{ CFS}$

$\frac{84.6}{267.6} \times 160.25 = 50.7 \text{ AC}$

$T_c = 18.6$

$F_m = .582$



```

*****
FLOW PROCESS FROM NODE 227.10 TO NODE 227.10 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 29.43
RAINFALL INTENSITY (INCH./HOUR) = 1.85
EFFECTIVE STREAM AREA(ACRES) = 1291.54
TOTAL STREAM AREA(ACRES) = 1425.48
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1474.93

*****
FLOW PROCESS FROM NODE 228.00 TO NODE 228.11 IS CODE = 2
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH = 1000.00
UPSTREAM ELEVATION = 1491.00
DOWNSTREAM ELEVATION = 1462.00
ELEVATION DIFFERENCE = 29.00
TC = .412*[( 1000.00** 3.00)/( 29.00)]** .20 = 13.256
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.986
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) - .5
SUBAREA RUNOFF(CFS) = 10.82
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 10.82

*****
FLOW PROCESS FROM NODE 228.11 TO NODE 228.12 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 10.3
UPSTREAM NODE ELEVATION = 1462.00
DOWNSTREAM NODE ELEVATION = 1433.50
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 10.82
TRAVEL TIME(MIN.) = 1.61 TC(MIN.) = 14.87

*****
FLOW PROCESS FROM NODE 228.10 TO NODE 228.12 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.787

```

SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 9.92  
 EFFECTIVE AREA(ACRES) = 10.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 10.00  
 PEAK FLOW RATE(CFS) = 19.85  
 TC(MIN) = 14.87

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 228.12 TO NODE 229.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.7 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 7.6  
 UPSTREAM NODE ELEVATION = 1433.50  
 DOWNSTREAM NODE ELEVATION = 1432.00  
 FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 19.85  
 TRAVEL TIME(MIN.) = .37 TC(MIN.) = 15.24

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 229.00 TO NODE 229.10 IS CODE = 8  
 -----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.747  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.48  
 EFFECTIVE AREA(ACRES) = 20.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 20.00  
 PEAK FLOW RATE(CFS) = 38.96  
 TC(MIN) = 15.24

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 229.10 TO NODE 230.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.2 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 9.2  
 UPSTREAM NODE ELEVATION = 1432.00  
 DOWNSTREAM NODE ELEVATION = 1429.00  
 FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 38.96

TRAVEL TIME(MIN.) = .60 TC(MIN.) = 15.84

\*\*\*\*\*  
FLOW PROCESS FROM NODE 230.00 TO NODE 230.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.684  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 37.83  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 75.67  
TC(MIN) = 15.84

\*\*\*\*\*  
FLOW PROCESS FROM NODE 230.10 TO NODE 231.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.0  
UPSTREAM NODE ELEVATION = 1429.00  
DOWNSTREAM NODE ELEVATION = 1424.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 75.67  
TRAVEL TIME(MIN.) = 1.12 TC(MIN.) = 16.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 231.00 TO NODE 231.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.576  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 71.78  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 143.56  
TC(MIN) = 16.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 231.10 TO NODE 232.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.1 INCHES  
PIPEFLOW VELOCITY(Feet/sec.) = 17.0  
UPSTREAM NODE ELEVATION = 1424.00  
DOWNSTREAM NODE ELEVATION = 1416.00  
FLOWLENGTH(Feet) = 670.00 MANNINGS N = .010  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 143.56  
TRAVEL TIME(MIN.) = .66 TC(MIN.) = 17.61

\*\*\*\*\*

FLOW PROCESS FROM NODE 232.00 TO NODE 233.10 IS CODE = 8

-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.518  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 69.69  
EFFECTIVE AREA(ACRES) = 120.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 120.00  
PEAK FLOW RATE(CFS) = 209.08  
TC(MIN) = 17.61

\*\*\*\*\*

FLOW PROCESS FROM NODE 232.10 TO NODE 233.10 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.7 INCHES  
PIPEFLOW VELOCITY(Feet/sec.) = 15.9  
UPSTREAM NODE ELEVATION = 1416.00  
DOWNSTREAM NODE ELEVATION = 1407.00  
FLOWLENGTH(Feet) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 209.08  
TRAVEL TIME(MIN.) = .70 TC(MIN.) = 18.32

\*\*\*\*\*

FLOW PROCESS FROM NODE 233.00 TO NODE 233.10 IS CODE = 8

-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.460  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 46.00 SUBAREA RUNOFF(CFS) = 77.73  
EFFECTIVE AREA(ACRES) = 166.00  
AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 166.00  
PEAK FLOW RATE(CFS) = 280.50  
TC(MIN) = 18.32

\*\*\*\*\*  
FLOW PROCESS FROM NODE 233.10 TO NODE 227.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 57.0 INCH PIPE IS 45.4 INCHES	<div>① SEE NEXT PAGE</div>
PIPEFLOW VELOCITY(FEET/SEC.) = 18.6	
UPSTREAM NODE ELEVATION = 1407.00	
DOWNSTREAM NODE ELEVATION = 1362.00	
FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013	
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1	
PIPEFLOW THRU SUBAREA(CFS) = 280.50	
TRAVEL TIME(MIN.) = 2.38 TC(MIN.) = 20.70	

=====

\*\*\*\*\*  
FLOW PROCESS FROM NODE 227.10 TO NODE 227.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MINUTES) = 20.70  
RAINFALL INTENSITY (INCH./HOUR) = 2.29  
EFFECTIVE STREAM AREA(ACRES) = 166.00  
TOTAL STREAM AREA(ACRES) = 166.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 280.50

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1474.93	29.43	1.851	.58	1291.54
2	280.50	20.70	2.286	.58	166.00

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

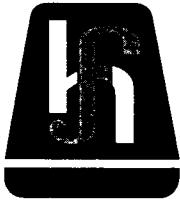
SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1683.80	1457.54
2	1673.57	1074.39

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1683.80 TIME(MINUTES) = 29.429  
EFFECTIVE AREA(ACRES) = 1457.54  
TOTAL AREA(ACRES) = 1591.48



# Hall & Foreman, Inc.

CIVIL ENGINEERING • LAND PLANNING • LAND SURVEYING

SUBJECT	BY	DATE	JOB NO.	SHEET OF
			3547	28A

OVERFLOW

①  $Q_{100} = 380.4$  DRAINS ALONG BEECH  
 $Q_{25} = \frac{280.5}{39.9 \text{ CFS}}$  TOWARDS SOUTH

$\frac{39.9}{380.4} \times 166 = 43.6 \text{ AC}$

$T_c = 18.6$

$F_m = .582$

\*\*\*\*\*  
FLOW PROCESS FROM NODE 227.10 TO NODE 234.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION	=	1362.00
DOWNSTREAM NODE ELEVATION	=	1336.00
CHANNEL LENGTH THRU SUBAREA(Feet)	=	2700.00
CHANNEL BASE(Feet)	=	18.00
"Z" FACTOR	=	.000
MANNINGS FACTOR	=	.015
MAXIMUM DEPTH(Feet)	=	6.00
CHANNEL FLOW THRU SUBAREA(CFS)	=	1683.80
FLOW VELOCITY(Feet/Sec)	=	20.42
FLOW DEPTH(Feet)	=	4.58
TRAVEL TIME(Min.)	=	2.20
TC(Min.)	=	31.63

\*\*\*\*\*  
FLOW PROCESS FROM NODE 234.00 TO NODE 234.10 IS CODE = 8  
-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	1.772
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	160.00
SUBAREA RUNOFF(CFS)	=	171.38
EFFECTIVE AREA(ACRES)	=	1617.54
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	1751.48
PEAK FLOW RATE(CFS)	=	1732.88
TC(Min)	=	31.63

\*\*\*\*\*  
FLOW PROCESS FROM NODE 234.10 TO NODE 234.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:	
TIME OF CONCENTRATION(MINUTES)	= 31.63
RAINFALL INTENSITY (INCH./HOUR)	= 1.77
EFFECTIVE STREAM AREA(ACRES)	= 1617.54
TOTAL STREAM AREA(ACRES)	= 1751.48
PEAK FLOW RATE(CFS) AT CONFLUENCE	= 1732.88

\*\*\*\*\*  
FLOW PROCESS FROM NODE 235.00 TO NODE 235.11 IS CODE = 2  
-----

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

=====

DEVELOPMENT IS	SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE
TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20	
INITIAL SUBAREA FLOW-LENGTH	= 1000.00
UPSTREAM ELEVATION	= 1463.00

DOWNSTREAM ELEVATION = 1435.00  
 ELEVATION DIFFERENCE = 28.00  
 $TC = .412 * [(1000.00 * 3.00) / (28.00)] * .20 = 13.350$   
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.974  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 10.76  
 TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 10.76

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 235.11 TO NODE 235.12 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====  
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000  
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.2 INCHES  
 PIPEFLOW VELOCITY(Feet/sec.) = 10.5  
 UPSTREAM NODE ELEVATION = 1435.00  
 DOWNSTREAM NODE ELEVATION = 1405.50  
 FLOWLENGTH(Feet) = 1000.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 10.76  
 TRAVEL TIME(MIN.) = 1.59 TC(MIN.) = 14.94

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 235.10 TO NODE 235.12 IS CODE = 8  
 -----

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

=====  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.779  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 9.89  
 EFFECTIVE AREA(ACRES) = 10.00  
 AVERAGED  $F_m$ (INCH/HR) = .582  
 TOTAL AREA(ACRES) = 10.00  
 PEAK FLOW RATE(CFS) = 19.77  
 TC(MIN) = 14.94

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 235.12 TO NODE 236.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====  
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.8 INCHES  
 PIPEFLOW VELOCITY(Feet/sec.) = 3.8  
 UPSTREAM NODE ELEVATION = 1405.50  
 DOWNSTREAM NODE ELEVATION = 1404.00  
 FLOWLENGTH(Feet) = 1000.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1



PIPEFLOW THRU SUBAREA(CFS) = 19.77  
TRAVEL TIME(MIN.) = 4.35 TC(MIN.) = 19.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 236.00 TO NODE 236.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.384  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 16.22  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 32.44  
TC(MIN) = 19.29

\*\*\*\*\*  
FLOW PROCESS FROM NODE 236.10 TO NODE 237.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.2  
UPSTREAM NODE ELEVATION = 1404.00  
DOWNSTREAM NODE ELEVATION = 1401.00  
FLOWLENGTH(FEET) = 170.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 32.44  
TRAVEL TIME(MIN.) = .25 TC(MIN.) = 19.55

\*\*\*\*\*  
FLOW PROCESS FROM NODE 237.00 TO NODE 237.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.366  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 32.10  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 64.21  
TC(MIN) = 19.55

\*\*\*\*\*  
FLOW PROCESS FROM NODE 237.10 TO NODE 238.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

```
=====
DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.4 INCHES
PIPEFLOW VELOCITY(Feet/sec.) = 10.3
UPSTREAM NODE ELEVATION = 1401.00
DOWNSTREAM NODE ELEVATION = 1395.00
FLOWLENGTH(Feet) = 670.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 64.21
TRAVEL TIME(MIN.) = 1.09 TC(MIN.) = 20.63
=====
```

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 238.00 TO NODE 238.10 IS CODE = 8  
 -----

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

```
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.290
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 61.49
EFFECTIVE AREA(ACRES) = 80.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 80.00
PEAK FLOW RATE(CFS) = 122.99
TC(MIN) = 20.63
=====
```

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 238.10 TO NODE 239.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

```
=====
DEPTH OF FLOW IN 48.0 INCH PIPE IS 36.4 INCHES
PIPEFLOW VELOCITY(Feet/sec.) = 12.0
UPSTREAM NODE ELEVATION = 1395.00
DOWNSTREAM NODE ELEVATION = 1383.00
FLOWLENGTH(Feet) = 1330.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 122.99
TRAVEL TIME(MIN.) = 1.85 TC(MIN.) = 22.48
=====
```

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 239.00 TO NODE 239.10 IS CODE = 8  
 -----

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

```
=====
25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.175
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 114.73
EFFECTIVE AREA(ACRES) = 160.00
=====
```

AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 160.00  
 PEAK FLOW RATE(CFS) = 229.45  
 TC(MIN) = 22.48

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 239.10 TO NODE 234.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 54.0 INCH PIPE IS 39.7 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 18.3  
 UPSTREAM NODE ELEVATION = 1383.00  
 DOWNSTREAM NODE ELEVATION = 1336.00  
 FLOWLENGTH(FEET) = 2600.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 229.45  
 TRAVEL TIME(MIN.) = 2.37 TC(MIN.) = 24.84

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 234.10 TO NODE 234.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 24.84  
 RAINFALL INTENSITY (INCH./HOUR) = 2.05  
 EFFECTIVE STREAM AREA(ACRES) = 160.00  
 TOTAL STREAM AREA(ACRES) = 160.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 229.45

#### CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1732.88	31.63	1.772	.58	1617.54
2	229.45	24.84	2.049	.58	160.00

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

#### SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	1919.07	1777.54
2	1906.45	1430.31

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1919.07 TIME(MINUTES) = 31.634  
 EFFECTIVE AREA(ACRES) = 1777.54  
 TOTAL AREA(ACRES) = 1911.48

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 234.10 TO NODE 240.10 IS CODE = 5  
 -----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
 >>>>TRAVELTIME THRU SUBAREA<<<<  
 =====

UPSTREAM NODE ELEVATION = 1336.00  
 DOWNSTREAM NODE ELEVATION = 1311.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 2650.00  
 CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = .000  
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 6.00  
 CHANNEL FLOW THRU SUBAREA(CFS) = 1919.07  
 FLOW VELOCITY(FEET/SEC) = 20.73 FLOW DEPTH(FEET) = 4.63  
 TRAVEL TIME(MIN.) = 2.13 TC(MIN.) = 33.76

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 240.00 TO NODE 240.10 IS CODE = 8  
 -----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.704  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 160.00 SUBAREA RUNOFF(CFS) = 161.59  
 EFFECTIVE AREA(ACRES) = 1937.54  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 2071.48  
 PEAK FLOW RATE(CFS) = 1957.11  
 TC(MIN) = 33.76

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 240.10 TO NODE 240.10 IS CODE = 1  
 -----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 33.76  
 RAINFALL INTENSITY (INCH./HOUR) = 1.70  
 EFFECTIVE STREAM AREA(ACRES) = 1937.54  
 TOTAL STREAM AREA(ACRES) = 2071.48  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1957.11

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 241.00 TO NODE 241.11 IS CODE = 2  
 -----

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
 INITIAL SUBAREA FLOW-LENGTH = 1000.00

UPSTREAM ELEVATION = 1431.00  
 DOWNSTREAM ELEVATION = 1406.00  
 ELEVATION DIFFERENCE = 25.00  
 $TC = .412 * [(1000.00 * 3.00) / (25.00)] * .20 = 13.656$   
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.934  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 10.58  
 TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 10.58

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 241.11 TO NODE 241.12 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====  
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.6 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 9.8  
 UPSTREAM NODE ELEVATION = 1406.00  
 DOWNSTREAM NODE ELEVATION = 1381.00  
 FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 10.58  
 TRAVEL TIME(MIN.) = 1.71 TC(MIN.) = 15.36

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 241.10 TO NODE 241.12 IS CODE = 8  
 -----

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

=====  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.733  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m$ (INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 9.68  
 EFFECTIVE AREA(ACRES) = 10.00  
 AVERAGED  $F_m$ (INCH/HR) = .582  
 TOTAL AREA(ACRES) = 10.00  
 PEAK FLOW RATE(CFS) = 19.36  
 TC(MIN) = 15.36

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 241.12 TO NODE 242.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====  
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 16.3 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 8.5  
 UPSTREAM NODE ELEVATION = 1381.00  
 DOWNSTREAM NODE ELEVATION = 1379.00  
 FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 19.36  
TRAVEL TIME(MIN.) = .33 TC(MIN.) = 15.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 242.00 TO NODE 242.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.699  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.06  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 38.11  
TC(MIN) = 15.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 242.10 TO NODE 243.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.7 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.0  
UPSTREAM NODE ELEVATION = 1379.00  
DOWNSTREAM NODE ELEVATION = 1375.00  
FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 38.11  
TRAVEL TIME(MIN.) = .55 TC(MIN.) = 16.24

\*\*\*\*\*  
FLOW PROCESS FROM NODE 243.00 TO NODE 243.10 IS CODE = 8  
-----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.644  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 37.12  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 74.24  
TC(MIN) = 16.24

\*\*\*\*\*  
FLOW PROCESS FROM NODE 243.10 TO NODE 244.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 39.0 INCH PIPE IS 29.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.2  
UPSTREAM NODE ELEVATION = 1375.00  
DOWNSTREAM NODE ELEVATION = 1368.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 74.24  
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 17.23

\*\*\*\*\*

FLOW PROCESS FROM NODE 244.00 TO NODE 244.10 IS CODE = 8

-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.551  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 70.90  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 141.80  
TC(MIN) = 17.23

\*\*\*\*\*

FLOW PROCESS FROM NODE 244.10 TO NODE 245.10 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 51.0 INCH PIPE IS 38.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 12.5  
UPSTREAM NODE ELEVATION = 1368.00  
DOWNSTREAM NODE ELEVATION = 1356.00  
FLOWLENGTH(FEET) = 1330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 141.80  
TRAVEL TIME(MIN.) = 1.78 TC(MIN.) = 19.01

\*\*\*\*\*

FLOW PROCESS FROM NODE 245.00 TO NODE 245.10 IS CODE = 8

-----

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

=====

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.406  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 131.30  
EFFECTIVE AREA(ACRES) = 160.00

AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 160.00  
 PEAK FLOW RATE(CFS) = 262.61  
 TC(MIN) = 19.01

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 245.10 TO NODE 240.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====  
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.7 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 18.5  
 UPSTREAM NODE ELEVATION = 1356.00  
 DOWNSTREAM NODE ELEVATION = 1311.00  
 FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 262.61  
 TRAVEL TIME(MIN.) = 2.39 TC(MIN.) = 21.40

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 240.10 TO NODE 240.10 IS CODE = 1  
 -----

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

=====  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 21.40  
 RAINFALL INTENSITY (INCH./HOUR) = 2.24  
 EFFECTIVE STREAM AREA(ACRES) = 160.00  
 TOTAL STREAM AREA(ACRES) = 160.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 262.61

#### CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1957.11	33.76	1.704	.58	1937.54
2	262.61	21.40	2.240	.58	160.00

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

#### SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	2134.80	2097.54
2	2095.76	1388.06

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 2134.80 TIME(MINUTES) = 33.764  
 EFFECTIVE AREA(ACRES) = 2097.54  
 TOTAL AREA(ACRES) = 2231.48



\*\*\*\*\*  
 FLOW PROCESS FROM NODE 240.10 TO NODE 240.10 IS CODE = 1  
 -----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 33.76  
 RAINFALL INTENSITY (INCH./HOUR) = 1.70  
 EFFECTIVE STREAM AREA(ACRES) = 2097.54  
 TOTAL STREAM AREA(ACRES) = 2231.48  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2134.80

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2134.80	33.76	1.704	.58	2097.54

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
 CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	2134.80	2097.54
---	---------	---------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 2134.80 TIME(MINUTES) = 33.764  
 EFFECTIVE AREA(ACRES) = 2097.54  
 TOTAL AREA(ACRES) = 2231.48

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 240.10 TO NODE 109.01 IS CODE = 5  
 -----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
 >>>>TRAVELTIME THRU SUBAREA<<<<  
 =====

UPSTREAM NODE ELEVATION = 1311.00  
 DOWNSTREAM NODE ELEVATION = 1263.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 5300.00  
 CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = .000  
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00  
 CHANNEL FLOW THRU SUBAREA(CFS) = 2134.80  
 FLOW VELOCITY(FEET/SEC) = 21.15 FLOW DEPTH(FEET) = 5.05  
 TRAVEL TIME(MIN.) = 4.18 TC(MIN.) = 37.94

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 240.10 TO NODE 190.01 IS CODE = 8  
 -----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.589

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 5-7 DWELLINGS/ACRE SUBAREA LOSS RATE,  $F_m(\text{INCH/HR}) = .4$   
SUBAREA AREA(ACRES) = 283.00 SUBAREA RUNOFF(CFS) = 281.18  
EFFECTIVE AREA(ACRES) = 2380.54  
AVERAGED  $F_m(\text{INCH/HR}) = .570$   
TOTAL AREA(ACRES) = 2514.48  
PEAK FLOW RATE(CFS) = 2182.46  
TC(MIN) = 37.94

\*\*\*\*\*  
FLOW PROCESS FROM NODE 109.01 TO NODE 109.01 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 37.94  
RAINFALL INTENSITY (INCH./HOUR) = 1.59  
EFFECTIVE STREAM AREA(ACRES) = 2380.54  
TOTAL STREAM AREA(ACRES) = 2514.48  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2182.46

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2182.46	37.94	1.589	.57	2380.54

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	2182.46	2380.54

-----

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
PEAK FLOW RATE(CFS) = 2182.46 TIME(MINUTES) = 37.941  
EFFECTIVE AREA(ACRES) = 2380.54  
TOTAL AREA(ACRES) = 2514.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 247.00 TO NODE 247.11 IS CODE = 2  
-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

$TC = K * [(\text{LENGTH} * 3.00) / (\text{ELEVATION CHANGE})] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1405.00  
DOWNSTREAM ELEVATION = 1380.00  
ELEVATION DIFFERENCE = 25.00  
 $TC = .412 * [(1000.00 * 3.00) / (25.00)] ** .20 = 13.656$

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.934  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 10.58  
 TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 10.58

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 247.11 TO NODE 247.12 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.5 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 9.8  
 UPSTREAM NODE ELEVATION = 1380.00  
 DOWNSTREAM NODE ELEVATION = 1354.50  
 FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 10.58  
 TRAVEL TIME(MIN.) = 1.69 TC(MIN.) = 15.35

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 247.10 TO NODE 247.12 IS CODE = 8  
 -----

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.735  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 9.69  
 EFFECTIVE AREA(ACRES) = 10.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 10.00  
 PEAK FLOW RATE(CFS) = 19.38  
 TC(MIN) = 15.35

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 247.12 TO NODE 248.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.3 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 7.6  
 UPSTREAM NODE ELEVATION = 1354.50  
 DOWNSTREAM NODE ELEVATION = 1353.00  
 FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 19.38  
 TRAVEL TIME(MIN.) = .37 TC(MIN.) = 15.72

```
*****
FLOW PROCESS FROM NODE    248.00 TO NODE    248.10 IS CODE =    8
-----
```

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

```
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.696
    SOIL CLASSIFICATION IS "A"
    RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =    .5
    SUBAREA AREA(ACRES) =    10.00    SUBAREA RUNOFF(CFS) =    19.03
    EFFECTIVE AREA(ACRES) =    20.00
    AVERAGED Fm(INCH/HR) =    .582
    TOTAL AREA(ACRES) =    20.00
    PEAK FLOW RATE(CFS) =    38.05
    TC(MIN) =    15.72
```

```
*****
FLOW PROCESS FROM NODE    248.10 TO NODE    249.10 IS CODE =    3
-----
```

```
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
```

```
    DEPTH OF FLOW IN    30.0 INCH PIPE IS    24.5 INCHES
    PIPEFLOW VELOCITY(FEET/SEC.) =    8.9
    UPSTREAM NODE ELEVATION =    1353.00
    DOWNSTREAM NODE ELEVATION =    1350.00
    FLOWLENGTH(FEET) =    330.00    MANNINGS N =    .013
    ESTIMATED PIPE DIAMETER(INCH) =    30.00    NUMBER OF PIPES =    1
    PIPEFLOW THRU SUBAREA(CFS) =    38.05
    TRAVEL TIME(MIN.) =    .62    TC(MIN.) =    16.34
```

```
*****
FLOW PROCESS FROM NODE    249.00 TO NODE    249.10 IS CODE =    8
-----
```

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

```
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.634
    SOIL CLASSIFICATION IS "A"
    RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =    .5
    SUBAREA AREA(ACRES) =    20.00    SUBAREA RUNOFF(CFS) =    36.94
    EFFECTIVE AREA(ACRES) =    40.00
    AVERAGED Fm(INCH/HR) =    .582
    TOTAL AREA(ACRES) =    40.00
    PEAK FLOW RATE(CFS) =    73.88
    TC(MIN) =    16.34
```

```
*****
FLOW PROCESS FROM NODE    249.10 TO NODE    250.10 IS CODE =    3
-----
```

```
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
```

```
    DEPTH OF FLOW IN    42.0 INCH PIPE IS    33.5 INCHES
```

PIPEFLOW VELOCITY(FEET/SEC.) = 9.0  
 UPSTREAM NODE ELEVATION = 1350.00  
 DOWNSTREAM NODE ELEVATION = 1346.00  
 FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 73.88  
 TRAVEL TIME(MIN.) = 1.24 TC(MIN.) = 17.58

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 250.00 TO NODE 250.10 IS CODE = 8  
 -----

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

=====  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.521  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 69.79  
 EFFECTIVE AREA(ACRES) = 80.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 80.00  
 PEAK FLOW RATE(CFS) = 139.58  
 TC(MIN) = 17.58

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 250.10 TO NODE 251.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====  
 DEPTH OF FLOW IN 57.0 INCH PIPE IS 41.1 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 10.2  
 UPSTREAM NODE ELEVATION = 1346.00  
 DOWNSTREAM NODE ELEVATION = 1339.00  
 FLOWLENGTH(FEET) = 1330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 139.58  
 TRAVEL TIME(MIN.) = 2.17 TC(MIN.) = 19.75

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 251.00 TO NODE 251.10 IS CODE = 8  
 -----

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

=====  
 25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.351  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 74.00 SUBAREA RUNOFF(CFS) = 117.79  
 EFFECTIVE AREA(ACRES) = 154.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 154.00  
 PEAK FLOW RATE(CFS) = 245.12  
 TC(MIN) = 19.75

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 251.10 TO NODE 252.10 IS CODE = 3

-----  
 >>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 63.0 INCH PIPE IS 46.3 INCHES  
 PIPEFLOW VELOCITY(Feet/sec.) = 14.4  
 UPSTREAM NODE ELEVATION = 1339.00  
 DOWNSTREAM NODE ELEVATION = 1320.00  
 FLOWLENGTH(Feet) = 2100.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 245.12  
 TRAVEL TIME(MIN.) = 2.44 TC(MIN.) = 22.19

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 252.00 TO NODE 252.10 IS CODE = 8

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

25 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.192  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 65.00 SUBAREA RUNOFF(CFS) = 94.19  
 EFFECTIVE AREA(ACRES) = 219.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 219.00  
 PEAK FLOW RATE(CFS) = 317.35  
 TC(MIN) = 22.19

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 252.10 TO NODE 252.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 22.19  
 RAINFALL INTENSITY (INCH./HOUR) = 2.19  
 EFFECTIVE STREAM AREA(ACRES) = 219.00  
 TOTAL STREAM AREA(ACRES) = 219.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 317.35

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	317.35	22.19	2.192	.58	219.00

-----  
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
 CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q (CFS)	EFFECTIVE AREA (ACRES)
------------------	-----------------------	---------------------------

1	317.35	219.00
---	--------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 317.35 TIME(MINUTES) = 22.192

EFFECTIVE AREA(ACRES) = 219.00

TOTAL AREA(ACRES) = 219.00

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 219.00

EFFECTIVE AREA(ACRES) = 219.00

PEAK FLOW RATE(CFS) = 317.35

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
 (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
 Copyright 1983,86,87 Advanced Engineering Software (aes)  
 Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN  
 \*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* NORTH FONTANA MASTER STORM DRAIN, LINE D  
 \* Q 100-YEAR, NOT DESIGN Q  
 \* JN 3547  
 \*\*\*\*\*

FILE NAME: LINED.100  
 TIME/DATE OF STUDY: 2: 3 1/ 1/1980

=====

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 =  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
 10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.040  
 100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.520  
 COMPUTED RAINFALL INTENSITY DATA:  
 STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.5200  
 SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 200.00 TO NODE 200.10 IS CODE = 2

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
 INITIAL SUBAREA FLOW-LENGTH = 1000.00  
 UPSTREAM ELEVATION = 1530.10  
 DOWNSTREAM ELEVATION = 1508.10  
 ELEVATION DIFFERENCE = 22.00  
 TC = .412\*[( 1000.00\*\* 3.00)/( 22.00)]\*\* .20 = 14.009  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.638  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 27.40  
 TOTAL AREA(ACRES) = 9.96 PEAK FLOW RATE(CFS) = 27.40



```

*****
FLOW PROCESS FROM NODE    200.10 TO NODE    202.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  11.5
UPSTREAM NODE ELEVATION =  1508.10
DOWNSTREAM NODE ELEVATION =  1503.00
FLOWLENGTH(FEET) =  240.00  MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  24.00  NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =  27.40
TRAVEL TIME(MIN.) =  .35  TC(MIN.) =  14.36

*****
FLOW PROCESS FROM NODE    202.10 TO NODE    202.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MINUTES) =  14.36
RAINFALL INTENSITY (INCH./HOUR) =  3.59
EFFECTIVE STREAM AREA(ACRES) =  9.96
TOTAL STREAM AREA(ACRES) =  9.96
PEAK FLOW RATE(CFS) AT CONFLUENCE =  27.40

*****
FLOW PROCESS FROM NODE    201.00 TO NODE    202.10 IS CODE =    2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
DEVELOPMENT IS  SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH =  1100.00
UPSTREAM ELEVATION =  1529.90
DOWNSTREAM ELEVATION =  1503.00
ELEVATION DIFFERENCE =  26.90
TC = .412*[( 1100.00** 3.00)/( 26.90)]** .20 =  14.249
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.601
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5
SUBAREA RUNOFF(CFS) =  18.04
TOTAL AREA(ACRES) =  6.64  PEAK FLOW RATE(CFS) =  18.04

*****
FLOW PROCESS FROM NODE    202.10 TO NODE    202.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:

```

TIME OF CONCENTRATION(MINUTES) = 14.25  
 RAINFALL INTENSITY (INCH./HOUR) = 3.60  
 EFFECTIVE STREAM AREA(ACRES) = 6.64  
 TOTAL STREAM AREA(ACRES) = 6.64  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 18.04

\*\*\*\*\*

FLOW PROCESS FROM NODE 202.00 TO NODE 202.10 IS CODE = 2

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
 INITIAL SUBAREA FLOW-LENGTH = 750.00  
 UPSTREAM ELEVATION = 1512.90  
 DOWNSTREAM ELEVATION = 1503.00  
 ELEVATION DIFFERENCE = 9.90  
 TC =  $.412 * [(750.00 ** 3.00) / (9.90)] ** .20 = 13.830$   
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.666  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 8.24  
 TOTAL AREA(ACRES) = 2.97 PEAK FLOW RATE(CFS) = 8.24

\*\*\*\*\*

FLOW PROCESS FROM NODE 202.10 TO NODE 202.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:

TIME OF CONCENTRATION(MINUTES) = 13.83  
 RAINFALL INTENSITY (INCH./HOUR) = 3.67  
 EFFECTIVE STREAM AREA(ACRES) = 2.97  
 TOTAL STREAM AREA(ACRES) = 2.97  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.24

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	27.40	14.36	3.585	.58	9.96
2	18.04	14.25	3.601	.58	6.64
3	8.24	13.83	3.666	.58	2.97

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	53.37	19.57

2           53.45           19.49  
 3           53.24           19.01  
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 PEAK FLOW RATE(CFS) =       53.45    TIME(MINUTES) =    14.249  
 EFFECTIVE AREA(ACRES) =       19.49  
 TOTAL AREA(ACRES) =       19.57

\*\*\*\*\*  
 FLOW PROCESS FROM NODE   202.10 TO NODE   204.10 IS CODE =   3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====  
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.8 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 14.0  
 UPSTREAM NODE ELEVATION = 1503.00  
 DOWNSTREAM NODE ELEVATION = 1490.50  
 FLOWLENGTH(FEET) = 540.00   MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 30.00   NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 53.45  
 TRAVEL TIME(MIN.) = .64    TC(MIN.) = 14.89

\*\*\*\*\*  
 FLOW PROCESS FROM NODE   203.00 TO NODE   204.10 IS CODE =   8  
 -----

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

=====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.507  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 13.51   SUBAREA RUNOFF(CFS) = 35.57  
 EFFECTIVE AREA(ACRES) = 33.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 33.08  
 PEAK FLOW RATE(CFS) = 86.89  
 TC(MIN) = 14.89

\*\*\*\*\*  
 FLOW PROCESS FROM NODE   204.00 TO NODE   204.10 IS CODE =   8  
 -----

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

=====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.507  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 5.75   SUBAREA RUNOFF(CFS) = 15.14  
 EFFECTIVE AREA(ACRES) = 38.75  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 38.83  
 PEAK FLOW RATE(CFS) = 102.03  
 TC(MIN) = 14.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 204.10 TO NODE 206.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN	39.0 INCH PIPE IS	26.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.)	=	16.9
UPSTREAM NODE ELEVATION	=	1490.50
DOWNSTREAM NODE ELEVATION	=	1474.60
FLOWLENGTH(FEET)	=	650.00
MANNINGS N	=	.013
ESTIMATED PIPE DIAMETER(INCH)	=	39.00
NUMBER OF PIPES	=	1
PIPEFLOW THRU SUBAREA(CFS)	=	102.03
TRAVEL TIME(MIN.)	=	.64
TC(MIN.)	=	15.53

\*\*\*\*\*  
FLOW PROCESS FROM NODE 205.00 TO NODE 206.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.420
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	11.62
SUBAREA RUNOFF(CFS)	=	29.67
EFFECTIVE AREA(ACRES)	=	50.37
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	50.45
PEAK FLOW RATE(CFS)	=	128.65
TC(MIN)	=	15.53

\*\*\*\*\*  
FLOW PROCESS FROM NODE 206.00 TO NODE 206.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR)	=	3.420
SOIL CLASSIFICATION IS	"A"	
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR)	=	.5
SUBAREA AREA(ACRES)	=	11.36
SUBAREA RUNOFF(CFS)	=	29.01
EFFECTIVE AREA(ACRES)	=	61.73
AVERAGED Fm(INCH/HR)	=	.582
TOTAL AREA(ACRES)	=	61.81
PEAK FLOW RATE(CFS)	=	157.66
TC(MIN)	=	15.53

\*\*\*\*\*  
FLOW PROCESS FROM NODE 206.10 TO NODE 208.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 45.0 INCH PIPE IS 34.1 INCHES  
 PIPEFLOW VELOCITY(Feet/sec.) = 17.5  
 UPSTREAM NODE ELEVATION = 1474.60  
 DOWNSTREAM NODE ELEVATION = 1468.00  
 FLOWLENGTH(Feet) = 315.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 157.66  
 TRAVEL TIME(MIN.) = .30 TC(MIN.) = 15.83

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 208.10 TO NODE 208.10 IS CODE = 1  
 -----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 15.83  
 RAINFALL INTENSITY (INCH./HOUR) = 3.38  
 EFFECTIVE STREAM AREA(ACRES) = 61.73  
 TOTAL STREAM AREA(ACRES) = 61.81  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 157.66

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 208.00 TO NODE 208.10 IS CODE = 2  
 -----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

$TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
 INITIAL SUBAREA FLOW-LENGTH = 820.00  
 UPSTREAM ELEVATION = 1478.90  
 DOWNSTREAM ELEVATION = 1468.00  
 ELEVATION DIFFERENCE = 10.90  
 $TC = .412 * [(820.00 ** 3.00) / (10.90)] ** .20 = 14.312$   
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.592  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 16.63  
 TOTAL AREA(ACRES) = 6.14 PEAK FLOW RATE(CFS) = 16.63

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 208.10 TO NODE 208.10 IS CODE = 1  
 -----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 14.31  
 RAINFALL INTENSITY (INCH./HOUR) = 3.59  
 EFFECTIVE STREAM AREA(ACRES) = 6.14  
 TOTAL STREAM AREA(ACRES) = 6.14  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.63

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA (ACRES)
1	157.66	15.83	3.381	.58	61.73
2	16.63	14.31	3.592	.58	6.14

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q (CFS)	EFFECTIVE AREA (ACRES)
1	173.12	67.87
2	169.90	61.94

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 173.12 TIME (MINUTES) = 15.833  
EFFECTIVE AREA (ACRES) = 67.87  
TOTAL AREA (ACRES) = 67.95

\*\*\*\*\*  
FLOW PROCESS FROM NODE 208.10 TO NODE 208.20 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

PIPEFLOW VELOCITY (FEET/SEC.) = 18.0  
UPSTREAM NODE ELEVATION = 1462.00  
DOWNSTREAM NODE ELEVATION = 1460.00  
FLOWLENGTH (FEET) = 620.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA (CFS) = 173.12  
TRAVEL TIME (MIN.) = .57 TC (MIN.) = 16.41

\*\*\*\*\*  
FLOW PROCESS FROM NODE 208.20 TO NODE 208.20 IS CODE = 1

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION (MINUTES) = 16.41  
RAINFALL INTENSITY (INCH./HOUR) = 3.31  
EFFECTIVE STREAM AREA (ACRES) = 67.87  
TOTAL STREAM AREA (ACRES) = 67.95  
PEAK FLOW RATE (CFS) AT CONFLUENCE = 173.12

\*\*\*\*\*  
FLOW PROCESS FROM NODE 207.00 TO NODE 208.20 IS CODE = 2

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20

INITIAL SUBAREA FLOW-LENGTH = 900.00

UPSTREAM ELEVATION = 1488.00

DOWNSTREAM ELEVATION = 1467.00

ELEVATION DIFFERENCE = 21.00

TC = .412\*[( 900.00\*\* 3.00)/( 21.00)]\*\* .20 = 13.274

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.758

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5

SUBAREA RUNOFF(CFS) = 24.92

TOTAL AREA(ACRES) = 8.72 PEAK FLOW RATE(CFS) = 24.92

\*\*\*\*\*  
FLOW PROCESS FROM NODE 208.20 TO NODE 208.20 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 13.27

RAINFALL INTENSITY (INCH./HOUR) = 3.76

EFFECTIVE STREAM AREA(ACRES) = 8.72

TOTAL STREAM AREA(ACRES) = 8.72

PEAK FLOW RATE(CFS) AT CONFLUENCE = 24.92

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	173.12	16.41	3.309	.58	67.87
2	24.92	13.27	3.758	.58	8.72

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	194.52	76.59
2	188.03	63.63

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 194.52 TIME(MINUTES) = 16.408

EFFECTIVE AREA(ACRES) = 76.59

TOTAL AREA(ACRES) = 76.67

\*\*\*\*\*  
FLOW PROCESS FROM NODE 208.20 TO NODE 209.10 IS CODE = 3

-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

DEPTH OF FLOW IN 48.0 INCH PIPE IS 35.8 INCHES  
 PIPEFLOW VELOCITY(Feet/Sec.) = 19.3  
 UPSTREAM NODE ELEVATION = 1460.00  
 DOWNSTREAM NODE ELEVATION = 1433.00  
 FLOWLENGTH(Feet) = 1150.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 194.52  
 TRAVEL TIME(MIN.) = .99 TC(MIN.) = 17.40

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 209.00 TO NODE 209.10 IS CODE = 8  
 -----

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

=====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.195  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 22.04 SUBAREA RUNOFF(CFS) = 51.82  
 EFFECTIVE AREA(ACRES) = 98.63  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 98.71  
 PEAK FLOW RATE(CFS) = 231.93  
 TC(MIN) = 17.40

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 209.00 TO NODE 210.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====  
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.9 INCHES  
 PIPEFLOW VELOCITY(Feet/Sec.) = 19.0  
 UPSTREAM NODE ELEVATION = 1433.00  
 DOWNSTREAM NODE ELEVATION = 1413.00  
 FLOWLENGTH(Feet) = 965.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 231.93  
 TRAVEL TIME(MIN.) = .84 TC(MIN.) = 18.24

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 210.00 TO NODE 210.10 IS CODE = 8  
 -----

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

=====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.105  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 25.47 SUBAREA RUNOFF(CFS) = 57.84  
 EFFECTIVE AREA(ACRES) = 124.10  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 124.18  
 PEAK FLOW RATE(CFS) = 281.81



TC(MIN) = 18.24

\*\*\*\*\*  
FLOW PROCESS FROM NODE 210.10 TO NODE 211.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 57.0 INCH PIPE IS 42.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 20.0  
UPSTREAM NODE ELEVATION = 1413.00  
DOWNSTREAM NODE ELEVATION = 1404.00  
FLOWLENGTH(FEET) = 450.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 281.81  
TRAVEL TIME(MIN.) = .38 TC(MIN.) = 18.62

\*\*\*\*\*  
FLOW PROCESS FROM NODE 211.00 TO NODE 211.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.067  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 27.71 SUBAREA RUNOFF(CFS) = 61.98  
EFFECTIVE AREA(ACRES) = 151.81  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 151.89  
PEAK FLOW RATE(CFS) = 339.58  
TC(MIN) = 18.62

\*\*\*\*\*  
FLOW PROCESS FROM NODE 211.10 TO NODE 211.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 18.62  
RAINFALL INTENSITY (INCH./HOUR) = 3.07  
EFFECTIVE STREAM AREA(ACRES) = 151.81  
TOTAL STREAM AREA(ACRES) = 151.89  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 339.58

\*\*\*\*\*  
FLOW PROCESS FROM NODE 211.10 TO NODE 211.10 IS CODE = 7  
-----

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<  
=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 32.74 RAIN INTENSITY(INCH/HOUR) = 2.19

EFFECTIVE AREA(ACRES) = 320.00  
 TOTAL AREA(ACRES) = 320.00 PEAK FLOW RATE(CFS) = 513.52  
 AVERAGED LOSS RATE, Fm(IN/HR) = .580

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 211.10 TO NODE 211.10 IS CODE = 1  
 -----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 32.74  
 RAINFALL INTENSITY (INCH./HOUR) = 2.19  
 EFFECTIVE STREAM AREA(ACRES) = 320.00  
 TOTAL STREAM AREA(ACRES) = 320.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 513.52

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	339.58	18.62	3.067	.58	151.81
2	513.52	32.74	2.186	.58	320.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	791.82	333.79
2	732.71	471.81

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 791.82 TIME(MINUTES) = 18.619  
 EFFECTIVE AREA(ACRES) = 333.79  
 TOTAL AREA(ACRES) = 471.89

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 211.10 TO NODE 212.10 IS CODE = 4  
 -----

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
 >>>>>USING USER-SPECIFIED PIPESIZE<<<<<

=====

PIPEFLOW VELOCITY(FEET/SEC.) = 15.8  
 UPSTREAM NODE ELEVATION = 1404.00  
 DOWNSTREAM NODE ELEVATION = 1398.00  
 FLOWLENGTH(FEET) = 1315.00 MANNINGS N = .013  
 GIVEN PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 791.82  
 TRAVEL TIME(MIN.) = 1.39 TC(MIN.) = 20.01

\*\*\*\*\*

FLOW PROCESS FROM NODE 212.00 TO NODE 212.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.938  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 78.90 SUBAREA RUNOFF(CFS) = 167.27  
EFFECTIVE AREA(ACRES) = 412.69  
AVERAGED Fm(INCH/HR) = .581  
TOTAL AREA(ACRES) = 550.79  
PEAK FLOW RATE(CFS) = 875.24  
TC(MIN) = 20.01

\*\*\*\*\*

FLOW PROCESS FROM NODE 212.10 TO NODE 213.10 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<

=====

PIPEFLOW VELOCITY(FEET/SEC.) = 17.4  
UPSTREAM NODE ELEVATION = 1398.00  
DOWNSTREAM NODE ELEVATION = 1392.00  
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 875.24  
TRAVEL TIME(MIN.) = 1.26 TC(MIN.) = 21.27

\*\*\*\*\*

FLOW PROCESS FROM NODE 213.00 TO NODE 213.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.832  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 78.75 SUBAREA RUNOFF(CFS) = 159.44  
EFFECTIVE AREA(ACRES) = 491.44  
AVERAGED Fm(INCH/HR) = .581  
TOTAL AREA(ACRES) = 629.54  
PEAK FLOW RATE(CFS) = 995.32  
TC(MIN) = 21.27

\*\*\*\*\*

FLOW PROCESS FROM NODE 213.10 TO NODE 214.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 114.0 INCH PIPE IS 87.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 17.0  
UPSTREAM NODE ELEVATION = 1392.00

DOWNSTREAM NODE ELEVATION = 1384.00  
 FLOWLENGTH(Feet) = 1400.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 114.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 995.32  
 TRAVEL TIME(MIN.) = 1.37 TC(MIN.) = 22.64

\*\*\*\*\*

FLOW PROCESS FROM NODE 214.00 TO NODE 214.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.728  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 82.69 SUBAREA RUNOFF(CFS) = 159.68  
 EFFECTIVE AREA(ACRES) = 574.13  
 AVERAGED Fm(INCH/HR) = .581  
 TOTAL AREA(ACRES) = 712.23  
 PEAK FLOW RATE(CFS) = 1108.99  
 TC(MIN) = 22.64

\*\*\*\*\*

FLOW PROCESS FROM NODE 214.10 TO NODE 214.10 IS CODE = 1

-----  
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<  
 =====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 22.64  
 RAINFALL INTENSITY (INCH./HOUR) = 2.73  
 EFFECTIVE STREAM AREA(ACRES) = 574.13  
 TOTAL STREAM AREA(ACRES) = 712.23  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1108.99

\*\*\*\*\*

FLOW PROCESS FROM NODE 215.00 TO NODE 215.11 IS CODE = 2

-----  
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<  
 =====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

$TC = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
 INITIAL SUBAREA FLOW-LENGTH = 1000.00  
 UPSTREAM ELEVATION = 1528.00  
 DOWNSTREAM ELEVATION = 1495.00  
 ELEVATION DIFFERENCE = 33.00  
 $TC = .412 * [(1000.00 ** 3.00) / (33.00)] ** .20 = 12.918$   
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.820  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 14.57  
 TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.57

```

*****
FLOW PROCESS FROM NODE    215.11 TO NODE    215.12 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  11.0
UPSTREAM NODE ELEVATION =  1495.00
DOWNSTREAM NODE ELEVATION =  1466.50
FLOWLENGTH(FEET) =  1000.00    MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    14.57
TRAVEL TIME(MIN.) =    1.52    TC(MIN.) =  14.44

*****
FLOW PROCESS FROM NODE    215.10 TO NODE    215.12 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.573
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =  .5
SUBAREA AREA(ACRES) =    5.00    SUBAREA RUNOFF(CFS) =  13.46
EFFECTIVE AREA(ACRES) =  10.00
AVERAGED Fm(INCH/HR) =  .582
TOTAL AREA(ACRES) =  10.00
PEAK FLOW RATE(CFS) =  26.92
TC(MIN) =  14.44

*****
FLOW PROCESS FROM NODE    215.12 TO NODE    216.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  5.4
UPSTREAM NODE ELEVATION =  1466.50
DOWNSTREAM NODE ELEVATION =  1466.00
FLOWLENGTH(FEET) =  167.00    MANNINGS N =  .013
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    26.92
TRAVEL TIME(MIN.) =    .51    TC(MIN.) =  14.95

*****
FLOW PROCESS FROM NODE    216.00 TO NODE    216.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.499

```

SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 26.25  
 EFFECTIVE AREA(ACRES) = 20.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 20.00  
 PEAK FLOW RATE(CFS) = 52.50  
 TC(MIN) = 14.95

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 216.10 TO NODE 217.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 42.0 INCH PIPE IS 33.4 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 6.4  
 UPSTREAM NODE ELEVATION = 1466.00  
 DOWNSTREAM NODE ELEVATION = 1465.00  
 FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 52.50  
 TRAVEL TIME(MIN.) = .86 TC(MIN.) = 15.81

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 217.00 TO NODE 217.10 IS CODE = 8  
 -----

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

100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.383  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 50.42  
 EFFECTIVE AREA(ACRES) = 40.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 40.00  
 PEAK FLOW RATE(CFS) = 100.84  
 TC(MIN) = 15.81

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 217.10 TO NODE 218.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 54.0 INCH PIPE IS 42.6 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 7.5  
 UPSTREAM NODE ELEVATION = 1465.00  
 DOWNSTREAM NODE ELEVATION = 1463.00  
 FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 100.84

TRAVEL TIME(MIN.) = 1.49 TC(MIN.) = 17.30

\*\*\*\*\*  
FLOW PROCESS FROM NODE 218.00 TO NODE 218.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	3.205
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5
SUBAREA AREA(ACRES) =	40.00
SUBAREA RUNOFF(CFS) =	94.44
EFFECTIVE AREA(ACRES) =	80.00
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	80.00
PEAK FLOW RATE(CFS) =	188.88
TC(MIN) =	17.30

\*\*\*\*\*  
FLOW PROCESS FROM NODE 218.10 TO NODE 219.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

=====

DEPTH OF FLOW IN 66.0 INCH PIPE IS	52.2 INCHES
PIPEFLOW VELOCITY(Feet/Sec.) =	9.4
UPSTREAM NODE ELEVATION =	1463.00
DOWNSTREAM NODE ELEVATION =	1458.00
FLOWLENGTH(Feet) =	1400.00
MANNINGS N =	.013
ESTIMATED PIPE DIAMETER(INCH) =	66.00
NUMBER OF PIPES =	1
PIPEFLOW THRU SUBAREA(CFS) =	188.88
TRAVEL TIME(MIN.) =	2.49
TC(MIN.) =	19.79

\*\*\*\*\*  
FLOW PROCESS FROM NODE 219.00 TO NODE 219.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	2.957
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5
SUBAREA AREA(ACRES) =	80.00
SUBAREA RUNOFF(CFS) =	171.01
EFFECTIVE AREA(ACRES) =	160.00
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	160.00
PEAK FLOW RATE(CFS) =	342.02
TC(MIN) =	19.79

\*\*\*\*\*  
FLOW PROCESS FROM NODE 219.10 TO NODE 220.10 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

>>>>USING USER-SPECIFIED PIPESIZE<<<<

```
=====
PIPEFLOW VELOCITY(FEET/SEC.) = 17.4
UPSTREAM NODE ELEVATION = 1458.00
DOWNSTREAM NODE ELEVATION = 1451.00
FLOWLENGTH(FEET) = 1400.00 MANNINGS N = .013
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 342.02
TRAVEL TIME(MIN.) = 1.34 TC(MIN.) = 21.13
```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 220.00 TO NODE 220.10 IS CODE = 8  
-----

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

```
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.843
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 83.00 SUBAREA RUNOFF(CFS) = 168.91
EFFECTIVE AREA(ACRES) = 243.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 243.00
PEAK FLOW RATE(CFS) = 494.52
TC(MIN) = 21.13
```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 220.10 TO NODE 214.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

```
=====
DEPTH OF FLOW IN 69.0 INCH PIPE IS 51.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 23.6
UPSTREAM NODE ELEVATION = 1451.00
DOWNSTREAM NODE ELEVATION = 1395.00
FLOWLENGTH(FEET) = 2600.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 494.52
TRAVEL TIME(MIN.) = 1.84 TC(MIN.) = 22.96
```

\*\*\*\*\*  
FLOW PROCESS FROM NODE 214.10 TO NODE 214.10 IS CODE = 1  
-----

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

```
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 22.96
RAINFALL INTENSITY (INCH./HOUR) = 2.70
EFFECTIVE STREAM AREA(ACRES) = 243.00
TOTAL STREAM AREA(ACRES) = 243.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 494.52
```



CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	1108.99	22.64	2.728	.58	574.13
2	494.52	22.96	2.705	.58	243.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	1601.86	813.73
2	1591.63	817.13

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 1601.86 TIME(MINUTES) = 22.643  
EFFECTIVE AREA(ACRES) = 813.73  
TOTAL AREA(ACRES) = 955.23

\*\*\*\*\*  
FLOW PROCESS FROM NODE 214.10 TO NODE 221.10 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1395.00
DOWNSTREAM NODE ELEVATION =	1380.00
CHANNEL LENGTH THRU SUBAREA(FEET) =	2600.00
CHANNEL BASE(FEET) =	16.00 "Z" FACTOR = .000
MANNINGS FACTOR =	.015 MAXIMUM DEPTH(FEET) = 6.00
CHANNEL FLOW THRU SUBAREA(CFS) =	1601.86
FLOW VELOCITY(FEET/SEC) =	16.98 FLOW DEPTH(FEET) = 5.89
TRAVEL TIME(MIN.) =	2.55 TC(MIN.) = 25.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 221.00 TO NODE 221.10 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	2.558
SOIL CLASSIFICATION IS	"A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =	.5
SUBAREA AREA(ACRES) =	156.00 SUBAREA RUNOFF(CFS) = 277.48
EFFECTIVE AREA(ACRES) =	969.73
AVERAGED Fm(INCH/HR) =	.582
TOTAL AREA(ACRES) =	1111.23
PEAK FLOW RATE(CFS) =	1725.17
TC(MIN) =	25.19

\*\*\*\*\*

```

FLOW PROCESS FROM NODE    221.10 TO NODE    221.10 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM    1 ARE:
TIME OF CONCENTRATION(MINUTES) =   25.19
RAINFALL INTENSITY (INCH./HOUR) =    2.56
EFFECTIVE STREAM AREA(ACRES) =   969.73
TOTAL STREAM AREA(ACRES) =  1111.23
PEAK FLOW RATE(CFS) AT CONFLUENCE =   1725.17

*****
FLOW PROCESS FROM NODE    222.00 TO NODE    222.11 IS CODE =    2
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
DEVELOPMENT IS   SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
INITIAL SUBAREA FLOW-LENGTH =  1000.00
UPSTREAM ELEVATION =   1511.00
DOWNSTREAM ELEVATION =   1481.00
ELEVATION DIFFERENCE =    30.00
TC = .412*[( 1000.00** 3.00)/(    30.00)]** .20 =   13.167
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    3.776
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA RUNOFF(CFS) =    14.37
TOTAL AREA(ACRES) =    5.00   PEAK FLOW RATE(CFS) =    14.37

*****
FLOW PROCESS FROM NODE    222.11 TO NODE    222.12 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =  11.3
UPSTREAM NODE ELEVATION =   1481.00
DOWNSTREAM NODE ELEVATION =   1450.00
FLOWLENGTH(FEET) =  1000.00   MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) =  18.00   NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    14.37
TRAVEL TIME(MIN.) =    1.47   TC(MIN.) =  14.64

*****
FLOW PROCESS FROM NODE    222.10 TO NODE    222.12 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    3.544
SOIL CLASSIFICATION IS "A"

```

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 13.33  
 EFFECTIVE AREA(ACRES) = 10.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 10.00  
 PEAK FLOW RATE(CFS) = 26.65  
 TC(MIN) = 14.64

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 222.12 TO NODE 223.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.5 INCHES  
 PIPEFLOW VELOCITY(Feet/Sec.) = 7.1  
 UPSTREAM NODE ELEVATION = 1450.00  
 DOWNSTREAM NODE ELEVATION = 1449.00  
 FLOWLENGTH(Feet) = 167.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 26.65  
 TRAVEL TIME(MIN.) = .39 TC(MIN.) = 15.03

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 223.00 TO NODE 223.10 IS CODE = 8  
 -----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.488  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 26.15  
 EFFECTIVE AREA(ACRES) = 20.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 20.00  
 PEAK FLOW RATE(CFS) = 52.30  
 TC(MIN) = 15.03

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 223.10 TO NODE 224.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 36.0 INCH PIPE IS 29.0 INCHES  
 PIPEFLOW VELOCITY(Feet/Sec.) = 8.6  
 UPSTREAM NODE ELEVATION = 1449.00  
 DOWNSTREAM NODE ELEVATION = 1446.80  
 FLOWLENGTH(Feet) = 330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 52.30  
 TRAVEL TIME(MIN.) = .64 TC(MIN.) = 15.67

\*\*\*\*\*  
FLOW PROCESS FROM NODE 224.00 TO NODE 224.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.401  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 50.75  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 101.49  
TC(MIN) = 15.67

\*\*\*\*\*  
FLOW PROCESS FROM NODE 224.10 TO NODE 225.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 9.2  
UPSTREAM NODE ELEVATION = 1446.80  
DOWNSTREAM NODE ELEVATION = 1443.50  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 101.49  
TRAVEL TIME(MIN.) = 1.22 TC(MIN.) = 16.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 225.00 TO NODE 225.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.252  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 96.13  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 192.25  
TC(MIN) = 16.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 225.10 TO NODE 226.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

```

=====
DEPTH OF FLOW IN 60.0 INCH PIPE IS 44.9 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 12.2
UPSTREAM NODE ELEVATION = 1443.50
DOWNSTREAM NODE ELEVATION = 1435.00
FLOWLENGTH(FEET) = 1225.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 192.25
TRAVEL TIME(MIN.) = 1.67 TC(MIN.) = 18.56
=====

```

```

*****
FLOW PROCESS FROM NODE 226.00 TO NODE 226.10 IS CODE = 8
-----

```

```

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

```

```

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.073
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 74.00 SUBAREA RUNOFF(CFS) = 165.90
EFFECTIVE AREA(ACRES) = 154.00
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 154.00
PEAK FLOW RATE(CFS) = 345.25
TC(MIN) = 18.56
=====

```

```

*****
FLOW PROCESS FROM NODE 226.10 TO NODE 221.10 IS CODE = 3
-----

```

```

>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====

```

```

DEPTH OF FLOW IN 60.0 INCH PIPE IS 46.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 21.4
UPSTREAM NODE ELEVATION = 1435.00
DOWNSTREAM NODE ELEVATION = 1380.00
FLOWLENGTH(FEET) = 2600.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 345.25
TRAVEL TIME(MIN.) = 2.03 TC(MIN.) = 20.59
=====

```

```

*****
FLOW PROCESS FROM NODE 221.10 TO NODE 221.10 IS CODE = 1
-----

```

```

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

```

```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 20.59
RAINFALL INTENSITY (INCH./HOUR) = 2.89
EFFECTIVE STREAM AREA(ACRES) = 154.00
TOTAL STREAM AREA(ACRES) = 154.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 345.25
=====

```

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA (ACRES)
1	1725.17	25.19	2.558	.58	969.73
2	345.25	20.59	2.888	.58	154.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q (CFS)	EFFECTIVE AREA (ACRES)
1	2021.11	1123.73
2	1990.03	946.51

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 2021.11 TIME (MINUTES) = 25.194  
EFFECTIVE AREA (ACRES) = 1123.73  
TOTAL AREA (ACRES) = 1265.23

\*\*\*\*\*  
FLOW PROCESS FROM NODE 221.10 TO NODE 227.10 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION =	1380.00
DOWNSTREAM NODE ELEVATION =	1362.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	2670.00
CHANNEL BASE (FEET) =	16.00
"Z" FACTOR =	.000
MANNINGS FACTOR =	.015
MAXIMUM DEPTH (FEET) =	6.00
CHANNEL FLOW THRU SUBAREA (CFS) =	2021.11

==>ERROR: FLOW IN CHANNEL EXCEEDS CHANNEL  
CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM  
ALLOWABLE DEPTH).  
AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM  
ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

FLOW VELOCITY (FEET/SEC) = 21.05 FLOW DEPTH (FEET) = 6.00  
TRAVEL TIME (MIN.) = 2.11 TC (MIN.) = 27.31

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

\*\*\*\*\*  
FLOW PROCESS FROM NODE 227.00 TO NODE 227.10 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.438  
SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 160.25 SUBAREA RUNOFF(CFS) = 267.62  
 EFFECTIVE AREA(ACRES) = 1283.98  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 1425.48  
 PEAK FLOW RATE(CFS) = 2144.63  
 TC(MIN) = 27.31

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 227.10 TO NODE 227.10 IS CODE = 1  
 -----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 27.31  
 RAINFALL INTENSITY (INCH./HOUR) = 2.44  
 EFFECTIVE STREAM AREA(ACRES) = 1283.98  
 TOTAL STREAM AREA(ACRES) = 1425.48  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2144.63

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 228.00 TO NODE 228.11 IS CODE = 2  
 -----

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
 INITIAL SUBAREA FLOW-LENGTH = 1000.00  
 UPSTREAM ELEVATION = 1491.00  
 DOWNSTREAM ELEVATION = 1462.00  
 ELEVATION DIFFERENCE = 29.00  
 TC = .412\*[(1000.00\*\* 3.00)/(29.00)]\*\* .20 = 13.256  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.761  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 14.30  
 TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.30

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 228.11 TO NODE 228.12 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.5 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 10.9  
 UPSTREAM NODE ELEVATION = 1462.00  
 DOWNSTREAM NODE ELEVATION = 1433.50  
 FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 14.30

TRAVEL TIME(MIN.) = 1.52 TC(MIN.) = 14.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 228.10 TO NODE 228.12 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.523  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 13.23  
EFFECTIVE AREA(ACRES) = 10.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 26.47  
TC(MIN) = 14.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 228.12 TO NODE 229.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 27.0 INCH PIPE IS 20.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 8.2  
UPSTREAM NODE ELEVATION = 1433.50  
DOWNSTREAM NODE ELEVATION = 1432.00  
FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 26.47  
TRAVEL TIME(MIN.) = .34 TC(MIN.) = 15.12

\*\*\*\*\*  
FLOW PROCESS FROM NODE 229.00 TO NODE 229.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.475  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 26.04  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 52.08  
TC(MIN) = 15.12

\*\*\*\*\*  
FLOW PROCESS FROM NODE 229.10 TO NODE 230.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<



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

=====

DEPTH OF FLOW IN 36.0 INCH PIPE IS 25.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 9.8  
UPSTREAM NODE ELEVATION = 1432.00  
DOWNSTREAM NODE ELEVATION = 1429.00  
FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 52.08  
TRAVEL TIME(MIN.) = .56 TC(MIN.) = 15.68

\*\*\*\*\*

FLOW PROCESS FROM NODE 230.00 TO NODE 230.10 IS CODE = 8

-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.400  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 50.73  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 101.45  
TC(MIN) = 15.68

\*\*\*\*\*

FLOW PROCESS FROM NODE 230.10 TO NODE 231.10 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<

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

=====

DEPTH OF FLOW IN 45.0 INCH PIPE IS 36.7 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.5  
UPSTREAM NODE ELEVATION = 1429.00  
DOWNSTREAM NODE ELEVATION = 1424.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 101.45  
TRAVEL TIME(MIN.) = 1.06 TC(MIN.) = 16.74

\*\*\*\*\*

FLOW PROCESS FROM NODE 231.00 TO NODE 231.10 IS CODE = 8

-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.269  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 96.73  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 193.47  
TC(MIN) = 16.74

\*\*\*\*\*  
FLOW PROCESS FROM NODE 231.10 TO NODE 232.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 48.0 INCH PIPE IS 38.2 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 18.0  
UPSTREAM NODE ELEVATION = 1424.00  
DOWNSTREAM NODE ELEVATION = 1416.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .010  
ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 193.47  
TRAVEL TIME(MIN.) = .62 TC(MIN.) = 17.36

\*\*\*\*\*  
FLOW PROCESS FROM NODE 232.00 TO NODE 233.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.199  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 94.20  
EFFECTIVE AREA(ACRES) = 120.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 120.00  
PEAK FLOW RATE(CFS) = 282.59  
TC(MIN) = 17.36

\*\*\*\*\*  
FLOW PROCESS FROM NODE 232.10 TO NODE 233.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 60.0 INCH PIPE IS 47.2 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 17.1  
UPSTREAM NODE ELEVATION = 1416.00  
DOWNSTREAM NODE ELEVATION = 1407.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 282.59  
TRAVEL TIME(MIN.) = .65 TC(MIN.) = 18.02

\*\*\*\*\*  
FLOW PROCESS FROM NODE 233.00 TO NODE 233.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.128  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 46.00 SUBAREA RUNOFF(CFS) = 105.42  
EFFECTIVE AREA(ACRES) = 166.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 166.00  
PEAK FLOW RATE(CFS) = 380.43  
TC(MIN) = 18.02

\*\*\*\*\*  
FLOW PROCESS FROM NODE 233.10 TO NODE 227.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 66.0 INCH PIPE IS 48.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 20.3  
UPSTREAM NODE ELEVATION = 1407.00  
DOWNSTREAM NODE ELEVATION = 1362.00  
FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 380.43  
TRAVEL TIME(MIN.) = 2.18 TC(MIN.) = 20.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 227.10 TO NODE 227.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MINUTES) = 20.19  
RAINFALL INTENSITY (INCH./HOUR) = 2.92  
EFFECTIVE STREAM AREA(ACRES) = 166.00  
TOTAL STREAM AREA(ACRES) = 166.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 380.43

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2144.63	27.31	2.438	.58	1283.98
2	380.43	20.19	2.921	.58	166.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

```

-----
      1      2446.37      1449.98
      2      2379.86      1115.50
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 2446.37    TIME(MINUTES) = 27.308
EFFECTIVE AREA(ACRES) = 1449.98
TOTAL AREA(ACRES) = 1591.48

```

```

*****
FLOW PROCESS FROM NODE 227.10 TO NODE 234.10 IS CODE = 5
-----

```

```

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====

```

```

UPSTREAM NODE ELEVATION = 1362.00
DOWNSTREAM NODE ELEVATION = 1336.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2700.00
CHANNEL BASE(FEET) = 18.00 "Z" FACTOR = .000
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 6.00
CHANNEL FLOW THRU SUBAREA(CFS) = 2446.37
FLOW VELOCITY(FEET/SEC) = 22.79 FLOW DEPTH(FEET) = 5.96
TRAVEL TIME(MIN.) = 1.97 TC(MIN.) = 29.28

```

```

*****
FLOW PROCESS FROM NODE 234.00 TO NODE 234.10 IS CODE = 8
-----

```

```

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

```

```

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.338
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 160.00 SUBAREA RUNOFF(CFS) = 252.80
EFFECTIVE AREA(ACRES) = 1609.98
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 1751.48
PEAK FLOW RATE(CFS) = 2544.14
TC(MIN) = 29.28

```

```

*****
FLOW PROCESS FROM NODE 234.10 TO NODE 234.10 IS CODE = 1
-----

```

```

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

```

```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 29.28
RAINFALL INTENSITY (INCH./HOUR) = 2.34
EFFECTIVE STREAM AREA(ACRES) = 1609.98
TOTAL STREAM AREA(ACRES) = 1751.48
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2544.14

```

```

*****

```

FLOW PROCESS FROM NODE 235.00 TO NODE 235.11 IS CODE = 2

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

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20

INITIAL SUBAREA FLOW-LENGTH = 1000.00

UPSTREAM ELEVATION = 1463.00

DOWNSTREAM ELEVATION = 1435.00

ELEVATION DIFFERENCE = 28.00

TC = .412\*[(1000.00\*\* 3.00)/(28.00)]\*\* .20 = 13.350

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.745

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5

SUBAREA RUNOFF(CFS) = 14.23

TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.23

\*\*\*\*\*

FLOW PROCESS FROM NODE 235.11 TO NODE 235.12 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.3 INCHES

PIPEFLOW VELOCITY(Feet/Sec.) = 11.1

UPSTREAM NODE ELEVATION = 1435.00

DOWNSTREAM NODE ELEVATION = 1405.50

FLOWLENGTH(Feet) = 1000.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 14.23

TRAVEL TIME(MIN.) = 1.50 TC(MIN.) = 14.85

\*\*\*\*\*

FLOW PROCESS FROM NODE 235.10 TO NODE 235.12 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.513

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5

SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 13.19

EFFECTIVE AREA(ACRES) = 10.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 10.00

PEAK FLOW RATE(CFS) = 26.38

TC(MIN) = 14.85

\*\*\*\*\*

FLOW PROCESS FROM NODE 235.12 TO NODE 236.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 4.2  
UPSTREAM NODE ELEVATION = 1405.50  
DOWNSTREAM NODE ELEVATION = 1404.00  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 26.38  
TRAVEL TIME(MIN.) = 3.96 TC(MIN.) = 18.81

\*\*\*\*\*

FLOW PROCESS FROM NODE 236.00 TO NODE 236.10 IS CODE = 8

-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.049  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 22.20  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 44.40  
TC(MIN) = 18.81

\*\*\*\*\*

FLOW PROCESS FROM NODE 236.10 TO NODE 237.10 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 12.1  
UPSTREAM NODE ELEVATION = 1404.00  
DOWNSTREAM NODE ELEVATION = 1401.00  
FLOWLENGTH(FEET) = 170.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 44.40  
TRAVEL TIME(MIN.) = .23 TC(MIN.) = 19.04

\*\*\*\*\*

FLOW PROCESS FROM NODE 237.00 TO NODE 237.10 IS CODE = 8

-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.026  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 44.00  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 87.99  
TC(MIN) = 19.04

\*\*\*\*\*  
FLOW PROCESS FROM NODE 237.10 TO NODE 238.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.0  
UPSTREAM NODE ELEVATION = 1401.00  
DOWNSTREAM NODE ELEVATION = 1395.00  
FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 87.99  
TRAVEL TIME(MIN.) = 1.02 TC(MIN.) = 20.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 238.00 TO NODE 238.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.933  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 84.64  
EFFECTIVE AREA(ACRES) = 80.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 80.00  
PEAK FLOW RATE(CFS) = 169.28  
TC(MIN) = 20.06

\*\*\*\*\*  
FLOW PROCESS FROM NODE 238.10 TO NODE 239.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.2 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 13.0  
UPSTREAM NODE ELEVATION = 1395.00  
DOWNSTREAM NODE ELEVATION = 1383.00  
FLOWLENGTH(FEET) = 1330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 169.28  
TRAVEL TIME(MIN.) = 1.70 TC(MIN.) = 21.77

\*\*\*\*\*  
FLOW PROCESS FROM NODE 239.00 TO NODE 239.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.793  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 159.19  
 EFFECTIVE AREA(ACRES) = 160.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 160.00  
 PEAK FLOW RATE(CFS) = 318.39  
 TC(MIN) = 21.77

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 239.10 TO NODE 234.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 =====

DEPTH OF FLOW IN 60.0 INCH PIPE IS 45.9 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 19.7  
 UPSTREAM NODE ELEVATION = 1383.00  
 DOWNSTREAM NODE ELEVATION = 1336.00  
 FLOWLENGTH(FEET) = 2600.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 318.39  
 TRAVEL TIME(MIN.) = 2.19 TC(MIN.) = 23.96

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 234.10 TO NODE 234.10 IS CODE = 1  
 -----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 23.96  
 RAINFALL INTENSITY (INCH./HOUR) = 2.64  
 EFFECTIVE STREAM AREA(ACRES) = 160.00  
 TOTAL STREAM AREA(ACRES) = 160.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 318.39

#### CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	2544.14	29.28	2.338	.58	1609.98
2	318.39	23.96	2.637	.58	160.00

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

#### SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------



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-----
      1      2816.18      1769.98
      2      2754.56      1477.30
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 2816.18    TIME(MINUTES) = 29.283
EFFECTIVE AREA(ACRES) = 1769.98
TOTAL AREA(ACRES) = 1911.48

```

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*****
FLOW PROCESS FROM NODE 234.10 TO NODE 240.10 IS CODE = 5
-----

```

```

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====

```

```

UPSTREAM NODE ELEVATION = 1336.00
DOWNSTREAM NODE ELEVATION = 1311.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2650.00
CHANNEL BASE(FEET) = 20.00    "Z" FACTOR = .000
MANNINGS FACTOR = .015    MAXIMUM DEPTH(FEET) = 6.00
CHANNEL FLOW THRU SUBAREA(CFS) = 2816.18

```

```

==>>ERROR: FLOW IN CHANNEL EXCEEDS CHANNEL
CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
ALLOWABLE DEPTH).
AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

```

```

FLOW VELOCITY(FEET/SEC) = 23.47    FLOW DEPTH(FEET) = 6.00
TRAVEL TIME(MIN.) = 1.88    TC(MIN.) = 31.16

```

```

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

```

```

*****
FLOW PROCESS FROM NODE 240.00 TO NODE 240.10 IS CODE = 8
-----

```

```

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

```

```

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.252
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5
SUBAREA AREA(ACRES) = 160.00    SUBAREA RUNOFF(CFS) = 240.46
EFFECTIVE AREA(ACRES) = 1929.98
AVERAGED Fm(INCH/HR) = .582
TOTAL AREA(ACRES) = 2071.48
PEAK FLOW RATE(CFS) = 2900.80
TC(MIN) = 31.16

```

```

*****
FLOW PROCESS FROM NODE 240.10 TO NODE 240.10 IS CODE = 1
-----

```

```

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

```

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 31.16  
RAINFALL INTENSITY (INCH./HOUR) = 2.25  
EFFECTIVE STREAM AREA(ACRES) = 1929.98  
TOTAL STREAM AREA(ACRES) = 2071.48  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2900.80

\*\*\*\*\*

FLOW PROCESS FROM NODE 241.00 TO NODE 241.11 IS CODE = 2

-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\* .20  
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1431.00  
DOWNSTREAM ELEVATION = 1406.00  
ELEVATION DIFFERENCE = 25.00  
TC = .412\*[(1000.00\*\* 3.00)/(25.00)]\*\* .20 = 13.656  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.694  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA RUNOFF(CFS) = 14.01  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.01

\*\*\*\*\*

FLOW PROCESS FROM NODE 241.11 TO NODE 241.12 IS CODE = 3

-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.3  
UPSTREAM NODE ELEVATION = 1406.00  
DOWNSTREAM NODE ELEVATION = 1381.00  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 14.01  
TRAVEL TIME(MIN.) = 1.62 TC(MIN.) = 15.27

\*\*\*\*\*

FLOW PROCESS FROM NODE 241.10 TO NODE 241.12 IS CODE = 8

-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.455  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 12.93  
EFFECTIVE AREA(ACRES) = 10.00

AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 10.00  
 PEAK FLOW RATE(CFS) = 25.85  
 TC(MIN) = 15.27

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 241.12 TO NODE 242.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.0 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 9.2  
 UPSTREAM NODE ELEVATION = 1381.00  
 DOWNSTREAM NODE ELEVATION = 1379.00  
 FLOWLENGTH(FEET) = 167.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 25.85  
 TRAVEL TIME(MIN.) = .30 TC(MIN.) = 15.57

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 242.00 TO NODE 242.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.414  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 25.49  
 EFFECTIVE AREA(ACRES) = 20.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 20.00  
 PEAK FLOW RATE(CFS) = 50.98  
 TC(MIN) = 15.57

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 242.10 TO NODE 243.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

DEPTH OF FLOW IN 33.0 INCH PIPE IS 24.6 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 10.7  
 UPSTREAM NODE ELEVATION = 1379.00  
 DOWNSTREAM NODE ELEVATION = 1375.00  
 FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 50.98  
 TRAVEL TIME(MIN.) = .51 TC(MIN.) = 16.09

\*\*\*\*\*

```

FLOW PROCESS FROM NODE    243.00 TO NODE    243.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   3.349
  SOIL CLASSIFICATION IS "A"
  RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =   .5
  SUBAREA AREA(ACRES) =   20.00    SUBAREA RUNOFF(CFS) =   49.80
  EFFECTIVE AREA(ACRES) =   40.00
  AVERAGED Fm(INCH/HR) =   .582
  TOTAL AREA(ACRES) =   40.00
  PEAK FLOW RATE(CFS) =   99.59
  TC(MIN) =   16.09

*****
FLOW PROCESS FROM NODE    243.10 TO NODE    244.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  34.2 INCHES
  PIPEFLOW VELOCITY(FEET/SEC.) =  11.9
  UPSTREAM NODE ELEVATION =  1375.00
  DOWNSTREAM NODE ELEVATION =  1368.00
  FLOWLENGTH(FEET) =   670.00    MANNINGS N =   .013
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =    1
  PIPEFLOW THRU SUBAREA(CFS) =   99.59
  TRAVEL TIME(MIN.) =   .94    TC(MIN.) =  17.03

*****
FLOW PROCESS FROM NODE    244.00 TO NODE    244.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   3.236
  SOIL CLASSIFICATION IS "A"
  RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =   .5
  SUBAREA AREA(ACRES) =   40.00    SUBAREA RUNOFF(CFS) =   95.56
  EFFECTIVE AREA(ACRES) =   80.00
  AVERAGED Fm(INCH/HR) =   .582
  TOTAL AREA(ACRES) =   80.00
  PEAK FLOW RATE(CFS) =  191.11
  TC(MIN) =   17.03

*****
FLOW PROCESS FROM NODE    244.10 TO NODE    245.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
  DEPTH OF FLOW IN  57.0 INCH PIPE IS  42.6 INCHES
  PIPEFLOW VELOCITY(FEET/SEC.) =  13.4

```

UPSTREAM NODE ELEVATION = 1368.00  
 DOWNSTREAM NODE ELEVATION = 1356.00  
 FLOWLENGTH(FEET) = 1330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 191.11  
 TRAVEL TIME(MIN.) = 1.65 TC(MIN.) = 18.68

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 245.00 TO NODE 245.10 IS CODE = 8  
 -----

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

=====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.062  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 178.54  
 EFFECTIVE AREA(ACRES) = 160.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 160.00  
 PEAK FLOW RATE(CFS) = 357.08  
 TC(MIN) = 18.68

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 245.10 TO NODE 240.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====  
 DEPTH OF FLOW IN 63.0 INCH PIPE IS 48.9 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 19.8  
 UPSTREAM NODE ELEVATION = 1356.00  
 DOWNSTREAM NODE ELEVATION = 1311.00  
 FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 357.08  
 TRAVEL TIME(MIN.) = 2.23 TC(MIN.) = 20.91

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 240.10 TO NODE 240.10 IS CODE = 1  
 -----

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 20.91  
 RAINFALL INTENSITY (INCH./HOUR) = 2.86  
 EFFECTIVE STREAM AREA(ACRES) = 160.00  
 TOTAL STREAM AREA(ACRES) = 160.00  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 357.08

CONFLUENCE INFORMATION:

STREAM	PEAK FLOW	TIME	INTENSITY	FM	EFFECTIVE
--------	-----------	------	-----------	----	-----------

NUMBER	RATE(CFS)	(MIN.)	(INCH/HOUR)	(IN/HR)	AREA(ACRES)
1	2900.80	31.16	2.252	.58	1929.98
2	357.08	20.91	2.861	.58	160.00

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

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	3162.39	2089.98
2	3013.22	1454.67

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 3162.39 TIME(MINUTES) = 31.165

EFFECTIVE AREA(ACRES) = 2089.98

TOTAL AREA(ACRES) = 2231.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 240.10 TO NODE 240.10 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 31.16

RAINFALL INTENSITY (INCH./HOUR) = 2.25

EFFECTIVE STREAM AREA(ACRES) = 2089.98

TOTAL STREAM AREA(ACRES) = 2231.48

PEAK FLOW RATE(CFS) AT CONFLUENCE = 3162.39

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	3162.39	31.16	2.252	.58	2089.98

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	3162.39	2089.98

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 3162.39 TIME(MINUTES) = 31.165

EFFECTIVE AREA(ACRES) = 2089.98

TOTAL AREA(ACRES) = 2231.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 240.10 TO NODE 109.01 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 1311.00  
DOWNSTREAM NODE ELEVATION = 1263.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 5300.00  
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = .000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 8.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 3162.39  
FLOW VELOCITY(FEET/SEC) = 23.70 FLOW DEPTH(FEET) = 6.67  
TRAVEL TIME(MIN.) = 3.73 TC(MIN.) = 34.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 240.10 TO NODE 190.01 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.104  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 5-7 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .4  
SUBAREA AREA(ACRES) = 283.00 SUBAREA RUNOFF(CFS) = 412.43  
EFFECTIVE AREA(ACRES) = 2372.98  
AVERAGED Fm(INCH/HR) = .570  
TOTAL AREA(ACRES) = 2514.48  
PEAK FLOW RATE(CFS) = 3276.09  
TC(MIN) = 34.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 109.01 TO NODE 109.01 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 34.89  
RAINFALL INTENSITY (INCH./HOUR) = 2.10  
EFFECTIVE STREAM AREA(ACRES) = 2372.98  
TOTAL STREAM AREA(ACRES) = 2514.48  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3276.09

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	3276.09	34.89	2.104	.57	2372.98

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	3276.09	2372.98

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 3276.09 TIME(MINUTES) = 34.892  
EFFECTIVE AREA(ACRES) = 2372.98  
TOTAL AREA(ACRES) = 2514.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 247.00 TO NODE 247.11 IS CODE = 2  
-----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
INITIAL SUBAREA FLOW-LENGTH = 1000.00  
UPSTREAM ELEVATION = 1405.00  
DOWNSTREAM ELEVATION = 1380.00  
ELEVATION DIFFERENCE = 25.00  
TC =  $.412 * [(1000.00 ** 3.00) / (25.00)] ** .20 = 13.656$   
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.694  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA RUNOFF(CFS) = 14.01  
TOTAL AREA(ACRES) = 5.00 PEAK FLOW RATE(CFS) = 14.01

\*\*\*\*\*  
FLOW PROCESS FROM NODE 247.11 TO NODE 247.12 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

DEPTH OF FLOW IN 18.0 INCH PIPE IS 12.8 INCHES  
PIPEFLOW VELOCITY(Feet/Sec.) = 10.4  
UPSTREAM NODE ELEVATION = 1380.00  
DOWNSTREAM NODE ELEVATION = 1354.50  
FLOWLENGTH(Feet) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 14.01  
TRAVEL TIME(Min.) = 1.60 TC(Min.) = 15.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 247.10 TO NODE 247.12 IS CODE = 8  
-----

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.456  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 12.93  
EFFECTIVE AREA(ACRES) = 10.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 10.00  
PEAK FLOW RATE(CFS) = 25.87  
TC(Min) = 15.26



```

*****
FLOW PROCESS FROM NODE    247.12 TO NODE    248.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =    8.1
UPSTREAM NODE ELEVATION =  1354.50
DOWNSTREAM NODE ELEVATION =  1353.00
FLOWLENGTH(FEET) =   167.00    MANNINGS N =   .013
ESTIMATED PIPE DIAMETER(INCH) =   27.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    25.87
TRAVEL TIME(MIN.) =    .34    TC(MIN.) =   15.60

*****
FLOW PROCESS FROM NODE    248.00 TO NODE    248.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   3.411
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =   .5
SUBAREA AREA(ACRES) =   10.00    SUBAREA RUNOFF(CFS) =   25.46
EFFECTIVE AREA(ACRES) =   20.00
AVERAGED Fm(INCH/HR) =   .582
TOTAL AREA(ACRES) =   20.00
PEAK FLOW RATE(CFS) =   50.92
TC(MIN) =   15.60

*****
FLOW PROCESS FROM NODE    248.10 TO NODE    249.10 IS CODE =    3
-----
>>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) =    9.8
UPSTREAM NODE ELEVATION =  1353.00
DOWNSTREAM NODE ELEVATION =  1350.00
FLOWLENGTH(FEET) =   330.00    MANNINGS N =   .013
ESTIMATED PIPE DIAMETER(INCH) =   36.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =   50.92
TRAVEL TIME(MIN.) =    .56    TC(MIN.) =   16.16

*****
FLOW PROCESS FROM NODE    249.00 TO NODE    249.10 IS CODE =    8
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

```

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.339  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 49.63  
 EFFECTIVE AREA(ACRES) = 40.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 40.00  
 PEAK FLOW RATE(CFS) = 99.26  
 TC(MIN) = 16.16

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 249.10 TO NODE 250.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 48.0 INCH PIPE IS 36.2 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 9.8  
 UPSTREAM NODE ELEVATION = 1350.00  
 DOWNSTREAM NODE ELEVATION = 1346.00  
 FLOWLENGTH(FEET) = 670.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 99.26  
 TRAVEL TIME(MIN.) = 1.14 TC(MIN.) = 17.31

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 250.00 TO NODE 250.10 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.205  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 94.43  
 EFFECTIVE AREA(ACRES) = 80.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 80.00  
 PEAK FLOW RATE(CFS) = 188.85  
 TC(MIN) = 17.31

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 250.10 TO NODE 251.10 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 63.0 INCH PIPE IS 46.7 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 11.0  
 UPSTREAM NODE ELEVATION = 1346.00  
 DOWNSTREAM NODE ELEVATION = 1339.00  
 FLOWLENGTH(FEET) = 1330.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 188.85  
TRAVEL TIME(MIN.) = 2.02 TC(MIN.) = 19.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 251.00 TO NODE 251.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.999  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 74.00 SUBAREA RUNOFF(CFS) = 161.00  
EFFECTIVE AREA(ACRES) = 154.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 154.00  
PEAK FLOW RATE(CFS) = 335.05  
TC(MIN) = 19.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 251.10 TO NODE 252.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 69.0 INCH PIPE IS 54.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 15.4  
UPSTREAM NODE ELEVATION = 1339.00  
DOWNSTREAM NODE ELEVATION = 1320.00  
FLOWLENGTH(FEET) = 2100.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 335.05  
TRAVEL TIME(MIN.) = 2.28 TC(MIN.) = 21.60

\*\*\*\*\*  
FLOW PROCESS FROM NODE 252.00 TO NODE 252.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.805  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 65.00 SUBAREA RUNOFF(CFS) = 130.07  
EFFECTIVE AREA(ACRES) = 219.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 219.00  
PEAK FLOW RATE(CFS) = 438.24  
TC(MIN) = 21.60

\*\*\*\*\*  
FLOW PROCESS FROM NODE 252.10 TO NODE 252.10 IS CODE = 1  
-----

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 21.60  
RAINFALL INTENSITY (INCH./HOUR) = 2.81  
EFFECTIVE STREAM AREA(ACRES) = 219.00  
TOTAL STREAM AREA(ACRES) = 219.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 438.24

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
------------------	------------------------	----------------	--------------------------	---------------	--------------------------

1	438.24	21.60	2.805	.58	219.00
---	--------	-------	-------	-----	--------

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
------------------	----------------------	--------------------------

1	438.24	219.00
---	--------	--------

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 438.24 TIME(MINUTES) = 21.605  
EFFECTIVE AREA(ACRES) = 219.00  
TOTAL AREA(ACRES) = 219.00

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 219.00  
EFFECTIVE AREA(ACRES) = 219.00  
PEAK FLOW RATE(CFS) = 438.24

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
 (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
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 Ver. 4.1C Release Date: 5/11/87 Serial # I00908

Especially prepared for:

HALL & FOREMAN  
 \*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* NORTH FONTANA MASTER STORM DRAIN  
 \* Q 100-YEAR, DESIGN Q  
 \* JN 3547  
 \*\*\*\*\*

FILE NAME: LINEDA.DAT  
 TIME/DATE OF STUDY: 0: 4 1/ 1/1980

=====

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 =  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*  
 10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.040  
 100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.520  
 COMPUTED RAINFALL INTENSITY DATA:  
 STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.5200  
 SLOPE OF INTENSITY DURATION CURVE = .6000

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 280.00 TO NODE 280.10 IS CODE = 2  
 -----

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

=====

DEVELOPMENT IS SINGLE FAMILY RESIDENTIAL -> 3-4 DWELLINGS/ACRE

TC =  $K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** .20$   
 INITIAL SUBAREA FLOW-LENGTH = 1350.00  
 UPSTREAM ELEVATION = 1525.00  
 DOWNSTREAM ELEVATION = 1520.00  
 ELEVATION DIFFERENCE = 5.00  
 $TC = .412 * [(1350.00 ** 3.00) / (5.00)] ** .20 = 22.558$   
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.734  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA RUNOFF(CFS) = 19.37  
 TOTAL AREA(ACRES) = 10.00 PEAK FLOW RATE(CFS) = 19.37

\*\*\*\*\*  
FLOW PROCESS FROM NODE 281.00 TO NODE 280.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.734  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 19.37  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00  
PEAK FLOW RATE(CFS) = 38.73  
TC(MIN) = 22.56

\*\*\*\*\*  
FLOW PROCESS FROM NODE 280.10 TO NODE 282.10 IS CODE = 6  
-----

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM ELEVATION = 1520.00 DOWNSTREAM ELEVATION = 1512.00  
STREET LENGTH(FEET) = 350.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK = 18.50  
INTERIOR STREET CROSSFALL(DECIMAL) = .020  
OUTSIDE STREET CROSSFALL(DECIMAL) = .020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 38.73  
STREETFLOW MODEL RESULTS:

NOTE: STREETFLOW EXCEEDS TOP OF CURB.  
THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION  
THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.  
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.

STREET FLOWDEPTH(FEET) = .51  
HALFSTREET FLOODWIDTH(FEET) = 19.13  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.12  
PRODUCT OF DEPTH&VELOCITY = 2.61  
STREETFLOW TRAVELTIME(MIN) = 1.14 TC(MIN) = 23.70

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.654  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = .00 SUBAREA RUNOFF(CFS) = .00  
EFFECTIVE AREA(ACRES) = 20.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 20.00 PEAK FLOW RATE(CFS) = 38.73  
END OF SUBAREA STREETFLOW HYDRAULICS:  
DEPTH(FEET) = .51 HALFSTREET FLOODWIDTH(FEET) = 19.13  
FLOW VELOCITY(FEET/SEC.) = 5.12 DEPTH\*VELOCITY = 2.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 282.00 TO NODE 282.10 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.654  
SOIL CLASSIFICATION IS "A"  
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 37.30  
EFFECTIVE AREA(ACRES) = 40.00  
AVERAGED Fm(INCH/HR) = .582  
TOTAL AREA(ACRES) = 40.00  
PEAK FLOW RATE(CFS) = 74.60  
TC(MIN) = 23.70

\*\*\*\*\*  
FLOW PROCESS FROM NODE 282.10 TO NODE 283.10 IS CODE = 6  
-----

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<  
=====

UPSTREAM ELEVATION = 1512.00 DOWNSTREAM ELEVATION = 1495.00  
STREET LENGTH(FEET) = 650.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK = 18.50  
INTERIOR STREET CROSSFALL(DECIMAL) = .020  
OUTSIDE STREET CROSSFALL(DECIMAL) = .020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 74.60

\*\*\*STREET FLOWING FULL\*\*\*

STREETFLOW MODEL RESULTS:

NOTE: STREETFLOW EXCEEDS TOP OF CURB.

THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION  
THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.  
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.

STREET FLOWDEPTH(FEET) = .59

HALFSTREET FLOODWIDTH(FEET) = 20.00

AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.80

PRODUCT OF DEPTH&VELOCITY = 4.04

STREETFLOW TRAVELTIME(MIN) = 1.59 TC(MIN) = 25.29

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.553

SOIL CLASSIFICATION IS "A"

RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5

SUBAREA AREA(ACRES) = .00 SUBAREA RUNOFF(CFS) = .00

EFFECTIVE AREA(ACRES) = 40.00

AVERAGED Fm(INCH/HR) = .582

TOTAL AREA(ACRES) = 40.00 PEAK FLOW RATE(CFS) = 74.60

END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .59 HALFSTREET FLOODWIDTH(FEET) = 20.00

FLOW VELOCITY(FEET/SEC.) = 6.80 DEPTH\*VELOCITY = 4.04

```

*****
FLOW PROCESS FROM NODE    283.00 TO NODE    283.10 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.553
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =    .5
SUBAREA AREA(ACRES) =    40.00    SUBAREA RUNOFF(CFS) =    70.94
EFFECTIVE AREA(ACRES) =    80.00
AVERAGED Fm(INCH/HR) =    .582
TOTAL AREA(ACRES) =    80.00
PEAK FLOW RATE(CFS) =    141.88
TC(MIN) =    25.29

*****
FLOW PROCESS FROM NODE    283.10 TO NODE    284.10 IS CODE =    3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.7
UPSTREAM NODE ELEVATION = 1495.00
DOWNSTREAM NODE ELEVATION = 1470.00
FLOWLENGTH(FEET) = 1300.00    MANNINGS N =    .013
ESTIMATED PIPE DIAMETER(INCH) = 45.00    NUMBER OF PIPES =    1
PIPEFLOW THRU SUBAREA(CFS) =    141.88
TRAVEL TIME(MIN.) =    1.30    TC(MIN.) =    26.59

*****
FLOW PROCESS FROM NODE    284.00 TO NODE    284.10 IS CODE =    8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.477
SOIL CLASSIFICATION IS "A"
RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) =    .5
SUBAREA AREA(ACRES) =    80.00    SUBAREA RUNOFF(CFS) =    136.43
EFFECTIVE AREA(ACRES) =    160.00
AVERAGED Fm(INCH/HR) =    .582
TOTAL AREA(ACRES) =    160.00
PEAK FLOW RATE(CFS) =    272.86
TC(MIN) =    26.59

*****
FLOW PROCESS FROM NODE    284.10 TO NODE    285.10 IS CODE =    3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====

```



DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.5 INCHES  
 PIPEFLOW VELOCITY(Feet/sec.) = 20.8  
 UPSTREAM NODE ELEVATION = 1470.00  
 DOWNSTREAM NODE ELEVATION = 1440.00  
 FLOWLENGTH(Feet) = 1300.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 272.86  
 TRAVEL TIME(MIN.) = 1.04 TC(MIN.) = 27.63

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 285.00 TO NODE 285.10 IS CODE = 8  
 -----

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

=====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.420  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 132.37  
 EFFECTIVE AREA(ACRES) = 240.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 240.00  
 PEAK FLOW RATE(CFS) = 397.11  
 TC(MIN) = 27.63

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 285.10 TO NODE 286.10 IS CODE = 3  
 -----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====  
 DEPTH OF FLOW IN 66.0 INCH PIPE IS 51.6 INCHES  
 PIPEFLOW VELOCITY(Feet/sec.) = 19.9  
 UPSTREAM NODE ELEVATION = 1440.00  
 DOWNSTREAM NODE ELEVATION = 1419.00  
 FLOWLENGTH(Feet) = 1300.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 397.11  
 TRAVEL TIME(MIN.) = 1.09 TC(MIN.) = 28.72

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 286.00 TO NODE 286.10 IS CODE = 8  
 -----

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

=====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.365  
 SOIL CLASSIFICATION IS "A"  
 RESIDENTIAL-> 3-4 DWELLINGS/ACRE SUBAREA LOSS RATE, Fm(INCH/HR) = .5  
 SUBAREA AREA(ACRES) = 80.00 SUBAREA RUNOFF(CFS) = 128.38  
 EFFECTIVE AREA(ACRES) = 320.00  
 AVERAGED Fm(INCH/HR) = .582  
 TOTAL AREA(ACRES) = 320.00  
 PEAK FLOW RATE(CFS) = 513.52

TC(MIN) = 28.72

\*\*\*\*\*  
FLOW PROCESS FROM NODE 286.10 TO NODE 211.10 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 102.0 INCH PIPE IS 79.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.9  
UPSTREAM NODE ELEVATION = 1419.00  
DOWNSTREAM NODE ELEVATION = 1412.00  
FLOWLENGTH(FEET) = 2600.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 102.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 513.52  
TRAVEL TIME(MIN.) = 3.99 TC(MIN.) = 32.70

\*\*\*\*\*  
FLOW PROCESS FROM NODE 211.10 TO NODE 211.10 IS CODE = 1  
-----

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 32.70  
RAINFALL INTENSITY (INCH./HOUR) = 2.19  
EFFECTIVE STREAM AREA(ACRES) = 320.00  
TOTAL STREAM AREA(ACRES) = 320.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 513.52

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
1	513.52	32.70	2.188	.58	320.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
1	513.52	320.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
PEAK FLOW RATE(CFS) = 513.52 TIME(MINUTES) = 32.704  
EFFECTIVE AREA(ACRES) = 320.00  
TOTAL AREA(ACRES) = 320.00

\*\*\*\*\*  
FLOW PROCESS FROM NODE 211.10 TO NODE 211.10 IS CODE = 1  
-----

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

>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 32.70  
RAINFALL INTENSITY (INCH./HOUR) = 2.19  
EFFECTIVE STREAM AREA(ACRES) = 320.00  
TOTAL STREAM AREA(ACRES) = 320.00  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 513.52

CONFLUENCE INFORMATION:

STREAM NUMBER	PEAK FLOW RATE(CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)	FM (IN/HR)	EFFECTIVE AREA(ACRES)
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1	513.52	32.70	2.188	.58	320.00
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RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
CONFLUENCE FORMULA USED FOR 1 STREAMS.

SUMMARY RESULTS:

STREAM NUMBER	CONFLUENCE Q(CFS)	EFFECTIVE AREA(ACRES)
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1	513.52	320.00
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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 513.52 TIME(MINUTES) = 32.704  
EFFECTIVE AREA(ACRES) = 320.00  
TOTAL AREA(ACRES) = 320.00

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 320.00  
EFFECTIVE AREA(ACRES) = 320.00  
PEAK FLOW RATE(CFS) = 513.52

END OF RATIONAL METHOD ANALYSIS