
 Process from Point/Station 5.200 to Point/Station 3.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.930 (Ac.)
 Runoff from this stream = 2.503 (CFS)
 Time of concentration = 10.90 min.
 Rainfall intensity = 5.579 (In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.485	11.72	5.322
2	2.503	10.90	5.579
Qmax(1) =			
	1.000 *	1.000 *	2.485) +
	0.954 *	1.000 *	2.503) + = 4.873
Qmax(2) =			
	1.000 *	0.929 *	2.485) +
	1.000 *	1.000 *	2.503) + = 4.813

Total of 2 streams to confluence:
 Flow rates before confluence point:
 2.485 2.503
 Maximum flow rates at confluence using above data:
 4.873 4.813
 Area of streams before confluence:
 0.960 0.930
 Results of confluence:
 Total flow rate = 4.873 (CFS)
 Time of concentration = 11.723 min.
 Effective stream area after confluence = 1.890 (Ac.)

 Process from Point/Station 3.000 to Point/Station 4.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 455.500 (Ft.)
 Downstream point/station elevation = 449.500 (Ft.)
 Pipe length = 169.50 (Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 4.873 (CFS)
 Given pipe size = 24.00 (In.)
 Calculated individual pipe flow = 4.873 (CFS)
 Normal flow depth in pipe = 5.89 (In.)
 Flow top width inside pipe = 20.65 (In.)
 Critical Depth = 9.32 (In.)
 Pipe flow velocity = 8.14 (Ft/s)
 Travel time through pipe = 0.35 min.
 Time of concentration (TC) = 12.07 min.

 Process from Point/Station 3.000 to Point/Station 4.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 1.890 (Ac.)
 Runoff from this stream = 4.873 (CFS)
 Time of concentration = 12.07 min.
 Rainfall intensity = 5.223 (In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	12.054	12.83	5.022
2	4.873	12.07	5.223
Qmax(1) =			
	1.000 *	1.000 *	12.054) +
	0.962 *	1.000 *	4.873) + = 16.740
Qmax(2) =			
	1.000 *	0.941 *	12.054) +
	1.000 *	1.000 *	4.873) + = 16.216

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 12.054 4.873
 Maximum flow rates at confluence using above data:
 16.740 16.216
 Area of streams before confluence:
 4.960 1.890
 Results of confluence:
 Total flow rate = 16.740 (CFS)
 Time of concentration = 12.828 min.
 Effective stream area after confluence = 6.850 (Ac.)

 Process from Point/Station 4.000 to Point/Station 5.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 449.500 (Ft.)
 Downstream point/station elevation = 447.500 (Ft.)
 Pipe length = 111.90 (Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 16.740 (CFS)
 Given pipe size = 36.00 (In.)
 Calculated individual pipe flow = 16.740 (CFS)
 Normal flow depth in pipe = 11.38 (In.)
 Flow top width inside pipe = 33.48 (In.)
 Critical Depth = 15.69 (In.)
 Pipe flow velocity = 8.73 (Ft/s)
 Travel time through pipe = 0.21 min.
 Time of concentration (TC) = 13.04 min.

 Process from Point/Station 4.000 to Point/Station 5.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 6.850 (Ac.)
 Runoff from this stream = 16.740 (CFS)
 Time of concentration = 13.04 min.
 Rainfall intensity = 4.969 (In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 6.100 to Point/Station 6.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.600
 Decimal fraction soil group C = 0.400
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.462
 Initial subarea total flow distance = 448.500 (Ft.)
 Highest elevation = 462.000 (Ft.)
 Lowest elevation = 454.000 (Ft.)
 Elevation difference = 8.000 (Ft.) Slope = 1.784 %
 Top of Initial Area Slope adjusted by User to 2.200 %
 Bottom of Initial Area Slope adjusted by User to 2.300 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 80.00 (Ft)
 for the top area slope value of 2.20 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 7.90 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.4620) * (80.000^{.5}) / (2.200^{(1/3)})] = 7.90$
 The initial area total distance of 448.50 (Ft.) entered leaves a
 remaining distance of 368.50 (Ft.)
 Using Figure 3-4, the travel time for this distance is 3.16 minutes
 for a distance of 368.50 (Ft.) and a slope of 2.30 %
 with an elevation difference of 8.48 (Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$
 $= 3.159 \text{ Minutes}$
 $Tt = [(11.9 * 0.0698^3) / (8.48)]^{.385} = 3.16$
 Total initial area Ti = 7.90 minutes from Figure 3-3 formula plus
 3.16 minutes from the Figure 3-4 formula = 11.06 minutes
 Rainfall intensity (I) = 5.527 (In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.462
 Subarea runoff = 4.801 (CFS)
 Total initial stream area = 1.880 (Ac.)

 Process from Point/Station 6.200 to Point/Station 5.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 448.500 (Ft.)
 Downstream point/station elevation = 447.500 (Ft.)
 Pipe length = 9.00 (Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 4.801 (CFS)
 Given pipe size = 24.00 (In.)
 Calculated individual pipe flow = 4.801 (CFS)
 Normal flow depth in pipe = 4.40 (In.)
 Flow top width inside pipe = 18.57 (In.)
 Critical Depth = 9.24 (In.)
 Pipe flow velocity = 12.15 (Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 11.07 min.

 Process from Point/Station 6.200 to Point/Station 5.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 1.880 (Ac.)
 Runoff from this stream = 4.801 (CFS)
 Time of concentration = 11.07 min.
 Rainfall intensity = 5.523 (In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	16.740	13.04	4.969
2	4.801	11.07	5.523
Qmax(1) =	1.000 * 0.900 *	1.000 * 1.000 *	16.740) + 4.801) + = 21.059
Qmax(2) =	1.000 * 1.000 *	0.849 * 1.000 *	16.740) + 4.801) + = 19.008

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 16.740 4.801
 Maximum flow rates at confluence using above data:
 21.059 19.008
 Area of streams before confluence:
 6.850 1.880

Results of confluence:
 Total flow rate = 21.059 (CFS)
 Time of concentration = 13.041 min.
 Effective stream area after confluence = 8.730 (Ac.)

Process from Point/Station 5.000 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 447.500(Ft.)
Downstream point/station elevation = 439.500(Ft.)
Pipe length = 267.76(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 21.059(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 21.059(CFS)
Normal flow depth in pipe = 11.21(In.)
Flow top width inside pipe = 33.34(In.)
Critical Depth = 17.69(In.)
Pipe flow velocity = 11.20(Ft/s)
Travel time through pipe = 0.40 min.
Time of concentration (TC) = 13.44 min.

Process from Point/Station 5.000 to Point/Station 6.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 8.730(Ac.)
Runoff from this stream = 21.059(CFS)
Time of concentration = 13.44 min.
Rainfall intensity = 4.873(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 7.100 to Point/Station 7.200
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(4.3 DU/A or Less)
Impervious value, Ai = 0.300
Sub-Area C Value = 0.474
Initial subarea total flow distance = 574.600(Ft.)
Highest elevation = 460.000(Ft.)
Lowest elevation = 446.000(Ft.)
Elevation difference = 14.000(Ft.) Slope = 2.436 %
Top of Initial Area Slope adjusted by User to 1.175 %
Bottom of Initial Area Slope adjusted by User to 2.600 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
For the top area slope value of 1.18 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 8.93 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{1/3})]$

$TC = [1.8 * (1.1 - 0.4740) * (70.000^{.5}) / (1.175^{1/3})] = 8.93$
The initial area total distance of 574.60 (Ft.) entered leaves a
remaining distance of 504.60 (Ft.)
Using Figure 3-4, the travel time for this distance is 3.84 minutes
for a distance of 504.60 (Ft.) and a slope of 2.60 %
with an elevation difference of 13.12(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3 / (elevation change(Ft.))]^{.385} * 60(min/hr)$
= 3.838 Minutes
 $Tt = [(11.9 * 0.0956^3) / (13.12)]^{.385} = 3.84$
Total initial area Ti = 8.93 minutes from Figure 3-3 formula plus
3.84 minutes from the Figure 3-4 formula = 12.77 minutes
Rainfall intensity (I) = 5.036(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.474
Subarea runoff = 5.419(CFS)
Total initial stream area = 2.270(Ac.)

Process from Point/Station 7.200 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 441.000(Ft.)
Downstream point/station elevation = 439.500(Ft.)
Pipe length = 9.90(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 5.419(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 5.419(CFS)
Normal flow depth in pipe = 4.33(In.)
Flow top width inside pipe = 18.46(In.)
Critical Depth = 9.84(In.)
Pipe flow velocity = 14.05(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 12.78 min.

Process from Point/Station 7.200 to Point/Station 6.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 2.270(Ac.)
Runoff from this stream = 5.419(CFS)
Time of concentration = 12.78 min.
Rainfall intensity = 5.033(In/Hr)
Program is now starting with Main Stream No. 3

Process from Point/Station 8.100 to Point/Station 8.200
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.950
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]

(4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.452
 Initial subarea total flow distance = 564.000(Ft.)
 Highest elevation = 460.000(Ft.)
 Lowest elevation = 446.000(Ft.)
 Elevation difference = 14.000(Ft.) Slope = 2.482 %
 Top of Initial Area Slope adjusted by User to 1.170 %
 Bottom of Initial Area Slope adjusted by User to 2.680 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 70.00 (Ft)
 for the top area slope value of 1.17 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 9.27 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.4515) * (70.000^{.5})] / (1.170^{(1/3)}) = 9.27$
 The initial area total distance of 564.00 (Ft.) entered leaves a
 remaining distance of 494.00 (Ft.)
 Using Figure 3-4, the travel time for this distance is 3.73 minutes
 for a distance of 494.00 (Ft.) and a slope of 2.68 %
 with an elevation difference of 13.24(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$
 $= 3.732 \text{ Minutes}$
 $Tt = [(11.9 * 0.0936^3) / (13.24)]^{.385} = 3.73$
 Total initial area Ti = 9.27 minutes from Figure 3-3 formula plus
 3.73 minutes from the Figure 3-4 formula = 13.00 minutes
 Rainfall intensity (I) = 4.979(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.452
 Subarea runoff = 3.260(CFS)
 Total initial stream area = 1.450(Ac.)

 Process from Point/Station 8.200 to Point/Station 6.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 441.000(Ft.)
 Downstream point/station elevation = 439.500(Ft.)
 Pipe length = 25.96(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 3.260(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 3.260(CFS)
 Normal flow depth in pipe = 4.27(In.)
 Flow top width inside pipe = 18.36(In.)
 Critical Depth = 7.56(In.)
 Pipe flow velocity = 8.61(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 13.05 min.

 Process from Point/Station 8.200 to Point/Station 6.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 3

Stream flow area = 1.450(Ac.)
 Runoff from this stream = 3.260(CFS)
 Time of concentration = 13.05 min.
 Rainfall intensity = 4.967(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	21.059	13.44	4.873
2	5.419	12.78	5.033
3	3.260	13.05	4.967
Qmax(1) =			
	1.000 *	1.000 *	21.059) +
	0.968 *	1.000 *	5.419) +
	0.981 *	1.000 *	3.260) + =
Qmax(2) =			
	1.000 *	0.951 *	21.059) +
	1.000 *	1.000 *	5.419) +
	1.000 *	0.980 *	3.260) + =
Qmax(3) =			
	1.000 *	0.971 *	21.059) +
	0.987 *	1.000 *	5.419) +
	1.000 *	1.000 *	3.260) + =
			29.055

Total of 3 main streams to confluence:
 Flow rates before confluence point:
 21.059 5.419 3.260
 Maximum flow rates at confluence using above data:
 29.504 28.642 29.055
 Area of streams before confluence:
 8.730 2.270 1.450

Results of confluence:
 Total flow rate = 29.504(CFS)
 Time of concentration = 13.440 min.
 Effective stream area after confluence = 12.450(Ac.)

 Process from Point/Station 6.000 to Point/Station 7.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 439.500(Ft.)
 Downstream point/station elevation = 432.500(Ft.)
 Pipe length = 145.26(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 29.504(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 29.504(CFS)
 Normal flow depth in pipe = 11.81(In.)
 Flow top width inside pipe = 33.81(In.)
 Critical Depth = 21.12(In.)
 Pipe flow velocity = 14.63(Ft/s)
 Travel time through pipe = 0.17 min.
 Time of concentration (TC) = 13.61 min.

 Process from Point/Station 6.000 to Point/Station 7.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 12.450(Ac.)
 Runoff from this stream = 29.504(CFS)
 Time of concentration = 13.61 min.
 Rainfall intensity = 4.835(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 9.100 to Point/Station 9.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.300
 Decimal fraction soil group C = 0.700
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL 1
 (4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.471
 Initial subarea total flow distance = 740.000(Ft.)
 Highest elevation = 470.000(Ft.)
 Lowest elevation = 438.000(Ft.)
 Elevation difference = 32.000(Ft.) Slope = 4.324 %
 Top of Initial Area Slope adjusted by User to 1.700 %
 Bottom of Initial Area Slope adjusted by User to 6.800 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 80.00 (Ft)
 for the top area slope value of 1.70 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 8.48 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.471) * (80.000^{.5}) / (1.700^{(1/3)})] = 8.48$
 The initial area total distance of 740.00 (Ft.) entered leaves a
 remaining distance of 660.00 (Ft.)
 Using Figure 3-4, the travel time for this distance is 3.26 minutes
 for a distance of 660.00 (Ft.) and a slope of 6.80 %
 with an elevation difference of 44.88(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$
 $= 3.259 Minutes$
 $Tt = [(11.9 * 0.1250^3) / (44.88)]^{.385} = 3.26$
 Total initial area Ti = 8.48 minutes from Figure 3-3 formula plus
 3.26 minutes from the Figure 3-4 formula = 11.74 minutes
 Rainfall intensity (I) = 5.316(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.471
 Subarea runoff = 4.282(CFS)
 Total initial stream area = 1.710(Ac.)

 Process from Point/Station 9.200 to Point/Station 7.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 433.000(Ft.)
 Downstream point/station elevation = 432.500(Ft.)
 Pipe length = 7.00(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 4.282(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.282(CFS)
 Normal flow depth in pipe = 4.64(In.)
 Flow top width inside pipe = 18.96(In.)
 Critical Depth = 8.72(In.)
 Pipe flow velocity = 10.05(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 11.76 min.

 Process from Point/Station 9.200 to Point/Station 7.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 1.710(Ac.)
 Runoff from this stream = 4.282(CFS)
 Time of concentration = 11.76 min.
 Rainfall intensity = 5.313(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	29.504	13.61	4.835
2	4.282	11.76	5.313
Qmax(1) =			
	1.000 *	1.000 *	29.504) +
	0.910 *	1.000 *	4.282) + = 33.400
Qmax(2) =			
	1.000 *	0.864 *	29.504) +
	1.000 *	1.000 *	4.282) + = 29.775

Total of 2 main streams to confluence:

Flow rates before confluence point:

29.504 4.282

Maximum flow rates at confluence using above data:

33.400 29.775

Area of streams before confluence:

12.450 1.710

Results of confluence:

Total flow rate = 33.400(CFS)

Time of concentration = 13.605 min.

Effective stream area after confluence = 14.160(Ac.)

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Process from Point/Station      7.000 to Point/Station      11.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

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Upstream point/station elevation = 432.500(Ft.)
Downstream point/station elevation = 427.500(Ft.)
Pipe length = 111.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 33.400(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 33.400(CFS)
Normal flow depth in pipe = 12.83(In.)
Flow top width inside pipe = 34.48(In.)
Critical Depth = 22.53(In.)
Pipe flow velocity = 14.77(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 13.73 min.

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*****
Process from Point/Station      7.000 to Point/Station      11.000
**** CONFLUENCE OF MAIN STREAMS ****

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The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 14.160(Ac.)
Runoff from this stream = 33.400(CFS)
Time of concentration = 13.73 min.
Rainfall intensity = 4.806(In/Hr)
Program is now starting with Main Stream No. 2

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Process from Point/Station      10.100 to Point/Station      10.200
**** INITIAL AREA EVALUATION ****

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL      ]
(4.3 DU/A or Less      )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.474
Initial subarea total flow distance = 726.000(Ft.)
Highest elevation = 470.000(Ft.)
Lowest elevation = 451.000(Ft.)
Elevation difference = 19.000(Ft.) Slope = 2.617 %
Top of Initial Area Slope adjusted by User to 1.770 %
Bottom of Initial Area Slope adjusted by User to 3.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of 1.77 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 8.33 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))

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TC = [1.8*(1.1-0.4740)*( 80.000^.5)]/( 1.770^(1/3))= 8.33
The initial area total distance of 726.00 (Ft.) entered leaves a
remaining distance of 646.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 4.19 minutes
for a distance of 646.00 (Ft.) and a slope of 3.40 %
with an elevation difference of 21.96(Ft.) from the end of the top area
Tt = [(11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 4.187 Minutes
Tt=[(11.9*0.1223^3)/( 21.96)]^.385= 4.19
Total initial area Ti = 8.33 minutes from Figure 3-3 formula plus
4.19 minutes from the Figure 3-4 formula = 12.52 minutes
Rainfall intensity (I) = 5.102(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.474
Subarea runoff = 8.996(CFS)
Total initial stream area = 3.720(Ac.)

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Process from Point/Station      10.200 to Point/Station      8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

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Upstream point/station elevation = 446.000(Ft.)
Downstream point/station elevation = 444.500(Ft.)
Pipe length = 11.73(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 8.996(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 8.996(CFS)
Normal flow depth in pipe = 5.81(In.)
Flow top width inside pipe = 20.56(In.)
Critical Depth = 12.84(In.)
Pipe flow velocity = 15.35(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 12.53 min.

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Process from Point/Station      8.000 to Point/Station      9.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

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Upstream point/station elevation = 444.500(Ft.)
Downstream point/station elevation = 436.500(Ft.)
Pipe length = 244.50(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 8.996(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 8.996(CFS)
Normal flow depth in pipe = 8.24(In.)
Flow top width inside pipe = 22.79(In.)
Critical Depth = 12.84(In.)
Pipe flow velocity = 9.42(Ft/s)
Travel time through pipe = 0.43 min.
Time of concentration (TC) = 12.96 min.

```

 Process from Point/Station 8.000 to Point/Station 9.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 3.720(Ac.)
 Runoff from this stream = 8.996(CFS)
 Time of concentration = 12.96 min.
 Rainfall intensity = 4.988(In/Hr)

 Process from Point/Station 11.100 to Point/Station 11.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.300
 Decimal fraction soil group C = 0.700
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.471
 Initial subarea total flow distance = 770.600(Ft.)
 Highest elevation = 468.000(Ft.)
 Lowest elevation = 442.000(Ft.)
 Elevation difference = 26.000(Ft.) Slope = 3.374 %
 Top of Initial Area Slope adjusted by User to 2.000 %
 Bottom of Initial Area Slope adjusted by User to 3.580 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 80.00 (Ft)
 for the top area slope value of 2.00 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 8.04 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.471) * (80.000^{.5})] / (2.000^{(1/3)}) = 8.04$
 The initial area total distance of 770.60 (Ft.) entered leaves a
 remaining distance of 690.60 (Ft.)
 Using Figure 3-4, the travel time for this distance is 4.32 minutes
 for a distance of 690.60 (Ft.) and a slope of 3.58 %
 with an elevation difference of 24.72(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$
 $= 4.321 Minutes$
 $Tt = [(11.9 * 0.1308^3) / (24.72)]^{.385} = 4.32$
 Total initial area Ti = 8.04 minutes from Figure 3-3 formula plus
 4.32 minutes from the Figure 3-4 formula = 12.36 minutes
 Rainfall intensity (I) = 5.144(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.471
 Subarea runoff = 4.676(CFS)
 Total initial stream area = 1.930(Ac.)

 Process from Point/Station 11.200 to Point/Station 9.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 437.000(Ft.)
 Downstream point/station elevation = 436.500(Ft.)
 Pipe length = 37.00(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 4.676(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.676(CFS)
 Normal flow depth in pipe = 7.38(In.)
 Flow top width inside pipe = 22.15(In.)
 Critical Depth = 9.13(In.)
 Pipe flow velocity = 5.71(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 12.47 min.

 Process from Point/Station 11.200 to Point/Station 9.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.930(Ac.)
 Runoff from this stream = 4.676(CFS)
 Time of concentration = 12.47 min.
 Rainfall intensity = 5.116(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.996	12.96	4.988
2	4.676	12.47	5.116
Qmax(1) =	1.000 * 0.975 *	1.000 * 1.000 *	8.996) + 4.676) + = 13.556
Qmax(2) =	1.000 * 1.000 *	0.962 * 1.000 *	8.996) + 4.676) + = 13.327

Total of 2 streams to confluence:
 Flow rates before confluence point:
 8.996 4.676
 Maximum flow rates at confluence using above data:
 13.556 13.327
 Area of streams before confluence:
 3.720 1.930
 Results of confluence:
 Total flow rate = 13.556(CFS)
 Time of concentration = 12.964 min.
 Effective stream area after confluence = 5.650(Ac.)

 Process from Point/Station 9.000 to Point/Station 10.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 436.500(Ft.)
 Downstream point/station elevation = 432.500(Ft.)
 Pipe length = 109.50(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 13.556(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 13.556(CFS)
 Normal flow depth in pipe = 9.98(In.)
 Flow top width inside pipe = 23.66(In.)
 Critical Depth = 15.92(In.)
 Pipe flow velocity = 10.97(Ft/s)
 Travel time through pipe = 0.17 min.
 Time of concentration (TC) = 13.13 min.

 Process from Point/Station 9.000 to Point/Station 10.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 5.650(Ac.)
 Runoff from this stream = 13.556(CFS)
 Time of concentration = 13.13 min.
 Rainfall intensity = 4.947(In/Hr)

 Process from Point/Station 12.100 to Point/Station 12.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.200
 Decimal fraction soil group C = 0.800
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.474
 Initial subarea total flow distance = 454.800(Ft.)
 Highest elevation = 450.000(Ft.)
 Lowest elevation = 438.000(Ft.)
 Elevation difference = 12.000(Ft.) Slope = 2.639 %
 Top of Initial Area Slope adjusted by User to 3.570 %
 Bottom of Initial Area Slope adjusted by User to 3.500 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 95.00 (Ft)
 for the top area slope value of 3.57 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 7.19 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.474) * (95.000^{.5}) / (3.570^{(1/3)})] = 7.19$
 The initial area total distance of 454.80 (Ft.) entered leaves a
 remaining distance of 359.80 (Ft.)

Using Figure 3-4, the travel time for this distance is 2.64 minutes
 for a distance of 359.80 (Ft.) and a slope of 3.50 %
 with an elevation difference of 12.59(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$
 = 2.638 Minutes
 $Tt = [(11.9 * 0.0681^3) / (12.59)]^{.385} = 2.64$
 Total initial area Ti = 7.19 minutes from Figure 3-3 formula plus
 2.64 minutes from the Figure 3-4 formula = 9.82 minutes
 Rainfall intensity (I) = 5.965(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.474
 Subarea runoff = 2.941(CFS)
 Total initial stream area = 1.040(Ac.)

 Process from Point/Station 12.200 to Point/Station 10.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 433.000(Ft.)
 Downstream point/station elevation = 432.500(Ft.)
 Pipe length = 9.00(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 2.941(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 2.941(CFS)
 Normal flow depth in pipe = 4.10(In.)
 Flow top width inside pipe = 18.07(In.)
 Critical Depth = 7.16(In.)
 Pipe flow velocity = 8.24(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 9.84 min.

 Process from Point/Station 12.200 to Point/Station 10.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.040(Ac.)
 Runoff from this stream = 2.941(CFS)
 Time of concentration = 9.84 min.
 Rainfall intensity = 5.958(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.556	13.13	4.947
2	2.941	9.84	5.958
Qmax(1) =	1.000 * 0.830 *	1.000 * 1.000 *	13.556) + 2.941) + = 15.997
Qmax(2) =	1.000 * 1.000 *	0.750 * 1.000 *	13.556) + 2.941) + = 13.102

Total of 2 streams to confluence:

Flow rates before confluence point:
 13.556 2.941
 Maximum flow rates at confluence using above data:
 15.997 13.102
 Area of streams before confluence:
 5.650 1.040
 Results of confluence:
 Total flow rate = 15.997(CFS)
 Time of concentration = 13.130 min.
 Effective stream area after confluence = 6.690(Ac.)

 Process from Point/Station 10.000 to Point/Station 11.000
 *** PIPEFLOW TRAVEL TIME (User specified size) ***

Upstream point/station elevation = 432.500(Ft.)
 Downstream point/station elevation = 427.500(Ft.)
 Pipe length = 149.48(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 15.997(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 15.997(CFS)
 Normal flow depth in pipe = 11.23(In.)
 Flow top width inside pipe = 23.95(In.)
 Critical Depth = 17.31(In.)
 Pipe flow velocity = 11.09(Ft/s)
 Travel time through pipe = 0.22 min.
 Time of concentration (TC) = 13.35 min.

 Process from Point/Station 10.000 to Point/Station 11.000
 *** CONFLUENCE OF MAIN STREAMS ***

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 6.690(Ac.)
 Runoff from this stream = 15.997(CFS)
 Time of concentration = 13.35 min.
 Rainfall intensity = 4.893(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	33.400	13.73	4.806
2	15.997	13.35	4.893
Qmax(1) =	1.000 * 1.000 * 33.400) +		
	0.982 * 1.000 * 15.997) + =		49.114
Qmax(2) =	1.000 * 0.973 * 33.400) +		
	1.000 * 1.000 * 15.997) + =		48.483

Total of 2 main streams to confluence:
 Flow rates before confluence point:

33.400 15.997
 Maximum flow rates at confluence using above data:
 49.114 48.483
 Area of streams before confluence:
 14.160 6.690

Results of confluence:
 Total flow rate = 49.114(CFS)
 Time of concentration = 13.731 min.
 Effective stream area after confluence = 20.850(Ac.)

 Process from Point/Station 11.000 to Point/Station 12.000
 *** PIPEFLOW TRAVEL TIME (User specified size) ***

Upstream point/station elevation = 427.500(Ft.)
 Downstream point/station elevation = 418.500(Ft.)
 Pipe length = 303.65(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 49.114(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 49.114(CFS)
 Normal flow depth in pipe = 17.86(In.)
 Flow top width inside pipe = 36.00(In.)
 Critical Depth = 27.37(In.)
 Pipe flow velocity = 14.03(Ft/s)
 Travel time through pipe = 0.36 min.
 Time of concentration (TC) = 14.09 min.

 Process from Point/Station 11.000 to Point/Station 12.000
 *** CONFLUENCE OF MAIN STREAMS ***

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 20.850(Ac.)
 Runoff from this stream = 49.114(CFS)
 Time of concentration = 14.09 min.
 Rainfall intensity = 4.727(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 13.100 to Point/Station 13.200
 *** INITIAL AREA EVALUATION ***

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.700
 Decimal fraction soil group C = 0.300
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.459
 Initial subarea total flow distance = 679.740(Ft.)
 Highest elevation = 460.000(Ft.)

Lowest elevation = 424.000(Ft.)
 Elevation difference = 36.000(Ft.) Slope = 5.296 %
 Top of Initial Area Slope adjusted by User to 6.300 %
 Bottom of Initial Area Slope adjusted by User to 3.180 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of 6.30 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 6.25 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.4590) * (100.000^{.5})] / (6.300^{(1/3)}) = 6.25$
 The initial area total distance of 679.74 (Ft.) entered leaves a
 remaining distance of 579.74 (Ft.)
 Using Figure 3-4, the travel time for this distance is 3.95 minutes
 for a distance of 579.74 (Ft.) and a slope of 3.18 %
 with an elevation difference of 18.44(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$
 $= 3.952 \text{ Minutes}$
 $Tt = [(11.9 * 0.1098^3) / (18.44)]^{.385} = 3.95$
 Total initial area $Ti = 6.25$ minutes from Figure 3-3 formula plus
 3.95 minutes from the Figure 3-4 formula = 10.20 minutes
 Rainfall intensity (I) = 5.822(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.459
 Subarea runoff = 3.742(CFS)
 Total initial stream area = 1.400(Ac.)

 Process from Point/Station 13.200 to Point/Station 12.000
 *** PIPEFLOW TRAVEL TIME (User specified size) ***

Upstream point/station elevation = 419.000(Ft.)
 Downstream point/station elevation = 418.500(Ft.)
 Pipe length = 27.00(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 3.742(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 3.742(CFS)
 Normal flow depth in pipe = 6.07(In.)
 Flow top width inside pipe = 20.87(In.)
 Critical Depth = 8.12(In.)
 Pipe flow velocity = 5.99(Ft/s)
 Travel time through pipe = 0.08 min.
 Time of concentration (TC) = 10.27 min.

 Process from Point/Station 13.200 to Point/Station 12.000
 *** CONFLUENCE OF MAIN STREAMS ***

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 1.400(Ac.)
 Runoff from this stream = 3.742(CFS)
 Time of concentration = 10.27 min.
 Rainfall intensity = 5.795(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	49.114	14.09	4.727
2	3.742	10.27	5.795
Qmax(1) =			
	1.000 *	1.000 *	49.114) +
	0.816 *	1.000 *	3.742) + = 52.166
Qmax(2) =			
	1.000 *	0.729 *	49.114) +
	1.000 *	1.000 *	3.742) + = 39.552

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 49.114 3.742
 Maximum flow rates at confluence using above data:
 52.166 39.552
 Area of streams before confluence:
 20.850 1.400

Results of confluence:
 Total flow rate = 52.166(CFS)
 Time of concentration = 14.091 min.
 Effective stream area after confluence = 22.250(Ac.)

 Process from Point/Station 12.000 to Point/Station 13.000
 *** PIPEFLOW TRAVEL TIME (User specified size) ***

Upstream point/station elevation = 418.500(Ft.)
 Downstream point/station elevation = 408.500(Ft.)
 Pipe length = 357.72(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 52.166(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 52.166(CFS)
 Normal flow depth in pipe = 18.84(In.)
 Flow top width inside pipe = 35.96(In.)
 Critical Depth = 28.18(In.)
 Pipe flow velocity = 13.94(Ft/s)
 Travel time through pipe = 0.43 min.
 Time of concentration (TC) = 14.52 min.

 Process from Point/Station 12.000 to Point/Station 13.000
 *** CONFLUENCE OF MAIN STREAMS ***

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 22.250(Ac.)
 Runoff from this stream = 52.166(CFS)
 Time of concentration = 14.52 min.
 Rainfall intensity = 4.636(In/Hr)
 Program is now starting with Main Stream No. 2

Process from Point/Station 15.100 to Point/Station 15.200
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(4.3 DU/A or Less)
Impervious value, Ai = 0.300
Sub-Area C Value = 0.462
Initial subarea total flow distance = 406.000(Ft.)
Highest elevation = 428.000(Ft.)
Lowest elevation = 416.000(Ft.)
Elevation difference = 12.000(Ft.) Slope = 2.956 %
Top of Initial Area Slope adjusted by User to 2.700 %
Bottom of Initial Area Slope adjusted by User to 2.320 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 95.00 (Ft)
for the top area slope value of 2.70 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 8.04 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.4620) * (95.000^{.5})] / (2.700^{(1/3)}) = 8.04$
The initial area total distance of 406.00 (Ft.) entered leaves a
remaining distance of 311.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 2.76 minutes
for a distance of 311.00 (Ft.) and a slope of 2.32 %
with an elevation difference of 7.22(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$
 $= 2.763 \text{ Minutes}$
 $Tt = [(11.9 * 0.0589^3) / (7.22)]^{.385} = 2.76$
Total initial area Ti = 8.04 minutes from Figure 3-3 formula plus
2.76 minutes from the Figure 3-4 formula = 10.80 minutes
Rainfall intensity (I) = 5.611(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.462
Subarea runoff = 2.100(CFS)
Total initial stream area = 0.810(Ac.)

Process from Point/Station 15.200 to Point/Station 13.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 411.000(Ft.)
Downstream point/station elevation = 408.500(Ft.)
Pipe length = 32.32(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 2.100(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 2.100(CFS)
Normal flow depth in pipe = 3.22(In.)
Flow top width inside pipe = 16.35(In.)
Critical Depth = 6.04(In.)

Pipe flow velocity = 8.37(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 10.87 min.

Process from Point/Station 15.200 to Point/Station 13.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 0.810(Ac.)
Runoff from this stream = 2.100(CFS)
Time of concentration = 10.87 min.
Rainfall intensity = 5.590(In/Hr)
Program is now starting with Main Stream No. 3

Process from Point/Station 14.100 to Point/Station 14.200
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(4.3 DU/A or Less)
Impervious value, Ai = 0.300
Sub-Area C Value = 0.450
Initial subarea total flow distance = 1070.000(Ft.)
Highest elevation = 442.000(Ft.)
Lowest elevation = 414.000(Ft.)
Elevation difference = 28.000(Ft.) Slope = 2.617 %
Top of Initial Area Slope adjusted by User to 2.000 %
Bottom of Initial Area Slope adjusted by User to 2.280 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of 2.00 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 8.31 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.4500) * (80.000^{.5})] / (2.000^{(1/3)}) = 8.31$
The initial area total distance of 1070.00 (Ft.) entered leaves a
remaining distance of 990.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 6.78 minutes
for a distance of 990.00 (Ft.) and a slope of 2.28 %
with an elevation difference of 22.57(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$
 $= 6.783 \text{ Minutes}$
 $Tt = [(11.9 * 0.1875^3) / (22.57)]^{.385} = 6.78$
Total initial area Ti = 8.31 minutes from Figure 3-3 formula plus
6.78 minutes from the Figure 3-4 formula = 15.09 minutes
Rainfall intensity (I) = 4.523(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff = 3.460(CFS)
Total initial stream area = 1.700(Ac.)

 Process from Point/Station 14.200 to Point/Station 13.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 409.000(Ft.)
 Downstream point/station elevation = 408.500(Ft.)
 Pipe length = 9.90(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 3.460(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 3.460(CFS)
 Normal flow depth in pipe = 4.55(In.)
 Flow top width inside pipe = 18.81(In.)
 Critical Depth = 7.80(In.)
 Pipe flow velocity = 8.35(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 15.11 min.

 Process from Point/Station 14.200 to Point/Station 13.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 3
 Stream flow area = 1.700(Ac.)
 Runoff from this stream = 3.460(CFS)
 Time of concentration = 15.11 min.
 Rainfall intensity = 4.519(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	52.166	14.52	4.636
2	2.100	10.87	5.590
3	3.460	15.11	4.519

Qmax(1) =
 1.000 * 1.000 * 52.166) +
 0.829 * 1.000 * 2.100) +
 1.000 * 0.961 * 3.460) + = 57.232

Qmax(2) =
 1.000 * 0.748 * 52.166) +
 1.000 * 1.000 * 2.100) +
 1.000 * 0.719 * 3.460) + = 43.625

Qmax(3) =
 0.975 * 1.000 * 52.166) +
 0.808 * 1.000 * 2.100) +
 1.000 * 1.000 * 3.460) + = 56.001

Total of 3 main streams to confluence:

Flow rates before confluence point:
 52.166 2.100 3.460

Maximum flow rates at confluence using above data:
 57.232 43.625 56.001

Area of streams before confluence:
 22.250 0.810 1.700

Results of confluence:

Total flow rate = 57.232(CFS)
 Time of concentration = 14.519 min.
 Effective stream area after confluence = 24.760(Ac.)

 Process from Point/Station 13.000 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 408.500(Ft.)
 Downstream point/station elevation = 405.500(Ft.)
 Pipe length = 366.31(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 57.232(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 57.232(CFS)
 Normal flow depth in pipe = 26.53(In.)
 Flow top width inside pipe = 40.52(In.)
 Critical Depth = 28.45(In.)
 Pipe flow velocity = 8.94(Ft/s)
 Travel time through pipe = 0.68 min.
 Time of concentration (TC) = 15.20 min.

 Process from Point/Station 13.000 to Point/Station 14.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 24.760(Ac.)
 Runoff from this stream = 57.232(CFS)
 Time of concentration = 15.20 min.
 Rainfall intensity = 4.501(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 16.100 to Point/Station 16.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.700
 Decimal fraction soil group C = 0.300
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.459
 Initial subarea total flow distance = 445.000(Ft.)
 Highest elevation = 420.000(Ft.)
 Lowest elevation = 411.000(Ft.)
 Elevation difference = 9.000(Ft.) Slope = 2.022 %
 Top of Initial Area Slope adjusted by User to 2.500 %
 Bottom of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 95.00 (Ft)

for the top area slope value of 2.50 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 8.29 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{1/3})]$
 $TC = [1.8 * (1.1 - 0.4590) * (95.000^{.5})] / (2.500^{1/3}) = 8.29$
 The initial area total distance of 445.00 (Ft.) entered leaves a
 remaining distance of 350.00 (Ft.)
 Using Figure 3-4, the travel time for this distance is 4.18 minutes
 for a distance of 350.00 (Ft.) and a slope of 1.00 %
 with an elevation difference of 3.50(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$
 $= 4.183 \text{ Minutes}$
 $Tt = [(11.9 * 0.0663^3) / (3.50)]^{.385} = 4.18$
 Total initial area $Ti = 8.29$ minutes from Figure 3-3 formula plus
 4.18 minutes from the Figure 3-4 formula = 12.47 minutes
 Rainfall intensity (I) = 5.115(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.459
 Subarea runoff = 2.066(CFS)
 Total initial stream area = 0.880(Ac.)

 Process from Point/Station 16.200 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 406.000(Ft.)
 Downstream point/station elevation = 405.500(Ft.)
 Pipe length = 24.56(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 2.066(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 2.066(CFS)
 Normal flow depth in pipe = 4.41(In.)
 Flow top width inside pipe = 18.59(In.)
 Critical Depth = 5.98(In.)
 Pipe flow velocity = 5.21(Ft/s)
 Travel time through pipe = 0.08 min.
 Time of concentration (TC) = 12.55 min.

 Process from Point/Station 16.200 to Point/Station 14.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 0.880(Ac.)
 Runoff from this stream = 2.066(CFS)
 Time of concentration = 12.55 min.
 Rainfall intensity = 5.094(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	57.232	15.20	4.501
2	2.066	12.55	5.094
Qmax(1) =			
	1.000 *	1.000 *	57.232) +
	0.884 *	1.000 *	2.066) + = 59.058
Qmax(2) =			
	1.000 *	0.825 *	57.232) +
	1.000 *	1.000 *	2.066) + = 49.306

Total of 2 main streams to confluence:

Flow rates before confluence point:

57.232 2.066

Maximum flow rates at confluence using above data:

59.058 49.306

Area of streams before confluence:

24.760 0.880

Results of confluence:

Total flow rate = 59.058(CFS)

Time of concentration = 15.202 min.

Effective stream area after confluence = 25.640(Ac.)

 Process from Point/Station 14.000 to Point/Station 15.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 405.500(Ft.)
 Downstream point/station elevation = 404.000(Ft.)
 Pipe length = 71.52(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 59.058(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 59.058(CFS)
 Normal flow depth in pipe = 20.20(In.)
 Flow top width inside pipe = 41.97(In.)
 Critical Depth = 28.91(In.)
 Pipe flow velocity = 12.91(Ft/s)
 Travel time through pipe = 0.09 min.
 Time of concentration (TC) = 15.29 min.
 End of computations, total study area = 25.640 (Ac.)

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2003 Version 7.3

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 11/07/12

***** Hydrology Study Control Information *****

WARNER RANCH

100-YEAR STORM EVENT DEVELOPMENT CONDITIONS

BIO-RETENTION POND 1

Shapouri & Associates, Rancho Santa Fe, CA - S/N 968

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:

6 hour, precipitation(inches) = 3.500

24 hour precipitation(inches) = 6.000

P6/P24 = 58.3%

San Diego hydrology manual 'C' values used

Process from Point/Station 17.100 to Point/Station 17.200
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000

Decimal fraction soil group D = 0.000

[MEDIUM DENSITY RESIDENTIAL
(4.3 DU/A or Less)]

Impervious value, Ai = 0.300

Sub-Area C Value = 0.480

Initial subarea total flow distance = 683.000(Ft.)

Highest elevation = 470.000(Ft.)

Lowest elevation = 436.000(Ft.)

Elevation difference = 34.000(Ft.) Slope = 4.978 %

Top of Initial Area Slope adjusted by User to 1.780 %

Bottom of Initial Area Slope adjusted by User to 9.410 %

INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:

The maximum overland flow distance is 80.00 (Ft)

for the top area slope value of 1.78 %, in a development type of
4.3 DU/A or Less

In Accordance With Figure 3-3

Initial Area Time of Concentration = 8.24 minutes

TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$

TC = $[1.8 * (1.1 - 0.4800) * (80.000^{.5})] / (1.780^{(1/3)}) = 8.24$

The initial area total distance of 683.00 (Ft.) entered leaves a

remaining distance of 603.00 (Ft.)

Using Figure 3-4, the travel time for this distance is 2.68 minutes

for a distance of 603.00 (Ft.) and a slope of 9.41 %

with an elevation difference of 56.74(Ft.) from the end of the top area

Tt = $[11.9 * \text{length}(\text{Mi})^3 / (\text{elevation change}(\text{Ft.}))^{.385}] * 60(\text{min/hr})$

= 2.683 Minutes

Tt = $[(11.9 * 0.1142^3) / (56.74)]^{.385} = 2.68$

Total initial area Ti = 8.24 minutes from Figure 3-3 formula plus

2.68 minutes from the Figure 3-4 formula = 10.92 minutes

Rainfall intensity (I) = 5.572(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.480

Subarea runoff = 5.697(CFS)

Total initial stream area = 2.130(Ac.)

Process from Point/Station 17.200 to Point/Station 16.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 431.000(Ft.)

Downstream point/station elevation = 429.500(Ft.)

Pipe length = 9.90(Ft.) Manning's N = 0.015

No. of pipes = 1 Required pipe flow = 5.697(CFS)

Given pipe size = 24.00(In.)

Calculated individual pipe flow = 5.697(CFS)

Normal flow depth in pipe = 4.44(In.)

Flow top width inside pipe = 18.63(In.)

Critical Depth = 10.11(In.)

Pipe flow velocity = 14.25(Ft/s)

Travel time through pipe = 0.01 min.

Time of concentration (TC) = 10.93 min.

Process from Point/Station 16.000 to Point/Station 17.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 429.500(Ft.)

Downstream point/station elevation = 417.500(Ft.)

Pipe length = 195.60(Ft.) Manning's N = 0.015

No. of pipes = 1 Required pipe flow = 5.697(CFS)

Given pipe size = 24.00(In.)

Calculated individual pipe flow = 5.697(CFS)

Normal flow depth in pipe = 5.55(In.)

Flow top width inside pipe = 20.24(In.)

Critical Depth = 10.11(In.)

Pipe flow velocity = 10.35(Ft/s)

Travel time through pipe = 0.31 min.

Time of concentration (TC) = 11.25 min.

Process from Point/Station 16.000 to Point/Station 17.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 2.130(Ac.)

Runoff from this stream = 5.697(CFS)

Time of concentration = 11.25 min.

Rainfall intensity = 5.467(In/Hr)

Program is now starting with Main Stream No. 2

```

*****
Process from Point/Station      18.100 to Point/Station      18.200
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.400
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL      ]
(4.3 DU/A or Less      )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.468
Initial subarea total flow distance = 615.670(Ft.)
Highest elevation = 458.000(Ft.)
Lowest elevation = 423.000(Ft.)
Elevation difference = 35.000(Ft.) Slope = 5.685 %
Top of Initial Area Slope adjusted by User to 5.440 %
Bottom of Initial Area Slope adjusted by User to 5.600 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 5.44 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.47 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^(.5)]/[(% slope^(1/3))]
TC = [1.8*(1.1-0.4680)*( 100.000^(.5)]/( 5.440^(1/3))= 6.47
The initial area total distance of 615.67 (Ft.) entered leaves a
remaining distance of 515.67 (Ft.)
Using Figure 3-4, the travel time for this distance is 2.90 minutes
for a distance of 515.67 (Ft.) and a slope of 5.60 %
with an elevation difference of 28.88(Ft.) from the end of the top area
Tt = [(11.9*length(Mi)^3)/(elevation change(Ft.))]^(.385 *60(min/hr)
= 2.904 Minutes
Tt=[(11.9*0.0977^3)/( 28.88)]^(.385)= 2.90
Total initial area Ti = 6.47 minutes from Figure 3-3 formula plus
2.90 minutes from the Figure 3-4 formula = 9.37 minutes
Rainfall intensity (I) = 6.149(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.468
Subarea runoff = 4.460(CFS)
Total initial stream area = 1.550(Ac.)

*****
Process from Point/Station      18.200 to Point/Station      17.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 418.000(Ft.)
Downstream point/station elevation = 417.500(Ft.)
Pipe length = 25.50(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 4.460(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 4.460(CFS)
Normal flow depth in pipe = 6.54(In.)
Flow top width inside pipe = 21.37(In.)
Critical Depth = 8.91(In.)
Pipe flow velocity = 6.43(Ft/s)
Travel time through pipe = 0.07 min.

```

Time of concentration (TC) = 9.44 min.

```

*****
Process from Point/Station      18.200 to Point/Station      17.000
**** CONFLUENCE OF MAIN STREAMS ****

```

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 1.550(Ac.)
Runoff from this stream = 4.460(CFS)
Time of concentration = 9.44 min.
Rainfall intensity = 6.121(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.697	11.25	5.467
2	4.460	9.44	6.121
Qmax(1) =	1.000 *	1.000 *	5.697) +
	0.893 *	1.000 *	4.460) + =
Qmax(2) =	1.000 *	0.839 *	5.697) +
	1.000 *	1.000 *	4.460) + =

9.681
9.242

Total of 2 main streams to confluence:

Flow rates before confluence point:

5.697 4.460

Maximum flow rates at confluence using above data:

9.681 9.242

Area of streams before confluence:

2.130 1.550

Results of confluence:

Total flow rate = 9.681(CFS)

Time of concentration = 11.246 min.

Effective stream area after confluence = 3.680(Ac.)

```

*****
Process from Point/Station      17.000 to Point/Station      19.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

Upstream point/station elevation = 417.500(Ft.)
Downstream point/station elevation = 410.500(Ft.)
Pipe length = 345.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 9.681(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 9.681(CFS)
Normal flow depth in pipe = 9.75(In.)
Flow top width inside pipe = 23.57(In.)
Critical Depth = 13.35(In.)
Pipe flow velocity = 8.08(Ft/s)
Travel time through pipe = 0.71 min.
Time of concentration (TC) = 11.96 min.

```

*****
Process from Point/Station      17.000 to Point/Station      19.000
**** CONFLUENCE OF MAIN STREAMS ****

```

The following data inside Main Stream is listed:

```

In Main Stream number: 1
Stream flow area =      3.680(Ac.)
Runoff from this stream =      9.681(CFS)
Time of concentration =    11.96 min.
Rainfall intensity =     5.255(In/Hr)
Program is now starting with Main Stream No. 2

```

```

*****
Process from Point/Station      20.100 to Point/Station      20.200
**** INITIAL AREA EVALUATION ****

```

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL
(4.3 DU/A or Less
Impervious value, Ai = 0.300
Sub-Area C Value = 0.480
Initial subarea total flow distance = 490.500(Ft.)
Highest elevation = 464.000(Ft.)
Lowest elevation = 434.000(Ft.)
Elevation difference = 30.000(Ft.) Slope = 6.116 %
Top of Initial Area Slope adjusted by User to 2.330 %
Bottom of Initial Area Slope adjusted by User to 9.800 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of 2.33 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 7.53 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.4800)*( 80.000^.5)/( 2.330^(1/3))]= 7.53
The initial area total distance of 490.50 (Ft.) entered leaves a
remaining distance of 410.50 (Ft.)
Using Figure 3-4, the travel time for this distance is 1.96 minutes
for a distance of 410.50 (Ft.) and a slope of 9.80 %
with an elevation difference of 40.23(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3]/(elevation change(Ft.))^.385 *60(min/hr)
= 1.964 Minutes
Tt=[(11.9*0.0777^3)/( 40.23)]^.385= 1.96
Total initial area Ti = 7.53 minutes from Figure 3-3 formula plus
1.96 minutes from the Figure 3-4 formula = 9.49 minutes
Rainfall intensity (I) = 6.098(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff = 3.073(CFS)
Total initial stream area = 1.050(Ac.)

```

```

*****
Process from Point/Station      20.200 to Point/Station      18.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 429.000(Ft.)
Downstream point/station elevation = 426.500(Ft.)
Pipe length = 9.90(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 3.073(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 3.073(CFS)
Normal flow depth in pipe = 2.91(In.)
Flow top width inside pipe = 15.66(In.)
Critical Depth = 7.33(In.)
Pipe flow velocity = 14.20(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 9.51 min.

```

```

*****
Process from Point/Station      20.200 to Point/Station      18.000
**** CONFLUENCE OF MINOR STREAMS ****

```

```

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.050(Ac.)
Runoff from this stream = 3.073(CFS)
Time of concentration = 9.51 min.
Rainfall intensity = 6.093(In/Hr)

```

```

*****
Process from Point/Station      21.100 to Point/Station      21.200
**** INITIAL AREA EVALUATION ****

```

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL
(4.3 DU/A or Less
Impervious value, Ai = 0.300
Sub-Area C Value = 0.480
Initial subarea total flow distance = 402.600(Ft.)
Highest elevation = 462.000(Ft.)
Lowest elevation = 432.000(Ft.)
Elevation difference = 30.000(Ft.) Slope = 7.452 %
Top of Initial Area Slope adjusted by User to 4.900 %
Bottom of Initial Area Slope adjusted by User to 9.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 4.90 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.57 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.4800)*( 100.000^.5)/( 4.900^(1/3))]= 6.57
The initial area total distance of 402.60 (Ft.) entered leaves a
remaining distance of 302.60 (Ft.)

```

Using Figure 3-4, the travel time for this distance is 1.57 minutes for a distance of 302.60 (Ft.) and a slope of 9.50 % with an elevation difference of 28.75(Ft.) from the end of the top area
 $T_t = [11.9 * \text{length}(\text{Mi})^3 / (\text{elevation change}(\text{Ft.}))]^{.385} * 60(\text{min/hr})$
 = 1.572 Minutes
 $T_t = [(11.9 * 0.0573^3) / (28.75)]^{.385} = 1.57$
 Total initial area $T_i = 6.57$ minutes from Figure 3-3 formula plus 1.57 minutes from the Figure 3-4 formula = 8.14 minutes
 Rainfall intensity (I) = 6.733(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
 Subarea runoff = 3.296(CFS)
 Total initial stream area = 1.020(Ac.)

 Process from Point/Station 21.200 to Point/Station 18.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 427.000(Ft.)
 Downstream point/station elevation = 426.500(Ft.)
 Pipe length = 25.56(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 3.296(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 3.296(CFS)
 Normal flow depth in pipe = 5.62(In.)
 Flow top width inside pipe = 20.33(In.)
 Critical Depth = 7.61(In.)
 Pipe flow velocity = 5.89(Ft/s)
 Travel time through pipe = 0.07 min.
 Time of concentration (TC) = 8.21 min.

 Process from Point/Station 21.200 to Point/Station 18.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.020(Ac.)
 Runoff from this stream = 3.296(CFS)
 Time of concentration = 8.21 min.
 Rainfall intensity = 6.695(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.073	9.51	6.093
2	3.296	8.21	6.695
Qmax(1) =	1.000 *	1.000 *	3.073) +
	0.910 *	1.000 *	3.296) + = 6.074
Qmax(2) =	1.000 *	0.864 *	3.073) +
	1.000 *	1.000 *	3.296) + = 5.953

Total of 2 streams to confluence:

Flow rates before confluence point:
 3.073 3.296
 Maximum flow rates at confluence using above data:
 6.074 5.953
 Area of streams before confluence:
 1.050 1.020
 Results of confluence:
 Total flow rate = 6.074(CFS)
 Time of concentration = 9.505 min.
 Effective stream area after confluence = 2.070(Ac.)

 Process from Point/Station 18.000 to Point/Station 19.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 426.500(Ft.)
 Downstream point/station elevation = 410.500(Ft.)
 Pipe length = 330.72(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 6.074(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 6.074(CFS)
 Normal flow depth in pipe = 6.08(In.)
 Flow top width inside pipe = 20.88(In.)
 Critical Depth = 10.44(In.)
 Pipe flow velocity = 9.69(Ft/s)
 Travel time through pipe = 0.57 min.
 Time of concentration (TC) = 10.07 min.

 Process from Point/Station 18.000 to Point/Station 19.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 2.070(Ac.)
 Runoff from this stream = 6.074(CFS)
 Time of concentration = 10.07 min.
 Rainfall intensity = 5.869(In/Hr)
 Program is now starting with Main Stream No. 3

 Process from Point/Station 19.100 to Point/Station 19.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, $A_i = 0.300$
 Sub-Area C Value = 0.480
 Initial subarea total flow distance = 613.170(Ft.)
 Highest elevation = 436.000(Ft.)

Lowest elevation = 416.000(Ft.)
 Elevation difference = 20.000(Ft.) Slope = 3.262 %
 Top of Initial Area Slope adjusted by User to 2.500 %
 Bottom of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 95.00 (Ft)
 for the top area slope value of 2.50 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 8.01 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.4800) * (95.000^{.5})] / (2.500^{(1/3)}) = 8.01$
 The initial area total distance of 613.17 (Ft.) entered leaves a
 remaining distance of 518.17 (Ft.)
 Using Figure 3-4, the travel time for this distance is 5.66 minutes
 for a distance of 518.17 (Ft.) and a slope of 1.00 %
 with an elevation difference of 5.18(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$
 $= 5.659 \text{ Minutes}$
 $Tt = [(11.9 * 0.0981^3) / (5.18)]^{.385} = 5.66$
 Total initial area $Ti = 8.01$ minutes from Figure 3-3 formula plus
 5.66 minutes from the Figure 3-4 formula = 13.67 minutes
 Rainfall intensity (I) = 4.819(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is $C = 0.480$
 Subarea runoff = 4.927(CFS)
 Total initial stream area = 2.130(Ac.)

 Process from Point/Station 19.100 to Point/Station 19.200
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 3 in normal stream number 1
 Stream flow area = 2.130(Ac.)
 Runoff from this stream = 4.927(CFS)
 Time of concentration = 13.67 min.
 Rainfall intensity = 4.819(In/Hr)

 Process from Point/Station 22.100 to Point/Station 22.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, $A_i = 0.300$
 Sub-Area C Value = 0.480
 Initial subarea total flow distance = 443.000(Ft.)
 Highest elevation = 442.000(Ft.)
 Lowest elevation = 416.000(Ft.)
 Elevation difference = 26.000(Ft.) Slope = 5.869 %
 Top of Initial Area Slope adjusted by User to 8.950 %
 Bottom of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:

The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of 8.95 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 5.38 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.4800) * (100.000^{.5})] / (8.950^{(1/3)}) = 5.38$
 The initial area total distance of 443.00 (Ft.) entered leaves a
 remaining distance of 343.00 (Ft.)
 Using Figure 3-4, the travel time for this distance is 4.12 minutes
 for a distance of 343.00 (Ft.) and a slope of 1.00 %
 with an elevation difference of 3.43(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$
 $= 4.119 \text{ Minutes}$
 $Tt = [(11.9 * 0.0650^3) / (3.43)]^{.385} = 4.12$
 Total initial area $Ti = 5.38$ minutes from Figure 3-3 formula plus
 4.12 minutes from the Figure 3-4 formula = 9.49 minutes
 Rainfall intensity (I) = 6.098(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is $C = 0.480$
 Subarea runoff = 3.103(CFS)
 Total initial stream area = 1.060(Ac.)

 Process from Point/Station 22.100 to Point/Station 22.200
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 3 in normal stream number 2
 Stream flow area = 1.060(Ac.)
 Runoff from this stream = 3.103(CFS)
 Time of concentration = 9.49 min.
 Rainfall intensity = 6.098(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.927	13.67	4.819
2	3.103	9.49	6.098
Qmax(1) =	1.000 * 0.790 *	1.000 * 1.000 *	4.927) + 3.103) + = 7.380
Qmax(2) =	1.000 * 1.000 *	0.694 * 1.000 *	4.927) + 3.103) + = 6.524

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.927 3.103
 Maximum flow rates at confluence using above data:
 7.380 6.524
 Area of streams before confluence:
 2.130 1.060
 Results of confluence:
 Total flow rate = 7.380(CFS)
 Time of concentration = 13.674 min.
 Effective stream area after confluence = 3.190(Ac.)

 Process from Point/Station 19.200 to Point/Station 19.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 411.000(Ft.)
 Downstream point/station elevation = 410.500(Ft.)
 Pipe length = 8.77(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 7.380(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 7.380(CFS)
 Normal flow depth in pipe = 6.45(In.)
 Flow top width inside pipe = 21.27(In.)
 Critical Depth = 11.57(In.)
 Pipe flow velocity = 10.87(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 13.69 min.

 Process from Point/Station 19.200 to Point/Station 19.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 3
 Stream flow area = 3.190(Ac.)
 Runoff from this stream = 7.380(CFS)
 Time of concentration = 13.69 min.
 Rainfall intensity = 4.816(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	9.681	11.96	5.255
2	6.074	10.07	5.869
3	7.380	13.69	4.816
Qmax(1) =			
	1.000 *	1.000 *	9.681) +
	0.895 *	1.000 *	6.074) +
	1.000 *	0.874 *	7.380) + =
			21.566
Qmax(2) =			
	1.000 *	0.843 *	9.681) +
	1.000 *	1.000 *	6.074) +
	1.000 *	0.736 *	7.380) + =
			19.661
Qmax(3) =			
	0.917 *	1.000 *	9.681) +
	0.821 *	1.000 *	6.074) +
	1.000 *	1.000 *	7.380) + =
			21.237

Total of 3 main streams to confluence:

Flow rates before confluence point:

9.681 6.074 7.380

Maximum flow rates at confluence using above data:

21.566 19.661 21.237

Area of streams before confluence:

3.680 2.070 3.190

Results of confluence:

Total flow rate = 21.566(CFS)
 Time of concentration = 11.957 min.
 Effective stream area after confluence = 8.940(Ac.)

 Process from Point/Station 19.000 to Point/Station 23.200
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 410.500(Ft.)
 Downstream point/station elevation = 409.500(Ft.)
 Pipe length = 29.00(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 21.566(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 21.566(CFS)
 Normal flow depth in pipe = 13.29(In.)
 Flow top width inside pipe = 23.86(In.)
 Critical Depth = 19.93(In.)
 Pipe flow velocity = 12.08(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 12.00 min.

 Process from Point/Station 19.000 to Point/Station 23.200
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 8.940(Ac.)
 Runoff from this stream = 21.566(CFS)
 Time of concentration = 12.00 min.
 Rainfall intensity = 5.244(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 23.100 to Point/Station 23.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.480
 Initial subarea total flow distance = 373.000 (Ft.)
 Highest elevation = 434.000 (Ft.)
 Lowest elevation = 416.000 (Ft.)
 Elevation difference = 18.000 (Ft.) Slope = 4.826 %
 Top of Initial Area Slope adjusted by User to 6.900 %
 Bottom of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of 6.90 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 5.86 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.4800) * (100.000^{.5}) / (6.900^{(1/3)})] = 5.86$
 The initial area total distance of 373.00 (Ft.) entered leaves a
 remaining distance of 273.00 (Ft.)
 Using Figure 3-4, the travel time for this distance is 3.45 minutes
 for a distance of 273.00 (Ft.) and a slope of 1.00 %
 with an elevation difference of 2.73 (Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$
 $= 3.455 \text{ Minutes}$
 $Tt = [(11.9 * 0.0517^3) / (2.73)]^{.385} = 3.45$
 Total initial area Ti = 5.86 minutes from Figure 3-3 formula plus
 3.45 minutes from the Figure 3-4 formula = 9.32 minutes
 Rainfall intensity (I) = 6.172 (In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
 Subarea runoff = 2.489 (CFS)
 Total initial stream area = 0.840 (Ac.)

 Process from Point/Station 23.100 to Point/Station 23.200
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 0.840 (Ac.)
 Runoff from this stream = 2.489 (CFS)
 Time of concentration = 9.32 min.
 Rainfall intensity = 6.172 (In/Hr)
 Program is now starting with Main Stream No. 3

 Process from Point/Station 24.100 to Point/Station 23.200
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL]
 (4.3 DU/A or Less)
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.480
 Initial subarea total flow distance = 428.500 (Ft.)
 Highest elevation = 422.000 (Ft.)
 Lowest elevation = 416.000 (Ft.)
 Elevation difference = 6.000 (Ft.) Slope = 1.400 %
 Top of Initial Area Slope adjusted by User to 4.270 %
 Bottom of Initial Area Slope adjusted by User to 1.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of 4.27 %, in a development type of
 4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration = 6.88 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.4800) * (100.000^{.5}) / (4.270^{(1/3)})] = 6.88$
 The initial area total distance of 428.50 (Ft.) entered leaves a
 remaining distance of 328.50 (Ft.)
 Using Figure 3-4, the travel time for this distance is 3.98 minutes
 for a distance of 328.50 (Ft.) and a slope of 1.00 %
 with an elevation difference of 3.29 (Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$
 $= 3.984 \text{ Minutes}$
 $Tt = [(11.9 * 0.0622^3) / (3.29)]^{.385} = 3.98$
 Total initial area Ti = 6.88 minutes from Figure 3-3 formula plus
 3.98 minutes from the Figure 3-4 formula = 10.86 minutes
 Rainfall intensity (I) = 5.591 (In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
 Subarea runoff = 2.388 (CFS)
 Total initial stream area = 0.890 (Ac.)

 Process from Point/Station 24.100 to Point/Station 23.200
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:
 In Main Stream number: 3
 Stream flow area = 0.890 (Ac.)
 Runoff from this stream = 2.388 (CFS)
 Time of concentration = 10.86 min.
 Rainfall intensity = 5.591 (In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	21.566	12.00	5.244
2	2.489	9.32	6.172
3	2.388	10.86	5.591

Qmax(1) =
 1.000 * 1.000 * 21.566) +
 0.850 * 1.000 * 2.489) +
 0.938 * 1.000 * 2.388) + = 25.920

Qmax(2) =
 1.000 * 0.777 * 21.566) +
 1.000 * 1.000 * 2.489) +
 1.000 * 0.858 * 2.388) + = 21.285

Qmax(3) =
 1.000 * 0.905 * 21.566) +
 0.906 * 1.000 * 2.489) +
 1.000 * 1.000 * 2.388) + = 24.169

Total of 3 main streams to confluence:
 Flow rates before confluence point:
 21.566 2.489 2.388
 Maximum flow rates at confluence using above data:
 25.920 21.285 24.169
 Area of streams before confluence:
 8.940 0.840 0.890

Results of confluence:
 Total flow rate = 25.920 (CFS)
 Time of concentration = 11.997 min.
 Effective stream area after confluence = 10.670 (Ac.)

 Process from Point/Station 23.200 to Point/Station 20.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 409.500 (Ft.)
 Downstream point/station elevation = 404.000 (Ft.)
 Pipe length = 25.11 (Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 25.920 (CFS)
 Given pipe size = 24.00 (In.)
 Calculated individual pipe flow = 25.920 (CFS)

Normal flow depth in pipe = 8.73 (In.)
 Flow top width inside pipe = 23.09 (In.)
 Critical Depth = 21.41 (In.)
 Pipe flow velocity = 25.12 (Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 12.01 min.
 End of computations, total study area = 10.670 (Ac.)

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2003 Version 7.3

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 11/14/12

***** Hydrology Study Control Information *****

WARNER RANCH
100-YEAR STORM EVENT DEVELOPMENT CONDITIONS
BIO-RETENTION POND 1

Shapouri & Associates, Rancho Santa Fe, CA - S/N 968

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:

6 hour, precipitation(inches) = 3.500

24 hour precipitation(inches) = 6.000

P6/P24 = 58.3%

San Diego hydrology manual 'C' values used

Process from Point/Station 25.100 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.700
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN]
(Permanent Open Space)
Impervious value, Ai = 0.000
Sub-Area C Value = 0.265
Initial subarea total flow distance = 325.000(Ft.)
Highest elevation = 418.000(Ft.)
Lowest elevation = 404.000(Ft.)
Elevation difference = 14.000(Ft.) Slope = 4.308 %
Top of Initial Area Slope adjusted by User to 25.000 %
Bottom of Initial Area Slope adjusted by User to 2.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 25.00 %, in a development type of
Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration = 5.14 minutes
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.2650) * (100.000^{.5})] / (25.000^{(1/3)}) = 5.14$
The initial area total distance of 325.00 (Ft.) entered leaves a
remaining distance of 225.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 2.28 minutes
for a distance of 225.00 (Ft.) and a slope of 2.00 %
with an elevation difference of 4.50(Ft.) from the end of the top area
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$

= 2.280 Minutes
 $Tt = [(11.9 * 0.0426^3) / (4.50)]^{.385} = 2.28$
Total initial area Ti = 5.14 minutes from Figure 3-3 formula plus
2.28 minutes from the Figure 3-4 formula = 7.42 minutes
Rainfall intensity (I) = 7.149(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.265
Subarea runoff = 2.842(CFS)
Total initial stream area = 1.500(Ac.)

Process from Point/Station 25.100 to Point/Station 21.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 1.500(Ac.)
Runoff from this stream = 2.842(CFS)
Time of concentration = 7.42 min.
Rainfall intensity = 7.149(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 23.200 to Point/Station 20.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(4.3 DU/A or Less)
Impervious value, Ai = 0.300
Sub-Area C Value = 0.474
Rainfall intensity (I) = 5.240(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 12.01 min. Rain intensity = 5.24(In/Hr)
Total area = 10.670(Ac.) Total runoff = 25.920(CFS)

Process from Point/Station 23.200 to Point/Station 20.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 10.670(Ac.)
Runoff from this stream = 25.920(CFS)
Time of concentration = 12.01 min.
Rainfall intensity = 5.240(In/Hr)
Program is now starting with Main Stream No. 3

 Process from Point/Station 14.000 to Point/Station 15.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.500
 Decimal fraction soil group C = 0.500
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL
 (4.3 DU/A or Less)]
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.465
 Rainfall intensity (I) = 4.484(In/Hr) for a 100.0 year storm
 User specified values are as follows:
 TC = 15.29 min. Rain intensity = 4.48 (In/Hr)
 Total area = 25.640(Ac.) Total runoff = 59.058(CFS)

 Process from Point/Station 14.000 to Point/Station 15.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 3
 Stream flow area = 25.640(Ac.)
 Runoff from this stream = 59.058(CFS)
 Time of concentration = 15.29 min.
 Rainfall intensity = 4.484(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.842	7.42	7.149
2	25.920	12.01	5.240
3	59.058	15.29	4.484

Qmax(1) =

1.000 *	1.000 *	2.842) +	
1.000 *	0.618 *	25.920) +	
1.000 *	0.485 *	59.058) + =	47.515

Qmax(2) =

0.733 *	1.000 *	2.842) +	
1.000 *	1.000 *	25.920) +	
1.000 *	0.785 *	59.058) + =	74.392

Qmax(3) =

0.627 *	1.000 *	2.842) +	
0.856 *	1.000 *	25.920) +	
1.000 *	1.000 *	59.058) + =	83.022

Total of 3 main streams to confluence:

Flow rates before confluence point:
 2.842 25.920 59.058

Maximum flow rates at confluence using above data:

47.515 74.392 83.022

Area of streams before confluence:

1.500 10.670 25.640

Results of confluence:

Total flow rate = 83.022(CFS)
 Time of concentration = 15.290 min.
 Effective stream area after confluence = 37.810(Ac.)

 Process from Point/Station 21.000 to Point/Station 21.000
 **** 6 HOUR HYDROGRAPH ****

 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 15.29
 Basin Area = 37.81 Acres
 6 Hour Rainfall = 3.500 Inches
 Runoff Coefficient = 0.460
 Peak Discharge = 83.02 CFS

Time (Min)	Discharge (CFS)
0	0.000
15	3.656
30	3.760
45	3.993
60	4.123
75	4.422
90	4.593
105	4.992
120	5.228
135	5.798
150	6.149
165	7.048
180	7.642
195	9.341
210	10.639
225	15.622
240	22.011
255	83.022
270	12.530
285	8.383
300	6.559
315	5.494
330	4.782
345	4.266
360	3.872
375	3.559

Job File: C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submittal\Pond Pack\BMP
1\5508RPL4-100 YR-BMP 1.PPW
Rain Dir: C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submittal\Pond Pack\BMP 1\

=====
JOB TITLE
=====

Project Date: 11/23/2012
Project Engineer: Shapouri & Associates
Project Title: 5508rpl4
Project Comments: NODE 21
5508rpl4 - Detention Pond - BMP 1

S/N:
PondPack Ver: Compute Time: Date:

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Read HYG 3.01

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***** OUTLET STRUCTURES *****

Outlet 1..... Outlet Input Data 5.01

***** POND ROUTING *****

DETENTION 1..... Pond E-V-Q Table 6.01

S/N:

PondPack Ver:

Compute Time:

Date:

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DETENTION 1 OUT 100

Pond Routing Summary	6.02
Detention Time	6.03

S/N:

PondPack Ver:

Compute Time:

Date:

Type.... Master Network Summary
 Name.... Watershed
 File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submittal\Pond Pack\BMP
 1\5508RPL4-100 YR-BMP 1.PPW

Page 1.01

MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
 SCS Unit Hydrograph Method
 Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
 (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage	Return	HYG Vol	Qpeak	Qpeak	Max WSEL	Max
Node ID	Type Event	cu.ft	Trun	min	cfs	Pond
						cu.ft
DETENTION 1	IN POND	100	224628	255.00	83.02	
DETENTION 1	OUT POND	100	182388	R	265.00	36.61
152870						408.87
HYD 1	HYG	100	224734	R	255.00	83.02
*OUT 1 - N77	JCT	100	182388	R	265.00	36.61

S/N:

PondPack Ver:

Compute Time:

Date:

Type.... Executive Summary (Nodes)

Page 2.01

Name.... Watershed

Event: 100 yr

File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submittal\Pond Pack\BMP 1\

Storm... 100 Tag: 100

NETWORK SUMMARY -- NODES

(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol cu.ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
DETENTION 1 IN	POND	224628		255.00	83.02	
DETENTION 1 OUT	POND	182388	R	265.00	36.61	408.87
HYD 1	HYG	224734	R	255.00	83.02	
Outfall OUT 1 - N77	JCT	182388	R	265.00	36.61	

S/N:

PondPack Ver:

Compute Time:

Date:

Type.... Read HYG
 Name.... HYD 1 Tag: 100 Page 3.01
 File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submittal\Pond Pack\BMP
 1\5508RPL4-100 YR-BMP 1.PPW Event: 100 yr
 Storm... Tag: 100

HYG file =
 HYG ID = HYG 1
 HYG Tag = N-21

 Peak Discharge = 83.02 cfs
 Time to Peak = 255.00 min
 HYG Volume = 224734 cu.ft

HYDROGRAPH ORDINATES (cfs)					
Output Time increment = 15.00 min					
Time min	Time on left represents time for first value in each row.				
.00	.00	3.66	3.76	3.99	4.12
75.00	4.42	4.59	4.99	5.23	5.80
150.00	6.15	7.05	7.64	9.34	10.64
225.00	15.62	22.01	83.02	12.53	8.38
300.00	6.56	5.49	4.78	4.27	3.87
375.00	3.56				

S/N:
 PondPack Ver: Compute Time: Date:

Type.... Vol: Elev-Area
Name.... DETENTION 1

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File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submittal\Pond Pack\BMP
1\5508RPL4-100 YR-BMP 1.PPW

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	$A1+A2+\text{sqr}(A1*A2)$ (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
405.00	-----	33800	0	0	0
406.00	-----	36650	105646	35215	35215
408.00	-----	42700	118910	79273	114488
410.00	-----	49100	137588	91726	206214

S/N:

PondPack Ver:

Compute Time:

Date:

Type.... Outlet Input Data
Name.... Outlet 1

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File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submittal\Pond Pack\BMP
1\5508RPL4-100 YR-BMP 1.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 405.00 ft
Increment = .50 ft
Max. Elev.= 410.00 ft

OUTLET CONNECTIVITY

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	O0	--->	CV	407.250	410.000
Stand Pipe	RP	--->	CV	408.200	410.000
Orifice-Circular	O1	--->	CV	405.000	410.000
Culvert-Circular	CV	--->	TW	400.000	410.000
TW SETUP, DS Channel					

S/N:

PondPack Ver:

Compute Time:

Date:

Type.... Outlet Input Data
Name.... Outlet 1

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File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submittal\Pond Pack\BMP
1\5508RPL4-100 YR-BMP 1.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = 00
Structure Type = Orifice-Circular

of Openings = 1
Invert Elev. = 407.25 ft
Diameter = 1.5000 ft
Orifice Coeff. = .600

Structure ID = RP
Structure Type = Stand Pipe

of Openings = 1
Invert Elev. = 408.20 ft
Diameter = 5.0000 ft
Orifice Area = 19.6350 sq.ft
Orifice Coeff. = .600
Weir Length = 15.71 ft
Weir Coeff. = 3.100
K, Reverse = 1.000
Mannings n = .0000
Kev, Charged Riser = .000
Weir Submergence = No

Structure ID = 01
Structure Type = Orifice-Circular

of Openings = 1
Invert Elev. = 405.00 ft
Diameter = .3750 ft
Orifice Coeff. = .600

S/N:
PondPack Ver:

Compute Time:

Date: