

HYDROLOGY REPORT
for
TRACT 38236 & 38237
Located in the City of Moreno Valley
County of Riverside

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Job No. 9971
August 17, 2021

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1. Purpose

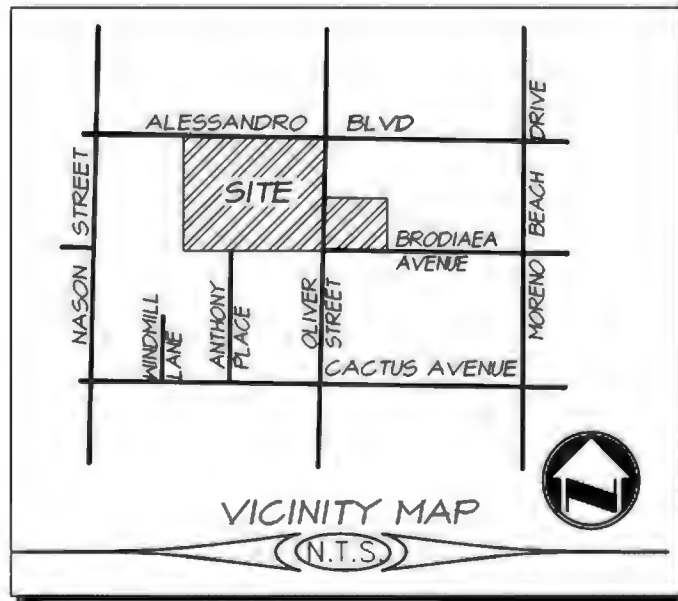
This Hydrology Report has been prepared in order to obtain entitlement approval of Tract 38236. Adkan Engineers has prepared this study to ensure that adequate size and proper operation of drainage facilities are incorporated into the Post-Development project site.

2. Project Description

Tract 38236 is located in the City of Moreno Valley north of Brodiaea Avenue, east of Nason Street, south of Alessandro Avenue and west of Oliver Street. The planned development will consist of 204 single-family residences, street improvements, and 4 onsite stormwater treatment areas (Bio-retention basins). They are located South of Lot 70, West of Lot 198, East of Lot 190 and North of Lot 183. Offsite street improvements will be done on Alessandro Avenue and Brodiaea Avenue in order to build out ultimate curb and gutter along the project frontage. All onsite runoff will flow to the south east as per the existing drainage path.

Tract 38237 is located in the City of Moreno Valley north of Brodiaea Avenue, east of Oliver Street, south of Alessandro Avenue and west of Moreno Beach Drive. The planned development will consist of 67 single-family residences, street improvements, and 2 onsite stormwater treatment areas (Bio-retention basins). They are at the intersection of Oliver Street and Brodiaea Avenue and between Lot 47 & 48. Offsite street improvements will be done on Oliver Street and Brodiaea Avenue in order to build out ultimate curb and gutter along the project frontage. All onsite runoff will flow to the south as per the existing drainage path.

A. Vicinity Map



3. Pre-Development Hydrology

Site is vacant with no existing structures or roads on the site. All flows from the site flow towards the south east Existing Q100 runoff flows are shown on the Riverside County Flood Control and Water Conservation District:

Moreno Master Drainage Plan (Adopted October 1980; Revision No.2 April 2015) in Section 3 of this report. Existing Q100 entering MDP Line H at the intersection of Cactus Avenue and Oliver Street drain lines. All major drainage paths along Alessandro Blvd and Brodiaea Avenue are earthen swales. The flows from the swales flow down Oliver Street.

4. Post-Development Hydrology

Tract 38236 Onsite low flow runoff from the proposed development will flow into 4 onsite stormwater treatment areas (Bio-retention basins). They are located South of Lot 70, West of Lot 198, East of Lot 190 and North of Lot 183. Offsite street improvements will be done on Alessandro Avenue and Brodiaea Avenue in order to build out ultimate curb and gutter along the project frontage. All onsite runoff will flow to the south east as per the existing drainage path.

MDP Line H at the intersection of Cactus Avenue and Oliver Street drain lines will be extended towards the intersection of Oliver Street and Brodiaea Avenue to collect the onsite runoff.

Tract 38237 onsite low flow runoff from the proposed development will flow into 2 onsite stormwater treatment areas (Bio-retention basins). They are at the intersection of Oliver Street and Brodiaea Avenue and between Lot 47 & 48. The site drains towards the southeast and the southwest. The east side of the site will flow towards MDP Line H-2 and the west side drains towards the proposed extended MDP Line H.

5. Method of Analysis

The site hydrology was based upon Riverside County Flood Control and Water Conservation District Hydrology Manual, from which pertinent soil and rainfall information was obtained.

Storm flows were determined by the "RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM", Riverside County Flood Control & Water Conservation District 1978 Hydrology Manual, produced by Bondamin Engineering.

6. Summary of Findings

Tract 38236 offsite and onsite flows surrounding the site will be collected by MDP Line H will be adequately sized to convey the 100-year storm event. All onsite flows will be collected by proposed catch basins and storm drain system to pretreat storm flows using the proposed Bio-retention basin prior to discharging into MDP Line H.

Tract 38237 offsite and onsite flows surrounding the site with flow towards the east side of the site will flow towards MDP Line H-2 and the west side drains towards the proposed extended MDP Line H. The extended Line H be adequately sized to convey the 100-year storm event. All onsite flows will be collected by proposed catch basins and storm drain system to pretreat storm flows using the proposed Bio-retention basins in the east and the west prior to discharging into MDP Line H or Line H-2.

Runoff Q's for the proposed storm drain lines on the Moreno Master Drainage Plan (Line H, H-5 & H-5a) are proposed and not existing facilities.

7. Conclusion

The hydrologic calculations provided herein substantiate the design of the Post-Development project and indicate the following:

- The Post-Development facilities demonstrate the ability to convey the 100 year storm events

Based on the Hydrology and Hydraulic analysis conducted and results shown herein and part thereof, it is our conclusion this project **does not** negatively impact the local community or watershed goals.

Section 1

**Post-Development 10 & 100 year Hydrology Offsite & Onsite
(Rational Method)**

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/21 File:pro10.out

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

English (in-lb) Units used in input data file

Program License Serial Number 5006

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.820(In/Hr)
Slope of intensity duration curve = 0.5000

Process from Point/Station 1.000 to Point/Station 1.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.420(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.709
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 20.00 min. Rain intensity = 1.42(In/Hr)
Total area = 0.00(Ac.) Total runoff = 355.00(CFS)

Process from Point/Station 1.000 to Point/Station 2.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1580.500(Ft.)
Downstream point/station elevation = 1564.000(Ft.)
Pipe length = 931.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 355.000(CFS)
Nearest computed pipe diameter = 60.00(In.)
Calculated individual pipe flow = 355.000(CFS)
Normal flow depth in pipe = 50.63(In.)
Flow top width inside pipe = 43.57(In.)
Critical depth could not be calculated.
Pipe flow velocity = 20.10(Ft/s)
Travel time through pipe = 0.77 min.
Time of concentration (TC) = 20.77 min.

Process from Point/Station 2.000 to Point/Station 2.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 0.000(Ac.)
Runoff from this stream = 355.000(CFS)
Time of concentration = 20.77 min.
Rainfall intensity = 1.394(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 3.000 to Point/Station 4.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 709.000(Ft.)
Top (of initial area) elevation = 1584.000(Ft.)
Bottom (of initial area) elevation = 1573.500(Ft.)
Difference in elevation = 10.500(Ft.)
Slope = 0.01481 s(percent)= 1.48
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.622 min.
Rainfall intensity = 2.048(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.531(CFS)
Total initial stream area = 0.860(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 4.000 to Point/Station 5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1573.500(Ft.)
Downstream point/station elevation = 1569.000(Ft.)
Pipe length = 65.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.531(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.531(CFS)
Normal flow depth in pipe = 3.69(In.)
Flow top width inside pipe = 8.85(In.)
Critical Depth = 6.84(In.)
Pipe flow velocity = 8.99(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 9.74 min.

Process from Point/Station 5.000 to Point/Station 5.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 0.860(Ac.)
Runoff from this stream = 1.531(CFS)
Time of concentration = 9.74 min.
Rainfall intensity = 2.035(In/Hr)

Process from Point/Station 6.000 to Point/Station 7.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 370.000(Ft.)
Top (of initial area) elevation = 1581.300(Ft.)
Bottom (of initial area) elevation = 1573.500(Ft.)
Difference in elevation = 7.800(Ft.)
Slope = 0.02108 s(percent)= 2.11
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.912 min.
Rainfall intensity = 2.416(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.873
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.548(CFS)
Total initial stream area = 0.260(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 7.000 to Point/Station 5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1573.500(Ft.)
Downstream point/station elevation = 1469.000(Ft.)
Pipe length = 44.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.548(CFS)

Nearest computed pipe diameter = 3.00(In.)
 Calculated individual pipe flow = 0.548(CFS)
 Normal flow depth in pipe = 1.32(In.)
 Flow top width inside pipe = 2.98(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 26.23(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 6.94 min.

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 Process from Point/Station 5.000 to Point/Station 5.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.260(Ac.)
 Runoff from this stream = 0.548(CFS)
 Time of concentration = 6.94 min.
 Rainfall intensity = 2.411(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.531	9.74	2.035
2	0.548	6.94	2.411

Largest stream flow has longer time of concentration

$Q_p = 1.531 + \text{sum of } Q_b \frac{I_a/I_b}{0.548 * 0.844} = 0.463$
 $Q_p = 1.994$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 1.531 0.548
 Area of streams before confluence:
 0.860 0.260

Results of confluence:
 Total flow rate = 1.994(CFS)
 Time of concentration = 9.743 min.
 Effective stream area after confluence = 1.120(Ac.)

++++++
 Process from Point/Station 5.000 to Point/Station 8.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1569.000(Ft.)
 Downstream point/station elevation = 1568.300(Ft.)
 Pipe length = 139.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.994(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 1.994(CFS)
 Normal flow depth in pipe = 8.04(In.)
 Flow top width inside pipe = 11.29(In.)
 Critical Depth = 7.23(In.)
 Pipe flow velocity = 3.57(Ft/s)
 Travel time through pipe = 0.65 min.
 Time of concentration (TC) = 10.39 min.

++++++
 Process from Point/Station 8.000 to Point/Station 9.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1568.300(Ft.)
 End of natural channel elevation = 1568.000(Ft.)
 Length of natural channel = 166.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 2.216(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $\text{Velocity (Ft/s)} = (7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
 velocity using mean channel flow = 0.75(Ft/s)

Correction to map slope used on extremely rugged channels with drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0018
 Corrected/adjusted channel slope = 0.0018
 Travel time = 3.70 min. TC = 14.09 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.598
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.692(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.253(CFS) for 0.250(Ac.)
 Total runoff = 2.247(CFS) Total area = 1.370(Ac.)

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

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 1.370(Ac.)
 Runoff from this stream = 2.247(CFS)
 Time of concentration = 14.09 min.
 Rainfall intensity = 1.692(In/Hr)

+-----+
 Process from Point/Station 10.000 to Point/Station 11.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 616.000(Ft.)
 Top (of initial area) elevation = 1579.600(Ft.)
 Bottom (of initial area) elevation = 1570.300(Ft.)
 Difference in elevation = 9.300(Ft.)
 Slope = 0.01510 s(percent) = 1.51
 $TC = k(0.390) * [(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 11.779 min.
 Rainfall intensity = 1.851(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.737
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 3.152(CFS)
 Total initial stream area = 2.310(Ac.)
 Pervious area fraction = 0.500

+-----+
 Process from Point/Station 11.000 to Point/Station 12.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1570.300(Ft.)
 Downstream point/station elevation = 1568.300(Ft.)
 Pipe length = 60.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.152(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 3.152(CFS)
 Normal flow depth in pipe = 5.89(In.)
 Flow top width inside pipe = 12.00(In.)
 Critical Depth = 9.12(In.)
 Pipe flow velocity = 8.22(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 11.90 min.

+-----+
 Process from Point/Station 12.000 to Point/Station 9.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1568.300(Ft.)
 End of natural channel elevation = 1568.000(Ft.)
 Length of natural channel = 161.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 3.152(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $Velocity(ft/s) = (7 + 8(q(English\ Units)^{0.352})(slope^{0.5}))$
 Velocity using mean channel flow = 0.82(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0019
 Corrected/adjusted channel slope = 0.0019
 Travel time = 3.27 min. TC = 15.18 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea

Runoff Coefficient = 0.591
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.630(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 3.152(CFS) Total area = 2.310(Ac.)

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

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 2.310(Ac.)
 Runoff from this stream = 3.152(CFS)
 Time of concentration = 15.18 min.
 Rainfall intensity = 1.630(In/Hr)

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 Process from Point/Station 7.000 to Point/Station 13.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 207.000(Ft.)
 Top (of initial area) elevation = 1573.500(Ft.)
 Bottom (of initial area) elevation = 1570.300(Ft.)
 Difference in elevation = 3.200(Ft.)
 Slope = 0.01546 s(percent)= 1.55
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 5.830 min.
 Rainfall intensity = 2.631(In/Hr) for a 10.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.874
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 0.483(CFS)
 Total initial stream area = 0.210(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 13.000 to Point/Station 9.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1570.300(Ft.)
 End of natural channel elevation = 1568.000(Ft.)
 Length of natural channel = 161.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 0.483(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $velocity(ft/s) = (7 + 8(q(English\ units)^{0.352})(slope^{0.5}))$
 velocity using mean channel flow = 1.58(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0143
 Corrected/adjusted channel slope = 0.0143
 Travel time = 1.70 min. TC = 7.53 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.658
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.314(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 0.483(CFS) Total area = 0.210(Ac.)

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

Along Main Stream number: 2 in normal stream number 3
Stream flow area = 0.210(Ac.)
Runoff from this stream = 0.483(CFS)
Time of concentration = 7.53 min.
Rainfall intensity = 2.314(In/Hr)

Process from Point/Station 14.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 806.000(Ft.)
Top (of initial area) elevation = 1581.700(Ft.)
Bottom (of initial area) elevation = 1569.800(Ft.)
Difference in elevation = 11.900(Ft.)
Slope = 0.01476 s(percent)= 1.48
TC = $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 13.175 min.
Rainfall intensity = 1.750(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.731
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 3.738(CFS)
Total initial stream area = 2.920(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 15.000 to Point/Station 16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1569.800(Ft.)
Downstream point/station elevation = 1568.300(Ft.)
Pipe length = 106.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.738(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 3.738(CFS)
Normal flow depth in pipe = 8.75(In.)
Flow top width inside pipe = 10.66(In.)
Critical Depth = 9.87(In.)
Pipe flow velocity = 6.09(Ft/s)
Travel time through pipe = 0.29 min.
Time of concentration (TC) = 13.47 min.

Process from Point/Station 16.000 to Point/Station 9.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1568.300(Ft.)
End of natural channel elevation = 1568.000(Ft.)
Length of natural channel = 148.000(Ft.)
Estimated mean flow rate at midpoint of channel = 3.738(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(Ft/s) = $(7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
velocity using mean channel flow = 0.89(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0020
Corrected/adjusted channel slope = 0.0020
Travel time = 2.78 min. TC = 16.24 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.584
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.576(In/Hr) for a 10.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 3.738(CFS) Total area = 2.920(Ac.)

Process from Point/Station 9.000 to Point/Station 9.000

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 4
 Stream flow area = 2.920(Ac.)
 Runoff from this stream = 3.738(CFS)
 Time of concentration = 16.24 min.
 Rainfall intensity = 1.576(In/Hr)

 Process from Point/Station 17.000 to Point/Station 18.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 483.000(Ft.)
 Top (of initial area) elevation = 1575.300(Ft.)
 Bottom (of initial area) elevation = 1570.500(Ft.)
 Difference in elevation = 4.800(Ft.)
 Slope = 0.00994 s(percent)= 0.99
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 11.619 min.
 Rainfall intensity = 1.863(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.738
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 3.191(CFS)
 Total initial stream area = 2.320(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 18.000 to Point/Station 9.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1570.500(Ft.)
 End of natural channel elevation = 1568.000(Ft.)
 Length of natural channel = 76.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 3.191(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $Velocity(ft/s) = (7 + 8(q(English\ Units)^{.352})^{.5})^{.5}$
 Velocity using mean channel flow = 3.45(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0329
 Corrected/adjusted channel slope = 0.0329
 Travel time = 0.37 min. TC = 11.99 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.614
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.835(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 3.191(CFS) Total area = 2.320(Ac.)

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

Along Main Stream number: 2 in normal stream number 5
 Stream flow area = 2.320(Ac.)
 Runoff from this stream = 3.191(CFS)
 Time of concentration = 11.99 min.
 Rainfall intensity = 1.835(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.247	14.09	1.692
2	3.152	15.18	1.630
3	0.483	7.53	2.314

```

4      3.738      16.24      1.576
5      3.191      11.99      1.835
Largest stream flow has longer time of concentration
Qp = 3.738 + sum of
      Qb      Ia/Ib
      2.247 * 0.931 = 2.093
      Qb      Ia/Ib
      3.152 * 0.967 = 3.047
      Qb      Ia/Ib
      0.483 * 0.681 = 0.329
      Qb      Ia/Ib
      3.191 * 0.859 = 2.741
Qp = 11.947

Total of 5 streams to confluence:
Flow rates before confluence point:
      2.247      3.152      0.483      3.738      3.191
Area of streams before confluence:
      1.370      2.310      0.210      2.920      2.320
Results of confluence:
Total flow rate = 11.947(CFS)
Time of concentration = 16.243 min.
Effective stream area after confluence = 9.130(Ac.)

```

```

*****
Process from Point/Station 9.000 to Point/Station 2.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```

```

Upstream point/station elevation = 1568.000(Ft.)
Downstream point/station elevation = 1564.000(Ft.)
Pipe length = 53.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.947(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 11.947(CFS)
Normal flow depth in pipe = 9.01(In.)
Flow top width inside pipe = 14.69(In.)
Critical depth could not be calculated.
Pipe flow velocity = 15.52(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 16.30 min.

```

```

*****
Process from Point/Station 2.000 to Point/Station 2.000
**** CONFLUENCE OF MAIN STREAMS ****

```

```

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 9.130(Ac.)
Runoff from this stream = 11.947(CFS)
Time of concentration = 16.30 min.
Rainfall intensity = 1.573(In/Hr)
Summary of stream data:

```

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

1	355.000	20.77	1.394
2	11.947	16.30	1.573

Largest stream flow has longer time of concentration

```

Qp = 355.000 + sum of
      Qb      Ia/Ib
      11.947 * 0.886 = 10.583
Qp = 365.583

```

```

Total of 2 main streams to confluence:
Flow rates before confluence point:
      355.000      11.947
Area of streams before confluence:
      0.000      9.130
Results of confluence:
Total flow rate = 365.583(CFS)
Time of concentration = 20.772 min.
Effective stream area after confluence = 9.130(Ac.)

```

```

*****
Process from Point/Station 2.000 to Point/Station 19.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```

```

Upstream point/station elevation = 1564.000(Ft.)
Downstream point/station elevation = 1553.000(Ft.)
Pipe length = 861.00(Ft.) Manning's N = 0.013

```

No. of pipes = 1 Required pipe flow = 365.583(CFS)
 Nearest computed pipe diameter = 66.00(In.)
 Calculated individual pipe flow = 365.583(CFS)
 Normal flow depth in pipe = 52.03(In.)
 Flow top width inside pipe = 53.92(In.)
 Critical Depth = 61.00(In.)
 Pipe flow velocity = 18.20(Ft/s)
 Travel time through pipe = 0.79 min.
 Time of concentration (TC) = 21.56 min.

 Process from Point/Station 19.000 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 = 9.130(Ac.)
 Runoff from this stream = 365.583(CFS)
 Time of concentration = 21.56 min.
 Rainfall intensity = 1.368(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 18.000 to Point/Station 19.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 662.000(Ft.)
 Top (of initial area) elevation = 1573.900(Ft.)
 Bottom (of initial area) elevation = 1567.800(Ft.)
 Difference in elevation = 6.100(Ft.)
 Slope = 0.00921 s(percent) = 0.92
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.294 min.
 Rainfall intensity = 1.980(In/Hr) for a 10.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.869
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 0.705(CFS)
 Total initial stream area = 0.410(Ac.)
 Pervious area fraction = 0.100

 Process from Point/Station 19.000 to Point/Station 20.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1567.800(Ft.)
 End of street segment elevation = 1557.500(Ft.)
 Length of street segment = 589.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.020
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 2.000(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.030(CFS)
 Depth of flow = 0.239(Ft.), Average velocity = 2.337(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 5.603(Ft.)
 Flow velocity = 2.34(Ft/s)
 Travel time = 4.20 min. TC = 14.49 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.865
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 1.668(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.592(CFS) for 0.410(Ac.)
 Total runoff = 1.297(CFS) Total area = 0.820(Ac.)

Street flow at end of street = 1.297(CFS)
Half street flow at end of street = 1.297(CFS)
Depth of flow = 0.254(Ft.); Average velocity = 2.438(Ft/s)
Flow width (from curb towards crown)= 6.367(Ft.)

Process from Point/Station 20.000 to Point/Station 21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1557.500(Ft.)
Downstream point/station elevation = 1556.500(Ft.)
Pipe length = 71.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.297(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.297(CFS)
Normal flow depth in pipe = 5.34(In.)
Flow top width inside pipe = 8.84(In.)
Critical Depth = 6.29(In.)
Pipe flow velocity = 4.75(Ft/s)
Travel time through pipe = 0.25 min.
Time of concentration (TC) = 14.74 min.

Process from Point/Station 21.000 to Point/Station 23.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1556.500(Ft.)
End of natural channel elevation = 1556.000(Ft.)
Length of natural channel = 38.000(Ft.)
Estimated mean flow rate at midpoint of channel = 1.479(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})(\text{slope}^{.5}))$
velocity using mean channel flow = 1.86(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0132
Corrected/adjusted channel slope = 0.0132
Travel time = 0.34 min. TC = 15.09 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.592
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.635(In/Hr) for a 10.0 year storm
Subarea runoff = 0.223(CFS) for 0.230(Ac.)
Total runoff = 1.520(CFS) Total area = 1.050(Ac.)

Process from Point/Station 23.000 to Point/Station 23.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.050(Ac.)
Runoff from this stream = 1.520(CFS)
Time of concentration = 15.09 min.
Rainfall intensity = 1.635(In/Hr)

Process from Point/Station 13.000 to Point/Station 22.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 922.000(Ft.)
Top (of initial area) elevation = 1570.300(Ft.)
Bottom (of initial area) elevation = 1557.500(Ft.)
Difference in elevation = 12.800(Ft.)
Slope = 0.01388 s(percent)= 1.39
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{.2}$
Initial area time of concentration = 10.827 min.
Rainfall intensity = 1.930(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.868
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.274(CFS)
Total initial stream area = 0.760(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 22.000 to Point/Station 21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1557.500(Ft.)
Downstream point/station elevation = 1556.500(Ft.)
Pipe length = 31.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.274(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.274(CFS)
Normal flow depth in pipe = 4.12(In.)
Flow top width inside pipe = 8.97(In.)
Critical Depth = 6.24(In.)
Pipe flow velocity = 6.47(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 10.91 min.

Process from Point/Station 21.000 to Point/Station 23.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1556.500(Ft.)
End of natural channel elevation = 1556.000(Ft.)
Length of natural channel = 38.000(Ft.)
Estimated mean flow rate at midpoint of channel = 1.274(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})(\text{slope}^{.5}))$
velocity using mean channel flow = 1.80(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0132
Corrected/adjusted channel slope = 0.0132
Travel time = 0.35 min. TC = 11.26 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.621
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.893(In/Hr) for a 10.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 1.274(CFS) Total area = 0.760(Ac.)

Process from Point/Station 23.000 to Point/Station 23.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.760(Ac.)
Runoff from this stream = 1.274(CFS)
Time of concentration = 11.26 min.
Rainfall intensity = 1.893(In/Hr)

Process from Point/Station 24.000 to Point/Station 25.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 328.000(Ft.)
Top (of initial area) elevation = 1570.500(Ft.)
Bottom (of initial area) elevation = 1566.500(Ft.)
Difference in elevation = 4.000(Ft.)
Slope = 0.01220 s(percent) = 1.22
 $TC = k(0.940)*[(\text{length}^3)/(\text{elevation change})]^{.2}$
Initial area time of concentration = 23.027 min.
Rainfall intensity = 1.324(In/Hr) for a 10.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.547
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 0.507(CFS)
Total initial stream area = 0.700(Ac.)
Pervious area fraction = 1.000

Process from Point/Station 25.000 to Point/Station 26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1566.500(Ft.)
Downstream point/station elevation = 1557.500(Ft.)
Pipe length = 293.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.507(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 0.507(CFS)
Normal flow depth in pipe = 3.06(In.)
Flow top width inside pipe = 6.00(In.)
Critical Depth = 4.35(In.)
Pipe flow velocity = 5.05(Ft/s)
Travel time through pipe = 0.97 min.
Time of concentration (TC) = 23.99 min.

Process from Point/Station 27.000 to Point/Station 26.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.699
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 23.99 min.
Rainfall intensity = 1.297(In/Hr) for a 10.0 year storm
Subarea runoff = 0.435(CFS) for 0.480(Ac.)
Total runoff = 0.942(CFS) Total area = 1.180(Ac.)

Process from Point/Station 26.000 to Point/Station 29.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1557.500(Ft.)
Downstream point/station elevation = 1557.000(Ft.)
Pipe length = 39.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.942(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 0.942(CFS)
Normal flow depth in pipe = 4.52(In.)
Flow top width inside pipe = 9.00(In.)
Critical Depth = 5.34(In.)
Pipe flow velocity = 4.25(Ft/s)
Travel time through pipe = 0.15 min.
Time of concentration (TC) = 24.15 min.

Process from Point/Station 30.000 to Point/Station 29.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.699
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 24.15 min.
Rainfall intensity = 1.293(In/Hr) for a 10.0 year storm
Subarea runoff = 0.614(CFS) for 0.680(Ac.)
Total runoff = 1.556(CFS) Total area = 1.860(Ac.)

Process from Point/Station 29.000 to Point/Station 32.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1557.000(Ft.)

Downstream point/station elevation = 1556.500(Ft.)
 Pipe length = 35.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.556(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 1.556(CFS)
 Normal flow depth in pipe = 6.02(In.)
 Flow top width inside pipe = 8.47(In.)
 Critical Depth = 6.89(In.)
 Pipe flow velocity = 4.96(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 24.26 min.

 Process from Point/Station 32.000 to Point/Station 23.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1556.500(Ft.)
 End of natural channel elevation = 1556.000(Ft.)
 Length of natural channel = 65.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 1.652(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $Velocity(ft/s) = (7 + 8(q(English\ Units)^{.352})(slope^{.5}))$
 Velocity using mean channel flow = 1.45(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0077
 Corrected/adjusted channel slope = 0.0077
 Travel time = 0.75 min. TC = 25.01 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.539
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.270(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.157(CFS) for 0.230(Ac.)
 Total runoff = 1.714(CFS) Total area = 2.090(Ac.)

 Process from Point/Station 23.000 to Point/Station 23.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 3
 Stream flow area = 2.090(Ac.)
 Runoff from this stream = 1.714(CFS)
 Time of concentration = 25.01 min.
 Rainfall intensity = 1.270(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.520	15.09	1.635
2	1.274	11.26	1.893
3	1.714	25.01	1.270

Largest stream flow has longer time of concentration
 $Q_p = 1.714 + \text{sum of}$
 $Q_b \frac{I_a/I_b}{1.520 * 0.777} = 1.180$
 $Q_b \frac{I_a/I_b}{1.274 * 0.671} = 0.855$
 $Q_p = 3.748$

Total of 3 streams to confluence:
 Flow rates before confluence point:
 1.520 1.274 1.714
 Area of streams before confluence:
 1.050 0.760 2.090
 Results of confluence:
 Total flow rate = 3.748(CFS)
 Time of concentration = 25.011 min.
 Effective stream area after confluence = 3.900(Ac.)

 Process from Point/Station 23.000 to Point/Station 19.000

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1556.000(Ft.)
 Downstream point/station elevation = 1553.000(Ft.)
 Pipe length = 65.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.748(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 3.748(CFS)
 Normal flow depth in pipe = 5.93(In.)
 Flow top width inside pipe = 12.00(In.)
 Critical Depth = 9.89(In.)
 Pipe flow velocity = 9.70(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 25.12 min.

Process from Point/Station 19.000 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 = 3.900(Ac.)
 Runoff from this stream = 3.748(CFS)
 Time of concentration = 25.12 min.
 Rainfall intensity = 1.267(In/Hr)
 Summary of stream data:

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

1	365.583	21.56	1.368
2	3.748	25.12	1.267

Largest stream flow has longer or shorter time of concentration

Qp = 365.583 + sum of

$$Q_a \cdot \frac{T_b}{T_a}$$
 3.748 * 0.858 = 3.217
 Qp = 368.800

Total of 2 main streams to confluence:

Flow rates before confluence point:
 365.583 3.748
 Area of streams before confluence:
 9.130 3.900

Results of confluence:

Total flow rate = 368.800(CFS)
 Time of concentration = 21.561 min.
 Effective stream area after confluence = 13.030(Ac.)

Process from Point/Station 19.000 to Point/Station 33.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
 Downstream point/station elevation = 1547.000(Ft.)
 Pipe length = 428.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 368.800(CFS)
 Nearest computed pipe diameter = 63.00(In.)
 Calculated individual pipe flow = 368.800(CFS)
 Normal flow depth in pipe = 55.13(In.)
 Flow top width inside pipe = 41.67(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 18.37(Ft/s)
 Travel time through pipe = 0.39 min.
 Time of concentration (TC) = 21.95 min.

Process from Point/Station 33.000 to Point/Station 33.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 13.030(Ac.)
 Runoff from this stream = 368.800(CFS)
 Time of concentration = 21.95 min.
 Rainfall intensity = 1.356(In/Hr)
 Program is now starting with Main Stream No. 2

Process from Point/Station 34.000 to Point/Station 35.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 365.000(Ft.)
Top (of initial area) elevation = 1566.000(Ft.)
Bottom (of initial area) elevation = 1562.000(Ft.)
Difference in elevation = 4.000(Ft.)
Slope = 0.01096 s(percent)= 1.10
TC = $k(0.940)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 24.552 min.
Rainfall intensity = 1.282(In/Hr) for a 10.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.541
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 0.831(CFS)
Total initial stream area = 1.200(Ac.)
Pervious area fraction = 1.000

Process from Point/Station 35.000 to Point/Station 36.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1562.000(Ft.)
Downstream point/station elevation = 1553.000(Ft.)
Pipe length = 329.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.831(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 0.831(CFS)
Normal flow depth in pipe = 4.43(In.)
Flow top width inside pipe = 5.27(In.)
Critical Depth = 5.40(In.)
Pipe flow velocity = 5.35(Ft/s)
Travel time through pipe = 1.03 min.
Time of concentration (TC) = 25.58 min.

Process from Point/Station 36.000 to Point/Station 36.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.200(Ac.)
Runoff from this stream = 0.831(CFS)
Time of concentration = 25.58 min.
Rainfall intensity = 1.256(In/Hr)

Process from Point/Station 59.000 to Point/Station 37.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 543.000(Ft.)
Top (of initial area) elevation = 1564.500(Ft.)
Bottom (of initial area) elevation = 1562.000(Ft.)
Difference in elevation = 2.500(Ft.)
Slope = 0.00460 s(percent)= 0.46
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 14.202 min.
Rainfall intensity = 1.685(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.728
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.514(CFS)
Total initial stream area = 2.050(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 37.000 to Point/Station 38.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1562.000(Ft.)
Downstream point/station elevation = 1552.000(Ft.)
Pipe length = 28.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.514(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 2.514(CFS)
Normal flow depth in pipe = 3.87(In.)

Flow top width inside pipe = 5.74(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 18.74(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 14.23 min.

 Process from Point/Station 62.000 to Point/Station 38.000
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.727
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 14.23 min.
 Rainfall intensity = 1.684(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.266(CFS) for 1.850(Ac.)
 Total runoff = 4.780(CFS) Total area = 3.900(Ac.)

 Process from Point/Station 38.000 to Point/Station 36.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1554.000(Ft.)
 Downstream point/station elevation = 1553.000(Ft.)
 Pipe length = 26.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.780(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 4.780(CFS)
 Normal flow depth in pipe = 7.29(In.)
 Flow top width inside pipe = 11.72(In.)
 Critical Depth = 10.85(In.)
 Pipe flow velocity = 9.58(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 14.27 min.

 Process from Point/Station 36.000 to Point/Station 36.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 3.900(Ac.)
 Runoff from this stream = 4.780(CFS)
 Time of concentration = 14.27 min.
 Rainfall intensity = 1.681(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	0.831	25.58	1.256
2	4.780	14.27	1.681

Largest stream flow has longer or shorter time of concentration
 $Q_p = 4.780 + \text{sum of}$
 $Q_a \cdot \frac{T_b}{T_a}$
 $Q_p = 0.831 * 0.558 = 0.464$
 $Q_p = 5.244$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 0.831 4.780
 Area of streams before confluence:
 1.200 3.900
 Results of confluence:
 Total flow rate = 5.244(CFS)
 Time of concentration = 14.272 min.
 Effective stream area after confluence = 5.100(Ac.)

 Process from Point/Station 36.000 to Point/Station 40.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
 Downstream point/station elevation = 1552.500(Ft.)
 Pipe length = 21.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.244(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 5.244(CFS)

Normal flow depth in pipe = 9.38(In.)
Flow top width inside pipe = 9.92(In.)
Critical Depth = 11.15(In.)
Pipe flow velocity = 7.97(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 14.32 min.

Process from Point/Station 40.000 to Point/Station 41.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1552.500(Ft.)
End of natural channel elevation = 1552.000(Ft.)
Length of natural channel = 80.000(Ft.)
Estimated mean flow rate at midpoint of channel = 5.393(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(Ft/s) = $(7 + 8(q(\text{English Units})^{.352})(\text{slope}^{.5}))$
velocity using mean channel flow = 1.70(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0063
Corrected/adjusted channel slope = 0.0063
Travel time = 0.79 min. TC = 15.10 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.592
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.634(In/Hr) for a 10.0 year storm
Subarea runoff = 0.280(CFS) for 0.290(Ac.)
Total runoff = 5.524(CFS) Total area = 5.390(Ac.)

Process from Point/Station 41.000 to Point/Station 41.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 5.390(Ac.)
Runoff from this stream = 5.524(CFS)
Time of concentration = 15.10 min.
Rainfall intensity = 1.634(In/Hr)

Process from Point/Station 55.000 to Point/Station 42.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 657.000(Ft.)
Top (of initial area) elevation = 1561.600(Ft.)
Bottom (of initial area) elevation = 1553.000(Ft.)
Difference in elevation = 8.600(Ft.)
Slope = 0.01309 s(percent) = 1.31
 $TC = k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{.2}$
Initial area time of concentration = 9.567 min.
Rainfall intensity = 2.054(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.607(CFS)
Total initial stream area = 0.900(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 42.000 to Point/Station 43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
Downstream point/station elevation = 1552.500(Ft.)
Pipe length = 23.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.607(CFS)

Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.607(CFS)
Normal flow depth in pipe = 5.33(In.)
Flow top width inside pipe = 8.84(In.)
Critical Depth = 7.00(In.)
Pipe flow velocity = 5.90(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 9.63 min.

Process from Point/Station 43.000 to Point/Station 41.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1552.500(Ft.)
End of natural channel elevation = 1552.000(Ft.)
Length of natural channel = 39.000(Ft.)
Estimated mean flow rate at midpoint of channel = 1.607(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})^{.5})$ (slope^{0.5})
Velocity using mean channel flow = 1.86(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0128
Corrected/adjusted channel slope = 0.0128
Travel time = 0.35 min. TC = 9.98 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.632
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.011(In/Hr) for a 10.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 1.607(CFS) Total area = 0.900(Ac.)

Process from Point/Station 41.000 to Point/Station 41.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.900(Ac.)
Runoff from this stream = 1.607(CFS)
Time of concentration = 9.98 min.
Rainfall intensity = 2.011(In/Hr)

Process from Point/Station 22.000 to Point/Station 44.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 556.000(Ft.)
Top (of initial area) elevation = 1557.500(Ft.)
Bottom (of initial area) elevation = 1553.000(Ft.)
Difference in elevation = 4.500(Ft.)
Slope = 0.00809 s(percent) = 0.81
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{.2}$
Initial area time of concentration = 9.852 min.
Rainfall intensity = 2.024(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.869
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.915(CFS)
Total initial stream area = 0.520(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 44.000 to Point/Station 45.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
Downstream point/station elevation = 1552.500(Ft.)

Pipe length = 31.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.915(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 0.915(CFS)
 Normal flow depth in pipe = 4.15(In.)
 Flow top width inside pipe = 8.97(In.)
 Critical Depth = 5.25(In.)
 Pipe flow velocity = 4.59(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 9.96 min.

 Process from Point/Station 45.000 to Point/Station 41.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1552.500(Ft.)
 End of natural channel elevation = 1552.000(Ft.)
 Length of natural channel = 31.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 0.915(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $velocity(ft/s) = (7 + 8(q(English\ Units)^{.352})(slope^{.5}))$
 velocity using mean channel flow = 1.87(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0161
 Corrected/adjusted channel slope = 0.0161
 Travel time = 0.28 min. TC = 10.24 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff coefficient = 0.630
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.985(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 0.915(CFS) Total area = 0.520(Ac.)

 Process from Point/Station 41.000 to Point/Station 41.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 3
 Stream flow area = 0.520(Ac.)
 Runoff from this stream = 0.915(CFS)
 Time of concentration = 10.24 min.
 Rainfall intensity = 1.985(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.524	15.10	1.634
2	1.607	9.98	2.011
3	0.915	10.24	1.985

Largest stream flow has longer time of concentration

Qp = 5.524 + sum of
 $Q_b \cdot \frac{I_a}{I_b}$
 $1.607 * 0.813 = 1.307$
 $Q_b \cdot \frac{I_a}{I_b}$
 $0.915 * 0.823 = 0.753$
 Qp = 7.584

Total of 3 streams to confluence:
 Flow rates before confluence point:
 5.524 1.607 0.915
 Area of streams before confluence:
 5.390 0.900 0.520
 Results of confluence:
 Total flow rate = 7.584(CFS)
 Time of concentration = 15.102 min.
 Effective stream area after confluence = 6.810(Ac.)

 Process from Point/Station 41.000 to Point/Station 33.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1552.000(Ft.)
 Downstream point/station elevation = 1547.000(Ft.)
 Pipe length = 71.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.584(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 7.584(CFS)
 Normal flow depth in pipe = 8.13(In.)
 Flow top width inside pipe = 11.22(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 13.38(Ft/s)
 Travel time through pipe = 0.09 min.
 Time of concentration (TC) = 15.19 min.

++++++
 Process from Point/Station 33.000 to Point/Station 33.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 6.810(Ac.)
 Runoff from this stream = 7.584(CFS)
 Time of concentration = 15.19 min.
 Rainfall intensity = 1.630(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	368.800	21.95	1.356
2	7.584	15.19	1.630

Largest stream flow has longer time of concentration

$Q_p = 368.800 + \text{sum of } \frac{Q_b \cdot I_a/I_b}{7.584} = 6.309$
 $Q_p = 375.109$

Total of 2 main streams to confluence:

Flow rates before confluence point:
 368.800 7.584
 Area of streams before confluence:
 13.030 6.810

Results of confluence:

Total flow rate = 375.109(CFS)
 Time of concentration = 21.949 min.
 Effective stream area after confluence = 19.840(Ac.)
 End of computations, total study area = 19.84 (Ac.)

The following figures may be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.486
 Area averaged RI index number = 56.7

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/21 File:pro110.out

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

English (in-lb) Units used in input data file

Program License Serial Number 5006

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.820(In/Hr)
Slope of intensity duration curve = 0.5000

Process from Point/Station 58.000 to Point/Station 59.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 933.000(Ft.)
Top (of initial area) elevation = 1575.900(Ft.)
Bottom (of initial area) elevation = 1564.500(Ft.)
Difference in elevation = 11.400(Ft.)
Slope = 0.01222 s(percent)= 1.22
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 14.508 min.
Rainfall intensity = 1.668(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.726
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.871(CFS)
Total initial stream area = 2.370(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 59.000 to Point/Station 60.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.500(Ft.)
Downstream point/station elevation = 1561.500(Ft.)
Pipe length = 22.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.871(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.871(CFS)
Normal flow depth in pipe = 4.34(In.)
Flow top width inside pipe = 8.99(In.)
Critical depth could not be calculated.
Pipe flow velocity = 13.62(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 14.54 min.

Process from Point/Station 60.000 to Point/Station 60.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 2.370(Ac.)

Runoff from this stream = 2.871(CFS)
 Time of concentration = 14.54 min.
 Rainfall intensity = 1.666(In/Hr)

 Process from Point/Station 61.000 to Point/Station 62.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 542.000(Ft.)
 Top (of initial area) elevation = 1572.100(Ft.)
 Bottom (of initial area) elevation = 1564.500(Ft.)
 Difference in elevation = 7.600(Ft.)
 Slope = 0.01402 s(percent)= 1.40
 TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 11.358 min.
 Rainfall intensity = 1.885(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.739
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 1.839(CFS)
 Total initial stream area = 1.320(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 62.000 to Point/Station 60.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.500(Ft.)
 Downstream point/station elevation = 1561.500(Ft.)
 Pipe length = 22.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.839(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 1.839(CFS)
 Normal flow depth in pipe = 4.40(In.)
 Flow top width inside pipe = 5.31(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 11.92(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 11.39 min.

 Process from Point/Station 60.000 to Point/Station 60.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.320(Ac.)
 Runoff from this stream = 1.839(CFS)
 Time of concentration = 11.39 min.
 Rainfall intensity = 1.882(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	2.871	14.54	1.666
2	1.839	11.39	1.882

Largest stream flow has longer time of concentration

Qp = 2.871 + sum of
 $Q_b \cdot \frac{I_a}{I_b}$
 $1.839 * 0.885 = 1.628$
 Qp = 4.499

Total of 2 streams to confluence:

Flow rates before confluence point:
 2.871 1.839

Area of streams before confluence:
 2.370 1.320

Results of confluence:

Total flow rate = 4.499(CFS)
 Time of concentration = 14.535 min.
 Effective stream area after confluence = 3.690(Ac.)

 Process from Point/Station 60.000 to Point/Station 63.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1561.500(Ft.)

Downstream point/station elevation = 1561.000(Ft.)
Pipe length = 33.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.499(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 4.499(CFS)
Normal flow depth in pipe = 8.07(In.)
Flow top width inside pipe = 14.96(In.)
Critical Depth = 10.31(In.)
Pipe flow velocity = 6.68(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 14.62 min.

Process from Point/Station 63.000 to Point/Station 63.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 3.690(Ac.)
Runoff from this stream = 4.499(CFS)
Time of concentration = 14.62 min.
Rainfall intensity = 1.661(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 64.000 to Point/Station 65.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 888.000(Ft.)
Top (of initial area) elevation = 1575.100(Ft.)
Bottom (of initial area) elevation = 1564.500(Ft.)
Difference in elevation = 10.600(Ft.)
Slope = 0.01194 s(percent) = 1.19
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 14.291 min.
Rainfall intensity = 1.680(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.332(CFS)
Total initial stream area = 1.090(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 65.000 to Point/Station 66.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.500(Ft.)
Downstream point/station elevation = 1561.500(Ft.)
Pipe length = 25.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.332(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 1.332(CFS)
Normal flow depth in pipe = 3.64(In.)
Flow top width inside pipe = 5.86(In.)
Critical depth could not be calculated.
Pipe flow velocity = 10.66(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 14.33 min.

Process from Point/Station 66.000 to Point/Station 66.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.090(Ac.)
Runoff from this stream = 1.332(CFS)
Time of concentration = 14.33 min.
Rainfall intensity = 1.678(In/Hr)

Process from Point/Station 67.000 to Point/Station 68.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 776.000(Ft.)
Top (of initial area) elevation = 1574.100(Ft.)
Bottom (of initial area) elevation = 1564.500(Ft.)

Difference in elevation = 9.600(Ft.)
 Slope = 0.01237 s(percent)= 1.24
 TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 13.444 min.
 Rainfall intensity = 1.732(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.730
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 3.998(CFS)
 Total initial stream area = 3.160(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 68.000 to Point/Station 66.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.500(Ft.)
 Downstream point/station elevation = 1561.500(Ft.)
 Pipe length = 16.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.998(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 3.998(CFS)
 Normal flow depth in pipe = 4.80(In.)
 Flow top width inside pipe = 8.98(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 16.66(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 13.46 min.

 Process from Point/Station 66.000 to Point/Station 66.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 3.160(Ac.)
 Runoff from this stream = 3.998(CFS)
 Time of concentration = 13.46 min.
 Rainfall intensity = 1.731(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	1.332	14.33	1.678
2	3.998	13.46	1.731

Largest stream flow has longer or shorter time of concentration

$Q_p = 3.998 + \sum \frac{Q_a T_b}{T_a}$
 $Q_p = 1.332 * 0.939 = 1.251$
 $Q_p = 5.249$

Total of 2 streams to confluence:

Flow rates before confluence point:

1.332	3.998
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Area of streams before confluence:

1.090	3.160
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Results of confluence:

Total flow rate = 5.249(CFS)
 Time of concentration = 13.460 min.
 Effective stream area after confluence = 4.250(Ac.)

 Process from Point/Station 66.000 to Point/Station 63.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1561.500(Ft.)
 Downstream point/station elevation = 1561.000(Ft.)
 Pipe length = 25.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.249(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 5.249(CFS)
 Normal flow depth in pipe = 8.16(In.)
 Flow top width inside pipe = 14.94(In.)
 Critical Depth = 11.14(In.)
 Pipe flow velocity = 7.70(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 13.51 min.

Process from Point/Station 63.000 to Point/Station 63.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 4.250(Ac.)
 Runoff from this stream = 5.249(CFS)
 Time of concentration = 13.51 min.
 Rainfall intensity = 1.728(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	4.499	14.62	1.661
2	5.249	13.51	1.728

Largest stream flow has longer or shorter time of concentration

Qp = 5.249 + sum of

$$Q_p = \frac{Q_a}{9.499} * \frac{T_b}{T_a} = \frac{4.499}{9.499} * 0.925 = 4.159$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

4.499 5.249

Area of streams before confluence:

3.690 4.250

Results of confluence:

Total flow rate = 9.408(CFS)

Time of concentration = 13.514 min.

Effective stream area after confluence = 7.940(Ac.)

Process from Point/Station 63.000 to Point/Station 69.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1561.000(Ft.)
 Downstream point/station elevation = 1560.500(Ft.)
 Pipe length = 91.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 9.408(CFS)
 Nearest computed pipe diameter = 21.00(In.)
 Calculated individual pipe flow = 9.408(CFS)
 Normal flow depth in pipe = 14.23(In.)
 Flow top width inside pipe = 19.63(In.)
 Critical depth = 13.70(In.)
 Pipe flow velocity = 5.43(Ft/s)
 Travel time through pipe = 0.28 min.
 Time of concentration (TC) = 13.79 min.

Process from Point/Station 69.000 to Point/Station 57.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1560.500(Ft.)
 End of natural channel elevation = 1560.000(Ft.)
 Length of natural channel = 113.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 9.722(CFS)

Natural valley channel type used

L.A. County flood control district formula for channel velocity:

Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{0.352})^{0.5})$

velocity using mean channel flow = 1.65(Ft/s)

Correction to map slope used on extremely rugged channels with drops and waterfalls (Plate D-6.2)

Normal channel slope = 0.0044

Corrected/adjusted channel slope = 0.0044

Travel time = 1.14 min. TC = 14.93 min.

Adding area flow to channel

UNDEVELOPED (good cover) subarea

Runoff Coefficient = 0.593

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

RI index for soil(AMC 2) = 61.00

Pervious area fraction = 1.000; Impervious fraction = 0.000

Rainfall intensity = 1.644(In/Hr) for a 10.0 year storm

Subarea runoff = 0.516(CFS) for 0.530(Ac.)
Total runoff = 9.925(CFS) Total area = 8.470(Ac.)

Process from Point/Station 57.000 to Point/Station 57.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 8.470(Ac.)
Runoff from this stream = 9.925(CFS)
Time of concentration = 14.93 min.
Rainfall intensity = 1.644(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 6.000 to Point/Station 54.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 873.000(Ft.)
Top (of initial area) elevation = 1581.300(Ft.)
Bottom (of initial area) elevation = 1573.000(Ft.)
Difference in elevation = 8.300(Ft.)
Slope = 0.00951 s(percent)= 0.95
TC = $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 11.427 min.
Rainfall intensity = 1.879(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.868
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 2.071(CFS)
Total initial stream area = 1.270(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 54.000 to Point/Station 55.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1573.000(Ft.)
End of street segment elevation = 1561.600(Ft.)
Length of street segment = 542.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
width of half street (curb to crown) = 32.000(Ft.)
Distance from crown to crossfall grade break = 30.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 18.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 3.060(CFS)
Depth of flow = 0.311(Ft.), Average velocity = 3.142(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 9.204(Ft.)
Flow velocity = 3.14(Ft/s)
Travel time = 2.88 min. TC = 14.30 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.865
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 1.680(In/Hr) for a 10.0 year storm
Subarea runoff = 1.919(CFS) for 1.320(Ac.)
Total runoff = 3.990(CFS) Total area = 2.590(Ac.)
Street flow at end of street = 3.990(CFS)
Half street flow at end of street = 3.990(CFS)
Depth of flow = 0.333(Ft.), Average velocity = 3.337(Ft/s)
Flow width (from curb towards crown)= 10.339(Ft.)

Process from Point/Station 55.000 to Point/Station 56.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1561.600(Ft.)
 Downstream point/station elevation = 1560.500(Ft.)
 Pipe length = 159.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.990(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 3.990(CFS)
 Normal flow depth in pipe = 9.62(In.)
 Flow top width inside pipe = 14.39(In.)
 Critical Depth = 9.69(In.)
 Pipe flow velocity = 4.79(Ft/s)
 Travel time through pipe = 0.55 min.
 Time of concentration (TC) = 14.85 min.

Process from Point/Station 56.000 to Point/Station 57.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1560.500(Ft.)
 End of natural channel elevation = 1560.000(Ft.)
 Length of natural channel = 90.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 3.990(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 Velocity(Ft/s) = $(7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
 velocity using mean channel flow = 1.49(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0056
 Corrected/adjusted channel slope = 0.0056
 Travel time = 1.01 min. TC = 15.86 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.587
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.595(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 3.990(CFS) Total area = 2.590(Ac.)

Process from Point/Station 57.000 to Point/Station 53.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1560.000(Ft.)
 Downstream point/station elevation = 1554.000(Ft.)
 Pipe length = 104.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.990(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 3.990(CFS)
 Normal flow depth in pipe = 5.76(In.)
 Flow top width inside pipe = 11.99(In.)
 Critical Depth = 10.15(In.)
 Pipe flow velocity = 10.71(Ft/s)
 Travel time through pipe = 0.16 min.
 Time of concentration (TC) = 16.02 min.

Process from Point/Station 57.000 to Point/Station 57.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 2.590(Ac.)
 Runoff from this stream = 3.990(CFS)
 Time of concentration = 16.02 min.
 Rainfall intensity = 1.587(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	9.925	14.93	1.644

2 3.990 16.02 1.587
 Largest stream flow has longer or shorter time of concentration
 Qp = 9.925 + sum of
 Qa Tb/Ta
 3.990 * 0.932 = 3.719
 Qp = 13.643

 Total of 2 main streams to confluence:
 Flow rates before confluence point:
 9.925 3.990
 Area of streams before confluence:
 8.470 2.590

Results of confluence:
 Total flow rate = 13.643(CFS)
 Time of concentration = 14.934 min.
 Effective stream area after confluence = 11.060(Ac.)

+-----+
 Process from Point/Station 57.000 to Point/Station 53.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1560.000(Ft.)
 Downstream point/station elevation = 1554.000(Ft.)
 Pipe length = 104.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 13.643(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 13.643(CFS)
 Normal flow depth in pipe = 10.92(In.)
 Flow top width inside pipe = 13.35(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 14.27(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 15.06 min.

+-----+
 Process from Point/Station 53.000 to Point/Station 53.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 11.060(Ac.)
 Runoff from this stream = 13.643(CFS)
 Time of concentration = 15.06 min.
 Rainfall intensity = 1.637(In/Hr)
 Program is now starting with Main Stream No. 2

+-----+
 Process from Point/Station 51.000 to Point/Station 52.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 664.000(Ft.)
 Top (of initial area) elevation = 14574.500(Ft.)
 Bottom (of initial area) elevation = 1560.000(Ft.)
 Difference in elevation = 13014.500(Ft.)
 Slope = 19.60015 s(percent) = 1960.02
 TC = k(0.300)*[(length^3)/(elevation change)]^0.2
 Warning: TC computed to be less than 5 min.; program is assuming the
 time of concentration is 5 minutes.
 Initial area time of concentration = 5.000 min.
 Rainfall intensity = 2.841(In/Hr) for a 10.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.876
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 5.921(CFS)
 Total initial stream area = 2.380(Ac.)
 Pervious area fraction = 0.100

+-----+
 Process from Point/Station 52.000 to Point/Station 53.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1560.000(Ft.)
 Downstream point/station elevation = 1554.000(Ft.)
 Pipe length = 250.00(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 5.921(CFS)
 Nearest computed pipe diameter = 15.00(In.)

Calculated individual pipe flow = 5.921(CFS)
 Normal flow depth in pipe = 9.09(In.)
 Flow top width inside pipe = 14.66(In.)
 Critical Depth = 11.81(In.)
 Pipe flow velocity = 7.61(Ft/s)
 Travel time through pipe = 0.55 min.
 Time of concentration (TC) = 5.55 min.

 Process from Point/Station 53.000 to Point/Station 53.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 2.380(Ac.)
 Runoff from this stream = 5.921(CFS)
 Time of concentration = 5.55 min.
 Rainfall intensity = 2.697(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	13.643	15.06	1.637
2	5.921	5.55	2.697

Largest stream flow has longer time of concentration

Qp = 13.643 + sum of

$$Q_b \frac{I_a/I_b}{5.921 * 0.607} = 3.594$$

 Qp = 17.237

Total of 2 main streams to confluence:

Flow rates before confluence point:
 13.643 5.921
 Area of streams before confluence:
 11.060 2.380

Results of confluence:

Total flow rate = 17.237(CFS)
 Time of concentration = 15.056 min.
 Effective stream area after confluence = 13.440(Ac.)

 Process from Point/Station 53.000 to Point/Station 70.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1554.000(Ft.)
 Downstream point/station elevation = 1546.000(Ft.)
 Pipe length = 416.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 17.237(CFS)
 Nearest computed pipe diameter = 21.00(In.)
 Calculated individual pipe flow = 17.237(CFS)
 Normal flow depth in pipe = 14.02(In.)
 Flow top width inside pipe = 19.79(In.)
 Critical Depth = 18.23(In.)
 Pipe flow velocity = 10.11(Ft/s)
 Travel time through pipe = 0.69 min.
 Time of concentration (TC) = 15.74 min.

 Process from Point/Station 70.000 to Point/Station 70.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 13.440(Ac.)
 Runoff from this stream = 17.237(CFS)
 Time of concentration = 15.74 min.
 Rainfall intensity = 1.601(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 71.000 to Point/Station 72.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 424.000(Ft.)
 Top (of initial area) elevation = 1562.000(Ft.)
 Bottom (of initial area) elevation = 1553.800(Ft.)
 Difference in elevation = 8.200(Ft.)
 Slope = 0.01934 s(percent) = 1.93
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 9.654 min.
Rainfall intensity = 2.044(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.748
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.620(CFS)
Total initial stream area = 1.060(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 72.000 to Point/Station 73.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.800(Ft.)
Downstream point/station elevation = 1550.000(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.620(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 1.620(CFS)
Normal flow depth in pipe = 3.57(In.)
Flow top width inside pipe = 5.89(In.)
Critical depth could not be calculated.
Pipe flow velocity = 13.32(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 9.68 min.

Process from Point/Station 73.000 to Point/Station 73.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.060(Ac.)
Runoff from this stream = 1.620(CFS)
Time of concentration = 9.68 min.
Rainfall intensity = 2.042(In/Hr)

Process from Point/Station 74.000 to Point/Station 75.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 318.000(Ft.)
Top (of initial area) elevation = 1562.000(Ft.)
Bottom (of initial area) elevation = 1553.800(Ft.)
Difference in elevation = 8.200(Ft.)
Slope = 0.02579 s(percent) = 2.58
TC = $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 8.124 min.
Rainfall intensity = 2.228(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.756
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.696(CFS)
Total initial stream area = 1.600(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 75.000 to Point/Station 73.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.800(Ft.)
Downstream point/station elevation = 1550.000(Ft.)
Pipe length = 29.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.696(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.696(CFS)
Normal flow depth in pipe = 4.23(In.)
Flow top width inside pipe = 8.98(In.)
Critical Depth = 8.46(In.)
Pipe flow velocity = 13.20(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 8.16 min.

 Process from Point/Station 73.000 to Point/Station 73.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.600(Ac.)
 Runoff from this stream = 2.696(CFS)
 Time of concentration = 8.16 min.
 Rainfall intensity = 2.223(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	1.620	9.68	2.042
2	2.696	8.16	2.223

Largest stream flow has longer or shorter time of concentration

Qp = 2.696 + sum of
 Qa Tb/Ta
 1.620 * 0.843 = 1.366
 Qp = 4.062

Total of 2 streams to confluence:
 Flow rates before confluence point:
 1.620 2.696

Area of streams before confluence:
 1.060 1.600

Results of confluence:
 Total flow rate = 4.062(CFS)
 Time of concentration = 8.160 min.
 Effective stream area after confluence = 2.660(Ac.)

 Process from Point/Station 73.000 to Point/Station 76.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1550.000(Ft.)
 Downstream point/station elevation = 1549.000(Ft.)
 Pipe length = 152.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.062(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 4.062(CFS)
 Normal flow depth in pipe = 9.91(In.)
 Flow top width inside pipe = 14.20(In.)
 Critical Depth = 9.79(In.)
 Pipe flow velocity = 4.72(Ft/s)
 Travel time through pipe = 0.54 min.
 Time of concentration (TC) = 8.70 min.

 Process from Point/Station 76.000 to Point/Station 76.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 2.660(Ac.)
 Runoff from this stream = 4.062(CFS)
 Time of concentration = 8.70 min.
 Rainfall intensity = 2.154(In/Hr)

 Process from Point/Station 52.000 to Point/Station 76.500
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 347.000(Ft.)
 Top (of initial area) elevation = 1560.000(Ft.)
 Bottom (of initial area) elevation = 1555.500(Ft.)
 Difference in elevation = 4.500(Ft.)
 Slope = 0.01297 s(percent) = 1.30
 $TC = k(0.390) * [(length^3)/(elevation change)]^{0.2}$
 Initial area time of concentration = 9.652 min.
 Rainfall intensity = 2.044(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.748
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.611(CFS)
 Total initial stream area = 0.400(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 76.500 to Point/Station 76.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1555.500(Ft.)
 Downstream point/station elevation = 1549.000(Ft.)
 Pipe length = 70.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.611(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 0.611(CFS)
 Normal flow depth in pipe = 2.48(In.)
 Flow top width inside pipe = 5.91(In.)
 Critical Depth = 4.77(In.)
 Pipe flow velocity = 7.98(Ft/s)
 Travel time through pipe = 0.15 min.
 Time of concentration (TC) = 9.80 min.

 Process from Point/Station 76.000 to Point/Station 76.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.400(Ac.)
 Runoff from this stream = 0.611(CFS)
 Time of concentration = 9.80 min.
 Rainfall intensity = 2.029(In/Hr)
 Summary of stream data:

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

1	4.062	8.70	2.154
2	0.611	9.80	2.029

Largest stream flow has longer or shorter time of concentration

Qp = 4.062 + sum of

$$Q_a \frac{T_b}{T_a}$$
 Qp = 0.611 * 0.888 = 0.543
 Qp = 4.604

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.062 0.611
 Area of streams before confluence:
 2.660 0.400
 Results of confluence:
 Total flow rate = 4.604(CFS)
 Time of concentration = 8.698 min.
 Effective stream area after confluence = 3.060(Ac.)

 Process from Point/Station 76.000 to Point/Station 77.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1549.000(Ft.)
 Downstream point/station elevation = 1548.000(Ft.)
 Pipe length = 146.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.604(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 4.604(CFS)
 Normal flow depth in pipe = 10.73(In.)
 Flow top width inside pipe = 13.53(In.)
 Critical Depth = 10.44(In.)
 Pipe flow velocity = 4.90(Ft/s)
 Travel time through pipe = 0.50 min.
 Time of concentration (TC) = 9.19 min.

 Process from Point/Station 77.000 to Point/Station 78.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1548.000(Ft.)
 End of natural channel elevation = 1547.500(Ft.)
 Length of natural channel = 77.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 4.860(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:

$$\text{velocity(ft/s)} = (7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$$
 velocity using mean channel flow = 1.69(Ft/s)

Correction to map slope used on extremely rugged channels with drops and waterfalls (Plate D-6.2)

Normal channel slope = 0.0065
Corrected/adjusted channel slope = 0.0065
Travel time = 0.76 min. TC = 9.95 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.632
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.013(In/Hr) for a 10.0 year storm
Subarea runoff = 0.433(CFS) for 0.340(Ac.)
Total runoff = 5.037(CFS) Total area = 3.400(Ac.)

Process from Point/Station 78.000 to Point/Station 78.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.400(Ac.)
Runoff from this stream = 5.037(CFS)
Time of concentration = 9.95 min.
Rainfall intensity = 2.013(In/Hr)

Process from Point/Station 79.000 to Point/Station 80.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 227.000(Ft.)
Top (of initial area) elevation = 1555.200(Ft.)
Bottom (of initial area) elevation = 1552.500(Ft.)
Difference in elevation = 2.700(Ft.)
Slope = 0.01189 s(percent) = 1.19
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 8.287 min.
Rainfall intensity = 2.206(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.755
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.333(CFS)
Total initial stream area = 0.800(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 80.000 to Point/Station 81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1552.500(Ft.)
Downstream point/station elevation = 1550.000(Ft.)
Pipe length = 22.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.333(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 1.333(CFS)
Normal flow depth in pipe = 3.71(In.)
Flow top width inside pipe = 5.83(In.)
Critical depth could not be calculated.
Pipe flow velocity = 10.44(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 8.32 min.

Process from Point/Station 82.000 to Point/Station 81.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.755
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 8.32 min.
Rainfall intensity = 2.202(In/Hr) for a 10.0 year storm

Subarea runoff = 1.263(CFS) for 0.760(Ac.)
Total runoff = 2.596(CFS) Total area = 1.560(Ac.)

Process from Point/Station 81.000 to Point/Station 84.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1550.000(Ft.)
Downstream point/station elevation = 1548.000(Ft.)
Pipe length = 230.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.596(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.596(CFS)
Normal flow depth in pipe = 7.98(In.)
Flow top width inside pipe = 11.33(In.)
Critical Depth = 8.28(In.)
Pipe flow velocity = 4.68(Ft/s)
Travel time through pipe = 0.82 min.
Time of concentration (TC) = 9.14 min.

Process from Point/Station 84.000 to Point/Station 78.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1548.000(Ft.)
End of natural channel elevation = 1547.500(Ft.)
Length of natural channel = 74.000(Ft.)
Estimated mean flow rate at midpoint of channel = 2.596(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{0.352})^{0.5})$
Velocity using mean channel flow = 1.50(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0068
Corrected/adjusted channel slope = 0.0068
Travel time = 0.82 min. TC = 9.97 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.632
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.012(In/Hr) for a 10.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 2.596(CFS) Total area = 1.560(Ac.)

Process from Point/Station 78.000 to Point/Station 78.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.560(Ac.)
Runoff from this stream = 2.596(CFS)
Time of concentration = 9.97 min.
Rainfall intensity = 2.012(In/Hr)

Process from Point/Station 85.000 to Point/Station 86.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 189.000(Ft.)
Top (of initial area) elevation = 1553.500(Ft.)
Bottom (of initial area) elevation = 1553.000(Ft.)
Difference in elevation = 0.500(Ft.)
Slope = 0.00265 s(percent) = 0.26
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 8.002 min.
Rainfall intensity = 2.245(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.871
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
RI index for soil(AMC 2) = 56.00

Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.333(CFS)
Total initial stream area = 0.170(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 86.000 to Point/Station 87.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
Downstream point/station elevation = 1548.000(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.333(CFS)
Nearest computed pipe diameter = 3.00(In.)
Calculated individual pipe flow = 0.333(CFS)
Normal flow depth in pipe = 2.41(In.)
Flow top width inside pipe = 2.39(In.)
Critical depth could not be calculated.
Pipe flow velocity = 7.87(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 8.07 min.

Process from Point/Station 87.000 to Point/Station 78.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1548.000(Ft.)
End of natural channel elevation = 1547.500(Ft.)
Length of natural channel = 23.000(Ft.)
Estimated mean flow rate at midpoint of channel = 0.333(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})(\text{slope}^{.5}))$
velocity using mean channel flow = 1.83(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0217
Corrected/adjusted channel slope = 0.0217
Travel time = 0.21 min. TC = 8.28 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.649
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.207(In/Hr) for a 10.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 0.333(CFS) Total area = 0.170(Ac.)

Process from Point/Station 78.000 to Point/Station 78.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 3
Stream flow area = 0.170(Ac.)
Runoff from this stream = 0.333(CFS)
Time of concentration = 8.28 min.
Rainfall intensity = 2.207(In/Hr)

Process from Point/Station 76.500 to Point/Station 88.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 248.000(Ft.)
Top (of initial area) elevation = 1555.500(Ft.)
Bottom (of initial area) elevation = 1553.500(Ft.)
Difference in elevation = 2.000(Ft.)
Slope = 0.00806 s(percent) = 0.81
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{.2}$
Initial area time of concentration = 7.138 min.
Rainfall intensity = 2.377(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 0.664(CFS)
 Total initial stream area = 0.320(Ac.)
 Pervious area fraction = 0.100

 Process from Point/Station 88.000 to Point/Station 89.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.500(Ft.)
 Downstream point/station elevation = 1548.000(Ft.)
 Pipe length = 37.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.664(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 0.664(CFS)
 Normal flow depth in pipe = 2.28(In.)
 Flow top width inside pipe = 5.83(In.)
 Critical Depth = 4.95(In.)
 Pipe flow velocity = 9.69(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 7.20 min.

 Process from Point/Station 89.000 to Point/Station 78.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1548.000(Ft.)
 End of natural channel elevation = 1547.500(Ft.)
 Length of natural channel = 5.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 0.664(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $Velocity(Ft/s) = (7 + 8(q(English\ Units)^{.352})(slope^{.5}))$
 Velocity using mean channel flow = 4.40(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.1000
 Corrected/adjusted channel slope = 0.1000
 Travel time = 0.02 min. TC = 7.22 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.661
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.364(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 0.664(CFS) Total area = 0.320(Ac.)

 Process from Point/Station 78.000 to Point/Station 78.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 4
 Stream flow area = 0.320(Ac.)
 Runoff from this stream = 0.664(CFS)
 Time of concentration = 7.22 min.
 Rainfall intensity = 2.364(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.037	9.95	2.013
2	2.596	9.97	2.012
3	0.333	8.28	2.207
4	0.664	7.22	2.364

Largest stream flow has longer or shorter time of concentration
 $Q_p = 5.037 + \text{sum of}$
 $Q_a \cdot \frac{T_b}{T_a}$
 $2.596 * 0.999 = 2.593$
 $Q_b \cdot \frac{I_a}{I_b}$
 $0.333 * 0.912 = 0.303$
 $Q_b \cdot \frac{I_a}{I_b}$

Qp = 0.664 * 0.852 = 0.565
8.499

Total of 4 streams to confluence:
Flow rates before confluence point:
5.037 2.596 0.333 0.664
Area of streams before confluence:
3.400 1.560 0.170 0.320
Results of confluence:
Total flow rate = 8.499(CFS)
Time of concentration = 9.954 min.
Effective stream area after confluence = 5.450(Ac.)

Process from Point/Station 78.000 to Point/Station 70.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1547.500(Ft.)
Downstream point/station elevation = 1546.000(Ft.)
Pipe length = 79.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.499(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 8.499(CFS)
Normal flow depth in pipe = 11.72(In.)
Flow top width inside pipe = 12.40(In.)
Critical depth = 13.64(In.)
Pipe flow velocity = 8.26(Ft/s)
Travel time through pipe = 0.16 min.
Time of concentration (TC) = 10.11 min.

Process from Point/Station 70.000 to Point/Station 70.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 5.450(Ac.)
Runoff from this stream = 8.499(CFS)
Time of concentration = 10.11 min.
Rainfall intensity = 1.997(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	17.237	15.74	1.601
2	8.499	10.11	1.997

Largest stream flow has longer time of concentration

Qp = 17.237 + sum of
Qb Ia/Ib
8.499 * 0.802 = 6.812
Qp = 24.049

Total of 2 main streams to confluence:
Flow rates before confluence point:
17.237 8.499
Area of streams before confluence:
13.440 5.450
Results of confluence:
Total flow rate = 24.049(CFS)
Time of concentration = 15.741 min.
Effective stream area after confluence = 18.890(Ac.)

Process from Point/Station 70.000 to Point/Station 50.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1546.000(Ft.)
Downstream point/station elevation = 1545.000(Ft.)
Pipe length = 25.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 24.049(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 24.049(CFS)
Normal flow depth in pipe = 13.69(In.)
Flow top width inside pipe = 20.01(In.)
Critical depth could not be calculated.
Pipe flow velocity = 14.49(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 15.77 min.

 Process from Point/Station 50.000 to Point/Station 50.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 18.890(Ac.)
 Runoff from this stream = 24.049(CFS)
 Time of concentration = 15.77 min.
 Rainfall intensity = 1.599(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 33.000 to Point/Station 50.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.365(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.705
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 User specified values are as follows:
 TC = 21.65 min. Rain intensity = 1.37(In/Hr)
 Total area = 19.85(Ac.) Total runoff = 375.11(CFS)

 Process from Point/Station 50.000 to Point/Station 50.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 19.850(Ac.)
 Runoff from this stream = 375.110(CFS)
 Time of concentration = 21.65 min.
 Rainfall intensity = 1.365(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	24.049	15.77	1.599
2	375.110	21.65	1.365

Largest stream flow has longer time of concentration
 $Q_p = 375.110 + \text{sum of } \frac{Q_b \cdot I_a}{I_b}$
 $Q_p = 24.049 * \frac{1.599}{1.365} = 20.526$
 $Q_p = 395.636$

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 24.049 375.110
 Area of streams before confluence:
 18.890 19.850

Results of confluence:
 Total flow rate = 395.636(CFS)
 Time of concentration = 21.650 min.
 Effective stream area after confluence = 38.740(Ac.)
 End of computations, total study area = 38.74 (Ac.)
 The following figures may be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.455
 Area averaged RI index number = 56.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/21 File:pro210.out

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

English (in-lb) Units used in input data file

Program License Serial Number 5006

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District 1978 hydrology manual
Storm event (year) = 10.00 Antecedent Moisture Condition = 2
Standard intensity-duration curves data (Plate D-4.1)
For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)
Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.820(In/Hr)
Slope of intensity duration curve = 0.5000

Process from Point/Station 51.000 to Point/Station 100.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 462.000(Ft.)
Top (of initial area) elevation = 1574.500(Ft.)
Bottom (of initial area) elevation = 1570.800(Ft.)
Difference in elevation = 3.700(Ft.)
Slope = 0.00801 s(percent)= 0.80
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.168 min.
Rainfall intensity = 2.098(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 2.281(CFS)
Total initial stream area = 1.250(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 100.000 to Point/Station 101.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1570.800(Ft.)
End of natural channel elevation = 1559.000(Ft.)
Length of natural channel = 604.000(Ft.)
Estimated mean flow rate at midpoint of channel = 8.259(CFS)
Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 3.33(Ft/s)
Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0195
Corrected/adjusted channel slope = 0.0195
Travel time = 3.02 min. TC = 12.19 min.
Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.867
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 1.819(In/Hr) for a 10.0 year storm
Subarea runoff = 10.332(CFS) for 6.550(Ac.)
Total runoff = 12.613(CFS) Total area = 7.800(Ac.)

Process from Point/Station 101.000 to Point/Station 101.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.613
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 12.19 min.
Rainfall intensity = 1.819(In/Hr) for a 10.0 year storm
Subarea runoff = 0.502(CFS) for 0.450(Ac.)
Total runoff = 13.115(CFS) Total area = 8.250(Ac.)

Process from Point/Station 101.000 to Point/Station 102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1559.000(Ft.)
Downstream point/station elevation = 1549.500(Ft.)
Pipe length = 695.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 13.115(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 13.115(CFS)
Normal flow depth in pipe = 13.04(In.)
Flow top width inside pipe = 20.37(In.)
Critical Depth = 16.18(In.)
Pipe flow velocity = 8.35(Ft/s)
Travel time through pipe = 1.39 min.
Time of concentration (TC) = 13.58 min.

Process from Point/Station 102.000 to Point/Station 102.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 8.250(Ac.)
Runoff from this stream = 13.115(CFS)
Time of concentration = 13.58 min.
Rainfall intensity = 1.724(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 103.000 to Point/Station 104.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 551.000(Ft.)
Top (of initial area) elevation = 1558.000(Ft.)
Bottom (of initial area) elevation = 1552.000(Ft.)
Difference in elevation = 6.000(Ft.)
Slope = 0.01089 s(percent)= 1.09
TC = $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{\wedge}0.2$
Initial area time of concentration = 12.026 min.
Rainfall intensity = 1.832(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.736
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 3.169(CFS)
Total initial stream area = 2.350(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 104.000 to Point/Station 105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1552.000(Ft.)
Downstream point/station elevation = 1550.500(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.169(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 3.169(CFS)
Normal flow depth in pipe = 6.75(In.)
Flow top width inside pipe = 7.79(In.)
Critical depth could not be calculated.

Pipe flow velocity = 8.92(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 12.09 min.

 Process from Point/Station 105.000 to Point/Station 105.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 2.350(Ac.)
 Runoff from this stream = 3.169(CFS)
 Time of concentration = 12.09 min.
 Rainfall intensity = 1.827(In/Hr)

 Process from Point/Station 106.000 to Point/Station 107.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 506.000(Ft.)
 Top (of initial area) elevation = 1557.000(Ft.)
 Bottom (of initial area) elevation = 1552.000(Ft.)
 Difference in elevation = 5.000(Ft.)
 Slope = 0.00988 s(percent)= 0.99
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{.2}$
 Initial area time of concentration = 11.851 min.
 Rainfall intensity = 1.845(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.737
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 2.121(CFS)
 Total initial stream area = 1.560(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 107.000 to Point/Station 105.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1552.000(Ft.)
 Downstream point/station elevation = 1550.500(Ft.)
 Pipe length = 9.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.121(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 2.121(CFS)
 Normal flow depth in pipe = 4.56(In.)
 Flow top width inside pipe = 5.13(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 13.25(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 11.86 min.

 Process from Point/Station 105.000 to Point/Station 105.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.560(Ac.)
 Runoff from this stream = 2.121(CFS)
 Time of concentration = 11.86 min.
 Rainfall intensity = 1.844(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.169	12.09	1.827
2	2.121	11.86	1.844

Largest stream flow has longer time of concentration
 $Q_p = 3.169 + \text{sum of } Q_b \cdot \frac{I_a}{I_b}$
 $2.121 * 0.991 = 2.101$
 $Q_p = 5.270$
 Total of 2 streams to confluence:
 Flow rates before confluence point:
 3.169 2.121
 Area of streams before confluence:
 2.350 1.560
 Results of confluence:
 Total flow rate = 5.270(CFS)
 Time of concentration = 12.090 min.
 Effective stream area after confluence = 3.910(Ac.)

 Process from Point/Station 105.000 to Point/Station 108.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1550.500(Ft.)
 Downstream point/station elevation = 1550.000(Ft.)
 Pipe length = 20.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.270(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 5.270(CFS)
 Normal flow depth in pipe = 9.21(In.)
 Flow top width inside pipe = 10.14(In.)
 Critical Depth = 11.16(In.)
 Pipe flow velocity = 8.15(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 12.13 min.

 Process from Point/Station 108.000 to Point/Station 102.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1550.000(Ft.)
 End of natural channel elevation = 1549.500(Ft.)
 Length of natural channel = 80.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 5.345(CFS)
 Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{0.352})^{0.5})$
 Velocity using mean channel flow = 1.69(Ft/s)
 Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0063
 Corrected/adjusted channel slope = 0.0063
 Travel time = 0.79 min. TC = 12.92 min.
 Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff coefficient = 0.607
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.767(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.118(CFS) for 0.110(Ac.)
 Total runoff = 5.388(CFS) Total area = 4.020(Ac.)

 Process from Point/Station 102.000 to Point/Station 102.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 4.020(Ac.)
 Runoff from this stream = 5.388(CFS)
 Time of concentration = 12.92 min.
 Rainfall intensity = 1.767(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.115	13.58	1.724
2	5.388	12.92	1.767

Largest stream flow has longer time of concentration
 $Q_p = 13.115 + \text{sum of } Q_b \cdot \frac{I_a/I_b}{5.388} = 5.256$
 $Q_p = 18.371$
 Total of 2 main streams to confluence:
 Flow rates before confluence point:
 13.115 5.388
 Area of streams before confluence:
 8.250 4.020
 Results of confluence:
 Total flow rate = 18.371(CFS)
 Time of concentration = 13.578 min.
 Effective stream area after confluence = 12.270(Ac.)
 End of computations, total study area = 12.27 (Ac.)
 The following figures maybe used for a unit hydrograph study of the same area.
 Area averaged pervious area fraction(Ap) = 0.269
 Area averaged RI index number = 56.2

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/21 File:pro100.out

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

English (in-lb) Units used in input data file

Program License Serial Number 5006

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5000

Process from Point/Station 1.000 to Point/Station 1.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.078(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.749
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 20.00 min. Rain intensity = 2.08(In/Hr)
Total area = 0.00(Ac.) Total runoff = 710.00(CFS)

Process from Point/Station 1.000 to Point/Station 2.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1580.500(Ft.)
Downstream point/station elevation = 1564.000(Ft.)
Pipe length = 931.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 710.000(CFS)
Nearest computed pipe diameter = 78.00(In.)
Calculated individual pipe flow = 710.000(CFS)
Normal flow depth in pipe = 65.25(In.)
Flow top width inside pipe = 57.69(In.)
Critical depth could not be calculated.
Pipe flow velocity = 23.96(Ft/s)
Travel time through pipe = 0.65 min.
Time of concentration (TC) = 20.65 min.

Process from Point/Station 2.000 to Point/Station 2.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 0.000(Ac.)
Runoff from this stream = 710.000(CFS)
Time of concentration = 20.65 min.
Rainfall intensity = 2.046(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 3.000 to Point/Station 4.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 709.000(Ft.)
Top (of initial area) elevation = 1584.000(Ft.)
Bottom (of initial area) elevation = 1573.500(Ft.)
Difference in elevation = 10.500(Ft.)
Slope = 0.01481 s(percent)= 1.48
TC = $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 9.622 min.
Rainfall intensity = 2.997(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 2.259(CFS)
Total initial stream area = 0.860(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 4.000 to Point/Station 5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1573.500(Ft.)
Downstream point/station elevation = 1569.000(Ft.)
Pipe length = 65.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.259(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.259(CFS)
Normal flow depth in pipe = 4.60(In.)
Flow top width inside pipe = 9.00(In.)
Critical Depth = 8.06(In.)
Pipe flow velocity = 9.94(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 9.73 min.

Process from Point/Station 5.000 to Point/Station 5.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 0.860(Ac.)
Runoff from this stream = 2.259(CFS)
Time of concentration = 9.73 min.
Rainfall intensity = 2.980(In/Hr)

Process from Point/Station 6.000 to Point/Station 7.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 370.000(Ft.)
Top (of initial area) elevation = 1581.300(Ft.)
Bottom (of initial area) elevation = 1573.500(Ft.)
Difference in elevation = 7.800(Ft.)
Slope = 0.02108 s(percent)= 2.11
TC = $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 6.912 min.
Rainfall intensity = 3.535(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.808(CFS)
Total initial stream area = 0.260(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 7.000 to Point/Station 5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1573.500(Ft.)
Downstream point/station elevation = 1469.000(Ft.)
Pipe length = 44.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.808(CFS)

Nearest computed pipe diameter = 3.00(In.)
 Calculated individual pipe flow = 0.808(CFS)
 Normal flow depth in pipe = 1.66(In.)
 Flow top width inside pipe = 2.98(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 28.92(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 6.94 min.

++++++
 Process from Point/Station 5.000 to Point/Station 5.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.260(Ac.)
 Runoff from this stream = 0.808(CFS)
 Time of concentration = 6.94 min.
 Rainfall intensity = 3.529(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	2.259	9.73	2.980
2	0.808	6.94	3.529

Largest stream flow has longer time of concentration

$Q_p = 2.259 + \text{sum of } \frac{Q_b \cdot I_a/I_b}{0.808 * 0.844} = 0.683$
 $Q_p = 2.942$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 2.259 0.808
 Area of streams before confluence:
 0.860 0.260
 Results of confluence:
 Total flow rate = 2.942(CFS)
 Time of concentration = 9.731 min.
 Effective stream area after confluence = 1.120(Ac.)

++++++
 Process from Point/Station 5.000 to Point/Station 8.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1569.000(Ft.)
 Downstream point/station elevation = 1568.300(Ft.)
 Pipe length = 139.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.942(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 2.942(CFS)
 Normal flow depth in pipe = 8.74(In.)
 Flow top width inside pipe = 14.79(In.)
 Critical Depth = 8.27(In.)
 Pipe flow velocity = 3.97(Ft/s)
 Travel time through pipe = 0.58 min.
 Time of concentration (TC) = 10.32 min.

++++++
 Process from Point/Station 8.000 to Point/Station 9.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1568.300(Ft.)
 End of natural channel elevation = 1568.000(Ft.)
 Length of natural channel = 166.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 3.270(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $\text{Velocity (Ft/s)} = (7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
 velocity using mean channel flow = 0.81(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0018
 Corrected/adjusted channel slope = 0.0018
 Travel time = 3.40 min. TC = 13.72 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.672
 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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.510(In/Hr) for a 100.0 year storm
Subarea runoff = 0.422(CFS) for 0.250(Ac.)
Total runoff = 3.363(CFS) Total area = 1.370(Ac.)

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

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.370(Ac.)
Runoff from this stream = 3.363(CFS)
Time of concentration = 13.72 min.
Rainfall intensity = 2.510(In/Hr)

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 616.000(Ft.)
Top (of initial area) elevation = 1579.600(Ft.)
Bottom (of initial area) elevation = 1570.300(Ft.)
Difference in elevation = 9.300(Ft.)
Slope = 0.01510 s(percent) = 1.51
TC = $k(0.390) * [(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 11.779 min.
Rainfall intensity = 2.708(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.774
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 4.845(CFS)
Total initial stream area = 2.310(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 11.000 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1570.300(Ft.)
Downstream point/station elevation = 1568.300(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.845(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.845(CFS)
Normal flow depth in pipe = 7.72(In.)
Flow top width inside pipe = 11.50(In.)
Critical Depth = 10.90(In.)
Pipe flow velocity = 9.08(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 11.89 min.

Process from Point/Station 12.000 to Point/Station 9.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1568.300(Ft.)
End of natural channel elevation = 1568.000(Ft.)
Length of natural channel = 161.000(Ft.)
Estimated mean flow rate at midpoint of channel = 4.845(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{0.352})^{0.5})$
Velocity using mean channel flow = 0.90(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0019
Corrected/adjusted channel slope = 0.0019
Travel time = 2.97 min. TC = 14.86 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea

Runoff Coefficient = 0.665
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.411(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 4.845(CFS) Total area = 2.310(Ac.)

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

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 2.310(Ac.)
 Runoff from this stream = 4.845(CFS)
 Time of concentration = 14.86 min.
 Rainfall intensity = 2.411(In/Hr)

++++++
 Process from Point/Station 7.000 to Point/Station 13.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 207.000(Ft.)
 Top (of initial area) elevation = 1573.500(Ft.)
 Bottom (of initial area) elevation = 1570.300(Ft.)
 Difference in elevation = 3.200(Ft.)
 Slope = 0.01546 s(percent)= 1.55
 $TC = k(0.300)^*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 5.830 min.
 Rainfall intensity = 3.850(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.881
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 0.712(CFS)
 Total initial stream area = 0.210(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 13.000 to Point/Station 9.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1570.300(Ft.)
 End of natural channel elevation = 1568.000(Ft.)
 Length of natural channel = 161.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 0.712(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $velocity(ft/s) = (7 + 8(q(English\ units)^{0.352})(slope^{0.5}))$
 velocity using mean channel flow = 1.69(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0143
 Corrected/adjusted channel slope = 0.0143
 Travel time = 1.59 min. TC = 7.42 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.720
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 3.412(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 0.712(CFS) Total area = 0.210(Ac.)

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

Along Main Stream number: 2 in normal stream number 3
Stream flow area = 0.210(Ac.)
Runoff from this stream = 0.712(CFS)
Time of concentration = 7.42 min.
Rainfall intensity = 3.412(In/Hr)

Process from Point/Station 14.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 806.000(Ft.)
Top (of initial area) elevation = 1581.700(Ft.)
Bottom (of initial area) elevation = 1569.800(Ft.)
Difference in elevation = 11.900(Ft.)
Slope = 0.01476 s(percent)= 1.48
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 13.175 min.
Rainfall intensity = 2.561(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.769
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 5.753(CFS)
Total initial stream area = 2.920(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 15.000 to Point/Station 16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1569.800(Ft.)
Downstream point/station elevation = 1568.300(Ft.)
Pipe length = 106.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.753(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 5.753(CFS)
Normal flow depth in pipe = 9.68(In.)
Flow top width inside pipe = 14.35(In.)
Critical Depth = 11.66(In.)
Pipe flow velocity = 6.87(Ft/s)
Travel time through pipe = 0.26 min.
Time of concentration (TC) = 13.43 min.

Process from Point/Station 16.000 to Point/Station 9.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1568.300(Ft.)
End of natural channel elevation = 1568.000(Ft.)
Length of natural channel = 148.000(Ft.)
Estimated mean flow rate at midpoint of channel = 5.753(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(Ft/s) = $(7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
velocity using mean channel flow = 0.98(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0020
Corrected/adjusted channel slope = 0.0020
Travel time = 2.51 min. TC = 15.94 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.659
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.328(In/Hr) for a 100.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 5.753(CFS) Total area = 2.920(Ac.)

Process from Point/Station 9.000 to Point/Station 9.000

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 4
 Stream flow area = 2.920(Ac.)
 Runoff from this stream = 5.753(CFS)
 Time of concentration = 15.94 min.
 Rainfall intensity = 2.328(In/Hr)

 Process from Point/Station 17.000 to Point/Station 18.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 483.000(Ft.)
 Top (of initial area) elevation = 1575.300(Ft.)
 Bottom (of initial area) elevation = 1570.500(Ft.)
 Difference in elevation = 4.800(Ft.)
 Slope = 0.00994 s(percent)= 0.99
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 11.619 min.
 Rainfall intensity = 2.727(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.775
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 4.904(CFS)
 Total initial stream area = 2.320(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 18.000 to Point/Station 9.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1570.500(Ft.)
 End of natural channel elevation = 1568.000(Ft.)
 Length of natural channel = 76.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 4.904(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $Velocity(ft/s) = (7 + 8(q(English\ Units)^{.352})(slope^{0.5}))$
 Velocity using mean channel flow = 3.81(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0329
 Corrected/adjusted channel slope = 0.0329
 Travel time = 0.33 min. TC = 11.95 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.683
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.689(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 4.904(CFS) Total area = 2.320(Ac.)

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

Along Main Stream number: 2 in normal stream number 5
 Stream flow area = 2.320(Ac.)
 Runoff from this stream = 4.904(CFS)
 Time of concentration = 11.95 min.
 Rainfall intensity = 2.689(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.363	13.72	2.510
2	4.845	14.86	2.411
3	0.712	7.42	3.412

4 5.753 15.94 2.328
 5 4.904 11.95 2.689
 Largest stream flow has longer time of concentration
 Qp = 5.753 + sum of
 Qb Ia/Ib
 3.363 * 0.927 = 3.119
 Qb Ia/Ib
 4.845 * 0.965 = 4.677
 Qb Ia/Ib
 0.712 * 0.682 = 0.486
 Qb Ia/Ib
 4.904 * 0.866 = 4.245
 Qp = 18.281

Total of 5 streams to confluence:
 Flow rates before confluence point:
 3.363 4.845 0.712 5.753 4.904
 Area of streams before confluence:
 1.370 2.310 0.210 2.920 2.320
 Results of confluence:
 Total flow rate = 18.281(CFS)
 Time of concentration = 15.944 min.
 Effective stream area after confluence = 9.130(Ac.)

++++++
 Process from Point/Station 9.000 to Point/Station 2.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1568.000(Ft.)
 Downstream point/station elevation = 1564.000(Ft.)
 Pipe length = 53.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 18.281(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 18.281(CFS)
 Normal flow depth in pipe = 10.39(In.)
 Flow top width inside pipe = 17.78(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 17.28(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 16.00 min.

++++++
 Process from Point/Station 2.000 to Point/Station 2.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 9.130(Ac.)
 Runoff from this stream = 18.281(CFS)
 Time of concentration = 16.00 min.
 Rainfall intensity = 2.324(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	710.000	20.65	2.046
2	18.281	16.00	2.324

Largest stream flow has longer time of concentration
 Qp = 710.000 + sum of
 Qb Ia/Ib
 18.281 * 0.880 = 16.090
 Qp = 726.090

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 710.000 18.281
 Area of streams before confluence:
 0.000 9.130
 Results of confluence:
 Total flow rate = 726.090(CFS)
 Time of concentration = 20.648 min.
 Effective stream area after confluence = 9.130(Ac.)

++++++
 Process from Point/Station 2.000 to Point/Station 19.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.000(Ft.)
 Downstream point/station elevation = 1553.000(Ft.)
 Pipe length = 861.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 726.090(CFS)
Nearest computed pipe diameter = 84.00(In.)
Calculated individual pipe flow = 726.090(CFS)
Normal flow depth in pipe = 69.28(In.)
Flow top width inside pipe = 63.87(In.)
Critical Depth = 79.21(In.)
Pipe flow velocity = 21.39(Ft/s)
Travel time through pipe = 0.67 min.
Time of concentration (TC) = 21.32 min.

Process from Point/Station 19.000 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 = 9.130(Ac.)
Runoff from this stream = 726.090(CFS)
Time of concentration = 21.32 min.
Rainfall intensity = 2.013(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 18.000 to Point/Station 19.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 662.000(Ft.)
Top (of initial area) elevation = 1573.900(Ft.)
Bottom (of initial area) elevation = 1567.800(Ft.)
Difference in elevation = 6.100(Ft.)
Slope = 0.00921 s(percent) = 0.92
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 10.294 min.
Rainfall intensity = 2.897(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.041(CFS)
Total initial stream area = 0.410(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 19.000 to Point/Station 20.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1567.800(Ft.)
End of street segment elevation = 1557.500(Ft.)
Length of street segment = 589.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 1.522(CFS)
Depth of flow = 0.265(Ft.), Average velocity = 2.516(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 6.915(Ft.)
Flow velocity = 2.52(Ft/s)
Travel time = 3.90 min. TC = 14.20 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.873
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 2.467(In/Hr) for a 100.0 year storm
Subarea runoff = 0.883(CFS) for 0.410(Ac.)
Total runoff = 1.924(CFS) Total area = 0.820(Ac.)

Street flow at end of street = 1.924(CFS)
Half street flow at end of street = 1.924(CFS)
Depth of flow = 0.282(Ft.); Average velocity = 2.641(Ft/s)
Flow width (from curb towards crown)= 7.757(Ft.)

Process from Point/Station 20.000 to Point/Station 21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1557.500(Ft.)
Downstream point/station elevation = 1556.500(Ft.)
Pipe length = 71.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.924(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.924(CFS)
Normal flow depth in pipe = 7.22(In.)
Flow top width inside pipe = 7.17(In.)
Critical Depth = 7.59(In.)
Pipe flow velocity = 5.07(Ft/s)
Travel time through pipe = 0.23 min.
Time of concentration (TC) = 14.43 min.

Process from Point/Station 21.000 to Point/Station 23.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1556.500(Ft.)
End of natural channel elevation = 1556.000(Ft.)
Length of natural channel = 38.000(Ft.)
Estimated mean flow rate at midpoint of channel = 2.194(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
velocity(ft/s) = $(7 + 8(q(\text{English Units})^{0.352})(\text{slope})^{0.5})$
velocity using mean channel flow = 2.01(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0132
Corrected/adjusted channel slope = 0.0132
Travel time = 0.31 min. TC = 14.74 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.666
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.421(In/Hr) for a 100.0 year storm
Subarea runoff = 0.371(CFS) for 0.230(Ac.)
Total runoff = 2.294(CFS) Total area = 1.050(Ac.)

Process from Point/Station 23.000 to Point/Station 23.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.050(Ac.)
Runoff from this stream = 2.294(CFS)
Time of concentration = 14.74 min.
Rainfall intensity = 2.421(In/Hr)

Process from Point/Station 13.000 to Point/Station 22.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 922.000(Ft.)
Top (of initial area) elevation = 1570.300(Ft.)
Bottom (of initial area) elevation = 1557.500(Ft.)
Difference in elevation = 12.800(Ft.)
Slope = 0.01388 s(percent)= 1.39
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 10.827 min.
Rainfall intensity = 2.825(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 1.880(CFS)
 Total initial stream area = 0.760(Ac.)
 Pervious area fraction = 0.100

 Process from Point/Station 22.000 to Point/Station 21.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1557.500(Ft.)
 Downstream point/station elevation = 1556.500(Ft.)
 Pipe length = 31.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.880(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 1.880(CFS)
 Normal flow depth in pipe = 5.20(In.)
 Flow top width inside pipe = 8.89(In.)
 Critical Depth = 7.52(In.)
 Pipe flow velocity = 7.12(Ft/s)
 Travel time through pipe = 0.07 min.
 Time of concentration (TC) = 10.90 min.

 Process from Point/Station 21.000 to Point/Station 23.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1556.500(Ft.)
 End of natural channel elevation = 1556.000(Ft.)
 Length of natural channel = 38.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 1.880(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})(\text{slope}^{.5}))$
 velocity using mean channel flow = 1.95(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0132
 Corrected/adjusted channel slope = 0.0132
 Travel time = 0.32 min. TC = 11.22 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.688
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.774(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 1.880(CFS) Total area = 0.760(Ac.)

 Process from Point/Station 23.000 to Point/Station 23.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.760(Ac.)
 Runoff from this stream = 1.880(CFS)
 Time of concentration = 11.22 min.
 Rainfall intensity = 2.774(In/Hr)

 Process from Point/Station 24.000 to Point/Station 25.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 328.000(Ft.)
 Top (of initial area) elevation = 1570.500(Ft.)
 Bottom (of initial area) elevation = 1566.500(Ft.)
 Difference in elevation = 4.000(Ft.)
 Slope = 0.01220 s(percent) = 1.22
 $TC = k(0.940)*[(\text{length}^3)/(\text{elevation change})]^{.2}$
 Initial area time of concentration = 23.027 min.
 Rainfall intensity = 1.937(In/Hr) for a 100.0 year storm
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.625
 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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 0.847(CFS)
Total initial stream area = 0.700(Ac.)
Pervious area fraction = 1.000

Process from Point/Station 25.000 to Point/Station 26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1566.500(Ft.)
Downstream point/station elevation = 1557.500(Ft.)
Pipe length = 293.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.847(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 0.847(CFS)
Normal flow depth in pipe = 4.29(In.)
Flow top width inside pipe = 5.41(In.)
Critical Depth = 5.43(In.)
Pipe flow velocity = 5.63(Ft/s)
Travel time through pipe = 0.87 min.
Time of concentration (TC) = 23.89 min.

Process from Point/Station 27.000 to Point/Station 26.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.740
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 23.89 min.
Rainfall intensity = 1.902(In/Hr) for a 100.0 year storm
Subarea runoff = 0.676(CFS) for 0.480(Ac.)
Total runoff = 1.523(CFS) Total area = 1.180(Ac.)

Process from Point/Station 26.000 to Point/Station 29.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1557.500(Ft.)
Downstream point/station elevation = 1557.000(Ft.)
Pipe length = 39.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.523(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.523(CFS)
Normal flow depth in pipe = 6.16(In.)
Flow top width inside pipe = 8.36(In.)
Critical Depth = 6.81(In.)
Pipe flow velocity = 4.72(Ft/s)
Travel time through pipe = 0.14 min.
Time of concentration (TC) = 24.03 min.

Process from Point/Station 30.000 to Point/Station 29.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.740
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 24.03 min.
Rainfall intensity = 1.896(In/Hr) for a 100.0 year storm
Subarea runoff = 0.954(CFS) for 0.680(Ac.)
Total runoff = 2.477(CFS) Total area = 1.860(Ac.)

Process from Point/Station 29.000 to Point/Station 32.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1557.000(Ft.)

Downstream point/station elevation = 1556.500(Ft.)
 Pipe length = 35.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.477(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 2.477(CFS)
 Normal flow depth in pipe = 6.57(In.)
 Flow top width inside pipe = 11.94(In.)
 Critical Depth = 8.09(In.)
 Pipe flow velocity = 5.63(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 24.14 min.

 Process from Point/Station 32.000 to Point/Station 23.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1556.500(Ft.)
 End of natural channel elevation = 1556.000(Ft.)
 Length of natural channel = 65.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 2.630(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})^{.5})$
 Velocity using mean channel flow = 1.60(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0077
 Corrected/adjusted channel slope = 0.0077
 Travel time = 0.68 min. TC = 24.81 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.618
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 1.866(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.265(CFS) for 0.230(Ac.)
 Total runoff = 2.742(CFS) Total area = 2.090(Ac.)

 Process from Point/Station 23.000 to Point/Station 23.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 3
 Stream flow area = 2.090(Ac.)
 Runoff from this stream = 2.742(CFS)
 Time of concentration = 24.81 min.
 Rainfall intensity = 1.866(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.294	14.74	2.421
2	1.880	11.22	2.774
3	2.742	24.81	1.866

Largest stream flow has longer time of concentration
 $Q_p = 2.742 + \text{sum of}$
 $Q_b \cdot \frac{I_a}{I_b}$
 $2.294 * 0.771 = 1.769$
 $Q_b \cdot \frac{I_a}{I_b}$
 $1.880 * 0.673 = 1.264$
 $Q_p = 5.775$

Total of 3 streams to confluence:
 Flow rates before confluence point:
 2.294 1.880 2.742
 Area of streams before confluence:
 1.050 0.760 2.090
 Results of confluence:
 Total flow rate = 5.775(CFS)
 Time of concentration = 24.812 min.
 Effective stream area after confluence = 3.900(Ac.)

 Process from Point/Station 23.000 to Point/Station 19.000

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1556.000(Ft.)
 Downstream point/station elevation = 1553.000(Ft.)
 Pipe length = 65.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.775(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 5.775(CFS)
 Normal flow depth in pipe = 7.78(In.)
 Flow top width inside pipe = 11.46(In.)
 Critical Depth = 11.39(In.)
 Pipe flow velocity = 10.71(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 24.91 min.

Process from Point/Station 19.000 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 = 3.900(Ac.)
 Runoff from this stream = 5.775(CFS)
 Time of concentration = 24.91 min.
 Rainfall intensity = 1.862(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	726.090	21.32	2.013
2	5.775	24.91	1.862

Largest stream flow has longer or shorter time of concentration

Qp = 726.090 + sum of

$$Q_a \quad T_b/T_a$$

$$5.775 * 0.856 = 4.942$$
 Qp = 731.032

Total of 2 main streams to confluence:

Flow rates before confluence point:
 726.090 5.775
 Area of streams before confluence:
 9.130 3.900

Results of confluence:

Total flow rate = 731.032(CFS)
 Time of concentration = 21.319 min.
 Effective stream area after confluence = 13.030(Ac.)

Process from Point/Station 19.000 to Point/Station 33.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
 Downstream point/station elevation = 1547.000(Ft.)
 Pipe length = 428.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 731.032(CFS)
 Nearest computed pipe diameter = 81.00(In.)
 Calculated individual pipe flow = 731.032(CFS)
 Normal flow depth in pipe = 72.90(In.)
 Flow top width inside pipe = 48.60(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 21.57(Ft/s)
 Travel time through pipe = 0.33 min.
 Time of concentration (TC) = 21.65 min.

Process from Point/Station 33.000 to Point/Station 33.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 13.030(Ac.)
 Runoff from this stream = 731.032(CFS)
 Time of concentration = 21.65 min.
 Rainfall intensity = 1.998(In/Hr)
 Program is now starting with Main Stream No. 2

Process from Point/Station 34.000 to Point/Station 35.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 365.000(Ft.)
Top (of initial area) elevation = 1566.000(Ft.)
Bottom (of initial area) elevation = 1562.000(Ft.)
Difference in elevation = 4.000(Ft.)
Slope = 0.01096 s(percent)= 1.10
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 24.552 min.
Rainfall intensity = 1.876(In/Hr) for a 100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.619
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 1.393(CFS)
Total initial stream area = 1.200(Ac.)
Pervious area fraction = 1.000

Process from Point/Station 35.000 to Point/Station 36.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1562.000(Ft.)
Downstream point/station elevation = 1553.000(Ft.)
Pipe length = 329.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.393(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 1.393(CFS)
Normal flow depth in pipe = 4.55(In.)
Flow top width inside pipe = 9.00(In.)
Critical Depth = 6.52(In.)
Pipe flow velocity = 6.22(Ft/s)
Travel time through pipe = 0.88 min.
Time of concentration (TC) = 25.43 min.

Process from Point/Station 36.000 to Point/Station 36.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.200(Ac.)
Runoff from this stream = 1.393(CFS)
Time of concentration = 25.43 min.
Rainfall intensity = 1.843(In/Hr)

Process from Point/Station 59.000 to Point/Station 37.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 543.000(Ft.)
Top (of initial area) elevation = 1564.500(Ft.)
Bottom (of initial area) elevation = 1562.000(Ft.)
Difference in elevation = 2.500(Ft.)
Slope = 0.00460 s(percent)= 0.46
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.202 min.
Rainfall intensity = 2.466(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.766
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 3.872(CFS)
Total initial stream area = 2.050(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 37.000 to Point/Station 38.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1562.000(Ft.)
Downstream point/station elevation = 1552.000(Ft.)
Pipe length = 28.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.872(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 3.872(CFS)
Normal flow depth in pipe = 3.91(In.)

Flow top width inside pipe = 8.92(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 21.02(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 14.22 min.

 Process from Point/Station 62.000 to Point/Station 38.000
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.766
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 14.22 min.
 Rainfall intensity = 2.465(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.491(CFS) for 1.850(Ac.)
 Total runoff = 7.364(CFS) Total area = 3.900(Ac.)

 Process from Point/Station 38.000 to Point/Station 36.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1554.000(Ft.)
 Downstream point/station elevation = 1553.000(Ft.)
 Pipe length = 26.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.364(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 7.364(CFS)
 Normal flow depth in pipe = 8.21(In.)
 Flow top width inside pipe = 14.93(In.)
 Critical Depth = 12.97(In.)
 Pipe flow velocity = 10.71(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 14.26 min.

 Process from Point/Station 36.000 to Point/Station 36.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 3.900(Ac.)
 Runoff from this stream = 7.364(CFS)
 Time of concentration = 14.26 min.
 Rainfall intensity = 2.461(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	1.393	25.43	1.843
2	7.364	14.26	2.461

Largest stream flow has longer or shorter time of concentration

Qp = 7.364 + sum of
 $Q_a \cdot \frac{T_b}{T_a}$
 Qp = 1.393 * 0.561 = 0.781
 Qp = 8.145

Total of 2 streams to confluence:
 Flow rates before confluence point:
 1.393 7.364

Area of streams before confluence:
 1.200 3.900

Results of confluence:
 Total flow rate = 8.145(CFS)
 Time of concentration = 14.265 min.
 Effective stream area after confluence = 5.100(Ac.)

 Process from Point/Station 36.000 to Point/Station 40.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
 Downstream point/station elevation = 1552.500(Ft.)
 Pipe length = 21.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.145(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 8.145(CFS)

Normal flow depth in pipe = 10.31(In.)
Flow top width inside pipe = 13.91(In.)
Critical Depth = 13.46(In.)
Pipe flow velocity = 9.06(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 14.30 min.

Process from Point/Station 40.000 to Point/Station 41.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1552.500(Ft.)
End of natural channel elevation = 1552.000(Ft.)
Length of natural channel = 80.000(Ft.)
Estimated mean flow rate at midpoint of channel = 8.377(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(Ft/s) = $(7 + 8(q(\text{English Units})^{.352})(\text{slope}^{.5}))$
velocity using mean channel flow = 1.89(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0063
Corrected/adjusted channel slope = 0.0063
Travel time = 0.71 min. TC = 15.01 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.664
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.399(In/Hr) for a 100.0 year storm
Subarea runoff = 0.462(CFS) for 0.290(Ac.)
Total runoff = 8.607(CFS) Total area = 5.390(Ac.)

Process from Point/Station 41.000 to Point/Station 41.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 5.390(Ac.)
Runoff from this stream = 8.607(CFS)
Time of concentration = 15.01 min.
Rainfall intensity = 2.399(In/Hr)

Process from Point/Station 55.000 to Point/Station 42.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 657.000(Ft.)
Top (of initial area) elevation = 1561.600(Ft.)
Bottom (of initial area) elevation = 1553.000(Ft.)
Difference in elevation = 8.600(Ft.)
Slope = 0.01309 s(percent) = 1.31
 $TC = k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{.2}$
Initial area time of concentration = 9.567 min.
Rainfall intensity = 3.005(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 2.371(CFS)
Total initial stream area = 0.900(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 42.000 to Point/Station 43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
Downstream point/station elevation = 1552.500(Ft.)
Pipe length = 23.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.371(CFS)

Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 2.371(CFS)
 Normal flow depth in pipe = 7.16(In.)
 Flow top width inside pipe = 7.26(In.)
 Critical Depth = 8.19(In.)
 Pipe flow velocity = 6.29(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 9.63 min.

+-----+
 Process from Point/Station 43.000 to Point/Station 41.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1552.500(Ft.)
 End of natural channel elevation = 1552.000(Ft.)
 Length of natural channel = 39.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 2.371(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})^{.5})$
 Velocity using mean channel flow = 2.02(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0128
 Corrected/adjusted channel slope = 0.0128
 Travel time = 0.32 min. TC = 9.95 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.698
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.947(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 2.371(CFS) Total area = 0.900(Ac.)

+-----+
 Process from Point/Station 41.000 to Point/Station 41.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.900(Ac.)
 Runoff from this stream = 2.371(CFS)
 Time of concentration = 9.95 min.
 Rainfall intensity = 2.947(In/Hr)

+-----+
 Process from Point/Station 22.000 to Point/Station 44.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 556.000(Ft.)
 Top (of initial area) elevation = 1557.500(Ft.)
 Bottom (of initial area) elevation = 1553.000(Ft.)
 Difference in elevation = 4.500(Ft.)
 Slope = 0.00809 s(percent) = 0.81
 $TC = k(0.300) * [(length^3)/(elevation\ change)]^{.2}$
 Initial area time of concentration = 9.852 min.
 Rainfall intensity = 2.961(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.876
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 1.350(CFS)
 Total initial stream area = 0.520(Ac.)
 Pervious area fraction = 0.100

+-----+
 Process from Point/Station 44.000 to Point/Station 45.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
 Downstream point/station elevation = 1552.500(Ft.)

Pipe length = 31.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.350(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 1.350(CFS)
 Normal flow depth in pipe = 5.24(In.)
 Flow top width inside pipe = 8.88(In.)
 Critical Depth = 6.42(In.)
 Pipe flow velocity = 5.05(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 9.95 min.

++++++
 Process from Point/Station 45.000 to Point/Station 41.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1552.500(Ft.)
 End of natural channel elevation = 1552.000(Ft.)
 Length of natural channel = 31.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 1.350(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 $velocity(ft/s) = (7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
 velocity using mean channel flow = 2.02(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0161
 Corrected/adjusted channel slope = 0.0161
 Travel time = 0.26 min. TC = 10.21 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.696
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.909(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 1.350(CFS) Total area = 0.520(Ac.)

++++++
 Process from Point/Station 41.000 to Point/Station 41.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 3
 Stream flow area = 0.520(Ac.)
 Runoff from this stream = 1.350(CFS)
 Time of concentration = 10.21 min.
 Rainfall intensity = 2.909(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.607	15.01	2.399
2	2.371	9.95	2.947
3	1.350	10.21	2.909

Largest stream flow has longer time of concentration

$Q_p = 8.607 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $2.371 * 0.814 = 1.931$
 $Q_b \quad I_a/I_b$
 $1.350 * 0.825 = 1.113$
 $Q_p = 11.651$

Total of 3 streams to confluence:
 Flow rates before confluence point:
 8.607 2.371 1.350
 Area of streams before confluence:
 5.390 0.900 0.520
 Results of confluence:
 Total flow rate = 11.651(CFS)
 Time of concentration = 15.009 min.
 Effective stream area after confluence = 6.810(Ac.)

++++++
 Process from Point/Station 41.000 to Point/Station 33.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1552.000(Ft.)
 Downstream point/station elevation = 1547.000(Ft.)
 Pipe length = 71.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 11.651(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 11.651(CFS)
 Normal flow depth in pipe = 9.07(In.)
 Flow top width inside pipe = 14.67(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 15.02(Ft/s)
 Travel time through pipe = 0.08 min.
 Time of concentration (TC) = 15.09 min.

++++++
 Process from Point/Station 33.000 to Point/Station 33.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 6.810(Ac.)
 Runoff from this stream = 11.651(CFS)
 Time of concentration = 15.09 min.
 Rainfall intensity = 2.393(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	731.032	21.65	1.998
2	11.651	15.09	2.393

Largest stream flow has longer time of concentration

$Q_p = 731.032 + \text{sum of } \frac{Q_b \cdot I_a/I_b}{11.651} = 9.726$
 $Q_p = 740.759$

Total of 2 main streams to confluence:

Flow rates before confluence point:
 731.032 11.651
 Area of streams before confluence:
 13.030 6.810

Results of confluence:

Total flow rate = 740.759(CFS)
 Time of concentration = 21.649 min.
 Effective stream area after confluence = 19.840(Ac.)
 End of computations, total study area = 19.84 (Ac.)
 The following figures may be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.486
 Area averaged RI index number = 56.7

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/21 File:pro1100.out

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

English (in-lb) Units used in input data file

Program License Serial Number 5006

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5000

Process from Point/Station 58.000 to Point/Station 59.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 933.000(Ft.)
Top (of initial area) elevation = 1575.900(Ft.)
Bottom (of initial area) elevation = 1564.500(Ft.)
Difference in elevation = 11.400(Ft.)
Slope = 0.01222 s(percent)= 1.22
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 14.508 min.
Rainfall intensity = 2.440(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.765
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 4.424(CFS)
Total initial stream area = 2.370(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 59.000 to Point/Station 60.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.500(Ft.)
Downstream point/station elevation = 1561.500(Ft.)
Pipe length = 22.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.424(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 4.424(CFS)
Normal flow depth in pipe = 5.68(In.)
Flow top width inside pipe = 8.69(In.)
Critical depth could not be calculated.
Pipe flow velocity = 15.07(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 14.53 min.

Process from Point/Station 60.000 to Point/Station 60.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 2.370(Ac.)

Runoff from this stream = 4.424(CFS)
 Time of concentration = 14.53 min.
 Rainfall intensity = 2.438(In/Hr)

 Process from Point/Station 61.000 to Point/Station 62.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 542.000(Ft.)
 Top (of initial area) elevation = 1572.100(Ft.)
 Bottom (of initial area) elevation = 1564.500(Ft.)
 Difference in elevation = 7.600(Ft.)
 Slope = 0.01402 s(percent)= 1.40
 TC = k(0.390)*[(length^3)/(elevation change)]^0.2
 Initial area time of concentration = 11.358 min.
 Rainfall intensity = 2.758(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.776
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 2.826(CFS)
 Total initial stream area = 1.320(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 62.000 to Point/Station 60.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.500(Ft.)
 Downstream point/station elevation = 1561.500(Ft.)
 Pipe length = 22.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.826(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 2.826(CFS)
 Normal flow depth in pipe = 4.30(In.)
 Flow top width inside pipe = 8.99(In.)
 Critical Depth = 8.54(In.)
 Pipe flow velocity = 13.56(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 11.39 min.

 Process from Point/Station 60.000 to Point/Station 60.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.320(Ac.)
 Runoff from this stream = 2.826(CFS)
 Time of concentration = 11.39 min.
 Rainfall intensity = 2.755(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	4.424	14.53	2.438
2	2.826	11.39	2.755

Largest stream flow has longer time of concentration
 $Q_p = 4.424 + \text{sum of } Q_b \frac{I_a}{I_b}$
 $Q_p = 2.826 * 0.885 = 2.501$
 $Q_p = 6.925$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.424 2.826
 Area of streams before confluence:
 2.370 1.320
 Results of confluence:
 Total flow rate = 6.925(CFS)
 Time of concentration = 14.533 min.
 Effective stream area after confluence = 3.690(Ac.)

 Process from Point/Station 60.000 to Point/Station 63.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1561.500(Ft.)

Downstream point/station elevation = 1561.000(Ft.)
Pipe length = 33.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.925(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 6.925(CFS)
Normal flow depth in pipe = 10.83(In.)
Flow top width inside pipe = 13.44(In.)
Critical Depth = 12.67(In.)
Pipe flow velocity = 7.30(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 14.61 min.

Process from Point/Station 63.000 to Point/Station 63.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 3.690(Ac.)
Runoff from this stream = 6.925(CFS)
Time of concentration = 14.61 min.
Rainfall intensity = 2.432(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 64.000 to Point/Station 65.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 888.000(Ft.)
Top (of initial area) elevation = 1575.100(Ft.)
Bottom (of initial area) elevation = 1564.500(Ft.)
Difference in elevation = 10.600(Ft.)
Slope = 0.01194 s(percent)= 1.19
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 14.291 min.
Rainfall intensity = 2.459(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.766
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.052(CFS)
Total initial stream area = 1.090(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 65.000 to Point/Station 66.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.500(Ft.)
Downstream point/station elevation = 1561.500(Ft.)
Pipe length = 25.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.052(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.052(CFS)
Normal flow depth in pipe = 3.72(In.)
Flow top width inside pipe = 8.86(In.)
Critical Depth = 7.78(In.)
Pipe flow velocity = 11.89(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 14.33 min.

Process from Point/Station 66.000 to Point/Station 66.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.090(Ac.)
Runoff from this stream = 2.052(CFS)
Time of concentration = 14.33 min.
Rainfall intensity = 2.456(In/Hr)

Process from Point/Station 67.000 to Point/Station 68.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 776.000(Ft.)
Top (of initial area) elevation = 1574.100(Ft.)
Bottom (of initial area) elevation = 1564.500(Ft.)

Difference in elevation = 9.600(Ft.)
 Slope = 0.01237 s(percent)= 1.24
 TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 13.444 min.
 Rainfall intensity = 2.535(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.768
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 6.156(CFS)
 Total initial stream area = 3.160(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 68.000 to Point/Station 66.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1564.500(Ft.)
 Downstream point/station elevation = 1561.500(Ft.)
 Pipe length = 16.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.156(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 6.156(CFS)
 Normal flow depth in pipe = 6.43(In.)
 Flow top width inside pipe = 8.13(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 18.23(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 13.46 min.

 Process from Point/Station 66.000 to Point/Station 66.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 3.160(Ac.)
 Runoff from this stream = 6.156(CFS)
 Time of concentration = 13.46 min.
 Rainfall intensity = 2.534(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	2.052	14.33	2.456
2	6.156	13.46	2.534

Largest stream flow has longer or shorter time of concentration

$Q_p = 6.156 + \text{sum of}$
 $Q_a \quad T_b/T_a$
 $2.052 * 0.939 = 1.928$
 $Q_p = 8.083$

Total of 2 streams to confluence:

Flow rates before confluence point:

2.052	6.156
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Area of streams before confluence:

1.090	3.160
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Results of confluence:

Total flow rate = 8.083(CFS)
 Time of concentration = 13.459 min.
 Effective stream area after confluence = 4.250(Ac.)

 Process from Point/Station 66.000 to Point/Station 63.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1561.500(Ft.)
 Downstream point/station elevation = 1561.000(Ft.)
 Pipe length = 25.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.083(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 8.083(CFS)
 Normal flow depth in pipe = 10.97(In.)
 Flow top width inside pipe = 13.30(In.)
 Critical Depth = 13.42(In.)
 Pipe flow velocity = 8.41(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 13.51 min.

 Process from Point/Station 63.000 to Point/Station 63.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 4.250(Ac.)
 Runoff from this stream = 8.083(CFS)
 Time of concentration = 13.51 min.
 Rainfall intensity = 2.529(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	6.925	14.61	2.432
2	8.083	13.51	2.529

Largest stream flow has longer or shorter time of concentration

Qp = 8.083 + sum of

$$Q_p = \frac{Q_a}{6.925} * \frac{T_b}{T_a} = \frac{8.083}{6.925} * \frac{13.51}{14.61} = 6.403$$

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 6.925 8.083
 Area of streams before confluence:
 3.690 4.250

Results of confluence:
 Total flow rate = 14.487(CFS)
 Time of concentration = 13.508 min.
 Effective stream area after confluence = 7.940(Ac.)

 Process from Point/Station 63.000 to Point/Station 69.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1561.000(Ft.)
 Downstream point/station elevation = 1560.500(Ft.)
 Pipe length = 91.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 14.487(CFS)
 Nearest computed pipe diameter = 24.00(In.)
 Calculated individual pipe flow = 14.487(CFS)
 Normal flow depth in pipe = 17.20(In.)
 Flow top width inside pipe = 21.63(In.)
 Critical depth = 16.44(In.)
 Pipe flow velocity = 6.01(Ft/s)
 Travel time through pipe = 0.25 min.
 Time of concentration (TC) = 13.76 min.

 Process from Point/Station 69.000 to Point/Station 57.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1560.500(Ft.)
 End of natural channel elevation = 1560.000(Ft.)
 Length of natural channel = 113.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 14.970(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:

$$\text{Velocity (ft/s)} = (7 + 8(q(\text{English Units})^{0.352})^{0.5}) \cdot (\text{slope})^{0.5}$$

 velocity using mean channel flow = 1.85(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0044
 Corrected/adjusted channel slope = 0.0044
 Travel time = 1.02 min. TC = 14.78 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.665
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.418(In/Hr) for a 100.0 year storm

Subarea runoff = 0.853(CFS) for 0.530(Ac.)
Total runoff = 15.339(CFS) Total area = 8.470(Ac.)

Process from Point/Station 57.000 to Point/Station 57.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 8.470(Ac.)
Runoff from this stream = 15.339(CFS)
Time of concentration = 14.78 min.
Rainfall intensity = 2.418(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 6.000 to Point/Station 54.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 873.000(Ft.)
Top (of initial area) elevation = 1581.300(Ft.)
Bottom (of initial area) elevation = 1573.000(Ft.)
Difference in elevation = 8.300(Ft.)
Slope = 0.00951 s(percent) = 0.95
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 11.427 min.
Rainfall intensity = 2.750(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.875
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.056(CFS)
Total initial stream area = 1.270(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 54.000 to Point/Station 55.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1573.000(Ft.)
End of street segment elevation = 1561.600(Ft.)
Length of street segment = 542.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
width of half street (curb to crown) = 32.000(Ft.)
Distance from crown to crossfall grade break = 30.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 18.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 4.525(CFS)
Depth of flow = 0.345(Ft.), Average velocity = 3.436(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 10.911(Ft.)
Flow velocity = 3.44(Ft/s)
Travel time = 2.63 min. TC = 14.06 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.873
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 2.479(In/Hr) for a 100.0 year storm
Subarea runoff = 2.858(CFS) for 1.320(Ac.)
Total runoff = 5.914(CFS) Total area = 2.590(Ac.)
Street flow at end of street = 5.914(CFS)
Half street flow at end of street = 5.914(CFS)
Depth of flow = 0.371(Ft.), Average velocity = 3.658(Ft/s)
Flow width (from curb towards crown) = 12.208(Ft.)

Process from Point/Station 55.000 to Point/Station 56.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1561.600(Ft.)
 Downstream point/station elevation = 1560.500(Ft.)
 Pipe length = 159.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.914(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 5.914(CFS)
 Normal flow depth in pipe = 10.85(In.)
 Flow top width inside pipe = 17.61(In.)
 Critical depth = 11.26(In.)
 Pipe flow velocity = 5.31(Ft/s)
 Travel time through pipe = 0.50 min.
 Time of concentration (TC) = 14.55 min.

Process from Point/Station 56.000 to Point/Station 57.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1560.500(Ft.)
 End of natural channel elevation = 1560.000(Ft.)
 Length of natural channel = 90.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 5.914(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 Velocity(Ft/s) = $(7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
 velocity using mean channel flow = 1.64(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0056
 Corrected/adjusted channel slope = 0.0056
 Travel time = 0.92 min. TC = 15.47 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.661
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.363(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 5.914(CFS) Total area = 2.590(Ac.)

Process from Point/Station 57.000 to Point/Station 53.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1560.000(Ft.)
 Downstream point/station elevation = 1554.000(Ft.)
 Pipe length = 104.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.914(CFS)
 Nearest computed pipe diameter = 12.00(In.)
 Calculated individual pipe flow = 5.914(CFS)
 Normal flow depth in pipe = 7.34(In.)
 Flow top width inside pipe = 11.70(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 11.76(Ft/s)
 Travel time through pipe = 0.15 min.
 Time of concentration (TC) = 15.62 min.

Process from Point/Station 57.000 to Point/Station 57.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 2.590(Ac.)
 Runoff from this stream = 5.914(CFS)
 Time of concentration = 15.62 min.
 Rainfall intensity = 2.352(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	15.339	14.78	2.418

2 5.914 15.62 2.352
 Largest stream flow has longer or shorter time of concentration
 Qp = 15.339 + sum of
 Qa Tb/Ta
 5.914 * 0.946 = 5.597
 Qp = 20.936

 Total of 2 main streams to confluence:
 Flow rates before confluence point:
 15.339 5.914
 Area of streams before confluence:
 8.470 2.590

Results of confluence:
 Total flow rate = 20.936(CFS)
 Time of concentration = 14.781 min.
 Effective stream area after confluence = 11.060(Ac.)

++++++
 Process from Point/Station 57.000 to Point/Station 53.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1560.000(Ft.)
 Downstream point/station elevation = 1554.000(Ft.)
 Pipe length = 104.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 20.936(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 20.936(CFS)
 Normal flow depth in pipe = 12.52(In.)
 Flow top width inside pipe = 16.57(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 15.96(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 14.89 min.

++++++
 Process from Point/Station 53.000 to Point/Station 53.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 11.060(Ac.)
 Runoff from this stream = 20.936(CFS)
 Time of concentration = 14.89 min.
 Rainfall intensity = 2.409(In/Hr)
 Program is now starting with Main Stream No. 2

++++++
 Process from Point/Station 51.000 to Point/Station 52.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 664.000(Ft.)
 Top (of initial area) elevation = 14574.500(Ft.)
 Bottom (of initial area) elevation = 1560.000(Ft.)
 Difference in elevation = 13014.500(Ft.)
 Slope = 19.60015 s(percent) = 1960.02
 TC = k(0.300)*[(length^3)/(elevation change)]^0.2
 Warning: TC computed to be less than 5 min.; program is assuming the
 time of concentration is 5 minutes.
 Initial area time of concentration = 5.000 min.
 Rainfall intensity = 4.157(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.882
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 8.725(CFS)
 Total initial stream area = 2.380(Ac.)
 Pervious area fraction = 0.100

++++++
 Process from Point/Station 52.000 to Point/Station 53.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1560.000(Ft.)
 Downstream point/station elevation = 1554.000(Ft.)
 Pipe length = 250.00(Ft.) Manning's N = 0.015
 No. of pipes = 1 Required pipe flow = 8.725(CFS)
 Nearest computed pipe diameter = 18.00(In.)

Calculated individual pipe flow = 8.725(CFS)
 Normal flow depth in pipe = 10.24(In.)
 Flow top width inside pipe = 17.83(In.)
 Critical Depth = 13.71(In.)
 Pipe flow velocity = 8.40(Ft/s)
 Travel time through pipe = 0.50 min.
 Time of concentration (TC) = 5.50 min.

 Process from Point/Station 53.000 to Point/Station 53.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 2.380(Ac.)
 Runoff from this stream = 8.725(CFS)
 Time of concentration = 5.50 min.
 Rainfall intensity = 3.965(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	20.936	14.89	2.409
2	8.725	5.50	3.965

Largest stream flow has longer time of concentration

Qp = 20.936 + sum of
 $Q_b \frac{I_a/I_b}{8.725 * 0.608} = 5.301$
 Qp = 26.237

Total of 2 main streams to confluence:

Flow rates before confluence point:
 20.936 8.725
 Area of streams before confluence:
 11.060 2.380

Results of confluence:

Total flow rate = 26.237(CFS)
 Time of concentration = 14.890 min.
 Effective stream area after confluence = 13.440(Ac.)

 Process from Point/Station 53.000 to Point/Station 70.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1554.000(Ft.)
 Downstream point/station elevation = 1546.000(Ft.)
 Pipe length = 416.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 26.237(CFS)
 Nearest computed pipe diameter = 24.00(In.)
 Calculated individual pipe flow = 26.237(CFS)
 Normal flow depth in pipe = 16.78(In.)
 Flow top width inside pipe = 22.01(In.)
 Critical Depth = 21.51(In.)
 Pipe flow velocity = 11.18(Ft/s)
 Travel time through pipe = 0.62 min.
 Time of concentration (TC) = 15.51 min.

 Process from Point/Station 70.000 to Point/Station 70.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 13.440(Ac.)
 Runoff from this stream = 26.237(CFS)
 Time of concentration = 15.51 min.
 Rainfall intensity = 2.360(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 71.000 to Point/Station 72.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 424.000(Ft.)
 Top (of initial area) elevation = 1562.000(Ft.)
 Bottom (of initial area) elevation = 1553.800(Ft.)
 Difference in elevation = 8.200(Ft.)
 Slope = 0.01934 s(percent) = 1.93
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 9.654 min.
Rainfall intensity = 2.992(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.783
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.484(CFS)
Total initial stream area = 1.060(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 72.000 to Point/Station 73.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.800(Ft.)
Downstream point/station elevation = 1550.000(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.484(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.484(CFS)
Normal flow depth in pipe = 3.64(In.)
Flow top width inside pipe = 8.84(In.)
Critical Depth = 8.30(In.)
Pipe flow velocity = 14.81(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 9.68 min.

Process from Point/Station 73.000 to Point/Station 73.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.060(Ac.)
Runoff from this stream = 2.484(CFS)
Time of concentration = 9.68 min.
Rainfall intensity = 2.988(In/Hr)

Process from Point/Station 74.000 to Point/Station 75.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 318.000(Ft.)
Top (of initial area) elevation = 1562.000(Ft.)
Bottom (of initial area) elevation = 1553.800(Ft.)
Difference in elevation = 8.200(Ft.)
Slope = 0.02579 s(percent)= 2.58
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 8.124 min.
Rainfall intensity = 3.261(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.791
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 4.125(CFS)
Total initial stream area = 1.600(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 75.000 to Point/Station 73.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.800(Ft.)
Downstream point/station elevation = 1550.000(Ft.)
Pipe length = 29.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.125(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 4.125(CFS)
Normal flow depth in pipe = 5.49(In.)
Flow top width inside pipe = 8.78(In.)
Critical depth could not be calculated.
Pipe flow velocity = 14.62(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 8.16 min.

 Process from Point/Station 73.000 to Point/Station 73.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.600(Ac.)
 Runoff from this stream = 4.125(CFS)
 Time of concentration = 8.16 min.
 Rainfall intensity = 3.255(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
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1	2.484	9.68	2.988
2	4.125	8.16	3.255

Largest stream flow has longer or shorter time of concentration

Qp = 4.125 + sum of
 Qa Tb/Ta
 2.484 * 0.843 = 2.094
 Qp = 6.219

Total of 2 streams to confluence:
 Flow rates before confluence point:
 2.484 4.125

Area of streams before confluence:
 1.060 1.600

Results of confluence:
 Total flow rate = 6.219(CFS)
 Time of concentration = 8.157 min.
 Effective stream area after confluence = 2.660(Ac.)

 Process from Point/Station 73.000 to Point/Station 76.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1550.000(Ft.)
 Downstream point/station elevation = 1549.000(Ft.)
 Pipe length = 152.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.219(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 6.219(CFS)
 Normal flow depth in pipe = 11.41(In.)
 Flow top width inside pipe = 17.34(In.)
 Critical Depth = 11.57(In.)
 Pipe flow velocity = 5.26(Ft/s)
 Travel time through pipe = 0.48 min.
 Time of concentration (TC) = 8.64 min.

 Process from Point/Station 76.000 to Point/Station 76.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 2.660(Ac.)
 Runoff from this stream = 6.219(CFS)
 Time of concentration = 8.64 min.
 Rainfall intensity = 3.163(In/Hr)

 Process from Point/Station 52.000 to Point/Station 76.500
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 347.000(Ft.)
 Top (of initial area) elevation = 1560.000(Ft.)
 Bottom (of initial area) elevation = 1555.500(Ft.)
 Difference in elevation = 4.500(Ft.)
 Slope = 0.01297 s(percent) = 1.30
 $TC = k(0.390) * [(length^3)/(elevation change)]^{0.2}$
 Initial area time of concentration = 9.652 min.
 Rainfall intensity = 2.992(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.783
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.937(CFS)
 Total initial stream area = 0.400(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 76.500 to Point/Station 76.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1555.500(Ft.)
 Downstream point/station elevation = 1549.000(Ft.)
 Pipe length = 70.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.937(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 0.937(CFS)
 Normal flow depth in pipe = 3.17(In.)
 Flow top width inside pipe = 5.99(In.)
 Critical Depth = 5.59(In.)
 Pipe flow velocity = 8.91(Ft/s)
 Travel time through pipe = 0.13 min.
 Time of concentration (TC) = 9.78 min.

 Process from Point/Station 76.000 to Point/Station 76.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 0.400(Ac.)
 Runoff from this stream = 0.937(CFS)
 Time of concentration = 9.78 min.
 Rainfall intensity = 2.972(In/Hr)
 Summary of stream data:

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

1	6.219	8.64	3.163
2	0.937	9.78	2.972

Largest stream flow has longer or shorter time of concentration

Qp = 6.219 + sum of

$$Q_a \frac{T_b}{T_a}$$
 0.937 * 0.883 = 0.828
 Qp = 7.047

Total of 2 streams to confluence:
 Flow rates before confluence point:
 6.219 0.937
 Area of streams before confluence:
 2.660 0.400
 Results of confluence:
 Total flow rate = 7.047(CFS)
 Time of concentration = 8.638 min.
 Effective stream area after confluence = 3.060(Ac.)

 Process from Point/Station 76.000 to Point/Station 77.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1549.000(Ft.)
 Downstream point/station elevation = 1548.000(Ft.)
 Pipe length = 146.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.047(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 7.047(CFS)
 Normal flow depth in pipe = 12.30(In.)
 Flow top width inside pipe = 16.74(In.)
 Critical Depth = 12.33(In.)
 Pipe flow velocity = 5.48(Ft/s)
 Travel time through pipe = 0.44 min.
 Time of concentration (TC) = 9.08 min.

 Process from Point/Station 77.000 to Point/Station 78.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1548.000(Ft.)
 End of natural channel elevation = 1547.500(Ft.)
 Length of natural channel = 77.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 7.438(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:

$$\text{velocity(ft/s)} = (7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$$
 velocity using mean channel flow = 1.87(Ft/s)

Correction to map slope used on extremely rugged channels with drops and waterfalls (Plate D-6.2)

Normal channel slope = 0.0065
Corrected/adjusted channel slope = 0.0065
Travel time = 0.69 min. TC = 9.77 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.699
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.974(In/Hr) for a 100.0 year storm
Subarea runoff = 0.707(CFS) for 0.340(Ac.)
Total runoff = 7.754(CFS) Total area = 3.400(Ac.)

Process from Point/Station 78.000 to Point/Station 78.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.400(Ac.)
Runoff from this stream = 7.754(CFS)
Time of concentration = 9.77 min.
Rainfall intensity = 2.974(In/Hr)

Process from Point/Station 79.000 to Point/Station 80.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 227.000(Ft.)
Top (of initial area) elevation = 1555.200(Ft.)
Bottom (of initial area) elevation = 1552.500(Ft.)
Difference in elevation = 2.700(Ft.)
Slope = 0.01189 s(percent) = 1.19
TC = $k(0.390) * [(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 8.287 min.
Rainfall intensity = 3.229(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.790
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.040(CFS)
Total initial stream area = 0.800(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 80.000 to Point/Station 81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1552.500(Ft.)
Downstream point/station elevation = 1550.000(Ft.)
Pipe length = 22.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.040(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.040(CFS)
Normal flow depth in pipe = 3.77(In.)
Flow top width inside pipe = 8.88(In.)
Critical Depth = 7.77(In.)
Pipe flow velocity = 11.64(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 8.32 min.

Process from Point/Station 82.000 to Point/Station 81.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.790
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 8.32 min.
Rainfall intensity = 3.223(In/Hr) for a 100.0 year storm

Subarea runoff = 1.934(CFS) for 0.760(Ac.)
Total runoff = 3.974(CFS) Total area = 1.560(Ac.)

Process from Point/Station 81.000 to Point/Station 84.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1550.000(Ft.)
Downstream point/station elevation = 1548.000(Ft.)
Pipe length = 230.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.974(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 3.974(CFS)
Normal flow depth in pipe = 8.89(In.)
Flow top width inside pipe = 14.74(In.)
Critical Depth = 9.67(In.)
Pipe flow velocity = 5.24(Ft/s)
Travel time through pipe = 0.73 min.
Time of concentration (TC) = 9.05 min.

Process from Point/Station 84.000 to Point/Station 78.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1548.000(Ft.)
End of natural channel elevation = 1547.500(Ft.)
Length of natural channel = 74.000(Ft.)
Estimated mean flow rate at midpoint of channel = 3.974(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})^{.5})$
Velocity using mean channel flow = 1.64(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0068
Corrected/adjusted channel slope = 0.0068
Travel time = 0.75 min. TC = 9.80 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.699
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.969(In/Hr) for a 100.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 3.974(CFS) Total area = 1.560(Ac.)

Process from Point/Station 78.000 to Point/Station 78.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.560(Ac.)
Runoff from this stream = 3.974(CFS)
Time of concentration = 9.80 min.
Rainfall intensity = 2.969(In/Hr)

Process from Point/Station 85.000 to Point/Station 86.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 189.000(Ft.)
Top (of initial area) elevation = 1553.500(Ft.)
Bottom (of initial area) elevation = 1553.000(Ft.)
Difference in elevation = 0.500(Ft.)
Slope = 0.00265 s(percent) = 0.26
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{.2}$
Initial area time of concentration = 8.002 min.
Rainfall intensity = 3.286(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.878
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
RI index for soil(AMC 2) = 56.00

Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.491(CFS)
Total initial stream area = 0.170(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 86.000 to Point/Station 87.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.000(Ft.)
Downstream point/station elevation = 1548.000(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.491(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 0.491(CFS)
Normal flow depth in pipe = 1.95(In.)
Flow top width inside pipe = 5.62(In.)
Critical Depth = 4.28(In.)
Pipe flow velocity = 8.88(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 8.07 min.

Process from Point/Station 87.000 to Point/Station 78.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1548.000(Ft.)
End of natural channel elevation = 1547.500(Ft.)
Length of natural channel = 23.000(Ft.)
Estimated mean flow rate at midpoint of channel = 0.491(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
velocity(ft/s) = $(7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
velocity using mean channel flow = 1.95(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0217
Corrected/adjusted channel slope = 0.0217
Travel time = 0.20 min. TC = 8.26 min.

Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.712
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 3.234(In/Hr) for a 100.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 0.491(CFS) Total area = 0.170(Ac.)

Process from Point/Station 78.000 to Point/Station 78.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 3
Stream flow area = 0.170(Ac.)
Runoff from this stream = 0.491(CFS)
Time of concentration = 8.26 min.
Rainfall intensity = 3.234(In/Hr)

Process from Point/Station 76.500 to Point/Station 88.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 248.000(Ft.)
Top (of initial area) elevation = 1555.500(Ft.)
Bottom (of initial area) elevation = 1553.500(Ft.)
Difference in elevation = 2.000(Ft.)
Slope = 0.00806 s(percent) = 0.81
TC = $k(0.300)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 7.138 min.
Rainfall intensity = 3.479(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Initial subarea runoff = 0.979(CFS)
 Total initial stream area = 0.320(Ac.)
 Pervious area fraction = 0.100

 Process from Point/Station 88.000 to Point/Station 89.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1553.500(Ft.)
 Downstream point/station elevation = 1548.000(Ft.)
 Pipe length = 37.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.979(CFS)
 Nearest computed pipe diameter = 6.00(In.)
 Calculated individual pipe flow = 0.979(CFS)
 Normal flow depth in pipe = 2.83(In.)
 Flow top width inside pipe = 5.99(In.)
 Critical Depth = 5.64(In.)
 Pipe flow velocity = 10.74(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 7.20 min.

 Process from Point/Station 89.000 to Point/Station 78.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1548.000(Ft.)
 End of natural channel elevation = 1547.500(Ft.)
 Length of natural channel = 5.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 0.979(CFS)

Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 Velocity(Ft/s) = $(7 + 8(q(\text{English Units})^{0.352})(\text{slope}^{0.5}))$
 Velocity using mean channel flow = 4.72(Ft/s)

Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.1000
 Corrected/adjusted channel slope = 0.1000
 Travel time = 0.02 min. TC = 7.21 min.

Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff Coefficient = 0.722
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 3.461(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.000(CFS) for 0.000(Ac.)
 Total runoff = 0.979(CFS) Total area = 0.320(Ac.)

 Process from Point/Station 78.000 to Point/Station 78.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 4
 Stream flow area = 0.320(Ac.)
 Runoff from this stream = 0.979(CFS)
 Time of concentration = 7.21 min.
 Rainfall intensity = 3.461(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.754	9.77	2.974
2	3.974	9.80	2.969
3	0.491	8.26	3.234
4	0.979	7.21	3.461

Largest stream flow has longer or shorter time of concentration
 $Q_p = 7.754 + \text{sum of}$
 $Q_a \cdot \frac{T_b}{T_a}$
 $3.974 * 0.997 = 3.961$
 $Q_b \cdot \frac{I_a}{I_b}$
 $0.491 * 0.920 = 0.451$
 $Q_b \cdot \frac{I_a}{I_b}$

$Q_p = \frac{0.979 * 0.859}{13.008} = 0.841$

Total of 4 streams to confluence:
 Flow rates before confluence point:
 7.754 3.974 0.491 0.979
 Area of streams before confluence:
 3.400 1.560 0.170 0.320
 Results of confluence:
 Total flow rate = 13.008(CFS)
 Time of concentration = 9.768 min.
 Effective stream area after confluence = 5.450(Ac.)

+-----+
 Process from Point/Station 78.000 to Point/Station 70.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1547.500(Ft.)
 Downstream point/station elevation = 1546.000(Ft.)
 Pipe length = 79.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 13.008(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 13.008(CFS)
 Normal flow depth in pipe = 13.34(In.)
 Flow top width inside pipe = 15.77(In.)
 Critical depth = 16.21(In.)
 Pipe flow velocity = 9.27(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 9.91 min.

+-----+
 Process from Point/Station 70.000 to Point/Station 70.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 5.450(Ac.)
 Runoff from this stream = 13.008(CFS)
 Time of concentration = 9.91 min.
 Rainfall intensity = 2.953(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.237	15.51	2.360
2	13.008	9.91	2.953

Largest stream flow has longer time of concentration

$Q_p = \frac{26.237 + \sum Q_b}{13.008 * 0.799} = 10.398$
 $Q_p = 36.635$

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 26.237 13.008
 Area of streams before confluence:
 13.440 5.450

Results of confluence:
 Total flow rate = 36.635(CFS)
 Time of concentration = 15.510 min.
 Effective stream area after confluence = 18.890(Ac.)

+-----+
 Process from Point/Station 70.000 to Point/Station 50.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1546.000(Ft.)
 Downstream point/station elevation = 1545.000(Ft.)
 Pipe length = 25.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 36.635(CFS)
 Nearest computed pipe diameter = 24.00(In.)
 Calculated individual pipe flow = 36.635(CFS)
 Normal flow depth in pipe = 16.38(In.)
 Flow top width inside pipe = 22.34(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 16.04(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 15.54 min.

 Process from Point/Station 50.000 to Point/Station 50.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 18.890(Ac.)
 Runoff from this stream = 36.635(CFS)
 Time of concentration = 15.54 min.
 Rainfall intensity = 2.358(In/Hr)
 Program is now starting with Main Stream No. 2

 Process from Point/Station 33.000 to Point/Station 50.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.998(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.745
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 User specified values are as follows:
 TC = 21.65 min. Rain intensity = 2.00(In/Hr)
 Total area = 19.85(Ac.) Total runoff = 740.76(CFS)

 Process from Point/Station 50.000 to Point/Station 50.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 19.850(Ac.)
 Runoff from this stream = 740.760(CFS)
 Time of concentration = 21.65 min.
 Rainfall intensity = 1.998(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	36.635	15.54	2.358
2	740.760	21.65	1.998

Largest stream flow has longer time of concentration
 $Q_p = 740.760 + \text{sum of } \frac{Q_b \cdot I_a}{I_b}$
 $Q_p = 36.635 * 0.847 = 31.034$
 $Q_p = 771.794$

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 36.635 740.760
 Area of streams before confluence:
 18.890 19.850

Results of confluence:
 Total flow rate = 771.794(CFS)
 Time of concentration = 21.650 min.
 Effective stream area after confluence = 38.740(Ac.)
 End of computations, total study area = 38.74 (Ac.)
 The following figures may be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.455
 Area averaged RI index number = 56.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/21 File:pro2100.out

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

English (in-lb) Units used in input data file

Program License Serial Number 5006

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District 1978 hydrology manual
Storm event (year) = 100.00 Antecedent Moisture Condition = 2
Standard intensity-duration curves data (Plate D-4.1)
For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)
Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5000

Process from Point/Station 51.000 to Point/Station 100.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 462.000(Ft.)
Top (of initial area) elevation = 1574.500(Ft.)
Bottom (of initial area) elevation = 1570.800(Ft.)
Difference in elevation = 3.700(Ft.)
Slope = 0.00801 s(percent)= 0.80
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.168 min.
Rainfall intensity = 3.070(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.366(CFS)
Total initial stream area = 1.250(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 100.000 to Point/Station 101.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1570.800(Ft.)
End of natural channel elevation = 1559.000(Ft.)
Length of natural channel = 604.000(Ft.)
Estimated mean flow rate at midpoint of channel = 12.184(CFS)
Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 3.67(Ft/s)
Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0195
Corrected/adjusted channel slope = 0.0195
Travel time = 2.74 min. TC = 11.91 min.
Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.875
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 2.694(In/Hr) for a 100.0 year storm
Subarea runoff = 15.435(CFS) for 6.550(Ac.)
Total runoff = 18.800(CFS) Total area = 7.800(Ac.)

Process from Point/Station 101.000 to Point/Station 101.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.684
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
RI index for soil(AMC 2) = 61.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 11.91 min.
Rainfall intensity = 2.694(In/Hr) for a 100.0 year storm
Subarea runoff = 0.829(CFS) for 0.450(Ac.)
Total runoff = 19.629(CFS) Total area = 8.250(Ac.)

Process from Point/Station 101.000 to Point/Station 102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1559.000(Ft.)
Downstream point/station elevation = 1549.500(Ft.)
Pipe length = 695.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.629(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 19.629(CFS)
Normal flow depth in pipe = 15.40(In.)
Flow top width inside pipe = 23.02(In.)
Critical Depth = 19.11(In.)
Pipe flow velocity = 9.22(Ft/s)
Travel time through pipe = 1.26 min.
Time of concentration (TC) = 13.16 min.

Process from Point/Station 102.000 to Point/Station 102.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 8.250(Ac.)
Runoff from this stream = 19.629(CFS)
Time of concentration = 13.16 min.
Rainfall intensity = 2.562(In/Hr)
Program is now starting with Main Stream No. 2

Process from Point/Station 103.000 to Point/Station 104.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 551.000(Ft.)
Top (of initial area) elevation = 1558.000(Ft.)
Bottom (of initial area) elevation = 1552.000(Ft.)
Difference in elevation = 6.000(Ft.)
Slope = 0.01089 s(percent)= 1.09
TC = $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 12.026 min.
Rainfall intensity = 2.680(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.774
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
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 4.872(CFS)
Total initial stream area = 2.350(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 104.000 to Point/Station 105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1552.000(Ft.)
Downstream point/station elevation = 1550.500(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.872(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 4.872(CFS)
Normal flow depth in pipe = 7.05(In.)
Flow top width inside pipe = 11.81(In.)
Critical Depth = 10.92(In.)

Pipe flow velocity = 10.15(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 12.08 min.

 Process from Point/Station 105.000 to Point/Station 105.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
 Stream flow area = 2.350(Ac.)
 Runoff from this stream = 4.872(CFS)
 Time of concentration = 12.08 min.
 Rainfall intensity = 2.674(In/Hr)

 Process from Point/Station 106.000 to Point/Station 107.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 506.000(Ft.)
 Top (of initial area) elevation = 1557.000(Ft.)
 Bottom (of initial area) elevation = 1552.000(Ft.)
 Difference in elevation = 5.000(Ft.)
 Slope = 0.00988 s(percent)= 0.99
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 11.851 min.
 Rainfall intensity = 2.700(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.774
 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
 RI index for soil(AMC 2) = 56.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 3.261(CFS)
 Total initial stream area = 1.560(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 107.000 to Point/Station 105.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1552.000(Ft.)
 Downstream point/station elevation = 1550.500(Ft.)
 Pipe length = 9.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.261(CFS)
 Nearest computed pipe diameter = 9.00(In.)
 Calculated individual pipe flow = 3.261(CFS)
 Normal flow depth in pipe = 4.41(In.)
 Flow top width inside pipe = 9.00(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 15.15(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 11.86 min.

 Process from Point/Station 105.000 to Point/Station 105.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
 Stream flow area = 1.560(Ac.)
 Runoff from this stream = 3.261(CFS)
 Time of concentration = 11.86 min.
 Rainfall intensity = 2.699(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.872	12.08	2.674
2	3.261	11.86	2.699

Largest stream flow has longer time of concentration
 $Q_p = 4.872 + \text{sum of } Q_b \cdot \frac{I_a}{I_b}$
 $Q_p = 3.261 * 0.991 = 3.231$
 $Q_p = 8.104$
 Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.872 3.261
 Area of streams before confluence:
 2.350 1.560
 Results of confluence:
 Total flow rate = 8.104(CFS)
 Time of concentration = 12.082 min.
 Effective stream area after confluence = 3.910(Ac.)

 Process from Point/Station 105.000 to Point/Station 108.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1550.500(Ft.)
 Downstream point/station elevation = 1550.000(Ft.)
 Pipe length = 20.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.104(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 8.104(CFS)
 Normal flow depth in pipe = 10.09(In.)
 Flow top width inside pipe = 14.08(In.)
 Critical Depth = 13.44(In.)
 Pipe flow velocity = 9.23(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 12.12 min.

 Process from Point/Station 108.000 to Point/Station 102.000
 **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1550.000(Ft.)
 End of natural channel elevation = 1549.500(Ft.)
 Length of natural channel = 80.000(Ft.)
 Estimated mean flow rate at midpoint of channel = 8.218(CFS)
 Natural valley channel type used
 L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = $(7 + 8(q(\text{English Units})^{.352})^{.5}) \text{ (slope}^{.5})$
 Velocity using mean channel flow = 1.88(Ft/s)
 Correction to map slope used on extremely rugged channels with
 drops and waterfalls (Plate D-6.2)
 Normal channel slope = 0.0063
 Corrected/adjusted channel slope = 0.0063
 Travel time = 0.71 min. TC = 12.83 min.
 Adding area flow to channel
 UNDEVELOPED (good cover) subarea
 Runoff coefficient = 0.677
 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
 RI index for soil(AMC 2) = 61.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 2.595(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.193(CFS) for 0.110(Ac.)
 Total runoff = 8.297(CFS) Total area = 4.020(Ac.)

 Process from Point/Station 102.000 to Point/Station 102.000
 **** CONFLUENCE OF MAIN STREAMS ****

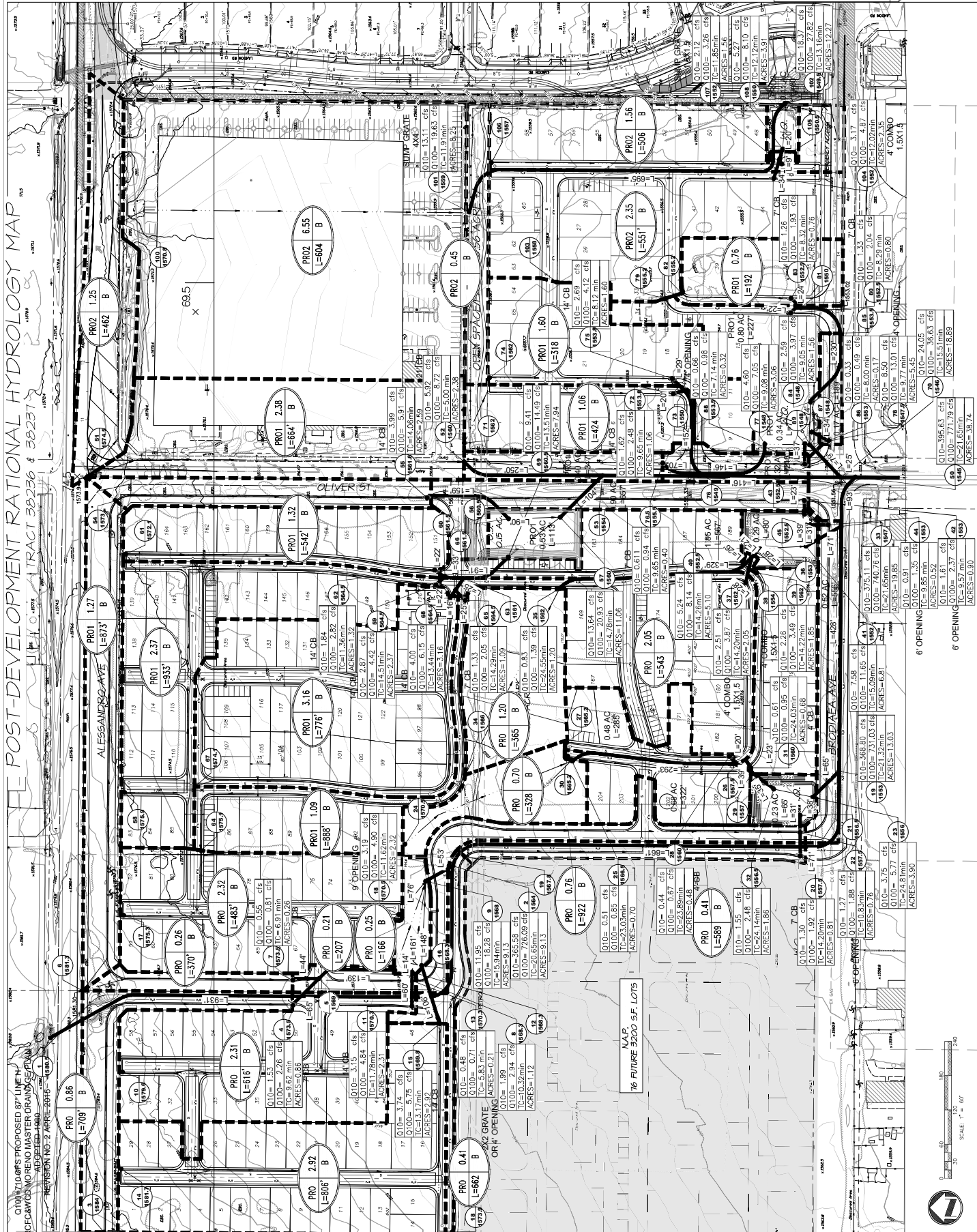
The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 4.020(Ac.)
 Runoff from this stream = 8.297(CFS)
 Time of concentration = 12.83 min.
 Rainfall intensity = 2.595(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	19.629	13.16	2.562
2	8.297	12.83	2.595

 Largest stream flow has longer time of concentration
 $Q_p = 19.629 + \text{sum of } \frac{Q_b \cdot I_a/I_b}{0.987} = 8.190$
 $Q_p = 27.819$
 Total of 2 main streams to confluence:
 Flow rates before confluence point:
 19.629 8.297
 Area of streams before confluence:
 8.250 4.020
 Results of confluence:
 Total flow rate = 27.819(CFS)
 Time of concentration = 13.164 min.
 Effective stream area after confluence = 12.270(Ac.)
 End of computations, total study area = 12.27 (Ac.)
 The following figures maybe used for a unit hydrograph study of the same area.
 Area averaged pervious area fraction(Ap) = 0.269
 Area averaged RI index number = 56.2

POST-DEVELOPMENT RATIONAL HYDROLOGY MAP

Q100=7.0 cfs PROPOSED 87" LINE
 RCF CANYON NO RENO MASTER DRAINAGE
 ADOPTED 1990
 REVISION NO. 2 APRIL 2016



1/8" FUTURE 2000 S.F. LOTS

LEGEND

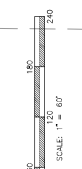
- AREA ACRES
- LENGTH
- PROJECT NO.
- MANHOLE
- CATCH BASIN
- STORMWATER
- DOWNSIDE AREA BOUNDARY
- FLOWPATH

VICINITY MAP

0100=7.0 cfs
 RCF CANYON NO RENO MASTER DRAINAGE
 ADOPTED 1990
 REVISION NO. 2 APRIL 2016

POST-DEVELOPMENT RATIONAL HYDROLOGY MAP
 TRACT 38236 & 38237
 PREPARED BY: [Firm Name]
 DATE: 2017

ADKINS ENGINEERS
 1000 N. 10th St., Suite 100
 Phoenix, AZ 85006
 Phone: (602) 955-1111
 Fax: (602) 955-1112



Section 2

Catch Basin and Street Capacity

Node 4 Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 4
Type	Curb Inlet On Grade
Solve For	Efficiency

Input Data	
Discharge	2.26 cfs
Slope	0.018000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	7.00 ft
Local Depression	8.0 in
Local Depression Width	2.00 ft

Results	
Efficiency	1.00
Intercepted Flow	2.26 cfs
Bypass Flow	0.00 cfs
Spread	6.71 ft
Depth	0.25 ft
Flow Area	0.6 ft ²
Gutter Depression	1.4 in
Total Depression	9.4 in
Velocity	3.96 ft/s
Equivalent Cross Slope	0.321394 ft/ft
Length Factor	1.03
Total Interception Length	6.77 ft

Node 13

Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 13
Type	Grate Inlet On Grade
Solve For	Efficiency
Input Data	
Discharge	0.71 cfs
Slope	0.018000 ft/ft
Gutter Width	2.50 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Grate Width	2.00 ft
Grate Length	2.00 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	50.0 %
Options	
Grate Flow Option	Exclude None
Results	
Efficiency	1.00
Intercepted Flow	0.71 cfs
Bypass Flow	0.00 cfs
Spread	2.21 ft
Depth	0.18 ft
Flow Area	0.2 ft ²
Gutter Depression	1.8 in
Total Depression	1.8 in
Velocity	3.62 ft/s
Splash Over Velocity	5.66 ft/s
Frontal Flow Factor	1.00
Side Flow Factor	0.01
Grate Flow Ratio	1.00
Active Grate Length	1.00 ft

Node 15

Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 15
Type	Curb Inlet On Grade
Solve For	Efficiency

Input Data	
Discharge	5.75 cfs
Slope	0.010000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	14.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results	
Efficiency	1.00
Intercepted Flow	5.75 cfs
Bypass Flow	0.00 cfs
Spread	12.03 ft
Depth	0.36 ft
Flow Area	1.6 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	3.67 ft/s
Equivalent Cross Slope	0.170573 ft/ft
Length Factor	1.14
Total Interception Length	12.29 ft

Node 20 Worksheet for Curb Inlet on Grade

Project Description

Worksheet	NODE 20
Type	Curb Inlet On Grade
Solve For	Efficiency

Input Data

Discharge	1.92 cfs
Slope	0.010000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	7.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results

Efficiency	1.00
Intercepted Flow	1.92 cfs
Bypass Flow	0.00 cfs
Spread	7.20 ft
Depth	0.26 ft
Flow Area	0.6 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	3.01 ft/s
Equivalent Cross Slope	0.247329 ft/ft
Length Factor	1.13
Total Interception Length	6.21 ft

Node 28 Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 28
Type	Curb Inlet On Grade
Solve For	Efficiency

Input Data	
Discharge	0.67 cfs
Slope	0.010000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	4.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results	
Efficiency	1.00
Intercepted Flow	0.67 cfs
Bypass Flow	0.00 cfs
Spread	3.58 ft
Depth	0.19 ft
Flow Area	0.2 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	2.70 ft/s
Equivalent Cross Slope	0.320054 ft/ft
Length Factor	1.17
Total Interception Length	3.42 ft

Node 31

Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 31
Type	Curb Inlet On Grade
Solve For	Efficiency

Input Data	
Discharge	0.95 cfs
Slope	0.010000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	4.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results	
Efficiency	1.00
Intercepted Flow	0.95 cfs
Bypass Flow	0.00 cfs
Spread	4.72 ft
Depth	0.21 ft
Flow Area	0.3 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	2.77 ft/s
Equivalent Cross Slope	0.300311 ft/ft
Length Factor	0.97
Total Interception Length	4.11 ft

Node 37

Worksheet for Combination Inlet in Sag

Project Description	
Worksheet	NODE 37
Type	Combination Inlet In Sag
Solve For	Spread
Input Data	
Discharge	3.87 cfs
Local Depression	6.0 in
Local Depression Width	2.00 ft
Gutter Width	4.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Curb Opening Length	4.00 ft
Opening Height	0.67 ft
Curb Throat Type	Horizontal
Grate Width	1.50 ft
Grate Length	1.50 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	50.0 %
Options	
Calculation Option	Use Both
Results	
Spread	1.73 ft
Throat Incline Angle	90.00 degrees
Depth	0.07 ft
Gutter Depression	2.9 in
Total Depression	8.9 in
Open Grate Area	1.0 ft ²
Active Grate Weir Length	3.00 ft

Node 39

Worksheet for Combination Inlet in Sag

Project Description	
Worksheet	NODE 39
Type	Combination Inlet In Sag
Solve For	Spread
Input Data	
Discharge	3.49 cfs
Local Depression	6.0 in
Local Depression Width	2.00 ft
Gutter Width	4.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Curb Opening Length	4.00 ft
Opening Height	0.67 ft
Curb Throat Type	Horizontal
Grate Width	1.50 ft
Grate Length	1.50 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	50.0 %
Options	
Calculation Option	Use Both
Results	
Spread	1.61 ft
Throat Incline Angle	90.00 degrees
Depth	0.03 ft
Gutter Depression	2.9 in
Total Depression	8.9 in
Open Grate Area	1.0 ft ²
Active Grate Weir Length	3.00 ft

Node 42 Worksheet for Curb Cutout

Project Description	
Worksheet	NODE 42
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.013
Slope	0.001000 ft/ft
Bottom Width	6.00 ft
Discharge	2.37 cfs

Results	
Depth	0.27 ft
Flow Area	1.6 ft ²
Wetted Perimeter	6.55 ft
Top Width	6.00 ft
Critical Depth	0.17 ft
Critical Slope	0.004790 ft/ft
Velocity	1.44 ft/s
Velocity Head	0.03 ft
Specific Energy	0.31 ft
Froude Number	0.48
Flow Type	Subcritical

Node 55

Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 55
Type	Curb Inlet On Grade
Solve For	Efficiency
Input Data	
Discharge	5.91 cfs
Slope	0.016000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	14.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft
Results	
Efficiency	1.00
Intercepted Flow	5.91 cfs
Bypass Flow	0.00 cfs
Spread	10.99 ft
Depth	0.34 ft
Flow Area	1.3 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	4.45 ft/s
Equivalent Cross Slope	0.183401 ft/ft
Length Factor	1.02
Total Interception Length	13.71 ft

Node 59

Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 59
Type	Curb Inlet On Grade
Solve For	Efficiency
Input Data	
Discharge	4.42 cfs
Slope	0.016000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	14.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft
Results	
Efficiency	1.00
Intercepted Flow	4.42 cfs
Bypass Flow	0.00 cfs
Spread	9.65 ft
Depth	0.31 ft
Flow Area	1.1 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	4.21 ft/s
Equivalent Cross Slope	0.202811 ft/ft
Length Factor	1.23
Total Interception Length	11.42 ft

Node 62

Worksheet for Curb Inlet on Grade

Project Description

Worksheet	NODE 62
Type	Curb Inlet On Grade
Solve For	Efficiency

Input Data

Discharge	2.82 cfs
Slope	0.016000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	14.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results

Efficiency	1.00
Intercepted Flow	2.82 cfs
Bypass Flow	0.00 cfs
Spread	7.77 ft
Depth	0.28 ft
Flow Area	0.7 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	3.89 ft/s
Equivalent Cross Slope	0.235791 ft/ft
Length Factor	1.62
Total Interception Length	8.64 ft

Node 65

Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 65
Type	Curb Inlet On Grade
Solve For	Efficiency

Input Data	
Discharge	2.05 cfs
Slope	0.013000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	7.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results	
Efficiency	1.00
Intercepted Flow	2.05 cfs
Bypass Flow	0.00 cfs
Spread	6.95 ft
Depth	0.26 ft
Flow Area	0.6 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	3.40 ft/s
Equivalent Cross Slope	0.252447 ft/ft
Length Factor	1.03
Total Interception Length	6.82 ft

Node 75

Worksheet for Curb Inlet in Sag

Project Description	
Worksheet	NODE 75
Type	Curb Inlet In Sag
Solve For	Spread

Input Data	
Discharge	4.12 cfs
Gutter Width	4.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Curb Opening Length	14.00 ft
Opening Height	0.67 ft
Curb Throat Type	Horizontal
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results	
Spread	9.63 ft
Throat Incline Angle	90.00 degrees
Depth	0.43 ft
Gutter Depression	2.9 in
Total Depression	8.9 in

Node 76.5

Worksheet for Curb Inlet on Grade

Project Description	
Worksheet	NODE 76.5
Type	Curb Inlet On Grade
Solve For	Efficiency

Input Data	
Discharge	0.94 cfs
Slope	0.016000 ft/ft
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Mannings Coefficient	0.013
Curb Opening Length	7.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results	
Efficiency	1.00
Intercepted Flow	0.94 cfs
Bypass Flow	0.00 cfs
Spread	3.92 ft
Depth	0.20 ft
Flow Area	0.3 ft ²
Gutter Depression	1.4 in
Total Depression	7.4 in
Velocity	3.44 ft/s
Equivalent Cross Slope	0.315078 ft/ft
Length Factor	1.53
Total Interception Length	4.58 ft

Node 80

Worksheet for Curb Inlet in Sag

Project Description

Worksheet	NODE 80
Type	Curb Inlet In Sag
Solve For	Spread

Input Data

Discharge	2.04 cfs
Gutter Width	4.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Curb Opening Length	7.00 ft
Opening Height	0.67 ft
Curb Throat Type	Horizontal
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results

Spread	7.87 ft
Throat Incline Angle	90.00 degrees
Depth	0.40 ft
Gutter Depression	2.9 in
Total Depression	8.9 in

Node 83

Worksheet for Curb Inlet in Sag

Project Description	
Worksheet	NODE 83
Type	Curb Inlet In Sag
Solve For	Spread

Input Data	
Discharge	1.93 cfs
Gutter Width	4.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Curb Opening Length	7.00 ft
Opening Height	0.67 ft
Curb Throat Type	Horizontal
Local Depression	6.0 in
Local Depression Width	2.00 ft

Results	
Spread	7.59 ft
Throat Incline Angle	90.00 degrees
Depth	0.39 ft
Gutter Depression	2.9 in
Total Depression	8.9 in

Node 86 Worksheet for Curb Cutout

Project Description	
Worksheet	NODE 86
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.013
Slope	0.001000 ft/ft
Bottom Width	4.00 ft
Discharge	0.49 cfs

Results	
Depth	0.13 ft
Flow Area	0.5 ft ²
Wetted Perimeter	4.27 ft
Top Width	4.00 ft
Critical Depth	0.08 ft
Critical Slope	0.006075 ft/ft
Velocity	0.91 ft/s
Velocity Head	0.01 ft
Specific Energy	0.15 ft
Froude Number	0.44
Flow Type	Subcritical

Node 88

Worksheet for Curb Cutout

Project Description	
Worksheet	NODE 88
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.013
Slope	0.001000 ft/ft
Bottom Width	4.00 ft
Discharge	0.98 cfs

Results	
Depth	0.21 ft
Flow Area	0.8 ft ²
Wetted Perimeter	4.41 ft
Top Width	4.00 ft
Critical Depth	0.12 ft
Critical Slope	0.005361 ft/ft
Velocity	1.18 ft/s
Velocity Head	0.02 ft
Specific Energy	0.23 ft
Froude Number	0.46
Flow Type	Subcritical

Node 101

Worksheet for Grate Inlet In Sag

Project Description

Worksheet	NODE 101
Type	Grate Inlet In Sag
Solve For	Spread

Input Data

Discharge	19.63 cfs
Gutter Width	4.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Grate Width	4.00 ft
Grate Length	4.00 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	50.0 %

Results

Spread	6.73 ft
Depth	0.37 ft
Gutter Depression	2.9 in
Total Depression	8.9 in
Open Grate Area	7.2 ft ²
Active Grate Weir Length	8.00 ft

Node 104

Worksheet for Combination Inlet in Sag

Project Description

Worksheet	NODE 104
Type	Combination Inlet In Sag
Solve For	Spread

Input Data

Discharge	4.87 cfs
Local Depression	6.0 in
Local Depression Width	2.00 ft
Gutter Width	4.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Curb Opening Length	4.00 ft
Opening Height	0.67 ft
Curb Throat Type	Horizontal
Grate Width	1.50 ft
Grate Length	1.50 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	50.0 %

Options

Calculation Option	Use Both
--------------------	----------

Results

Spread	3.32 ft
Throat Incline Angle	90.00 degrees
Depth	0.27 ft
Gutter Depression	2.9 in
Total Depression	8.9 in
Open Grate Area	1.0 ft ²
Active Grate Weir Length	3.00 ft

Node 107

Worksheet for Grate inlet in Sag

Project Description

Worksheet	NODE 107
Type	Grate Inlet In Sag
Solve For	Spread

Input Data

Discharge	3.26 cfs
Gutter Width	2.00 ft
Gutter Cross Slope	0.080000 ft/ft
Road Cross Slope	0.020000 ft/ft
Grate Width	1.50 ft
Grate Length	1.50 ft
Local Depression	6.0 in
Local Depression Width	2.00 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	50.0 %

Results

Spread	1.54 ft
Depth	0.01 ft
Gutter Depression	1.4 in
Total Depression	7.4 in
Open Grate Area	1.0 ft ²
Active Grate Weir Length	3.00 ft

Private Streets Worksheet for Irregular Channel

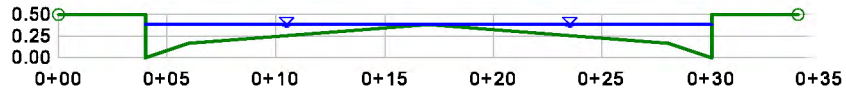
Project Description	
Worksheet	Private Streets
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.010000 ft/ft
Water Surface Elevation	0.38 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Elevation Range	0.00 to 0.50
Discharge	9.45 cfs
Flow Area	3.6 ft ²
Wetted Perimeter	26.78 ft
Top Width	26.00 ft
Actual Depth	0.38 ft
Critical Elevation	0.40 ft
Critical Slope	0.006293 ft/ft
Velocity	2.61 ft/s
Velocity Head	0.11 ft
Specific Energy	0.49 ft
Froude Number	1.23
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

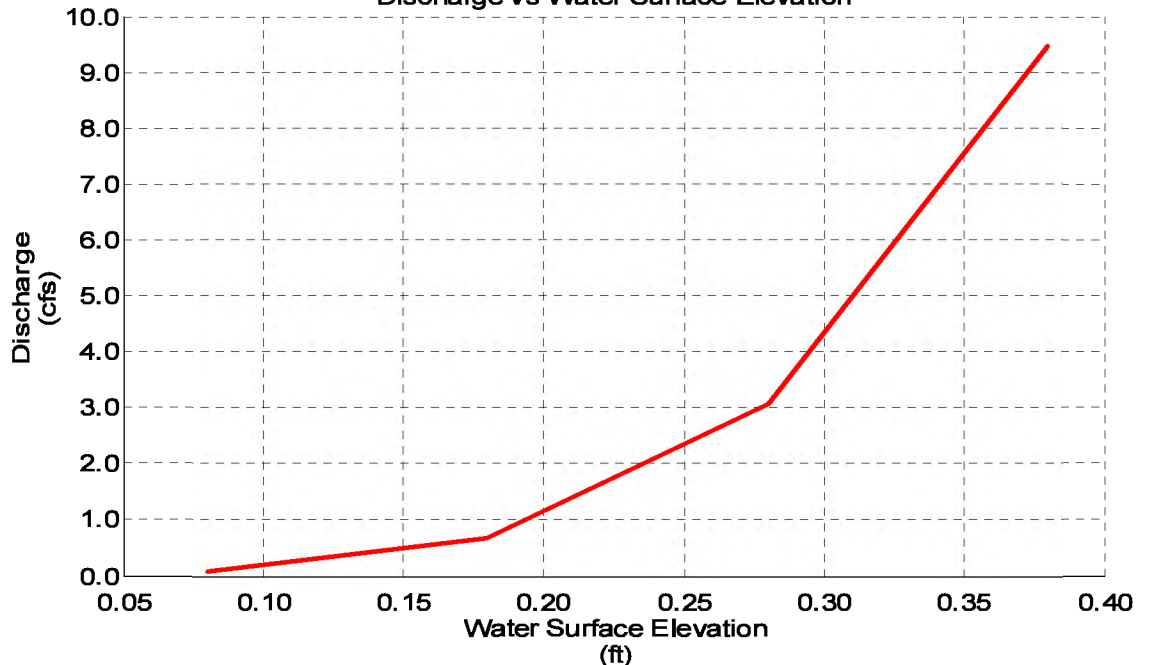


Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+34	0.015

V:4.0
H:1
NTS

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	0.50
0+04	0.50
0+04	0.00
0+06	0.16
0+17	0.38
0+28	0.16
0+30	0.00
0+30	0.50
0+34	0.50

Worksheet: Private Streets
Discharge vs Water Surface Elevation



Street B & C Worksheet for Irregular Channel

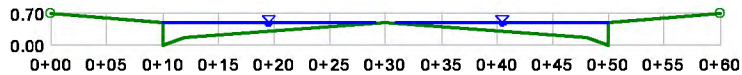
Project Description	
Worksheet	Street B & C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.010000 ft/ft
Water Surface Elevation	0.50 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Elevation Range	0.00 to 0.70
Discharge	24.53 cfs
Flow Area	7.5 ft ²
Wetted Perimeter	39.02 ft
Top Width	38.00 ft
Actual Depth	0.50 ft
Critical Elevation	0.55 ft
Critical Slope	0.005677 ft/ft
Velocity	3.29 ft/s
Velocity Head	0.17 ft
Specific Energy	0.67 ft
Froude Number	1.31
Flow Type	Supercritical

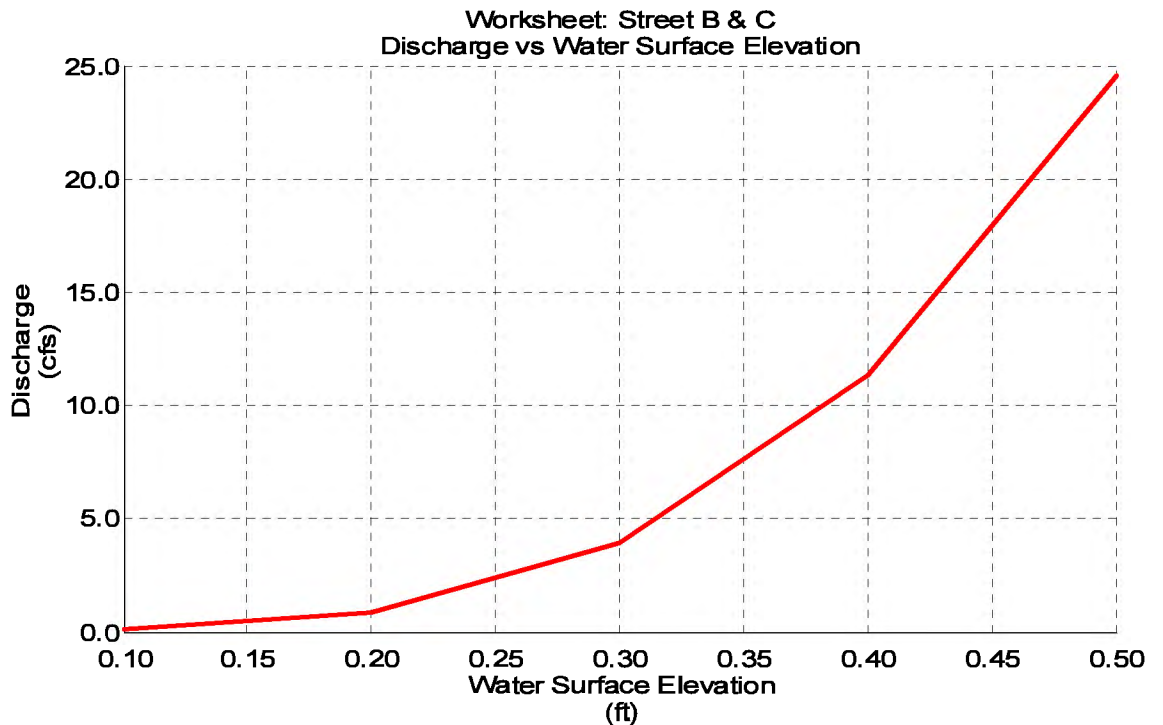
Calculation Messages:
Flow is divided.



Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+60	0.015

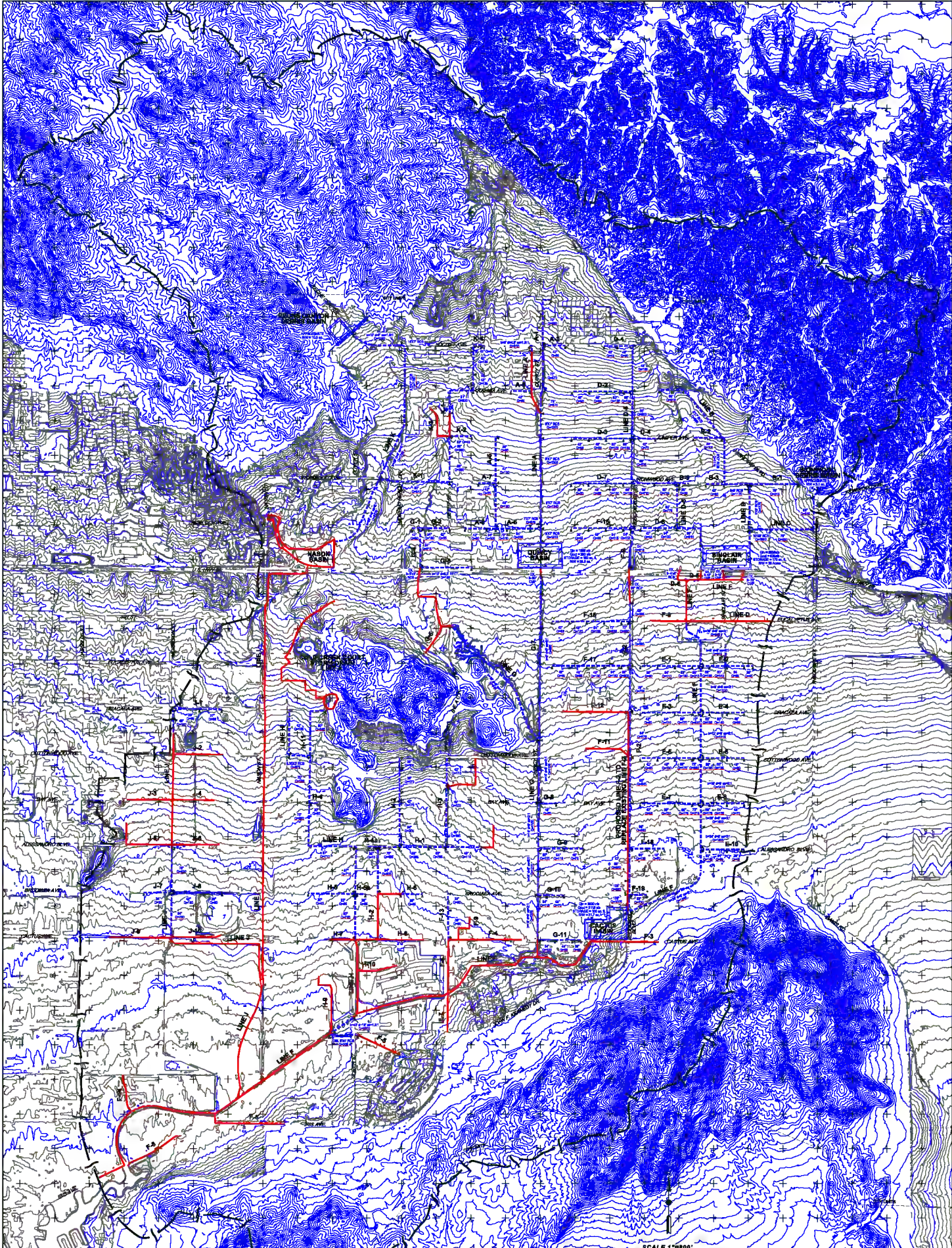
V:4.0
H:1
NTS

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	0.70
0+10	0.50
0+10	0.00
0+12	0.16
0+30	0.52
0+48	0.16
0+50	0.00
0+50	0.50
0+60	0.70



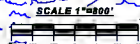
Section 3

Approved Offsite Hydrology Maps and MDP Storm Drain Plans



LEGEND

- DRAINAGE BOUNDARY
- PROPOSED STORM DRAIN
- PROPOSED OPEN CHANNEL
- EXISTING FACILITY
- Q=10
10 YEAR FLOW IN CFS
- Q=100
100 YEAR FLOW IN CFS



NOTES

1. ADOPTED IN OCTOBER 1980
2. REVISION #1 IN APRIL 1981
3. REVISION #2 IN PROGRESS

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REVERSH COUNTY FLOOD CONTROL
WATER CONSERVATION DISTRICT

MORENO MASTER DRAINAGE PLAN

ADOPTED OCTOBER 1980 REVISION NO. 2 APRIL 2015

Section 4

Riverside County Plates

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>NATURAL COVERS -</u>					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
<u>URBAN COVERS -</u>					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
<u>AGRICULTURAL COVERS -</u>					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

RCFC & WCD
HYDROLOGY MANUAL

**RUNOFF INDEX NUMBERS
FOR
PERVIOUS AREA**

ACTUAL IMPERVIOUS COVER

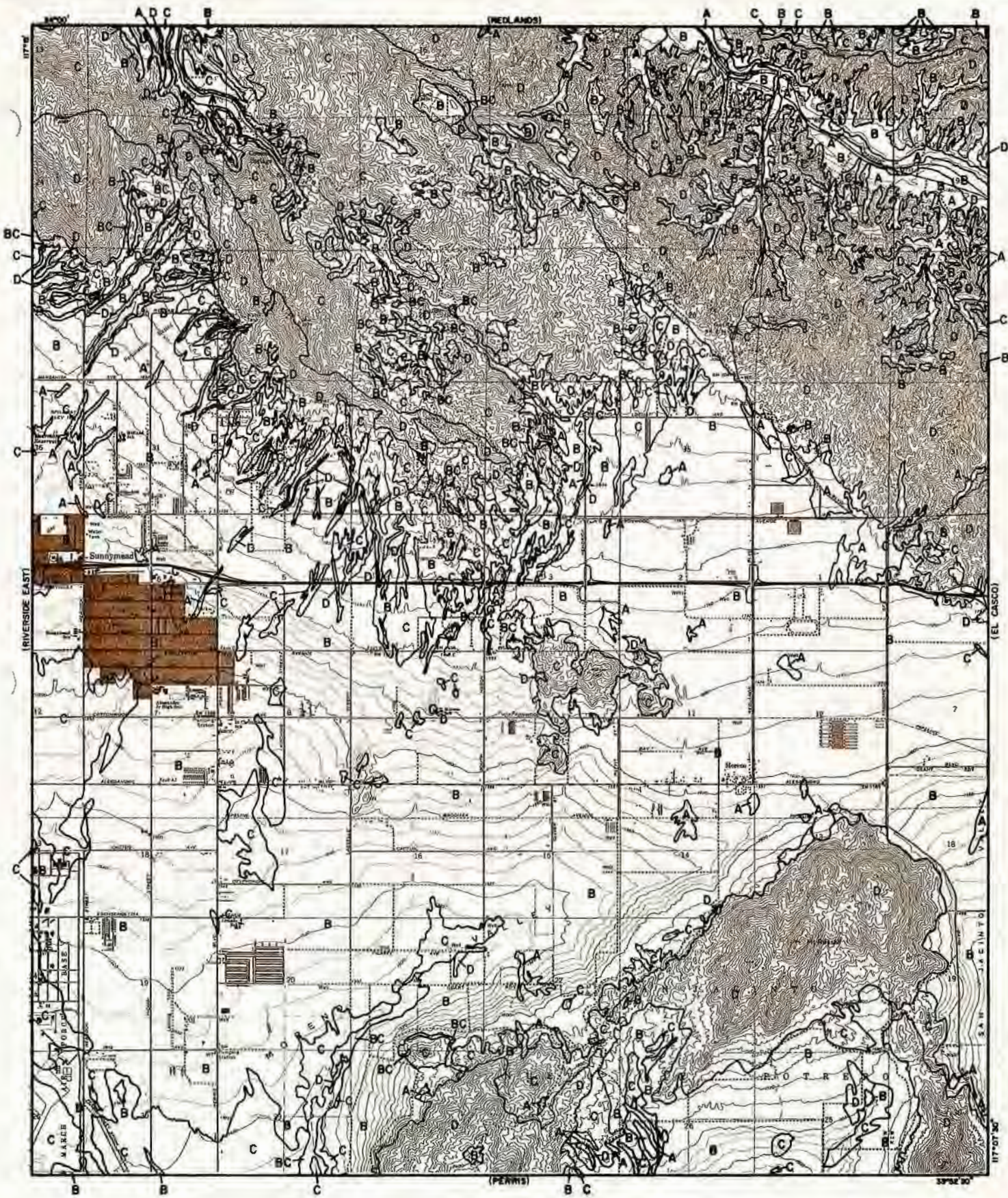
Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.
2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.
3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

RCFC & WCD
HYDROLOGY MANUAL

**IMPERVIOUS COVER
FOR
DEVELOPED AREAS**



LEGEND

— SOILS GROUP BOUNDARY
 A SOILS GROUP DESIGNATION

RCFC & WCD
 Hydrology Manual

0 FEET 5000

**HYDROLOGIC SOILS GROUP MAP
 FOR
 SUNNYMEAD**



RIVERSIDE COUNTY FLOOD CONTROL
 AND
 WATER CONSERVATION DISTRICT
**2-YEAR 1-HOUR
 PRECIPITATION**

RCFC & WCD
 HYDROLOGY MANUAL

prepared based on NOAA Atlas 14
 Volume II - California, 1973

SCALE
 50,000'



RIVERSIDE COUNTY FLOOD CONTROL
 AND
 WATER CONSERVATION DISTRICT
 100-YEAR - 1-HOUR
 PRECIPITATION

Prepared by: *[Signature]*
 Checked by: *[Signature]*
 Date: *[Date]*

PLATE D-4.4



Scale of Intensity - Duration Curve Based on District analysis of automatic recording rain gauge records

RCFC & WCD

HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

SLOPE OF INTENSITY DURATION CURVE

DATE	DRAWN BY
12/22/52	J. Z.

Approved: _____ Date: _____