

**PRELIMINARY DRAINAGE STUDY  
FOR  
TENTATIVE TRACT MAP NO. 36841  
(RANCHO DIAMANTE)**

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**FOR REVIEW ONLY**

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### **APPENDICES**

- A. Rational Method Support Material and Analysis
- B. Detention Analysis

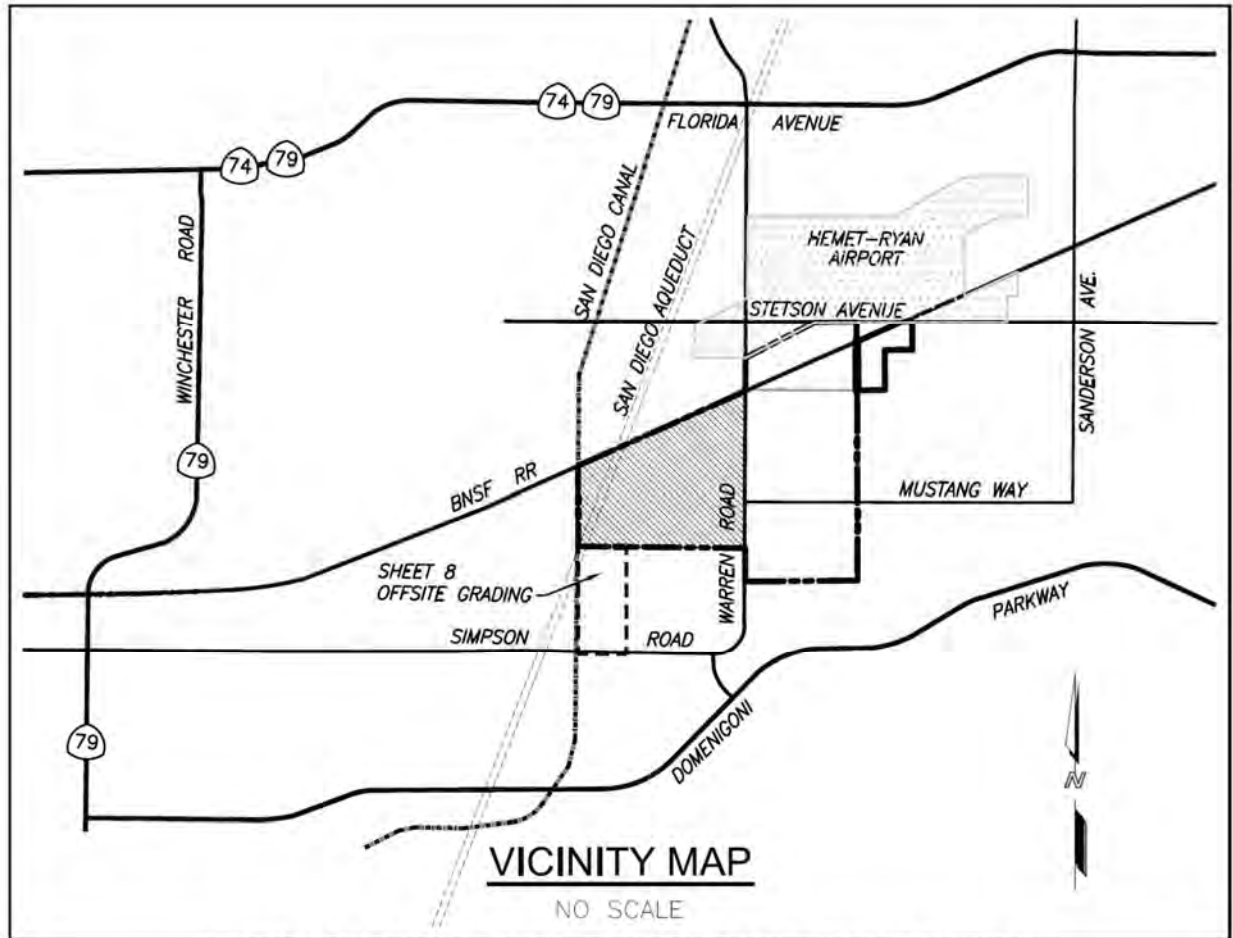
### **MAP POCKET**

East-West Channel Plans (Line 3B)  
Proposed Condition Rational Method Work Map

**FOR REVIEW ONLY**

## INTRODUCTION

Tentative Tract Map No. 36841 (Rancho Diamante) is located on the west side of Warren Road near Mustang Way in the city of Hemet (see the Vicinity Map). The tentative tract map by Pangaea Land Consultants, Inc. covers 245.07 acres and proposes 634 single-family residential lots and a public park.



THOMAS GUIDE: PAGE 840, GRID C-5, 2004 EDITION

Under existing conditions, the site is undeveloped and supports low lying sporadic vegetation. Storm runoff from the majority of the site sheet flows over the gently sloping ground surface in a southwesterly direction. An existing earthen channel has been graded within the southerly site boundary and represents the east-west segment of Line 3B from the City of Hemet's *Master Flood Control and Drainage Plan* (Master Plan). The relevant Master Plan exhibit is included in Appendix A and the channel plans are in the map pocket. The existing channel conveys off-site runoff from the east as well as on-site runoff to an existing detention basin located within the southwest corner of the site. The Master Plan indicates that the 100-year flow rate immediately downstream of the site should be 345 cubic feet per second (cfs). The detention basin was intended to provide this attenuation. Storm runoff from the detention basin is conveyed by a natural channel (north-south continuation of Line 3B) south nearly a mile to Salt Creek. The northerly half of north-south Line 3B between the project site and Simpson Road will be

constructed by the project. The southerly half of north-south Line 3B between Simpson Road and Salt Creek has already been constructed. This segment is off-site, so is being maintained by others.

The northerly portion of the site sheet flows northerly to the adjacent Hemet Channel. The Master Plan shows 200 cfs entering the Hemet Channel from the site (from Line 3C).

Under post-development conditions, storm runoff from the project footprint will continue to be conveyed similar to the existing drainage patterns and in accordance with the Master Plan. The proposed streets and storm drain systems will convey the majority of the project runoff to the existing earthen channel along the southerly site boundary. This on-site runoff as well as the tributary off-site runoff from the east will be detained by a detention basin within the southwesterly portion of the site. The basin will be generally at the location of the existing detention basin, but the footprint will be modified to fit the development. The 100-year flow released from the detention basin will be less than 345 cfs in accordance with the Master Plan.

Storm runoff from the northerly portion of the site will be conveyed to the Hemet Channel at existing culverts connecting to the channel. The project has been designed so that the proposed condition 100-year flow into the Hemet Channel does not exceed the 200 cfs specified by the Master Plan.

This drainage study contains 100-year proposed condition hydrologic analyses for TTM 36841. The preliminary analyses in this report are at the tentative map level and intended to show that storm drain facilities are feasible for the project and that the Master Plan goals are being met. More detailed analyses will be required for final design.

## **HYDROLOGIC ANALYSIS**

The Riverside County Flood Control and Water Conservation District's (RCFCWCD) *Hydrology Manual* criteria were the basis for the hydrologic analyses. The CivilDesign rational method program was used to perform the proposed condition analyses. Existing condition analyses are not required because the proposed condition runoff is required to achieve the flow rates from the Master Plan. The rational method input parameters are summarized as follows and the supporting data is included in Appendix A:

- Intensity-Duration curve data: The Hemet intensity-duration curve was selected
- Hydrologic soil groups: The hydrologic soil groups in the study area are primarily "B" and "C" with some "D" according to the *Hydrologic Soils Group Map for Winchester*. The soil group boundaries have been delineated on the Proposed Condition Rational Method Work Map.
- Drainage areas, flow lengths and elevations: For the proposed condition analyses, the grading and drainage improvements proposed on TTM 36841 were used to model the drainage patterns within the development.

At the current entitlement (i.e., tentative map) stage, plan and profiles for the proposed storm drain systems are not required. Since plan and profiles have not been prepared, the elevations in the rational method pipeflow routines are generally based on the proposed ground elevations or ground surface slope. Since the pipeflow routines are merely intended to estimate travel time for the hydrologic analyses, these assumptions are appropriate for the preliminary entitlement phase drainage analyses. More detailed hydraulic analyses of the storm drain system will be performed during final engineering.

- Land Uses: Three land use categories were used for the proposed condition analyses. The larger natural subareas were modeled as undeveloped with poor cover and the public park was modeled as undeveloped with good cover. The on-site land uses within the single-family development footprint were based on the single-family (¼ acre lot) category.
- Off-site Flow: An existing natural drainage channel exists along the southerly property line. The channel conveys off-site flow approaching the project from the east. The off-site flow is contributed from adjacent portions of the Rancho Diamante Specific Plan project as well as additional tributary areas. The off-site flow has been estimated in Stantec's July 2007, *Preliminary Drainage Report for Rancho Diamante Planned Community* (see excerpts in Appendix A). The off-site 100-year flow rate where the off-site flow enters the project at Warren Road is 350.2 cfs from a 250.48 acre area. This has been entered as user defined data in the rational method analysis (at node 10).

The 100-year proposed condition rational method results are included in Appendix A. The Proposed Condition Rational Method Work Map is in the map pocket at the back of this report. The overall study area has been subdivided into fifteen Major Drainage Basins. Thirteen of the drainage basins are tributary to each of the thirteen infiltration and/or bioretention basins described in the *Water Quality Management Plan*. The fourteenth basin encompasses the future commercial site at the northwest corner of the site that is merely being mass graded under the current project. The fifteenth basin covers the aqueduct corridor along the westerly portion of the site. The rational method node numbers reflect the associated Major Drainage Basins, e.g., rational method node numbers 102, 104, 106, etc. are in Major Drainage Basin 100; rational method node numbers 200, 202, 204, etc. are in Major Drainage Basin 200; etc. Major Drainage Basins 100 through 400 are tributary to *Master Flood Control and Drainage Plan* (Master Plan) Line 3B, while Major Drainage Basins 500 to 1300 are tributary to Line 1A (Hemet Channel).

The project flow will enter Line 1A (Hemet Channel) at multiple locations. Table 1 summarizes the 100-year flow rate into the Hemet Channel at each location. The total flow rate is 180 cfs. This is lower than the 200 cfs identified on the Master Plan. Therefore, the project is in conformance with the Master Plan.

The majority of the project flow will enter Line 3B at the southwest corner of the site. An existing detention basin exists at this location. The detention basin will be partially regraded to fit within the project footprint. Table 2 provides the overall results at Line 3B (as well as the overall results at Line 1A). Table 2 also provides the allowable flow rate per the Master Plan. The results show that detention is required for Line 3B.

<b>Major Drainage Basin</b>	<b>Overall Area, ac</b>	<b>Prop. Q100, cfs</b>
500	9.97	21
600-700	6.64	14
800-900	12.42	20
1000	9.32	21
1100	29.60	60
1200-1400	22.94	39
1300	2.63	5
Total	93.52	180

**Table 1. Summary of Flows Tributary to Line 1A**

<b>Discharge Location</b>	<b>Major Drainage Basins</b>	<b>Overall Area, ac</b>	<b>Prop. Q100, cfs</b>	<b>Allowable Q100 per Master Plan, cfs</b>
Line 1A	500 to 1400	93.52	180	200
Line 3B	100 to 400	372.43	510	345

**Table 2. Summary of Rational Method Results**

A conceptual detention analysis was performed to estimate the storage volume required to attenuate the 510 cfs to 345 cfs. The rational method results were entered into CivilDesign Unit Hydrograph Analysis (UH) program. The lag time was adjusted until the unit hydrograph peak flow generally matched the rational method peak flow (see Appendix B). The UH program generates HEC-1 data that were used to perform the detention analysis. The HEC-1 results are included in Appendix B and show that at least 9.0 acre-feet of storage is needed. The southwest corner of the project covers approximately 9 acres, so can accommodate this volume.

## **HYDRAULIC ANALYSES**

The east-west portion of Line 3B along the southerly portion of the site has already been constructed. The channel plans in the map pocket show a trapezoidal channel with 0.0015 ft/ft longitudinal slope, 4:1 side slopes, 17' bottom width, and 5.5' depth. The channel was intended to be maintained, but maintenance has not occurred, so the channel now supports mature vegetation and trees. A normal depth analysis was performed based on the design dimensions and a high roughness coefficient ( $n=0.10$ ) to reflect the current vegetation. The results are included after this report text and show a current capacity of 281 cfs.

It is anticipated that future vegetation removal in the east-west channel cannot be performed due to resource agency constraints. In order to increase the current channel capacity to the proposed condition 100-year flow rate of 510 cfs, the project proposes walls along the north and south sides of the channel. A normal depth analysis was performed to establish the wall heights with at least a foot of freeboard. The analysis is included after this report text.

The project will construct a portion of the Line 3B channel from the southwest corner of the site to Simpson Road. The northerly portion of Line 3B will be an earthen trapezoidal channel with a 20 foot bottom width and 4:1 (horizontal:vertical) side slopes. The maximum 100-year flow rate in this segment of the channel is 365 cfs from the Master Plan. A normal depth analysis is included after this text and shows that the channel can convey the runoff with normal depth of 3.7 feet.

The southerly portion of Line 3B will be a trapezoidal channel with concrete banks and an earthen bottom. The channel will have a 13 foot bottom width and 2:1 side slopes. The maximum 100-year flow rate in this segment of the channel is 505 cfs from the Master Plan. A normal depth analysis is included after this text and shows that the channel can convey the runoff with normal depth of 4.8 feet.

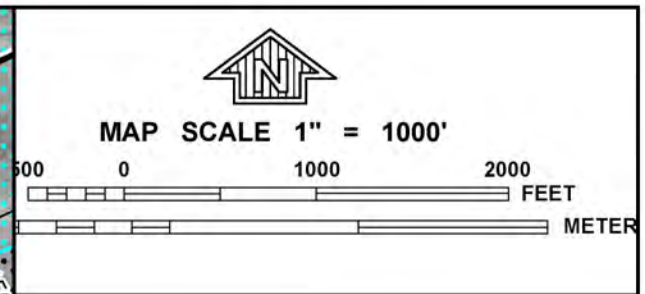
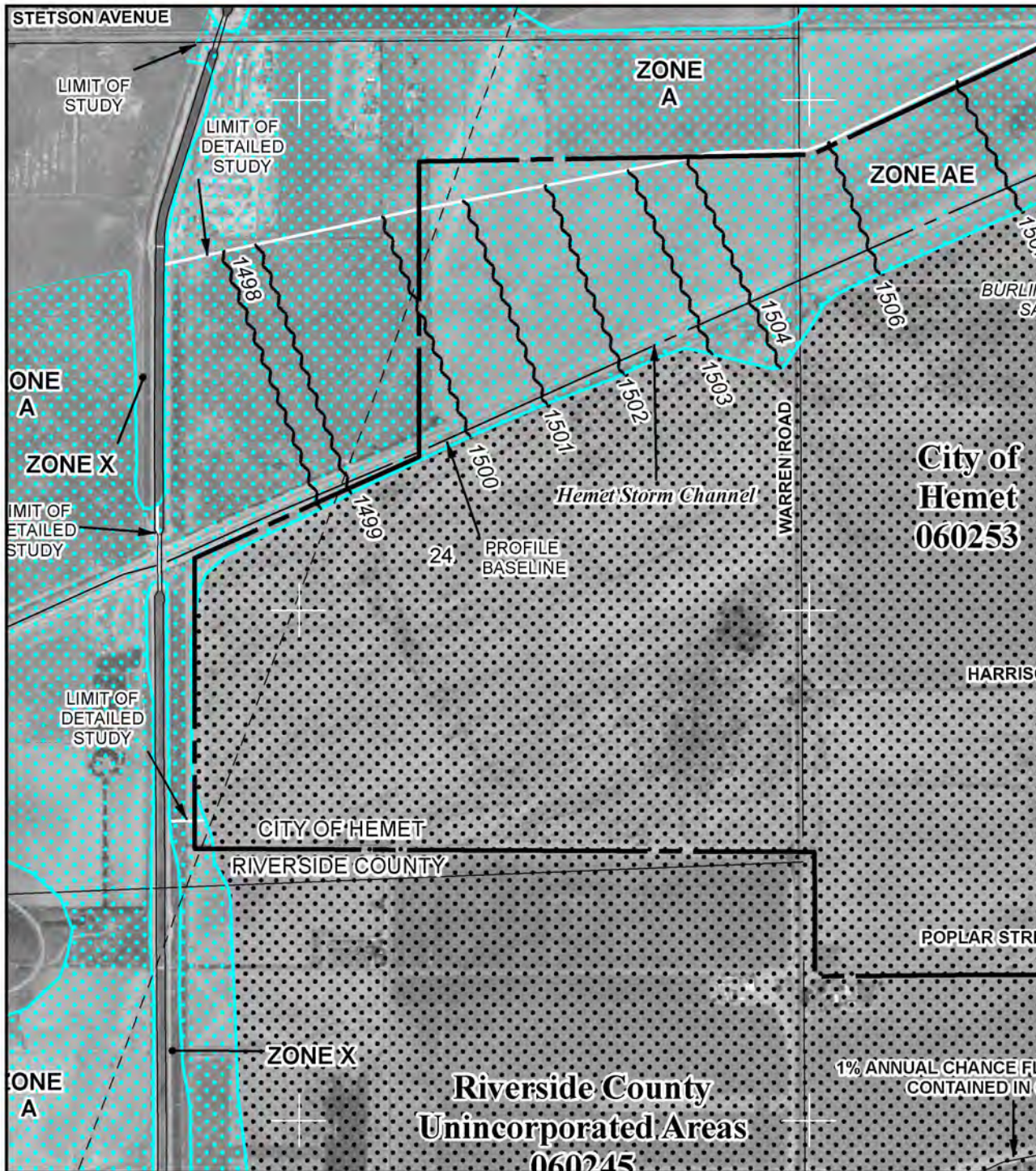
## **FEMA FLOODPLAIN**

The project is adjacent to a 100-year floodplain associated with the Hemet Storm Channel. The FIRMette is included after this report text. The floodplain linework was obtained from FEMA and included on the Rational Method Work Map. The FIRM water surface contours have been added to the work map. Comparison of the contours with the proposed pad elevations reveals the pads are above the 100-year water surface with at least a foot of freeboard. The proposed residential lots do not encroach on the floodplain, so the project will cause minor impacts on the floodplain, which are primarily associated with Stetson Road improvements. The commercial pad does encroach further onto the floodplain. Development of the commercial pad is not part of the project. The encroachment will be assessed during final engineering and mitigation or adjustments will be provided, as needed.

## **CONCLUSION**

Hydrologic and hydraulic analyses have been performed for Tentative Tract Map 36841. The analyses show that proposed condition on-site 100-year flow rates are within the range that can be handled by typical storm drain facilities. Therefore, the on-site drainage design is feasible. The portion of the on-site runoff directed north to the Hemet Channel is less than the flow rate from the Master Plan, so the project is in conformance with the Master Plan. The portion of on- and off-site runoff directed south to Line 3B exceeds the Master Plan flow rate. The project will mitigate for the increase by providing detention at the southwest corner where a detention basin already exists and will be modified to fit within the project footprint. The detention basin will attenuate the 100-year flow rate to the level identified in the Master Plan, and the downstream Line 3B can be designed to accommodate the Master Plan flows.





NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2085G

# FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY,  
CALIFORNIA  
AND INCORPORATED AREAS

PANEL 2085 OF 3805  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
HEMET, CITY OF	060253	2085	G
RIVERSIDE COUNTY	060245	2085	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER  
06065C2085G

EFFECTIVE DATE  
AUGUST 28, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)



## Worksheet for Existing East-West Channel Capacity

### Project Description

Friction Method	Manning Formula
Solve For	Discharge

### Input Data

Roughness Coefficient	0.100	
Channel Slope	0.00150	ft/ft
Normal Depth	5.50	ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	17.00	ft

### Results

Discharge	281.30	ft <sup>3</sup> /s
Flow Area	214.50	ft <sup>2</sup>
Wetted Perimeter	62.35	ft
Hydraulic Radius	3.44	ft
Top Width	61.00	ft
Critical Depth	1.76	ft
Critical Slope	0.13383	ft/ft
Velocity	1.31	ft/s
Velocity Head	0.03	ft
Specific Energy	5.53	ft
Froude Number	0.12	
Flow Type	Subcritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.50	ft
Critical Depth	1.76	ft
Channel Slope	0.00150	ft/ft

## Worksheet for Proposed East-West Channel with Walls

### Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

### Input Data

Channel Slope	0.00150	ft/ft
Discharge	448.00	ft <sup>3</sup> /s
Section Definitions		

Station (ft)	Elevation (ft)
0+00	110.00
0+00	104.50
0+15	104.50
0+33	100.00
0+51	100.00
0+63	103.00
0+65	103.00
0+65	110.00

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 110.00)	(0+15, 104.50)	0.030
(0+15, 104.50)	(0+63, 103.00)	0.100
(0+63, 103.00)	(0+65, 110.00)	0.030

### Options

Current Roughness weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	6.19	ft
Elevation Range	100.00 to 110.00 ft	
Flow Area	270.23	ft <sup>2</sup>

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## Worksheet for Proposed East-West Channel with Walls

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### Results

Wetted Perimeter	70.80	ft
Hydraulic Radius	3.82	ft
Top Width	65.00	ft
Normal Depth	6.19	ft
Critical Depth	2.25	ft
Critical Slope	0.08978	ft/ft
Velocity	1.66	ft/s
Velocity Head	0.04	ft
Specific Energy	6.23	ft
Froude Number	0.14	
Flow Type	Subcritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	6.19	ft
Critical Depth	2.25	ft
Channel Slope	0.00150	ft/ft
Critical Slope	0.08978	ft/ft

## Cross Section for Proposed East-West Channel with Walls

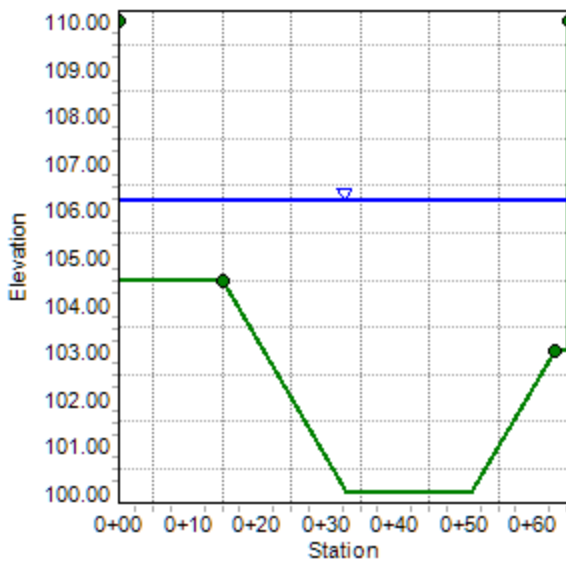
### Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

### Input Data

Channel Slope	0.00150	ft/ft
Normal Depth	6.19	ft
Discharge	448.00	ft <sup>3</sup> /s

### Cross Section Image



## Worksheet for Trapezoidal Channel - Section C-C

### Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

### Input Data

Channel Slope	0.00130	ft/ft
Discharge	505.00	ft³/s
Section Definitions		

Station (ft)	Elevation (ft)
0+00	5.50
0+11	0.00
0+24	0.00
0+35	5.50

### Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5.50)	(0+11, 0.00)	0.014
(0+11, 0.00)	(0+24, 0.00)	0.035
(0+24, 0.00)	(0+35, 5.50)	0.014

### Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

### Results

Normal Depth	4.75	ft
Elevation Range	0.00 to 5.50 ft	
Flow Area	106.89	ft²
Wetted Perimeter	34.24	ft
Hydraulic Radius	3.12	ft
Top Width	32.00	ft
Normal Depth	4.75	ft

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## Worksheet for Trapezoidal Channel - Section C-C

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### Results

Critical Depth	3.06	ft
Critical Slope	0.00696	ft/ft
Velocity	4.72	ft/s
Velocity Head	0.35	ft
Specific Energy	5.10	ft
Froude Number	0.46	
Flow Type	Subcritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.75	ft
Critical Depth	3.06	ft
Channel Slope	0.00130	ft/ft
Critical Slope	0.00696	ft/ft



## Cross Section for Trapezoidal Channel - Section C-C

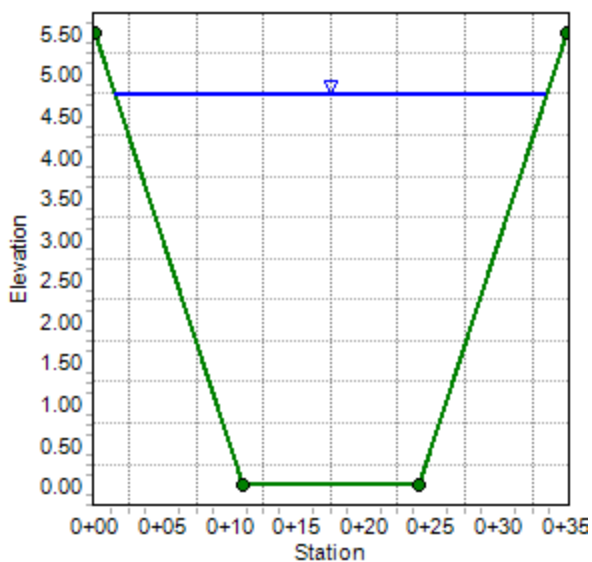
### Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

### Input Data

Channel Slope	0.00130	ft/ft
Normal Depth	4.75	ft
Discharge	505.00	ft <sup>3</sup> /s

### Cross Section Image



## Worksheet for Trapezoidal Channel - Section D-D

### Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

### Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00130	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	20.00	ft
Discharge	365.00	ft³/s

### Results

Normal Depth	3.69	ft
Flow Area	128.05	ft²
Wetted Perimeter	50.39	ft
Hydraulic Radius	2.54	ft
Top Width	49.49	ft
Critical Depth	1.91	ft
Critical Slope	0.01589	ft/ft
Velocity	2.85	ft/s
Velocity Head	0.13	ft
Specific Energy	3.81	ft
Froude Number	0.31	
Flow Type	Subcritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.69	ft
Critical Depth	1.91	ft
Channel Slope	0.00130	ft/ft

# **APPENDIX A**

## **RATIONAL METHOD SUPPORT MATERIAL AND ANALYSIS**

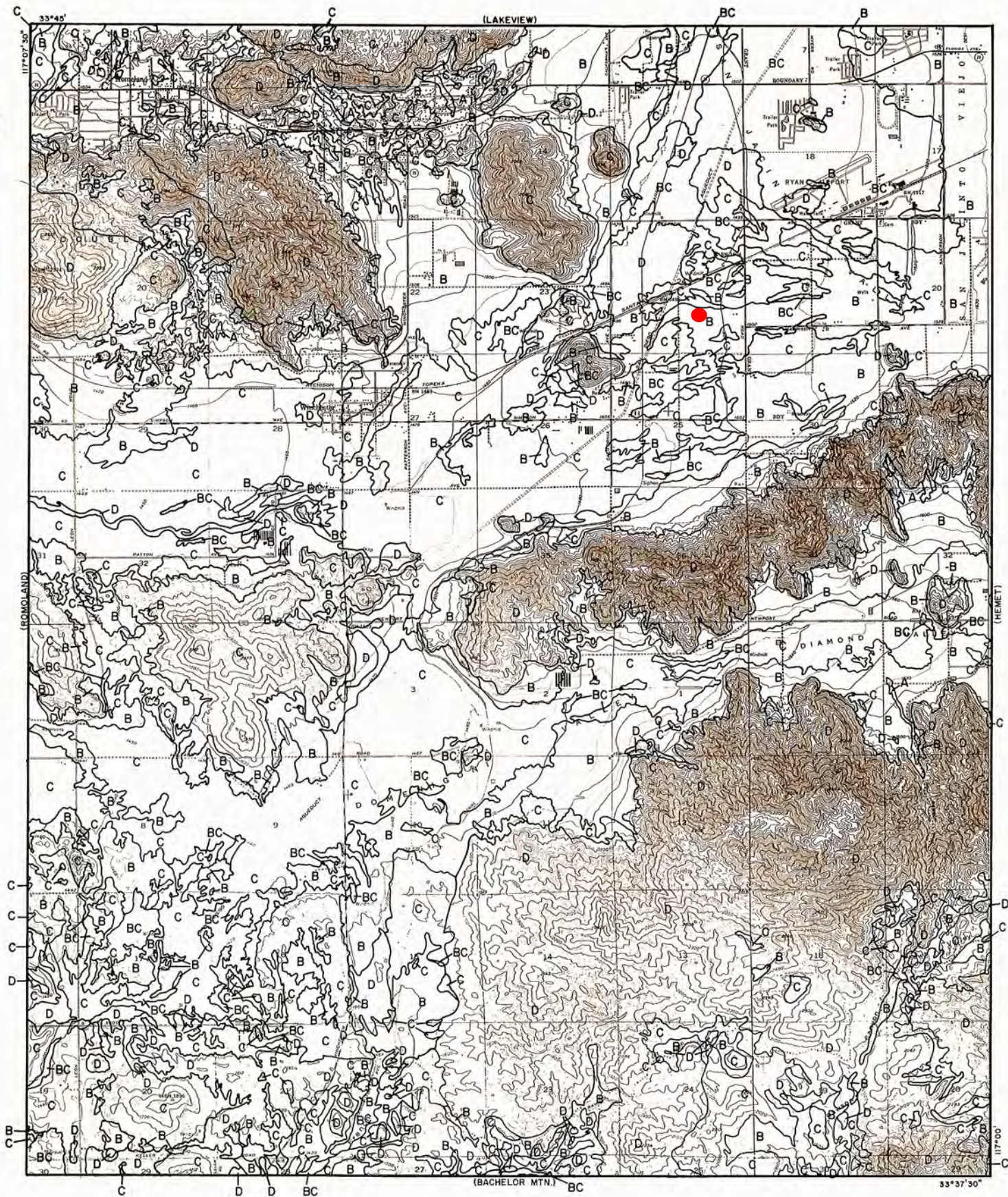
# RAINFALL INTENSITY—INCHES PER HOUR

HEMET			HIGHGROVE			HOMELAND - WINCHESTER			IDYLLWILD			LAKEVIEW		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.40	5	3.02	4.37	5	2.91	4.37	5	4.91	7.28	5	2.77	4.16
6	2.58	4.00	6	2.75	3.97	6	2.65	3.97	6	4.47	6.62	6	2.53	3.79
7	2.37	3.68	7	2.54	3.67	7	2.44	3.67	7	4.13	6.11	7	2.34	3.51
8	2.21	3.43	8	2.37	3.42	8	2.28	3.42	8	3.85	5.70	8	2.19	3.29
9	2.08	3.23	9	2.23	3.22	9	2.15	3.22	9	3.62	5.36	9	2.07	3.10
10	1.96	3.05	10	2.11	3.05	10	2.03	3.05	10	3.43	5.08	10	1.96	2.94
11	1.87	2.90	11	2.01	2.90	11	1.93	2.90	11	3.26	4.83	11	1.87	2.80
12	1.78	2.77	12	1.92	2.77	12	1.85	2.77	12	3.12	4.62	12	1.79	2.68
13	1.71	2.65	13	1.84	2.66	13	1.77	2.66	13	2.99	4.43	13	1.72	2.58
14	1.64	2.55	14	1.77	2.56	14	1.71	2.56	14	2.88	4.26	14	1.66	2.48
15	1.58	2.46	15	1.71	2.47	15	1.64	2.47	15	2.78	4.11	15	1.60	2.40
16	1.53	2.38	16	1.65	2.39	16	1.59	2.39	16	2.68	3.98	16	1.55	2.32
17	1.48	2.30	17	1.60	2.31	17	1.54	2.31	17	2.60	3.85	17	1.50	2.25
18	1.44	2.23	18	1.55	2.24	18	1.50	2.24	18	2.52	3.74	18	1.46	2.19
19	1.40	2.17	19	1.51	2.18	19	1.45	2.18	19	2.45	3.64	19	1.42	2.13
20	1.36	2.11	20	1.47	2.12	20	1.42	2.12	20	2.39	3.54	20	1.39	2.08
22	1.29	2.01	22	1.40	2.02	22	1.35	2.02	22	2.27	3.37	22	1.32	1.98
24	1.24	1.92	24	1.34	1.93	24	1.29	1.93	24	2.17	3.22	24	1.26	1.90
26	1.18	1.84	26	1.28	1.85	26	1.24	1.85	26	2.09	3.09	26	1.22	1.82
28	1.14	1.77	28	1.23	1.78	28	1.19	1.78	28	2.01	2.97	28	1.17	1.76
30	1.10	1.70	30	1.19	1.72	30	1.15	1.72	30	1.94	2.87	30	1.13	1.70
32	1.06	1.65	32	1.15	1.66	32	1.11	1.66	32	1.87	2.77	32	1.10	1.64
34	1.03	1.59	34	1.12	1.61	34	1.07	1.61	34	1.81	2.69	34	1.06	1.59
36	1.00	1.55	36	1.08	1.57	36	1.04	1.57	36	1.76	2.61	36	1.03	1.55
38	.97	1.50	38	1.05	1.52	38	1.01	1.52	38	1.71	2.54	38	1.01	1.51
40	.94	1.46	40	1.02	1.48	40	.99	1.48	40	1.67	2.47	40	.98	1.47
45	.89	1.37	45	.96	1.39	45	.93	1.39	45	1.57	2.32	45	.92	1.39
50	.84	1.30	50	.91	1.32	50	.88	1.32	50	1.48	2.20	50	.88	1.31
55	.80	1.24	55	.87	1.26	55	.84	1.26	55	1.41	2.09	55	.84	1.25
60	.76	1.18	60	.83	1.20	60	.80	1.20	60	1.35	2.00	60	.80	1.20
65	.73	1.13	65	.80	1.15	65	.77	1.15	65	1.29	1.92	65	.77	1.15
70	.70	1.09	70	.77	1.11	70	.74	1.11	70	1.25	1.85	70	.74	1.11
75	.68	1.05	75	.74	1.07	75	.71	1.07	75	1.20	1.78	75	.72	1.07
80	.65	1.01	80	.71	1.03	80	.69	1.03	80	1.16	1.72	80	.69	1.04
85	.63	.98	85	.69	1.00	85	.67	1.00	85	1.13	1.67	85	.67	1.01
SLOPE = .530			SLOPE = .520			SLOPE = .520			SLOPE = .520			SLOPE = .500		

RCFC & WCD  
HYDROLOGY MANUAL

STANDARD  
INTENSITY - DURATION  
CURVES DATA

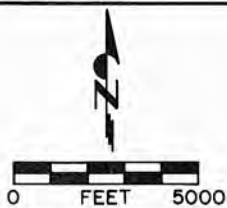




# **LEGEND**

- SOILS GROUP BOUNDARY
- A SOILS GROUP DESIGNATION

**RCFC&WCD**  
HYDROLOGY MANUAL



**HYDROLOGIC SOILS GROUP MAP  
FOR  
WINCHESTER**



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. ( $\frac{1}{2}$ 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

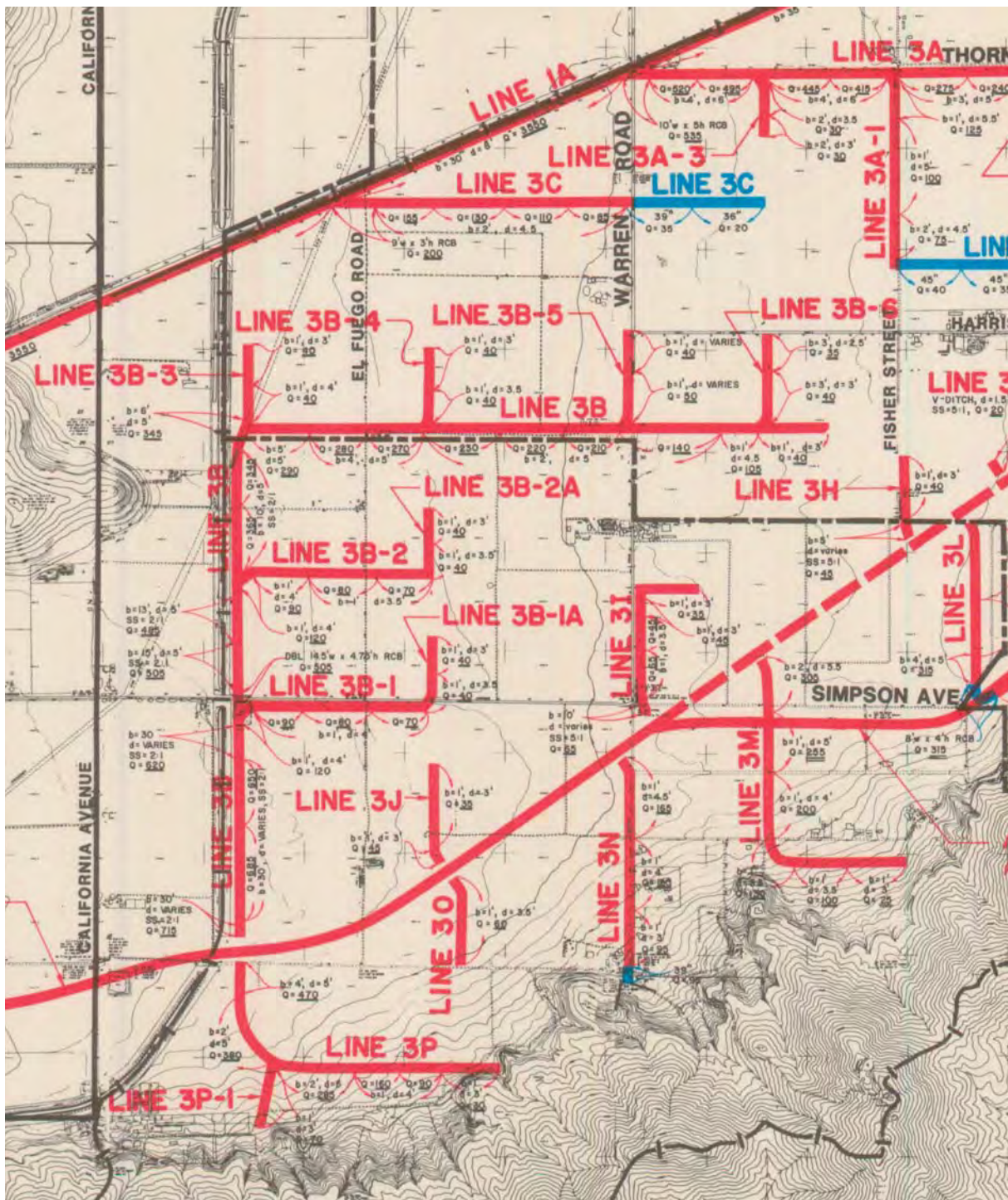
Notes:

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**





**MASTER FLOOD CONTROL AND  
DRAINAGE PLAN EXHIBIT**

**PRELIMINARY DRAINAGE REPORT  
FOR  
RANCHO DIAMANTE  
PLANNED COMMUNITY  
(Phase 2)**

**TTM No. 35393**

**HEMET, CALIFORNIA**

July 2007

*Prepared for:*

Benchmark Pacific  
550 Laguna Drive, Suite B  
Carlsbad, CA 92008

*Prepared by:*

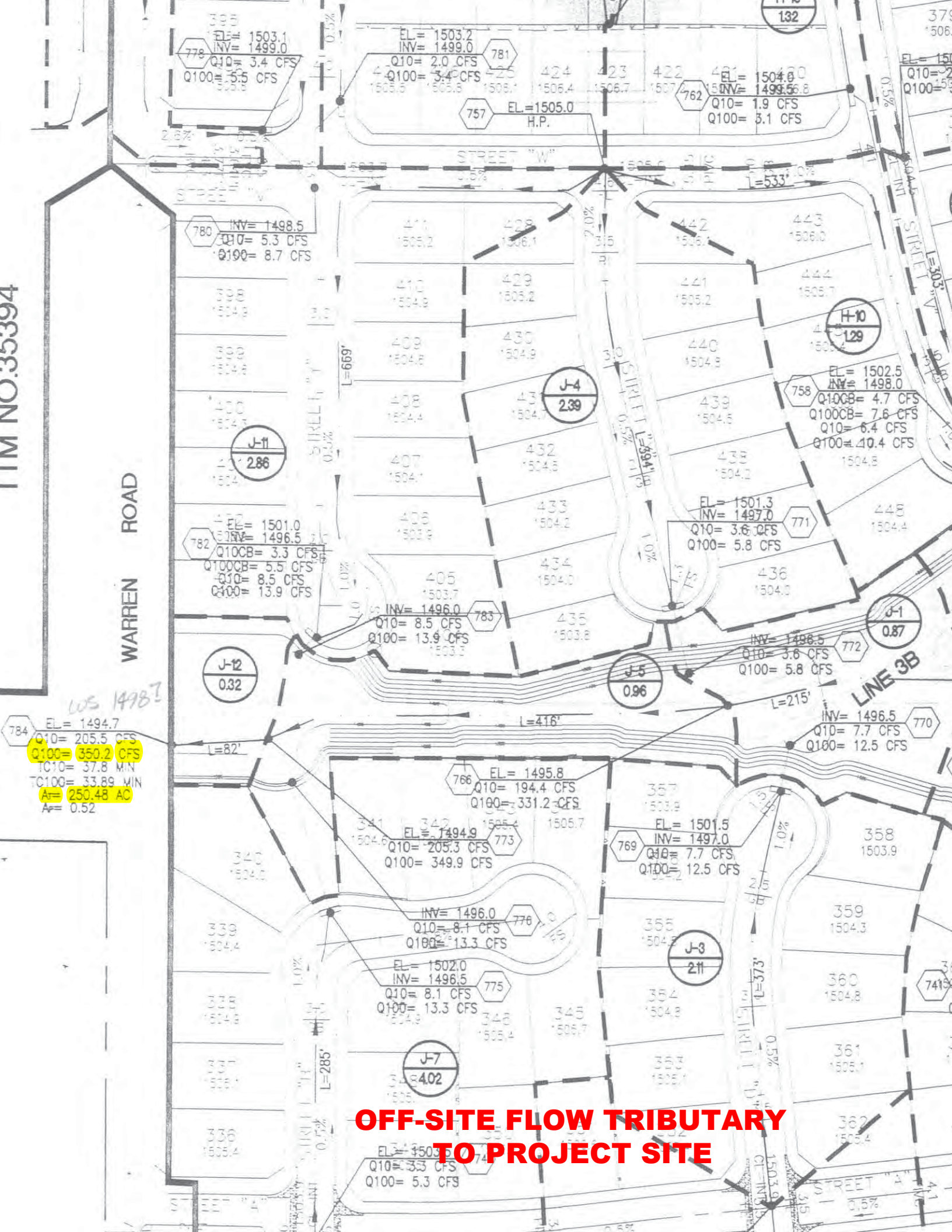
Stantec  
19 Technology Drive  
Irvine, CA



**Stantec**



ITEM NO. 35394



Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1  
Rational Hydrology Study Date: 02/01/18 File:prop.out

-----  
**Tentative Tract Map No. 36841**  
**Rancho Diamante**  
**Proposed Conditions**  
**100-Year Flow Rate**  
-----

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

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

Program License Serial Number 4028  
-----

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 [ Hemet ] area used.

10 year storm 10 minute intensity = 1.960(In/Hr)

10 year storm 60 minute intensity = 0.760(In/Hr)

100 year storm 10 minute intensity = 3.050(In/Hr)

100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.180(In/Hr)

Slope of intensity duration curve = 0.5300

+++++  
Process from Point/Station 100.000 to Point/Station 104.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Initial area flow distance = 911.000(Ft.)

Top (of initial area) elevation = 1511.900(Ft.)

Bottom (of initial area) elevation = 1503.300(Ft.)

Difference in elevation = 8.600(Ft.)

Slope = 0.00944 s(percent)= 0.94

TC =  $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$

Initial area time of concentration = 15.131 min.  
 Rainfall intensity = 2.449(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.807  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.100  
 Decimal fraction soil group C = 0.900  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 67.70  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 10.398(CFS)  
 Total initial stream area = 5.260(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 104.000 to Point/Station 106.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1503.400(Ft.)  
 Downstream point/station elevation = 1502.800(Ft.)  
 Pipe length = 56.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 10.398(CFS)  
 Nearest computed pipe diameter = 18.00(In.)  
 Calculated individual pipe flow = 10.398(CFS)  
 Normal flow depth in pipe = 14.09(In.)  
 Flow top width inside pipe = 14.85(In.)  
 Critical Depth = 14.88(In.)  
 Pipe flow velocity = 7.00(Ft/s)  
 Travel time through pipe = 0.13 min.  
 Time of concentration (TC) = 15.26 min.

++++++  
 Process from Point/Station 106.000 to Point/Station 108.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1500.700(Ft.)  
 Downstream point elevation = 1499.900(Ft.)  
 Channel length thru subarea = 205.000(Ft.)  
 Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 3.000  
 Slope or 'Z' of right channel bank = 3.000  
 Estimated mean flow rate at midpoint of channel = 10.645(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 10.645(CFS)  
 Depth of flow = 0.604(Ft.), Average velocity = 1.493(Ft/s)  
 Channel flow top width = 13.622(Ft.)  
 Flow Velocity = 1.49(Ft/s)  
 Travel time = 2.29 min.  
 Time of concentration = 17.55 min.

Sub-Channel No. 1 Critical depth = 0.316(Ft.)  
 ' ' ' Critical flow top width = 11.898(Ft.)  
 ' ' ' Critical flow velocity= 3.073(Ft/s)  
 ' ' ' Critical flow area = 3.464(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.758  
 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  
 Rainfall intensity = 2.264(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.429(CFS) for 0.250(Ac.)  
 Total runoff = 10.826(CFS) Total area = 5.510(Ac.)  
 Depth of flow = 0.610(Ft.), Average velocity = 1.501(Ft/s)

Sub-Channel No. 1 Critical depth = 0.320(Ft.)  
 ' ' ' Critical flow top width = 11.922(Ft.)  
 ' ' ' Critical flow velocity= 3.084(Ft/s)  
 ' ' ' Critical flow area = 3.511(Sq.Ft)

+++++  
 Process from Point/Station 108.000 to Point/Station 108.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.770  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.750  
 Decimal fraction soil group C = 0.250  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 59.25  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 17.55 min.  
 Rainfall intensity = 2.264(In/Hr) for a 100.0 year storm  
 Subarea runoff = 9.467(CFS) for 5.430(Ac.)  
 Total runoff = 20.294(CFS) Total area = 10.940(Ac.)

+++++  
 Process from Point/Station 108.000 to Point/Station 110.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1499.900(Ft.)  
 Downstream point/station elevation = 1499.600(Ft.)  
 Pipe length = 68.00(Ft.) Manning's N = 0.013



No. of pipes = 1 Required pipe flow = 20.294(CFS)  
 Nearest computed pipe diameter = 27.00(In.)  
 Calculated individual pipe flow = 20.294(CFS)  
 Normal flow depth in pipe = 21.80(In.)  
 Flow top width inside pipe = 21.30(In.)  
 Critical Depth = 18.92(In.)  
 Pipe flow velocity = 5.90(Ft/s)  
 Travel time through pipe = 0.19 min.  
 Time of concentration (TC) = 17.75 min.

++++++  
 Process from Point/Station 110.000 to Point/Station 112.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1499.600(Ft.)  
 Downstream point elevation = 1498.900(Ft.)  
 Channel length thru subarea = 201.000(Ft.)  
 Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 3.000  
 Slope or 'Z' of right channel bank = 3.000  
 Estimated mean flow rate at midpoint of channel = 20.535(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 20.535(CFS)  
 Depth of flow = 0.906(Ft.), Average velocity = 1.782(Ft/s)  
 Channel flow top width = 15.437(Ft.)  
 Flow Velocity = 1.78(Ft/s)  
 Travel time = 1.88 min.  
 Time of concentration = 19.63 min.

Sub-Channel No. 1 Critical depth = 0.484(Ft.)  
 ' ' ' Critical flow top width = 12.906(Ft.)  
 ' ' ' Critical flow velocity = 3.702(Ft/s)  
 ' ' ' Critical flow area = 5.548(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.752  
 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  
 Rainfall intensity = 2.134(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.417(CFS) for 0.260(Ac.)  
 Total runoff = 20.711(CFS) Total area = 11.200(Ac.)  
 Depth of flow = 0.911(Ft.), Average velocity = 1.787(Ft/s)

Sub-Channel No. 1 Critical depth = 0.484(Ft.)  
 ' ' ' Critical flow top width = 12.906(Ft.)

'	'	'	Critical flow velocity=	3.733(Ft/s)
'	'	'	Critical flow area =	5.548(Sq.Ft)

+++++  
 Process from Point/Station 112.000 to Point/Station 112.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.757  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.900  
 Decimal fraction soil group C = 0.100  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 57.30  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 19.63 min.  
 Rainfall intensity = 2.134(In/Hr) for a 100.0 year storm  
 Subarea runoff = 9.287(CFS) for 5.750(Ac.)  
 Total runoff = 29.998(CFS) Total area = 16.950(Ac.)

+++++  
 Process from Point/Station 112.000 to Point/Station 114.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1498.900(Ft.)  
 Downstream point/station elevation = 1498.600(Ft.)  
 Pipe length = 68.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 29.998(CFS)  
 Nearest computed pipe diameter = 33.00(In.)  
 Calculated individual pipe flow = 29.998(CFS)  
 Normal flow depth in pipe = 23.46(In.)  
 Flow top width inside pipe = 29.92(In.)  
 Critical Depth = 21.84(In.)  
 Pipe flow velocity = 6.64(Ft/s)  
 Travel time through pipe = 0.17 min.  
 Time of concentration (TC) = 19.80 min.

+++++  
 Process from Point/Station 114.000 to Point/Station 116.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1498.600(Ft.)  
 Downstream point elevation = 1498.300(Ft.)  
 Channel length thru subarea = 93.000(Ft.)  
 Channel base width = 30.000(Ft.)  
 Slope or 'Z' of left channel bank = 3.000  
 Slope or 'Z' of right channel bank = 3.000  
 Estimated mean flow rate at midpoint of channel = 30.157(CFS)

Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 30.157(CFS)  
 Depth of flow = 0.634(Ft.), Average velocity = 1.492(Ft/s)  
 Channel flow top width = 33.802(Ft.)  
 Flow Velocity = 1.49(Ft/s)  
 Travel time = 1.04 min.  
 Time of concentration = 20.84 min.

Sub-Channel No. 1 Critical depth = 0.313(Ft.)  
 ' ' ' Critical flow top width = 31.875(Ft.)  
 ' ' ' Critical flow velocity= 3.119(Ft/s)  
 ' ' ' Critical flow area = 9.668(Sq.Ft)

Adding area flow to channel  
 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  
 Rainfall intensity = 2.067(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.279(CFS) for 0.180(Ac.)  
 Total runoff = 30.277(CFS) Total area = 17.130(Ac.)  
 Depth of flow = 0.635(Ft.), Average velocity = 1.494(Ft/s)

Sub-Channel No. 1 Critical depth = 0.313(Ft.)  
 ' ' ' Critical flow top width = 31.875(Ft.)  
 ' ' ' Critical flow velocity= 3.132(Ft/s)  
 ' ' ' Critical flow area = 9.668(Sq.Ft)

++++++  
 Process from Point/Station 114.000 to Point/Station 116.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
 Stream flow area = 17.130(Ac.)  
 Runoff from this stream = 30.277(CFS)  
 Time of concentration = 20.84 min.  
 Rainfall intensity = 2.067(In/Hr)

++++++  
 Process from Point/Station 115.000 to Point/Station 117.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 955.000(Ft.)  
 Top (of initial area) elevation = 1512.000(Ft.)

Bottom (of initial area) elevation = 1504.500(Ft.)  
 Difference in elevation = 7.500(Ft.)  
 Slope = 0.00785 s(percent)= 0.79  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 15.998 min.  
 Rainfall intensity = 2.378(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.772  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.800  
 Decimal fraction soil group C = 0.200  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 58.60  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 2.277(CFS)  
 Total initial stream area = 1.240(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 117.000 to Point/Station 116.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1504.500(Ft.)  
 Downstream point/station elevation = 1501.000(Ft.)  
 Pipe length = 713.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 2.277(CFS)  
 Nearest computed pipe diameter = 12.00(In.)  
 Calculated individual pipe flow = 2.277(CFS)  
 Normal flow depth in pipe = 9.00(In.)  
 Flow top width inside pipe = 10.39(In.)  
 Critical Depth = 7.74(In.)  
 Pipe flow velocity = 3.60(Ft/s)  
 Travel time through pipe = 3.30 min.  
 Time of concentration (TC) = 19.30 min.

++++++  
 Process from Point/Station 117.000 to Point/Station 116.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
 Stream flow area = 1.240(Ac.)  
 Runoff from this stream = 2.277(CFS)  
 Time of concentration = 19.30 min.  
 Rainfall intensity = 2.153(In/Hr)  
 Summary of stream data:

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

1	30.277	20.84	2.067
2	2.277	19.30	2.153

Largest stream flow has longer time of concentration

Qp = 30.277 + sum of  
       Qb           Ia/Ib  
       2.277 \*     0.960 =     2.186

Qp = 32.463

Total of 2 streams to confluence:

Flow rates before confluence point:

30.277	2.277
--------	-------

Area of streams before confluence:

17.130	1.240
--------	-------

Results of confluence:

Total flow rate = 32.463(CFS)

Time of concentration = 20.835 min.

Effective stream area after confluence = 18.370(Ac.)

+++++  
 Process from Point/Station 116.000 to Point/Station 116.000  
 \*\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)

Runoff Coefficient = 0.750

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.980

Decimal fraction soil group C = 0.020

Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 56.26

Pervious area fraction = 0.500; Impervious fraction = 0.500

Time of concentration = 20.84 min.

Rainfall intensity = 2.067(In/Hr) for a 100.0 year storm

Subarea runoff = 12.691(CFS) for 8.190(Ac.)

Total runoff = 45.154(CFS) Total area = 26.560(Ac.)

+++++  
 Process from Point/Station 116.000 to Point/Station 118.000  
 \*\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*\*

---

Upstream point/station elevation = 1498.300(Ft.)

Downstream point/station elevation = 1497.100(Ft.)

Pipe length = 234.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 45.154(CFS)

Nearest computed pipe diameter = 36.00(In.)

Calculated individual pipe flow = 45.154(CFS)

Normal flow depth in pipe = 27.89(In.)

Flow top width inside pipe = 30.08(In.)

Critical Depth = 26.27(In.)

Pipe flow velocity = 7.69(Ft/s)

Travel time through pipe = 0.51 min.

Time of concentration (TC) = 21.34 min.

+++++  
Process from Point/Station 118.000 to Point/Station 118.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.771  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.550  
Decimal fraction soil group C = 0.450  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 61.85  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 21.34 min.  
Rainfall intensity = 2.041(In/Hr) for a 100.0 year storm  
Subarea runoff = 8.116(CFS) for 5.160(Ac.)  
Total runoff = 53.271(CFS) Total area = 31.720(Ac.)

+++++  
Process from Point/Station 118.000 to Point/Station 120.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1497.300(Ft.)  
Downstream point/station elevation = 1497.000(Ft.)  
Pipe length = 60.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 53.271(CFS)  
Nearest computed pipe diameter = 39.00(In.)  
Calculated individual pipe flow = 53.271(CFS)  
Normal flow depth in pipe = 29.25(In.)  
Flow top width inside pipe = 33.77(In.)  
Critical Depth = 27.97(In.)  
Pipe flow velocity = 7.98(Ft/s)  
Travel time through pipe = 0.13 min.  
Time of concentration (TC) = 21.47 min.

+++++  
Process from Point/Station 120.000 to Point/Station 122.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1497.000(Ft.)  
Downstream point elevation = 1496.300(Ft.)  
Channel length thru subarea = 193.000(Ft.)  
Channel base width = 20.000(Ft.)  
Slope or 'Z' of left channel bank = 3.000  
Slope or 'Z' of right channel bank = 3.000  
Estimated mean flow rate at midpoint of channel = 53.548(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 3.000(Ft.)



Flow(q) thru subarea = 53.548(CFS)  
 Depth of flow = 1.078(Ft.), Average velocity = 2.138(Ft/s)  
 Channel flow top width = 26.469(Ft.)  
 Flow Velocity = 2.14(Ft/s)  
 Travel time = 1.50 min.  
 Time of concentration = 22.97 min.

Sub-Channel No. 1 Critical depth = 0.586(Ft.)  
 ' ' ' Critical flow top width = 23.516(Ft.)  
 ' ' ' Critical flow velocity= 4.200(Ft/s)  
 ' ' ' Critical flow area = 12.749(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.795  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 1.963(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.515(CFS) for 0.330(Ac.)  
 Total runoff = 53.786(CFS) Total area = 32.050(Ac.)  
 Depth of flow = 1.081(Ft.), Average velocity = 2.141(Ft/s)

Sub-Channel No. 1 Critical depth = 0.586(Ft.)  
 ' ' ' Critical flow top width = 23.516(Ft.)  
 ' ' ' Critical flow velocity= 4.219(Ft/s)  
 ' ' ' Critical flow area = 12.749(Sq.Ft)

+++++  
 Process from Point/Station 122.000 to Point/Station 122.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.778  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.330  
 Decimal fraction soil group C = 0.670  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 64.71  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 22.97 min.  
 Rainfall intensity = 1.963(In/Hr) for a 100.0 year storm  
 Subarea runoff = 5.759(CFS) for 3.770(Ac.)  
 Total runoff = 59.545(CFS) Total area = 35.820(Ac.)

+++++

Process from Point/Station 122.000 to Point/Station 124.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1496.300(Ft.)  
 Downstream point/station elevation = 1496.000(Ft.)  
 Pipe length = 78.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 59.545(CFS)  
 Nearest computed pipe diameter = 42.00(In.)  
 Calculated individual pipe flow = 59.545(CFS)  
 Normal flow depth in pipe = 32.81(In.)  
 Flow top width inside pipe = 34.73(In.)  
 Critical Depth = 29.01(In.)  
 Pipe flow velocity = 7.38(Ft/s)  
 Travel time through pipe = 0.18 min.  
 Time of concentration (TC) = 23.15 min.

+++++  
 Process from Point/Station 124.000 to Point/Station 126.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1496.000(Ft.)  
 Downstream point elevation = 1495.300(Ft.)  
 Channel length thru subarea = 182.000(Ft.)  
 Channel base width = 20.000(Ft.)  
 Slope or 'Z' of left channel bank = 3.000  
 Slope or 'Z' of right channel bank = 3.000  
 Estimated mean flow rate at midpoint of channel = 59.861(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 59.861(CFS)  
 Depth of flow = 1.130(Ft.), Average velocity = 2.264(Ft/s)  
 Channel flow top width = 26.783(Ft.)  
 Flow Velocity = 2.26(Ft/s)  
 Travel time = 1.34 min.  
 Time of concentration = 24.49 min.

Sub-Channel No. 1 Critical depth = 0.633(Ft.)  
 ' ' ' Critical flow top width = 23.797(Ft.)  
 ' ' ' Critical flow velocity = 4.320(Ft/s)  
 ' ' ' Critical flow area = 13.858(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.792  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 1.897(In/Hr) for a 100.0 year storm

Subarea runoff = 0.571(CFS) for 0.380(Ac.)  
Total runoff = 60.116(CFS) Total area = 36.200(Ac.)  
Depth of flow = 1.133(Ft.), Average velocity = 2.267(Ft/s)

Sub-Channel No. 1 Critical depth = 0.633(Ft.)  
' ' ' Critical flow top width = 23.797(Ft.)  
' ' ' Critical flow velocity= 4.338(Ft/s)  
' ' ' Critical flow area = 13.858(Sq.Ft)

+++++  
Process from Point/Station 126.000 to Point/Station 126.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.761  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.600  
Decimal fraction soil group C = 0.400  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 61.20  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 24.49 min.  
Rainfall intensity = 1.897(In/Hr) for a 100.0 year storm  
Subarea runoff = 6.298(CFS) for 4.360(Ac.)  
Total runoff = 66.414(CFS) Total area = 40.560(Ac.)

+++++  
Process from Point/Station 126.000 to Point/Station 128.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1495.300(Ft.)  
Downstream point/station elevation = 1495.000(Ft.)  
Pipe length = 78.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 66.414(CFS)  
Nearest computed pipe diameter = 42.00(In.)  
Calculated individual pipe flow = 66.414(CFS)  
Normal flow depth in pipe = 37.69(In.)  
Flow top width inside pipe = 25.50(In.)  
Critical Depth = 30.65(In.)  
Pipe flow velocity = 7.30(Ft/s)  
Travel time through pipe = 0.18 min.  
Time of concentration (TC) = 24.67 min.

+++++  
Process from Point/Station 128.000 to Point/Station 130.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.000(Ft.)

Downstream point elevation = 1494.000(Ft.)  
 Channel length thru subarea = 257.000(Ft.)  
 Channel base width = 20.000(Ft.)  
 Slope or 'Z' of left channel bank = 3.000  
 Slope or 'Z' of right channel bank = 3.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 66.414(CFS)  
 Depth of flow = 1.196(Ft.), Average velocity = 2.354(Ft/s)  
 Channel flow top width = 27.177(Ft.)  
 Flow Velocity = 2.35(Ft/s)  
 Travel time = 1.82 min.  
 Time of concentration = 26.49 min.

Sub-Channel No. 1 Critical depth = 0.672(Ft.)  
 ' ' ' Critical flow top width = 24.031(Ft.)  
 ' ' ' Critical flow velocity = 4.490(Ft/s)  
 ' ' ' Critical flow area = 14.792(Sq.Ft)

++++++  
 Process from Point/Station 132.000 to Point/Station 130.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

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  
 Time of concentration = 26.49 min.  
 Rainfall intensity = 1.820(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.767(CFS) for 1.320(Ac.)  
 Total runoff = 68.181(CFS) Total area = 41.880(Ac.)

++++++  
 Process from Point/Station 130.000 to Point/Station 134.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1494.000(Ft.)  
 Downstream point elevation = 1493.200(Ft.)  
 Channel length thru subarea = 149.000(Ft.)  
 Channel base width = 20.000(Ft.)  
 Slope or 'Z' of left channel bank = 3.000  
 Slope or 'Z' of right channel bank = 3.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 68.181(CFS)

Depth of flow = 1.107(Ft.), Average velocity = 2.642(Ft/s)  
Channel flow top width = 26.641(Ft.)  
Flow Velocity = 2.64(Ft/s)  
Travel time = 0.94 min.  
Time of concentration = 27.43 min.

Sub-Channel No. 1 Critical depth = 0.688(Ft.)  
' ' ' Critical flow top width = 24.125(Ft.)  
' ' ' Critical flow velocity= 4.495(Ft/s)  
' ' ' Critical flow area = 15.168(Sq.Ft)

+++++  
Process from Point/Station 130.000 to Point/Station 134.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 41.880(Ac.)  
Runoff from this stream = 68.181(CFS)  
Time of concentration = 27.43 min.  
Rainfall intensity = 1.787(In/Hr)

+++++  
Process from Point/Station 150.000 to Point/Station 152.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 107.000(Ft.)  
Top (of initial area) elevation = 1507.300(Ft.)  
Bottom (of initial area) elevation = 1506.200(Ft.)  
Difference in elevation = 1.100(Ft.)  
Slope = 0.01028 s(percent)= 1.03  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
Initial area time of concentration = 6.316 min.  
Rainfall intensity = 3.891(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.805  
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 = 0.376(CFS)  
Total initial stream area = 0.120(Ac.)  
Pervious area fraction = 0.500

+++++  
Process from Point/Station 152.000 to Point/Station 154.000  
\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1506.200(Ft.)  
 End of street segment elevation = 1504.400(Ft.)  
 Length of street segment = 343.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 3.494(CFS)  
 Depth of flow = 0.396(Ft.), Average velocity = 1.687(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 13.984(Ft.)  
 Flow velocity = 1.69(Ft/s)  
 Travel time = 3.39 min. TC = 9.71 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.801  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.670  
 Decimal fraction soil group C = 0.330  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 60.29  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 3.099(In/Hr) for a 100.0 year storm  
 Subarea runoff = 6.178(CFS) for 2.490(Ac.)  
 Total runoff = 6.553(CFS) Total area = 2.610(Ac.)  
 Street flow at end of street = 6.553(CFS)  
 Half street flow at end of street = 6.553(CFS)  
 Depth of flow = 0.476(Ft.), Average velocity = 1.957(Ft/s)  
 Flow width (from curb towards crown)= 17.980(Ft.)

++++++  
 Process from Point/Station 154.000 to Point/Station 156.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1504.400(Ft.)  
 Downstream point/station elevation = 1503.000(Ft.)  
 Pipe length = 297.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 6.553(CFS)  
 Nearest computed pipe diameter = 18.00(In.)  
 Calculated individual pipe flow = 6.553(CFS)  
 Normal flow depth in pipe = 13.45(In.)

Flow top width inside pipe = 15.64(In.)  
Critical Depth = 11.88(In.)  
Pipe flow velocity = 4.62(Ft/s)  
Travel time through pipe = 1.07 min.  
Time of concentration (TC) = 10.78 min.

+++++  
Process from Point/Station 156.000 to Point/Station 156.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.782  
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 = 10.78 min.  
Rainfall intensity = 2.932(In/Hr) for a 100.0 year storm  
Subarea runoff = 6.140(CFS) for 2.680(Ac.)  
Total runoff = 12.693(CFS) Total area = 5.290(Ac.)

+++++  
Process from Point/Station 156.000 to Point/Station 158.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1503.000(Ft.)  
Downstream point/station elevation = 1502.200(Ft.)  
Pipe length = 137.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 12.693(CFS)  
Nearest computed pipe diameter = 24.00(In.)  
Calculated individual pipe flow = 12.693(CFS)  
Normal flow depth in pipe = 15.28(In.)  
Flow top width inside pipe = 23.09(In.)  
Critical Depth = 15.38(In.)  
Pipe flow velocity = 6.01(Ft/s)  
Travel time through pipe = 0.38 min.  
Time of concentration (TC) = 11.16 min.

+++++  
Process from Point/Station 158.000 to Point/Station 158.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.780  
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 = 11.16 min.  
Rainfall intensity = 2.878(In/Hr) for a 100.0 year storm  
Subarea runoff = 4.243(CFS) for 1.890(Ac.)  
Total runoff = 16.936(CFS) Total area = 7.180(Ac.)

+++++  
Process from Point/Station 159.000 to Point/Station 158.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.780  
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 = 11.16 min.  
Rainfall intensity = 2.878(In/Hr) for a 100.0 year storm  
Subarea runoff = 2.941(CFS) for 1.310(Ac.)  
Total runoff = 19.877(CFS) Total area = 8.490(Ac.)

+++++  
Process from Point/Station 158.000 to Point/Station 160.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1497.000(Ft.)  
Downstream point/station elevation = 1494.800(Ft.)  
Pipe length = 221.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 19.877(CFS)  
Nearest computed pipe diameter = 24.00(In.)  
Calculated individual pipe flow = 19.877(CFS)  
Normal flow depth in pipe = 17.48(In.)  
Flow top width inside pipe = 21.35(In.)  
Critical Depth = 19.22(In.)  
Pipe flow velocity = 8.11(Ft/s)  
Travel time through pipe = 0.45 min.  
Time of concentration (TC) = 11.61 min.

+++++  
Process from Point/Station 160.000 to Point/Station 134.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1494.800(Ft.)  
Downstream point elevation = 1493.200(Ft.)  
Channel length thru subarea = 563.000(Ft.)



Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 50.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 19.877(CFS)  
 Depth of flow = 0.661(Ft.), Average velocity = 1.079(Ft/s)  
 Channel flow top width = 45.709(Ft.)  
 Flow Velocity = 1.08(Ft/s)  
 Travel time = 8.70 min.  
 Time of concentration = 20.31 min.

Sub-Channel No. 1 Critical depth = 0.359(Ft.)  
 ' ' ' Critical flow top width = 29.406(Ft.)  
 ' ' ' Critical flow velocity = 2.807(Ft/s)  
 ' ' ' Critical flow area = 7.081(Sq.Ft)

++++++  
 Process from Point/Station 160.000 to Point/Station 134.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
 Stream flow area = 8.490(Ac.)  
 Runoff from this stream = 19.877(CFS)  
 Time of concentration = 20.31 min.  
 Rainfall intensity = 2.095(In/Hr)  
 Summary of stream data:

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

1	68.181	27.43	1.787
2	19.877	20.31	2.095

Largest stream flow has longer time of concentration

Qp = 68.181 + sum of  
     Qb      Ia/Ib  
     19.877 \* 0.853 = 16.949  
 Qp = 85.131

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
     68.181      19.877

Area of streams before confluence:  
     41.880      8.490

Results of confluence:

Total flow rate = 85.131(CFS)  
 Time of concentration = 27.427 min.  
 Effective stream area after confluence = 50.370(Ac.)

+++++  
Process from Point/Station        134.000 to Point/Station        134.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.734  
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 = 27.43 min.  
Rainfall intensity = 1.787(In/Hr) for a 100.0 year storm  
Subarea runoff = 3.907(CFS) for 2.980(Ac.)  
Total runoff = 89.037(CFS)    Total area = 53.350(Ac.)

+++++  
Process from Point/Station        134.000 to Point/Station        134.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area = 53.350(Ac.)  
Runoff from this stream = 89.037(CFS)  
Time of concentration = 27.43 min.  
Rainfall intensity = 1.787(In/Hr)  
Program is now starting with Main Stream No. 2

+++++  
Process from Point/Station        10.000 to Point/Station        144.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

---

Rainfall intensity = 1.597(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.750  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.500  
Decimal fraction soil group C = 0.500  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 62.50  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
User specified values are as follows:  
TC = 33.89 min.    Rain intensity = 1.60(In/Hr)  
Total area = 250.48(Ac.)    Total runoff = 350.20(CFS)

+++++  
Process from Point/Station        10.000 to Point/Station        134.000

\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.000(Ft.)  
 Downstream point elevation = 1493.400(Ft.)  
 Channel length thru subarea = 958.000(Ft.)  
 Channel base width = 18.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Estimated mean flow rate at midpoint of channel = 350.977(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 350.977(CFS)  
 Depth of flow = 3.659(Ft.), Average velocity = 2.983(Ft/s)  
 !!Warning: Water is above left or right bank elevations  
 Channel flow top width = 42.000(Ft.)  
 Flow Velocity = 2.98(Ft/s)  
 Travel time = 5.35 min.  
 Time of concentration = 39.24 min.

Sub-Channel No. 1 Critical depth = 1.953(Ft.)  
 ' ' ' Critical flow top width = 33.625(Ft.)  
 ' ' ' Critical flow velocity= 6.962(Ft/s)  
 ' ' ' Critical flow area = 50.415(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth

Adding area flow to channel

UNDEVELOPED (poor cover) subarea

Runoff Coefficient = 0.717

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) = 78.00

Pervious area fraction = 1.000; Impervious fraction = 0.000

Rainfall intensity = 1.478(In/Hr) for a 100.0 year storm

Subarea runoff = 1.495(CFS) for 1.410(Ac.)

Total runoff = 351.695(CFS) Total area = 251.890(Ac.)

Depth of flow = 3.662(Ft.), Average velocity = 2.985(Ft/s)

!!Warning: Water is above left or right bank elevations

ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth = 1.969(Ft.)  
 ' ' ' Critical flow top width = 33.750(Ft.)  
 ' ' ' Critical flow velocity= 6.904(Ft/s)  
 ' ' ' Critical flow area = 50.941(Sq.Ft)

+++++

Process from Point/Station 10.000 to Point/Station 134.000

\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 251.890(Ac.)  
Runoff from this stream = 351.695(CFS)  
Time of concentration = 39.24 min.  
Rainfall intensity = 1.478(In/Hr)  
Summary of stream data:

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

1	89.037	27.43	1.787
2	351.695	39.24	1.478

Largest stream flow has longer time of concentration

$Q_p = 351.695 + \text{sum of}$   
 $Q_b \quad I_a/I_b$   
 $89.037 * 0.827 = 73.639$

$Q_p = 425.334$

Total of 2 main streams to confluence:

Flow rates before confluence point:

89.037      351.695

Area of streams before confluence:

53.350      251.890

Results of confluence:

Total flow rate = 425.334(CFS)

Time of concentration = 39.243 min.

Effective stream area after confluence = 305.240(Ac.)

+++++  
Process from Point/Station 134.000 to Point/Station 170.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1493.400(Ft.)  
Downstream point elevation = 1493.200(Ft.)  
Channel length thru subarea = 163.000(Ft.)  
Channel base width = 18.000(Ft.)  
Slope or 'Z' of left channel bank = 3.000  
Slope or 'Z' of right channel bank = 3.000  
Estimated mean flow rate at midpoint of channel = 425.515(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 5.000(Ft.)  
Flow(q) thru subarea = 425.515(CFS)  
Depth of flow = 4.715(Ft.), Average velocity = 2.808(Ft/s)  
Channel flow top width = 46.288(Ft.)  
Flow Velocity = 2.81(Ft/s)  
Travel time = 0.97 min.  
Time of concentration = 40.21 min.

Sub-Channel No. 1 Critical depth = 2.266(Ft.)  
 ' ' ' Critical flow top width = 31.594(Ft.)  
 ' ' ' Critical flow velocity= 7.574(Ft/s)  
 ' ' ' Critical flow area = 56.180(Sq.Ft)

Adding area flow to channel  
 UNDEVELOPED (poor cover) subarea  
 Runoff Coefficient = 0.716  
 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) = 78.00  
 Pervious area fraction = 1.000; Impervious fraction = 0.000  
 Rainfall intensity = 1.459(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.271(CFS) for 0.260(Ac.)  
 Total runoff = 425.605(CFS) Total area = 305.500(Ac.)  
 Depth of flow = 4.715(Ft.), Average velocity = 2.808(Ft/s)

Sub-Channel No. 1 Critical depth = 2.266(Ft.)  
 ' ' ' Critical flow top width = 31.594(Ft.)  
 ' ' ' Critical flow velocity= 7.576(Ft/s)  
 ' ' ' Critical flow area = 56.180(Sq.Ft)

+++++  
 Process from Point/Station 170.000 to Point/Station 200.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1493.200(Ft.)  
 Downstream point elevation = 1493.000(Ft.)  
 Channel length thru subarea = 294.000(Ft.)  
 Channel base width = 18.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Estimated mean flow rate at midpoint of channel = 426.076(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 6.000(Ft.)  
 Flow(q) thru subarea = 426.076(CFS)  
 Depth of flow = 5.151(Ft.), Average velocity = 2.143(Ft/s)  
 Channel flow top width = 59.210(Ft.)  
 Flow Velocity = 2.14(Ft/s)  
 Travel time = 2.29 min.  
 Time of concentration = 42.50 min.

Sub-Channel No. 1 Critical depth = 2.188(Ft.)  
 ' ' ' Critical flow top width = 35.500(Ft.)  
 ' ' ' Critical flow velocity= 7.281(Ft/s)  
 ' ' ' Critical flow area = 58.516(Sq.Ft)

Adding area flow to channel  
 UNDEVELOPED (poor cover) subarea  
 Runoff Coefficient = 0.729  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.750  
 Decimal fraction soil group C = 0.250  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 80.00  
 Pervious area fraction = 1.000; Impervious fraction = 0.000  
 Rainfall intensity = 1.417(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.867(CFS) for 0.840(Ac.)  
 Total runoff = 426.472(CFS) Total area = 306.340(Ac.)  
 Depth of flow = 5.154(Ft.), Average velocity = 2.143(Ft/s)

Sub-Channel No. 1 Critical depth = 2.188(Ft.)  
 ' ' ' Critical flow top width = 35.500(Ft.)  
 ' ' ' Critical flow velocity= 7.288(Ft/s)  
 ' ' ' Critical flow area = 58.516(Sq.Ft)

+++++  
 Process from Point/Station 200.000 to Point/Station 202.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1493.000(Ft.)  
 Downstream point elevation = 1491.500(Ft.)  
 Channel length thru subarea = 780.000(Ft.)  
 Channel base width = 18.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Estimated mean flow rate at midpoint of channel = 427.007(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 5.000(Ft.)  
 Flow(q) thru subarea = 427.007(CFS)  
 Depth of flow = 4.004(Ft.), Average velocity = 3.135(Ft/s)  
 Channel flow top width = 50.032(Ft.)  
 Flow Velocity = 3.14(Ft/s)  
 Travel time = 4.15 min.  
 Time of concentration = 46.64 min.

Sub-Channel No. 1 Critical depth = 2.188(Ft.)  
 ' ' ' Critical flow top width = 35.500(Ft.)  
 ' ' ' Critical flow velocity= 7.297(Ft/s)  
 ' ' ' Critical flow area = 58.516(Sq.Ft)

Adding area flow to channel  
 UNDEVELOPED (poor cover) subarea  
 Runoff Coefficient = 0.732  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.600  
 Decimal fraction soil group C = 0.400

Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 81.20  
 Pervious area fraction = 1.000; Impervious fraction = 0.000  
 Rainfall intensity = 1.348(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.017(CFS) for 1.030(Ac.)  
 Total runoff = 427.489(CFS) Total area = 307.370(Ac.)  
 Depth of flow = 4.006(Ft.), Average velocity = 3.136(Ft/s)

Sub-Channel No. 1 Critical depth = 2.188(Ft.)  
 ' ' ' Critical flow top width = 35.500(Ft.)  
 ' ' ' Critical flow velocity= 7.306(Ft/s)  
 ' ' ' Critical flow area = 58.516(Sq.Ft)

+++++  
 Process from Point/Station 200.000 to Point/Station 202.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
 Stream flow area = 307.370(Ac.)  
 Runoff from this stream = 427.489(CFS)  
 Time of concentration = 46.64 min.  
 Rainfall intensity = 1.348(In/Hr)

+++++  
 Process from Point/Station 210.000 to Point/Station 212.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 649.000(Ft.)  
 Top (of initial area) elevation = 1507.400(Ft.)  
 Bottom (of initial area) elevation = 1502.200(Ft.)  
 Difference in elevation = 5.200(Ft.)  
 Slope = 0.00801 s(percent)= 0.80  
 $TC = k(0.940)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 32.906 min.  
 Rainfall intensity = 1.622(In/Hr) for a 100.0 year storm  
 UNDEVELOPED (good cover) subarea  
 Runoff Coefficient = 0.590  
 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 = 5.130(CFS)  
 Total initial stream area = 5.360(Ac.)  
 Pervious area fraction = 1.000

+++++

Process from Point/Station 212.000 to Point/Station 214.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1502.200(Ft.)  
Downstream point/station elevation = 1501.800(Ft.)  
Pipe length = 37.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 5.130(CFS)  
Nearest computed pipe diameter = 15.00(In.)  
Calculated individual pipe flow = 5.130(CFS)  
Normal flow depth in pipe = 9.82(In.)  
Flow top width inside pipe = 14.26(In.)  
Critical Depth = 11.03(In.)  
Pipe flow velocity = 6.03(Ft/s)  
Travel time through pipe = 0.10 min.  
Time of concentration (TC) = 33.01 min.

+++++  
Process from Point/Station 214.000 to Point/Station 214.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.723  
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 = 33.01 min.  
Rainfall intensity = 1.620(In/Hr) for a 100.0 year storm  
Subarea runoff = 3.432(CFS) for 2.930(Ac.)  
Total runoff = 8.563(CFS) Total area = 8.290(Ac.)

+++++  
Process from Point/Station 214.000 to Point/Station 216.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1501.800(Ft.)  
Downstream point/station elevation = 1501.400(Ft.)  
Pipe length = 40.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 8.563(CFS)  
Nearest computed pipe diameter = 18.00(In.)  
Calculated individual pipe flow = 8.563(CFS)  
Normal flow depth in pipe = 12.35(In.)  
Flow top width inside pipe = 16.71(In.)  
Critical Depth = 13.60(In.)  
Pipe flow velocity = 6.63(Ft/s)  
Travel time through pipe = 0.10 min.  
Time of concentration (TC) = 33.11 min.



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+++++
Process from Point/Station      216.000 to Point/Station      218.000
**** IMPROVED CHANNEL TRAVEL TIME ****

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Upstream point elevation = 1497.000(Ft.)
Downstream point elevation = 1495.900(Ft.)
Channel length thru subarea = 301.000(Ft.)
Channel base width = 18.000(Ft.)
Slope or 'Z' of left channel bank = 3.000
Slope or 'Z' of right channel bank = 3.000
Estimated mean flow rate at midpoint of channel = 8.759(CFS)
Manning's 'N' = 0.040
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 8.759(CFS)
Depth of flow = 0.395(Ft.), Average velocity = 1.156(Ft/s)
Channel flow top width = 20.369(Ft.)
Flow Velocity = 1.16(Ft/s)
Travel time = 4.34 min.
Time of concentration = 37.45 min.

```

```

Sub-Channel No. 1 Critical depth = 0.191(Ft.)
'      '      '      Critical flow top width = 19.148(Ft.)
'      '      '      Critical flow velocity= 2.464(Ft/s)
'      '      '      Critical flow area = 3.555(Sq.Ft)

```

```

Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.716
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
Rainfall intensity = 1.515(In/Hr) for a 100.0 year storm
Subarea runoff = 0.412(CFS) for 0.380(Ac.)
Total runoff = 8.975(CFS) Total area = 8.670(Ac.)
Depth of flow = 0.401(Ft.), Average velocity = 1.167(Ft/s)

```

```

Sub-Channel No. 1 Critical depth = 0.195(Ft.)
'      '      '      Critical flow top width = 19.172(Ft.)
'      '      '      Critical flow velocity= 2.472(Ft/s)
'      '      '      Critical flow area = 3.630(Sq.Ft)

```

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+++++
Process from Point/Station      220.000 to Point/Station      218.000
**** SUBAREA FLOW ADDITION ****

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---

```

SINGLE FAMILY (1/4 Acre Lot)

```

Runoff Coefficient = 0.716  
 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 = 37.45 min.  
 Rainfall intensity = 1.515(In/Hr) for a 100.0 year storm  
 Subarea runoff = 2.668(CFS) for 2.460(Ac.)  
 Total runoff = 11.643(CFS) Total area = 11.130(Ac.)

++++++  
 Process from Point/Station 218.000 to Point/Station 222.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.900(Ft.)  
 Downstream point elevation = 1495.500(Ft.)  
 Channel length thru subarea = 118.000(Ft.)  
 Channel base width = 25.000(Ft.)  
 Slope or 'Z' of left channel bank = 3.000  
 Slope or 'Z' of right channel bank = 3.000  
 Estimated mean flow rate at midpoint of channel = 11.727(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 11.727(CFS)  
 Depth of flow = 0.396(Ft.), Average velocity = 1.130(Ft/s)  
 Channel flow top width = 27.378(Ft.)  
 Flow Velocity = 1.13(Ft/s)  
 Travel time = 1.74 min.  
 Time of concentration = 39.19 min.

Sub-Channel No. 1 Critical depth = 0.188(Ft.)  
 ' ' ' Critical flow top width = 26.125(Ft.)  
 ' ' ' Critical flow velocity = 2.447(Ft/s)  
 ' ' ' Critical flow area = 4.793(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.713  
 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  
 Rainfall intensity = 1.479(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.169(CFS) for 0.160(Ac.)  
 Total runoff = 11.812(CFS) Total area = 11.290(Ac.)  
 Depth of flow = 0.398(Ft.), Average velocity = 1.133(Ft/s)

Sub-Channel No. 1 Critical depth = 0.189(Ft.)  
 ' ' ' Critical flow top width = 26.137(Ft.)  
 ' ' ' Critical flow velocity= 2.439(Ft/s)  
 ' ' ' Critical flow area = 4.844(Sq.Ft)

+++++  
 Process from Point/Station 222.000 to Point/Station 222.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.714  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.990  
 Decimal fraction soil group C = 0.010  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 56.13  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 39.19 min.  
 Rainfall intensity = 1.479(In/Hr) for a 100.0 year storm  
 Subarea runoff = 3.030(CFS) for 2.870(Ac.)  
 Total runoff = 14.843(CFS) Total area = 14.160(Ac.)

+++++  
 Process from Point/Station 222.000 to Point/Station 224.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1495.500(Ft.)  
 Downstream point/station elevation = 1495.100(Ft.)  
 Pipe length = 76.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 14.843(CFS)  
 Nearest computed pipe diameter = 24.00(In.)  
 Calculated individual pipe flow = 14.843(CFS)  
 Normal flow depth in pipe = 17.86(In.)  
 Flow top width inside pipe = 20.94(In.)  
 Critical Depth = 16.67(In.)  
 Pipe flow velocity = 5.91(Ft/s)  
 Travel time through pipe = 0.21 min.  
 Time of concentration (TC) = 39.40 min.

+++++  
 Process from Point/Station 224.000 to Point/Station 226.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.100(Ft.)  
 Downstream point elevation = 1494.400(Ft.)  
 Channel length thru subarea = 192.000(Ft.)  
 Channel base width = 12.000(Ft.)  
 Slope or 'Z' of left channel bank = 3.000

Slope or 'Z' of right channel bank = 3.000  
 Estimated mean flow rate at midpoint of channel = 14.963(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 14.963(CFS)  
 Depth of flow = 0.679(Ft.), Average velocity = 1.569(Ft/s)  
 Channel flow top width = 16.076(Ft.)  
 Flow Velocity = 1.57(Ft/s)  
 Travel time = 2.04 min.  
 Time of concentration = 41.44 min.

Sub-Channel No. 1 Critical depth = 0.352(Ft.)  
 ' ' ' Critical flow top width = 14.109(Ft.)  
 ' ' ' Critical flow velocity= 3.260(Ft/s)  
 ' ' ' Critical flow area = 4.590(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.710  
 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  
 Rainfall intensity = 1.436(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.235(CFS) for 0.230(Ac.)  
 Total runoff = 15.077(CFS) Total area = 14.390(Ac.)  
 Depth of flow = 0.682(Ft.), Average velocity = 1.573(Ft/s)

Sub-Channel No. 1 Critical depth = 0.355(Ft.)  
 ' ' ' Critical flow top width = 14.133(Ft.)  
 ' ' ' Critical flow velocity= 3.246(Ft/s)  
 ' ' ' Critical flow area = 4.645(Sq.Ft)

++++++  
 Process from Point/Station 228.000 to Point/Station 226.000  
 \*\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.713  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.950  
 Decimal fraction soil group C = 0.050  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 56.65  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 41.44 min.  
 Rainfall intensity = 1.436(In/Hr) for a 100.0 year storm  
 Subarea runoff = 2.181(CFS) for 2.130(Ac.)

Total runoff = 17.258(CFS) Total area = 16.520(Ac.)

+++++  
Process from Point/Station 226.000 to Point/Station 202.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1494.400(Ft.)  
Downstream point elevation = 1491.500(Ft.)  
Channel length thru subarea = 684.000(Ft.)  
Channel base width = 20.000(Ft.)  
Slope or 'Z' of left channel bank = 50.000  
Slope or 'Z' of right channel bank = 50.000  
Estimated mean flow rate at midpoint of channel = 18.939(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 3.000(Ft.)  
Flow(q) thru subarea = 18.939(CFS)  
Depth of flow = 0.434(Ft.), Average velocity = 1.048(Ft/s)  
Channel flow top width = 63.357(Ft.)  
Flow Velocity = 1.05(Ft/s)  
Travel time = 10.88 min.  
Time of concentration = 52.32 min.

Sub-Channel No. 1 Critical depth = 0.246(Ft.)  
' ' ' Critical flow top width = 44.609(Ft.)  
' ' ' Critical flow velocity = 2.382(Ft/s)  
' ' ' Critical flow area = 7.950(Sq.Ft)

Adding area flow to channel  
UNDEVELOPED (poor cover) subarea  
Runoff Coefficient = 0.719  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.670  
Decimal fraction soil group C = 0.330  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 80.64  
Pervious area fraction = 1.000; Impervious fraction = 0.000  
Rainfall intensity = 1.269(In/Hr) for a 100.0 year storm  
Subarea runoff = 3.301(CFS) for 3.620(Ac.)  
Total runoff = 20.559(CFS) Total area = 20.140(Ac.)  
Depth of flow = 0.451(Ft.), Average velocity = 1.071(Ft/s)

Sub-Channel No. 1 Critical depth = 0.258(Ft.)  
' ' ' Critical flow top width = 45.781(Ft.)  
' ' ' Critical flow velocity = 2.425(Ft/s)  
' ' ' Critical flow area = 8.480(Sq.Ft)

+++++  
Process from Point/Station 230.000 to Point/Station 202.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.702  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.900  
 Decimal fraction soil group C = 0.100  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 57.30  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 52.32 min.  
 Rainfall intensity = 1.269(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.961(CFS) for 2.200(Ac.)  
 Total runoff = 22.520(CFS) Total area = 22.340(Ac.)

++++++  
 Process from Point/Station 226.000 to Point/Station 202.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
 Stream flow area = 22.340(Ac.)  
 Runoff from this stream = 22.520(CFS)  
 Time of concentration = 52.32 min.  
 Rainfall intensity = 1.269(In/Hr)  
 Summary of stream data:

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

1	427.489	46.64	1.348
2	22.520	52.32	1.269

Largest stream flow has longer or shorter time of concentration

Qp = 427.489 + sum of  
     Qa           Tb/Ta  
     22.520 \*   0.892 = 20.077  
 Qp = 447.566

Total of 2 streams to confluence:

Flow rates before confluence point:

427.489          22.520

Area of streams before confluence:

307.370          22.340

Results of confluence:

Total flow rate = 447.566(CFS)

Time of concentration = 46.644 min.

Effective stream area after confluence = 329.710(Ac.)

++++++  
 Process from Point/Station 202.000 to Point/Station 300.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1491.500(Ft.)  
Downstream point elevation = 1491.400(Ft.)  
Channel length thru subarea = 513.000(Ft.)  
Channel base width = 10.000(Ft.)  
Slope or 'Z' of left channel bank = 3.000  
Slope or 'Z' of right channel bank = 3.000  
Estimated mean flow rate at midpoint of channel = 447.939(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 5.000(Ft.)  
Flow(q) thru subarea = 447.939(CFS)  
Depth of flow = 8.294(Ft.), Average velocity = 1.745(Ft/s)  
!!Warning: Water is above left or right bank elevations  
Channel flow top width = 40.000(Ft.)  
Flow Velocity = 1.74(Ft/s)  
Travel time = 4.90 min.  
Time of concentration = 51.55 min.

Sub-Channel No. 1 Critical depth = 2.938(Ft.)  
' ' ' Critical flow top width = 27.625(Ft.)  
' ' ' Critical flow velocity= 8.106(Ft/s)  
' ' ' Critical flow area = 55.262(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth  
Adding area flow to channel  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.756  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Rainfall intensity = 1.279(In/Hr) for a 100.0 year storm  
Subarea runoff = 0.677(CFS) for 0.700(Ac.)  
Total runoff = 448.244(CFS) Total area = 330.410(Ac.)  
Depth of flow = 8.297(Ft.), Average velocity = 1.745(Ft/s)  
!!Warning: Water is above left or right bank elevations  
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth = 2.969(Ft.)  
' ' ' Critical flow top width = 27.813(Ft.)  
' ' ' Critical flow velocity= 7.986(Ft/s)  
' ' ' Critical flow area = 56.128(Sq.Ft)

++++  
Process from Point/Station 202.000 to Point/Station 300.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:



In Main Stream number: 1  
 Stream flow area = 330.410(Ac.)  
 Runoff from this stream = 448.244(CFS)  
 Time of concentration = 51.55 min.  
 Rainfall intensity = 1.279(In/Hr)  
 Program is now starting with Main Stream No. 2

+++++  
 Process from Point/Station 310.000 to Point/Station 312.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 83.000(Ft.)  
 Top (of initial area) elevation = 1504.900(Ft.)  
 Bottom (of initial area) elevation = 1504.100(Ft.)  
 Difference in elevation = 0.800(Ft.)  
 Slope = 0.00964 s(percent)= 0.96  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 5.780 min.  
 Rainfall intensity = 4.078(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.808  
 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 = 0.692(CFS)  
 Total initial stream area = 0.210(Ac.)  
 Pervious area fraction = 0.500

+++++  
 Process from Point/Station 312.000 to Point/Station 314.000  
 \*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1503.200(Ft.)  
 End of street segment elevation = 1499.000(Ft.)  
 Length of street segment = 708.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180

Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 3.230(CFS)  
 Depth of flow = 0.380(Ft.), Average velocity = 1.736(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 13.207(Ft.)  
 Flow velocity = 1.74(Ft/s)  
 Travel time = 6.80 min. TC = 12.58 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.812  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.150  
 Decimal fraction soil group C = 0.850  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 67.05  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.701(In/Hr) for a 100.0 year storm  
 Subarea runoff = 4.979(CFS) for 2.270(Ac.)  
 Total runoff = 5.671(CFS) Total area = 2.480(Ac.)  
 Street flow at end of street = 5.671(CFS)  
 Half street flow at end of street = 5.671(CFS)  
 Depth of flow = 0.448(Ft.), Average velocity = 1.981(Ft/s)  
 Flow width (from curb towards crown)= 16.573(Ft.)

++++++  
 Process from Point/Station 314.000 to Point/Station 316.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1499.000(Ft.)  
 Downstream point/station elevation = 1498.300(Ft.)  
 Pipe length = 62.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 5.671(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 5.671(CFS)  
 Normal flow depth in pipe = 10.39(In.)  
 Flow top width inside pipe = 13.84(In.)  
 Critical Depth = 11.57(In.)  
 Pipe flow velocity = 6.25(Ft/s)  
 Travel time through pipe = 0.17 min.  
 Time of concentration (TC) = 12.74 min.

++++++  
 Process from Point/Station 318.000 to Point/Station 316.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.776  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.950  
 Decimal fraction soil group C = 0.050

Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 56.65  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 12.74 min.  
Rainfall intensity = 2.682(In/Hr) for a 100.0 year storm  
Subarea runoff = 6.119(CFS) for 2.940(Ac.)  
Total runoff = 11.791(CFS) Total area = 5.420(Ac.)

+++++  
Process from Point/Station 316.000 to Point/Station 320.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1498.300(Ft.)  
Downstream point/station elevation = 1496.700(Ft.)  
Pipe length = 161.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 11.791(CFS)  
Nearest computed pipe diameter = 21.00(In.)  
Calculated individual pipe flow = 11.791(CFS)  
Normal flow depth in pipe = 13.52(In.)  
Flow top width inside pipe = 20.11(In.)  
Critical Depth = 15.36(In.)  
Pipe flow velocity = 7.20(Ft/s)  
Travel time through pipe = 0.37 min.  
Time of concentration (TC) = 13.12 min.

+++++  
Process from Point/Station 320.000 to Point/Station 320.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.813  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.100  
Decimal fraction soil group C = 0.900  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 67.70  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 13.12 min.  
Rainfall intensity = 2.642(In/Hr) for a 100.0 year storm  
Subarea runoff = 5.624(CFS) for 2.620(Ac.)  
Total runoff = 17.415(CFS) Total area = 8.040(Ac.)

+++++  
Process from Point/Station 320.000 to Point/Station 322.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1496.700(Ft.)  
Downstream point/station elevation = 1493.500(Ft.)  
Pipe length = 175.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 17.415(CFS)  
 Nearest computed pipe diameter = 21.00(In.)  
 Calculated individual pipe flow = 17.415(CFS)  
 Normal flow depth in pipe = 14.37(In.)  
 Flow top width inside pipe = 19.52(In.)  
 Critical Depth = 18.31(In.)  
 Pipe flow velocity = 9.92(Ft/s)  
 Travel time through pipe = 0.29 min.  
 Time of concentration (TC) = 13.41 min.

++++++  
 Process from Point/Station 322.000 to Point/Station 300.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1493.500(Ft.)  
 Downstream point elevation = 1491.900(Ft.)  
 Channel length thru subarea = 393.000(Ft.)  
 Channel base width = 15.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Estimated mean flow rate at midpoint of channel = 18.401(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 5.000(Ft.)  
 Flow(q) thru subarea = 18.401(CFS)  
 Depth of flow = 0.649(Ft.), Average velocity = 1.612(Ft/s)  
 Channel flow top width = 20.190(Ft.)  
 Flow Velocity = 1.61(Ft/s)  
 Travel time = 4.06 min.  
 Time of concentration = 17.47 min.

Sub-Channel No. 1 Critical depth = 0.348(Ft.)  
 ' ' ' Critical flow top width = 17.781(Ft.)  
 ' ' ' Critical flow velocity = 3.229(Ft/s)  
 ' ' ' Critical flow area = 5.698(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.806  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.269(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.884(CFS) for 1.030(Ac.)  
 Total runoff = 19.299(CFS) Total area = 9.070(Ac.)  
 Depth of flow = 0.667(Ft.), Average velocity = 1.638(Ft/s)

Sub-Channel No. 1 Critical depth = 0.359(Ft.)  
 ' ' ' Critical flow top width = 17.875(Ft.)

```

'      '      '      Critical flow velocity=      3.267(Ft/s)
'      '      '      Critical flow area =      5.907(Sq.Ft)

```

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+++++
Process from Point/Station      322.000 to Point/Station      300.000
**** CONFLUENCE OF MINOR STREAMS ****

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```

Along Main Stream number: 2 in normal stream number 1
Stream flow area =      9.070(Ac.)
Runoff from this stream =      19.299(CFS)
Time of concentration =      17.47 min.
Rainfall intensity =      2.269(In/Hr)

```

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+++++
Process from Point/Station      330.000 to Point/Station      332.000
**** INITIAL AREA EVALUATION ****

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```

Initial area flow distance =      121.000(Ft.)
Top (of initial area) elevation =      1504.900(Ft.)
Bottom (of initial area) elevation =      1503.700(Ft.)
Difference in elevation =      1.200(Ft.)
Slope =      0.00992 s(percent)=      0.99
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =      6.682 min.
Rainfall intensity =      3.777(In/Hr) for a      100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.802
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 =      0.485(CFS)
Total initial stream area =      0.160(Ac.)
Pervious area fraction = 0.500

```

```

+++++
Process from Point/Station      332.000 to Point/Station      334.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

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---

```

Top of street segment elevation =      1503.200(Ft.)
End of street segment elevation =      1500.400(Ft.)
Length of street segment =      550.000(Ft.)
Height of curb above gutter flowline =      6.0(In.)
Width of half street (curb to crown) =      30.000(Ft.)
Distance from crown to crossfall grade break =      18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 2.663(CFS)  
 Depth of flow = 0.368(Ft.), Average velocity = 1.565(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 12.590(Ft.)  
 Flow velocity = 1.57(Ft/s)  
 Travel time = 5.86 min. TC = 12.54 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.814  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.100  
 Decimal fraction soil group C = 0.900  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 67.70  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.705(In/Hr) for a 100.0 year storm  
 Subarea runoff = 4.296(CFS) for 1.950(Ac.)  
 Total runoff = 4.781(CFS) Total area = 2.110(Ac.)  
 Street flow at end of street = 4.781(CFS)  
 Half street flow at end of street = 4.781(CFS)  
 Depth of flow = 0.435(Ft.), Average velocity = 1.795(Ft/s)  
 Flow width (from curb towards crown)= 15.962(Ft.)

++++++  
 Process from Point/Station 334.000 to Point/Station 336.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1500.400(Ft.)  
 Downstream point/station elevation = 1499.500(Ft.)  
 Pipe length = 585.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 4.781(CFS)  
 Nearest computed pipe diameter = 21.00(In.)  
 Calculated individual pipe flow = 4.781(CFS)  
 Normal flow depth in pipe = 13.80(In.)  
 Flow top width inside pipe = 19.93(In.)  
 Critical Depth = 9.61(In.)  
 Pipe flow velocity = 2.85(Ft/s)  
 Travel time through pipe = 3.42 min.  
 Time of concentration (TC) = 15.96 min.

+++++

Process from Point/Station            336.000 to Point/Station            336.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.810  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 15.96 min.  
Rainfall intensity = 2.381(In/Hr) for a 100.0 year storm  
Subarea runoff = 4.934(CFS) for 2.560(Ac.)  
Total runoff = 9.715(CFS)    Total area = 4.670(Ac.)

+++++  
Process from Point/Station            336.000 to Point/Station            338.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1499.500(Ft.)  
Downstream point/station elevation = 1493.000(Ft.)  
Pipe length = 10.00(Ft.)    Manning's N = 0.013  
No. of pipes = 1    Required pipe flow = 9.715(CFS)  
Nearest computed pipe diameter = 9.00(In.)  
Calculated individual pipe flow = 9.715(CFS)  
Normal flow depth in pipe = 5.70(In.)  
Flow top width inside pipe = 8.68(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 32.93(Ft/s)  
Travel time through pipe = 0.01 min.  
Time of concentration (TC) = 15.96 min.

+++++  
Process from Point/Station            338.000 to Point/Station            300.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1493.000(Ft.)  
Downstream point elevation = 1491.900(Ft.)  
Channel length thru subarea = 101.000(Ft.)  
Channel base width = 10.000(Ft.)  
Slope or 'Z' of left channel bank = 10.000  
Slope or 'Z' of right channel bank = 10.000  
Manning's 'N' = 0.040  
Maximum depth of channel = 2.000(Ft.)  
Flow(q) thru subarea = 9.715(CFS)  
Depth of flow = 0.395(Ft.), Average velocity = 1.764(Ft/s)  
Channel flow top width = 17.895(Ft.)  
Flow Velocity = 1.76(Ft/s)  
Travel time = 0.95 min.



Time of concentration = 16.92 min.

Sub-Channel No. 1 Critical depth = 0.279(Ft.)  
' ' ' Critical flow top width = 15.586(Ft.)  
' ' ' Critical flow velocity= 2.719(Ft/s)  
' ' ' Critical flow area = 3.573(Sq.Ft)

++++  
Process from Point/Station 338.000 to Point/Station 300.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 2  
Stream flow area = 4.670(Ac.)  
Runoff from this stream = 9.715(CFS)  
Time of concentration = 16.92 min.  
Rainfall intensity = 2.308(In/Hr)  
Summary of stream data:

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

1	19.299	17.47	2.269
2	9.715	16.92	2.308

Largest stream flow has longer time of concentration

Qp = 19.299 + sum of  
Qb Ia/Ib  
9.715 \* 0.983 = 9.550  
Qp = 28.849

Total of 2 streams to confluence:

Flow rates before confluence point:

19.299 9.715

Area of streams before confluence:

9.070 4.670

Results of confluence:

Total flow rate = 28.849(CFS)

Time of concentration = 17.473 min.

Effective stream area after confluence = 13.740(Ac.)

++++  
Process from Point/Station 340.000 to Point/Station 300.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)

Runoff Coefficient = 0.806

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000

Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 17.47 min.  
 Rainfall intensity = 2.269(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.097(CFS) for 0.600(Ac.)  
 Total runoff = 29.947(CFS) Total area = 14.340(Ac.)

++++++  
 Process from Point/Station 300.000 to Point/Station 300.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 14.340(Ac.)  
 Runoff from this stream = 29.947(CFS)  
 Time of concentration = 17.47 min.  
 Rainfall intensity = 2.269(In/Hr)  
 Summary of stream data:

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

1	448.244	51.55	1.279
2	29.947	17.47	2.269

Largest stream flow has longer time of concentration

Qp = 448.244 + sum of  
       Qb       Ia/Ib  
       29.947 \* 0.564 = 16.879  
 Qp = 465.122

Total of 2 main streams to confluence:

Flow rates before confluence point:

448.244        29.947

Area of streams before confluence:

330.410        14.340

Results of confluence:

Total flow rate = 465.122(CFS)

Time of concentration = 51.545 min.

Effective stream area after confluence = 344.750(Ac.)

++++++  
 Process from Point/Station 300.000 to Point/Station 400.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1491.800(Ft.)  
 Downstream point elevation = 1491.000(Ft.)

Channel length thru subarea = 856.000(Ft.)  
 Channel base width = 20.000(Ft.)  
 Slope or 'Z' of left channel bank = 5.000  
 Slope or 'Z' of right channel bank = 10.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 5.000(Ft.)  
 Flow(q) thru subarea = 465.122(CFS)  
 Depth of flow = 4.209(Ft.), Average velocity = 2.143(Ft/s)  
 Channel flow top width = 83.140(Ft.)  
 Flow Velocity = 2.14(Ft/s)  
 Travel time = 6.66 min.  
 Time of concentration = 58.20 min.

Sub-Channel No. 1 Critical depth = 1.984(Ft.)  
 ' ' ' Critical flow top width = 49.766(Ft.)  
 ' ' ' Critical flow velocity = 6.719(Ft/s)  
 ' ' ' Critical flow area = 69.221(Sq.Ft)

++++++  
 Process from Point/Station 300.000 to Point/Station 400.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
 Stream flow area = 344.750(Ac.)  
 Runoff from this stream = 465.122(CFS)  
 Time of concentration = 58.20 min.  
 Rainfall intensity = 1.199(In/Hr)  
 Program is now starting with Main Stream No. 2

++++++  
 Process from Point/Station 410.000 to Point/Station 412.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 105.000(Ft.)  
 Top (of initial area) elevation = 1503.400(Ft.)  
 Bottom (of initial area) elevation = 1502.400(Ft.)  
 Difference in elevation = 1.000(Ft.)  
 Slope = 0.00952 s(percent) = 0.95  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 6.365 min.  
 Rainfall intensity = 3.875(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.804  
 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 = 0.561(CFS)  
 Total initial stream area = 0.180(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 412.000 to Point/Station 414.000  
 \*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1501.800(Ft.)  
 End of street segment elevation = 1500.200(Ft.)  
 Length of street segment = 232.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 2.547(CFS)  
 Depth of flow = 0.348(Ft.), Average velocity = 1.742(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 11.601(Ft.)  
 Flow velocity = 1.74(Ft/s)  
 Travel time = 2.22 min. TC = 8.58 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.792  
 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  
 Rainfall intensity = 3.307(In/Hr) for a 100.0 year storm  
 Subarea runoff = 3.875(CFS) for 1.480(Ac.)  
 Total runoff = 4.436(CFS) Total area = 1.660(Ac.)  
 Street flow at end of street = 4.436(CFS)  
 Half street flow at end of street = 4.436(CFS)  
 Depth of flow = 0.408(Ft.), Average velocity = 1.980(Ft/s)  
 Flow width (from curb towards crown)= 14.574(Ft.)

++++++  
 Process from Point/Station 414.000 to Point/Station 416.000

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

---

Upstream point/station elevation = 1500.200(Ft.)  
Downstream point/station elevation = 1498.700(Ft.)  
Pipe length = 327.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 4.436(CFS)  
Nearest computed pipe diameter = 18.00(In.)  
Calculated individual pipe flow = 4.436(CFS)  
Normal flow depth in pipe = 10.29(In.)  
Flow top width inside pipe = 17.81(In.)  
Critical Depth = 9.69(In.)  
Pipe flow velocity = 4.24(Ft/s)  
Travel time through pipe = 1.28 min.  
Time of concentration (TC) = 9.87 min.

+++++  
Process from Point/Station 418.000 to Point/Station 416.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.807  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.500  
Decimal fraction soil group C = 0.500  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 62.50  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 9.87 min.  
Rainfall intensity = 3.072(In/Hr) for a 100.0 year storm  
Subarea runoff = 13.212(CFS) for 5.330(Ac.)  
Total runoff = 17.648(CFS) Total area = 6.990(Ac.)

+++++  
Process from Point/Station 416.000 to Point/Station 420.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1498.700(Ft.)  
Downstream point/station elevation = 1498.100(Ft.)  
Pipe length = 152.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 17.648(CFS)  
Nearest computed pipe diameter = 27.00(In.)  
Calculated individual pipe flow = 17.648(CFS)  
Normal flow depth in pipe = 20.16(In.)  
Flow top width inside pipe = 23.49(In.)  
Critical Depth = 17.61(In.)  
Pipe flow velocity = 5.54(Ft/s)  
Travel time through pipe = 0.46 min.  
Time of concentration (TC) = 10.33 min.

```

+++++
Process from Point/Station      422.000 to Point/Station      420.000
**** SUBAREA FLOW ADDITION ****

```

---

```

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.812
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.330
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 64.71
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 10.33 min.
Rainfall intensity = 2.999(In/Hr) for a 100.0 year storm
Subarea runoff = 7.988(CFS) for 3.280(Ac.)
Total runoff = 25.637(CFS) Total area = 10.270(Ac.)

```

```

+++++
Process from Point/Station      420.000 to Point/Station      424.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```

---

```

Upstream point/station elevation = 1498.100(Ft.)
Downstream point/station elevation = 1496.200(Ft.)
Pipe length = 44.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 25.637(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 25.637(CFS)
Normal flow depth in pipe = 13.93(In.)
Flow top width inside pipe = 19.85(In.)
Critical depth could not be calculated.
Pipe flow velocity = 15.13(Ft/s)
Travel time through pipe = 0.05 min.
Time of concentration (TC) = 10.37 min.

```

```

+++++
Process from Point/Station      424.000 to Point/Station      426.000
**** IMPROVED CHANNEL TRAVEL TIME ****

```

---

```

Upstream point elevation = 1496.200(Ft.)
Downstream point elevation = 1495.800(Ft.)
Channel length thru subarea = 148.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 10.000
Slope or 'Z' of right channel bank = 10.000
Manning's 'N' = 0.040
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 25.637(CFS)
Depth of flow = 0.935(Ft.), Average velocity = 1.417(Ft/s)
Channel flow top width = 28.701(Ft.)
Flow Velocity = 1.42(Ft/s)

```

Travel time = 1.74 min.  
Time of concentration = 12.11 min.

Sub-Channel No. 1 Critical depth = 0.496(Ft.)  
' ' ' Critical flow top width = 19.922(Ft.)  
' ' ' Critical flow velocity = 3.454(Ft/s)  
' ' ' Critical flow area = 7.422(Sq.Ft)

+++++  
Process from Point/Station 424.000 to Point/Station 426.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 1  
Stream flow area = 10.270(Ac.)  
Runoff from this stream = 25.637(CFS)  
Time of concentration = 12.11 min.  
Rainfall intensity = 2.755(In/Hr)

+++++  
Process from Point/Station 430.000 to Point/Station 432.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 111.000(Ft.)  
Top (of initial area) elevation = 1504.300(Ft.)  
Bottom (of initial area) elevation = 1503.200(Ft.)  
Difference in elevation = 1.100(Ft.)  
Slope = 0.00991 s(percent) = 0.99  
TC =  $k(0.390) * [(length^3) / (elevation\ change)]^{0.2}$   
Initial area time of concentration = 6.456 min.  
Rainfall intensity = 3.846(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.804  
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 = 0.247(CFS)  
Total initial stream area = 0.080(Ac.)  
Pervious area fraction = 0.500

+++++  
Process from Point/Station 432.000 to Point/Station 434.000  
\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1503.100(Ft.)  
End of street segment elevation = 1501.500(Ft.)



Length of street segment = 286.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 1.622(CFS)  
 Depth of flow = 0.316(Ft.), Average velocity = 1.452(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 10.002(Ft.)  
 Flow velocity = 1.45(Ft/s)  
 Travel time = 3.28 min. TC = 9.74 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.786  
 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  
 Rainfall intensity = 3.093(In/Hr) for a 100.0 year storm  
 Subarea runoff = 2.845(CFS) for 1.170(Ac.)  
 Total runoff = 3.092(CFS) Total area = 1.250(Ac.)  
 Street flow at end of street = 3.092(CFS)  
 Half street flow at end of street = 3.092(CFS)  
 Depth of flow = 0.379(Ft.), Average velocity = 1.680(Ft/s)  
 Flow width (from curb towards crown)= 13.131(Ft.)

++++++  
 Process from Point/Station 434.000 to Point/Station 436.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1501.500(Ft.)  
 Downstream point/station elevation = 1501.100(Ft.)  
 Pipe length = 20.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 3.092(CFS)  
 Nearest computed pipe diameter = 12.00(In.)  
 Calculated individual pipe flow = 3.092(CFS)  
 Normal flow depth in pipe = 6.80(In.)  
 Flow top width inside pipe = 11.89(In.)  
 Critical Depth = 9.05(In.)  
 Pipe flow velocity = 6.74(Ft/s)

Travel time through pipe = 0.05 min.  
Time of concentration (TC) = 9.79 min.

+++++  
Process from Point/Station 436.000 to Point/Station 438.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1501.100(Ft.)  
Downstream point elevation = 1500.000(Ft.)  
Channel length thru subarea = 209.000(Ft.)  
Channel base width = 1.000(Ft.)  
Slope or 'Z' of left channel bank = 2.000  
Slope or 'Z' of right channel bank = 2.000  
Estimated mean flow rate at midpoint of channel = 3.648(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 2.000(Ft.)  
Flow(q) thru subarea = 3.648(CFS)  
Depth of flow = 0.836(Ft.), Average velocity = 1.633(Ft/s)  
Channel flow top width = 4.345(Ft.)  
Flow Velocity = 1.63(Ft/s)  
Travel time = 2.13 min.  
Time of concentration = 11.92 min.

Sub-Channel No. 1 Critical depth = 0.531(Ft.)  
' ' ' Critical flow top width = 3.125(Ft.)  
' ' ' Critical flow velocity= 3.330(Ft/s)  
' ' ' Critical flow area = 1.096(Sq.Ft)

Adding area flow to channel  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.777  
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  
Rainfall intensity = 2.779(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.036(CFS) for 0.480(Ac.)  
Total runoff = 4.128(CFS) Total area = 1.730(Ac.)  
Depth of flow = 0.885(Ft.), Average velocity = 1.685(Ft/s)

Sub-Channel No. 1 Critical depth = 0.563(Ft.)  
' ' ' Critical flow top width = 3.250(Ft.)  
' ' ' Critical flow velocity= 3.454(Ft/s)  
' ' ' Critical flow area = 1.195(Sq.Ft)

+++++  
Process from Point/Station 438.000 to Point/Station 440.000

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

---

Upstream point/station elevation = 1500.000(Ft.)  
Downstream point/station elevation = 1499.000(Ft.)  
Pipe length = 75.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 4.128(CFS)  
Nearest computed pipe diameter = 15.00(In.)  
Calculated individual pipe flow = 4.128(CFS)  
Normal flow depth in pipe = 7.97(In.)  
Flow top width inside pipe = 14.97(In.)  
Critical Depth = 9.87(In.)  
Pipe flow velocity = 6.23(Ft/s)  
Travel time through pipe = 0.20 min.  
Time of concentration (TC) = 12.12 min.

+++++  
Process from Point/Station 442.000 to Point/Station 440.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

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  
Time of concentration = 12.12 min.  
Rainfall intensity = 2.754(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.838(CFS) for 0.860(Ac.)  
Total runoff = 5.967(CFS) Total area = 2.590(Ac.)

+++++  
Process from Point/Station 440.000 to Point/Station 426.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1499.000(Ft.)  
Downstream point elevation = 1495.800(Ft.)  
Channel length thru subarea = 436.000(Ft.)  
Channel base width = 20.000(Ft.)  
Slope or 'Z' of left channel bank = 2.000  
Slope or 'Z' of right channel bank = 2.000  
Estimated mean flow rate at midpoint of channel = 6.620(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 2.000(Ft.)  
Flow(q) thru subarea = 6.620(CFS)  
Depth of flow = 0.256(Ft.), Average velocity = 1.259(Ft/s)  
Channel flow top width = 21.026(Ft.)  
Flow Velocity = 1.26(Ft/s)  
Travel time = 5.77 min.

Time of concentration = 17.89 min.

Sub-Channel No. 1 Critical depth = 0.150(Ft.)  
' ' ' Critical flow top width = 20.602(Ft.)  
' ' ' Critical flow velocity= 2.168(Ft/s)  
' ' ' Critical flow area = 3.053(Sq.Ft)

Adding area flow to channel  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.784  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.450  
Decimal fraction soil group C = 0.550  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 63.15  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Rainfall intensity = 2.241(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.212(CFS) for 0.690(Ac.)  
Total runoff = 7.179(CFS) Total area = 3.280(Ac.)  
Depth of flow = 0.269(Ft.), Average velocity = 1.299(Ft/s)

Sub-Channel No. 1 Critical depth = 0.158(Ft.)  
' ' ' Critical flow top width = 20.633(Ft.)  
' ' ' Critical flow velocity= 2.233(Ft/s)  
' ' ' Critical flow area = 3.214(Sq.Ft)

+++++  
Process from Point/Station 440.000 to Point/Station 426.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 2

Stream flow area = 3.280(Ac.)  
Runoff from this stream = 7.179(CFS)  
Time of concentration = 17.89 min.  
Rainfall intensity = 2.241(In/Hr)  
Summary of stream data:

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

1	25.637	12.11	2.755
2	7.179	17.89	2.241

Largest stream flow has longer or shorter time of concentration

Qp = 25.637 + sum of  
Qa Tb/Ta  
7.179 \* 0.677 = 4.860  
Qp = 30.496

Total of 2 streams to confluence:

Flow rates before confluence point:

25.637          7.179

Area of streams before confluence:

10.270          3.280

Results of confluence:

Total flow rate =        30.496(CFS)

Time of concentration =    12.114 min.

Effective stream area after confluence =        13.550(Ac.)

+++++  
Process from Point/Station        444.000 to Point/Station        426.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)

Runoff Coefficient = 0.819

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.020

Decimal fraction soil group C = 0.980

Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 68.74

Pervious area fraction = 0.500; Impervious fraction = 0.500

Time of concentration =    12.11 min.

Rainfall intensity =        2.755(In/Hr) for a    100.0 year storm

Subarea runoff =           0.880(CFS) for        0.390(Ac.)

Total runoff =            31.376(CFS)    Total area =        13.940(Ac.)

+++++  
Process from Point/Station        426.000 to Point/Station        446.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.800(Ft.)

Downstream point elevation = 1494.400(Ft.)

Channel length thru subarea = 467.000(Ft.)

Channel base width        = 20.000(Ft.)

Slope or 'Z' of left channel bank = 2.000

Slope or 'Z' of right channel bank = 2.000

Estimated mean flow rate at midpoint of channel =        32.295(CFS)

Manning's 'N'        = 0.040

Maximum depth of channel = 2.000(Ft.)

Flow(q) thru subarea =        32.295(CFS)

Depth of flow = 0.860(Ft.), Average velocity = 1.729(Ft/s)

Channel flow top width = 23.441(Ft.)

Flow Velocity = 1.73(Ft/s)

Travel time = 4.50 min.

Time of concentration = 16.62 min.

Sub-Channel No. 1 Critical depth = 0.426(Ft.)

'        '        '        Critical flow top width = 21.703(Ft.)

'        '        '        Critical flow velocity= 3.638(Ft/s)

'        '        '        Critical flow area = 8.878(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.808  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.330(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.751(CFS) for 0.930(Ac.)  
 Total runoff = 33.127(CFS) Total area = 14.870(Ac.)  
 Depth of flow = 0.873(Ft.), Average velocity = 1.745(Ft/s)

Sub-Channel No. 1 Critical depth = 0.434(Ft.)  
 ' ' ' Critical flow top width = 21.734(Ft.)  
 ' ' ' Critical flow velocity = 3.661(Ft/s)  
 ' ' ' Critical flow area = 9.048(Sq.Ft)

+++++  
 Process from Point/Station 446.000 to Point/Station 448.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1494.400(Ft.)  
 Downstream point/station elevation = 1493.800(Ft.)  
 Pipe length = 56.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 33.127(CFS)  
 Nearest computed pipe diameter = 27.00(In.)  
 Calculated individual pipe flow = 33.127(CFS)  
 Normal flow depth in pipe = 23.06(In.)  
 Flow top width inside pipe = 19.06(In.)  
 Critical Depth = 23.67(In.)  
 Pipe flow velocity = 9.17(Ft/s)  
 Travel time through pipe = 0.10 min.  
 Time of concentration (TC) = 16.72 min.

+++++  
 Process from Point/Station 446.000 to Point/Station 448.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 1  
 Stream flow area = 14.870(Ac.)  
 Runoff from this stream = 33.127(CFS)  
 Time of concentration = 16.72 min.  
 Rainfall intensity = 2.323(In/Hr)

+++++

Process from Point/Station 450.000 to Point/Station 452.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 889.000(Ft.)  
Top (of initial area) elevation = 1506.500(Ft.)  
Bottom (of initial area) elevation = 1500.700(Ft.)  
Difference in elevation = 5.800(Ft.)  
Slope = 0.00652 s(percent)= 0.65  
TC =  $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 16.133 min.  
Rainfall intensity = 2.367(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.762  
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 = 5.771(CFS)  
Total initial stream area = 3.200(Ac.)  
Pervious area fraction = 0.500

+++++  
Process from Point/Station 452.000 to Point/Station 454.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1500.700(Ft.)  
Downstream point/station elevation = 1499.500(Ft.)  
Pipe length = 6.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 5.771(CFS)  
Nearest computed pipe diameter = 9.00(In.)  
Calculated individual pipe flow = 5.771(CFS)  
Normal flow depth in pipe = 5.98(In.)  
Flow top width inside pipe = 8.50(In.)  
Critical depth could not be calculated.  
Pipe flow velocity = 18.52(Ft/s)  
Travel time through pipe = 0.01 min.  
Time of concentration (TC) = 16.14 min.

+++++  
Process from Point/Station 454.000 to Point/Station 456.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1499.500(Ft.)  
Downstream point elevation = 1497.900(Ft.)  
Channel length thru subarea = 410.000(Ft.)  
Channel base width = 1.000(Ft.)  
Slope or 'Z' of left channel bank = 2.000  
Slope or 'Z' of right channel bank = 2.000

Estimated mean flow rate at midpoint of channel = 5.961(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 2.000(Ft.)  
Flow(q) thru subarea = 5.961(CFS)  
Depth of flow = 1.115(Ft.), Average velocity = 1.654(Ft/s)  
Channel flow top width = 5.461(Ft.)  
Flow Velocity = 1.65(Ft/s)  
Travel time = 4.13 min.  
Time of concentration = 20.27 min.

Sub-Channel No. 1 Critical depth = 0.680(Ft.)  
' ' ' Critical flow top width = 3.719(Ft.)  
' ' ' Critical flow velocity= 3.717(Ft/s)  
' ' ' Critical flow area = 1.604(Sq.Ft)

Adding area flow to channel  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.776  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.500  
Decimal fraction soil group C = 0.500  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 62.50  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Rainfall intensity = 2.097(In/Hr) for a 100.0 year storm  
Subarea runoff = 0.342(CFS) for 0.210(Ac.)  
Total runoff = 6.113(CFS) Total area = 3.410(Ac.)  
Depth of flow = 1.128(Ft.), Average velocity = 1.665(Ft/s)

Sub-Channel No. 1 Critical depth = 0.688(Ft.)  
' ' ' Critical flow top width = 3.750(Ft.)  
' ' ' Critical flow velocity= 3.744(Ft/s)  
' ' ' Critical flow area = 1.633(Sq.Ft)

+++++  
Process from Point/Station 456.000 to Point/Station 458.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1497.900(Ft.)  
Downstream point/station elevation = 1495.400(Ft.)  
Pipe length = 503.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 6.113(CFS)  
Nearest computed pipe diameter = 18.00(In.)  
Calculated individual pipe flow = 6.113(CFS)  
Normal flow depth in pipe = 12.47(In.)  
Flow top width inside pipe = 16.61(In.)  
Critical Depth = 11.46(In.)  
Pipe flow velocity = 4.68(Ft/s)  
Travel time through pipe = 1.79 min.  
Time of concentration (TC) = 22.06 min.



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+++++
Process from Point/Station      460.000 to Point/Station      458.000
**** SUBAREA FLOW ADDITION ****

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---

```

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.796
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 22.06 min.
Rainfall intensity = 2.005(In/Hr) for a 100.0 year storm
Subarea runoff = 0.990(CFS) for 0.620(Ac.)
Total runoff = 7.103(CFS) Total area = 4.030(Ac.)

```

```

+++++
Process from Point/Station      458.000 to Point/Station      448.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

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---

```

Upstream point/station elevation = 1495.400(Ft.)
Downstream point/station elevation = 1495.000(Ft.)
Pipe length = 38.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.103(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 7.103(CFS)
Normal flow depth in pipe = 10.66(In.)
Flow top width inside pipe = 17.69(In.)
Critical Depth = 12.39(In.)
Pipe flow velocity = 6.51(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 22.16 min.

```

```

+++++
Process from Point/Station      458.000 to Point/Station      448.000
**** CONFLUENCE OF MINOR STREAMS ****

```

---

```

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 4.030(Ac.)
Runoff from this stream = 7.103(CFS)
Time of concentration = 22.16 min.
Rainfall intensity = 2.001(In/Hr)
Summary of stream data:

```

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

1	33.127	16.72	2.323
2	7.103	22.16	2.001

Largest stream flow has longer or shorter time of concentration

Qp = 33.127 + sum of

Qa	Tb/Ta	
7.103 *	0.755 =	5.360

Qp = 38.487

Total of 2 streams to confluence:

Flow rates before confluence point:

33.127	7.103
--------	-------

Area of streams before confluence:

14.870	4.030
--------	-------

Results of confluence:

Total flow rate = 38.487(CFS)

Time of concentration = 16.719 min.

Effective stream area after confluence = 18.900(Ac.)

+++++

Process from Point/Station 448.000 to Point/Station 462.000

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

---

Upstream point/station elevation = 1495.000(Ft.)

Downstream point/station elevation = 1493.600(Ft.)

Pipe length = 283.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 38.487(CFS)

Nearest computed pipe diameter = 33.00(In.)

Calculated individual pipe flow = 38.487(CFS)

Normal flow depth in pipe = 28.22(In.)

Flow top width inside pipe = 23.23(In.)

Critical Depth = 24.78(In.)

Pipe flow velocity = 7.12(Ft/s)

Travel time through pipe = 0.66 min.

Time of concentration (TC) = 17.38 min.

+++++

Process from Point/Station 462.000 to Point/Station 400.000

\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1493.600(Ft.)

Downstream point elevation = 1491.000(Ft.)

Channel length thru subarea = 784.000(Ft.)

Channel base width = 10.000(Ft.)

Slope or 'Z' of left channel bank = 10.000

Slope or 'Z' of right channel bank = 10.000

Manning's 'N' = 0.040

Maximum depth of channel = 2.000(Ft.)

Flow(q) thru subarea = 38.487(CFS)

Depth of flow = 1.084(Ft.), Average velocity = 1.704(Ft/s)

Channel flow top width = 31.680(Ft.)  
Flow Velocity = 1.70(Ft/s)  
Travel time = 7.67 min.  
Time of concentration = 25.05 min.

Sub-Channel No. 1 Critical depth = 0.625(Ft.)  
' ' ' Critical flow top width = 22.500(Ft.)  
' ' ' Critical flow velocity= 3.790(Ft/s)  
' ' ' Critical flow area = 10.156(Sq.Ft)

++++  
Process from Point/Station 462.000 to Point/Station 400.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
Stream flow area = 18.900(Ac.)  
Runoff from this stream = 38.487(CFS)  
Time of concentration = 25.05 min.  
Rainfall intensity = 1.875(In/Hr)  
Program is now starting with Main Stream No. 3

++++  
Process from Point/Station 464.000 to Point/Station 466.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 103.000(Ft.)  
Top (of initial area) elevation = 1503.800(Ft.)  
Bottom (of initial area) elevation = 1502.800(Ft.)  
Difference in elevation = 1.000(Ft.)  
Slope = 0.00971 s(percent)= 0.97  
TC =  $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 6.292 min.  
Rainfall intensity = 3.899(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.840  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Initial subarea runoff = 0.262(CFS)  
Total initial stream area = 0.080(Ac.)  
Pervious area fraction = 0.500

++++  
Process from Point/Station 466.000 to Point/Station 468.000

\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1502.300(Ft.)  
 End of street segment elevation = 1500.800(Ft.)  
 Length of street segment = 317.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 2.814(CFS)  
 Depth of flow = 0.378(Ft.), Average velocity = 1.541(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 13.073(Ft.)  
 Flow velocity = 1.54(Ft/s)  
 Travel time = 3.43 min. TC = 9.72 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.827  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 3.096(In/Hr) for a 100.0 year storm  
 Subarea runoff = 5.199(CFS) for 2.030(Ac.)  
 Total runoff = 5.461(CFS) Total area = 2.110(Ac.)  
 Street flow at end of street = 5.461(CFS)  
 Half street flow at end of street = 5.461(CFS)  
 Depth of flow = 0.458(Ft.), Average velocity = 1.801(Ft/s)  
 Flow width (from curb towards crown)= 17.075(Ft.)

++++++  
 Process from Point/Station 468.000 to Point/Station 470.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1500.800(Ft.)  
 Downstream point/station elevation = 1494.400(Ft.)  
 Pipe length = 18.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 5.461(CFS)  
 Nearest computed pipe diameter = 9.00(In.)  
 Calculated individual pipe flow = 5.461(CFS)

Normal flow depth in pipe = 4.78(In.)  
 Flow top width inside pipe = 8.98(In.)  
 Critical depth could not be calculated.  
 Pipe flow velocity = 22.89(Ft/s)  
 Travel time through pipe = 0.01 min.  
 Time of concentration (TC) = 9.73 min.

++++++  
 Process from Point/Station 470.000 to Point/Station 472.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1494.400(Ft.)  
 Downstream point elevation = 1493.400(Ft.)  
 Channel length thru subarea = 171.000(Ft.)  
 Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 2.000  
 Slope or 'Z' of right channel bank = 2.000  
 Estimated mean flow rate at midpoint of channel = 6.182(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 2.000(Ft.)  
 Flow(q) thru subarea = 6.182(CFS)  
 Depth of flow = 0.396(Ft.), Average velocity = 1.446(Ft/s)  
 Channel flow top width = 11.584(Ft.)  
 Flow Velocity = 1.45(Ft/s)  
 Travel time = 1.97 min.  
 Time of concentration = 11.70 min.

Sub-Channel No. 1 Critical depth = 0.225(Ft.)  
 ' ' ' Critical flow top width = 10.898(Ft.)  
 ' ' ' Critical flow velocity = 2.634(Ft/s)  
 ' ' ' Critical flow area = 2.347(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.821  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.806(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.359(CFS) for 0.590(Ac.)  
 Total runoff = 6.820(CFS) Total area = 2.700(Ac.)  
 Depth of flow = 0.420(Ft.), Average velocity = 1.499(Ft/s)

Sub-Channel No. 1 Critical depth = 0.238(Ft.)  
 ' ' ' Critical flow top width = 10.953(Ft.)  
 ' ' ' Critical flow velocity = 2.732(Ft/s)  
 ' ' ' Critical flow area = 2.496(Sq.Ft)

```

+++++
Process from Point/Station      472.000 to Point/Station      474.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```

---

```

Upstream point/station elevation = 1493.400(Ft.)
Downstream point/station elevation = 1492.000(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.820(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 6.820(CFS)
Normal flow depth in pipe = 9.28(In.)
Flow top width inside pipe = 10.05(In.)
Critical depth could not be calculated.
Pipe flow velocity = 10.47(Ft/s)
Travel time through pipe = 0.05 min.
Time of concentration (TC) = 11.76 min.

```

```

+++++
Process from Point/Station      474.000 to Point/Station      400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

```

---

```

Upstream point elevation = 1492.000(Ft.)
Downstream point elevation = 1491.000(Ft.)
Channel length thru subarea = 710.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 10.000
Slope or 'Z' of right channel bank = 10.000
Manning's 'N' = 0.040
Maximum depth of channel = 2.000(Ft.)
Flow(q) thru subarea = 6.820(CFS)
Depth of flow = 0.564(Ft.), Average velocity = 0.774(Ft/s)
Channel flow top width = 21.275(Ft.)
Flow Velocity = 0.77(Ft/s)
Travel time = 15.30 min.
Time of concentration = 27.05 min.

```

```

Sub-Channel No. 1 Critical depth = 0.225(Ft.)
'      '      '      Critical flow top width = 14.492(Ft.)
'      '      '      Critical flow velocity= 2.479(Ft/s)
'      '      '      Critical flow area = 2.751(Sq.Ft)

```

```

+++++
Process from Point/Station      474.000 to Point/Station      400.000
**** CONFLUENCE OF MAIN STREAMS ****

```

---

```

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

```

Stream flow area = 2.700(Ac.)  
 Runoff from this stream = 6.820(CFS)  
 Time of concentration = 27.05 min.  
 Rainfall intensity = 1.800(In/Hr)  
 Program is now starting with Main Stream No. 4

+++++  
 Process from Point/Station 480.000 to Point/Station 482.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 123.000(Ft.)  
 Top (of initial area) elevation = 1503.600(Ft.)  
 Bottom (of initial area) elevation = 1503.400(Ft.)  
 Difference in elevation = 0.200(Ft.)  
 Slope = 0.00163 s(percent)= 0.16  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 9.656 min.  
 Rainfall intensity = 3.107(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.827  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 0.540(CFS)  
 Total initial stream area = 0.210(Ac.)  
 Pervious area fraction = 0.500

+++++  
 Process from Point/Station 482.000 to Point/Station 484.000  
 \*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1502.200(Ft.)  
 End of street segment elevation = 1500.100(Ft.)  
 Length of street segment = 365.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180

Estimated mean flow rate at midpoint of street = 3.353(CFS)  
 Depth of flow = 0.386(Ft.), Average velocity = 1.730(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 13.495(Ft.)  
 Flow velocity = 1.73(Ft/s)  
 Travel time = 3.52 min. TC = 13.17 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.800  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.400  
 Decimal fraction soil group C = 0.600  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 63.80  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.636(In/Hr) for a 100.0 year storm  
 Subarea runoff = 5.543(CFS) for 2.630(Ac.)  
 Total runoff = 6.083(CFS) Total area = 2.840(Ac.)  
 Street flow at end of street = 6.083(CFS)  
 Half street flow at end of street = 6.083(CFS)  
 Depth of flow = 0.459(Ft.), Average velocity = 1.991(Ft/s)  
 Flow width (from curb towards crown)= 17.144(Ft.)

++++++  
 Process from Point/Station 484.000 to Point/Station 486.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1496.000(Ft.)  
 Downstream point elevation = 1494.900(Ft.)  
 Channel length thru subarea = 259.000(Ft.)  
 Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 2.000  
 Slope or 'Z' of right channel bank = 2.000  
 Estimated mean flow rate at midpoint of channel = 6.681(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 2.000(Ft.)  
 Flow(q) thru subarea = 6.681(CFS)  
 Depth of flow = 0.456(Ft.), Average velocity = 1.343(Ft/s)  
 Channel flow top width = 11.823(Ft.)  
 Flow Velocity = 1.34(Ft/s)  
 Travel time = 3.21 min.  
 Time of concentration = 16.39 min.

Sub-Channel No. 1 Critical depth = 0.236(Ft.)  
 ' ' ' Critical flow top width = 10.945(Ft.)  
 ' ' ' Critical flow velocity= 2.699(Ft/s)  
 ' ' ' Critical flow area = 2.475(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.786



Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.500  
 Decimal fraction soil group C = 0.500  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 62.50  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.348(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.107(CFS) for 0.600(Ac.)  
 Total runoff = 7.189(CFS) Total area = 3.440(Ac.)  
 Depth of flow = 0.476(Ft.), Average velocity = 1.379(Ft/s)

Sub-Channel No. 1 Critical depth = 0.248(Ft.)  
 ' ' ' Critical flow top width = 10.992(Ft.)  
 ' ' ' Critical flow velocity = 2.761(Ft/s)  
 ' ' ' Critical flow area = 2.604(Sq.Ft)

++++++  
 Process from Point/Station 486.000 to Point/Station 488.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1494.900(Ft.)  
 Downstream point/station elevation = 1494.700(Ft.)  
 Pipe length = 55.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 7.189(CFS)  
 Nearest computed pipe diameter = 21.00(In.)  
 Calculated individual pipe flow = 7.189(CFS)  
 Normal flow depth in pipe = 13.59(In.)  
 Flow top width inside pipe = 20.07(In.)  
 Critical Depth = 11.89(In.)  
 Pipe flow velocity = 4.36(Ft/s)  
 Travel time through pipe = 0.21 min.  
 Time of concentration (TC) = 16.60 min.

++++++  
 Process from Point/Station 488.000 to Point/Station 488.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.801  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.150  
 Decimal fraction soil group C = 0.850  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 67.05  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 16.60 min.  
 Rainfall intensity = 2.332(In/Hr) for a 100.0 year storm  
 Subarea runoff = 3.569(CFS) for 1.910(Ac.)  
 Total runoff = 10.758(CFS) Total area = 5.350(Ac.)

```

+++++
Process from Point/Station      488.000 to Point/Station      490.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

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```

Upstream point/station elevation = 1494.700(Ft.)
Downstream point/station elevation = 1494.500(Ft.)
Pipe length = 9.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 10.758(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 10.758(CFS)
Normal flow depth in pipe = 10.96(In.)
Flow top width inside pipe = 17.57(In.)
Critical Depth = 15.09(In.)
Pipe flow velocity = 9.55(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 16.61 min.

```

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+++++
Process from Point/Station      490.000 to Point/Station      492.000
**** IMPROVED CHANNEL TRAVEL TIME ****

```

---

```

Upstream point elevation = 1494.500(Ft.)
Downstream point elevation = 1493.500(Ft.)
Channel length thru subarea = 311.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 10.000
Slope or 'Z' of right channel bank = 10.000
Estimated mean flow rate at midpoint of channel = 11.393(CFS)
Manning's 'N' = 0.040
Maximum depth of channel = 2.000(Ft.)
Flow(q) thru subarea = 11.393(CFS)
Depth of flow = 0.594(Ft.), Average velocity = 1.203(Ft/s)
Channel flow top width = 21.881(Ft.)
Flow Velocity = 1.20(Ft/s)
Travel time = 4.31 min.
Time of concentration = 20.92 min.

```

```

Sub-Channel No. 1 Critical depth = 0.309(Ft.)
'      '      '      Critical flow top width = 16.172(Ft.)
'      '      '      Critical flow velocity= 2.821(Ft/s)
'      '      '      Critical flow area = 4.038(Sq.Ft)

```

```

Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.799
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000

```

RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.063(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.203(CFS) for 0.730(Ac.)  
 Total runoff = 11.961(CFS) Total area = 6.080(Ac.)  
 Depth of flow = 0.609(Ft.), Average velocity = 1.220(Ft/s)

Sub-Channel No. 1 Critical depth = 0.316(Ft.)  
 ' ' ' Critical flow top width = 16.328(Ft.)  
 ' ' ' Critical flow velocity = 2.872(Ft/s)  
 ' ' ' Critical flow area = 4.165(Sq.Ft)

++++++  
 Process from Point/Station 492.000 to Point/Station 494.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1493.500(Ft.)  
 Downstream point/station elevation = 1493.100(Ft.)  
 Pipe length = 34.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 11.961(CFS)  
 Nearest computed pipe diameter = 21.00(In.)  
 Calculated individual pipe flow = 11.961(CFS)  
 Normal flow depth in pipe = 12.89(In.)  
 Flow top width inside pipe = 20.45(In.)  
 Critical Depth = 15.47(In.)  
 Pipe flow velocity = 7.72(Ft/s)  
 Travel time through pipe = 0.07 min.  
 Time of concentration (TC) = 20.99 min.

++++++  
 Process from Point/Station 494.000 to Point/Station 400.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1493.100(Ft.)  
 Downstream point elevation = 1491.000(Ft.)  
 Channel length thru subarea = 722.000(Ft.)  
 Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 10.000  
 Slope or 'Z' of right channel bank = 10.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 2.000(Ft.)  
 Flow(q) thru subarea = 11.961(CFS)  
 Depth of flow = 0.625(Ft.), Average velocity = 1.177(Ft/s)  
 Channel flow top width = 22.505(Ft.)  
 Flow Velocity = 1.18(Ft/s)  
 Travel time = 10.22 min.  
 Time of concentration = 31.22 min.

Sub-Channel No. 1 Critical depth = 0.316(Ft.)

'	'	'	Critical flow top width =	16.328(Ft.)
'	'	'	Critical flow velocity=	2.872(Ft/s)
'	'	'	Critical flow area =	4.165(Sq.Ft)

++++++  
 Process from Point/Station 494.000 to Point/Station 400.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 4  
 Stream flow area = 6.080(Ac.)  
 Runoff from this stream = 11.961(CFS)  
 Time of concentration = 31.22 min.  
 Rainfall intensity = 1.668(In/Hr)  
 Summary of stream data:

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

1	465.122	58.20	1.199
2	38.487	25.05	1.875
3	6.820	27.05	1.800
4	11.961	31.22	1.668

Largest stream flow has longer time of concentration

Qp = 465.122 + sum of  
     Qb      Ia/Ib  
     38.487 \* 0.640 = 24.619  
     Qb      Ia/Ib  
     6.820 \* 0.666 = 4.544  
     Qb      Ia/Ib  
     11.961 \* 0.719 = 8.597

Qp = 502.882

Total of 4 main streams to confluence:

Flow rates before confluence point:

465.122	38.487	6.820	11.961
---------	--------	-------	--------

Area of streams before confluence:

344.750	18.900	2.700	6.080
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Results of confluence:

Total flow rate = 502.882(CFS)

Time of concentration = 58.204 min.

Effective stream area after confluence = 372.430(Ac.)

++++++  
 Process from Point/Station 400.000 to Point/Station 400.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

UNDEVELOPED (fair cover) subarea  
 Runoff Coefficient = 0.695  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 79.00  
 Pervious area fraction = 1.000; Impervious fraction = 0.000  
 Time of concentration = 58.20 min.  
 Rainfall intensity = 1.199(In/Hr) for a 100.0 year storm  
 Subarea runoff = 7.522(CFS) for 9.030(Ac.)  
 Total runoff = 510.405(CFS) Total area = 381.460(Ac.)

++++++  
 Process from Point/Station 500.000 to Point/Station 502.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 114.000(Ft.)  
 Top (of initial area) elevation = 1504.700(Ft.)  
 Bottom (of initial area) elevation = 1503.600(Ft.)  
 Difference in elevation = 1.100(Ft.)  
 Slope = 0.00965 s(percent)= 0.96  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 6.560 min.  
 Rainfall intensity = 3.814(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.839  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 0.416(CFS)  
 Total initial stream area = 0.130(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 502.000 to Point/Station 504.000  
 \*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1503.100(Ft.)  
 End of street segment elevation = 1500.000(Ft.)  
 Length of street segment = 670.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 7.604(CFS)  
 Depth of flow = 0.509(Ft.), Average velocity = 1.917(Ft/s)  
 Warning: depth of flow exceeds top of curb  
 Distance that curb overflow reaches into property = 0.43(Ft.)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 19.616(Ft.)  
 Flow velocity = 1.92(Ft/s)  
 Travel time = 5.82 min. TC = 12.38 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.822  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.030  
 Decimal fraction soil group C = 0.750  
 Decimal fraction soil group D = 0.220  
 RI index for soil(AMC 2) = 69.93  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.723(In/Hr) for a 100.0 year storm  
 Subarea runoff = 14.322(CFS) for 6.400(Ac.)  
 Total runoff = 14.738(CFS) Total area = 6.530(Ac.)  
 Street flow at end of street = 14.738(CFS)  
 Half street flow at end of street = 14.738(CFS)  
 Depth of flow = 0.625(Ft.), Average velocity = 2.115(Ft/s)  
 Warning: depth of flow exceeds top of curb  
 Distance that curb overflow reaches into property = 6.23(Ft.)  
 Flow width (from curb towards crown)= 25.422(Ft.)

++++++  
 Process from Point/Station 504.000 to Point/Station 506.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1500.000(Ft.)  
 Downstream point/station elevation = 1494.000(Ft.)  
 Pipe length = 24.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 14.738(CFS)  
 Nearest computed pipe diameter = 12.00(In.)  
 Calculated individual pipe flow = 14.738(CFS)  
 Normal flow depth in pipe = 8.32(In.)  
 Flow top width inside pipe = 11.07(In.)  
 Critical depth could not be calculated.  
 Pipe flow velocity = 25.35(Ft/s)  
 Travel time through pipe = 0.02 min.  
 Time of concentration (TC) = 12.40 min.

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+++++
Process from Point/Station      506.000 to Point/Station      508.000
**** IMPROVED CHANNEL TRAVEL TIME ****

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```

Upstream point elevation = 1494.100(Ft.)
Downstream point elevation = 1492.800(Ft.)
Channel length thru subarea = 325.000(Ft.)
Channel base width      = 20.000(Ft.)
Slope or 'Z' of left channel bank = 2.000
Slope or 'Z' of right channel bank = 2.000
Estimated mean flow rate at midpoint of channel = 15.602(CFS)
Manning's 'N'          = 0.040
Maximum depth of channel = 2.000(Ft.)
Flow(q) thru subarea = 15.602(CFS)
Depth of flow = 0.513(Ft.), Average velocity = 1.447(Ft/s)
Channel flow top width = 22.051(Ft.)
Flow Velocity = 1.45(Ft/s)
Travel time = 3.74 min.
Time of concentration = 16.14 min.

```

```

Sub-Channel No. 1 Critical depth = 0.266(Ft.)
'      '      '      Critical flow top width = 21.063(Ft.)
'      '      '      Critical flow velocity= 2.861(Ft/s)
'      '      '      Critical flow area = 5.454(Sq.Ft)

```

```

Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.762
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
Rainfall intensity = 2.366(In/Hr) for a 100.0 year storm
Subarea runoff = 1.677(CFS) for 0.930(Ac.)
Total runoff = 16.414(CFS) Total area = 7.460(Ac.)
Depth of flow = 0.528(Ft.), Average velocity = 1.475(Ft/s)

```

```

Sub-Channel No. 1 Critical depth = 0.273(Ft.)
'      '      '      Critical flow top width = 21.094(Ft.)
'      '      '      Critical flow velocity= 2.922(Ft/s)
'      '      '      Critical flow area = 5.618(Sq.Ft)

```

```

+++++
Process from Point/Station      510.000 to Point/Station      508.000
**** SUBAREA FLOW ADDITION ****

```

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.799  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.450  
 Decimal fraction soil group C = 0.050  
 Decimal fraction soil group D = 0.500  
 RI index for soil(AMC 2) = 66.15  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 16.14 min.  
 Rainfall intensity = 2.366(In/Hr) for a 100.0 year storm  
 Subarea runoff = 4.747(CFS) for 2.510(Ac.)  
 Total runoff = 21.162(CFS) Total area = 9.970(Ac.)

++++++  
 Process from Point/Station 508.000 to Point/Station 512.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1492.800(Ft.)  
 Downstream point/station elevation = 1491.910(Ft.)  
 Pipe length = 163.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 21.162(CFS)  
 Nearest computed pipe diameter = 27.00(In.)  
 Calculated individual pipe flow = 21.162(CFS)  
 Normal flow depth in pipe = 20.48(In.)  
 Flow top width inside pipe = 23.11(In.)  
 Critical Depth = 19.32(In.)  
 Pipe flow velocity = 6.53(Ft/s)  
 Travel time through pipe = 0.42 min.  
 Time of concentration (TC) = 16.56 min.

++++++  
 Process from Point/Station 600.000 to Point/Station 602.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 509.000(Ft.)  
 Top (of initial area) elevation = 1501.200(Ft.)  
 Bottom (of initial area) elevation = 1498.700(Ft.)  
 Difference in elevation = 2.500(Ft.)  
 Slope = 0.00491 s(percent)= 0.49  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 13.662 min.  
 Rainfall intensity = 2.585(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.807  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.200  
 Decimal fraction soil group C = 0.800  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 66.40  
 Pervious area fraction = 0.500; Impervious fraction = 0.500



Initial subarea runoff = 4.339(CFS)  
Total initial stream area = 2.080(Ac.)  
Pervious area fraction = 0.500

+++++  
Process from Point/Station 602.000 to Point/Station 604.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1498.700(Ft.)  
Downstream point/station elevation = 1494.400(Ft.)  
Pipe length = 158.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 4.339(CFS)  
Nearest computed pipe diameter = 12.00(In.)  
Calculated individual pipe flow = 4.339(CFS)  
Normal flow depth in pipe = 7.66(In.)  
Flow top width inside pipe = 11.53(In.)  
Critical Depth = 10.50(In.)  
Pipe flow velocity = 8.19(Ft/s)  
Travel time through pipe = 0.32 min.  
Time of concentration (TC) = 13.98 min.

+++++  
Process from Point/Station 604.000 to Point/Station 606.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1494.400(Ft.)  
Downstream point elevation = 1493.600(Ft.)  
Channel length thru subarea = 84.000(Ft.)  
Channel base width = 10.000(Ft.)  
Slope or 'Z' of left channel bank = 3.000  
Slope or 'Z' of right channel bank = 2.000  
Estimated mean flow rate at midpoint of channel = 4.777(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 2.000(Ft.)  
Flow(q) thru subarea = 4.777(CFS)  
Depth of flow = 0.293(Ft.), Average velocity = 1.520(Ft/s)  
Channel flow top width = 11.464(Ft.)  
Flow Velocity = 1.52(Ft/s)  
Travel time = 0.92 min.  
Time of concentration = 14.90 min.

Sub-Channel No. 1 Critical depth = 0.189(Ft.)  
' ' ' Critical flow top width = 10.947(Ft.)  
' ' ' Critical flow velocity = 2.407(Ft/s)  
' ' ' Critical flow area = 1.984(Sq.Ft)

Adding area flow to channel  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.799  
Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.300  
 Decimal fraction soil group C = 0.700  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 65.10  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.469(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.828(CFS) for 0.420(Ac.)  
 Total runoff = 5.167(CFS) Total area = 2.500(Ac.)  
 Depth of flow = 0.307(Ft.), Average velocity = 1.564(Ft/s)

Sub-Channel No. 1 Critical depth = 0.199(Ft.)  
 ' ' ' Critical flow top width = 10.996(Ft.)  
 ' ' ' Critical flow velocity = 2.471(Ft/s)  
 ' ' ' Critical flow area = 2.091(Sq.Ft)

++++++  
 Process from Point/Station 606.000 to Point/Station 608.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1493.600(Ft.)  
 Downstream point/station elevation = 1493.300(Ft.)  
 Pipe length = 28.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 5.167(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 5.167(CFS)  
 Normal flow depth in pipe = 9.90(In.)  
 Flow top width inside pipe = 14.21(In.)  
 Critical Depth = 11.05(In.)  
 Pipe flow velocity = 6.02(Ft/s)  
 Travel time through pipe = 0.08 min.  
 Time of concentration (TC) = 14.98 min.

++++++  
 Process from Point/Station 606.000 to Point/Station 608.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
 Stream flow area = 2.500(Ac.)  
 Runoff from this stream = 5.167(CFS)  
 Time of concentration = 14.98 min.  
 Rainfall intensity = 2.462(In/Hr)

++++++  
 Process from Point/Station 700.000 to Point/Station 702.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 315.000(Ft.)  
 Top (of initial area) elevation = 1502.700(Ft.)

Bottom (of initial area) elevation = 1500.700(Ft.)  
 Difference in elevation = 2.000(Ft.)  
 Slope = 0.00635 s(percent)= 0.63  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 10.711 min.  
 Rainfall intensity = 2.941(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.824  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 3.368(CFS)  
 Total initial stream area = 1.390(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 702.000 to Point/Station 704.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1497.700(Ft.)  
 Downstream point/station elevation = 1495.500(Ft.)  
 Pipe length = 221.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 3.368(CFS)  
 Nearest computed pipe diameter = 12.00(In.)  
 Calculated individual pipe flow = 3.368(CFS)  
 Normal flow depth in pipe = 9.30(In.)  
 Flow top width inside pipe = 10.02(In.)  
 Critical Depth = 9.42(In.)  
 Pipe flow velocity = 5.15(Ft/s)  
 Travel time through pipe = 0.72 min.  
 Time of concentration (TC) = 11.43 min.

++++++  
 Process from Point/Station 704.000 to Point/Station 706.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.500(Ft.)  
 Downstream point elevation = 1494.800(Ft.)  
 Channel length thru subarea = 174.000(Ft.)  
 Channel base width = 40.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Estimated mean flow rate at midpoint of channel = 3.944(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 3.944(CFS)  
 Depth of flow = 0.149(Ft.), Average velocity = 0.654(Ft/s)

Channel flow top width = 41.188(Ft.)  
Flow Velocity = 0.65(Ft/s)  
Travel time = 4.43 min.  
Time of concentration = 15.86 min.

Sub-Channel No. 1 Critical depth = 0.067(Ft.)  
' ' ' Critical flow top width = 40.539(Ft.)  
' ' ' Critical flow velocity= 1.453(Ft/s)  
' ' ' Critical flow area = 2.713(Sq.Ft)

Adding area flow to channel  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.810  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Rainfall intensity = 2.389(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.083(CFS) for 0.560(Ac.)  
Total runoff = 4.451(CFS) Total area = 1.950(Ac.)  
Depth of flow = 0.160(Ft.), Average velocity = 0.686(Ft/s)

Sub-Channel No. 1 Critical depth = 0.072(Ft.)  
' ' ' Critical flow top width = 40.578(Ft.)  
' ' ' Critical flow velocity= 1.529(Ft/s)  
' ' ' Critical flow area = 2.912(Sq.Ft)

+++++  
Process from Point/Station 708.000 to Point/Station 706.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.815  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.030  
Decimal fraction soil group C = 0.650  
Decimal fraction soil group D = 0.320  
RI index for soil(AMC 2) = 70.53  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 15.86 min.  
Rainfall intensity = 2.389(In/Hr) for a 100.0 year storm  
Subarea runoff = 4.263(CFS) for 2.190(Ac.)  
Total runoff = 8.714(CFS) Total area = 4.140(Ac.)

+++++  
Process from Point/Station 706.000 to Point/Station 608.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1494.800(Ft.)  
 Downstream point/station elevation = 1493.300(Ft.)  
 Pipe length = 252.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 8.714(CFS)  
 Nearest computed pipe diameter = 21.00(In.)  
 Calculated individual pipe flow = 8.714(CFS)  
 Normal flow depth in pipe = 13.10(In.)  
 Flow top width inside pipe = 20.35(In.)  
 Critical Depth = 13.16(In.)  
 Pipe flow velocity = 5.52(Ft/s)  
 Travel time through pipe = 0.76 min.  
 Time of concentration (TC) = 16.62 min.

++++++  
 Process from Point/Station 706.000 to Point/Station 608.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
 Stream flow area = 4.140(Ac.)  
 Runoff from this stream = 8.714(CFS)  
 Time of concentration = 16.62 min.  
 Rainfall intensity = 2.330(In/Hr)  
 Summary of stream data:

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

1	5.167	14.98	2.462
2	8.714	16.62	2.330

Largest stream flow has longer time of concentration

$Q_p = 8.714 + \text{sum of}$   
 $\frac{Q_b}{I_a/I_b}$   
 $5.167 * 0.946 = 4.890$   
 $Q_p = 13.604$

Total of 2 streams to confluence:

Flow rates before confluence point:

5.167      8.714

Area of streams before confluence:

2.500      4.140

Results of confluence:

Total flow rate = 13.604(CFS)

Time of concentration = 16.621 min.

Effective stream area after confluence = 6.640(Ac.)

++++++  
 Process from Point/Station 608.000 to Point/Station 610.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1493.300(Ft.)  
Downstream point/station elevation = 1491.800(Ft.)  
Pipe length = 163.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 13.604(CFS)  
Nearest computed pipe diameter = 21.00(In.)  
Calculated individual pipe flow = 13.604(CFS)  
Normal flow depth in pipe = 15.49(In.)  
Flow top width inside pipe = 18.47(In.)  
Critical Depth = 16.46(In.)  
Pipe flow velocity = 7.15(Ft/s)  
Travel time through pipe = 0.38 min.  
Time of concentration (TC) = 17.00 min.

+++++  
Process from Point/Station 800.000 to Point/Station 802.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 493.000(Ft.)  
Top (of initial area) elevation = 1502.400(Ft.)  
Bottom (of initial area) elevation = 1499.300(Ft.)  
Difference in elevation = 3.100(Ft.)  
Slope = 0.00629 s(percent)= 0.63  
TC =  $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 12.838 min.  
Rainfall intensity = 2.672(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 = 0.950  
Decimal fraction soil group C = 0.050  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 56.65  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Initial subarea runoff = 3.295(CFS)  
Total initial stream area = 1.590(Ac.)  
Pervious area fraction = 0.500

+++++  
Process from Point/Station 802.000 to Point/Station 804.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1497.200(Ft.)  
Downstream point/station elevation = 1496.700(Ft.)  
Pipe length = 66.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 3.295(CFS)  
Nearest computed pipe diameter = 15.00(In.)  
Calculated individual pipe flow = 3.295(CFS)  
Normal flow depth in pipe = 8.25(In.)  
Flow top width inside pipe = 14.92(In.)

Critical Depth = 8.78(In.)  
Pipe flow velocity = 4.76(Ft/s)  
Travel time through pipe = 0.23 min.  
Time of concentration (TC) = 13.07 min.

+++++  
Process from Point/Station 804.000 to Point/Station 804.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.817  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 13.07 min.  
Rainfall intensity = 2.647(In/Hr) for a 100.0 year storm  
Subarea runoff = 0.605(CFS) for 0.280(Ac.)  
Total runoff = 3.900(CFS) Total area = 1.870(Ac.)

+++++  
Process from Point/Station 804.000 to Point/Station 900.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1496.700(Ft.)  
Downstream point/station elevation = 1494.700(Ft.)  
Pipe length = 198.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 3.900(CFS)  
Nearest computed pipe diameter = 15.00(In.)  
Calculated individual pipe flow = 3.900(CFS)  
Normal flow depth in pipe = 8.38(In.)  
Flow top width inside pipe = 14.90(In.)  
Critical Depth = 9.59(In.)  
Pipe flow velocity = 5.53(Ft/s)  
Travel time through pipe = 0.60 min.  
Time of concentration (TC) = 13.67 min.

+++++  
Process from Point/Station 902.000 to Point/Station 900.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.789  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.600  
Decimal fraction soil group C = 0.400  
Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 61.20  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 13.67 min.  
 Rainfall intensity = 2.585(In/Hr) for a 100.0 year storm  
 Subarea runoff = 4.895(CFS) for 2.400(Ac.)  
 Total runoff = 8.795(CFS) Total area = 4.270(Ac.)

++++++  
 Process from Point/Station 900.000 to Point/Station 904.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1496.100(Ft.)  
 Downstream point/station elevation = 1495.400(Ft.)  
 Pipe length = 70.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 8.795(CFS)  
 Nearest computed pipe diameter = 18.00(In.)  
 Calculated individual pipe flow = 8.795(CFS)  
 Normal flow depth in pipe = 12.61(In.)  
 Flow top width inside pipe = 16.49(In.)  
 Critical Depth = 13.77(In.)  
 Pipe flow velocity = 6.66(Ft/s)  
 Travel time through pipe = 0.18 min.  
 Time of concentration (TC) = 13.84 min.

++++++  
 Process from Point/Station 904.000 to Point/Station 906.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.400(Ft.)  
 Downstream point elevation = 1494.500(Ft.)  
 Channel length thru subarea = 209.000(Ft.)  
 Channel base width = 40.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 8.795(CFS)  
 Depth of flow = 0.235(Ft.), Average velocity = 0.914(Ft/s)  
 Channel flow top width = 41.881(Ft.)  
 Flow Velocity = 0.91(Ft/s)  
 Travel time = 3.81 min.  
 Time of concentration = 17.65 min.

Sub-Channel No. 1 Critical depth = 0.114(Ft.)  
 ' ' ' Critical flow top width = 40.914(Ft.)  
 ' ' ' Critical flow velocity = 1.903(Ft/s)  
 ' ' ' Critical flow area = 4.623(Sq.Ft)



+++++  
Process from Point/Station 904.000 to Point/Station 906.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
Stream flow area = 4.270(Ac.)  
Runoff from this stream = 8.795(CFS)  
Time of concentration = 17.65 min.  
Rainfall intensity = 2.257(In/Hr)

+++++  
Process from Point/Station 910.000 to Point/Station 912.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 202.000(Ft.)  
Top (of initial area) elevation = 1507.600(Ft.)  
Bottom (of initial area) elevation = 1506.600(Ft.)  
Difference in elevation = 1.000(Ft.)  
Slope = 0.00495 s(percent)= 0.50  
TC =  $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 9.425 min.  
Rainfall intensity = 3.147(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.788  
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 = 1.066(CFS)  
Total initial stream area = 0.430(Ac.)  
Pervious area fraction = 0.500

+++++  
Process from Point/Station 912.000 to Point/Station 914.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1506.600(Ft.)  
Downstream point/station elevation = 1505.900(Ft.)  
Pipe length = 64.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 1.066(CFS)  
Nearest computed pipe diameter = 9.00(In.)  
Calculated individual pipe flow = 1.066(CFS)  
Normal flow depth in pipe = 5.11(In.)  
Flow top width inside pipe = 8.92(In.)  
Critical Depth = 5.69(In.)  
Pipe flow velocity = 4.12(Ft/s)  
Travel time through pipe = 0.26 min.  
Time of concentration (TC) = 9.68 min.

```

+++++
Process from Point/Station      914.000 to Point/Station      916.000
**** IMPROVED CHANNEL TRAVEL TIME ****

```

---

```

Upstream point elevation = 1505.900(Ft.)
Downstream point elevation = 1504.300(Ft.)
Channel length thru subarea = 424.000(Ft.)
Channel base width      = 4.000(Ft.)
Slope or 'Z' of left channel bank = 3.000
Slope or 'Z' of right channel bank = 3.000
Estimated mean flow rate at midpoint of channel = 1.318(CFS)
Manning's 'N'          = 0.040
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 1.318(CFS)
Depth of flow = 0.299(Ft.), Average velocity = 0.901(Ft/s)
Channel flow top width = 5.792(Ft.)
Flow Velocity = 0.90(Ft/s)
Travel time = 7.84 min.
Time of concentration = 17.52 min.

```

```

Sub-Channel No. 1 Critical depth = 0.145(Ft.)
'      '      '      Critical flow top width = 4.867(Ft.)
'      '      '      Critical flow velocity= 2.057(Ft/s)
'      '      '      Critical flow area = 0.641(Sq.Ft)

```

```

Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.758
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
Rainfall intensity = 2.266(In/Hr) for a 100.0 year storm
Subarea runoff = 0.412(CFS) for 0.240(Ac.)
Total runoff = 1.478(CFS) Total area = 0.670(Ac.)
Depth of flow = 0.319(Ft.), Average velocity = 0.936(Ft/s)

```

```

Sub-Channel No. 1 Critical depth = 0.156(Ft.)
'      '      '      Critical flow top width = 4.938(Ft.)
'      '      '      Critical flow velocity= 2.117(Ft/s)
'      '      '      Critical flow area = 0.698(Sq.Ft)

```

```

+++++
Process from Point/Station      916.000 to Point/Station      918.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```

---

Upstream point/station elevation = 1504.300(Ft.)  
 Downstream point/station elevation = 1502.400(Ft.)  
 Pipe length = 421.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 1.478(CFS)  
 Nearest computed pipe diameter = 12.00(In.)  
 Calculated individual pipe flow = 1.478(CFS)  
 Normal flow depth in pipe = 6.82(In.)  
 Flow top width inside pipe = 11.89(In.)  
 Critical Depth = 6.18(In.)  
 Pipe flow velocity = 3.21(Ft/s)  
 Travel time through pipe = 2.19 min.  
 Time of concentration (TC) = 19.71 min.

++++++  
 Process from Point/Station 920.000 to Point/Station 918.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.800  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.020  
 Decimal fraction soil group C = 0.980  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 68.74  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 19.71 min.  
 Rainfall intensity = 2.129(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.073(CFS) for 0.630(Ac.)  
 Total runoff = 2.551(CFS) Total area = 1.300(Ac.)

++++++  
 Process from Point/Station 922.000 to Point/Station 918.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.752  
 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 = 19.71 min.  
 Rainfall intensity = 2.129(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.256(CFS) for 0.160(Ac.)  
 Total runoff = 2.807(CFS) Total area = 1.460(Ac.)

++++++  
 Process from Point/Station 918.000 to Point/Station 924.000

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

---

Upstream point/station elevation = 1499.000(Ft.)  
Downstream point/station elevation = 1496.100(Ft.)  
Pipe length = 289.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 2.807(CFS)  
Nearest computed pipe diameter = 12.00(In.)  
Calculated individual pipe flow = 2.807(CFS)  
Normal flow depth in pipe = 8.02(In.)  
Flow top width inside pipe = 11.30(In.)  
Critical Depth = 8.62(In.)  
Pipe flow velocity = 5.03(Ft/s)  
Travel time through pipe = 0.96 min.  
Time of concentration (TC) = 20.67 min.

+++++  
Process from Point/Station 926.000 to Point/Station 924.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.757  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.850  
Decimal fraction soil group C = 0.150  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 57.95  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 20.67 min.  
Rainfall intensity = 2.076(In/Hr) for a 100.0 year storm  
Subarea runoff = 4.588(CFS) for 2.920(Ac.)  
Total runoff = 7.395(CFS) Total area = 4.380(Ac.)

+++++  
Process from Point/Station 924.000 to Point/Station 928.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1496.100(Ft.)  
Downstream point/station elevation = 1495.400(Ft.)  
Pipe length = 73.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 7.395(CFS)  
Nearest computed pipe diameter = 18.00(In.)  
Calculated individual pipe flow = 7.395(CFS)  
Normal flow depth in pipe = 11.30(In.)  
Flow top width inside pipe = 17.40(In.)  
Critical Depth = 12.64(In.)  
Pipe flow velocity = 6.33(Ft/s)  
Travel time through pipe = 0.19 min.  
Time of concentration (TC) = 20.86 min.

+++++  
Process from Point/Station 928.000 to Point/Station 930.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.400(Ft.)  
Downstream point elevation = 1495.100(Ft.)  
Channel length thru subarea = 94.000(Ft.)  
Channel base width = 30.000(Ft.)  
Slope or 'Z' of left channel bank = 4.000  
Slope or 'Z' of right channel bank = 4.000  
Manning's 'N' = 0.040  
Maximum depth of channel = 3.000(Ft.)  
Flow(q) thru subarea = 7.395(CFS)  
Depth of flow = 0.275(Ft.), Average velocity = 0.865(Ft/s)  
Channel flow top width = 32.198(Ft.)  
Flow Velocity = 0.87(Ft/s)  
Travel time = 1.81 min.  
Time of concentration = 22.67 min.

Sub-Channel No. 1 Critical depth = 0.123(Ft.)  
' ' ' Critical flow top width = 30.984(Ft.)  
' ' ' Critical flow velocity = 1.971(Ft/s)  
' ' ' Critical flow area = 3.752(Sq.Ft)

+++++  
Process from Point/Station 932.000 to Point/Station 930.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.795  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 22.67 min.  
Rainfall intensity = 1.977(In/Hr) for a 100.0 year storm  
Subarea runoff = 0.676(CFS) for 0.430(Ac.)  
Total runoff = 8.071(CFS) Total area = 4.810(Ac.)

+++++  
Process from Point/Station 930.000 to Point/Station 934.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1495.100(Ft.)  
Downstream point elevation = 1494.800(Ft.)  
Channel length thru subarea = 62.000(Ft.)  
Channel base width = 20.000(Ft.)

Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 8.071(CFS)  
 Depth of flow = 0.324(Ft.), Average velocity = 1.169(Ft/s)  
 Channel flow top width = 22.593(Ft.)  
 Flow Velocity = 1.17(Ft/s)  
 Travel time = 0.88 min.  
 Time of concentration = 23.55 min.

Sub-Channel No. 1 Critical depth = 0.170(Ft.)  
 ' ' ' Critical flow top width = 21.359(Ft.)  
 ' ' ' Critical flow velocity = 2.297(Ft/s)  
 ' ' ' Critical flow area = 3.514(Sq.Ft)

++++++  
 Process from Point/Station 936.000 to Point/Station 934.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.774  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.400  
 Decimal fraction soil group C = 0.600  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 63.80  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 23.55 min.  
 Rainfall intensity = 1.937(In/Hr) for a 100.0 year storm  
 Subarea runoff = 3.356(CFS) for 2.240(Ac.)  
 Total runoff = 11.428(CFS) Total area = 7.050(Ac.)

++++++  
 Process from Point/Station 934.000 to Point/Station 908.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1494.800(Ft.)  
 Downstream point elevation = 1494.500(Ft.)  
 Channel length thru subarea = 85.000(Ft.)  
 Channel base width = 20.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 11.428(CFS)  
 Depth of flow = 0.437(Ft.), Average velocity = 1.203(Ft/s)  
 Channel flow top width = 23.494(Ft.)  
 Flow Velocity = 1.20(Ft/s)

Travel time = 1.18 min.  
Time of concentration = 24.73 min.

Sub-Channel No. 1 Critical depth = 0.213(Ft.)  
' ' ' Critical flow top width = 21.703(Ft.)  
' ' ' Critical flow velocity = 2.574(Ft/s)  
' ' ' Critical flow area = 4.439(Sq.Ft)

+++++  
Process from Point/Station 934.000 to Point/Station 908.000  
\*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
Stream flow area = 7.050(Ac.)  
Runoff from this stream = 11.428(CFS)  
Time of concentration = 24.73 min.  
Rainfall intensity = 1.887(In/Hr)  
Summary of stream data:

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

1	8.795	17.65	2.257
2	11.428	24.73	1.887

Largest stream flow has longer time of concentration  
Qp = 11.428 + sum of  
Qb Ia/Ib  
8.795 \* 0.836 = 7.356  
Qp = 18.784

Total of 2 streams to confluence:  
Flow rates before confluence point:  
8.795 11.428

Area of streams before confluence:  
4.270 7.050

Results of confluence:  
Total flow rate = 18.784(CFS)  
Time of concentration = 24.732 min.  
Effective stream area after confluence = 11.320(Ac.)

+++++  
Process from Point/Station 908.000 to Point/Station 908.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.792  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 24.73 min.  
 Rainfall intensity = 1.887(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.643(CFS) for 1.100(Ac.)  
 Total runoff = 20.427(CFS) Total area = 12.420(Ac.)

++++++  
 Process from Point/Station 908.000 to Point/Station 938.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1494.500(Ft.)  
 Downstream point/station elevation = 1494.400(Ft.)  
 Pipe length = 306.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 20.427(CFS)  
 Nearest computed pipe diameter = 45.00(In.)  
 Calculated individual pipe flow = 20.427(CFS)  
 Normal flow depth in pipe = 34.50(In.)  
 Flow top width inside pipe = 38.07(In.)  
 Critical Depth = 16.28(In.)  
 Pipe flow velocity = 2.25(Ft/s)  
 Travel time through pipe = 2.27 min.  
 Time of concentration (TC) = 27.00 min.

++++++  
 Process from Point/Station 1000.000 to Point/Station 1002.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 99.000(Ft.)  
 Top (of initial area) elevation = 1507.300(Ft.)  
 Bottom (of initial area) elevation = 1506.300(Ft.)  
 Difference in elevation = 1.000(Ft.)  
 Slope = 0.01010 s(percent)= 1.01  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 6.144 min.  
 Rainfall intensity = 3.948(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.806  
 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 = 0.382(CFS)  
 Total initial stream area = 0.120(Ac.)  
 Pervious area fraction = 0.500



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+++++
Process from Point/Station      1002.000 to Point/Station      1004.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

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Top of street segment elevation = 1505.700(Ft.)
End of street segment elevation = 1503.200(Ft.)
Length of street segment = 484.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 30.000(Ft.)
Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0180
Manning's N from grade break to crown = 0.0180
Estimated mean flow rate at midpoint of street = 3.683(CFS)
Depth of flow = 0.403(Ft.), Average velocity = 1.697(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 14.331(Ft.)
Flow velocity = 1.70(Ft/s)
Travel time = 4.75 min. TC = 10.90 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.330
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 64.71
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 2.914(In/Hr) for a 100.0 year storm
Subarea runoff = 6.516(CFS) for 2.760(Ac.)
Total runoff = 6.898(CFS) Total area = 2.880(Ac.)
Street flow at end of street = 6.898(CFS)
Half street flow at end of street = 6.898(CFS)
Depth of flow = 0.484(Ft.), Average velocity = 1.969(Ft/s)
Flow width (from curb towards crown)= 18.403(Ft.)

```

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+++++
Process from Point/Station      1004.000 to Point/Station      1006.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

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---

```

Upstream point/station elevation = 1503.200(Ft.)
Downstream point/station elevation = 1500.100(Ft.)
Pipe length = 568.00(Ft.) Manning's N = 0.013

```

No. of pipes = 1    Required pipe flow =        6.898(CFS)  
 Nearest computed pipe diameter =        18.00(In.)  
 Calculated individual pipe flow =        6.898(CFS)  
 Normal flow depth in pipe =    13.22(In.)  
 Flow top width inside pipe =    15.90(In.)  
 Critical Depth =    12.19(In.)  
 Pipe flow velocity =        4.96(Ft/s)  
 Travel time through pipe =    1.91 min.  
 Time of concentration (TC) =    12.81 min.

++++++  
 Process from Point/Station        1006.000 to Point/Station        1006.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.817  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.020  
 Decimal fraction soil group C = 0.980  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 68.74  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration =    12.81 min.  
 Rainfall intensity =        2.675(In/Hr) for a    100.0 year storm  
 Subarea runoff =        6.578(CFS) for        3.010(Ac.)  
 Total runoff =        13.476(CFS)    Total area =        5.890(Ac.)

++++++  
 Process from Point/Station        1004.000 to Point/Station        1006.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
 Stream flow area =        5.890(Ac.)  
 Runoff from this stream =        13.476(CFS)  
 Time of concentration =    12.81 min.  
 Rainfall intensity =        2.675(In/Hr)

++++++  
 Process from Point/Station        1010.000 to Point/Station        1012.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance =    421.000(Ft.)  
 Top (of initial area) elevation = 1502.700(Ft.)  
 Bottom (of initial area) elevation = 1500.700(Ft.)  
 Difference in elevation =        2.000(Ft.)  
 Slope =        0.00475    s(percent)=        0.48  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration =    12.748 min.  
 Rainfall intensity =        2.682(In/Hr) for a    100.0 year storm

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.818  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 6.097(CFS)  
 Total initial stream area = 2.780(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 1012.000 to Point/Station 1006.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1498.200(Ft.)  
 Downstream point/station elevation = 1496.700(Ft.)  
 Pipe length = 147.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 6.097(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 6.097(CFS)  
 Normal flow depth in pipe = 11.48(In.)  
 Flow top width inside pipe = 12.71(In.)  
 Critical Depth = 11.96(In.)  
 Pipe flow velocity = 6.04(Ft/s)  
 Travel time through pipe = 0.41 min.  
 Time of concentration (TC) = 13.15 min.

++++++  
 Process from Point/Station 1012.000 to Point/Station 1006.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 2  
 Stream flow area = 2.780(Ac.)  
 Runoff from this stream = 6.097(CFS)  
 Time of concentration = 13.15 min.  
 Rainfall intensity = 2.638(In/Hr)  
 Summary of stream data:

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

1	13.476	12.81	2.675
2	6.097	13.15	2.638

Largest stream flow has longer or shorter time of concentration

Qp = 13.476 + sum of  
 Qa Tb/Ta  
 6.097 \* 0.974 = 5.936

Qp = 19.412

Total of 2 streams to confluence:

Flow rates before confluence point:

13.476 6.097

Area of streams before confluence:

5.890 2.780

Results of confluence:

Total flow rate = 19.412(CFS)

Time of concentration = 12.805 min.

Effective stream area after confluence = 8.670(Ac.)

+++++  
Process from Point/Station 1006.000 to Point/Station 1014.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1496.700(Ft.)

Downstream point elevation = 1495.700(Ft.)

Channel length thru subarea = 182.000(Ft.)

Channel base width = 20.000(Ft.)

Slope or 'Z' of left channel bank = 3.000

Slope or 'Z' of right channel bank = 4.000

Estimated mean flow rate at midpoint of channel = 20.102(CFS)

Manning's 'N' = 0.040

Maximum depth of channel = 3.000(Ft.)

Flow(q) thru subarea = 20.102(CFS)

Depth of flow = 0.536(Ft.), Average velocity = 1.713(Ft/s)

Channel flow top width = 23.754(Ft.)

Flow Velocity = 1.71(Ft/s)

Travel time = 1.77 min.

Time of concentration = 14.58 min.

Sub-Channel No. 1 Critical depth = 0.309(Ft.)

' ' ' Critical flow top width = 22.160(Ft.)

' ' ' Critical flow velocity = 3.090(Ft/s)

' ' ' Critical flow area = 6.505(Sq.Ft)

Adding area flow to channel

SINGLE FAMILY (1/4 Acre Lot)

Runoff Coefficient = 0.804

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.200

Decimal fraction soil group C = 0.800

Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 66.40

Pervious area fraction = 0.500; Impervious fraction = 0.500

Rainfall intensity = 2.498(In/Hr) for a 100.0 year storm

Subarea runoff = 1.306(CFS) for 0.650(Ac.)

Total runoff = 20.718(CFS) Total area = 9.320(Ac.)

Depth of flow = 0.546(Ft.), Average velocity = 1.732(Ft/s)

Sub-Channel No. 1 Critical depth = 0.316(Ft.)  
 ' ' ' Critical flow top width = 22.215(Ft.)  
 ' ' ' Critical flow velocity= 3.102(Ft/s)  
 ' ' ' Critical flow area = 6.679(Sq.Ft)

+++++  
 Process from Point/Station 1014.000 to Point/Station 1016.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1495.700(Ft.)  
 Downstream point/station elevation = 1494.300(Ft.)  
 Pipe length = 209.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 20.718(CFS)  
 Nearest computed pipe diameter = 27.00(In.)  
 Calculated individual pipe flow = 20.718(CFS)  
 Normal flow depth in pipe = 18.56(In.)  
 Flow top width inside pipe = 25.03(In.)  
 Critical Depth = 19.13(In.)  
 Pipe flow velocity = 7.11(Ft/s)  
 Travel time through pipe = 0.49 min.  
 Time of concentration (TC) = 15.07 min.

+++++  
 Process from Point/Station 1100.000 to Point/Station 1102.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 108.000(Ft.)  
 Top (of initial area) elevation = 1508.400(Ft.)  
 Bottom (of initial area) elevation = 1507.300(Ft.)  
 Difference in elevation = 1.100(Ft.)  
 Slope = 0.01019 s(percent)= 1.02  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 6.351 min.  
 Rainfall intensity = 3.880(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.840  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 0.228(CFS)  
 Total initial stream area = 0.070(Ac.)  
 Pervious area fraction = 0.500

+++++  
 Process from Point/Station 1102.000 to Point/Station 1104.000

\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*

---

Top of street segment elevation = 1506.700(Ft.)  
 End of street segment elevation = 1503.800(Ft.)  
 Length of street segment = 592.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 2.947(CFS)  
 Depth of flow = 0.381(Ft.), Average velocity = 1.579(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 13.230(Ft.)  
 Flow velocity = 1.58(Ft/s)  
 Travel time = 6.25 min. TC = 12.60 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.818  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.698(In/Hr) for a 100.0 year storm  
 Subarea runoff = 5.498(CFS) for 2.490(Ac.)  
 Total runoff = 5.726(CFS) Total area = 2.560(Ac.)  
 Street flow at end of street = 5.726(CFS)  
 Half street flow at end of street = 5.726(CFS)  
 Depth of flow = 0.462(Ft.), Average velocity = 1.846(Ft/s)  
 Flow width (from curb towards crown)= 17.280(Ft.)

++++++  
 Process from Point/Station 1104.000 to Point/Station 1106.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1503.800(Ft.)  
 Downstream point/station elevation = 1502.900(Ft.)  
 Pipe length = 136.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 5.726(CFS)  
 Nearest computed pipe diameter = 18.00(In.)  
 Calculated individual pipe flow = 5.726(CFS)

Normal flow depth in pipe = 10.78(In.)  
Flow top width inside pipe = 17.64(In.)  
Critical Depth = 11.08(In.)  
Pipe flow velocity = 5.18(Ft/s)  
Travel time through pipe = 0.44 min.  
Time of concentration (TC) = 13.04 min.

+++++  
Process from Point/Station 1106.000 to Point/Station 1106.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.809  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.200  
Decimal fraction soil group C = 0.800  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 66.40  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 13.04 min.  
Rainfall intensity = 2.650(In/Hr) for a 100.0 year storm  
Subarea runoff = 9.279(CFS) for 4.330(Ac.)  
Total runoff = 15.005(CFS) Total area = 6.890(Ac.)

+++++  
Process from Point/Station 1106.000 to Point/Station 1108.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1502.900(Ft.)  
Downstream point/station elevation = 1501.500(Ft.)  
Pipe length = 278.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 15.005(CFS)  
Nearest computed pipe diameter = 24.00(In.)  
Calculated individual pipe flow = 15.005(CFS)  
Normal flow depth in pipe = 18.40(In.)  
Flow top width inside pipe = 20.30(In.)  
Critical Depth = 16.74(In.)  
Pipe flow velocity = 5.81(Ft/s)  
Travel time through pipe = 0.80 min.  
Time of concentration (TC) = 13.84 min.

+++++  
Process from Point/Station 1108.000 to Point/Station 1108.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.809  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.150

Decimal fraction soil group C = 0.850  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 67.05  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 13.84 min.  
Rainfall intensity = 2.568(In/Hr) for a 100.0 year storm  
Subarea runoff = 12.872(CFS) for 6.200(Ac.)  
Total runoff = 27.877(CFS) Total area = 13.090(Ac.)

+++++  
Process from Point/Station 1108.000 to Point/Station 1110.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1499.300(Ft.)  
Downstream point/station elevation = 1498.500(Ft.)  
Pipe length = 80.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 27.877(CFS)  
Nearest computed pipe diameter = 27.00(In.)  
Calculated individual pipe flow = 27.877(CFS)  
Normal flow depth in pipe = 20.02(In.)  
Flow top width inside pipe = 23.65(In.)  
Critical Depth = 22.04(In.)  
Pipe flow velocity = 8.81(Ft/s)  
Travel time through pipe = 0.15 min.  
Time of concentration (TC) = 13.99 min.

+++++  
Process from Point/Station 1110.000 to Point/Station 1110.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.802  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.300  
Decimal fraction soil group C = 0.700  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 65.10  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 13.99 min.  
Rainfall intensity = 2.553(In/Hr) for a 100.0 year storm  
Subarea runoff = 5.055(CFS) for 2.470(Ac.)  
Total runoff = 32.932(CFS) Total area = 15.560(Ac.)

+++++  
Process from Point/Station 1110.000 to Point/Station 1112.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1498.500(Ft.)  
Downstream point elevation = 1497.400(Ft.)



Channel length thru subarea = 429.000(Ft.)  
 Channel base width = 90.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 32.932(CFS)  
 Depth of flow = 0.373(Ft.), Average velocity = 0.964(Ft/s)  
 Channel flow top width = 92.986(Ft.)  
 Flow Velocity = 0.96(Ft/s)  
 Travel time = 7.42 min.  
 Time of concentration = 21.40 min.

Sub-Channel No. 1 Critical depth = 0.160(Ft.)  
 ' ' ' Critical flow top width = 91.281(Ft.)  
 ' ' ' Critical flow velocity = 2.269(Ft/s)  
 ' ' ' Critical flow area = 14.517(Sq.Ft)

++++++  
 Process from Point/Station 1110.000 to Point/Station 1112.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
 Stream flow area = 15.560(Ac.)  
 Runoff from this stream = 32.932(CFS)  
 Time of concentration = 21.40 min.  
 Rainfall intensity = 2.038(In/Hr)  
 Program is now starting with Main Stream No. 2

++++++  
 Process from Point/Station 1120.000 to Point/Station 1122.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 109.000(Ft.)  
 Top (of initial area) elevation = 1505.400(Ft.)  
 Bottom (of initial area) elevation = 1504.300(Ft.)  
 Difference in elevation = 1.100(Ft.)  
 Slope = 0.01009 s(percent) = 1.01  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 6.386 min.  
 Rainfall intensity = 3.868(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.840  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00

Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 0.455(CFS)  
 Total initial stream area = 0.140(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 1122.000 to Point/Station 1124.000  
 \*\*\*\*\* STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION \*\*\*\*\*

---

Top of street segment elevation = 1503.800(Ft.)  
 End of street segment elevation = 1500.600(Ft.)  
 Length of street segment = 652.000(Ft.)  
 Height of curb above gutter flowline = 6.0(In.)  
 Width of half street (curb to crown) = 30.000(Ft.)  
 Distance from crown to crossfall grade break = 18.000(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 = 1.875(In.)  
 Manning's N in gutter = 0.0150  
 Manning's N from gutter to grade break = 0.0180  
 Manning's N from grade break to crown = 0.0180  
 Estimated mean flow rate at midpoint of street = 4.227(CFS)  
 Depth of flow = 0.422(Ft.), Average velocity = 1.719(Ft/s)  
 Streetflow hydraulics at midpoint of street travel:  
 Halfstreet flow width = 15.307(Ft.)  
 Flow velocity = 1.72(Ft/s)  
 Travel time = 6.32 min. TC = 12.71 min.  
 Adding area flow to street  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.801  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.400  
 Decimal fraction soil group C = 0.600  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 63.80  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.686(In/Hr) for a 100.0 year storm  
 Subarea runoff = 7.467(CFS) for 3.470(Ac.)  
 Total runoff = 7.922(CFS) Total area = 3.610(Ac.)  
 Street flow at end of street = 7.922(CFS)  
 Half street flow at end of street = 7.922(CFS)  
 Depth of flow = 0.511(Ft.), Average velocity = 1.976(Ft/s)  
 Warning: depth of flow exceeds top of curb  
 Distance that curb overflow reaches into property = 0.53(Ft.)  
 Flow width (from curb towards crown)= 19.721(Ft.)

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+++++
Process from Point/Station      1124.000 to Point/Station      1126.000
**** IMPROVED CHANNEL TRAVEL TIME ****

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---

```

Upstream point elevation = 1498.100(Ft.)
Downstream point elevation = 1497.900(Ft.)
Channel length thru subarea = 63.000(Ft.)
Channel base width = 50.000(Ft.)
Slope or 'Z' of left channel bank = 3.000
Slope or 'Z' of right channel bank = 4.000
Manning's 'N' = 0.040
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 7.922(CFS)
Depth of flow = 0.212(Ft.), Average velocity = 0.736(Ft/s)
Channel flow top width = 51.484(Ft.)
Flow Velocity = 0.74(Ft/s)
Travel time = 1.43 min.
Time of concentration = 14.13 min.

```

```

Sub-Channel No. 1 Critical depth = 0.092(Ft.)
' ' ' Critical flow top width = 50.643(Ft.)
' ' ' Critical flow velocity= 1.715(Ft/s)
' ' ' Critical flow area = 4.619(Sq.Ft)

```

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+++++
Process from Point/Station      1124.000 to Point/Station      1126.000
**** CONFLUENCE OF MINOR STREAMS ****

```

---

```

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.610(Ac.)
Runoff from this stream = 7.922(CFS)
Time of concentration = 14.13 min.
Rainfall intensity = 2.539(In/Hr)

```

```

+++++
Process from Point/Station      1130.000 to Point/Station      1132.000
**** INITIAL AREA EVALUATION ****

```

---

```

Initial area flow distance = 412.000(Ft.)
Top (of initial area) elevation = 1503.700(Ft.)
Bottom (of initial area) elevation = 1501.700(Ft.)
Difference in elevation = 2.000(Ft.)
Slope = 0.00485 s(percent)= 0.49
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.583 min.
Rainfall intensity = 2.700(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.816
Decimal fraction soil group A = 0.000

```

Decimal fraction soil group B = 0.050  
 Decimal fraction soil group C = 0.950  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 68.35  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 4.695(CFS)  
 Total initial stream area = 2.130(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 1132.000 to Point/Station 1126.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1499.400(Ft.)  
 Downstream point/station elevation = 1497.900(Ft.)  
 Pipe length = 145.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 4.695(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 4.695(CFS)  
 Normal flow depth in pipe = 9.38(In.)  
 Flow top width inside pipe = 14.52(In.)  
 Critical Depth = 10.54(In.)  
 Pipe flow velocity = 5.82(Ft/s)  
 Travel time through pipe = 0.42 min.  
 Time of concentration (TC) = 13.00 min.

++++++  
 Process from Point/Station 1132.000 to Point/Station 1126.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 2 in normal stream number 2  
 Stream flow area = 2.130(Ac.)  
 Runoff from this stream = 4.695(CFS)  
 Time of concentration = 13.00 min.  
 Rainfall intensity = 2.654(In/Hr)  
 Summary of stream data:

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

1	7.922	14.13	2.539
2	4.695	13.00	2.654

Largest stream flow has longer time of concentration

Qp = 7.922 + sum of  
       Qb       Ia/Ib  
       4.695 \* 0.957 = 4.491  
 Qp = 12.413

Total of 2 streams to confluence:

Flow rates before confluence point:

7.922            4.695

Area of streams before confluence:

3.610            2.130

Results of confluence:

Total flow rate =        12.413(CFS)

Time of concentration =    14.134 min.

Effective stream area after confluence =        5.740(Ac.)

+++++  
Process from Point/Station        1128.000 to Point/Station        1126.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)

Runoff Coefficient = 0.788

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.600

Decimal fraction soil group C = 0.400

Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 61.20

Pervious area fraction = 0.500; Impervious fraction = 0.500

Time of concentration =    14.13 min.

Rainfall intensity =        2.539(In/Hr) for a    100.0 year storm

Subarea runoff =        4.039(CFS) for        2.020(Ac.)

Total runoff =        16.453(CFS)    Total area =        7.760(Ac.)

+++++  
Process from Point/Station        1126.000 to Point/Station        1112.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1497.900(Ft.)

Downstream point elevation = 1497.300(Ft.)

Channel length thru subarea = 364.000(Ft.)

Channel base width = 20.000(Ft.)

Slope or 'Z' of left channel bank = 3.000

Slope or 'Z' of right channel bank = 4.000

Manning's 'N' = 0.040

Maximum depth of channel = 3.000(Ft.)

Flow(q) thru subarea = 16.453(CFS)

Depth of flow = 0.679(Ft.), Average velocity = 1.083(Ft/s)

Channel flow top width = 24.751(Ft.)

Flow Velocity = 1.08(Ft/s)

Travel time = 5.60 min.

Time of concentration = 19.73 min.

Sub-Channel No. 1 Critical depth = 0.271(Ft.)

'        '        '        Critical flow top width = 21.900(Ft.)

'        '        '        Critical flow velocity= 2.893(Ft/s)

'        '        '        Critical flow area = 5.688(Sq.Ft)

+++++  
Process from Point/Station 1126.000 to Point/Station 1112.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
In Main Stream number: 2  
Stream flow area = 7.760(Ac.)  
Runoff from this stream = 16.453(CFS)  
Time of concentration = 19.73 min.  
Rainfall intensity = 2.127(In/Hr)  
Program is now starting with Main Stream No. 3

+++++  
Process from Point/Station 1140.000 to Point/Station 1142.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 514.000(Ft.)  
Top (of initial area) elevation = 1505.200(Ft.)  
Bottom (of initial area) elevation = 1502.700(Ft.)  
Difference in elevation = 2.500(Ft.)  
Slope = 0.00486 s(percent)= 0.49  
TC =  $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 13.742 min.  
Rainfall intensity = 2.577(In/Hr) for a 100.0 year storm  
SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.815  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Initial subarea runoff = 5.294(CFS)  
Total initial stream area = 2.520(Ac.)  
Pervious area fraction = 0.500

+++++  
Process from Point/Station 1142.000 to Point/Station 1144.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1499.200(Ft.)  
Downstream point/station elevation = 1497.700(Ft.)  
Pipe length = 148.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 5.294(CFS)  
Nearest computed pipe diameter = 15.00(In.)  
Calculated individual pipe flow = 5.294(CFS)  
Normal flow depth in pipe = 10.28(In.)  
Flow top width inside pipe = 13.93(In.)

Critical Depth = 11.19(In.)  
Pipe flow velocity = 5.91(Ft/s)  
Travel time through pipe = 0.42 min.  
Time of concentration (TC) = 14.16 min.

+++++  
Process from Point/Station 1146.000 to Point/Station 1144.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.814  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 14.16 min.  
Rainfall intensity = 2.537(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.032(CFS) for 0.500(Ac.)  
Total runoff = 6.326(CFS) Total area = 3.020(Ac.)

+++++  
Process from Point/Station 1148.000 to Point/Station 1144.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.814  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.000  
Decimal fraction soil group C = 1.000  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 69.00  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 14.16 min.  
Rainfall intensity = 2.537(In/Hr) for a 100.0 year storm  
Subarea runoff = 1.260(CFS) for 0.610(Ac.)  
Total runoff = 7.586(CFS) Total area = 3.630(Ac.)

+++++  
Process from Point/Station 1144.000 to Point/Station 1112.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1497.700(Ft.)  
Downstream point elevation = 1497.300(Ft.)  
Channel length thru subarea = 248.000(Ft.)  
Channel base width = 20.000(Ft.)  
Slope or 'Z' of left channel bank = 4.000  
Slope or 'Z' of right channel bank = 3.000

Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 7.586(CFS)  
 Depth of flow = 0.433(Ft.), Average velocity = 0.814(Ft/s)  
 Channel flow top width = 23.033(Ft.)  
 Flow Velocity = 0.81(Ft/s)  
 Travel time = 5.08 min.  
 Time of concentration = 19.24 min.

Sub-Channel No. 1 Critical depth = 0.164(Ft.)  
 ' ' ' Critical flow top width = 21.148(Ft.)  
 ' ' ' Critical flow velocity = 2.247(Ft/s)  
 ' ' ' Critical flow area = 3.375(Sq.Ft)

++++++  
 Process from Point/Station 1144.000 to Point/Station 1112.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 3  
 Stream flow area = 3.630(Ac.)  
 Runoff from this stream = 7.586(CFS)  
 Time of concentration = 19.24 min.  
 Rainfall intensity = 2.156(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	32.932	21.40	2.038
2	16.453	19.73	2.127
3	7.586	19.24	2.156

Largest stream flow has longer time of concentration

Qp = 32.932 + sum of  

$$Q_b \cdot \frac{I_a}{I_b} = 16.453 * 0.958 = 15.760$$
  

$$Q_b \cdot \frac{I_a}{I_b} = 7.586 * 0.945 = 7.169$$
  
 Qp = 55.861

Total of 3 main streams to confluence:

Flow rates before confluence point:

32.932      16.453      7.586

Area of streams before confluence:

15.560      7.760      3.630

Results of confluence:

Total flow rate = 55.861(CFS)



Time of concentration = 21.402 min.  
Effective stream area after confluence = 26.950(Ac.)

+++++  
Process from Point/Station 1112.000 to Point/Station 1112.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
Runoff Coefficient = 0.791  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.150  
Decimal fraction soil group C = 0.850  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 67.05  
Pervious area fraction = 0.500; Impervious fraction = 0.500  
Time of concentration = 21.40 min.  
Rainfall intensity = 2.038(In/Hr) for a 100.0 year storm  
Subarea runoff = 4.269(CFS) for 2.650(Ac.)  
Total runoff = 60.130(CFS) Total area = 29.600(Ac.)

+++++  
Process from Point/Station 1112.000 to Point/Station 1150.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1497.300(Ft.)  
Downstream point/station elevation = 1494.800(Ft.)  
Pipe length = 283.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 60.130(CFS)  
Nearest computed pipe diameter = 36.00(In.)  
Calculated individual pipe flow = 60.130(CFS)  
Normal flow depth in pipe = 28.27(In.)  
Flow top width inside pipe = 29.57(In.)  
Critical Depth = 30.07(In.)  
Pipe flow velocity = 10.10(Ft/s)  
Travel time through pipe = 0.47 min.  
Time of concentration (TC) = 21.87 min.

+++++  
Process from Point/Station 1200.000 to Point/Station 1202.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 546.000(Ft.)  
Top (of initial area) elevation = 1511.800(Ft.)  
Bottom (of initial area) elevation = 1501.500(Ft.)  
Difference in elevation = 10.300(Ft.)  
Slope = 0.01886 s(percent)= 1.89  
TC =  $k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 10.735 min.  
Rainfall intensity = 2.937(In/Hr) for a 100.0 year storm

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.804  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.500  
 Decimal fraction soil group C = 0.500  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 62.50  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 1.629(CFS)  
 Total initial stream area = 0.690(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 1204.000 to Point/Station 1202.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.795  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.700  
 Decimal fraction soil group C = 0.300  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 59.90  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 10.74 min.  
 Rainfall intensity = 2.937(In/Hr) for a 100.0 year storm  
 Subarea runoff = 2.382(CFS) for 1.020(Ac.)  
 Total runoff = 4.011(CFS) Total area = 1.710(Ac.)

++++++  
 Process from Point/Station 1202.000 to Point/Station 1206.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1501.500(Ft.)  
 Downstream point elevation = 1498.600(Ft.)  
 Channel length thru subarea = 575.000(Ft.)  
 Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 2.000  
 Slope or 'Z' of right channel bank = 4.000  
 Estimated mean flow rate at midpoint of channel = 4.551(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 4.551(CFS)  
 Depth of flow = 0.342(Ft.), Average velocity = 1.207(Ft/s)  
 Channel flow top width = 12.051(Ft.)  
 Flow Velocity = 1.21(Ft/s)  
 Travel time = 7.94 min.  
 Time of concentration = 18.67 min.

Sub-Channel No. 1 Critical depth = 0.184(Ft.)

'	'	'	Critical flow top width =	11.102(Ft.)
'	'	'	Critical flow velocity=	2.349(Ft/s)
'	'	'	Critical flow area =	1.937(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.775  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.600  
 Decimal fraction soil group C = 0.400  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 61.20  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.191(In/Hr) for a 100.0 year storm  
 Subarea runoff = 0.984(CFS) for 0.580(Ac.)  
 Total runoff = 4.996(CFS) Total area = 2.290(Ac.)  
 Depth of flow = 0.361(Ft.), Average velocity = 1.248(Ft/s)

Sub-Channel No. 1	Critical depth =	0.193(Ft.)
'	'	'
'	Critical flow top width =	11.160(Ft.)
'	'	'
'	Critical flow velocity=	2.442(Ft/s)
'	'	'
	Critical flow area =	2.046(Sq.Ft)

+++++  
 Process from Point/Station 1208.000 to Point/Station 1206.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.792  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.250  
 Decimal fraction soil group C = 0.750  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 65.75  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Time of concentration = 18.67 min.  
 Rainfall intensity = 2.191(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.994(CFS) for 1.150(Ac.)  
 Total runoff = 6.990(CFS) Total area = 3.440(Ac.)

+++++  
 Process from Point/Station 1206.000 to Point/Station 1210.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1498.600(Ft.)  
 Downstream point elevation = 1497.800(Ft.)  
 Channel length thru subarea = 210.000(Ft.)  
 Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 2.000

Slope or 'Z' of right channel bank = 4.000  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 6.990(CFS)  
 Depth of flow = 0.477(Ft.), Average velocity = 1.282(Ft/s)  
 Channel flow top width = 12.861(Ft.)  
 Flow Velocity = 1.28(Ft/s)  
 Travel time = 2.73 min.  
 Time of concentration = 21.40 min.

Sub-Channel No. 1 Critical depth = 0.242(Ft.)  
 ' ' ' Critical flow top width = 11.453(Ft.)  
 ' ' ' Critical flow velocity = 2.691(Ft/s)  
 ' ' ' Critical flow area = 2.598(Sq.Ft)

++++++  
 Process from Point/Station 1206.000 to Point/Station 1210.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1  
 Stream flow area = 3.440(Ac.)  
 Runoff from this stream = 6.990(CFS)  
 Time of concentration = 21.40 min.  
 Rainfall intensity = 2.038(In/Hr)

++++++  
 Process from Point/Station 1220.000 to Point/Station 1222.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 516.000(Ft.)  
 Top (of initial area) elevation = 1507.200(Ft.)  
 Bottom (of initial area) elevation = 1504.700(Ft.)  
 Difference in elevation = 2.500(Ft.)  
 Slope = 0.00484 s(percent) = 0.48  
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$   
 Initial area time of concentration = 13.774 min.  
 Rainfall intensity = 2.574(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.815  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 1.000  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 69.00  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 4.531(CFS)  
 Total initial stream area = 2.160(Ac.)  
 Pervious area fraction = 0.500

```

+++++
Process from Point/Station      1222.000 to Point/Station      1224.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```

---

```

Upstream point/station elevation = 1500.500(Ft.)
Downstream point/station elevation = 1498.900(Ft.)
Pipe length = 144.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.531(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 4.531(CFS)
Normal flow depth in pipe = 8.94(In.)
Flow top width inside pipe = 14.72(In.)
Critical Depth = 10.35(In.)
Pipe flow velocity = 5.94(Ft/s)
Travel time through pipe = 0.40 min.
Time of concentration (TC) = 14.18 min.

```

```

+++++
Process from Point/Station      1224.000 to Point/Station      1210.000
**** IMPROVED CHANNEL TRAVEL TIME ****

```

---

```

Upstream point elevation = 1498.900(Ft.)
Downstream point elevation = 1497.800(Ft.)
Channel length thru subarea = 383.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 4.000
Slope or 'Z' of right channel bank = 4.000
Manning's 'N' = 0.040
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 4.531(CFS)
Depth of flow = 0.398(Ft.), Average velocity = 0.983(Ft/s)
Channel flow top width = 13.181(Ft.)
Flow Velocity = 0.98(Ft/s)
Travel time = 6.49 min.
Time of concentration = 20.67 min.

```

```

Sub-Channel No. 1 Critical depth = 0.182(Ft.)
'      '      '      Critical flow top width = 11.453(Ft.)
'      '      '      Critical flow velocity= 2.326(Ft/s)
'      '      '      Critical flow area = 1.948(Sq.Ft)

```

```

+++++
Process from Point/Station      1224.000 to Point/Station      1210.000
**** CONFLUENCE OF MINOR STREAMS ****

```

---

```

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.160(Ac.)
Runoff from this stream = 4.531(CFS)

```

Time of concentration = 20.67 min.  
 Rainfall intensity = 2.076(In/Hr)  
 Summary of stream data:

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

1	6.990	21.40	2.038
2	4.531	20.67	2.076

Largest stream flow has longer time of concentration

Qp = 6.990 + sum of  

$$Q_b \frac{I_a}{I_b}$$

$$4.531 * 0.982 = 4.449$$
 Qp = 11.439

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

6.990 4.531

Area of streams before confluence:

3.440 2.160

Results of confluence:

Total flow rate = 11.439(CFS)

Time of concentration = 21.401 min.

Effective stream area after confluence = 5.600(Ac.)

+++++  
 Process from Point/Station 1210.000 to Point/Station 1210.000  
 \*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

SINGLE FAMILY (1/4 Acre Lot)

Runoff Coefficient = 0.798

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000

Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 69.00

Pervious area fraction = 0.500; Impervious fraction = 0.500

Time of concentration = 21.40 min.

Rainfall intensity = 2.038(In/Hr) for a 100.0 year storm

Subarea runoff = 1.756(CFS) for 1.080(Ac.)

Total runoff = 13.194(CFS) Total area = 6.680(Ac.)

+++++  
 Process from Point/Station 1210.000 to Point/Station 1210.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

---

Along Main Stream number: 1 in normal stream number 1

Stream flow area = 6.680(Ac.)

Runoff from this stream = 13.194(CFS)

Time of concentration = 21.40 min.  
Rainfall intensity = 2.038(In/Hr)

+++++  
Process from Point/Station 1400.000 to Point/Station 1402.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 382.000(Ft.)  
Top (of initial area) elevation = 1513.500(Ft.)  
Bottom (of initial area) elevation = 1510.000(Ft.)  
Difference in elevation = 3.500(Ft.)  
Slope = 0.00916 s(percent)= 0.92  
TC =  $k(0.530)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
Initial area time of concentration = 14.612 min.  
Rainfall intensity = 2.495(In/Hr) for a 100.0 year storm  
UNDEVELOPED (poor cover) subarea  
Runoff Coefficient = 0.810  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.400  
Decimal fraction soil group C = 0.600  
Decimal fraction soil group D = 0.000  
RI index for soil(AMC 2) = 82.80  
Pervious area fraction = 1.000; Impervious fraction = 0.000  
Initial subarea runoff = 6.042(CFS)  
Total initial stream area = 2.990(Ac.)  
Pervious area fraction = 1.000

+++++  
Process from Point/Station 1402.000 to Point/Station 1404.000  
\*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1510.000(Ft.)  
Downstream point elevation = 1502.900(Ft.)  
Channel length thru subarea = 765.000(Ft.)  
Channel base width = 0.000(Ft.)  
Slope or 'Z' of left channel bank = 50.000  
Slope or 'Z' of right channel bank = 50.000  
Estimated mean flow rate at midpoint of channel = 16.202(CFS)  
Manning's 'N' = 0.040  
Maximum depth of channel = 3.000(Ft.)  
Flow(q) thru subarea = 16.202(CFS)  
Depth of flow = 0.483(Ft.), Average velocity = 1.388(Ft/s)  
Channel flow top width = 48.316(Ft.)  
Flow Velocity = 1.39(Ft/s)  
Travel time = 9.19 min.  
Time of concentration = 23.80 min.

Sub-Channel No. 1 Critical depth = 0.365(Ft.)  
' ' ' Critical flow top width = 36.523(Ft.)  
' ' ' Critical flow velocity= 2.429(Ft/s)

```

      '      '      '      Critical flow area =      6.670(Sq.Ft)

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.300
Decimal fraction soil group C = 0.700
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 83.60
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.926(In/Hr) for a 100.0 year storm
Subarea runoff = 20.256(CFS) for 13.270(Ac.)
Total runoff = 26.299(CFS) Total area = 16.260(Ac.)
Depth of flow = 0.579(Ft.), Average velocity = 1.567(Ft/s)

Sub-Channel No. 1 Critical depth = 0.445(Ft.)
      '      '      '      Critical flow top width = 44.531(Ft.)
      '      '      '      Critical flow velocity= 2.652(Ft/s)
      '      '      '      Critical flow area = 9.915(Sq.Ft)

```

```

+++++
Process from Point/Station 1404.000 to Point/Station 1210.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```

---

```

Upstream point/station elevation = 1502.900(Ft.)
Downstream point/station elevation = 1497.800(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 26.299(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 26.299(CFS)
Normal flow depth in pipe = 14.25(In.)
Flow top width inside pipe = 14.62(In.)
Critical depth could not be calculated.
Pipe flow velocity = 17.54(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 23.87 min.

```

```

+++++
Process from Point/Station 1404.000 to Point/Station 1210.000
**** CONFLUENCE OF MINOR STREAMS ****

```

---

```

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 16.260(Ac.)
Runoff from this stream = 26.299(CFS)
Time of concentration = 23.87 min.
Rainfall intensity = 1.923(In/Hr)
Summary of stream data:

```



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

1	13.194	21.40	2.038
2	26.299	23.87	1.923

Largest stream flow has longer time of concentration

Qp = 26.299 + sum of  

$$Q_b \quad I_a/I_b$$

$$13.194 * 0.944 = 12.453$$
Qp = 38.752

Total of 2 streams to confluence:

Flow rates before confluence point:

13.194      26.299

Area of streams before confluence:

6.680      16.260

Results of confluence:

Total flow rate = 38.752(CFS)

Time of concentration = 23.869 min.

Effective stream area after confluence = 22.940(Ac.)

\*\*\*\*\*  
Process from Point/Station 1210.000 to Point/Station 1226.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1497.800(Ft.)  
Downstream point/station elevation = 1496.900(Ft.)  
Pipe length = 207.00(Ft.) Manning's N = 0.013  
No. of pipes = 1 Required pipe flow = 38.752(CFS)  
Nearest computed pipe diameter = 36.00(In.)  
Calculated individual pipe flow = 38.752(CFS)  
Normal flow depth in pipe = 26.25(In.)  
Flow top width inside pipe = 32.00(In.)  
Critical Depth = 24.33(In.)  
Pipe flow velocity = 7.02(Ft/s)  
Travel time through pipe = 0.49 min.  
Time of concentration (TC) = 24.36 min.

\*\*\*\*\*  
Process from Point/Station 1300.000 to Point/Station 1302.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 418.000(Ft.)  
Top (of initial area) elevation = 1507.200(Ft.)  
Bottom (of initial area) elevation = 1505.200(Ft.)  
Difference in elevation = 2.000(Ft.)  
Slope = 0.00478 s(percent)= 0.48  
TC = k(0.390)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 12.693 min.

Rainfall intensity = 2.688(In/Hr) for a 100.0 year storm  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.804  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.330  
 Decimal fraction soil group C = 0.670  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 64.71  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Initial subarea runoff = 3.977(CFS)  
 Total initial stream area = 1.840(Ac.)  
 Pervious area fraction = 0.500

++++++  
 Process from Point/Station 1302.000 to Point/Station 1304.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1502.500(Ft.)  
 Downstream point/station elevation = 1501.100(Ft.)  
 Pipe length = 145.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 3.977(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 3.977(CFS)  
 Normal flow depth in pipe = 8.60(In.)  
 Flow top width inside pipe = 14.84(In.)  
 Critical Depth = 9.68(In.)  
 Pipe flow velocity = 5.46(Ft/s)  
 Travel time through pipe = 0.44 min.  
 Time of concentration (TC) = 13.14 min.

++++++  
 Process from Point/Station 1304.000 to Point/Station 1306.000  
 \*\*\*\* IMPROVED CHANNEL TRAVEL TIME \*\*\*\*

---

Upstream point elevation = 1501.100(Ft.)  
 Downstream point elevation = 1499.900(Ft.)  
 Channel length thru subarea = 292.000(Ft.)  
 Channel base width = 10.000(Ft.)  
 Slope or 'Z' of left channel bank = 4.000  
 Slope or 'Z' of right channel bank = 4.000  
 Estimated mean flow rate at midpoint of channel = 4.714(CFS)  
 Manning's 'N' = 0.040  
 Maximum depth of channel = 3.000(Ft.)  
 Flow(q) thru subarea = 4.714(CFS)  
 Depth of flow = 0.367(Ft.), Average velocity = 1.121(Ft/s)  
 Channel flow top width = 12.934(Ft.)  
 Flow Velocity = 1.12(Ft/s)  
 Travel time = 4.34 min.  
 Time of concentration = 17.48 min.

Sub-Channel No. 1 Critical depth = 0.186(Ft.)  
 ' ' ' Critical flow top width = 11.484(Ft.)  
 ' ' ' Critical flow velocity= 2.365(Ft/s)  
 ' ' ' Critical flow area = 1.993(Sq.Ft)

Adding area flow to channel  
 SINGLE FAMILY (1/4 Acre Lot)  
 Runoff Coefficient = 0.778  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.600  
 Decimal fraction soil group C = 0.400  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 61.20  
 Pervious area fraction = 0.500; Impervious fraction = 0.500  
 Rainfall intensity = 2.269(In/Hr) for a 100.0 year storm  
 Subarea runoff = 1.394(CFS) for 0.790(Ac.)  
 Total runoff = 5.371(CFS) Total area = 2.630(Ac.)  
 Depth of flow = 0.396(Ft.), Average velocity = 1.172(Ft/s)

Sub-Channel No. 1 Critical depth = 0.203(Ft.)  
 ' ' ' Critical flow top width = 11.625(Ft.)  
 ' ' ' Critical flow velocity= 2.446(Ft/s)  
 ' ' ' Critical flow area = 2.196(Sq.Ft)

+++++  
 Process from Point/Station 1306.000 to Point/Station 1308.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1499.900(Ft.)  
 Downstream point/station elevation = 1498.900(Ft.)  
 Pipe length = 198.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 5.371(CFS)  
 Nearest computed pipe diameter = 18.00(In.)  
 Calculated individual pipe flow = 5.371(CFS)  
 Normal flow depth in pipe = 11.30(In.)  
 Flow top width inside pipe = 17.40(In.)  
 Critical Depth = 10.72(In.)  
 Pipe flow velocity = 4.60(Ft/s)  
 Travel time through pipe = 0.72 min.  
 Time of concentration (TC) = 18.20 min.

+++++  
 Process from Point/Station 1500.000 to Point/Station 1502.000  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Initial area flow distance = 1000.000(Ft.)  
 Top (of initial area) elevation = 1502.700(Ft.)  
 Bottom (of initial area) elevation = 1500.300(Ft.)  
 Difference in elevation = 2.400(Ft.)

Slope = 0.00240 s(percent)= 0.24  
 TC =  $k(0.710)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$   
 Initial area time of concentration = 37.602 min.  
 Rainfall intensity = 1.512(In/Hr) for a 100.0 year storm  
 UNDEVELOPED (fair cover) subarea  
 Runoff Coefficient = 0.704  
 Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.300  
 Decimal fraction soil group C = 0.700  
 Decimal fraction soil group D = 0.000  
 RI index for soil(AMC 2) = 76.00  
 Pervious area fraction = 1.000; Impervious fraction = 0.000  
 Initial subarea runoff = 5.927(CFS)  
 Total initial stream area = 5.570(Ac.)  
 Pervious area fraction = 1.000

++++++  
 Process from Point/Station 1502.000 to Point/Station 1504.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1500.300(Ft.)  
 Downstream point/station elevation = 1499.600(Ft.)  
 Pipe length = 70.00(Ft.) Manning's N = 0.013  
 No. of pipes = 1 Required pipe flow = 5.927(CFS)  
 Nearest computed pipe diameter = 15.00(In.)  
 Calculated individual pipe flow = 5.927(CFS)  
 Normal flow depth in pipe = 11.31(In.)  
 Flow top width inside pipe = 12.92(In.)  
 Critical Depth = 11.82(In.)  
 Pipe flow velocity = 5.97(Ft/s)  
 Travel time through pipe = 0.20 min.  
 Time of concentration (TC) = 37.80 min.  
 End of computations, total study area = 480.55 (Ac.)  
 The following figures may  
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction( $A_p$ ) = 0.545  
 Area averaged RI index number = 64.1

# **APPENDIX B**

## **DETENTION ANALYSIS**

# Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 02/01/18 File: det1100.out

+++++

Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4028

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format  
-----

## Rancho Diamante

### Proposed Conditions

#### 100-Year Storm Event

#### Determine 100-Year Hydrograph Entering SW Detention Basin

-----

Drainage Area = 372.43(Ac.) = 0.582 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 372.43(Ac.)=0.582 Sq. Mi.  
USER Entry of lag time in hours  
Lag time = 0.301 Hr.  
Lag time = 18.06 Min.  
25% of lag time = 4.51 Min.  
40% of lag time = 7.22 Min.  
Unit time = 5.00 Min.  
Duration of storm = 1 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
372.43	0.50	186.22

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
372.43	1.17	435.74

STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 0.500(In)  
Area Averaged 100-Year Rainfall = 1.170(In)

Point rain (area averaged) = 1.170(In)  
 Areal adjustment factor = 99.66 %  
 Adjusted average point rain = 1.166(In)

Sub-Area Data:

Area(Ac.)                  Runoff Index      Impervious %  
       372.430                    63.00                  0.550  
 Total Area Entered =      372.43(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
63.0	63.0	0.438	0.550	0.221	1.000	0.221
						Sum (F) = 0.221

Area averaged mean soil loss (F) (In/Hr) = 0.221

Minimum soil loss rate ((In/Hr)) = 0.110

(for 24 hour storm duration)

Soil loss rate (decimal) = 0.460

-----  
 Slope of intensity-duration curve for a 1 hour storm =0.5300  
 -----

Unit Hydrograph  
 VALLEY S-Curve

-----  
 Unit Hydrograph Data

Unit time period	Time % of lag	Distribution	Unit Hydrograph
(hrs)		Graph %	(CFS)
1	0.083	27.685	9.792
2	0.167	55.371	34.460
3	0.250	83.056	61.161
4	0.333	110.742	72.365
5	0.417	138.427	53.050
6	0.500	166.113	31.207
7	0.583	193.798	19.477
8	0.667	221.484	14.621
9	0.750	249.169	11.751
10	0.833	276.855	9.818
11	0.917	304.540	8.189
12	1.000	332.226	6.671
13	1.083	359.911	6.128
14	1.167	387.597	4.915
15	1.250	415.282	4.382
16	1.333	442.968	3.450
17	1.417	470.653	3.267
18	1.500	498.339	3.124
19	1.583	526.024	2.750
20	1.667	553.710	2.284
21	1.750	581.395	2.026

22	1.833	609.081	0.492	1.848
23	1.917	636.766	0.413	1.549
24	2.000	664.452	0.373	1.398
25	2.083	692.137	0.290	1.087
26	2.167	719.823	0.277	1.039
27	2.250	747.508	0.277	1.039
28	2.333	775.194	0.277	1.039
29	2.417	802.879	0.386	1.451
Sum = 100.000			Sum=	375.340

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
				Max	Low	
1	0.08	3.40	0.476	( 0.221)	0.219	0.257
2	0.17	4.70	0.658	0.221	( 0.303)	0.437
3	0.25	4.70	0.658	0.221	( 0.303)	0.437
4	0.33	5.10	0.714	0.221	( 0.328)	0.493
5	0.42	5.80	0.812	0.221	( 0.373)	0.591
6	0.50	5.90	0.826	0.221	( 0.380)	0.605
7	0.58	7.10	0.993	0.221	( 0.457)	0.772
8	0.67	8.70	1.217	0.221	( 0.560)	0.996
9	0.75	13.20	1.847	0.221	( 0.850)	1.626
10	0.83	29.70	4.156	0.221	( 1.912)	3.935
11	0.92	7.70	1.077	0.221	( 0.496)	0.856
12	1.00	4.00	0.560	0.221	( 0.257)	0.339

(Loss Rate Not Used)

Sum = 100.0 Sum = 11.3

Flood volume = Effective rainfall 0.95(In)  
times area 372.4(Ac.)/[(In)/(Ft.)] = 29.3(Ac.Ft)

Total soil loss = 0.22(In)

Total soil loss = 6.853(Ac.Ft)

Total rainfall = 1.17(In)

Flood volume = 1277892.0 Cubic Feet

Total soil loss = 298516.8 Cubic Feet

Peak flow rate of this hydrograph = 510.140(CFS)

+++++

1 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 150.0 300.0 450.0 600.0



0+ 5	0.0173	2.52	Q						
0+10	0.1078	13.14	Q						
0+15	0.3492	35.05	V Q						
0+20	0.7983	65.20	V Q						
0+25	1.4508	94.74	V Q						
0+30	2.2720	119.24	V Q						
0+35	3.2502	142.04	V Q						
0+40	4.4086	168.20	V Q						
0+45	5.8272	205.97	V Q						
0+50	7.7947	285.69	V Q						
0+55	10.5896	405.82	V Q						
1+ 0	14.0618	504.16	V Q						
1+ 5	17.5751	510.14	V Q						
1+10	20.3084	396.87	V Q						
1+15	22.1555	268.20	V Q						
1+20	23.4045	181.35	V Q						
1+25	24.3301	134.40	V Q						
1+30	25.0684	107.19	V Q						
1+35	25.6823	89.15	V Q						
1+40	26.1978	74.85	V Q						
1+45	26.6327	63.14	V Q						
1+50	27.0127	55.18	V Q						
1+55	27.3343	46.69	V Q						
2+ 0	27.6144	40.68	V Q						
2+ 5	27.8528	34.62	V Q						
2+10	28.0686	31.33	V Q						
2+15	28.2649	28.50	V Q						
2+20	28.4388	25.25	V Q						
2+25	28.5905	22.02	V Q						
2+30	28.7239	19.37	V Q						
2+35	28.8404	16.93	V Q						
2+40	28.9402	14.49	V Q						
2+45	29.0266	12.55	V Q						
2+50	29.0983	10.41	V Q						
2+55	29.1627	9.34	V Q						
3+ 0	29.2211	8.49	V Q						
3+ 5	29.2741	7.69	V Q						
3+10	29.3220	6.95	V Q						
3+15	29.3330	1.60	V Q						
3+20	29.3364	0.49	V Q						V

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 01FEB18 TIME 20:11:51
*
*****

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*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

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X X XXXXXXX XXXX X
X X X X X XX
X X X X X
XXXXXXXX XXXX X XXXXX X
X X X X X
X X X X X
X X XXXXXXX XXXX XXX

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.  
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION  
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,  
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION  
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

\*DIAGRAM

\*\*\* FREE \*\*\*

1	ID	RANCHO DIAMANTE									
2	ID	100-YEAR, 1-HOUR DETENTION ANALYSIS									
3	ID	SOUTHWEST DETENTION BASIN									
4	ID	DETAIN TO 345 CFS PER MASTER DRAINAGE PLAN LINE 3B									
5	IO	1	2								
6	IT	5		40							
7	KK	BASIN									
8	KM	VALLEY S-Curve									
9	BA	0.58									
10	QI	2.5	13.1	35.1	65.2	94.7	119.2	142.0	168.2	206.0	285.7
11	QI	405.8	504.2	510.1	396.9	268.2	181.4	134.4	107.2	89.1	74.8
12	QI	63.1	55.2	46.7	40.7	34.6	31.3	28.5	25.2	22.0	19.4
13	QI	16.9	14.5	12.6	10.4	9.3	8.5	7.7	7.0	1.6	0.5
14	QI	0.0									
15	KK	DETAIN									
16	RS	1	STOR	-1							
17	SV	0	9.0								
18	SQ	0	345								
19	SE	100	101								
20	ZZ										

# SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT

LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
7	BASIN	
	V	
	V	
15	DETAIN	

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
*****
*
*
*   U.S. ARMY CORPS OF ENGINEERS
*   HYDROLOGIC ENGINEERING CENTER
*   609 SECOND STREET
*   DAVIS, CALIFORNIA 95616
*   (916) 756-1104
*
*
*****
```

ENGLISH UNITS	
DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-Feet
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

DA MON HRMN ORD FLOW \* DA MON HRMN ORD FLOW \* DA MON HRMN ORD FLOW \* DA MON HRMN ORD FLOW

				*				*					*					
1	0000	1	3.	*	1	0050	11	406.	*	1	0140	21	63.	*	1	0230	31	17.
1	0005	2	13.	*	1	0055	12	504.	*	1	0145	22	55.	*	1	0235	32	15.
1	0010	3	35.	*	1	0100	13	510.	*	1	0150	23	47.	*	1	0240	33	13.
1	0015	4	65.	*	1	0105	14	397.	*	1	0155	24	41.	*	1	0245	34	10.
1	0020	5	95.	*	1	0110	15	268.	*	1	0200	25	35.	*	1	0250	35	9.
1	0025	6	119.	*	1	0115	16	181.	*	1	0205	26	31.	*	1	0255	36	9.
1	0030	7	142.	*	1	0120	17	134.	*	1	0210	27	29.	*	1	0300	37	8.
1	0035	8	168.	*	1	0125	18	107.	*	1	0215	28	25.	*	1	0305	38	7.
1	0040	9	206.	*	1	0130	19	89.	*	1	0220	29	22.	*	1	0310	39	2.
1	0045	10	286.	*	1	0135	20	75.	*	1	0225	30	19.	*	1	0315	40	1.
			*					*					*					

\*\*\*\*\*

PEAK FLOW		TIME	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	3.25-HR
+	(CFS)	(HR)				
		(CFS)				
+	510.	1.00	109.	109.	109.	109.
		(INCHES)	.948	.948	.948	.948
		(AC-FT)	29.	29.	29.	29.
CUMULATIVE AREA =			.58 SQ MI			

STATION	BASIN
---------	-------

(O) OUTFLOW

0.      50.      100.      150.      200.      250.      300.      350.      400.      450.      500.      550.      0.

DAHRMN PER

Iteration	Value
10000	1.0
10005	2.0
10010	3.0
10015	4.0
10020	5.0
10025	6.0
10030	7.0
10035	8.0
10040	9.0
10045	10.0
10050	11.0
10055	12.0
10100	13.0
10105	14.0
10110	15.0
10115	16.0
10120	17.0
10125	18.0
10130	19.0
10135	20.0
10140	21.0
10145	22.0
10150	23.0
10155	24.0
10200	25.0
10205	26.0
10210	27.0
10215	28.0
10220	29.0
10225	30.0
10230	31.0
10235	32.0
10240	33.0
10245	34.0
10250	35.0
10255	36.0
10300	37.0
10305	38.0
10310	39.0
10315	40.0

\*\*\* \*\*

\*\*\*\*\*  
\*           \*  
15 KK     \*     DETAIN     \*  
\*           \*  
\*\*\*\*\*

HYDROGRAPH ROUTING DATA

16 RS           STORAGE ROUTING  
          NSIPS           1   NUMBER OF SUBREACHES  
          ITYP           STOR   TYPE OF INITIAL CONDITION  
          RSVRIC       -1.00   INITIAL CONDITION  
          X           .00   WORKING R AND D COEFFICIENT

17 SV           STORAGE           .0       9.0

18 SQ           DISCHARGE       0.       345.

19 SE           ELEVATION       100.00   101.00

\*\*\*

\*\*\*\*\*

HYDROGRAPH AT STATION   DETAIN

\*\*\*\*\*

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
							*								*							
1	0000	1	3.	.1	100.0	*	1	0110	15	342.	8.9	101.0	*	1	0220	29	46.	1.2	100.1			
1	0005	2	4.	.1	100.0	*	1	0115	16	315.	8.2	100.9	*	1	0225	30	40.	1.1	100.1			
1	0010	3	8.	.2	100.0	*	1	0120	17	278.	7.3	100.8	*	1	0230	31	35.	.9	100.1			
1	0015	4	18.	.5	100.1	*	1	0125	18	241.	6.3	100.7	*	1	0235	32	31.	.8	100.1			
1	0020	5	33.	.9	100.1	*	1	0130	19	208.	5.4	100.6	*	1	0240	33	27.	.7	100.1			
1	0025	6	50.	1.3	100.1	*	1	0135	20	179.	4.7	100.5	*	1	0245	34	23.	.6	100.1			
1	0030	7	69.	1.8	100.2	*	1	0140	21	153.	4.0	100.4	*	1	0250	35	20.	.5	100.1			
1	0035	8	89.	2.3	100.3	*	1	0145	22	131.	3.4	100.4	*	1	0255	36	17.	.5	100.1			
1	0040	9	112.	2.9	100.3	*	1	0150	23	112.	2.9	100.3	*	1	0300	37	15.	.4	100.0			
1	0045	10	143.	3.7	100.4	*	1	0155	24	96.	2.5	100.3	*	1	0305	38	13.	.4	100.0			
1	0050	11	190.	5.0	100.6	*	1	0200	25	83.	2.2	100.2	*	1	0310	39	11.	.3	100.0			
1	0055	12	252.	6.6	100.7	*	1	0205	26	71.	1.9	100.2	*	1	0315	40	9.	.2	100.0			
1	0100	13	312.	8.1	100.9	*	1	0210	27	61.	1.6	100.2	*									
1	0105	14	345.	9.0	101.0	*	1	0215	28	53.	1.4	100.2	*									
							*								*							

\*\*\*\*\*

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	3.25-HR
+	(CFS)				
+	345.	1.08	109.	109.	109.
			.943	.943	.943
			29.	29.	29.
			(INCHES)		
			(AC-FT)		
PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	3.25-HR
+	(AC-FT)				
	9.	1.08	3.	3.	3.
PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	3.25-HR
+	(FEET)				
	101.00	1.08	100.31	100.31	100.31

CUMULATIVE AREA = .58 SQ MI

## STATION DETAIN

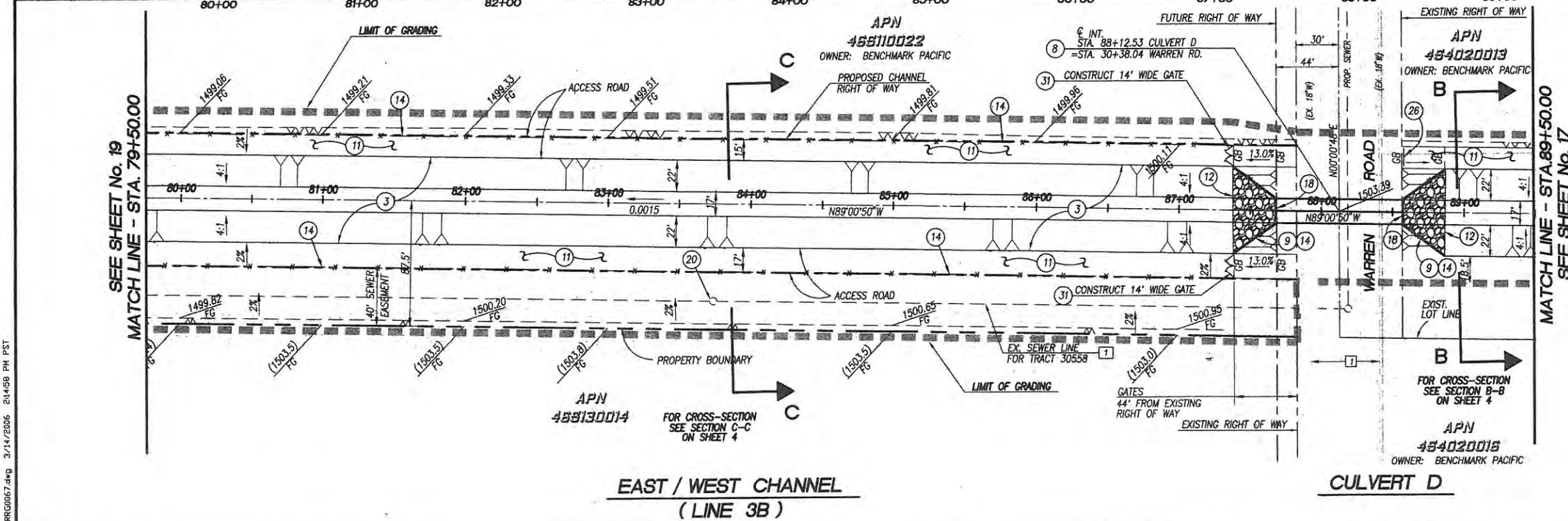
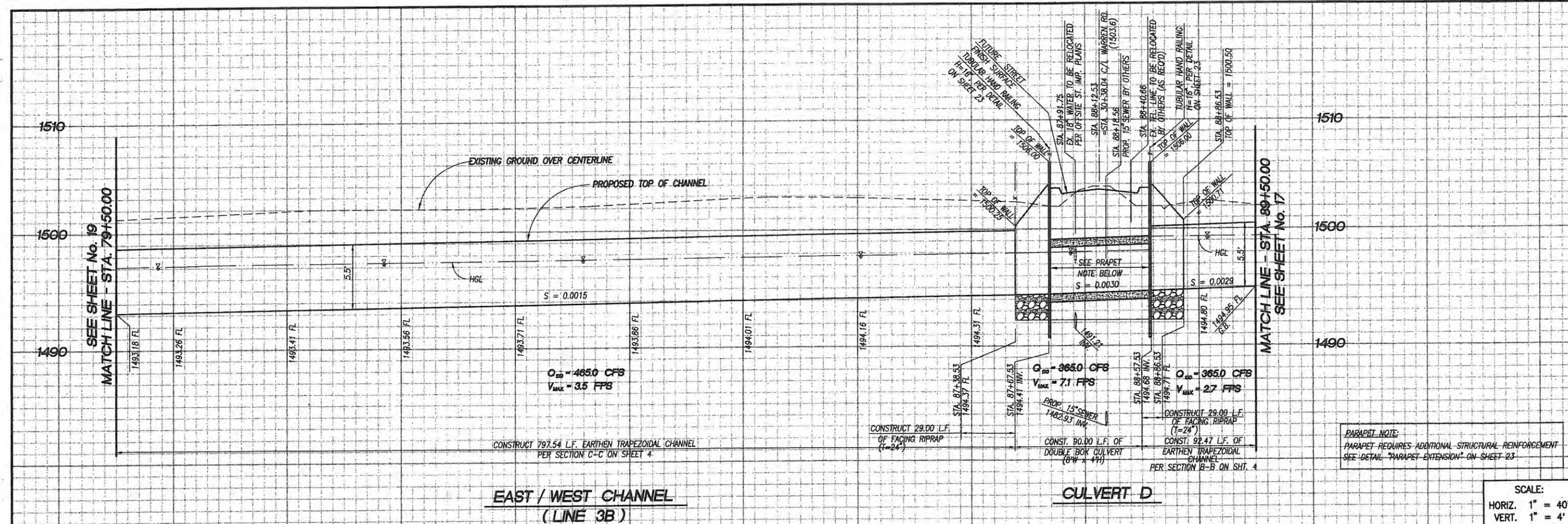
		(I) INFLOW,		(O) OUTFLOW									
		0.	100.	200.	300.	400.	500.	600.	0.	0.	0.	0.	0.
		(S) STORAGE											
		0.	0.	0.	0.	0.	0.	0.	4.	8.	12.	0.	0.
DAHRMN PER													
10000	1I	-----	-----	-----	-----	-----	-----	S	-----	-----	-----	-----	-----
10005	2OI	.	.	.	.	.	.	S	.	.	.	.	.
10010	3.O I	.	.	.	.	.	.	.S	.	.	.	.	.
10015	4. O I	.	.	.	.	.	.	.S	.	.	.	.	.
10020	5. O I.	.	.	.	.	.	.	.S	.	.	.	.	.
10025	6. O . I	.	.	.	.	.	.	.S	.	.	.	.	.
10030	7. O I	.	.	.	.	.	.	.S	.	.	.	.	.
10035	8. O. I	.	.	.	.	.	.	.S	.	.	.	.	.
10040	9. .O .I	.	.	.	.	.	.	.S	.	.	.	.	.
10045	10. . O .	.	.	I.	.	.	.	.S	.	.	.	.	.
10050	11. . . . .	.O.	.	.	I.	.	.	.S	.	.	.	.	.
10055	12. . . . .	.	O	.	.	I	.	.S	.	.	.	.	.
10100	13. . . . .	.O	.	.	.I	.	.	.S	.	.	.	.	.
10105	14. . . . .	.	O	I	.	.	.	.S	.	.	.	.	.
10110	15. . . . .	I	O	.	.	.	.	.S	.	.	.	.	.
10115	16. . . . .	I	.O	.	.	.	.	.S	.	.	.	.	.
10120	17. . I . .	.	O	.	.	.	.	.S	.	.	.	.	.
10125	18. . I . .	.	O	.	.	.	.	.S	.	.	.	.	.
10130	19. . I . .	.O	.	.	.	.	.	.S	.	.	.	.	.
10135	20. . I . .	O	.	.	.	.	.	.S	.	.	.	.	.
10140	21. . . I . .	.O.	.	.	.	.	.	.S	.	.	.	.	.
10145	22. . I . O	.	.	.	.	.	.	.S	.	.	.	.	.
10150	23. . I .O	.	.	.	.	.	.	.S	.	.	.	.	.
10155	24. . I O	.	.	.	.	.	.	.S	.	.	.	.	.
10200	25. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10205	26. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10210	27. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10215	28. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10220	29. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10225	30. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10230	31. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10235	32. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10240	33. I O .	.	.	.	.	.	.	.S	.	.	.	.	.
10245	34. IO	.	.	.	.	.	.	.S	.	.	.	.	.
10250	35. IO	.	.	.	.	.	.	.S	.	.	.	.	.
10255	36. IO	.	.	.	.	.	.	.S	.	.	.	.	.
10300	37. IO	.	.	.	.	.	.	.S	.	.	.	.	.
10305	38. I	.	.	.	.	.	.	.S	.	.	.	.	.
10310	39IO	.	.	.	.	.	.	.S	.	.	.	.	.
10315	40IO	-----	-----	-----	-----	-----	-----	S	-----	-----	-----	-----	-----



RUNOFF SUMMARY  
 FLOW IN CUBIC FEET PER SECOND  
 TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT									
+		BASIN	510.	1.00	109.	109.	109.	.58		
+	ROUTED TO									
+		DETAIN	345.	1.08	109.	109.	109.	.58		
+									101.00	1.08

\*\*\* NORMAL END OF HEC-1 \*\*\*

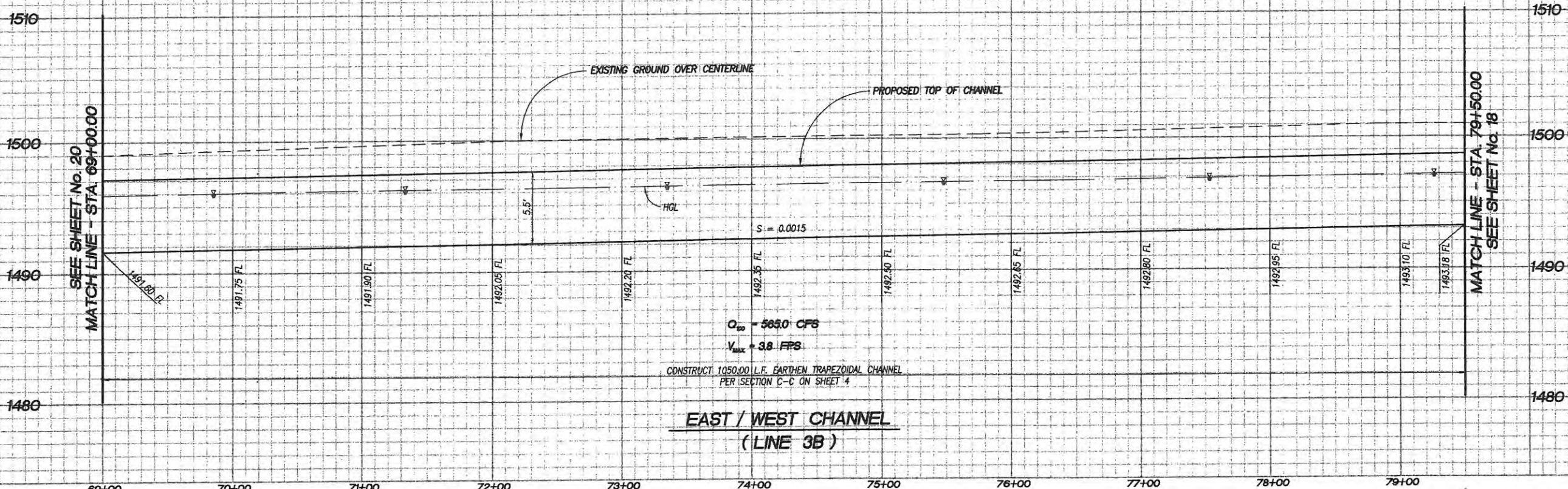


- CONSTRUCTION NOTES**
- CONSTRUCT TRAPEZOIDAL CHANNEL PER SECTION B-B ON SHEET 4.
  - CONSTRUCT TRAPEZOIDAL CHANNEL PER SECTION C-C ON SHEET 4.
  - CONSTRUCT DOUBLE BOX CULVERT (8'W x 4'H) PER CALTRANS DETAIL DB1 AS SHOWN ON SHEET 23.
  - CONSTRUCT BOX CULVERT WINGWALLS PER CALTRANS DETAIL DB4, TYPE B AS SHOWN ON SHEET 23.
  - CONSTRUCT 3" OF DECOMPOSED GRANITE ON CHANNEL ACCESS ROAD.
  - CONSTRUCT FACING RIP-RAP PER CALTRANS STANDARD SPECIFICATIONS SECTION 72, METHOD B, DIMENSION PER PLAN. (THICKNESS = 24")
  - CONSTRUCT 6.0' CHAIN LINK FENCE PER RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT STD. NO. M801.
  - ADJUST SEWER MANHOLE.
  - CONSTRUCT PIPE SWING GATE PER RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT STD. NO. M820.
  - CONSTRUCT 6.0' CHAIN LINK FENCE GATE PER RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT STD. NO. M801.
- KEY NOTES**
- PROTECT IN PLACE
- GRAPHIC SCALE**  
1 inch = 40 ft.

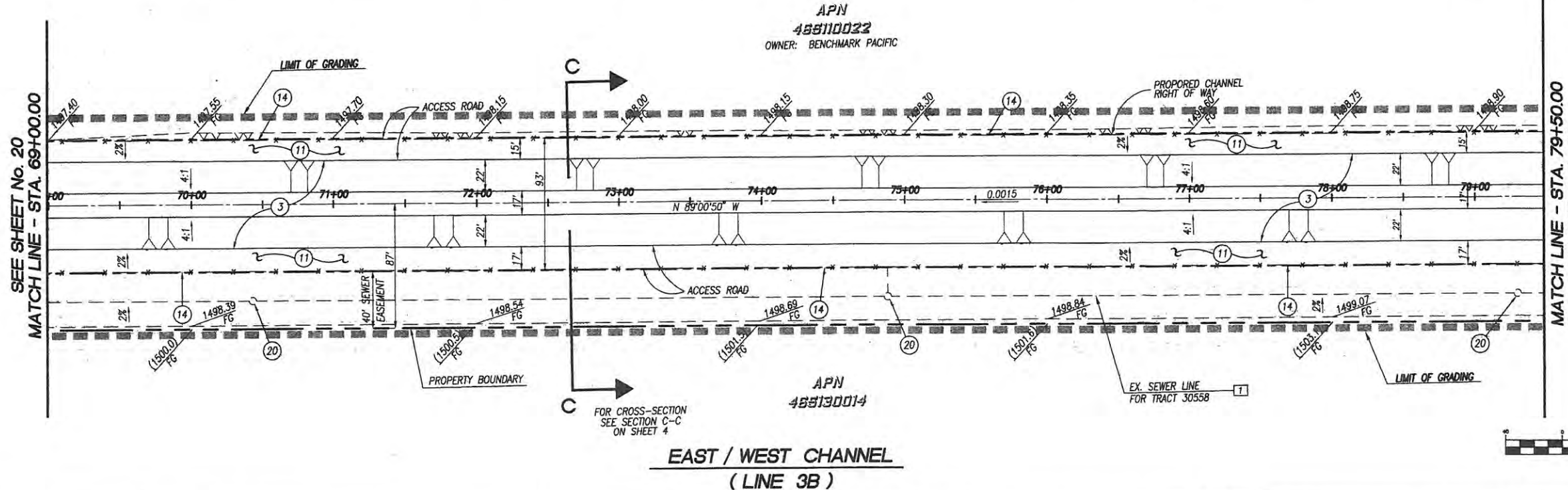
<p>DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO DAYS BEFORE YOU DIG</p> <p>UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA</p>		<p>STANTEC CONSULTING INC. 19 TECHNOLOGY DRIVE IRVINE, CA 92618 949.923.6000</p>	REVISIONS: DESIGNED BY: T.P.    DRAWN BY: S.H.    CHECKED BY: T.P.	APPROVED BY: TODD L. PITNER DATE: 3-15-06 APPROVED BY: JORGE BAGIONI DATE: 3-23-06	BASIS OF BEARINGS: A PORTION OF THE CENTERLINE OF STETSON AVENUE AS SHOWN ON TRACT MAP 24124-S, I.E. N89°52'48"E.	SCALE: 2-8-06 BENCH MARK: DESCRIPTION: 2" BRASS DISK IN CONCRETE STAMPED DNR 28. ELEVATION: 1506.99 FT. NAVD-88	ROUGH GRADING PLANS FOR: TRACTS NO. 31807 AND 31808 PHASE 1 RANCHO DIAMANTE ROUGH GRADING PLAN	DRAWING NO. 18 OF 39 SHEETS FILE NO.
			CITY OF HEMET	W.O.    F.B.	2/8/06			



V:\projects\14827\DWG\PRG006B.dwg 3/14/2006 2:03:37 PM PST



SCALE:  
HORIZ. 1" = 40'  
VERT. 1" = 4'



#### CONSTRUCTION NOTES

- ③ CONSTRUCT TRAPEZOIDAL CHANNEL PER SECTION C-C ON SHEET 4.
- ⑪ CONSTRUCT 3" OF DECOMPOSED GRANITE ON CHANNEL ACCESS ROAD.
- ⑭ CONSTRUCT 6.0' CHAIN LINK FENCE PER RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT STD. NO. M801.
- ②⑤ ADJUST SEWER MANHOLE.

#### KEY NOTE

- ① PROTECT IN PLACE

SCALE: 1" = 40'

GRAPHIC SCALE

(IN FEET)  
1 inch = 40 ft.



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949.923.6000

stantec.com

#### REVISIONS:

DESIGNED BY:	T.P.	DRAWN BY:	S.H.	CHECKED BY:	T.P.
--------------	------	-----------	------	-------------	------

#### APPROVED BY:

TODD L. PITNER  
DATE: 3-15-06  
R.C.E. 58606  
EXP. 12-31-06  
APPROVED BY: JORGE BIAGIONI  
DATE: 3-23-06  
R.C.E. 33751  
EXP. 3-30-06  
CITY OF HEMET

#### BASIS OF BEARINGS:

A PORTION OF THE CENTERLINE OF STETSON AVENUE  
AS SHOWN ON TRACT MAP 24124-S,  
I.E. N89°52'48"E  
SCALE: 2" = 8'-06  
DATE: 2-8-06  
BENCH MARK:  
DESCRIPTION: 2" BRASS DISK IN CONCRETE  
STAMPED DWR 28.  
ELEVATION: 1506.99 FT. NAVD-88

#### ROUGH GRADING PLANS FOR:

TRACTS NO. 31807 AND 31808  
PHASE 1  
RANCHO DIAMANTE  
ROUGH GRADING PLAN

W.D.

F.B.

#### DRAWING NO.

19  
OF 39 SHEETS  
FILE NO.

2/8/06





SCALE: 1" = 40'

APN  
48810022  
OWNER: BENCHMARK PACIFIC

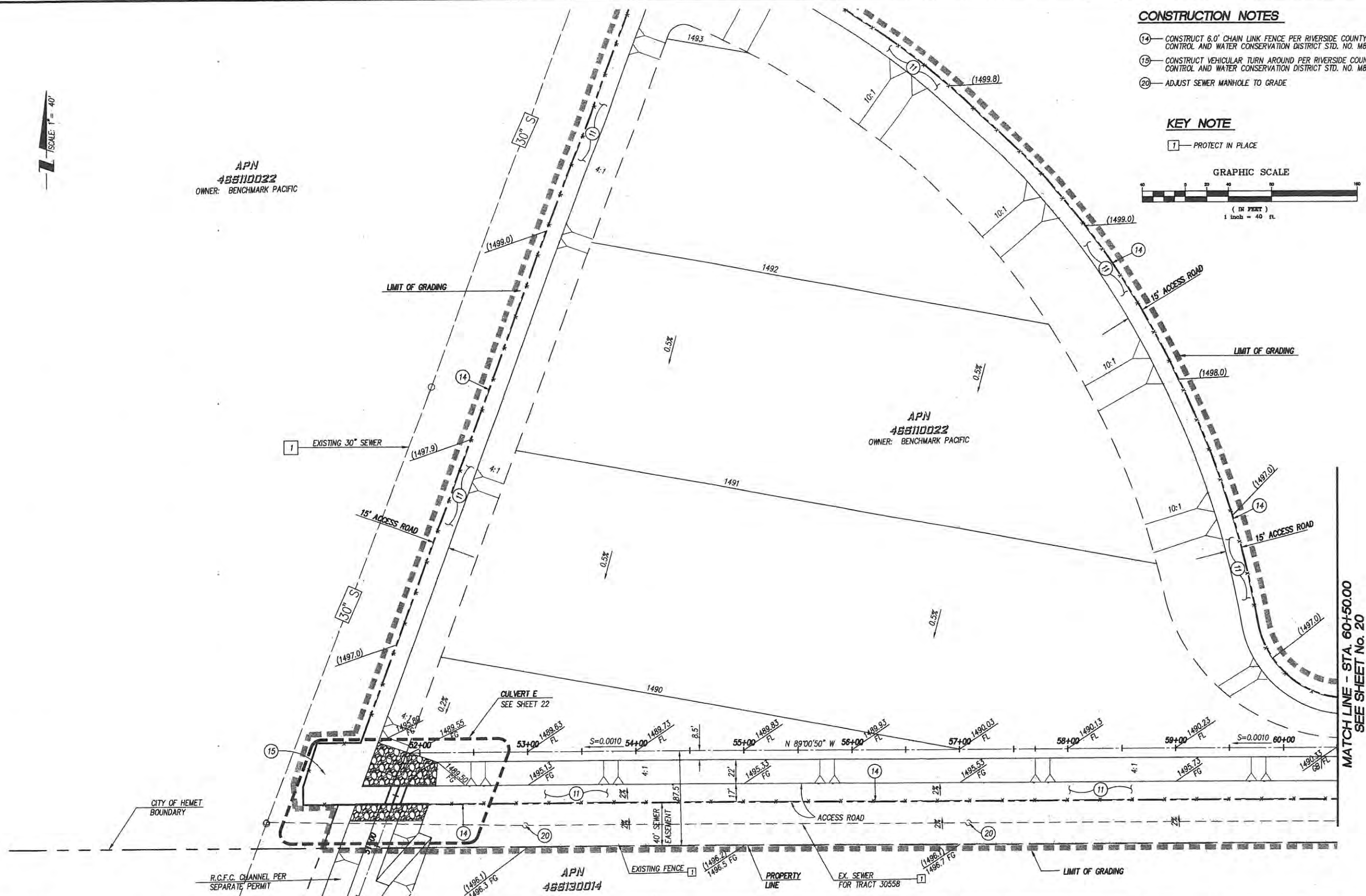
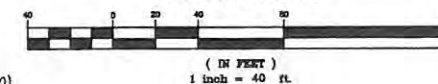
### CONSTRUCTION NOTES

- (14) CONSTRUCT 6.0' CHAIN LINK FENCE PER RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT STD. NO. M801.
- (15) CONSTRUCT VEHICULAR TURN AROUND PER RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT STD. NO. M827.
- (20) ADJUST SEWER MANHOLE TO GRADE

### KEY NOTE

- 1 PROTECT IN PLACE

### GRAPHIC SCALE



MATCH LINE - STA. 60+50.00  
SEE SHEET No. 20

\\projects\14237\00\DWG\PRG070.dwg 3/14/2006 2:05:54 PM PST



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STANTEC CONSULTING INC.  
19 TECHNOLOGY DRIVE  
IRVINE, CA 92618  
949.923.6000

stantec.com

#### REVISIONS:

DESIGNED BY:	T.P.	DRAWN BY:	S.H.	CHECKED BY:	P.C.
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#### APPROVED BY:

TODD L. PITNER  
DATE: 3-15-06  
APPROVED BY: JORGE BIAGIONI  
DATE: 3-23-06  
R.C.E. 58806  
EXP. 12-31-08  
R.C.E. 33751  
EXP. 3-30-08  
CITY OF HEMET

#### BASIS OF BEARINGS:

A PORTION OF THE CENTERLINE OF STETSON AVENUE  
AS SHOWN ON TRACT MAP 24124-5,  
I.E. N87°52'48"E.

#### SCALE:

1" = 40'

DATE: 2-8-06

#### BENCH MARK:

DESCRIPTION: 2" BRASS DISK IN CONCRETE  
STAMPED DWR 28.

ELEVATION: 1506.99 FT. NAVD-88

#### ROUGH GRADING PLANS FOR:

TRACTS NO. 31807 AND 31808  
PHASE 1  
RANCHO DIAMANTE  
ROUGH GRADING PLAN

W.O.

F.B.

#### DRAWING NO.

21  
OF 39 SHEETS  
FILE NO.



- LEGEND:
- MAJOR DRAINAGE BASIN BOUNDARY
  - DRAINAGE BASIN BOUNDARY
  - OVERLAND FLOW PATH
  - PROPOSED DRAINAGE FACILITY
  - 3.62 AC DRAINAGE BASIN AREA
  - 100 RATIONAL METHOD NODE NUMBER
  - D HYDROLOGIC SOIL GROUP
  - FEMA 100-YEAR FLOODPLAIN
  - WS 1503.0 FIRM 100-YEAR WATER SURFACE ELEVATION

NOTES:

THE MAJOR DRAINAGE BASIN BOUNDARIES REPRESENT THE STUDY AREAS TRIBUTARY TO THE WEST, CENTRAL, AND EAST PORTIONS OF THE SITE.

THIS WORK MAP SHOWS THE ON-SITE PROPOSED DRAINAGE FACILITIES. THE PROJECT WILL ALSO BE CONDITIONED TO CONSTRUCT OFF-SITE DRAINAGE FACILITIES, AS REQUIRED BY THE CITY OF HEMET AND RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT (SOUTHWEST HEMET MASTER DRAINAGE PLAN LINE 38).

THE 100-YEAR WATER SURFACE ELEVATIONS FROM THE EFFECTIVE FIRM (MAP NO. 0606520850 DATED AUGUST 8, 2008) ARE LABELED ALONG THE HEMET CHANNEL. THE FIRM AND FLOOD INSURANCE STUDY PROFILE DO NOT PROVIDE WATER SURFACE ELEVATIONS DOWNSTREAM OF THE 1,498.0 FOOT LABEL SHOWN HEREON. SINCE WATER SURFACE TYPICALLY DECREASES (WATER FLOWS DOWNHILL) OR IS LEVEL (DUE TO BACKWATER CONDITION) IN THE DOWNSTREAM DIRECTION, A REASONABLE ASSUMPTION IS THAT THE WATER SURFACE ELEVATION ALONG THE SITE DOWNSTREAM OF THE 1,498.0 FOOT LABEL IS 1,498.0 FEET. COMPARISON OF THE PROPOSED PAD ELEVATIONS WITH THE ADJACENT FIRM ELEVATIONS REVEALS THAT THE PADS ARE ABOVE THE 100-YEAR WATER SURFACE WITH AT LEAST A FOOT OF FREEBOARD.

# PROPOSED CONDITION RATIONAL METHOD WORK MAP

