Ventura Engineering Inland INC
VEI

PRELIMINARY HYDROLOGY REPORT

GARBANI SOUTH (TTM 37450)
DEV2021-009

27441 GARBANI ROAD
MENIFEE, CALIFORNIA 92584
APN: 360-350-004 & 005 *LEGAL TTM 37450*

PREPARED FOR:

MENIFEE 18 HOLDINGS, LLC
ATTENTION: JORDAN BURSCH
32823 TEMECULA PARKWAY
TEMECULA, CALIFORNIA 92592
(509) 954-6518

PREPARED BY:

VENTURA ENGINEERING INLAND
27393 YNEZ ROAD, SUITE 159
TEMECULA, CALIFORNIA 92591
(951) 252-7632

REVISION 2: *August 16, 2022* ***REVISION 1:*** *March 17, 2022*
ORIGINAL DATE: *June 7, 2018*

I hereby declare that I am the engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions code, and that the design is consistent with current standards.

WILFREDO VENTURA
R.C.E. NO. 66532
EXPIRES 6/30/24

8/16/22
DATE

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DESCRIPTIONS ***PAGE***

1.0 INTRODUCTION

The purpose of this report is to calculate the pre-development and post-development hydrology conditions for the proposed Garbani South Tentative Tract Map. The project site is located at 27441 Garbani Road in Menifee, California 92584.

The project consists of slopes, new paved areas, new lots, new hardscaped areas, new landscaped areas, and a bioretention basin.

This report has been created using the Riverside County Flood Control and Water Conservation District Hydrology Manual (April 1978).

2.0 LOCATION

The project site is located at 27441 Garbani Road in Menifee, California 92584. Furthermore, the project is located on APNs 360-350-004 & 005. A vicinity map is provided for reference in Attachment 4.

3.0 METHODOLOGY

This report has calculated the 10-Year and 100-Year Maximum Peak Discharge Rates based on the Riverside County Flood Control and Water Conservation District Hydrology Manual (April 1978) rational methodology. In addition, this manual will be referred to as the 'Standards' throughout this report. Clean copies of the excerpts from the standards have been included in Attachment 1: Standards Excerpts for reference. The existing conditions calculations are provided in Attachment 2: Existing Conditions Calculations. The proposed conditions calculations are provided in Attachment 3: Proposed Conditions Calculations. Exhibits are provided for reference in Attachment 4: Exhibits. Typically, FEMA mapping is reference and provided; however, the project site is listed as Zone X on FEMA mapping and FEMA design is discussed further in Section 6.0.

4.0 EXISTING CONDITIONS CALCULATIONS

The project site has been evaluated using the Rational Method from the Riverside County Flood Control and Water Conservation District Hydrology Manual (April 1978) to determine the 10-Year and 100-Year Design Storm Event Peak Discharge Rates and the 100-Year Unit Hydrograph Volume. Certain tables and figures from the Standards are referenced in this report and have been included in Attachment 1: Standards Excerpts. The existing conditions calculations are provided in Attachment 2 for reference. The hydrology exhibits are provided for reference in Attachment 4. A summary of the existing conditions are as follows:

EXISTING CONDITIONS SUMMARY		
DATA	***10-YEAR***	***100-YEAR***
AMC	II	
STUDY NODE POINT	1.92	
INTENSITY (IN/HR)	2.461	3.769
TOTAL DISCHARGE (CFS)	48.1	74.5
TIME OF CONCENTRATION (MIN)	8.97	8.60
AREA (ACRES)	22.074	
UNIT HYDROGRAPH VOLUME (ACRE-FT)	NOT-A-PART	4.4075

5.0 PROPOSED CONDITIONS CALCULATIONS

The project site has been evaluated using the Rational Method from the Riverside County Flood Control and Water Conservation District Hydrology Manual (April 1978) to determine the 10-Year and 100-Year Design Storm Event Peak Discharge Rates and the 100-Year Unit Hydrograph Volume. Certain tables and figures from the Standards are referenced in this report and have been included in Attachment 1: Standards Excerpts. The proposed conditions calculations are provided in Attachment 3 for reference. The hydrology exhibits are provided for reference in Attachment 4. A summary of the existing conditions are as follows:

PROPOSED CONDITIONS SUMMARY		
DATA	***10-YEAR***	***100-YEAR***
AMC	II	
STUDY NODE POINT	1.185	
INTENSITY (IN/HR)	2.845	3.981
TOTAL DISCHARGE (CFS)	37.5	58.0
TIME OF CONCENTRATION (MIN)	7.48	7.02
AREA (ACRES)	22.074	
UNIT HYDROGRAPH VOLUME (ACRE-FT)	NOT-A-PART	3.8180

6.0 FEMA DETERMINATION

In order to access the impacts to existing flood control impacts, FEMA flood mapping was reviewed and the site is listed in Area X. This means that there is no FEMA flooding risk associated with the project site or its proposed elements. An excerpt from the localized FEMA Flood Insurance Study mapping is provided for reference in Attachment 5.

7.0 CONCLUSION

The proposed project site as designed will include biorientation BMPs that will also act as a retention basin. Due to the flattening of the site and routing of the storm water through and around the site, the proposed conditions will reduce the peak discharge rates and provide storage.

An overall comparison of the storm data is as follows:

10-YEAR DESIGN STORM EVENT COMPARISON			
DATA	***EXISTING***	***PROPOSED***	***COMPARISON***
STUDY NODE POINT	1.92	1.185	N/A
INTENSITY (IN/HR)	2.461	2.845	+ 0.384
TOTAL DISCHARGE (cfs)	48.1	37.5	- 10.6
TIME OF CONCENTRATION (MIN)	8.97	7.48	- 1.50
AREA (ACRES)	22.074	22.074	NO CHANGE
UNIT HYDROGRAPH VOLUME (ACRE-FT)	NOT-A-PART		
STORAGE (ACRE-FT)	NOT-A-PART		

100-YEAR DESIGN STORM EVENT COMPARISON			
DATA	***EXISTING***	***PROPOSED***	***COMPARISON***
STUDY NODE POINT	1.92	1.185	N/A
INTENSITY (IN/HR)	3.769	3.981	+ 0.212
TOTAL DISCHARGE (cfs)	74.5	58.0	- 16.5
TIME OF CONCENTRATION (MIN)	8.60	7.02	- 1.58
AREA (ACRES)	22.074	22.074	NO CHANGE
UNIT HYDROGRAPH VOLUME (ACRE-FT)	4.4075	3.8180	- 0.5895
STORAGE (ACRE-FT)	0.0000	0.8264	+ 0.8264

In addition, the following statements apply to the project site:

Retention Requirements: The proposed site provides 0.8264 acre-ft of storage in addition to a reduction in the unit hydrograph volume of 0.5895 acre-ft.

Drainage Pattern Alteration Statement: The proposed project does not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site. This project site will continue to discharge at the same general confluence point, the existing channel along the north side of the property.

Flooding Statement: The project site is mapped by FEMA area as Zone X with no flooding on-site.

Housing in a 100-Year Flood Hazard Statement: The project does not propose any housing in a FEMA mapped floodplain.

8.0 REFERENCES

The following references were utilized in the creation of this hydrology report:

Brater & King, *Handbook of Hydraulics*, 6th ed.

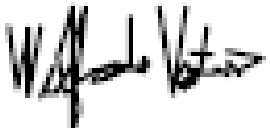
Design Handbook for Low Impact Development Best Management Practices, Riverside County Flood Control & Water Conservation District, September 2011.

Hydrology Manual, Riverside County Flood Control & Water Conservation District, April 1978

9.0 DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the agency is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.



Wilfredo Ventura

8/16/22

Date

10.0 ATTACHMENTS

The following attachment sections are provided for reference:

10.1 ATTACHMENT 1: STANDARD EXCERPTS

This attachment contains excerpts from the standards. Please refer to the attached references.

10.2 ATTACHMENT 2: EXISTING CONDITIONS CALCULATIONS

This attachment contains the existing conditions calculations.

10.3 ATTACHMENT 3: PROPOSED CONDITIONS CALCULATIONS

This attachment contains the proposed conditions calculations.

10.4 ATTACHMENT 4: EXHIBITS

This attachment contains the project's exhibits.

10.5 ATTACHMENT 5: FEMA DETERMINATION

This attachment contains the project site's FEMA determination.

ATTACHMENT 1: STANDARD EXCERPTS

This attachment contains various excerpts from the Riverside County Flood Control & Water Conservation District Hydrology Manual (April 1978 edition). Please see the attached excerpts from the standards.

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

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RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (cont.) -					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Deciduous (Apples, apricots, pears, walnuts, etc.)		See Note 4			
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small Grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87
Vineyard		See Note 4			

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.

2. Quality of cover definitions:
   Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Plate C-2 for a detailed description of cover types.

4. Use runoff index numbers based on ground cover type. See discussion under "Cover Type Descriptions" on Plate C-2.

5. Reference Bibliography item 17.

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

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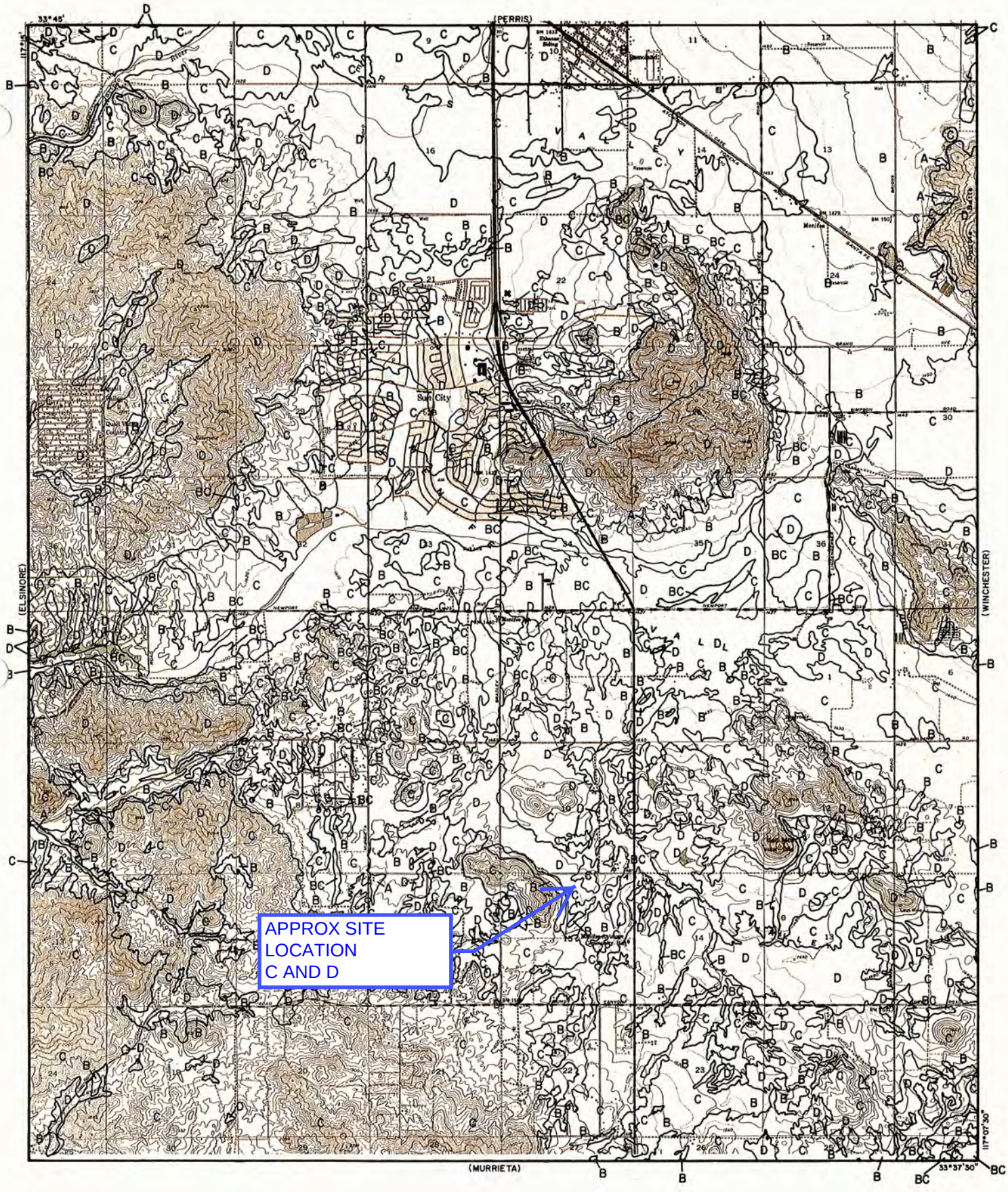
IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE E-6.3



LEGEND

SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

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0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR ROMOLAND

PLATE C-1.42

RAINFALL INTENSITY–INCHES PER HOUR

RIVERSIDE			RIVERSIDE (FOOTHILL AREAS)			RUBIDOUX			SAN JACINTO			SUN CITY		
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	2.75	3.92	5	3.14	4.71	5	3.18	4.71	5	2.81	4.16	5	3.25	4.85
6	2.48	3.55	6	2.84	4.26	6	2.87	4.26	6	2.56	3.79	6	2.95	4.40
7	2.28	3.26	7	2.61	3.91	7	2.64	3.91	7	2.37	3.51	7	2.72	4.06
8	2.12	3.03	8	2.42	3.63	8	2.45	3.63	8	2.22	3.29	8	2.53	3.78
9	1.99	2.84	9	2.27	3.41	9	2.30	3.41	9	2.09	3.10	9	2.38	3.55
10	1.88	2.68	10	2.14	3.21	10	2.17	3.21	10	1.98	2.94	10	2.25	3.36
11	1.78	2.54	11	2.03	3.05	11	2.06	3.05	11	1.89	2.80	11	2.14	3.19
12	1.70	2.42	12	1.94	2.91	12	1.96	2.91	12	1.81	2.68	12	2.04	3.05
13	1.62	2.32	13	1.86	2.78	13	1.88	2.78	13	1.74	2.58	13	1.96	2.92
14	1.56	2.23	14	1.78	2.67	14	1.80	2.67	14	1.68	2.48	14	1.88	2.81
15	1.50	2.14	15	1.71	2.57	15	1.74	2.57	15	1.62	2.40	15	1.81	2.71
16	1.45	2.07	16	1.66	2.48	16	1.68	2.48	16	1.57	2.32	16	1.75	2.62
17	1.40	2.00	17	1.60	2.40	17	1.62	2.40	17	1.52	2.25	17	1.70	2.54
18	1.36	1.94	18	1.55	2.33	18	1.57	2.33	18	1.48	2.19	18	1.65	2.46
19	1.32	1.88	19	1.51	2.26	19	1.52	2.26	19	1.44	2.13	19	1.60	2.39
20	1.28	1.83	20	1.46	2.20	20	1.48	2.20	20	1.40	2.08	20	1.56	2.33
22	1.22	1.74	22	1.39	2.08	22	1.41	2.08	22	1.34	1.98	22	1.48	2.21
24	1.16	1.66	24	1.32	1.99	24	1.34	1.99	24	1.28	1.90	24	1.41	2.11
26	1.11	1.58	26	1.27	1.90	26	1.28	1.90	26	1.23	1.82	26	1.36	2.03
28	1.06	1.52	28	1.22	1.82	28	1.23	1.82	28	1.19	1.76	28	1.30	1.95
30	1.02	1.46	30	1.17	1.76	30	1.19	1.76	30	1.15	1.70	30	1.26	1.88
32	.99	1.41	32	1.13	1.70	32	1.14	1.70	32	1.11	1.64	32	1.21	1.81
34	.96	1.37	34	1.09	1.64	34	1.11	1.64	34	1.08	1.59	34	1.18	1.76
36	.93	1.32	36	1.06	1.59	36	1.07	1.59	36	1.05	1.55	36	1.14	1.70
38	.90	1.29	38	1.03	1.54	38	1.04	1.54	38	1.02	1.51	38	1.11	1.66
40	.87	1.25	40	1.00	1.50	40	1.01	1.50	40	.99	1.47	40	1.08	1.61
45	.82	1.17	45	.94	1.41	45	.95	1.41	45	.94	1.39	45	1.01	1.51
50	.77	1.11	50	.88	1.33	50	.90	1.33	50	.89	1.31	50	.96	1.43
55	.73	1.05	55	.84	1.26	55	.85	1.26	55	.85	1.25	55	.91	1.36
60	.70	1.00	60	.80	1.20	60	.81	1.20	60	.81	1.20	60	.87	1.30
65	.67	.96	65	.77	1.15	65	.78	1.15	65	.78	1.15	65	.83	1.25
70	.64	.92	70	.73	1.10	70	.74	1.10	70	.75	1.11	70	.80	1.20
75	.62	.88	75	.71	1.06	75	.72	1.06	75	.72	1.07	75	.77	1.15
80	.60	.85	80	.68	1.02	80	.69	1.02	80	.70	1.04	80	.75	1.12
85	.58	.83	85	.66	.99	85	.67	.99	85	.68	1.01	85	.72	1.08
SLOPE = .550			SLOPE = .550			SLOPE = .550			SLOPE = .500			SLOPE = .530		

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STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1(5 of 6)

APPROX SITE LOCATION
0.51

NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973

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RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

2-YEAR — 1-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.E. NO. 8822	DRAWN BY: R.A.S.	SHEET NO.
DATE	PLATE D-4.3	DR. NO.
REVISED:		

APPROX SITE LOCATION
1.82

NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.

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RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

2-YEAR — 24-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.E. NO. 8822	DRAWN BY: R.A.S.	SHEET NO.
DATE	PLATE E-5.5	DR. No.

APPROX SITE LOCATION 4.9

NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.

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HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100-YEAR — 24-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.E. NO. 8822	DRAWN BY:	SHEET NO.
DATE	PLATE E-5.6	DR. NO.
REVISED		

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California

Garbani South Hydrology

March 8, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,140 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 14, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 15, 2018—Jun 25, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
LaD2	Las Posas loam, 8 to 15 percent slopes, eroded	4.0	10.1%
LkF3	Las Posas rocky loam, 15 to 50 percent slopes, severely eroded	23.4	58.4%
WxD2	Wyman fine sandy loam, 8 to 15 percent slopes, eroded	9.5	23.7%
YbC	Yokohl loam, 2 to 8 percent slopes	3.1	7.8%
Totals for Area of Interest		**40.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

LaD2—Las Posas loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcwk
Elevation: 200 to 3,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 240 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Las posas and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Posas

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from gabbro

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 30 inches: clay loam
H3 - 30 to 54 inches: weathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Murrieta

Percent of map unit: 5 percent
Hydric soil rating: No

Tumescal

Percent of map unit: 5 percent
Hydric soil rating: No

Cajalco

Percent of map unit: 5 percent
Hydric soil rating: No

LkF3—Las Posas rocky loam, 15 to 50 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: hcwp
Elevation: 200 to 3,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 240 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Las posas and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Posas

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from gabbro

Typical profile

H1 - 0 to 6 inches: stony loam
H2 - 6 to 20 inches: clay loam
H3 - 20 to 24 inches: weathered bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY (1975)
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Tumescal

Percent of map unit: 5 percent
Hydric soil rating: No

Murrieta

Percent of map unit: 5 percent
Hydric soil rating: No

Cajalco

Percent of map unit: 5 percent
Hydric soil rating: No

WxD2—Wyman fine sandy loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hd0d
Elevation: 300 to 2,500 feet
Mean annual precipitation: 9 to 25 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Wyman and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wyman

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 12 inches: fine sandy loam

H2 - 12 to 36 inches: clay loam
H3 - 36 to 60 inches: stratified loam to clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Honcut

Percent of map unit: 10 percent
Hydric soil rating: No

Buren

Percent of map unit: 5 percent
Hydric soil rating: No

YbC—Yokohl loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hd0g
Elevation: 500 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Yokohl and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yokohl

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 10 inches: loam
H2 - 10 to 26 inches: clay loam
H3 - 26 to 30 inches: indurated
H4 - 30 to 60 inches: stratified sandy loam to gravelly loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 39 inches to duripan
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R019XD061CA - CLAYPAN (1975)
Hydric soil rating: No

Minor Components

Wyman

Percent of map unit: 5 percent
Hydric soil rating: No

Porterville

Percent of map unit: 5 percent
Hydric soil rating: No

Buren

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

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ATTACHMENT 2: EXISTING CONDITIONS CALCULATIONS

This attachment contains the existing conditions hydrology calculations. Please see the attached calculations.

EXISTING CONDITIONS 10-YEAR DESIGN STORM EVENT

```
                    Riverside County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
          Rational Hydrology Study        Date: 03/08/22  File:garbaniex10d1.out
--------------------------------------------------------------------------
 *********  Hydrology Study Control Information **********
 English (in-lb) Units used in input data file
--------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

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

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity =  2.250(In/Hr)
10 year storm 60 minute intensity =  0.870(In/Hr)
100 year storm 10 minute intensity =  3.360(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.870(In/Hr)
Slope of intensity duration curve = 0.5300

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.110 to Point/Station        1.210
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
Initial area flow distance =   200.000(Ft.)
Top (of initial area) elevation =  1726.000(Ft.)
Bottom (of initial area) elevation =  1680.000(Ft.)
Difference in elevation =    46.000(Ft.)
Slope =    0.23000  s(percent)=      23.00
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.920 min.
Rainfall intensity =      2.969(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.853
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.767(CFS)
Total initial stream area =        0.303(Ac.)
Pervious area fraction = 1.000
```

++
Process from Point/Station 1.210 to Point/Station 1.310
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 4.279(CFS)
Depth of flow = 0.231(Ft.), Average velocity = 6.828(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	20.60	1.00
3	37.40	0.00
4	44.10	1.00
5	66.50	1.50
6	99.90	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 4.279(CFS)
' ' flow top width = 5.427(Ft.)
' ' velocity= 6.828(Ft/s)
' ' area = 0.627(Sq.Ft)
' ' Froude number = 3.541

Upstream point elevation = 1680.000(Ft.)
Downstream point elevation = 1523.000(Ft.)
Flow length = 665.000(Ft.)
Travel time = 1.62 min.
Time of concentration = 7.54 min.
Depth of flow = 0.231(Ft.)
Average velocity = 6.828(Ft/s)
Total irregular channel flow = 4.279(CFS)
Irregular channel normal depth above invert elev. = 0.231(Ft.)
Average velocity of channel(s) = 6.828(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.843
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.244
Decimal fraction soil group D = 0.756
RI index for soil(AMC 2) = 88.27
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.611(In/Hr) for a 10.0 year storm
Subarea runoff = 6.954(CFS) for 3.160(Ac.)
Total runoff = 7.721(CFS) Total area = 3.463(Ac.)
Depth of flow = 0.288(Ft.), Average velocity = 7.914(Ft/s)

++
Process from Point/Station 1.310 to Point/Station 1.920
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 8.327(CFS)
Depth of flow = 0.390(Ft.), Average velocity = 4.457(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	2.00	0.50
3	7.80	0.00
4	11.10	0.25
5	13.90	0.50
6	23.10	1.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 8.327(CFS)
' ' flow top width = 9.396(Ft.)
' ' velocity= 4.457(Ft/s)
' ' area = 1.868(Sq.Ft)
' ' Froude number = 1.762

Upstream point elevation = 1523.000(Ft.)
Downstream point elevation = 1486.000(Ft.)
Flow length = 760.000(Ft.)
Travel time = 2.84 min.
Time of concentration = 10.39 min.
Depth of flow = 0.390(Ft.)
Average velocity = 4.457(Ft/s)
Total irregular channel flow = 8.327(CFS)
Irregular channel normal depth above invert elev. = 0.390(Ft.)
Average velocity of channel(s) = 4.457(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.779
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 2.204(In/Hr) for a 10.0 year storm
Subarea runoff = 1.127(CFS) for 0.656(Ac.)
Total runoff = 8.848(CFS) Total area = 4.119(Ac.)
Depth of flow = 0.399(Ft.), Average velocity = 4.527(Ft/s)

++
Process from Point/Station 1.110 to Point/Station 1.920
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 4.119(Ac.)
Runoff from this stream = 8.848(CFS)
Time of concentration = 10.39 min.
Rainfall intensity = 2.204(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 1.410 to Point/Station 1.510
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1748.000(Ft.)
Bottom (of initial area) elevation = 1669.000(Ft.)
Difference in elevation = 79.000(Ft.)
Slope = 0.39500 s(percent)= 39.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.313 min.
Rainfall intensity = 3.144(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.850
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.361
Decimal fraction soil group D = 0.639
RI index for soil(AMC 2) = 87.92
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 3.198(CFS)
Total initial stream area = 1.196(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.510 to Point/Station 1.610
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel = 7.827(CFS)
Depth of flow = 0.301(Ft.), Average velocity = 9.523(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	17.10	1.00
3	31.30	0.00
4	35.20	1.00
5	51.90	2.00

```
Manning's 'N' friction factor =   0.025
-----------------------------------------------------------------
Sub-Channel flow  =     7.827(CFS)
 '    '     flow top width =     5.455(Ft.)
 '    '    velocity=    9.523(Ft/s)
 '    '     area =     0.822(Sq.Ft)
 '    '     Froude number =     4.323

Upstream point elevation =  1669.000(Ft.)
Downstream point elevation =  1520.000(Ft.)
Flow length =   460.000(Ft.)
Travel time  =    0.81 min.
Time of concentration =    6.12 min.
Depth of flow =   0.301(Ft.)
Average velocity =   9.523(Ft/s)
Total irregular channel flow =     7.827(CFS)
Irregular channel normal depth above invert elev. =   0.301(Ft.)
Average velocity of channel(s) =   9.523(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.002
Decimal fraction soil group D = 0.998
RI index for soil(AMC 2)  =  88.99
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.918(In/Hr) for a    10.0 year storm
Subarea runoff =      9.168(CFS) for      3.689(Ac.)
Total runoff =     12.366(CFS)     Total area =       4.885(Ac.)
Depth of flow =   0.358(Ft.), Average velocity =  10.676(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.610 to Point/Station        1.920
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     17.022(CFS)
Depth of flow =   0.321(Ft.), Average velocity =   3.942(Ft/s)
          ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
          1            0.00             2.00
          2           44.20             1.00
          3           73.60             0.00
          4          127.80             1.00
          5          145.50             2.00
Manning's 'N' friction factor =   0.025
-----------------------------------------------------------------
Sub-Channel flow  =     17.023(CFS)
 '    '     flow top width =     26.869(Ft.)
 '    '    velocity=    3.942(Ft/s)
 '    '     area =     4.318(Sq.Ft)
 '    '     Froude number =     1.733
```

Upstream point elevation = 1520.000(Ft.)
Downstream point elevation = 1486.000(Ft.)
Flow length = 675.000(Ft.)
Travel time = 2.85 min.
Time of concentration = 8.97 min.
Depth of flow = 0.321(Ft.)
Average velocity = 3.942(Ft/s)
Total irregular channel flow = 17.022(CFS)
Irregular channel normal depth above invert elev. = 0.321(Ft.)
Average velocity of channel(s) = 3.942(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.745
Decimal fraction soil group D = 0.255
RI index for soil(AMC 2) = 86.76
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.382(In/Hr) for a 10.0 year storm
Subarea runoff = 9.227(CFS) for 4.672(Ac.)
Total runoff = 21.593(CFS) Total area = 9.557(Ac.)
Depth of flow = 0.351(Ft.), Average velocity = 4.184(Ft/s)

++
Process from Point/Station 1.410 to Point/Station 1.920
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 9.557(Ac.)
Runoff from this stream = 21.593(CFS)
Time of concentration = 8.97 min.
Rainfall intensity = 2.382(In/Hr)
Program is now starting with Main Stream No. 3

++
Process from Point/Station 1.710 to Point/Station 1.810
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1781.000(Ft.)
Bottom (of initial area) elevation = 1660.000(Ft.)
Difference in elevation = 121.000(Ft.)
Slope = 0.60500 s(percent)= 60.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration = 5.000 min.
Rainfall intensity = 3.247(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea

Runoff Coefficient = 0.857
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 2.089(CFS)
Total initial stream area = 0.751(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.810 to Point/Station 1.910
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel = 10.309(CFS)
Depth of flow = 0.325(Ft.), Average velocity = 7.664(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	24.00	1.50
3	41.50	1.00
4	54.30	0.00
5	79.50	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 10.309(CFS)
' ' flow top width = 8.266(Ft.)
' ' velocity= 7.664(Ft/s)
' ' area = 1.345(Sq.Ft)
' ' Froude number = 3.348

Upstream point elevation = 1660.000(Ft.)
Downstream point elevation = 1489.000(Ft.)
Flow length = 910.000(Ft.)
Travel time = 1.98 min.
Time of concentration = 6.98 min.
Depth of flow = 0.325(Ft.)
Average velocity = 7.664(Ft/s)
Total irregular channel flow = 10.309(CFS)
Irregular channel normal depth above invert elev. = 0.325(Ft.)
Average velocity of channel(s) = 7.664(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.845
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.262
Decimal fraction soil group D = 0.738
RI index for soil(AMC 2) = 88.21
Pervious area fraction = 1.000; Impervious fraction = 0.000

Rainfall intensity = 2.721(In/Hr) for a 10.0 year storm
Subarea runoff = 16.379(CFS) for 7.126(Ac.)
Total runoff = 18.467(CFS) Total area = 7.877(Ac.)
Depth of flow = 0.405(Ft.), Average velocity = 8.867(Ft/s)

++
Process from Point/Station 1.910 to Point/Station 1.920
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel = 19.000(CFS)
Depth of flow = 0.869(Ft.), Average velocity = 3.091(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	3.20	0.75
3	11.10	0.50
4	14.70	0.25
5	16.40	0.00
6	17.70	0.50
7	19.80	1.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 19.000(CFS)
' ' flow top width = 17.568(Ft.)
' ' velocity= 3.091(Ft/s)
' ' area = 6.147(Sq.Ft)
' ' Froude number = 0.921

Upstream point elevation = 1489.000(Ft.)
Downstream point elevation = 1486.000(Ft.)
Flow length = 270.000(Ft.)
Travel time = 1.46 min.
Time of concentration = 8.43 min.
Depth of flow = 0.869(Ft.)
Average velocity = 3.091(Ft/s)
Total irregular channel flow = 19.000(CFS)
Irregular channel normal depth above invert elev. = 0.869(Ft.)
Average velocity of channel(s) = 3.091(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.790
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 2.461(In/Hr) for a 10.0 year storm
Subarea runoff = 1.013(CFS) for 0.521(Ac.)
Total runoff = 19.480(CFS) Total area = 8.398(Ac.)
Depth of flow = 0.875(Ft.), Average velocity = 3.115(Ft/s)

++
Process from Point/Station 1.710 to Point/Station 1.920
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area = 8.398(Ac.)
Runoff from this stream = 19.480(CFS)
Time of concentration = 8.43 min.
Rainfall intensity = 2.461(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.848	10.39	2.204
2	21.593	8.97	2.382
3	19.480	8.43	2.461

Largest stream flow has longer or shorter time of concentration
Qp = 21.593 + sum of
Qa Tb/Ta
8.848 * 0.864 = 7.644
Qb Ia/Ib
19.480 * 0.968 = 18.853
Qp = 48.090

Total of 3 main streams to confluence:
Flow rates before confluence point:
8.848 21.593 19.480
Area of streams before confluence:
4.119 9.557 8.398

Results of confluence:
Total flow rate = 48.090(CFS)
Time of concentration = 8.972 min.
Effective stream area after confluence = 22.074(Ac.)
End of computations, total study area = 22.07 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.989
Area averaged RI index number = 87.4

EXISTING CONDITIONS 100-YEAR DESIGN STORM EVENT

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 03/08/22 File:garbaniex100d1.out

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********* Hydrology Study Control Information **********
English (in-lb) Units used in input data file

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 [Sun City] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

++

Process from Point/Station 1.110 to Point/Station 1.210
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1726.000(Ft.)
Bottom (of initial area) elevation = 1680.000(Ft.)
Difference in elevation = 46.000(Ft.)
Slope = 0.23000 s(percent)= 23.00
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.920 min.
Rainfall intensity = 4.436(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 1.166(CFS)
Total initial stream area = 0.303(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.210 to Point/Station 1.310
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 6.587(CFS)
Depth of flow = 0.271(Ft.), Average velocity = 7.606(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	20.60	1.00
3	37.40	0.00
4	44.10	1.00
5	66.50	1.50
6	99.90	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 6.587(CFS)
' ' flow top width = 6.380(Ft.)
' ' velocity= 7.606(Ft/s)
' ' area = 0.866(Sq.Ft)
' ' Froude number = 3.638

Upstream point elevation = 1680.000(Ft.)
Downstream point elevation = 1523.000(Ft.)
Flow length = 665.000(Ft.)
Travel time = 1.46 min.
Time of concentration = 7.38 min.
Depth of flow = 0.271(Ft.)
Average velocity = 7.606(Ft/s)
Total irregular channel flow = 6.587(CFS)
Irregular channel normal depth above invert elev. = 0.271(Ft.)
Average velocity of channel(s) = 7.606(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.244
Decimal fraction soil group D = 0.756
RI index for soil(AMC 2) = 88.27
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 3.948(In/Hr) for a 100.0 year storm
Subarea runoff = 10.746(CFS) for 3.160(Ac.)
Total runoff = 11.912(CFS) Total area = 3.463(Ac.)
Depth of flow = 0.339(Ft.), Average velocity = 8.820(Ft/s)

++
Process from Point/Station 1.310 to Point/Station 1.920
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 12.844(CFS)
Depth of flow = 0.460(Ft.), Average velocity = 4.979(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	2.00	0.50
3	7.80	0.00
4	11.10	0.25
5	13.90	0.50
6	23.10	1.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 12.844(CFS)
' ' flow top width = 10.987(Ft.)
' ' velocity= 4.979(Ft/s)
' ' area = 2.579(Sq.Ft)
' ' Froude number = 1.811

Upstream point elevation = 1523.000(Ft.)
Downstream point elevation = 1486.000(Ft.)
Flow length = 760.000(Ft.)
Travel time = 2.54 min.
Time of concentration = 9.92 min.
Depth of flow = 0.460(Ft.)
Average velocity = 4.979(Ft/s)
Total irregular channel flow = 12.844(CFS)
Irregular channel normal depth above invert elev. = 0.460(Ft.)
Average velocity of channel(s) = 4.979(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.816
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 3.374(In/Hr) for a 100.0 year storm
Subarea runoff = 1.807(CFS) for 0.656(Ac.)
Total runoff = 13.719(CFS) Total area = 4.119(Ac.)
Depth of flow = 0.472(Ft.), Average velocity = 5.064(Ft/s)

++
Process from Point/Station 1.110 to Point/Station 1.920
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 4.119(Ac.)
Runoff from this stream = 13.719(CFS)
Time of concentration = 9.92 min.
Rainfall intensity = 3.374(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 1.410 to Point/Station 1.510
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1748.000(Ft.)
Bottom (of initial area) elevation = 1669.000(Ft.)
Difference in elevation = 79.000(Ft.)
Slope = 0.39500 s(percent)= 39.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.313 min.
Rainfall intensity = 4.698(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.866
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.361
Decimal fraction soil group D = 0.639
RI index for soil(AMC 2) = 87.92
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 4.867(CFS)
Total initial stream area = 1.196(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.510 to Point/Station 1.610
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel = 11.922(CFS)
Depth of flow = 0.353(Ft.), Average velocity = 10.579(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	17.10	1.00
3	31.30	0.00
4	35.20	1.00
5	51.90	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 11.922(CFS)
' ' flow top width = 6.387(Ft.)
' ' velocity= 10.579(Ft/s)
' ' area = 1.127(Sq.Ft)
' ' Froude number = 4.438
Upstream point elevation = 1669.000(Ft.)
Downstream point elevation = 1520.000(Ft.)
Flow length = 460.000(Ft.)
Travel time = 0.72 min.
Time of concentration = 6.04 min.
Depth of flow = 0.353(Ft.)
Average velocity = 10.579(Ft/s)
Total irregular channel flow = 11.922(CFS)
Irregular channel normal depth above invert elev. = 0.353(Ft.)
Average velocity of channel(s) = 10.579(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.867
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.002
Decimal fraction soil group D = 0.998
RI index for soil(AMC 2) = 88.99
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 4.390(In/Hr) for a 100.0 year storm
Subarea runoff = 14.048(CFS) for 3.689(Ac.)
Total runoff = 18.916(CFS) Total area = 4.885(Ac.)
Depth of flow = 0.420(Ft.), Average velocity = 11.873(Ft/s)

++
Process from Point/Station 1.610 to Point/Station 1.920
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 26.193(CFS)
Depth of flow = 0.378(Ft.), Average velocity = 4.391(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	44.20	1.00
3	73.60	0.00
4	127.80	1.00
5	145.50	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 26.193(CFS)
' ' flow top width = 31.582(Ft.)
' ' velocity= 4.391(Ft/s)
' ' area = 5.965(Sq.Ft)
' ' Froude number = 1.780

Upstream point elevation = 1520.000(Ft.)
Downstream point elevation = 1486.000(Ft.)
Flow length = 675.000(Ft.)
Travel time = 2.56 min.
Time of concentration = 8.60 min.
Depth of flow = 0.378(Ft.)
Average velocity = 4.391(Ft/s)
Total irregular channel flow = 26.193(CFS)
Irregular channel normal depth above invert elev. = 0.378(Ft.)
Average velocity of channel(s) = 4.391(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.745
Decimal fraction soil group D = 0.255
RI index for soil(AMC 2) = 86.76
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 3.640(In/Hr) for a 100.0 year storm
Subarea runoff = 14.495(CFS) for 4.672(Ac.)
Total runoff = 33.410(CFS) Total area = 9.557(Ac.)
Depth of flow = 0.414(Ft.), Average velocity = 4.666(Ft/s)

++
Process from Point/Station 1.410 to Point/Station 1.920
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 9.557(Ac.)
Runoff from this stream = 33.410(CFS)
Time of concentration = 8.60 min.
Rainfall intensity = 3.640(In/Hr)
Program is now starting with Main Stream No. 3

++
Process from Point/Station 1.710 to Point/Station 1.810
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1781.000(Ft.)
Bottom (of initial area) elevation = 1660.000(Ft.)
Difference in elevation = 121.000(Ft.)
Slope = 0.60500 s(percent)= 60.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration = 5.000 min.
Rainfall intensity = 4.852(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.870

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 3.172(CFS)
Total initial stream area = 0.751(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.810 to Point/Station 1.910
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel = 15.910(CFS)
Depth of flow = 0.383(Ft.), Average velocity = 8.542(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	24.00	1.50
3	41.50	1.00
4	54.30	0.00
5	79.50	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 15.910(CFS)
' ' flow top width = 9.727(Ft.)
' ' velocity= 8.542(Ft/s)
' ' area = 1.863(Sq.Ft)
' ' Froude number = 3.440

Upstream point elevation = 1660.000(Ft.)
Downstream point elevation = 1489.000(Ft.)
Flow length = 910.000(Ft.)
Travel time = 1.78 min.
Time of concentration = 6.78 min.
Depth of flow = 0.383(Ft.)
Average velocity = 8.542(Ft/s)
Total irregular channel flow = 15.910(CFS)
Irregular channel normal depth above invert elev. = 0.383(Ft.)
Average velocity of channel(s) = 8.542(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.863
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.262
Decimal fraction soil group D = 0.738
RI index for soil(AMC 2) = 88.21
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 4.130(In/Hr) for a 100.0 year storm

Subarea runoff = 25.393(CFS) for 7.126(Ac.)
Total runoff = 28.565(CFS) Total area = 7.877(Ac.)
Depth of flow = 0.477(Ft.), Average velocity = 9.888(Ft/s)

++
Process from Point/Station 1.910 to Point/Station 1.920
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel = 29.408(CFS)
Depth of flow = 0.987(Ft.), Average velocity = 3.525(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	3.20	0.75
3	11.10	0.50
4	14.70	0.25
5	16.40	0.00
6	17.70	0.50
7	19.80	1.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 29.408(CFS)
' ' flow top width = 19.577(Ft.)
' ' velocity= 3.525(Ft/s)
' ' area = 8.342(Sq.Ft)
' ' Froude number = 0.952

Upstream point elevation = 1489.000(Ft.)
Downstream point elevation = 1486.000(Ft.)
Flow length = 270.000(Ft.)
Travel time = 1.28 min.
Time of concentration = 8.05 min.
Depth of flow = 0.987(Ft.)
Average velocity = 3.525(Ft/s)
Total irregular channel flow = 29.408(CFS)
Irregular channel normal depth above invert elev. = 0.987(Ft.)
Average velocity of channel(s) = 3.525(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 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 = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 3.769(In/Hr) for a 100.0 year storm
Subarea runoff = 1.618(CFS) for 0.521(Ac.)
Total runoff = 30.183(CFS) Total area = 8.398(Ac.)
Depth of flow = 0.995(Ft.), Average velocity = 3.552(Ft/s)

++
Process from Point/Station 1.710 to Point/Station 1.920
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area = 8.398(Ac.)
Runoff from this stream = 30.183(CFS)
Time of concentration = 8.05 min.
Rainfall intensity = 3.769(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.719	9.92	3.374
2	33.410	8.60	3.640
3	30.183	8.05	3.769

Largest stream flow has longer or shorter time of concentration
Qp = 33.410 + sum of

Qa	Tb/Ta	
13.719 *	0.867 =	11.892
Qb	**Ia/Ib**	
30.183 *	0.966 =	29.147

Qp = 74.449

Total of 3 main streams to confluence:
Flow rates before confluence point:
13.719 33.410 30.183
Area of streams before confluence:
4.119 9.557 8.398

Results of confluence:
Total flow rate = 74.449(CFS)
Time of concentration = 8.600 min.
Effective stream area after confluence = 22.074(Ac.)
End of computations, total study area = 22.07 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.989
Area averaged RI index number = 87.4

EXISTING CONDITIONS 100-YEAR DESIGN STORM EVENT UNIT HYDROGRAPH

Please Note: the 10-Year Design Storm Event Unit hydrograph was not analyzed.

```
                U n i t   H y d r o g r a p h   A n a l y s i s
                Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
                     Study date  03/08/22 File: garbaniex100uhd124100.out
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978
------------------------------------------------------------------------
 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format
------------------------------------------------------------------------
------------------------------------------------------------------------
Drainage Area =      22.07(Ac.)  =      0.034 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      22.07(Ac.)  =      0.034 Sq. Mi.
Length along longest watercourse =    1625.00(Ft.)
Length along longest watercourse measured to centroid =     875.00(Ft.)
Length along longest watercourse =      0.308 Mi.
Length along longest watercourse measured to centroid =      0.166 Mi.
Difference in elevation =     240.00(Ft.)
Slope along watercourse =    779.8154 Ft./Mi.
Average Manning's 'N' = 0.050
Lag time =    0.109 Hr.
Lag time =     6.56 Min.
25% of lag time =     1.64 Min.
40% of lag time =     2.62 Min.
Unit time =    10.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:
Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      22.07                1.82                       40.17

100 YEAR Area rainfall data:
Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      22.07                4.90                      108.16

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.820(In)
Area Averaged 100-Year Rainfall =    4.900(In)

Point rain (area averaged) =    4.900(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    4.900(In)
```

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
22.074	87.40	0.011

Total Area Entered = 22.07(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
87.4	87.4	0.160	0.011	0.158	1.000	0.158

Sum (F) = 0.158

Area averaged mean soil loss (F) (In/Hr) = 0.158
Minimum soil loss rate ((In/Hr)) = 0.079
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.167	152.497	33.774	7.514
2	0.333	304.993	46.826	10.417
3	0.500	457.490	11.038	2.456
4	0.667	609.987	4.808	1.070
5	0.833	762.483	2.395	0.533
6	1.000	914.980	1.159	0.258
		Sum = 100.000	Sum=	22.246

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) Max	Low	Effective (In/Hr)
1	0.17	0.17	0.049	(0.280)	0.044	0.005
2	0.33	0.17	0.049	(0.277)	0.044	0.005
3	0.50	0.17	0.049	(0.275)	0.044	0.005
4	0.67	0.23	0.069	(0.273)	0.062	0.007
5	0.83	0.23	0.069	(0.271)	0.062	0.007
6	1.00	0.23	0.069	(0.269)	0.062	0.007
7	1.17	0.20	0.059	(0.267)	0.053	0.006
8	1.33	0.20	0.059	(0.265)	0.053	0.006
9	1.50	0.20	0.059	(0.263)	0.053	0.006
10	1.67	0.23	0.069	(0.260)	0.062	0.007
11	1.83	0.23	0.069	(0.258)	0.062	0.007
12	2.00	0.23	0.069	(0.256)	0.062	0.007
13	2.17	0.27	0.078	(0.254)	0.071	0.008
14	2.33	0.27	0.078	(0.252)	0.071	0.008
15	2.50	0.27	0.078	(0.250)	0.071	0.008
16	2.67	0.33	0.098	(0.248)	0.088	0.010
17	2.83	0.33	0.098	(0.246)	0.088	0.010
18	3.00	0.33	0.098	(0.244)	0.088	0.010

19	3.17	0.33	0.098	(0.242)	0.088	0.010
20	3.33	0.33	0.098	(0.240)	0.088	0.010
21	3.50	0.33	0.098	(0.238)	0.088	0.010
22	3.67	0.37	0.108	(0.236)	0.097	0.011
23	3.83	0.37	0.108	(0.234)	0.097	0.011
24	4.00	0.37	0.108	(0.232)	0.097	0.011
25	4.17	0.43	0.127	(0.230)	0.115	0.013
26	4.33	0.43	0.127	(0.228)	0.115	0.013
27	4.50	0.43	0.127	(0.226)	0.115	0.013
28	4.67	0.50	0.147	(0.224)	0.132	0.015
29	4.83	0.50	0.147	(0.222)	0.132	0.015
30	5.00	0.50	0.147	(0.220)	0.132	0.015
31	5.17	0.43	0.127	(0.219)	0.115	0.013
32	5.33	0.43	0.127	(0.217)	0.115	0.013
33	5.50	0.43	0.127	(0.215)	0.115	0.013
34	5.67	0.53	0.157	(0.213)	0.141	0.016
35	5.83	0.53	0.157	(0.211)	0.141	0.016
36	6.00	0.53	0.157	(0.209)	0.141	0.016
37	6.17	0.60	0.176	(0.207)	0.159	0.018
38	6.33	0.60	0.176	(0.205)	0.159	0.018
39	6.50	0.60	0.176	(0.204)	0.159	0.018
40	6.67	0.67	0.196	(0.202)	0.176	0.020
41	6.83	0.67	0.196	(0.200)	0.176	0.020
42	7.00	0.67	0.196	(0.198)	0.176	0.020
43	7.17	0.70	0.206	(0.196)	0.185	0.021
44	7.33	0.70	0.206	(0.195)	0.185	0.021
45	7.50	0.70	0.206	(0.193)	0.185	0.021
46	7.67	0.83	0.245	0.191	(0.220)	0.054
47	7.83	0.83	0.245	0.189	(0.220)	0.056
48	8.00	0.83	0.245	0.187	(0.220)	0.057
49	8.17	1.00	0.294	0.186	(0.265)	0.108
50	8.33	1.00	0.294	0.184	(0.265)	0.110
51	8.50	1.00	0.294	0.182	(0.265)	0.112
52	8.67	1.10	0.323	0.181	(0.291)	0.143
53	8.83	1.10	0.323	0.179	(0.291)	0.144
54	9.00	1.10	0.323	0.177	(0.291)	0.146
55	9.17	1.30	0.382	0.176	(0.344)	0.207
56	9.33	1.30	0.382	0.174	(0.344)	0.208
57	9.50	1.30	0.382	0.172	(0.344)	0.210
58	9.67	1.43	0.421	0.171	(0.379)	0.251
59	9.83	1.43	0.421	0.169	(0.379)	0.252
60	10.00	1.43	0.421	0.167	(0.379)	0.254
61	10.17	1.00	0.294	0.166	(0.265)	0.128
62	10.33	1.00	0.294	0.164	(0.265)	0.130
63	10.50	1.00	0.294	0.163	(0.265)	0.131
64	10.67	1.33	0.392	0.161	(0.353)	0.231
65	10.83	1.33	0.392	0.159	(0.353)	0.233
66	11.00	1.33	0.392	0.158	(0.353)	0.234
67	11.17	1.27	0.372	0.156	(0.335)	0.216
68	11.33	1.27	0.372	0.155	(0.335)	0.218
69	11.50	1.27	0.372	0.153	(0.335)	0.219
70	11.67	1.17	0.343	0.152	(0.309)	0.191
71	11.83	1.17	0.343	0.150	(0.309)	0.193
72	12.00	1.17	0.343	0.149	(0.309)	0.194

73	12.17	1.70	0.500	0.147	(0.450)	0.353
74	12.33	1.70	0.500	0.146	(0.450)	0.354
75	12.50	1.70	0.500	0.144	(0.450)	0.356
76	12.67	1.90	0.559	0.143	(0.503)	0.416
77	12.83	1.90	0.559	0.141	(0.503)	0.417
78	13.00	1.90	0.559	0.140	(0.503)	0.419
79	13.17	2.27	0.666	0.139	(0.600)	0.528
80	13.33	2.27	0.666	0.137	(0.600)	0.529
81	13.50	2.27	0.666	0.136	(0.600)	0.531
82	13.67	1.53	0.451	0.134	(0.406)	0.316
83	13.83	1.53	0.451	0.133	(0.406)	0.318
84	14.00	1.53	0.451	0.132	(0.406)	0.319
85	14.17	1.77	0.519	0.130	(0.467)	0.389
86	14.33	1.77	0.519	0.129	(0.467)	0.390
87	14.50	1.77	0.519	0.128	(0.467)	0.392
88	14.67	1.70	0.500	0.126	(0.450)	0.373
89	14.83	1.70	0.500	0.125	(0.450)	0.375
90	15.00	1.70	0.500	0.124	(0.450)	0.376
91	15.17	1.57	0.461	0.123	(0.415)	0.338
92	15.33	1.57	0.461	0.121	(0.415)	0.339
93	15.50	1.57	0.461	0.120	(0.415)	0.341
94	15.67	1.27	0.372	0.119	(0.335)	0.254
95	15.83	1.27	0.372	0.118	(0.335)	0.255
96	16.00	1.27	0.372	0.116	(0.335)	0.256
97	16.17	0.27	0.078	(0.115)	0.071	0.008
98	16.33	0.27	0.078	(0.114)	0.071	0.008
99	16.50	0.27	0.078	(0.113)	0.071	0.008
100	16.67	0.20	0.059	(0.112)	0.053	0.006
101	16.83	0.20	0.059	(0.111)	0.053	0.006
102	17.00	0.20	0.059	(0.109)	0.053	0.006
103	17.17	0.33	0.098	(0.108)	0.088	0.010
104	17.33	0.33	0.098	(0.107)	0.088	0.010
105	17.50	0.33	0.098	(0.106)	0.088	0.010
106	17.67	0.30	0.088	(0.105)	0.079	0.009
107	17.83	0.30	0.088	(0.104)	0.079	0.009
108	18.00	0.30	0.088	(0.103)	0.079	0.009
109	18.17	0.27	0.078	(0.102)	0.071	0.008
110	18.33	0.27	0.078	(0.101)	0.071	0.008
111	18.50	0.27	0.078	(0.100)	0.071	0.008
112	18.67	0.17	0.049	(0.099)	0.044	0.005
113	18.83	0.17	0.049	(0.098)	0.044	0.005
114	19.00	0.17	0.049	(0.097)	0.044	0.005
115	19.17	0.23	0.069	(0.096)	0.062	0.007
116	19.33	0.23	0.069	(0.095)	0.062	0.007
117	19.50	0.23	0.069	(0.095)	0.062	0.007
118	19.67	0.17	0.049	(0.094)	0.044	0.005
119	19.83	0.17	0.049	(0.093)	0.044	0.005
120	20.00	0.17	0.049	(0.092)	0.044	0.005
121	20.17	0.20	0.059	(0.091)	0.053	0.006
122	20.33	0.20	0.059	(0.090)	0.053	0.006
123	20.50	0.20	0.059	(0.090)	0.053	0.006
124	20.67	0.17	0.049	(0.089)	0.044	0.005
125	20.83	0.17	0.049	(0.088)	0.044	0.005
126	21.00	0.17	0.049	(0.087)	0.044	0.005

127	21.17	0.17	0.049	(0.087)	0.044	0.005
128	21.33	0.17	0.049	(0.086)	0.044	0.005
129	21.50	0.17	0.049	(0.085)	0.044	0.005
130	21.67	0.17	0.049	(0.085)	0.044	0.005
131	21.83	0.17	0.049	(0.084)	0.044	0.005
132	22.00	0.17	0.049	(0.084)	0.044	0.005
133	22.17	0.17	0.049	(0.083)	0.044	0.005
134	22.33	0.17	0.049	(0.083)	0.044	0.005
135	22.50	0.17	0.049	(0.082)	0.044	0.005
136	22.67	0.13	0.039	(0.082)	0.035	0.004
137	22.83	0.13	0.039	(0.081)	0.035	0.004
138	23.00	0.13	0.039	(0.081)	0.035	0.004
139	23.17	0.13	0.039	(0.080)	0.035	0.004
140	23.33	0.13	0.039	(0.080)	0.035	0.004
141	23.50	0.13	0.039	(0.080)	0.035	0.004
142	23.67	0.13	0.039	(0.079)	0.035	0.004
143	23.83	0.13	0.039	(0.079)	0.035	0.004
144	24.00	0.13	0.039	(0.079)	0.035	0.004

(Loss Rate Not Used)

Sum = 100.0 Sum = 14.4

Flood volume = Effective rainfall 2.40(In)
times area 22.1(Ac.)/[(In)/(Ft.)] = 4.4(Ac.Ft)
Total soil loss = 2.50(In)
Total soil loss = 4.606(Ac.Ft)
Total rainfall = 4.90(In)
Flood volume = 191988.9 Cubic Feet
Total soil loss = 200624.4 Cubic Feet

Peak flow rate of this hydrograph = 11.580(CFS)

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24 - 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 10 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+10	0.0005	0.04	Q	|	|	|	|
0+20	0.0017	0.09	Q	|	|	|	|
0+30	0.0031	0.10	Q	|	|	|	|
0+40	0.0047	0.12	Q	|	|	|	|
0+50	0.0067	0.14	Q	|	|	|	|
1+ 0	0.0088	0.15	Q	|	|	|	|
1+10	0.0107	0.14	Q	|	|	|	|
1+20	0.0126	0.13	Q	|	|	|	|
1+30	0.0144	0.13	Q	|	|	|	|
1+40	0.0163	0.14	Q	|	|	|	|
1+50	0.0184	0.15	Q	|	|	|	|
2+ 0	0.0205	0.15	Q	|	|	|	|
2+10	0.0227	0.16	Q	|	|	|	|
2+20	0.0250	0.17	Q	|	|	|	|
2+30	0.0274	0.17	Q	|	|	|	|

```
 2+40     0.0300     0.19  Q       |       |       |       |
 2+50     0.0329     0.21  Q       |       |       |       |
 3+ 0     0.0358     0.21  Q       |       |       |       |
 3+10     0.0388     0.22  Q       |       |       |       |
 3+20     0.0418     0.22  Q       |       |       |       |
 3+30     0.0448     0.22  Q       |       |       |       |
 3+40     0.0479     0.23  Q       |       |       |       |
 3+50     0.0512     0.24  Q       |       |       |       |
 4+ 0     0.0544     0.24  Q       |       |       |       |
 4+10     0.0579     0.25  Q       |       |       |       |
 4+20     0.0617     0.27  Q       |       |       |       |
 4+30     0.0656     0.28  Q       |       |       |       |
 4+40     0.0697     0.30  Q       |       |       |       |
 4+50     0.0740     0.32  Q       |       |       |       |
 5+ 0     0.0785     0.32  Q       |       |       |       |
 5+10     0.0828     0.31  Q       |       |       |       |
 5+20     0.0868     0.29  Q       |       |       |       |
 5+30     0.0908     0.29  Q       |       |       |       |
 5+40     0.0950     0.31  Q       |       |       |       |
 5+50     0.0996     0.34  Q       |       |       |       |
 6+ 0     0.1044     0.34  Q       |       |       |       |
 6+10     0.1093     0.36  Q       |       |       |       |
 6+20     0.1146     0.38  QV      |       |       |       |
 6+30     0.1200     0.39  QV      |       |       |       |
 6+40     0.1256     0.41  QV      |       |       |       |
 6+50     0.1314     0.43  QV      |       |       |       |
 7+ 0     0.1374     0.43  QV      |       |       |       |
 7+10     0.1435     0.44  QV      |       |       |       |
 7+20     0.1497     0.45  QV      |       |       |       |
 7+30     0.1560     0.46  QV      |       |       |       |
 7+40     0.1658     0.71  |Q      |       |       |       |
 7+50     0.1805     1.07  |VQ     |       |       |       |
 8+ 0     0.1968     1.18  |VQ     |       |       |       |
 8+10     0.2192     1.62  |V Q    |       |       |       |
 8+20     0.2494     2.19  | V Q   |       |       |       |
 8+30     0.2818     2.36  | V Q   |       |       |       |
 8+40     0.3186     2.67  | V  Q  |       |       |       |
 8+50     0.3604     3.04  |  V  Q |       |       |       |
 9+ 0     0.4040     3.16  |  V  Q |       |       |       |
 9+10     0.4546     3.67  |   V  Q|       |       |       |
 9+20     0.5143     4.34  |   V   Q       |       |       |
 9+30     0.5767     4.53  |    V   Q      |       |       |
 9+40     0.6445     4.92  |    V   Q      |       |       |
 9+50     0.7188     5.40  |     V   Q     |       |       |
10+ 0     0.7952     5.55  |     V  |Q     |       |       |
10+10     0.8595     4.67  |      V Q|     |       |       |
10+20     0.9063     3.40  |     Q V |     |       |       |
10+30     0.9494     3.13  |     Q V |     |       |       |
10+40     1.0012     3.76  |      Q V|     |       |       |
10+50     1.0667     4.75  |       Q|      |       |       |
11+ 0     1.1355     5.00  |       QV      |       |       |
11+10     1.2042     4.99  |       QV      |       |       |
11+20     1.2713     4.87  |       Q|V     |       |       |
11+30     1.3385     4.88  |       Q| V     |       |       |
```

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11+40     1.4029    4.67 |      Q| V     |       |       |
11+50     1.4634    4.39 |      Q | V    |       |       |
12+ 0     1.5233    4.35 |      Q | V    |       |       |
12+10     1.5994    5.53 |       |Q  V   |       |       |
12+20     1.6983    7.18 |       |  QV   |       |       |
12+30     1.8028    7.59 |       |  QV   |       |       |
12+40     1.9162    8.23 |       |   QV  |       |       |
12+50     2.0397    8.96 |       |   QV  |       |       |
13+ 0     2.1661    9.18 |       |    QV |       |       |
13+10     2.3049   10.08 |       |      Q|       |       |
13+20     2.4601   11.27 |       |       | Q     |       |
13+30     2.6196   11.58 |       |       |  Q    |       |
13+40     2.7588   10.11 |       |       Q   V   |       |
13+50     2.8683    7.95 |       |   Q   |   V   |       |
14+ 0     2.9713    7.48 |       |   Q   |   V   |       |
14+10     3.0786    7.79 |       |   Q   |    V  |       |
14+20     3.1945    8.42 |       |   Q   |    V  |       |
14+30     3.3125    8.56 |       |   Q   |     V |       |
14+40     3.4298    8.52 |       |   Q   |     V |       |
14+50     3.5452    8.38 |       |   Q   |      V|       |
15+ 0     3.6606    8.38 |       |   Q   |      V|       |
15+10     3.7720    8.09 |       |   Q   |       V       |
15+20     3.8781    7.70 |       |   Q   |       V       |
15+30     3.9831    7.63 |       |   Q   |       V       |
15+40     4.0789    6.95 |       |  Q    |       V       |
15+50     4.1620    6.04 |       |  Q    |       V       |
16+ 0     4.2424    5.84 |       |Q      |       |       V|
16+10     4.2960    3.89 |      Q|       |       |       V|
16+20     4.3134    1.27 | Q     |       |       |       V|
16+30     4.3222    0.64 |Q      |       |       |       V|
16+40     4.3271    0.36 Q       |       |       |       V|
16+50     4.3299    0.20 Q       |       |       |       V|
17+ 0     4.3317    0.13 Q       |       |       |       V|
17+10     4.3340    0.16 Q       |       |       |       V|
17+20     4.3368    0.20 Q       |       |       |       V|
17+30     4.3397    0.21 Q       |       |       |       V|
17+40     4.3425    0.21 Q       |       |       |       V|
17+50     4.3453    0.20 Q       |       |       |       V|
18+ 0     4.3480    0.20 Q       |       |       |       V|
18+10     4.3506    0.19 Q       |       |       |       V|
18+20     4.3531    0.18 Q       |       |       |       V|
18+30     4.3555    0.18 Q       |       |       |       V|
18+40     4.3576    0.15 Q       |       |       |       V|
18+50     4.3593    0.12 Q       |       |       |       V|
19+ 0     4.3609    0.11 Q       |       |       |       V|
19+10     4.3626    0.13 Q       |       |       |       V|
19+20     4.3646    0.14 Q       |       |       |       V|
19+30     4.3667    0.15 Q       |       |       |       V|
19+40     4.3685    0.14 Q       |       |       |       V|
19+50     4.3701    0.12 Q       |       |       |       V|
20+ 0     4.3717    0.11 Q       |       |       |       V|
20+10     4.3733    0.12 Q       |       |       |       V|
20+20     4.3751    0.13 Q       |       |       |       V|
20+30     4.3769    0.13 Q       |       |       |       V|
```

20+40	4.3785	0.12	Q	|	|	|	V|
20+50	4.3801	0.11	Q	|	|	|	V|
21+ 0	4.3816	0.11	Q	|	|	|	V|
21+10	4.3831	0.11	Q	|	|	|	V|
21+20	4.3846	0.11	Q	|	|	|	V|
21+30	4.3861	0.11	Q	|	|	|	V|
21+40	4.3876	0.11	Q	|	|	|	V|
21+50	4.3892	0.11	Q	|	|	|	V|
22+ 0	4.3907	0.11	Q	|	|	|	V|
22+10	4.3922	0.11	Q	|	|	|	V|
22+20	4.3937	0.11	Q	|	|	|	V|
22+30	4.3952	0.11	Q	|	|	|	V|
22+40	4.3966	0.10	Q	|	|	|	V|
22+50	4.3978	0.09	Q	|	|	|	V|
23+ 0	4.3990	0.09	Q	|	|	|	V|
23+10	4.4003	0.09	Q	|	|	|	V|
23+20	4.4015	0.09	Q	|	|	|	V|
23+30	4.4027	0.09	Q	|	|	|	V|
23+40	4.4039	0.09	Q	|	|	|	V|
23+50	4.4051	0.09	Q	|	|	|	V|
24+ 0	4.4063	0.09	Q	|	|	|	V|
24+10	4.4071	0.06	Q	|	|	|	V|
24+20	4.4073	0.02	Q	|	|	|	V|
24+30	4.4074	0.01	Q	|	|	|	V|
24+40	4.4074	0.00	Q	|	|	|	V|
24+50	4.4075	0.00	Q	|	|	|	V|

ATTACHMENT 3: PROPOSED CONDITIONS CALCULATIONS

This attachment contains the proposed conditions hydrology calculations. Please see the attached calculations.

PROPOSED CONDITIONS 10-YEAR DESIGN STORM EVENT

```
                    Riverside County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
          Rational Hydrology Study        Date: 03/10/22  File:garbanipr100d1.out
--------------------------------------------------------------------------
 *********  Hydrology Study Control Information **********
 English (in-lb) Units used in input data file
--------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

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

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity =  2.250(In/Hr)
10 year storm 60 minute intensity =  0.870(In/Hr)
100 year storm 10 minute intensity =  3.360(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.870(In/Hr)
Slope of intensity duration curve = 0.5300


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.110 to Point/Station        1.210
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   180.000(Ft.)
Top (of initial area) elevation =  1498.000(Ft.)
Bottom (of initial area) elevation =  1490.000(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.04444  s(percent)=       4.44
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.141 min.
Rainfall intensity =      2.688(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.769
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 =  0.800; Impervious fraction =  0.200
Initial subarea runoff =      0.393(CFS)
Total initial stream area =       0.190(Ac.)
Pervious area fraction = 0.800
```

++
Process from Point/Station 1.210 to Point/Station 1.320
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 0.767(CFS)
Depth of flow = 0.125(Ft.), Average velocity = 1.958(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	0.00	0.00
3	36.00	0.72

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 0.767(CFS)
' ' flow top width = 6.259(Ft.)
' ' velocity= 1.958(Ft/s)
' ' area = 0.392(Sq.Ft)
' ' Froude number = 1.379

Upstream point elevation = 1490.000(Ft.)
Downstream point elevation = 1486.000(Ft.)
Flow length = 330.000(Ft.)
Travel time = 2.81 min.
Time of concentration = 9.95 min.
Depth of flow = 0.125(Ft.)
Average velocity = 1.958(Ft/s)
Total irregular channel flow = 0.767(CFS)
Irregular channel normal depth above invert elev. = 0.125(Ft.)
Average velocity of channel(s) = 1.958(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.776
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.179
Decimal fraction soil group D = 0.821
RI index for soil(AMC 2) = 73.93
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 2.255(In/Hr) for a 10.0 year storm
Subarea runoff = 0.686(CFS) for 0.392(Ac.)
Total runoff = 1.078(CFS) Total area = 0.582(Ac.)
Depth of flow = 0.142(Ft.), Average velocity = 2.132(Ft/s)

++
Process from Point/Station 1.110 to Point/Station 1.320
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 0.582(Ac.)
Runoff from this stream = 1.078(CFS)
Time of concentration = 9.95 min.
Rainfall intensity = 2.255(In/Hr)

++
Process from Point/Station 1.310 to Point/Station 1.320
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 175.000(Ft.)
Top (of initial area) elevation = 1488.000(Ft.)
Bottom (of initial area) elevation = 1486.000(Ft.)
Difference in elevation = 2.000(Ft.)
Slope = 0.01143 s(percent)= 1.14
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.265 min.
Rainfall intensity = 2.342(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.785
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 0.333(CFS)
Total initial stream area = 0.181(Ac.)
Pervious area fraction = 0.800

++
Process from Point/Station 1.310 to Point/Station 1.320
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.181(Ac.)
Runoff from this stream = 0.333(CFS)
Time of concentration = 9.27 min.
Rainfall intensity = 2.342(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.078	9.95	2.255
2	0.333	9.27	2.342

Largest stream flow has longer time of concentration
Qp = 1.078 + sum of
Qb Ia/Ib
0.333 * 0.963 = 0.320
Qp = 1.399

Total of 2 streams to confluence:
Flow rates before confluence point:
1.078 0.333
Area of streams before confluence:
0.582 0.181
Results of confluence:
Total flow rate = 1.399(CFS)
Time of concentration = 9.951 min.
Effective stream area after confluence = 0.763(Ac.)

++
Process from Point/Station 1.320 to Point/Station 1.101
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1484.000(Ft.)
Downstream point/station elevation = 1478.000(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.399(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.399(CFS)
Normal flow depth in pipe = 2.41(In.)
Flow top width inside pipe = 12.26(In.)
Critical Depth = 5.32(In.)
Pipe flow velocity = 9.92(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 10.04 min.

++
Process from Point/Station 1.110 to Point/Station 1.101
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 0.763(Ac.)
Runoff from this stream = 1.399(CFS)
Time of concentration = 10.04 min.
Rainfall intensity = 2.245(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 1.410 to Point/Station 1.420
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 65.000(Ft.)
Top (of initial area) elevation = 1552.000(Ft.)
Bottom (of initial area) elevation = 1527.000(Ft.)
Difference in elevation = 25.000(Ft.)
Slope = 0.38462 s(percent)= 38.46
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.043 min.
Rainfall intensity = 2.937(In/Hr) for a 10.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 80.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 0.807(CFS)
Total initial stream area = 0.340(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.420 to Point/Station 1.430
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.332(Ft.), Average velocity = 7.323(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.50
2	1.50	0.00
3	3.00	1.50

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 0.807(CFS)
' ' flow top width = 0.664(Ft.)
' ' velocity= 7.323(Ft/s)
' ' area = 0.110(Sq.Ft)
' ' Froude number = 3.168
Upstream point elevation = 1527.000(Ft.)
Downstream point elevation = 1522.000(Ft.)
Flow length = 70.000(Ft.)
Travel time = 0.16 min.
Time of concentration = 6.20 min.
Depth of flow = 0.332(Ft.)
Average velocity = 7.323(Ft/s)
Total irregular channel flow = 0.807(CFS)
Irregular channel normal depth above invert elev. = 0.332(Ft.)
Average velocity of channel(s) = 7.323(Ft/s)

++
Process from Point/Station 1.430 to Point/Station 1.510
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.282(Ft.), Average velocity = 10.169(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 1.50
2 1.50 0.00
3 3.00 1.50
Manning's 'N' friction factor = 0.013

Sub-Channel flow = 0.807(CFS)
' ' flow top width = 0.563(Ft.)
' ' velocity= 10.169(Ft/s)
' ' area = 0.079(Sq.Ft)
' ' Froude number = 4.775

Upstream point elevation = 1522.000(Ft.)
Downstream point elevation = 1516.000(Ft.)
Flow length = 35.000(Ft.)
Travel time = 0.06 min.
Time of concentration = 6.26 min.
Depth of flow = 0.282(Ft.)
Average velocity = 10.169(Ft/s)
Total irregular channel flow = 0.807(CFS)
Irregular channel normal depth above invert elev. = 0.282(Ft.)
Average velocity of channel(s) = 10.169(Ft/s)

++
Process from Point/Station 1.510 to Point/Station 1.720
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 4.471(CFS)
Depth of flow = 0.195(Ft.), Average velocity = 4.688(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.50
2 0.00 0.00
3 20.00 0.40
Manning's 'N' friction factor = 0.013

Sub-Channel flow = 4.471(CFS)
' ' flow top width = 9.766(Ft.)
' ' velocity= 4.688(Ft/s)
' ' area = 0.954(Sq.Ft)
' ' Froude number = 2.644
Upstream point elevation = 1516.000(Ft.)
Downstream point elevation = 1487.000(Ft.)
Flow length = 755.000(Ft.)

Travel time = 2.68 min.
Time of concentration = 8.94 min.
Depth of flow = 0.195(Ft.)
Average velocity = 4.688(Ft/s)
Total irregular channel flow = 4.471(CFS)
Irregular channel normal depth above invert elev. = 0.195(Ft.)
Average velocity of channel(s) = 4.688(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.775
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.399
Decimal fraction soil group D = 0.601
RI index for soil(AMC 2) = 72.61
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 2.386(In/Hr) for a 10.0 year storm
Subarea runoff = 7.253(CFS) for 3.925(Ac.)
Total runoff = 8.060(CFS) Total area = 4.265(Ac.)
Depth of flow = 0.244(Ft.), Average velocity = 5.432(Ft/s)

++
Process from Point/Station 1.410 to Point/Station 1.720
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 4.265(Ac.)
Runoff from this stream = 8.060(CFS)
Time of concentration = 8.94 min.
Rainfall intensity = 2.386(In/Hr)

++
Process from Point/Station 1.610 to Point/Station 1.710
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 190.000(Ft.)
Top (of initial area) elevation = 1518.000(Ft.)
Bottom (of initial area) elevation = 1505.000(Ft.)
Difference in elevation = 13.000(Ft.)
Slope = 0.06842 s(percent)= 6.84
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.694 min.
Rainfall intensity = 2.782(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.775
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.905
Decimal fraction soil group D = 0.095
RI index for soil(AMC 2) = 69.57
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 0.272(CFS)
Total initial stream area = 0.126(Ac.)
Pervious area fraction = 0.800

++
Process from Point/Station 1.710 to Point/Station 1.720
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 1.704(CFS)
Depth of flow = 0.134(Ft.), Average velocity = 3.771(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	0.00	0.00
3	20.00	0.40

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 1.704(CFS)
' ' flow top width = 6.722(Ft.)
' ' velocity= 3.771(Ft/s)
' ' area = 0.452(Sq.Ft)
' ' Froude number = 2.564

Upstream point elevation = 1505.000(Ft.)
Downstream point elevation = 1487.000(Ft.)
Flow length = 440.000(Ft.)
Travel time = 1.94 min.
Time of concentration = 8.64 min.
Depth of flow = 0.134(Ft.)
Average velocity = 3.771(Ft/s)
Total irregular channel flow = 1.704(CFS)
Irregular channel normal depth above invert elev. = 0.134(Ft.)
Average velocity of channel(s) = 3.771(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.773
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.501
Decimal fraction soil group D = 0.499
RI index for soil(AMC 2) = 71.99
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 2.430(In/Hr) for a 10.0 year storm
Subarea runoff = 2.810(CFS) for 1.495(Ac.)
Total runoff = 3.081(CFS) Total area = 1.621(Ac.)
Depth of flow = 0.168(Ft.), Average velocity = 4.373(Ft/s)

++
Process from Point/Station 1.610 to Point/Station 1.720
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.621(Ac.)
Runoff from this stream = 3.081(CFS)
Time of concentration = 8.64 min.
Rainfall intensity = 2.430(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.060	8.94	2.386
2	3.081	8.64	2.430

Largest stream flow has longer time of concentration
Qp = 8.060 + sum of
Qb Ia/Ib
3.081 * 0.982 = 3.025
Qp = 11.085

Total of 2 streams to confluence:
Flow rates before confluence point:
8.060 3.081
Area of streams before confluence:
4.265 1.621
Results of confluence:
Total flow rate = 11.085(CFS)
Time of concentration = 8.944 min.
Effective stream area after confluence = 5.886(Ac.)

++
Process from Point/Station 1.720 to Point/Station 1.920
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1484.500(Ft.)
Downstream point/station elevation = 1484.100(Ft.)
Pipe length = 40.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.085(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 11.085(CFS)
Normal flow depth in pipe = 18.00(In.)
Flow top width inside pipe = 0.00(In.)
Critical Depth = 15.29(In.)
Pipe flow velocity = 5.94(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 9.06 min.

++
Process from Point/Station 1.410 to Point/Station 1.920
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 5.886(Ac.)
Runoff from this stream = 11.085(CFS)
Time of concentration = 9.06 min.
Rainfall intensity = 2.370(In/Hr)

++
Process from Point/Station 1.810 to Point/Station 1.910
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 185.000(Ft.)
Top (of initial area) elevation = 1516.000(Ft.)
Bottom (of initial area) elevation = 1510.000(Ft.)
Difference in elevation = 6.000(Ft.)
Slope = 0.03243 s(percent)= 3.24
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.690 min.
Rainfall intensity = 2.585(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.195
Decimal fraction soil group D = 0.805
RI index for soil(AMC 2) = 73.83
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 0.685(CFS)
Total initial stream area = 0.336(Ac.)
Pervious area fraction = 0.800

++
Process from Point/Station 1.910 to Point/Station 1.920
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.641(CFS)
Depth of flow = 0.160(Ft.), Average velocity = 4.107(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	0.00	0.00
3	20.00	0.40

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 2.641(CFS)
' ' flow top width = 8.019(Ft.)

```
 '    '   velocity=    4.107(Ft/s)
 '    '    area =      0.643(Sq.Ft)
 '    '    Froude number =     2.556

Upstream point elevation =  1510.000(Ft.)
Downstream point elevation =  1487.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    2.44 min.
Time of concentration =   10.12 min.
Depth of flow =   0.160(Ft.)
Average velocity =   4.107(Ft/s)
Total irregular channel flow =     2.641(CFS)
Irregular channel normal depth above invert elev. =   0.160(Ft.)
Average velocity of channel(s) =   4.107(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.758
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.688
Decimal fraction soil group D = 0.312
RI index for soil(AMC 2)  =  70.87
Pervious area fraction =  0.800; Impervious fraction =  0.200
Rainfall intensity =      2.234(In/Hr) for a    10.0 year storm
Subarea runoff =      3.858(CFS) for      2.278(Ac.)
Total runoff =      4.543(CFS)      Total area =       2.614(Ac.)
Depth of flow =   0.197(Ft.), Average velocity =   4.703(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.810 to Point/Station        1.920
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.614(Ac.)
Runoff from this stream =      4.543(CFS)
Time of concentration =   10.12 min.
Rainfall intensity =     2.234(In/Hr)
Summary of stream data:

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


1       11.085      9.06              2.370
2        4.543     10.12              2.234
Largest stream flow has longer or shorter time of concentration
Qp =     11.085 + sum of
            Qa         Tb/Ta
             4.543 *    0.894 =      4.064
Qp =     15.149
```

Total of 2 streams to confluence:
Flow rates before confluence point:
11.085 4.543
Area of streams before confluence:
5.886 2.614
Results of confluence:
Total flow rate = 15.149(CFS)
Time of concentration = 9.057 min.
Effective stream area after confluence = 8.500(Ac.)

++
Process from Point/Station 1.920 to Point/Station 1.101
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1484.100(Ft.)
Downstream point/station elevation = 1478.000(Ft.)
Pipe length = 25.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 15.149(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 15.149(CFS)
Normal flow depth in pipe = 6.66(In.)
Flow top width inside pipe = 17.38(In.)
Critical Depth = 16.90(In.)
Pipe flow velocity = 25.48(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 9.07 min.

++
Process from Point/Station 1.410 to Point/Station 1.101
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 8.500(Ac.)
Runoff from this stream = 15.149(CFS)
Time of concentration = 9.07 min.
Rainfall intensity = 2.368(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.399	10.04	2.245
2	15.149	9.07	2.368

Largest stream flow has longer or shorter time of concentration
Qp = 15.149 + sum of
Qa Tb/Ta
1.399 * 0.904 = 1.265
Qp = 16.414

Total of 2 main streams to confluence:
Flow rates before confluence point:
1.399 15.149
Area of streams before confluence:
0.763 8.500
Results of confluence:
Total flow rate = 16.414(CFS)
Time of concentration = 9.073 min.
Effective stream area after confluence = 9.263(Ac.)

++
Process from Point/Station 1.101 to Point/Station 1.102
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 16.646(CFS)
Depth of flow = 0.317(Ft.), Average velocity = 0.866(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	6.00
2	12.00	0.00
3	72.00	0.00
4	84.00	6.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 16.646(CFS)
' ' flow top width = 61.268(Ft.)
' ' velocity= 0.866(Ft/s)
' ' area = 19.216(Sq.Ft)
' ' Froude number = 0.273
Upstream point elevation = 1478.100(Ft.)
Downstream point elevation = 1478.000(Ft.)
Flow length = 100.000(Ft.)
Travel time = 1.92 min.
Time of concentration = 11.00 min.
Depth of flow = 0.317(Ft.)
Average velocity = 0.866(Ft/s)
Total irregular channel flow = 16.646(CFS)
Irregular channel normal depth above invert elev. = 0.317(Ft.)
Average velocity of channel(s) = 0.866(Ft/s)
Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.779
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 80.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.138(In/Hr) for a 10.0 year storm
Subarea runoff = 0.436(CFS) for 0.262(Ac.)
Total runoff = 16.850(CFS) Total area = 9.525(Ac.)
Depth of flow = 0.319(Ft.), Average velocity = 0.870(Ft/s)

++
Process from Point/Station 1.102 to Point/Station 1.155
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1482.300(Ft.)
Downstream point/station elevation = 1481.600(Ft.)
Pipe length = 70.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 16.850(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
3.218(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 1.801(Ft.)
Minor friction loss = 2.118(Ft.) K-factor = 1.50
Pipe flow velocity = 9.54(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 11.12 min.

++
Process from Point/Station 1.110 to Point/Station 1.155
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 9.525(Ac.)
Runoff from this stream = 16.850(CFS)
Time of concentration = 11.12 min.
Rainfall intensity = 2.126(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 1.111 to Point/Station 1.121
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1726.000(Ft.)
Bottom (of initial area) elevation = 1680.000(Ft.)
Difference in elevation = 46.000(Ft.)
Slope = 0.23000 s(percent)= 23.00
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.920 min.
Rainfall intensity = 2.969(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.853
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 0.767(CFS)
Total initial stream area = 0.303(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.121 to Point/Station 1.131
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 4.391(CFS)
Depth of flow = 0.232(Ft.), Average velocity = 6.969(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	20.60	1.00
3	37.40	0.00
4	44.10	1.00
5	66.50	1.50
6	94.90	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 4.391(CFS)
' ' flow top width = 5.442(Ft.)
' ' velocity= 6.970(Ft/s)
' ' area = 0.630(Sq.Ft)
' ' Froude number = 3.610

Upstream point elevation = 1680.000(Ft.)
Downstream point elevation = 1506.000(Ft.)
Flow length = 710.000(Ft.)
Travel time = 1.70 min.
Time of concentration = 7.62 min.
Depth of flow = 0.232(Ft.)
Average velocity = 6.969(Ft/s)
Total irregular channel flow = 4.391(CFS)
Irregular channel normal depth above invert elev. = 0.232(Ft.)
Average velocity of channel(s) = 6.969(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.842
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.271
Decimal fraction soil group D = 0.729
RI index for soil(AMC 2) = 88.19
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.598(In/Hr) for a 10.0 year storm
Subarea runoff = 7.172(CFS) for 3.279(Ac.)
Total runoff = 7.939(CFS) Total area = 3.582(Ac.)
Depth of flow = 0.289(Ft.), Average velocity = 8.082(Ft/s)

++
Process from Point/Station 1.131 to Point/Station 1.132
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 8.192(CFS)
Depth of flow = 0.239(Ft.), Average velocity = 5.727(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	0.00	0.00
3	36.00	0.72

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 8.192(CFS)
' ' flow top width = 11.960(Ft.)
' ' velocity= 5.727(Ft/s)
' ' area = 1.430(Sq.Ft)
' ' Froude number = 2.918

Upstream point elevation = 1506.000(Ft.)
Downstream point elevation = 1499.000(Ft.)
Flow length = 160.000(Ft.)
Travel time = 0.47 min.
Time of concentration = 8.08 min.
Depth of flow = 0.239(Ft.)
Average velocity = 5.727(Ft/s)
Total irregular channel flow = 8.192(CFS)
Irregular channel normal depth above invert elev. = 0.239(Ft.)
Average velocity of channel(s) = 5.727(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.762
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 = 0.800; Impervious fraction = 0.200
Rainfall intensity = 2.517(In/Hr) for a 10.0 year storm
Subarea runoff = 0.437(CFS) for 0.228(Ac.)
Total runoff = 8.376(CFS) Total area = 3.810(Ac.)
Depth of flow = 0.241(Ft.), Average velocity = 5.759(Ft/s)

++
Process from Point/Station 1.132 to Point/Station 1.154
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1496.500(Ft.)
Downstream point/station elevation = 1496.300(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.376(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 8.376(CFS)
Normal flow depth in pipe = 12.15(In.)
Flow top width inside pipe = 16.86(In.)
Critical Depth = 13.46(In.)
Pipe flow velocity = 6.60(Ft/s)
Travel time through pipe = 0.05 min.
Time of concentration (TC) = 8.13 min.

++
Process from Point/Station 1.111 to Point/Station 1.154
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.810(Ac.)
Runoff from this stream = 8.376(CFS)
Time of concentration = 8.13 min.
Rainfall intensity = 2.509(In/Hr)

++
Process from Point/Station 1.141 to Point/Station 1.151
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1748.000(Ft.)
Bottom (of initial area) elevation = 1669.000(Ft.)
Difference in elevation = 79.000(Ft.)
Slope = 0.39500 s(percent)= 39.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.313 min.
Rainfall intensity = 3.144(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.855
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 3.216(CFS)
Total initial stream area = 1.196(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.151 to Point/Station 1.152
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 7.983(CFS)
Depth of flow = 0.301(Ft.), Average velocity = 9.756(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	17.10	1.00
3	31.30	0.00
4	35.20	1.00
5	51.90	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 7.983(CFS)
' ' flow top width = 5.442(Ft.)
' ' velocity= 9.757(Ft/s)
' ' area = 0.818(Sq.Ft)
' ' Froude number = 4.434

Upstream point elevation = 1669.000(Ft.)
Downstream point elevation = 1536.000(Ft.)
Flow length = 390.000(Ft.)
Travel time = 0.67 min.
Time of concentration = 5.98 min.
Depth of flow = 0.301(Ft.)
Average velocity = 9.756(Ft/s)
Total irregular channel flow = 7.983(CFS)
Irregular channel normal depth above invert elev. = 0.301(Ft.)
Average velocity of channel(s) = 9.756(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.850
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.152
Decimal fraction soil group D = 0.848
RI index for soil(AMC 2) = 88.54
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.953(In/Hr) for a 10.0 year storm
Subarea runoff = 9.450(CFS) for 3.763(Ac.)
Total runoff = 12.666(CFS) Total area = 4.959(Ac.)
Depth of flow = 0.358(Ft.), Average velocity = 10.950(Ft/s)

++
Process from Point/Station 1.152 to Point/Station 1.153
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.909(Ft.), Average velocity = 15.329(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.50
2	1.50	0.00
3	3.00	1.50

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 12.666(CFS)
' ' flow top width = 1.818(Ft.)
' ' velocity= 15.329(Ft/s)
' ' area = 0.826(Sq.Ft)
' ' Froude number = 4.007

Upstream point elevation = 1536.000(Ft.)
Downstream point elevation = 1507.000(Ft.)
Flow length = 355.000(Ft.)
Travel time = 0.39 min.
Time of concentration = 6.37 min.
Depth of flow = 0.909(Ft.)
Average velocity = 15.329(Ft/s)
Total irregular channel flow = 12.666(CFS)
Irregular channel normal depth above invert elev. = 0.909(Ft.)
Average velocity of channel(s) = 15.329(Ft/s)

++
Process from Point/Station 1.153 to Point/Station 1.154
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1507.000(Ft.)
Downstream point/station elevation = 1496.300(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 12.666(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 12.666(CFS)
Normal flow depth in pipe = 6.27(In.)
Flow top width inside pipe = 17.15(In.)
Critical Depth = 16.07(In.)
Pipe flow velocity = 23.12(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 6.40 min.

++
Process from Point/Station 1.141 to Point/Station 1.154
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 4.959(Ac.)
Runoff from this stream = 12.666(CFS)
Time of concentration = 6.40 min.
Rainfall intensity = 2.848(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.376	8.13	2.509
2	12.666	6.40	2.848

Largest stream flow has longer or shorter time of concentration
Qp = 12.666 + sum of

Qa	Tb/Ta	
8.376 *	0.787 =	6.592

Qp = 19.258

Total of 2 streams to confluence:
Flow rates before confluence point:
8.376 12.666
Area of streams before confluence:
3.810 4.959
Results of confluence:
Total flow rate = 19.258(CFS)
Time of concentration = 6.402 min.
Effective stream area after confluence = 8.769(Ac.)

++
Process from Point/Station 1.154 to Point/Station 1.155
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1496.300(Ft.)
Downstream point/station elevation = 1481.600(Ft.)
Pipe length = 580.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.258(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
7.554(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 19.488(Ft.)
Minor friction loss = 2.766(Ft.) K-factor = 1.50
Pipe flow velocity = 10.90(Ft/s)
Travel time through pipe = 0.89 min.
Time of concentration (TC) = 7.29 min.

++
Process from Point/Station 1.111 to Point/Station 1.155
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 8.769(Ac.)
Runoff from this stream = 19.258(CFS)
Time of concentration = 7.29 min.
Rainfall intensity = 2.659(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	16.850	11.12	2.126
2	19.258	7.29	2.659

Largest stream flow has longer or shorter time of concentration
Qp = 19.258 + sum of
Qa Tb/Ta
16.850 * 0.655 = 11.045
Qp = 30.303

Total of 2 main streams to confluence:
Flow rates before confluence point:
16.850 19.258
Area of streams before confluence:
9.525 8.769

Results of confluence:
Total flow rate = 30.303(CFS)
Time of concentration = 7.289 min.
Effective stream area after confluence = 18.294(Ac.)

++
Process from Point/Station 1.155 to Point/Station 1.183
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1481.600(Ft.)
Downstream point/station elevation = 1481.400(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 30.303(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
7.897(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 1.248(Ft.)
Minor friction loss = 6.849(Ft.) K-factor = 1.50
Pipe flow velocity = 17.15(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 7.30 min.

++
Process from Point/Station 1.110 to Point/Station 1.183
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 18.294(Ac.)
Runoff from this stream = 30.303(CFS)
Time of concentration = 7.30 min.
Rainfall intensity = 2.656(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 1.161 to Point/Station 1.171
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1781.000(Ft.)
Bottom (of initial area) elevation = 1660.000(Ft.)
Difference in elevation = 121.000(Ft.)
Slope = 0.60500 s(percent)= 60.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration = 5.000 min.
Rainfall intensity = 3.247(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.857
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 2.089(CFS)
Total initial stream area = 0.751(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.171 to Point/Station 1.181
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 3.101(CFS)
Depth of flow = 0.180(Ft.), Average velocity = 7.494(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	24.00	1.50
3	41.50	1.00
4	54.30	0.00
5	79.90	2.00

```
Manning's 'N' friction factor =   0.025
-----------------------------------------------------------------
Sub-Channel flow  =      3.101(CFS)
 '    '     flow top width =      4.603(Ft.)
 '    '    velocity=    7.494(Ft/s)
 '    '     area =      0.414(Sq.Ft)
 '    '     Froude number =     4.405

Upstream point elevation =  1660.000(Ft.)
Downstream point elevation =  1551.000(Ft.)
Flow length =   275.000(Ft.)
Travel time  =    0.61 min.
Time of concentration =    5.61 min.
Depth of flow =   0.180(Ft.)
Average velocity =   7.494(Ft/s)
Total irregular channel flow =     3.101(CFS)
Irregular channel normal depth above invert elev. =   0.180(Ft.)
Average velocity of channel(s) =   7.494(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.054(In/Hr) for a    10.0 year storm
Subarea runoff =      1.959(CFS) for      0.751(Ac.)
Total runoff =      4.047(CFS)      Total area =       1.502(Ac.)
Depth of flow =   0.199(Ft.), Average velocity =   8.010(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.181 to Point/Station        1.182
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.744(CFS)
Depth of flow =   0.635(Ft.), Average velocity =  14.267(Ft/s)
          ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
           1            0.00             1.50
           2            1.50             0.00
           3            3.00             1.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      5.744(CFS)
 '    '     flow top width =      1.269(Ft.)
 '    '    velocity=   14.267(Ft/s)
 '    '     area =      0.403(Sq.Ft)
 '    '     Froude number =     4.464
```

Upstream point elevation = 1551.000(Ft.)
Downstream point elevation = 1495.000(Ft.)
Flow length = 490.000(Ft.)
Travel time = 0.57 min.
Time of concentration = 6.18 min.
Depth of flow = 0.635(Ft.)
Average velocity = 14.267(Ft/s)
Total irregular channel flow = 5.744(CFS)
Irregular channel normal depth above invert elev. = 0.635(Ft.)
Average velocity of channel(s) = 14.267(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.901(In/Hr) for a 10.0 year storm
Subarea runoff = 3.318(CFS) for 1.343(Ac.)
Total runoff = 7.366(CFS) Total area = 2.845(Ac.)
Depth of flow = 0.697(Ft.), Average velocity = 15.182(Ft/s)

++
Process from Point/Station 1.182 to Point/Station 1.183
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1495.500(Ft.)
Downstream point/station elevation = 1481.400(Ft.)
Pipe length = 675.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.366(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 7.366(CFS)
Normal flow depth in pipe = 8.84(In.)
Flow top width inside pipe = 18.00(In.)
Critical Depth = 12.61(In.)
Pipe flow velocity = 8.53(Ft/s)
Travel time through pipe = 1.32 min.
Time of concentration (TC) = 7.50 min.

++
Process from Point/Station 1.161 to Point/Station 1.183
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 2.845(Ac.)
Runoff from this stream = 7.366(CFS)
Time of concentration = 7.50 min.
Rainfall intensity = 2.618(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	30.303	7.30	2.656
2	7.366	7.50	2.618

Largest stream flow has longer or shorter time of concentration
Qp = 30.303 + sum of
Qa Tb/Ta
7.366 * 0.973 = 7.169
Qp = 37.472

Total of 2 main streams to confluence:
Flow rates before confluence point:
30.303 7.366
Area of streams before confluence:
18.294 2.845
Results of confluence:
Total flow rate = 37.472(CFS)
Time of concentration = 7.303 min.
Effective stream area after confluence = 21.139(Ac.)

++
Process from Point/Station 1.183 to Point/Station 1.184
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1481.400(Ft.)
Downstream point/station elevation = 1480.900(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 37.472(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
16.334(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 6.361(Ft.)
Minor friction loss = 10.473(Ft.) K-factor = 1.50
Pipe flow velocity = 21.20(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 7.34 min.

++
Process from Point/Station 1.184 to Point/Station 1.185
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 1480.900(Ft.)
Downstream point elevation = 1480.600(Ft.)
Channel length thru subarea = 30.000(Ft.)
Channel base width = 2.500(Ft.)
Slope or 'Z' of left channel bank = 3.000
Slope or 'Z' of right channel bank = 3.000
Manning's 'N' = 0.044
Maximum depth of channel = 1.000(Ft.)
Flow(q) thru subarea = 37.472(CFS)
Depth of flow = 1.544(Ft.), Average velocity = 3.701(Ft/s)
Channel flow top width = 8.500(Ft.)
Flow Velocity = 3.70(Ft/s)
Travel time = 0.14 min.
Time of concentration = 7.48 min.

Sub-Channel No. 1 Critical depth = 1.203(Ft.)
' ' ' Critical flow top width = 8.500(Ft.)
' ' ' Critical flow velocity= 5.185(Ft/s)
' ' ' Critical flow area = 7.227(Sq.Ft)

End of computations, total study area = 21.14 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.913
Area averaged RI index number = 81.2

PROPOSED CONDITIONS 100-YEAR DESIGN STORM EVENT

```
                    Riverside County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
          Rational Hydrology Study        Date: 03/10/22  File:garbanipr100d1.out
--------------------------------------------------------------------------
 *********  Hydrology Study Control Information **********
 English (in-lb) Units used in input data file
--------------------------------------------------------------------------
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 [ Sun City ] area used.
10 year storm 10 minute intensity =  2.250(In/Hr)
10 year storm 60 minute intensity =  0.870(In/Hr)
100 year storm 10 minute intensity =  3.360(In/Hr)
100 year storm 60 minute intensity =  1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5300

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.110 to Point/Station        1.210
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
Initial area flow distance =   180.000(Ft.)
Top (of initial area) elevation =  1498.000(Ft.)
Bottom (of initial area) elevation =  1490.000(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.04444  s(percent)=       4.44
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.141 min.
Rainfall intensity =      4.017(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.807
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 =  0.800; Impervious fraction =  0.200
Initial subarea runoff =      0.616(CFS)
Total initial stream area =        0.190(Ac.)
Pervious area fraction = 0.800
```

++
Process from Point/Station 1.210 to Point/Station 1.320
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 1.206(CFS)
Depth of flow = 0.148(Ft.), Average velocity = 2.192(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	0.00	0.00
3	36.00	0.72

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 1.206(CFS)
' ' flow top width = 7.418(Ft.)
' ' velocity= 2.192(Ft/s)
' ' area = 0.550(Sq.Ft)
' ' Froude number = 1.419
Upstream point elevation = 1490.000(Ft.)
Downstream point elevation = 1486.000(Ft.)
Flow length = 330.000(Ft.)
Travel time = 2.51 min.
Time of concentration = 9.65 min.
Depth of flow = 0.148(Ft.)
Average velocity = 2.192(Ft/s)
Total irregular channel flow = 1.206(CFS)
Irregular channel normal depth above invert elev. = 0.148(Ft.)
Average velocity of channel(s) = 2.192(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.813
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.179
Decimal fraction soil group D = 0.821
RI index for soil(AMC 2) = 73.93
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 3.424(In/Hr) for a 100.0 year storm
Subarea runoff = 1.091(CFS) for 0.392(Ac.)
Total runoff = 1.707(CFS) Total area = 0.582(Ac.)
Depth of flow = 0.169(Ft.), Average velocity = 2.391(Ft/s)

++
Process from Point/Station 1.110 to Point/Station 1.320
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 0.582(Ac.)
Runoff from this stream = 1.707(CFS)
Time of concentration = 9.65 min.
Rainfall intensity = 3.424(In/Hr)

++
Process from Point/Station 1.310 to Point/Station 1.320
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 175.000(Ft.)
Top (of initial area) elevation = 1488.000(Ft.)
Bottom (of initial area) elevation = 1486.000(Ft.)
Difference in elevation = 2.000(Ft.)
Slope = 0.01143 s(percent)= 1.14
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.265 min.
Rainfall intensity = 3.499(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 0.519(CFS)
Total initial stream area = 0.181(Ac.)
Pervious area fraction = 0.800

++
Process from Point/Station 1.310 to Point/Station 1.320
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.181(Ac.)
Runoff from this stream = 0.519(CFS)
Time of concentration = 9.27 min.
Rainfall intensity = 3.499(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.707	9.65	3.424
2	0.519	9.27	3.499

Largest stream flow has longer time of concentration
Qp = 1.707 + sum of
Qb Ia/Ib
0.519 * 0.979 = 0.508
Qp = 2.214
Total of 2 streams to confluence:
Flow rates before confluence point:
1.707 0.519
Area of streams before confluence:
0.582 0.181
Results of confluence:
Total flow rate = 2.214(CFS)
Time of concentration = 9.650 min.
Effective stream area after confluence = 0.763(Ac.)

++
Process from Point/Station 1.320 to Point/Station 1.101
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1484.000(Ft.)
Downstream point/station elevation = 1478.000(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.214(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 2.214(CFS)
Normal flow depth in pipe = 3.01(In.)
Flow top width inside pipe = 13.44(In.)
Critical Depth = 6.74(In.)
Pipe flow velocity = 11.38(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 9.72 min.

++
Process from Point/Station 1.110 to Point/Station 1.101
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 0.763(Ac.)
Runoff from this stream = 2.214(CFS)
Time of concentration = 9.72 min.
Rainfall intensity = 3.410(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 1.410 to Point/Station 1.420
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 65.000(Ft.)
Top (of initial area) elevation = 1552.000(Ft.)
Bottom (of initial area) elevation = 1527.000(Ft.)
Difference in elevation = 25.000(Ft.)
Slope = 0.38462 s(percent)= 38.46
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.043 min.
Rainfall intensity = 4.388(In/Hr) for a 100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.836
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 80.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 1.248(CFS)
Total initial stream area = 0.340(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.420 to Point/Station 1.430
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.391(Ft.), Average velocity = 8.167(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.50
2	1.50	0.00
3	3.00	1.50

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 1.248(CFS)
' ' flow top width = 0.782(Ft.)
' ' velocity= 8.167(Ft/s)
' ' area = 0.153(Sq.Ft)
' ' Froude number = 3.255

Upstream point elevation = 1527.000(Ft.)
Downstream point elevation = 1522.000(Ft.)
Flow length = 70.000(Ft.)
Travel time = 0.14 min.
Time of concentration = 6.19 min.
Depth of flow = 0.391(Ft.)
Average velocity = 8.167(Ft/s)
Total irregular channel flow = 1.248(CFS)
Irregular channel normal depth above invert elev. = 0.391(Ft.)
Average velocity of channel(s) = 8.167(Ft/s)

++
Process from Point/Station 1.430 to Point/Station 1.510
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.332(Ft.), Average velocity = 11.340(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.50
2	1.50	0.00
3	3.00	1.50

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 1.248(CFS)
' ' flow top width = 0.663(Ft.)
' ' velocity= 11.340(Ft/s)
' ' area = 0.110(Sq.Ft)
' ' Froude number = 4.907

Upstream point elevation = 1522.000(Ft.)

Downstream point elevation = 1516.000(Ft.)
Flow length = 35.000(Ft.)
Travel time = 0.05 min.
Time of concentration = 6.24 min.
Depth of flow = 0.332(Ft.)
Average velocity = 11.340(Ft/s)
Total irregular channel flow = 1.248(CFS)
Irregular channel normal depth above invert elev. = 0.332(Ft.)
Average velocity of channel(s) = 11.340(Ft/s)

++
Process from Point/Station 1.510 to Point/Station 1.720
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 7.091(CFS)
Depth of flow = 0.232(Ft.), Average velocity = 5.261(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	0.00	0.00
3	20.00	0.40

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 7.091(CFS)
' ' flow top width = 11.610(Ft.)
' ' velocity= 5.261(Ft/s)
' ' area = 1.348(Sq.Ft)
' ' Froude number = 2.721
Upstream point elevation = 1516.000(Ft.)
Downstream point elevation = 1487.000(Ft.)
Flow length = 755.000(Ft.)
Travel time = 2.39 min.
Time of concentration = 8.63 min.
Depth of flow = 0.232(Ft.)
Average velocity = 5.261(Ft/s)
Total irregular channel flow = 7.091(CFS)
Irregular channel normal depth above invert elev. = 0.232(Ft.)
Average velocity of channel(s) = 5.261(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.812
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.399
Decimal fraction soil group D = 0.601
RI index for soil(AMC 2) = 72.61
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 3.633(In/Hr) for a 100.0 year storm
Subarea runoff = 11.585(CFS) for 3.925(Ac.)
Total runoff = 12.833(CFS) Total area = 4.265(Ac.)
Depth of flow = 0.290(Ft.), Average velocity = 6.102(Ft/s)

++
Process from Point/Station 1.410 to Point/Station 1.720
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 4.265(Ac.)
Runoff from this stream = 12.833(CFS)
Time of concentration = 8.63 min.
Rainfall intensity = 3.633(In/Hr)

++
Process from Point/Station 1.610 to Point/Station 1.710
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 190.000(Ft.)
Top (of initial area) elevation = 1518.000(Ft.)
Bottom (of initial area) elevation = 1505.000(Ft.)
Difference in elevation = 13.000(Ft.)
Slope = 0.06842 s(percent)= 6.84
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.694 min.
Rainfall intensity = 4.157(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.905
Decimal fraction soil group D = 0.095
RI index for soil(AMC 2) = 69.57
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 0.425(CFS)
Total initial stream area = 0.126(Ac.)
Pervious area fraction = 0.800

++
Process from Point/Station 1.710 to Point/Station 1.720
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.693(CFS)
Depth of flow = 0.160(Ft.), Average velocity = 4.229(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	0.00	0.00
3	20.00	0.40

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 2.694(CFS)
' ' flow top width = 7.981(Ft.)
' ' velocity= 4.229(Ft/s)
' ' area = 0.637(Sq.Ft)
' ' Froude number = 2.638

Upstream point elevation = 1505.000(Ft.)
Downstream point elevation = 1487.000(Ft.)
Flow length = 440.000(Ft.)
Travel time = 1.73 min.
Time of concentration = 8.43 min.
Depth of flow = 0.160(Ft.)
Average velocity = 4.229(Ft/s)
Total irregular channel flow = 2.693(CFS)
Irregular channel normal depth above invert elev. = 0.160(Ft.)
Average velocity of channel(s) = 4.229(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.501
Decimal fraction soil group D = 0.499
RI index for soil(AMC 2) = 71.99
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 3.679(In/Hr) for a 100.0 year storm
Subarea runoff = 4.461(CFS) for 1.495(Ac.)
Total runoff = 4.886(CFS) Total area = 1.621(Ac.)
Depth of flow = 0.200(Ft.), Average velocity = 4.908(Ft/s)

++
Process from Point/Station 1.610 to Point/Station 1.720
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.621(Ac.)
Runoff from this stream = 4.886(CFS)
Time of concentration = 8.43 min.
Rainfall intensity = 3.679(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	12.833	8.63	3.633
2	4.886	8.43	3.679

Largest stream flow has longer time of concentration
Qp = 12.833 + sum of
Qb Ia/Ib
4.886 * 0.988 = 4.825
Qp = 17.658

Total of 2 streams to confluence:
Flow rates before confluence point:
12.833 4.886
Area of streams before confluence:
4.265 1.621
Results of confluence:
Total flow rate = 17.658(CFS)
Time of concentration = 8.630 min.
Effective stream area after confluence = 5.886(Ac.)

++
Process from Point/Station 1.720 to Point/Station 1.920
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1484.500(Ft.)
Downstream point/station elevation = 1484.100(Ft.)
Pipe length = 40.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 17.658(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
3.056(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 1.130(Ft.)
Minor friction loss = 2.326(Ft.) K-factor = 1.50
Pipe flow velocity = 9.99(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 8.70 min.

++
Process from Point/Station 1.410 to Point/Station 1.920
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 5.886(Ac.)
Runoff from this stream = 17.658(CFS)
Time of concentration = 8.70 min.
Rainfall intensity = 3.618(In/Hr)

++
Process from Point/Station 1.810 to Point/Station 1.910
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 185.000(Ft.)
Top (of initial area) elevation = 1516.000(Ft.)
Bottom (of initial area) elevation = 1510.000(Ft.)
Difference in elevation = 6.000(Ft.)
Slope = 0.03243 s(percent)= 3.24
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.690 min.
Rainfall intensity = 3.862(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1 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 = 0.195
Decimal fraction soil group D = 0.805
RI index for soil(AMC 2) = 73.83
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 1.066(CFS)
Total initial stream area = 0.336(Ac.)
Pervious area fraction = 0.800

++
Process from Point/Station 1.910 to Point/Station 1.920
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 4.185(CFS)
Depth of flow = 0.191(Ft.), Average velocity = 4.608(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	0.00	0.00
3	20.00	0.40

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 4.185(CFS)
' ' flow top width = 9.530(Ft.)
' ' velocity= 4.608(Ft/s)
' ' area = 0.908(Sq.Ft)
' ' Froude number = 2.630

Upstream point elevation = 1510.000(Ft.)
Downstream point elevation = 1487.000(Ft.)
Flow length = 600.000(Ft.)
Travel time = 2.17 min.
Time of concentration = 9.86 min.
Depth of flow = 0.191(Ft.)
Average velocity = 4.608(Ft/s)
Total irregular channel flow = 4.185(CFS)
Irregular channel normal depth above invert elev. = 0.191(Ft.)
Average velocity of channel(s) = 4.608(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.688
Decimal fraction soil group D = 0.312
RI index for soil(AMC 2) = 70.87
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 3.385(In/Hr) for a 100.0 year storm
Subarea runoff = 6.167(CFS) for 2.278(Ac.)
Total runoff = 7.233(CFS) Total area = 2.614(Ac.)
Depth of flow = 0.234(Ft.), Average velocity = 5.283(Ft/s)

++
Process from Point/Station 1.810 to Point/Station 1.920
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 2.614(Ac.)
Runoff from this stream = 7.233(CFS)
Time of concentration = 9.86 min.
Rainfall intensity = 3.385(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	17.658	8.70	3.618
2	7.233	9.86	3.385

Largest stream flow has longer or shorter time of concentration
Qp = 17.658 + sum of

Qa	Tb/Ta	
7.233 *	0.882 =	6.380

Qp = 24.038

Total of 2 streams to confluence:
Flow rates before confluence point:
17.658 7.233
Area of streams before confluence:
5.886 2.614
Results of confluence:
Total flow rate = 24.038(CFS)
Time of concentration = 8.696 min.
Effective stream area after confluence = 8.500(Ac.)

++
Process from Point/Station 1.920 to Point/Station 1.101
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1484.100(Ft.)
Downstream point/station elevation = 1478.000(Ft.)
Pipe length = 25.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 24.038(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 24.038(CFS)
Normal flow depth in pipe = 8.61(In.)
Flow top width inside pipe = 17.98(In.)
Critical depth could not be calculated.
Pipe flow velocity = 28.80(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 8.71 min.

++
Process from Point/Station 1.410 to Point/Station 1.101
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 8.500(Ac.)
Runoff from this stream = 24.038(CFS)
Time of concentration = 8.71 min.
Rainfall intensity = 3.615(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.214	9.72	3.410
2	24.038	8.71	3.615

Largest stream flow has longer or shorter time of concentration
Qp = 24.038 + sum of

Qa	Tb/Ta	
2.214 *	0.896 =	1.984

Qp = 26.022

Total of 2 main streams to confluence:
Flow rates before confluence point:
2.214 24.038
Area of streams before confluence:
0.763 8.500
Results of confluence:
Total flow rate = 26.022(CFS)
Time of concentration = 8.711 min.
Effective stream area after confluence = 9.263(Ac.)

++
Process from Point/Station 1.101 to Point/Station 1.102
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 26.390(CFS)
Depth of flow = 0.418(Ft.), Average velocity = 1.039(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	6.00
2	12.00	0.00
3	72.00	0.00
4	84.00	6.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 26.390(CFS)
' ' flow top width = 61.671(Ft.)
' ' velocity= 1.039(Ft/s)
' ' area = 25.410(Sq.Ft)
' ' Froude number = 0.285

```
Upstream point elevation =  1478.100(Ft.)
Downstream point elevation =  1478.000(Ft.)
Flow length =   100.000(Ft.)
Travel time  =    1.60 min.
Time of concentration =   10.32 min.
Depth of flow =   0.418(Ft.)
Average velocity =   1.039(Ft/s)
Total irregular channel flow =    26.390(CFS)
Irregular channel normal depth above invert elev. =   0.418(Ft.)
Average velocity of channel(s) =   1.039(Ft/s)
 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  80.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.305(In/Hr) for a   100.0 year storm
Subarea runoff =      0.708(CFS) for      0.262(Ac.)
Total runoff =     26.730(CFS)     Total area =       9.525(Ac.)
Depth of flow =   0.421(Ft.), Average velocity =   1.044(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.102 to Point/Station        1.155
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1482.300(Ft.)
Downstream point/station elevation =  1481.600(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.730(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     9.160(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      4.531(Ft.)
 Minor friction loss =      5.329(Ft.)          K-factor =   1.50
Critical depth could not be calculated.
Pipe flow velocity =     15.13(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    10.39 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.110 to Point/Station        1.155
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      9.525(Ac.)
Runoff from this stream =     26.730(CFS)
Time of concentration =   10.39 min.
Rainfall intensity =     3.292(In/Hr)
Program is now starting with Main Stream No. 2
```

++
Process from Point/Station 1.111 to Point/Station 1.121
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1726.000(Ft.)
Bottom (of initial area) elevation = 1680.000(Ft.)
Difference in elevation = 46.000(Ft.)
Slope = 0.23000 s(percent)= 23.00
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.920 min.
Rainfall intensity = 4.436(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 1.166(CFS)
Total initial stream area = 0.303(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.121 to Point/Station 1.131
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 6.738(CFS)
Depth of flow = 0.272(Ft.), Average velocity = 7.757(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	20.60	1.00
3	37.40	0.00
4	44.10	1.00
5	66.50	1.50
6	94.90	2.00

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 6.738(CFS)
' ' flow top width = 6.389(Ft.)
' ' velocity= 7.757(Ft/s)
' ' area = 0.869(Sq.Ft)
' ' Froude number = 3.707
Upstream point elevation = 1680.000(Ft.)
Downstream point elevation = 1506.000(Ft.)
Flow length = 710.000(Ft.)
Travel time = 1.53 min.
Time of concentration = 7.45 min.

Depth of flow = 0.272(Ft.)
Average velocity = 7.757(Ft/s)
Total irregular channel flow = 6.738(CFS)
Irregular channel normal depth above invert elev. = 0.272(Ft.)
Average velocity of channel(s) = 7.757(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.271
Decimal fraction soil group D = 0.729
RI index for soil(AMC 2) = 88.19
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 3.929(In/Hr) for a 100.0 year storm
Subarea runoff = 11.090(CFS) for 3.279(Ac.)
Total runoff = 12.256(CFS) Total area = 3.582(Ac.)
Depth of flow = 0.340(Ft.), Average velocity = 9.008(Ft/s)

++
Process from Point/Station 1.131 to Point/Station 1.132
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel = 12.646(CFS)
Depth of flow = 0.281(Ft.), Average velocity = 6.384(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.50
2 0.00 0.00
3 36.00 0.72
Manning's 'N' friction factor = 0.013

Sub-Channel flow = 12.647(CFS)
' ' flow top width = 14.075(Ft.)
' ' velocity= 6.384(Ft/s)
' ' area = 1.981(Sq.Ft)
' ' Froude number = 2.999
Upstream point elevation = 1506.000(Ft.)
Downstream point elevation = 1499.000(Ft.)
Flow length = 160.000(Ft.)
Travel time = 0.42 min.
Time of concentration = 7.86 min.
Depth of flow = 0.281(Ft.)
Average velocity = 6.384(Ft/s)
Total irregular channel flow = 12.646(CFS)
Irregular channel normal depth above invert elev. = 0.281(Ft.)
Average velocity of channel(s) = 6.384(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.802
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 = 0.800; Impervious fraction = 0.200
Rainfall intensity = 3.817(In/Hr) for a 100.0 year storm
Subarea runoff = 0.698(CFS) for 0.228(Ac.)
Total runoff = 12.954(CFS) Total area = 3.810(Ac.)
Depth of flow = 0.284(Ft.), Average velocity = 6.422(Ft/s)

++
Process from Point/Station 1.132 to Point/Station 1.154
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1496.500(Ft.)
Downstream point/station elevation = 1496.300(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 12.954(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
1.356(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.304(Ft.)
Minor friction loss = 1.252(Ft.) K-factor = 1.50
Critical depth could not be calculated.
Pipe flow velocity = 7.33(Ft/s)
Travel time through pipe = 0.05 min.
Time of concentration (TC) = 7.91 min.

++
Process from Point/Station 1.111 to Point/Station 1.154
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.810(Ac.)
Runoff from this stream = 12.954(CFS)
Time of concentration = 7.91 min.
Rainfall intensity = 3.805(In/Hr)

++
Process from Point/Station 1.141 to Point/Station 1.151
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1748.000(Ft.)
Bottom (of initial area) elevation = 1669.000(Ft.)
Difference in elevation = 79.000(Ft.)
Slope = 0.39500 s(percent)= 39.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.313 min.
Rainfall intensity = 4.698(In/Hr) for a 100.0 year storm

```
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.886(CFS)
Total initial stream area =       1.196(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.151 to Point/Station       1.152
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     12.150(CFS)
Depth of flow =   0.352(Ft.), Average velocity =  10.837(Ft/s)
          ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
           1            0.00             2.00
           2           17.10             1.00
           3           31.30             0.00
           4           35.20             1.00
           5           51.90             2.00
Manning's 'N' friction factor =   0.025
-------------------------------------------------------------
Sub-Channel flow  =     12.150(CFS)
 '    '     flow top width =      6.371(Ft.)
 '    '    velocity=   10.837(Ft/s)
 '    '     area =      1.121(Sq.Ft)
 '    '     Froude number =     4.552

Upstream point elevation =  1669.000(Ft.)
Downstream point elevation =  1536.000(Ft.)
Flow length =   390.000(Ft.)
Travel time  =    0.60 min.
Time of concentration =    5.91 min.
Depth of flow =   0.352(Ft.)
Average velocity =  10.837(Ft/s)
Total irregular channel flow =    12.150(CFS)
Irregular channel normal depth above invert elev. =   0.352(Ft.)
Average velocity of channel(s) =  10.837(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.866
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.152
Decimal fraction soil group D = 0.848
RI index for soil(AMC 2)  =  88.54
```

Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 4.439(In/Hr) for a 100.0 year storm
Subarea runoff = 14.472(CFS) for 3.763(Ac.)
Total runoff = 19.357(CFS) Total area = 4.959(Ac.)
Depth of flow = 0.419(Ft.), Average velocity = 12.175(Ft/s)

++
Process from Point/Station 1.152 to Point/Station 1.153
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Depth of flow = 1.066(Ft.), Average velocity = 17.043(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.50
2	1.50	0.00
3	3.00	1.50

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 19.357(CFS)
' ' flow top width = 2.131(Ft.)
' ' velocity= 17.044(Ft/s)
' ' area = 1.136(Sq.Ft)
' ' Froude number = 4.115

Upstream point elevation = 1536.000(Ft.)
Downstream point elevation = 1507.000(Ft.)
Flow length = 355.000(Ft.)
Travel time = 0.35 min.
Time of concentration = 6.26 min.
Depth of flow = 1.066(Ft.)
Average velocity = 17.043(Ft/s)
Total irregular channel flow = 19.357(CFS)
Irregular channel normal depth above invert elev. = 1.066(Ft.)
Average velocity of channel(s) = 17.043(Ft/s)

++
Process from Point/Station 1.153 to Point/Station 1.154
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1507.000(Ft.)
Downstream point/station elevation = 1496.300(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.357(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 19.357(CFS)
Normal flow depth in pipe = 7.90(In.)
Flow top width inside pipe = 17.86(In.)
Critical depth could not be calculated.
Pipe flow velocity = 25.94(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 6.29 min.

++
Process from Point/Station 1.141 to Point/Station 1.154
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 4.959(Ac.)
Runoff from this stream = 19.357(CFS)
Time of concentration = 6.29 min.
Rainfall intensity = 4.295(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	12.954	7.91	3.805
2	19.357	6.29	4.295

Largest stream flow has longer or shorter time of concentration
Qp = 19.357 + sum of
Qa Tb/Ta
12.954 * 0.796 = 10.307
Qp = 29.664

Total of 2 streams to confluence:
Flow rates before confluence point:
12.954 19.357
Area of streams before confluence:
3.810 4.959
Results of confluence:
Total flow rate = 29.664(CFS)
Time of concentration = 6.292 min.
Effective stream area after confluence = 8.769(Ac.)

++
Process from Point/Station 1.154 to Point/Station 1.155
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1496.300(Ft.)
Downstream point/station elevation = 1481.600(Ft.)
Pipe length = 580.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 29.664(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
38.102(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 46.239(Ft.)
Minor friction loss = 6.563(Ft.) K-factor = 1.50
Critical depth could not be calculated.
Pipe flow velocity = 16.79(Ft/s)
Travel time through pipe = 0.58 min.
Time of concentration (TC) = 6.87 min.

++
Process from Point/Station 1.111 to Point/Station 1.155
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 8.769(Ac.)
Runoff from this stream = 29.664(CFS)
Time of concentration = 6.87 min.
Rainfall intensity = 4.100(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.730	10.39	3.292
2	29.664	6.87	4.100

Largest stream flow has longer or shorter time of concentration
Qp = 29.664 + sum of
Qa Tb/Ta
26.730 * 0.661 = 17.665
Qp = 47.329

Total of 2 main streams to confluence:
Flow rates before confluence point:
26.730 29.664
Area of streams before confluence:
9.525 8.769

Results of confluence:
Total flow rate = 47.329(CFS)
Time of concentration = 6.868 min.
Effective stream area after confluence = 18.294(Ac.)

++
Process from Point/Station 1.155 to Point/Station 1.183
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1481.600(Ft.)
Downstream point/station elevation = 1481.400(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 47.329(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
19.552(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 3.044(Ft.)
Minor friction loss = 16.707(Ft.) K-factor = 1.50
Critical depth could not be calculated.
Pipe flow velocity = 26.78(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 6.88 min.

++
Process from Point/Station 1.110 to Point/Station 1.183
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 18.294(Ac.)
Runoff from this stream = 47.329(CFS)
Time of concentration = 6.88 min.
Rainfall intensity = 4.098(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 1.161 to Point/Station 1.171
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 200.000(Ft.)
Top (of initial area) elevation = 1781.000(Ft.)
Bottom (of initial area) elevation = 1660.000(Ft.)
Difference in elevation = 121.000(Ft.)
Slope = 0.60500 s(percent)= 60.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration = 5.000 min.
Rainfall intensity = 4.852(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 3.172(CFS)
Total initial stream area = 0.751(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 1.171 to Point/Station 1.181
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel = 4.713(CFS)
Depth of flow = 0.210(Ft.), Average velocity = 8.321(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.00
2	24.00	1.50
3	41.50	1.00

```
          4          54.30          0.00
          5          79.90          2.00
Manning's 'N' friction factor =   0.025
-----------------------------------------------------------------
Sub-Channel flow  =     4.714(CFS)
 '   '    flow top width =     5.385(Ft.)
 '   '   velocity=    8.322(Ft/s)
 '   '    area =     0.566(Sq.Ft)
 '   '    Froude number =     4.522

Upstream point elevation =  1660.000(Ft.)
Downstream point elevation =  1551.000(Ft.)
Flow length =   275.000(Ft.)
Travel time  =    0.55 min.
Time of concentration =    5.55 min.
Depth of flow =   0.210(Ft.)
Average velocity =   8.321(Ft/s)
Total irregular channel flow =     4.713(CFS)
Irregular channel normal depth above invert elev. =   0.210(Ft.)
Average velocity of channel(s) =   8.321(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =     4.590(In/Hr) for a   100.0 year storm
Subarea runoff =     2.995(CFS) for     0.751(Ac.)
Total runoff =     6.167(CFS)     Total area =      1.502(Ac.)
Depth of flow =   0.233(Ft.), Average velocity =   8.900(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.181 to Point/Station       1.182
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     8.744(CFS)
Depth of flow =   0.743(Ft.), Average velocity =  15.847(Ft/s)
          ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
          1           0.00           1.50
          2           1.50           0.00
          3           3.00           1.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =     8.744(CFS)
 '   '    flow top width =     1.486(Ft.)
 '   '   velocity=   15.847(Ft/s)
 '   '    area =     0.552(Sq.Ft)
 '   '    Froude number =     4.58
```

Upstream point elevation = 1551.000(Ft.)
Downstream point elevation = 1495.000(Ft.)
Flow length = 490.000(Ft.)
Travel time = 0.52 min.
Time of concentration = 6.07 min.
Depth of flow = 0.743(Ft.)
Average velocity = 15.847(Ft/s)
Total irregular channel flow = 8.744(CFS)
Irregular channel normal depth above invert elev. = 0.743(Ft.)
Average velocity of channel(s) = 15.847(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.867
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 4.379(In/Hr) for a 100.0 year storm
Subarea runoff = 5.101(CFS) for 1.343(Ac.)
Total runoff = 11.268(CFS) Total area = 2.845(Ac.)
Depth of flow = 0.817(Ft.), Average velocity = 16.885(Ft/s)

++
Process from Point/Station 1.182 to Point/Station 1.183
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1495.500(Ft.)
Downstream point/station elevation = 1481.400(Ft.)
Pipe length = 675.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.268(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 11.268(CFS)
Normal flow depth in pipe = 11.55(In.)
Flow top width inside pipe = 17.26(In.)
Critical Depth = 15.40(In.)
Pipe flow velocity = 9.41(Ft/s)
Travel time through pipe = 1.20 min.
Time of concentration (TC) = 7.26 min.

++
Process from Point/Station 1.161 to Point/Station 1.183
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 2.845(Ac.)
Runoff from this stream = 11.268(CFS)
Time of concentration = 7.26 min.
Rainfall intensity = 3.981(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	47.329	6.88	4.098
2	11.268	7.26	3.981

Largest stream flow has longer or shorter time of concentration
Qp = 47.329 + sum of

Qa	Tb/Ta	
11.268 *	0.947 =	10.673

Qp = 58.001

Total of 2 main streams to confluence:
Flow rates before confluence point:
47.329 11.268
Area of streams before confluence:
18.294 2.845

Results of confluence:
Total flow rate = 58.001(CFS)
Time of concentration = 6.878 min.
Effective stream area after confluence = 21.139(Ac.)

++
Process from Point/Station 1.183 to Point/Station 1.184
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 1481.400(Ft.)
Downstream point/station elevation = 1480.900(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 58.001(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
39.831(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 15.239(Ft.)
Minor friction loss = 25.092(Ft.) K-factor = 1.50
Pipe flow velocity = 32.82(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 6.90 min.

++
Process from Point/Station 1.184 to Point/Station 1.185
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 1480.900(Ft.)
Downstream point elevation = 1480.600(Ft.)
Channel length thru subarea = 30.000(Ft.)
Channel base width = 2.500(Ft.)
Slope or 'Z' of left channel bank = 3.000
Slope or 'Z' of right channel bank = 3.000
Manning's 'N' = 0.044
Maximum depth of channel = 1.000(Ft.)
Flow(q) thru subarea = 58.001(CFS)
Depth of flow = 1.901(Ft.), Average velocity = 4.408(Ft/s)
Channel flow top width = 8.500(Ft.)
Flow Velocity = 4.41(Ft/s)
Travel time = 0.11 min.
Time of concentration = 7.02 min.

Sub-Channel No. 1 Critical depth = 1.484(Ft.)
' ' ' Critical flow top width = 8.500(Ft.)
' ' ' Critical flow velocity= 6.031(Ft/s)
' ' ' Critical flow area = 9.617(Sq.Ft)

End of computations, total study area = 21.14 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.913
Area averaged RI index number = 81.2

PROPOSED CONDITIONS 100-YEAR DESIGN STORM EVENT UNIT HYDROGRAPH

Please Note: the 10-Year Design Storm Event Unit hydrograph was not analyzed.

```
                U n i t   H y d r o g r a p h   A n a l y s i s

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                     Study date  03/10/22 File: garbanipr100uhd124100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------
Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978
------------------------------------------------------------------------
 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format
------------------------------------------------------------------------
------------------------------------------------------------------------
Drainage Area =      22.07(Ac.)  =      0.034 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      22.07(Ac.)  =      0.034 Sq. Mi.
Length along longest watercourse =    1720.00(Ft.)
Length along longest watercourse measured to centroid =     825.00(Ft.)
Length along longest watercourse =      0.326 Mi.
Length along longest watercourse measured to centroid =      0.156 Mi.
Difference in elevation =     245.00(Ft.)
Slope along watercourse =    752.0930 Ft./Mi.
Average Manning's 'N' = 0.025
Lag time =    0.055 Hr.
Lag time =     3.30 Min.
25% of lag time =     0.82 Min.
40% of lag time =     1.32 Min.
Unit time =    10.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:
Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      22.07                1.82                       40.17

100 YEAR Area rainfall data:
Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      22.07                4.90                      108.16

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.820(In)
Area Averaged 100-Year Rainfall =    4.900(In)
```

Point rain (area averaged) = 4.900(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 4.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
22.074	81.20	0.087

Total Area Entered = 22.07(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
81.2	81.2	0.230	0.087	0.212	1.000	0.212

Sum (F) = 0.212
Area averaged mean soil loss (F) (In/Hr) = 0.212
Minimum soil loss rate ((In/Hr)) = 0.106
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.830

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.167	303.136	57.000	12.680
2	0.333	606.272	36.956	8.221
3	0.500	909.408	6.044	1.345
		Sum = 100.000	Sum=	22.246

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) Max	Low	Effective (In/Hr)
1	0.17	0.17	0.049	(0.376)	0.041	0.008
2	0.33	0.17	0.049	(0.373)	0.041	0.008
3	0.50	0.17	0.049	(0.370)	0.041	0.008
4	0.67	0.23	0.069	(0.367)	0.057	0.012
5	0.83	0.23	0.069	(0.364)	0.057	0.012
6	1.00	0.23	0.069	(0.361)	0.057	0.012
7	1.17	0.20	0.059	(0.358)	0.049	0.010
8	1.33	0.20	0.059	(0.355)	0.049	0.010
9	1.50	0.20	0.059	(0.353)	0.049	0.010
10	1.67	0.23	0.069	(0.350)	0.057	0.012
11	1.83	0.23	0.069	(0.347)	0.057	0.012
12	2.00	0.23	0.069	(0.344)	0.057	0.012
13	2.17	0.27	0.078	(0.341)	0.065	0.013
14	2.33	0.27	0.078	(0.339)	0.065	0.013
15	2.50	0.27	0.078	(0.336)	0.065	0.013
16	2.67	0.33	0.098	(0.333)	0.081	0.017
17	2.83	0.33	0.098	(0.330)	0.081	0.017
18	3.00	0.33	0.098	(0.328)	0.081	0.017

19	3.17	0.33	0.098	(0.325)	0.081	0.017
20	3.33	0.33	0.098	(0.322)	0.081	0.017
21	3.50	0.33	0.098	(0.320)	0.081	0.017
22	3.67	0.37	0.108	(0.317)	0.090	0.018
23	3.83	0.37	0.108	(0.314)	0.090	0.018
24	4.00	0.37	0.108	(0.312)	0.090	0.018
25	4.17	0.43	0.127	(0.309)	0.106	0.022
26	4.33	0.43	0.127	(0.306)	0.106	0.022
27	4.50	0.43	0.127	(0.304)	0.106	0.022
28	4.67	0.50	0.147	(0.301)	0.122	0.025
29	4.83	0.50	0.147	(0.299)	0.122	0.025
30	5.00	0.50	0.147	(0.296)	0.122	0.025
31	5.17	0.43	0.127	(0.293)	0.106	0.022
32	5.33	0.43	0.127	(0.291)	0.106	0.022
33	5.50	0.43	0.127	(0.288)	0.106	0.022
34	5.67	0.53	0.157	(0.286)	0.130	0.027
35	5.83	0.53	0.157	(0.283)	0.130	0.027
36	6.00	0.53	0.157	(0.281)	0.130	0.027
37	6.17	0.60	0.176	(0.278)	0.146	0.030
38	6.33	0.60	0.176	(0.276)	0.146	0.030
39	6.50	0.60	0.176	(0.273)	0.146	0.030
40	6.67	0.67	0.196	(0.271)	0.163	0.033
41	6.83	0.67	0.196	(0.269)	0.163	0.033
42	7.00	0.67	0.196	(0.266)	0.163	0.033
43	7.17	0.70	0.206	(0.264)	0.171	0.035
44	7.33	0.70	0.206	(0.261)	0.171	0.035
45	7.50	0.70	0.206	(0.259)	0.171	0.035
46	7.67	0.83	0.245	(0.257)	0.203	0.042
47	7.83	0.83	0.245	(0.254)	0.203	0.042
48	8.00	0.83	0.245	(0.252)	0.203	0.042
49	8.17	1.00	0.294	(0.249)	0.244	0.050
50	8.33	1.00	0.294	(0.247)	0.244	0.050
51	8.50	1.00	0.294	(0.245)	0.244	0.050
52	8.67	1.10	0.323	0.243	(0.269)	0.081
53	8.83	1.10	0.323	0.240	(0.269)	0.083
54	9.00	1.10	0.323	0.238	(0.269)	0.085
55	9.17	1.30	0.382	0.236	(0.317)	0.146
56	9.33	1.30	0.382	0.234	(0.317)	0.149
57	9.50	1.30	0.382	0.231	(0.317)	0.151
58	9.67	1.43	0.421	0.229	(0.350)	0.192
59	9.83	1.43	0.421	0.227	(0.350)	0.194
60	10.00	1.43	0.421	0.225	(0.350)	0.197
61	10.17	1.00	0.294	0.223	(0.244)	0.071
62	10.33	1.00	0.294	0.220	(0.244)	0.074
63	10.50	1.00	0.294	0.218	(0.244)	0.076
64	10.67	1.33	0.392	0.216	(0.326)	0.176
65	10.83	1.33	0.392	0.214	(0.326)	0.178
66	11.00	1.33	0.392	0.212	(0.326)	0.180
67	11.17	1.27	0.372	0.210	(0.309)	0.163
68	11.33	1.27	0.372	0.208	(0.309)	0.165
69	11.50	1.27	0.372	0.206	(0.309)	0.167
70	11.67	1.17	0.343	0.204	(0.285)	0.139
71	11.83	1.17	0.343	0.202	(0.285)	0.141
72	12.00	1.17	0.343	0.200	(0.285)	0.143

73	12.17	1.70	0.500	0.198	(0.415)	0.302
74	12.33	1.70	0.500	0.196	(0.415)	0.304
75	12.50	1.70	0.500	0.194	(0.415)	0.306
76	12.67	1.90	0.559	0.192	(0.464)	0.367
77	12.83	1.90	0.559	0.190	(0.464)	0.369
78	13.00	1.90	0.559	0.188	(0.464)	0.371
79	13.17	2.27	0.666	0.186	(0.553)	0.480
80	13.33	2.27	0.666	0.184	(0.553)	0.482
81	13.50	2.27	0.666	0.182	(0.553)	0.484
82	13.67	1.53	0.451	0.180	(0.374)	0.270
83	13.83	1.53	0.451	0.179	(0.374)	0.272
84	14.00	1.53	0.451	0.177	(0.374)	0.274
85	14.17	1.77	0.519	0.175	(0.431)	0.344
86	14.33	1.77	0.519	0.173	(0.431)	0.346
87	14.50	1.77	0.519	0.171	(0.431)	0.348
88	14.67	1.70	0.500	0.170	(0.415)	0.330
89	14.83	1.70	0.500	0.168	(0.415)	0.332
90	15.00	1.70	0.500	0.166	(0.415)	0.334
91	15.17	1.57	0.461	0.165	(0.382)	0.296
92	15.33	1.57	0.461	0.163	(0.382)	0.298
93	15.50	1.57	0.461	0.161	(0.382)	0.299
94	15.67	1.27	0.372	0.160	(0.309)	0.213
95	15.83	1.27	0.372	0.158	(0.309)	0.214
96	16.00	1.27	0.372	0.156	(0.309)	0.216
97	16.17	0.27	0.078	(0.155)	0.065	0.013
98	16.33	0.27	0.078	(0.153)	0.065	0.013
99	16.50	0.27	0.078	(0.152)	0.065	0.013
100	16.67	0.20	0.059	(0.150)	0.049	0.010
101	16.83	0.20	0.059	(0.149)	0.049	0.010
102	17.00	0.20	0.059	(0.147)	0.049	0.010
103	17.17	0.33	0.098	(0.146)	0.081	0.017
104	17.33	0.33	0.098	(0.144)	0.081	0.017
105	17.50	0.33	0.098	(0.143)	0.081	0.017
106	17.67	0.30	0.088	(0.141)	0.073	0.015
107	17.83	0.30	0.088	(0.140)	0.073	0.015
108	18.00	0.30	0.088	(0.138)	0.073	0.015
109	18.17	0.27	0.078	(0.137)	0.065	0.013
110	18.33	0.27	0.078	(0.136)	0.065	0.013
111	18.50	0.27	0.078	(0.134)	0.065	0.013
112	18.67	0.17	0.049	(0.133)	0.041	0.008
113	18.83	0.17	0.049	(0.132)	0.041	0.008
114	19.00	0.17	0.049	(0.131)	0.041	0.008
115	19.17	0.23	0.069	(0.129)	0.057	0.012
116	19.33	0.23	0.069	(0.128)	0.057	0.012
117	19.50	0.23	0.069	(0.127)	0.057	0.012
118	19.67	0.17	0.049	(0.126)	0.041	0.008
119	19.83	0.17	0.049	(0.125)	0.041	0.008
120	20.00	0.17	0.049	(0.124)	0.041	0.008
121	20.17	0.20	0.059	(0.122)	0.049	0.010
122	20.33	0.20	0.059	(0.121)	0.049	0.010
123	20.50	0.20	0.059	(0.120)	0.049	0.010
124	20.67	0.17	0.049	(0.119)	0.041	0.008
125	20.83	0.17	0.049	(0.118)	0.041	0.008
126	21.00	0.17	0.049	(0.117)	0.041	0.008

127	21.17	0.17	0.049	(0.116)	0.041	0.008
128	21.33	0.17	0.049	(0.116)	0.041	0.008
129	21.50	0.17	0.049	(0.115)	0.041	0.008
130	21.67	0.17	0.049	(0.114)	0.041	0.008
131	21.83	0.17	0.049	(0.113)	0.041	0.008
132	22.00	0.17	0.049	(0.112)	0.041	0.008
133	22.17	0.17	0.049	(0.112)	0.041	0.008
134	22.33	0.17	0.049	(0.111)	0.041	0.008
135	22.50	0.17	0.049	(0.110)	0.041	0.008
136	22.67	0.13	0.039	(0.110)	0.033	0.007
137	22.83	0.13	0.039	(0.109)	0.033	0.007
138	23.00	0.13	0.039	(0.108)	0.033	0.007
139	23.17	0.13	0.039	(0.108)	0.033	0.007
140	23.33	0.13	0.039	(0.107)	0.033	0.007
141	23.50	0.13	0.039	(0.107)	0.033	0.007
142	23.67	0.13	0.039	(0.107)	0.033	0.007
143	23.83	0.13	0.039	(0.106)	0.033	0.007
144	24.00	0.13	0.039	(0.106)	0.033	0.007

(Loss Rate Not Used)

Sum = 100.0 Sum = 12.5

Flood volume = Effective rainfall 2.08(In)
times area 22.1(Ac.)/[(In)/(Ft.)] = 3.8(Ac.Ft)
Total soil loss = 2.82(In)
Total soil loss = 5.195(Ac.Ft)
Total rainfall = 4.90(In)
Flood volume = 166314.2 Cubic Feet
Total soil loss = 226299.1 Cubic Feet

Peak flow rate of this hydrograph = 10.754(CFS)

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24 - 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 10 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+10	0.0015	0.11	Q	|	|	|	|
0+20	0.0038	0.17	Q	|	|	|	|
0+30	0.0064	0.18	Q	|	|	|	|
0+40	0.0095	0.23	Q	|	|	|	|
0+50	0.0130	0.25	Q	|	|	|	|
1+ 0	0.0166	0.26	Q	|	|	|	|
1+10	0.0199	0.24	Q	|	|	|	|
1+20	0.0230	0.22	Q	|	|	|	|
1+30	0.0260	0.22	Q	|	|	|	|
1+40	0.0294	0.24	Q	|	|	|	|
1+50	0.0329	0.26	Q	|	|	|	|
2+ 0	0.0365	0.26	Q	|	|	|	|
2+10	0.0403	0.28	Q	|	|	|	|
2+20	0.0444	0.29	Q	|	|	|	|
2+30	0.0484	0.30	Q	|	|	|	|

```
 2+40     0.0531     0.34  Q       |       |       |       |
 2+50     0.0581     0.37  Q       |       |       |       |
 3+ 0     0.0632     0.37  Q       |       |       |       |
 3+10     0.0683     0.37  Q       |       |       |       |
 3+20     0.0734     0.37  Q       |       |       |       |
 3+30     0.0785     0.37  Q       |       |       |       |
 3+40     0.0839     0.39  Q       |       |       |       |
 3+50     0.0895     0.40  Q       |       |       |       |
 4+ 0     0.0951     0.41  Q       |       |       |       |
 4+10     0.1013     0.45  QV      |       |       |       |
 4+20     0.1078     0.48  QV      |       |       |       |
 4+30     0.1145     0.48  QV      |       |       |       |
 4+40     0.1217     0.52  |Q      |       |       |       |
 4+50     0.1292     0.55  |Q      |       |       |       |
 5+ 0     0.1369     0.55  |Q      |       |       |       |
 5+10     0.1439     0.51  |Q      |       |       |       |
 5+20     0.1506     0.49  QV      |       |       |       |
 5+30     0.1573     0.48  QV      |       |       |       |
 5+40     0.1648     0.54  |Q      |       |       |       |
 5+50     0.1728     0.59  |Q      |       |       |       |
 6+ 0     0.1810     0.59  |Q      |       |       |       |
 6+10     0.1897     0.63  |Q      |       |       |       |
 6+20     0.1988     0.66  |QV     |       |       |       |
 6+30     0.2080     0.67  |QV     |       |       |       |
 6+40     0.2177     0.71  |QV     |       |       |       |
 6+50     0.2279     0.74  |QV     |       |       |       |
 7+ 0     0.2381     0.74  |QV     |       |       |       |
 7+10     0.2485     0.76  |QV     |       |       |       |
 7+20     0.2592     0.77  |QV     |       |       |       |
 7+30     0.2699     0.78  |QV     |       |       |       |
 7+40     0.2818     0.86  |QV     |       |       |       |
 7+50     0.2944     0.92  |Q V    |       |       |       |
 8+ 0     0.3071     0.92  |Q V    |       |       |       |
 8+10     0.3213     1.03  | QV    |       |       |       |
 8+20     0.3364     1.10  | QV    |       |       |       |
 8+30     0.3517     1.11  | QV    |       |       |       |
 8+40     0.3724     1.50  |  Q    |       |       |       |
 8+50     0.3970     1.79  |  QV   |       |       |       |
 9+ 0     0.4229     1.88  |  QV   |       |       |       |
 9+10     0.4597     2.67  |   VQ  |       |       |       |
 9+20     0.5038     3.21  |   VQ  |       |       |       |
 9+30     0.5497     3.33  |   VQ  |       |       |       |
 9+40     0.6032     3.88  |    VQ |       |       |       |
 9+50     0.6618     4.25  |    V Q|       |       |       |
10+ 0     0.7217     4.35  |    VQ |       |       |       |
10+10     0.7601     2.79  |   Q V |       |       |       |
10+20     0.7847     1.79  |  Q   V|       |       |       |
10+30     0.8076     1.66  |  Q   V|       |       |       |
10+40     0.8483     2.95  |   Q  V|       |       |       |
10+50     0.9007     3.81  |    Q V|       |       |       |
11+ 0     0.9556     3.98  |    Q  V       |       |       |
11+10     1.0077     3.78  |    Q  V       |       |       |
11+20     1.0582     3.67  |    Q   V      |       |       |
11+30     1.1090     3.69  |    Q  |V      |       |       |
```

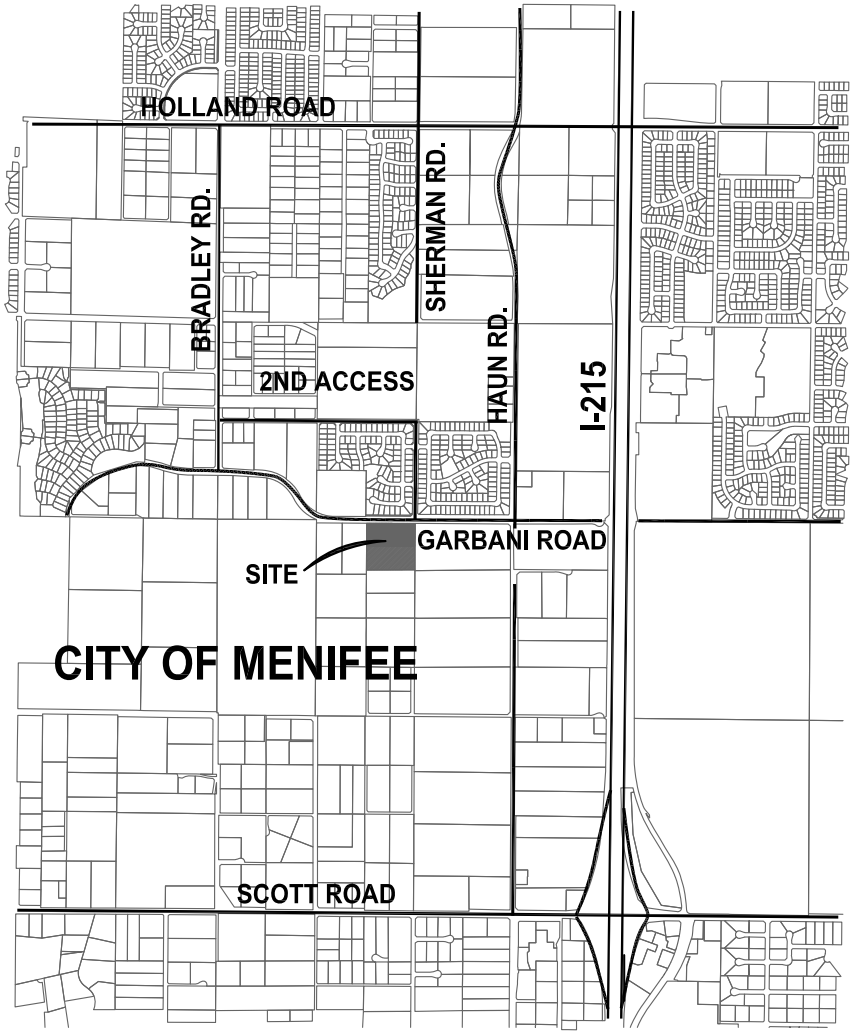
```
11+40    1.1553    3.36 |    Q   | V      |        |        |
11+50    1.1988    3.16 |    Q   | V      |        |        |
12+ 0    1.2425    3.17 |    Q   |  V     |        |        |
12+10    1.3141    5.20 |        Q  V     |        |        |
12+20    1.4041    6.54 |        |  QV    |        |        |
12+30    1.4977    6.79 |        |  Q V   |        |        |
12+40    1.6021    7.58 |        |   QV   |        |        |
12+50    1.7137    8.11 |        |    QV  |        |        |
13+ 0    1.8271    8.23 |        |    Q  V|        |        |
13+10    1.9598    9.64 |        |       QV        |        |
13+20    2.1054   10.57 |        |        |QV      |        |
13+30    2.2535   10.75 |        |        |Q V     |        |
13+40    2.3646    8.06 |        |    Q   |  V     |        |
13+50    2.4517    6.33 |        |  Q     |   V    |        |
14+ 0    2.5355    6.08 |        |  Q     |    V   |        |
14+10    2.6317    6.99 |        |  Q     |     V  |        |
14+20    2.7363    7.59 |        |   Q    |      V |        |
14+30    2.8427    7.73 |        |   Q    |       V|        |
14+40    2.9462    7.52 |        |   Q    |        V        |
14+50    3.0481    7.39 |        |   Q    |        |V       |
15+ 0    3.1501    7.41 |        |   Q    |        | V      |
15+10    3.2458    6.95 |        |  Q     |        |  V     |
15+20    3.3375    6.66 |        |  Q     |        |  V     |
15+30    3.4291    6.65 |        |  Q     |        |   V    |
15+40    3.5057    5.56 |        | Q      |        |    V   |
15+50    3.5728    4.87 |        Q|      |        |     V  |
16+ 0    3.6388    4.79 |        Q|      |        |      V |
16+10    3.6696    2.23 |   Q    |       |        |      V |
16+20    3.6775    0.57 |Q       |       |        |      V |
16+30    3.6815    0.30 Q        |       |        |      V |
16+40    3.6850    0.25 Q        |       |        |      V |
16+50    3.6881    0.23 Q        |       |        |      V |
17+ 0    3.6912    0.22 Q        |       |        |      V |
17+10    3.6954    0.31 Q        |       |        |      V |
17+20    3.7004    0.36 Q        |       |        |      V |
17+30    3.7055    0.37 Q        |       |        |      V |
17+40    3.7103    0.35 Q        |       |        |      V |
17+50    3.7149    0.34 Q        |       |        |      V |
18+ 0    3.7195    0.33 Q        |       |        |      V |
18+10    3.7238    0.31 Q        |       |        |       V|
18+20    3.7279    0.30 Q        |       |        |       V|
18+30    3.7320    0.30 Q        |       |        |       V|
18+40    3.7352    0.23 Q        |       |        |       V|
18+50    3.7378    0.19 Q        |       |        |       V|
19+ 0    3.7404    0.18 Q        |       |        |       V|
19+10    3.7435    0.23 Q        |       |        |       V|
19+20    3.7470    0.25 Q        |       |        |       V|
19+30    3.7506    0.26 Q        |       |        |       V|
19+40    3.7536    0.22 Q        |       |        |       V|
19+50    3.7562    0.19 Q        |       |        |       V|
20+ 0    3.7587    0.18 Q        |       |        |       V|
20+10    3.7615    0.21 Q        |       |        |       V|
20+20    3.7646    0.22 Q        |       |        |       V|
20+30    3.7676    0.22 Q        |       |        |       V|
```

20+40	3.7704	0.20	Q	|	|	| V|
20+50	3.7730	0.19	Q	|	|	| V|
21+ 0	3.7755	0.18	Q	|	|	| V|
21+10	3.7781	0.18	Q	|	|	| V|
21+20	3.7806	0.18	Q	|	|	| V|
21+30	3.7832	0.18	Q	|	|	| V|
21+40	3.7857	0.18	Q	|	|	| V|
21+50	3.7883	0.18	Q	|	|	| V|
22+ 0	3.7908	0.18	Q	|	|	| V|
22+10	3.7934	0.18	Q	|	|	| V|
22+20	3.7959	0.18	Q	|	|	| V|
22+30	3.7985	0.18	Q	|	|	| V|
22+40	3.8007	0.16	Q	|	|	| V|
22+50	3.8028	0.15	Q	|	|	| V|
23+ 0	3.8048	0.15	Q	|	|	| V|
23+10	3.8069	0.15	Q	|	|	| V|
23+20	3.8089	0.15	Q	|	|	| V|
23+30	3.8109	0.15	Q	|	|	| V|
23+40	3.8130	0.15	Q	|	|	| V|
23+50	3.8150	0.15	Q	|	|	| V|
24+ 0	3.8170	0.15	Q	|	|	| V|
24+10	3.8179	0.06	Q	|	|	| V|
24+20	3.8180	0.01	Q	|	|	| V

ATTACHMENT 4: EXHIBITS

This attachment contains the project site's vicinity map and hydrology exhibits. Please see the attached exhibits.

VICINITY MAP



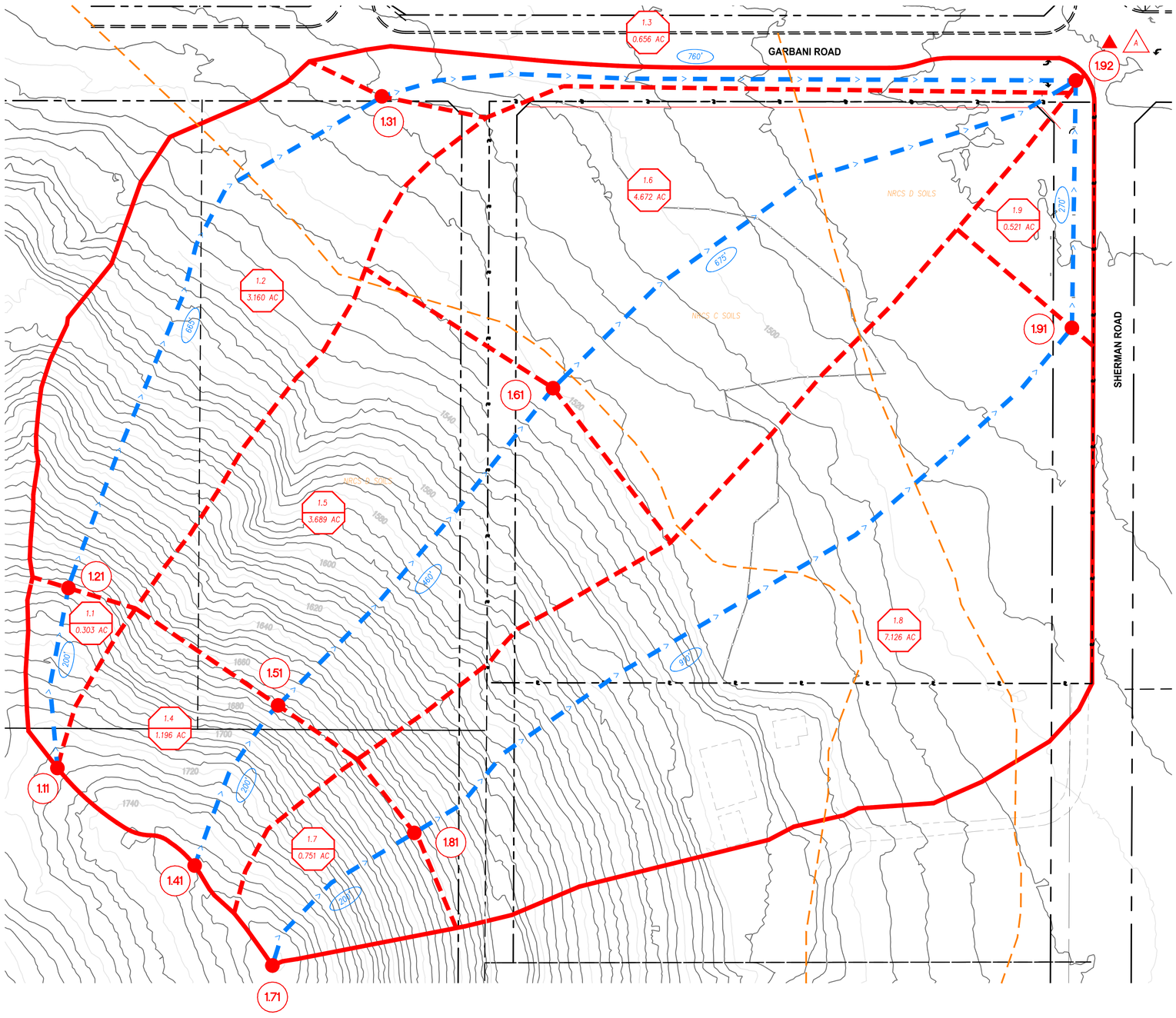
VICINITY MAP

N.T.S.
SECT 15 SBM, T6S, R3W

APN
360–350–004
360–350–005

ADDRESS
27441 GARBANI ROAD
MENIFEE, CALIFORNIA 92584

THOMAS BROTHERS MAP
PAGE 868, GRID D5



LEGEND

- DRAINAGE AREA BOUNDARY
- DRAINAGE AREA SUB BOUNDARY, NUMBER, AND ACREAGE
- FLOW PATH, DIRECTION, LENGTH
- STUDY NODE NUMBER
- CONFLUENCE POINT
- NRCS SOIL BOUNDARY
- NRCS SOIL TYPE (TYPE XX SOILS)
- TTM BOUNDARY

EXISTING CONDITIONS SUMMARY		
DATA	10-YEAR	100-YEAR
AMC	II	
STUDY NODE POINT	1.92	
INTENSITY (IN/HR)	2.461	3.769
TOTAL DISCHARGE (CFS)	48.1	74.5
TIME OF CONCENTRATION (MIN)	8.97	8.60
AREA (ACRES)	22.074	
UNIT HYDROGRAPH VOLUME (ACRE-FT)	NOT-A-PART	4.4075

COVER TYPES FOR 1.3 AND 1.9

THE COVER TYPE FOR SUB-BASINS 1.3 AND 1.9 IS ASSUMED TO BE 50% COMPACTED ROAD AND THE LAND USE OF SFR WITH 7200-10000 SQ-FT WILL BE USED SINCE IT YIELDS A 50% IMPERVIOUS RATIO.

60 0 60 120
(IN FEET)
1 inch = 60 ft.

N

VENTURA ENGINEERING, LLC
27393 YNEZ ROAD, SUITE 159
TEMECULA, CALIFORNIA 92591
PHONE (951) 252-7632
FAX (951) 346-5726

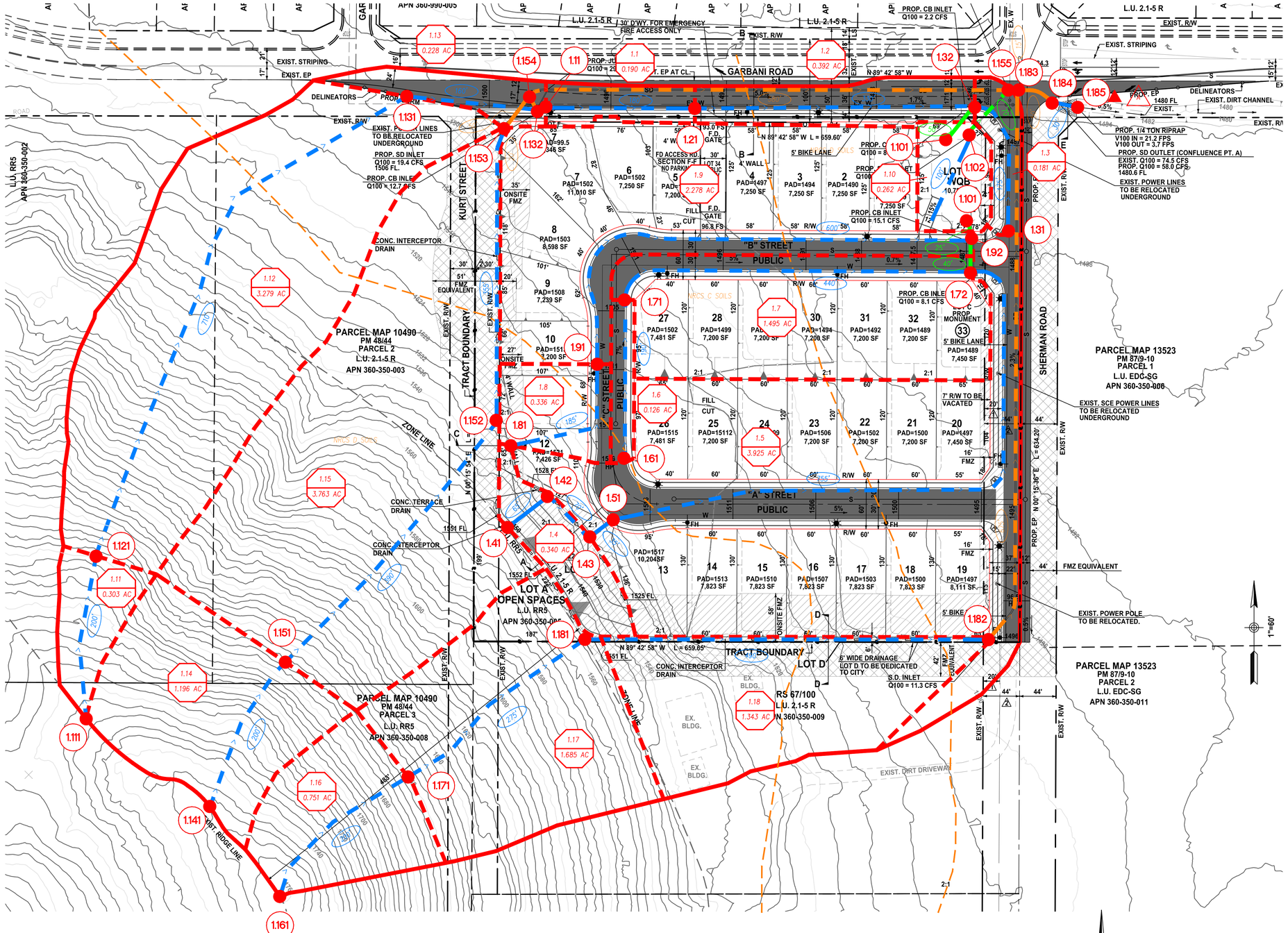
DEV2021-009, TTM 37450

CITY OF MENIFEE

TTM 37450
GARBANI SOUTH
27441 GARBANI ROAD, MENIFEE, CALIFORNIA 92584
APN: 360-350-004 & 005

EXISTING CONDITIONS

PRELIMINARY HYDROLOGY REPORT



LEGEND

🟥	STUDY AREA OUTER BOUNDARY
# / #	DRAINAGE AREA SUB BOUNDARY, NUMBER, AND ACREAGE
#	OVERLAND FLOW PATH, DIRECTION, LENGTH
#	PIPED FLOW PATH, DIRECTION, LENGTH (ON-SITE, TREATED)
#	PIPED FLOW PATH, DIRECTION, LENGTH (OFF-SITE, UNTREATED)
● #	STUDY NODE NUMBER
▲ #	CONFLUENCE POINT
TYPE XX SOILS	NRCS SOIL BOUNDARY NRCS SOIL TYPE

PROPOSED CONDITIONS SUMMARY		
DATA	***10-YEAR***	***100-YEAR***
AMC	II	
STUDY NODE POINT	1.185	
INTENSITY (IN/HR)	2.845	3.981
TOTAL DISCHARGE (CFS)	37.5	58.0
TIME OF CONCENTRATION (MIN)	7.48	7.02
AREA (ACRES)	22.074	
UNIT HYDROGRAPH VOLUME (ACRE-FT)	NOT-A-PART	3.8180

10-YEAR DESIGN STORM EVENT COMPARISON			
DATA	***EXISTING***	***PROPOSED***	***COMPARISON***
STUDY NODE POINT	1.92	1.185	N/A
INTENSITY (IN/HR)	2.461	2.845	+ 0.384
TOTAL DISCHARGE (cfs)	48.1	37.5	- 10.6
TIME OF CONCENTRATION (MIN)	8.97	7.48	- 1.50
AREA (ACRES)	22.074	22.074	NO CHANGE
UNIT HYDROGRAPH VOLUME (ACRE-FT)	NOT-A-PART		
STORAGE (ACRE-FT)	NOT-A-PART		

100-YEAR DESIGN STORM EVENT COMPARISON			
DATA	***EXISTING***	***PROPOSED***	***COMPARISON***
STUDY NODE POINT	1.92	1.185	N/A
INTENSITY (IN/HR)	3.769	3.981	+ 0.212
TOTAL DISCHARGE (cfs)	74.5	58.0	- 16.5
TIME OF CONCENTRATION (MIN)	8.60	7.02	- 1.58
AREA (ACRES)	22.074	22.074	NO CHANGE
UNIT HYDROGRAPH VOLUME (ACRE-FT)	4.4075	3.8180	- 0.5895
STORAGE (ACRE-FT)	0.0000	0.8264	+ 0.8264

LANDSCAPING NOTE:

ALL LANDSCAPED AREAS WILL BE REQUIRED TO PROVIDE FOR FUTURE STRUCTURAL PEST CONTROL METHODS PER ACCEPTABLE BMPS AND STANDARDS.

60 0 60 120
(IN FEET)
1 inch = 60 ft.

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27393 YNEZ ROAD, SUITE 159
TEMECULA, CALIFORNIA 92591
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CITY OF MENIFEE

TTM 37450
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27441 GARBANI ROAD, MENIFEE, CALIFORNIA 92584
APN: 360-350-004 & 005

PROPOSED CONDITIONS

PRELIMINARY HYDROLOGY REPORT

ATTACHMENT 5: FEMA DETERMINATION

This attachment contains the project site's FEMA determination. Please see the attached exhibits.

National Flood Hazard Layer FIRMette

FEMA

117°11'10"W 33°39'34"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

117°10'32"W 33°39'4"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/4/2022 at 7:50 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.