JPN – TPM 37121
City of Menifee, Riverside County, California

Preliminary Drainage Study

Prepared for:
JPN Corporation, Inc.
1100 Wagner Drive
El Cajon, CA 92020-3047

Prepared By:

ALBERT A. WEBB ASSOCIATES
3788 McCray Street
Riverside, CA 92506

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Sarah Kowalski, P.E.
Senior Engineer, Land Development Engineering

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SECTION 1 - SUMMARY

PURPOSE

The purpose of this report is to document the preliminary hydrologic analyses performed in support of the JPN project located in the City of Menifee, County of Riverside, California. The project site is located in the northeast corner of the intersection of Haun Road and Holland Road. The project site is bounded by vacant land to the north, by the I-215 to the east, by Holland Road to the south, and by Haun Road and the Paloma Wash Channel to the west. This project proposes to split the site into six parcels and grade them in the interim condition. This report will determine the necessary drainage improvements required to convey off-site flows to the proposed bioretention basins. The proposed basins will be sized to capture and treat off-site flows for water quality purposes.

The scope of this report will include the following:

- Determine the peak 100-year and 10-year flow rates for the existing, interim, and ultimate developed conditions using the Riverside County Flood Control and Water Conservation District (RCFC&WCD) Rational Method.
- Determine the required storm drain facilities, alignments, and sizes required to protect the project site from off-site flows.
- Preparation of a preliminary report summarizing the hydrologic results.

EXISTING CONDITIONS

The project is proposing to develop currently vacant land within the City of Menifee, Riverside County, California. The land is relatively flat, gently sloping to the north. The property site currently displays a natural ridge line approximately 340 feet east from the Haun Road centerline. Existing elevations across the site vary from 1437 at the northwest corner to 1431 at the center of the east side of the project (NAVD88 datum). The project site drainage is currently conveyed into two separate drainage channels. Approximately 6.4 acres of the western portion of the site drains toward the Paloma Wash Channel, which parallels Haun Road to the west of the project site. The remaining eastern portion of the site drains to a Caltrans drainage ditch, which parallels Interstate 215 to the east of the site. Both of these drainage features drain to the north.

The portion of the site that drains into the Paloma Wash currently slopes down at approximately 0.9% grade to the west and slopes down at approximately 0.5% to the north. The runoff in this area is collected by existing inlets located along Haun Road, which discharge into the Paloma Channel.

The remainder acreage slopes to the northeast at approximately 0.5% slope. The existing drainage pattern for the site and the general area is characterized by sheet flows that follow the slope to the east side of the project and into the Caltrans drainage ditch. The drainage ditch terminates north of the project site into two (2) 8-foot by 4-foot Reinforced Concrete Boxes (RCBs) where the ditch crosses Newport Road and Interstate-215. The project is not impacted by off-site flows as there are existing streets around the perimeter of the project that convey any off-site flow away from the proposed streets.

PROPOSED CONDITIONS

OFF-SITE

The project proposes to widen Haun Road to its full width, per coordinating with the City of Menifee Traffic Engineer. Water quality BMPs have been designed to treat the public street flows within Haun Road. The proposed water quality basins and the proposed storm drain facilities designed for the widening of Haun Road are described below. Future Holland Road improvements are not part of this project, but they will ultimately drain to the Caltrans drainage ditch to the east.

Basin B is the northern water quality basin along Haun Road. It uses a 2.5 foot section of filter media (1.5' of engineered soil and 1' of gravel) to filter storm water runoff. The underdrains will connect to into a proposed outlet structure, which will outlet water quality flows into a new proposed storm drain connection to the Paloma Wash Channel. The proposed storm drain, Line A, will be sized during final

engineering to accommodate ultimate on-site flows. Basin B is designed to hold its respective water quality volume and then convey the storm water runoff back out during larger storm events. Lateral Line T to the north has been sized to treat these full width street flows.

The project site proposes to extend the existing Lateral Line P. This storm drain line has been designed to account for the proposed roadway expansions, with the Haun Road expansion being ultimately drained to the Paloma Wash Channel to the west.

Basin C is the southern water quality basin along Haun Road, and it connects directly to the extension of Lateral Line P. Basin C is designed to hold most of its respective water quality volume before entering the proposed outlet structure during larger storm events. Basin C uses a 4′ foot section of filter media (3′ of engineered soil and 1′ of gravel) to filter storm water runoff. This basin also proposes to connect the underdrains into the proposed outlet structure. There will be curb cuts on both sides of the catch basins to collect the QBMP. In larger storm events, some flows will collect in Basin C, but the rest will bypass the basin and flow directly into the catch basin. However, due to the bus turn out on the southwest side of Basin C, the bottom area necessary to treat the runoff was not achievable, because there was a lack of available area. The ponding depth of the basin has been increased to compensate for the lack of space.

ON-SITE

The Tentative Parcel Map consists of six private parcels. The net acreage for this TPM is approximately 34.1 acres. The on-site project area will be graded in the interim condition, draining to inlets placed at low spots throughout the site. The proposed interim slopes will vary between 0.5% and 1.0% to minimize earthwork while still providing sufficient fall. Inlets at low spots will collect flows into proposed storm drain lines. These storm drain lines have been proposed for the ultimate condition of the project site, a commercial development. This ultimate condition is not proposed per this project.

The BMPs this project proposes are designed to treat public street flows in the off-site condition. In the future, each parcel will have to submit its own hydrology and hydraulic analyses for the on-site conditions. In the event that future development disturbs the function of the proposed off-site BMPs, that particular future project will have to validate that the existing storm water tributary to the modified BMP will be treated by a BMP of equal of greater effectiveness.

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed in accordance with the RCFC&WCD Hydrology Manual, dated April 1978. The Rational Method was utilized to determine peak flow rates.

The hydrological parameters, including rainfall values and soil types were derived from the RCFC&WCD Hydrology Manual. The isohyetal maps and soil map have been included in Section 2. In the existing and interim conditions, the land use was assumed to be undeveloped (poor cover). The land use was assumed to be commercial for the ultimate, developed condition.

The Rational Method calculations were performed using a computer program developed by CivilDesign Corporation and Joseph E. Bonadiman and Associates Inc. The computer program is commonly referred to as CivilD which incorporates the hydrological parameters outlined in the RCFC&WCD Hydrology Manual.

The Rational Method was used to determine the peak flow rates used to size and design the subsurface storm drain systems to convey ultimate on-site flows to the Paloma Wash channel. The flow rates were computed by generating a hydrologic "link-node" model in which the overall area is divided into separate drainage sub-areas, each tributary to a concentration point (node) determined by the proposed layout and grading.

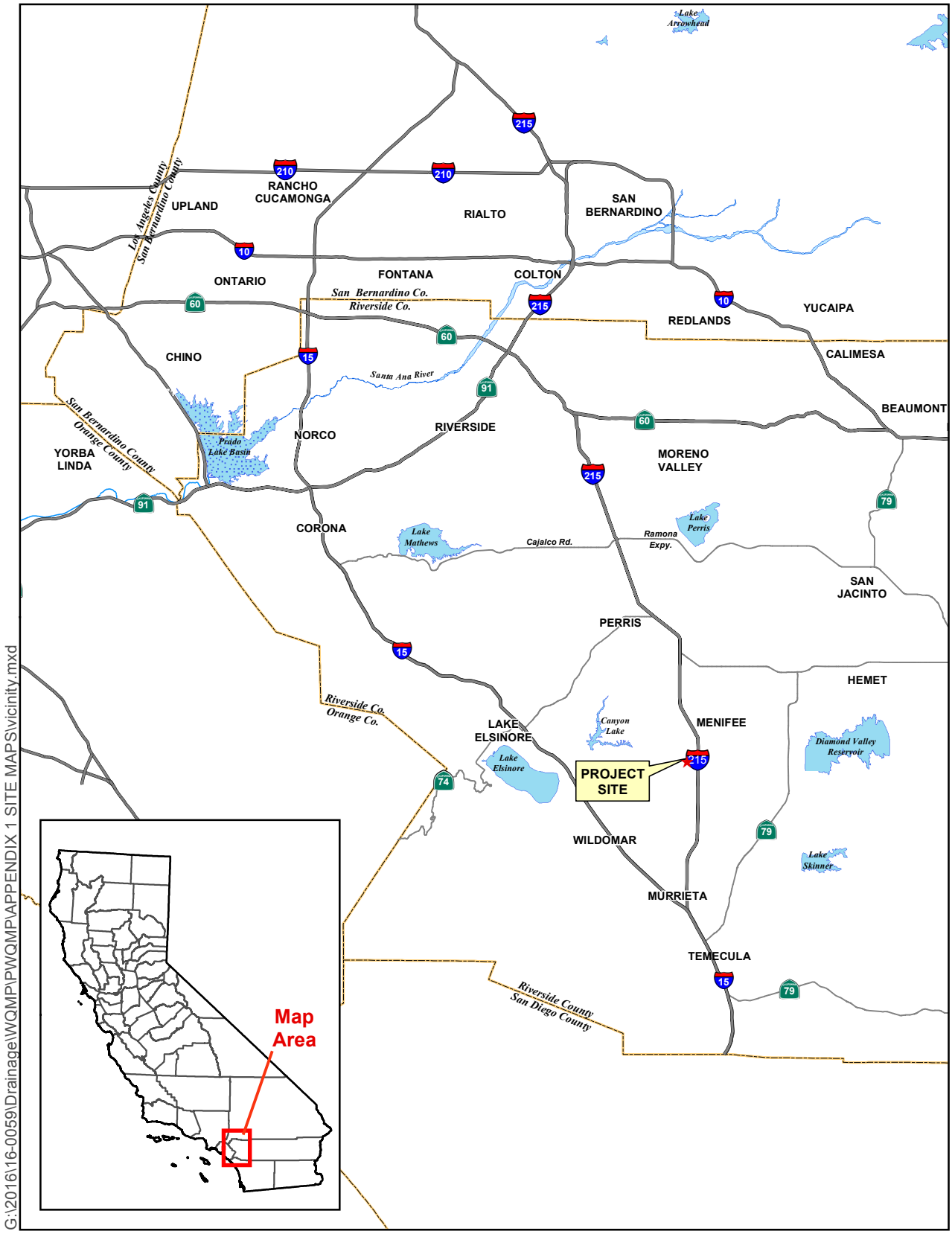
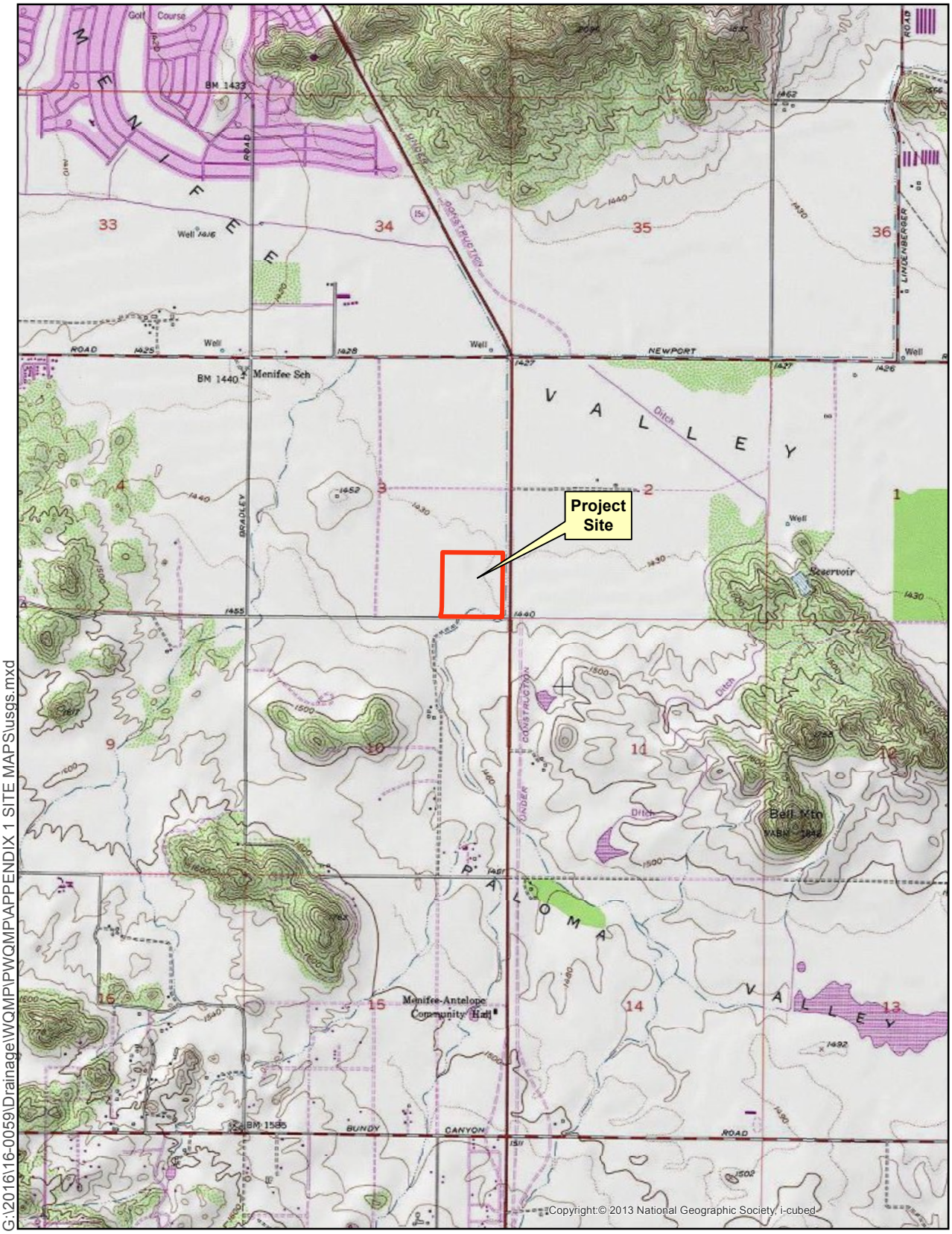


Figure 1. Vicinity Map

Albert A. WEBB Associates

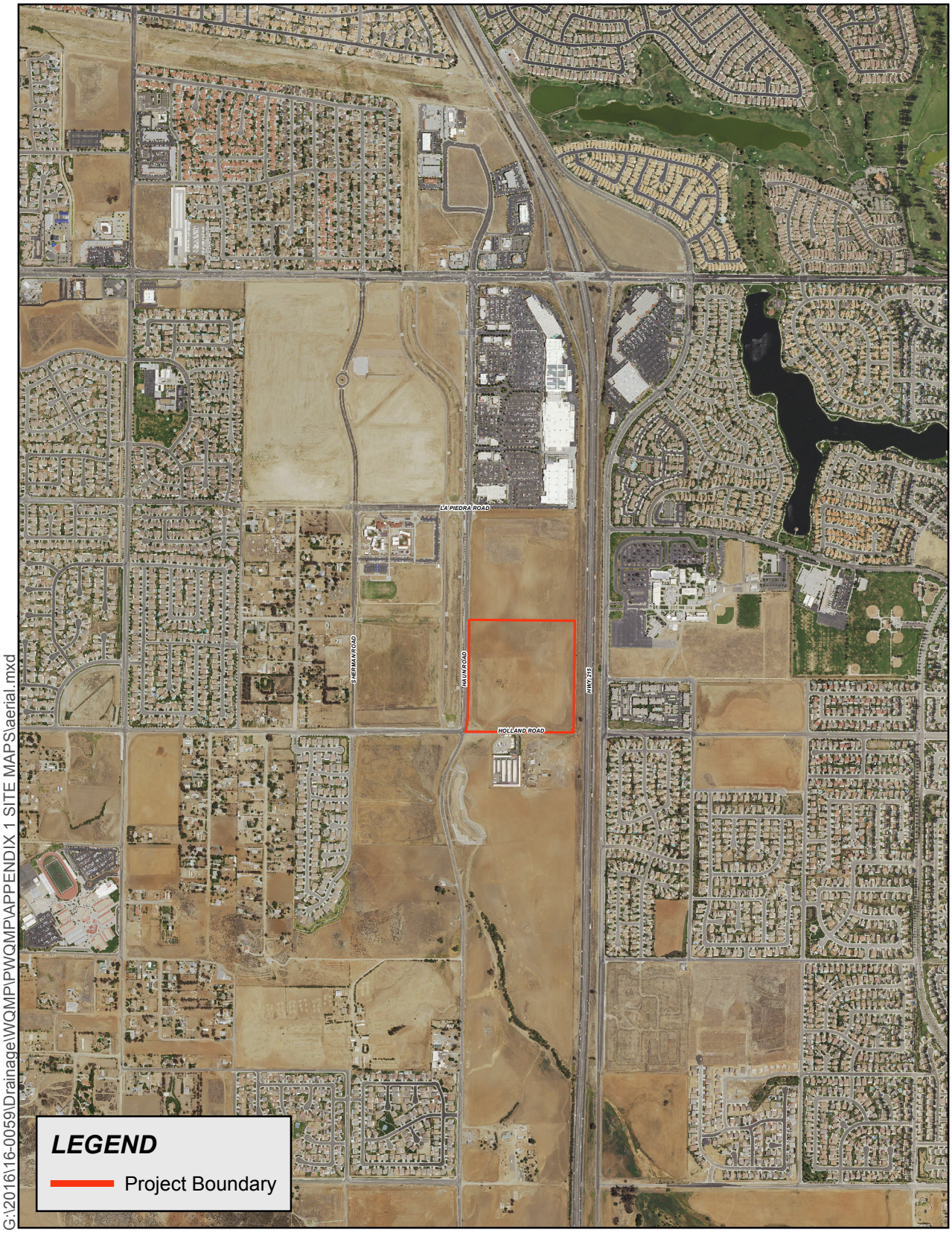


G:\2016\16-0059\Drainage\WQMP\PWQMP\APPENDIX 1 SITE MAPS\usgs.mxd

Sources: ESRI / USGS 7.5min Quad
DRGs: ROMOLAND

Figure 2. USGS Topography Map

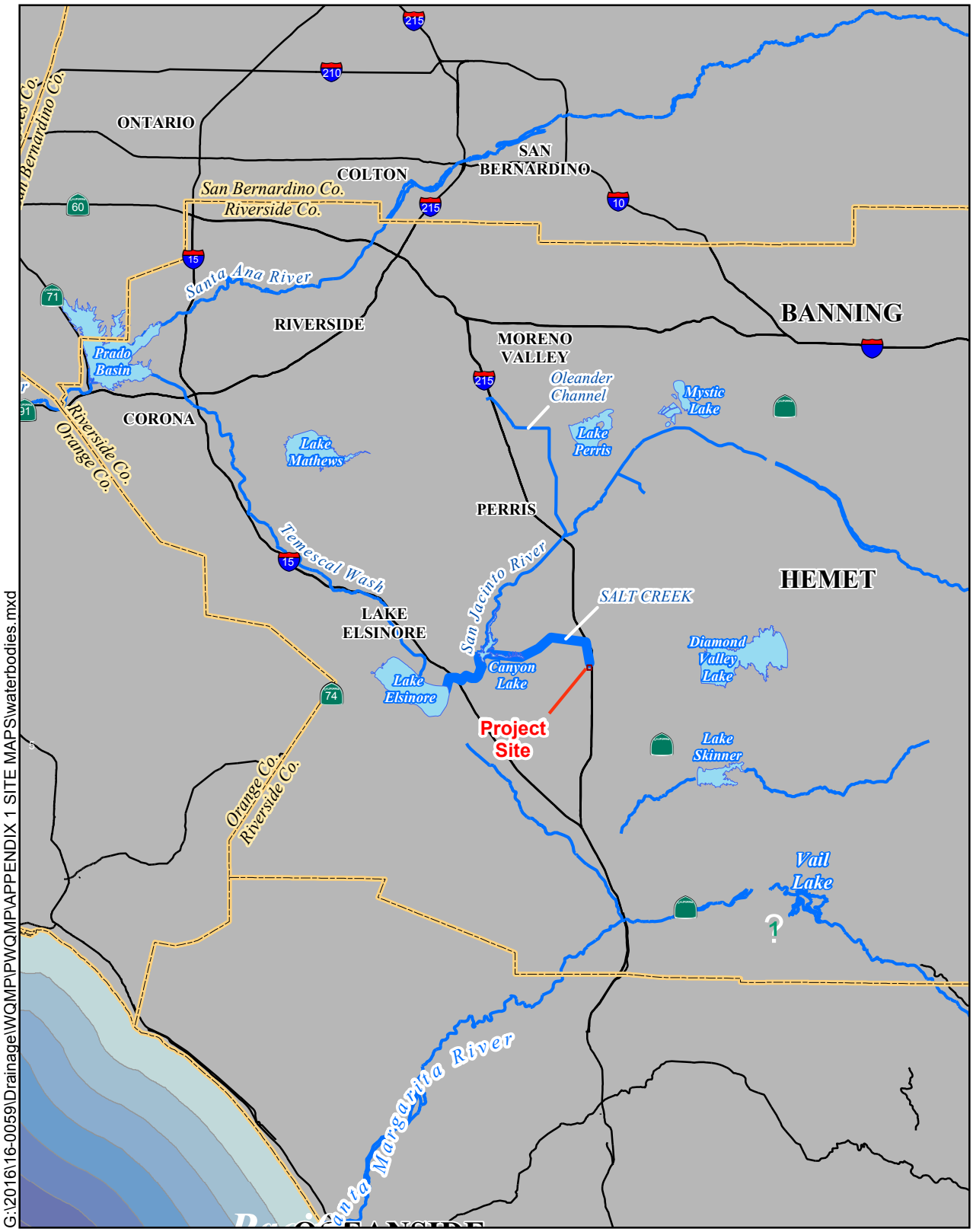
0 1,000 2,000
Feet



Sources: County of Riverside GIS, 2013; Eagle Aerial, April 2012.

Figure 3. Aerial Photograph

0 400 800
Feet



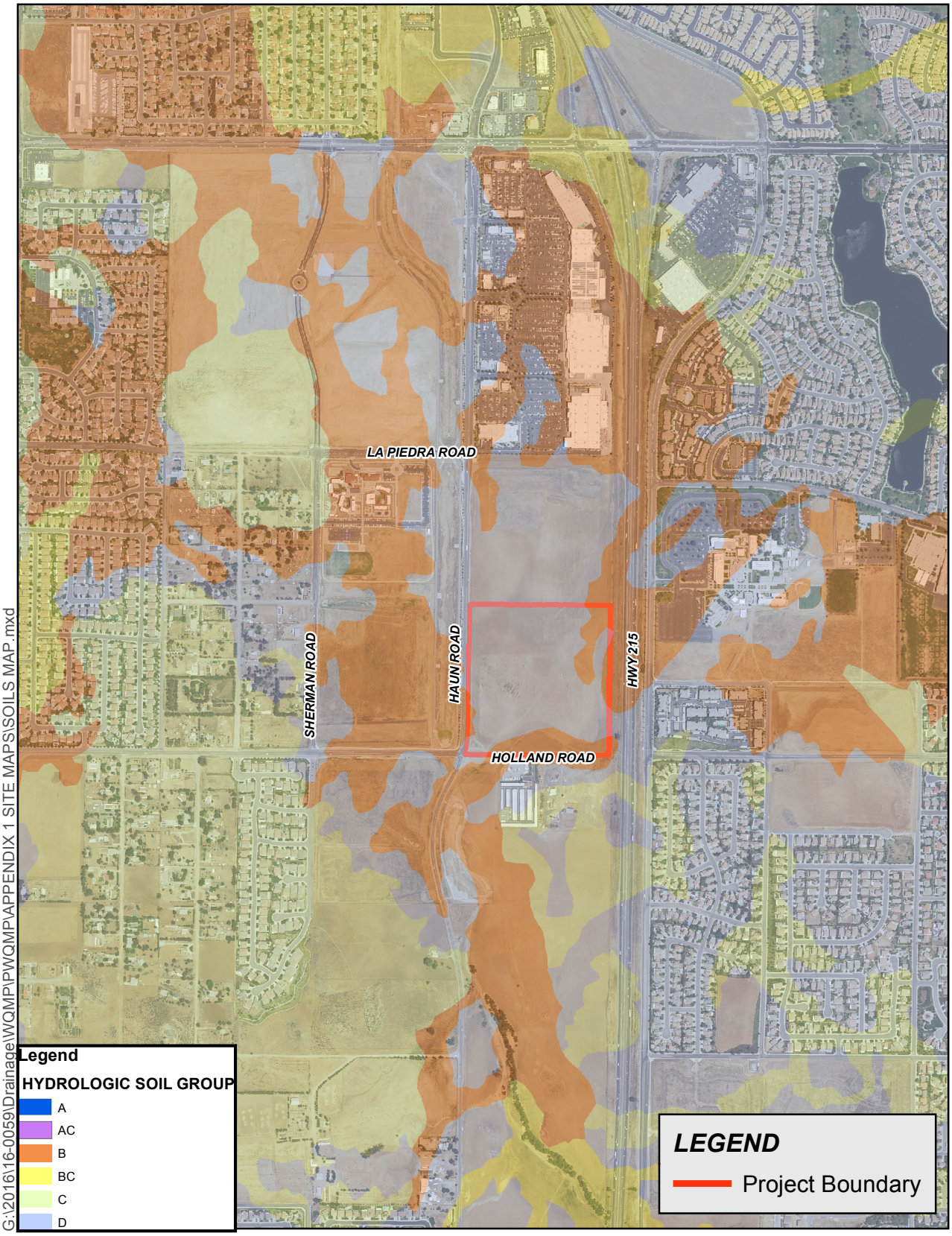
G:\2016\16-0059\Drainage\WQMP\PWQMP\APPENDIX 1 SITE MAPS\waterbodies.mxd

Sources: USGS 30 Meter DEM;
USGS Digital Line Graph

Figure 4. Receiving Waterbodies

0 2 4 6
Miles

Flowpath



G:\2016\16-0059\Drainage\WQMP\PWQMP\APPENDIX 1 SITE MAPS\SOILS MAP.mxd

Eagle Aerial, April 2010;
Riverside County GIS, 2012
RCFC&WCD Hydology Manual Plate C-1.42

N
W E
S

0 500 1,000
Feet

Soils Map

SECTION 2 - HYDROLOGY ANALYSIS

HYDROLOGY PARAMETERS

The RCFC&WCD Hydrology Manual was used to determine several of the hydrological parameters.

Based on the Plate C-1.42 (Romoland) in the RCFC&WCD Hydrology Manual, the project site is classified as mainly soil type D. The Soils Map is included on the following pages.

The value for slope of intensity was determined to be 0.530. The Standard Intensity-Duration Curves Data has been included on the following pages.

The cover type was determined based on the proposed use of the site. The commercial landscaping cover type was used to represent the ultimate, developed condition. The grass natural cover was used to represent the existing and interim conditions. The table below summarizes the runoff index values and recommended values for percentage each category of impervious cover.

Table 1 Cover Type

Cover Type	Soil Group A	Soil Group B	Soil Group C	Soil Group D	Percentage of Impervious Cover
Commercial Landscaping	32	56	69	75	90
Grass, Annual or Perennial	67	78	86	89	0

The Runoff Index and Impervious Cover tables from the RCFC&WCD Hydrology Manual are included on the following pages.

RATIONAL METHOD HYDROLOGY

The rational method was utilized to analyze three different development conditions: existing, interim, and ultimate. This method was used to determine peak flow rates in order to adequately size the proposed subsurface storm drain and associated inlets/outlets. The project site was divided into four subareas, described as follows:

- Area-A represents the on-site development of the six proposed parcels. In the interim condition, this area will remain undeveloped, but graded to drain to storm drain inlets. In the ultimate condition, this area will be a commercial development. This area is proposed to drain to the Paloma Wash Channel through a new lateral connection to the channel, proposed Line A.
- Area-B represents the off-site area along the Haun Road frontage that will ultimately drain to the Paloma Wash Lateral Line T connection. Lateral Line T is an existing storm drain lateral located north of our project site. It has been sized to accept the flows from this project frontage.
- Area-C represents the off-site area along the Haun Road frontage that will ultimately drain to the Paloma Wash Lateral Line P connection. Lateral Line P will be extended as part of this project to account for the widening of Haun Road.
- Area-D represents the flows that will drain to the existing Caltrans drainage ditch to the east of the site. The size of this area changes between the existing condition and the interim and developed conditions. The development of this site proposes a new connection to the Paloma Wash Channel to discharge on-site flows through Line A.

The following tables summarize the rational method results at key points for each of the three different development conditions:

EXISTING CONDITION

The existing development condition, see Table 2 below, includes Areas B, C, and D in the natural, undeveloped state. In the existing condition, Area-D encompasses the majority of the site.

Table 2 Rational Method Results, Existing Development Condition

Point of Interest	10-Year Peak Flow Rate (CFS)	100-Year Peak Flow Rate (CFS)
Node 202 Runoff generated from the north portion of Haun Rd – Basin B	0.71	1.1
Node 302 Runoff generated from the south portion of Haun Rd. - Connection point to Lateral Line P of Paloma Wash Channel	6.7	10.4
Node 402 Runoff generated from the southern portion of the site that is to remain undeveloped, draining to the Caltrans drainage ditch	6.3	10.0
Node 405 Runoff generated from the entirety of the site, which represents the existing flows to the Caltrans drainage ditch	30.7	48.1

INTERIM CONDITION

The interim development, see Table 3 below, includes Areas A, B, C, and D in the interim grading condition. This represents the grading proposed with this Tentative Parcel Map. Area A will consist of natural landscape cover, while the site is graded to drain to several low spots throughout the site. These low spots connect to the proposed connection to the Paloma Wash Channel, Line A.

Table 3 Rational Method Results, Interim Development Condition

Point of Interest	10-Year Peak Flow Rate (CFS)	100-Year Peak Flow Rate (CFS)
Node 137 Runoff generated from the entirety of the on-site development of the project site	40.0	62.0
Node 202 Runoff generated from the north portion of Haun Rd – Basin B	1.9	2.8
Node 302 Runoff generated from the south portion of Haun Rd. - Connection point to Line P of Paloma Channel	2.4	3.6
Node 402 Runoff generated from the southern portion of the site that is to remain undeveloped, draining to the Caltrans drainage ditch	5.5	8.8

ULTIMATE CONDITION

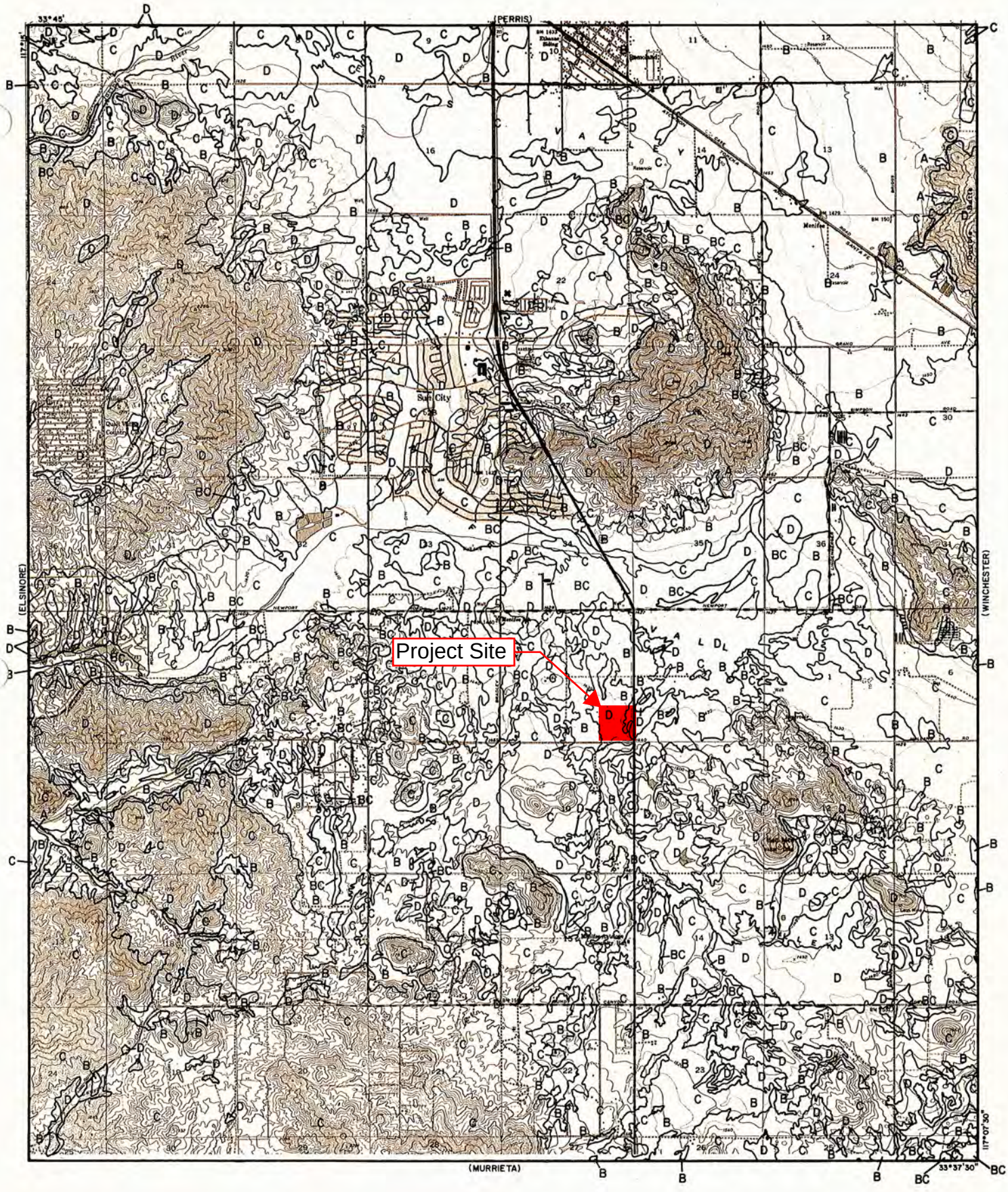
The ultimate development, see Table 4 below, includes Areas A, B, C, and D in the ultimate developed condition. Calculations were run with the grading elevations per this Tentative Parcel Map, but with Area-A utilizing the commercial landscape cover and impervious cover percentage. Areas B, C, and D remain unchanged from the interim development condition. The ultimate condition was analyzed to size the storm drain stub-outs for each parcel appropriate to anticipated flows. These storm drain stub-outs will connect to the proposed connection to the Paloma Wash Channel, Line A.

Table 4 Rational Method Results, Ultimate Development Condition

Point of Interest	10-Year Peak Flow Rate (CFS)	100-Year Peak Flow Rate (CFS)
Node 137 Runoff generated from the entirety of the on-site development of the project site	57.6	86.9
Node 202 Runoff generated from the north portion of Haun Rd – Basin B	1.9	2.8
Node 302 Runoff generated from the south portion of Haun Rd. - Connection point to Line P of Paloma Channel	2.4	3.6
Node 402 Runoff generated from the southern portion of the site that is to remain undeveloped, draining to the Caltrans drainage ditch	5.5	8.8

The rational method output files and hydrology map have been included at the end of this section.

SOILS MAP



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC & WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR ROMOLAND

PLATE C-1.42

STANDARD INTENSITY-DURATION CURVES DATA

RAINFALL INTENSITY–INCHES PER HOUR

RIVERSIDE			RIVERSIDE (FOOTHILL AREAS)			RUBIDOUX			SAN JACINTO			SUN CITY		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 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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HYDROLOGY MANUAL

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1(5 of 6)

RUNOFF INDEX

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

PLATE D-5.5 (1 of 2)

IMPERVIOUS COVER

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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HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE D-5.6

10-YEAR HYDROLOGY (RATIONAL METHOD, EXISTING DEVELOPMENT CONDITION)

EXAREAB10

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 09/22/18 File:EXAREAB10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:EXAREAB10.OUT

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

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

Program License Serial Number 4010

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 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 610.000(Ft.)
Top (of initial area) elevation = 1438.300(Ft.)
Bottom (of initial area) elevation = 1435.200(Ft.)
Difference in elevation = 3.100(Ft.)
Slope = 0.00508 s(percent)= 0.51
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 19.824 min.
Rainfall intensity = 1.565(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.814
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

EXAREAB10
Initial subarea runoff = 0.713(CFS)
Total initial stream area = 0.560(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 0.56 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 89.0

EXAREAC10

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 09/22/18 File:EXAREAC10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:EXAREAC10.OUT

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

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

Program License Serial Number 4010

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 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 510.000(Ft.)
Top (of initial area) elevation = 1443.500(Ft.)
Bottom (of initial area) elevation = 1437.100(Ft.)
Difference in elevation = 6.400(Ft.)
Slope = 0.01255 s(percent)= 1.25
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.402 min.
Rainfall intensity = 1.789(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.415
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.585
RI index for soil(AMC 2) = 84.44
Pervious area fraction = 1.000; Impervious fraction = 0.000

EXAREAC10
Initial subarea runoff = 6.680(CFS)
Total initial stream area = 4.720(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 4.72 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 84.4

EXAREAD10

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:EXAREAD10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:EXAREAD10.OUT

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

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

Program License Serial Number 4010

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 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1432.900(Ft.)
Difference in elevation = 8.200(Ft.)
Slope = 0.00820 s(percent)= 0.82
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 21.954 min.
Rainfall intensity = 1.482(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.748
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.670
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.330
RI index for soil(AMC 2) = 81.63
Pervious area fraction = 1.000; Impervious fraction = 0.000

Initial subarea runoff = 6.291(CFS)
Total initial stream area = 5.670(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 402.000 to Point/Station 403.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1432.900(Ft.)
End of natural channel elevation = 1431.300(Ft.)
Length of natural channel = 910.000(Ft.)
Estimated mean flow rate at midpoint of channel = 6.291(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 0.93(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0018
Corrected/adjusted channel slope = 0.0018
Travel time = 16.23 min. TC = 38.19 min.

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.672
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.105(In/Hr) for a 10.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 6.291(CFS) Total area = 5.670(Ac.)

++
Process from Point/Station 402.000 to Point/Station 403.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 5.670(Ac.)
Runoff from this stream = 6.291(CFS)
Time of concentration = 38.19 min.
Rainfall intensity = 1.105(In/Hr)

++
Process from Point/Station 404.000 to Point/Station 403.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 840.000(Ft.)
Top (of initial area) elevation = 1441.700(Ft.)
Bottom (of initial area) elevation = 1431.300(Ft.)
Difference in elevation = 10.400(Ft.)
Slope = 0.01238 s(percent)= 1.24
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 18.855 min.
Rainfall intensity = 1.607(In/Hr) for a 10.0 year storm

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.280
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.720
RI index for soil(AMC 2) = 85.92
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 3.921(CFS)
Total initial stream area = 3.080(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 404.000 to Point/Station 403.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 3.080(Ac.)
Runoff from this stream = 3.921(CFS)
Time of concentration = 18.86 min.
Rainfall intensity = 1.607(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.291	38.19	1.105
2	3.921	18.86	1.607

Largest stream flow has longer time of concentration
Qp = 6.291 + sum of
Qb Ia/Ib
3.921 * 0.688 = 2.697
Qp = 8.988

Total of 2 streams to confluence:
Flow rates before confluence point:
6.291 3.921
Area of streams before confluence:
5.670 3.080
Results of confluence:
Total flow rate = 8.988(CFS)
Time of concentration = 38.186 min.
Effective stream area after confluence = 8.750(Ac.)

++
Process from Point/Station 403.000 to Point/Station 405.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1431.300(Ft.)
End of natural channel elevation = 1431.100(Ft.)
Length of natural channel = 590.000(Ft.)
Estimated mean flow rate at midpoint of channel = 8.988(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 0.45(Ft/s)

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

```
        Normal channel slope =  0.0003
Corrected/adjusted channel slope =  0.0003
Travel time =   21.95 min.     TC =   60.14  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.628
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      0.869(In/Hr) for a    10.0 year storm
Subarea runoff =      0.000(CFS) for      0.000(Ac.)
Total runoff =      8.988(CFS)  Total area =       8.750(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      405.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.750(Ac.)
Runoff from this stream =      8.988(CFS)
Time of concentration =   60.14 min.
Rainfall intensity =     0.869(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      406.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   750.000(Ft.)
Top (of initial area) elevation =  1441.700(Ft.)
Bottom (of initial area) elevation =  1435.300(Ft.)
Difference in elevation =     6.400(Ft.)
Slope =    0.00853  s(percent)=       0.85
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.412 min.
Rainfall intensity =      1.582(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.080
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.920
RI index for soil(AMC 2)  =  88.12
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     12.634(CFS)
Total initial stream area =        9.880(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      9.880(Ac.)
```

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Runoff from this stream =     12.634(CFS)
Time of concentration =   19.41 min.
Rainfall intensity =     1.582(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      407.000 to Point/Station      406.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =  1439.000(Ft.)
Bottom (of initial area) elevation =  1435.300(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00463  s(percent)=       0.46
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   22.516 min.
Rainfall intensity =      1.463(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.809
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 =     10.908(CFS)
Total initial stream area =        9.220(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      407.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      9.220(Ac.)
Runoff from this stream =     10.908(CFS)
Time of concentration =   22.52 min.
Rainfall intensity =     1.463(In/Hr)
Summary of stream data:

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


1       12.634     19.41                  1.582
2       10.908     22.52                  1.463
Largest stream flow has longer or shorter time of concentration
Qp =     12.634 + sum of
          Qa          Tb/Ta
          10.908 *    0.862 =      9.404
Qp =     22.038

Total of 2 streams to confluence:
Flow rates before confluence point:
      12.634      10.908
Area of streams before confluence:
        9.880        9.220
Results of confluence:
Total flow rate =     22.038(CFS)
Time of concentration =    19.412 min.
Effective stream area after confluence =     19.100(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      405.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1435.300(Ft.)
End of natural channel elevation =   1431.100(Ft.)
Length of natural channel  =   590.000(Ft.)
Estimated mean flow rate at midpoint of channel =     24.760(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   2.68(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0071
Corrected/adjusted channel slope =  0.0071
Travel time =    3.67 min.     TC =   23.08  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.763
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.520
RI index for soil(AMC 2)  =  83.72
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.443(In/Hr) for a    10.0 year storm
Subarea runoff =      5.198(CFS) for      4.720(Ac.)
Total runoff =     27.236(CFS)  Total area =      23.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      405.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     23.820(Ac.)
Runoff from this stream =     27.236(CFS)
Time of concentration =   23.08 min.
Rainfall intensity =     1.443(In/Hr)
Summary of stream data:

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


1        8.988     60.14                  0.869
2       27.236     23.08                  1.443
Largest stream flow has longer or shorter time of concentration
Qp =     27.236 + sum of
          Qa          Tb/Ta
           8.988 *    0.384 =      3.450
Qp =     30.686

Total of 2 main streams to confluence:
Flow rates before confluence point:
       8.988      27.236
```

Area of streams before confluence:
8.750 23.820

Results of confluence:
Total flow rate = 30.686(CFS)
Time of concentration = 23.082 min.
Effective stream area after confluence = 32.570(Ac.)
End of computations, total study area = 32.57 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 86.4

100-YEAR HYDROLOGY (RATIONAL METHOD, EXISTING DEVELOPMENT CONDITION)

EXAREAB100

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 09/22/18 File:EXAREAB100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:EXAREAB100.OUT

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

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

Program License Serial Number 4010

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 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 610.000(Ft.)
Top (of initial area) elevation = 1438.300(Ft.)
Bottom (of initial area) elevation = 1435.200(Ft.)
Difference in elevation = 3.100(Ft.)
Slope = 0.00508 s(percent)= 0.51
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 19.824 min.
Rainfall intensity = 2.338(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.841
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

EXAREAB100
Initial subarea runoff = 1.101(CFS)
Total initial stream area = 0.560(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 0.56 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 89.0

EXAREAC100

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 09/22/18 File:EXAREAC100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:EXAREAC100.OUT

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

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

Program License Serial Number 4010

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 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 510.000(Ft.)
Top (of initial area) elevation = 1443.500(Ft.)
Bottom (of initial area) elevation = 1437.100(Ft.)
Difference in elevation = 6.400(Ft.)
Slope = 0.01255 s(percent)= 1.25
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.402 min.
Rainfall intensity = 2.673(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.824
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.415
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.585
RI index for soil(AMC 2) = 84.44
Pervious area fraction = 1.000; Impervious fraction = 0.000

EXAREAC100
Initial subarea runoff = 10.397(CFS)
Total initial stream area = 4.720(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 4.72 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 84.4

EXAREAD100

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:EXAREAD100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:EXAREAD100.OUT

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

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

Program License Serial Number 4010

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 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1432.900(Ft.)
Difference in elevation = 8.200(Ft.)
Slope = 0.00820 s(percent)= 0.82
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 21.954 min.
Rainfall intensity = 2.215(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.793
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.670
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.330
RI index for soil(AMC 2) = 81.63
Pervious area fraction = 1.000; Impervious fraction = 0.000

Initial subarea runoff = 9.954(CFS)
Total initial stream area = 5.670(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 402.000 to Point/Station 403.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1432.900(Ft.)
End of natural channel elevation = 1431.300(Ft.)
Length of natural channel = 910.000(Ft.)
Estimated mean flow rate at midpoint of channel = 9.954(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 1.05(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0018
Corrected/adjusted channel slope = 0.0018
Travel time = 14.49 min. TC = 36.44 min.

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.736
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.693(In/Hr) for a 100.0 year storm
Subarea runoff = 0.000(CFS) for 0.000(Ac.)
Total runoff = 9.954(CFS) Total area = 5.670(Ac.)

++
Process from Point/Station 402.000 to Point/Station 403.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 5.670(Ac.)
Runoff from this stream = 9.954(CFS)
Time of concentration = 36.44 min.
Rainfall intensity = 1.693(In/Hr)

++
Process from Point/Station 404.000 to Point/Station 403.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 840.000(Ft.)
Top (of initial area) elevation = 1441.700(Ft.)
Bottom (of initial area) elevation = 1431.300(Ft.)
Difference in elevation = 10.400(Ft.)
Slope = 0.01238 s(percent)= 1.24
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 18.855 min.
Rainfall intensity = 2.401(In/Hr) for a 100.0 year storm

```
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.825
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.280
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.720
RI index for soil(AMC 2)  =  85.92
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.100(CFS)
Total initial stream area =        3.080(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      403.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.080(Ac.)
Runoff from this stream =      6.100(CFS)
Time of concentration =   18.86 min.
Rainfall intensity =     2.401(In/Hr)
Summary of stream data:

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


1        9.954     36.44                  1.693
2        6.100     18.86                  2.401
Largest stream flow has longer time of concentration
Qp =      9.954 + sum of
          Qb         Ia/Ib
           6.100 *    0.705 =      4.302
Qp =     14.256

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.954       6.100
Area of streams before confluence:
        5.670        3.080
Results of confluence:
Total flow rate =     14.256(CFS)
Time of concentration =    36.443 min.
Effective stream area after confluence =      8.750(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      405.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1431.300(Ft.)
End of natural channel elevation =   1431.100(Ft.)
Length of natural channel  =   590.000(Ft.)
Estimated mean flow rate at midpoint of channel =     14.256(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   0.50(Ft/s)

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

```
        Normal channel slope =  0.0003
Corrected/adjusted channel slope =  0.0003
Travel time =   19.50 min.     TC =   55.95  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.704
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.349(In/Hr) for a   100.0 year storm
Subarea runoff =      0.000(CFS) for      0.000(Ac.)
Total runoff =     14.256(CFS)  Total area =       8.750(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      405.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.750(Ac.)
Runoff from this stream =     14.256(CFS)
Time of concentration =   55.95 min.
Rainfall intensity =     1.349(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      406.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   750.000(Ft.)
Top (of initial area) elevation =  1441.700(Ft.)
Bottom (of initial area) elevation =  1435.300(Ft.)
Difference in elevation =     6.400(Ft.)
Slope =    0.00853  s(percent)=       0.85
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.412 min.
Rainfall intensity =      2.364(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.836
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.080
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.920
RI index for soil(AMC 2)  =  88.12
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     19.537(CFS)
Total initial stream area =        9.880(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      9.880(Ac.)
```

Runoff from this stream = 19.537(CFS)
Time of concentration = 19.41 min.
Rainfall intensity = 2.364(In/Hr)

++
Process from Point/Station 407.000 to Point/Station 406.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 800.000(Ft.)
Top (of initial area) elevation = 1439.000(Ft.)
Bottom (of initial area) elevation = 1435.300(Ft.)
Difference in elevation = 3.700(Ft.)
Slope = 0.00463 s(percent)= 0.46
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 22.516 min.
Rainfall intensity = 2.185(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.837
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 = 16.863(CFS)
Total initial stream area = 9.220(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 407.000 to Point/Station 406.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 9.220(Ac.)
Runoff from this stream = 16.863(CFS)
Time of concentration = 22.52 min.
Rainfall intensity = 2.185(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	19.537	19.41	2.364
2	16.863	22.52	2.185

Largest stream flow has longer or shorter time of concentration
Qp = 19.537 + sum of
Qa Tb/Ta
16.863 * 0.862 = 14.539
Qp = 34.076

Total of 2 streams to confluence:
Flow rates before confluence point:
19.537 16.863
Area of streams before confluence:
9.880 9.220
Results of confluence:
Total flow rate = 34.076(CFS)
Time of concentration = 19.412 min.
Effective stream area after confluence = 19.100(Ac.)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      405.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1435.300(Ft.)
End of natural channel elevation =   1431.100(Ft.)
Length of natural channel  =   590.000(Ft.)
Estimated mean flow rate at midpoint of channel =     38.286(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   3.03(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0071
Corrected/adjusted channel slope =  0.0071
Travel time =    3.25 min.     TC =   22.66  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.520
RI index for soil(AMC 2)  =  83.72
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.178(In/Hr) for a   100.0 year storm
Subarea runoff =      8.268(CFS) for      4.720(Ac.)
Total runoff =     42.344(CFS)  Total area =      23.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      405.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     23.820(Ac.)
Runoff from this stream =     42.344(CFS)
Time of concentration =   22.66 min.
Rainfall intensity =     2.178(In/Hr)
Summary of stream data:

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


1       14.256     55.95                 1.349
2       42.344     22.66                 2.178
Largest stream flow has longer or shorter time of concentration
Qp =     42.344 + sum of
          Qa          Tb/Ta
          14.256 *    0.405 =      5.775
Qp =     48.119

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.256      42.344
```

EXAREAD100
Area of streams before confluence:
8.750 23.820

Results of confluence:
Total flow rate = 48.119(CFS)
Time of concentration = 22.662 min.
Effective stream area after confluence = 32.570(Ac.)
End of computations, total study area = 32.57 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 86.4

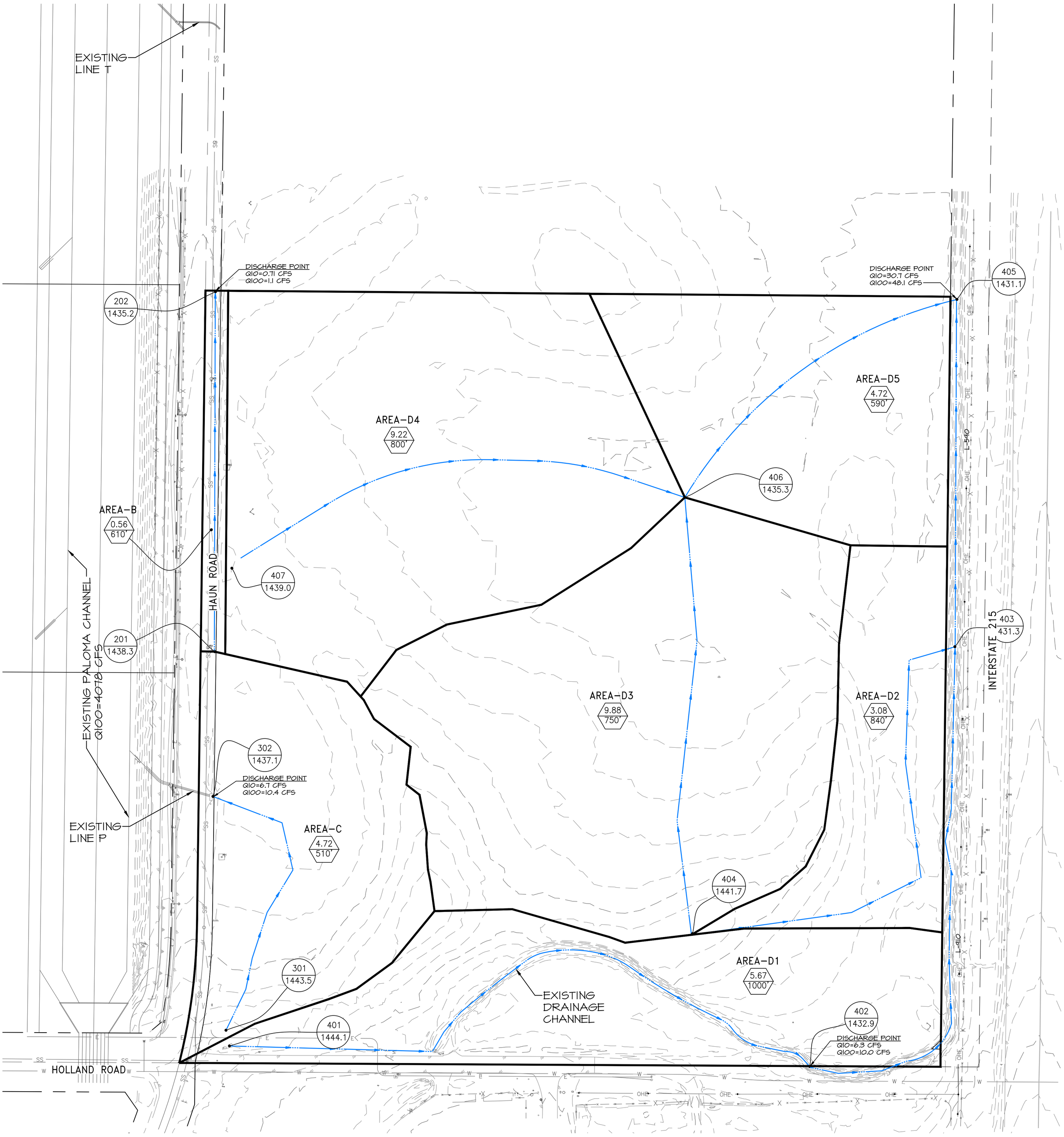
RATIONAL METHOD HYDROLOGY MAP, EXISTING DEVELOPMENT CONDITION

RATIONAL METHOD HYDROLOGY MAP

EXISTING CONDITION

TPM 37121, JPN CORPORATION

CITY OF MENIFEE



LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- FLOW DIRECTION
- LANDSCAPING
- 101 / 14xx — NODE DESIGNATION, NODE ELEVATION
- 5.0 / 1000' — WATERSHED AREA (ACRES), LONGEST WATER PATH (FT)

N W E S WEBB

1" = 80'

40 0 80 160 240

ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256

W.O.16-0059

SHEET

OF SHEETS

G:\2016\16-0059\DRAINAGE\HYD\PRELIMINARY DRAINAGE\AUTOCAD DWGS\16-0059-C-HYD-PRE.DWG 2/14/2020 10:18:20 AM

10-YEAR HYDROLOGY (RATIONAL METHOD, INTERIM DEVELOPMENT CONDITION)

Riverside County Rational Hydrology Program

```
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
        Rational Hydrology Study        Date: 01/18/19  File:AREAA10.out
------------------------------------------------------------------------
16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:AREAA10.OUT
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

------------------------------------------------------------------------


Program License Serial Number 4010

------------------------------------------------------------------------
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      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   530.000(Ft.)
Top (of initial area) elevation =  1439.200(Ft.)
Bottom (of initial area) elevation =  1435.900(Ft.)
Difference in elevation =     3.300(Ft.)
Slope =    0.00623  s(percent)=       0.62
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.994 min.
Rainfall intensity =      1.647(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.796
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.260
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.740
RI index for soil(AMC 2)  =  86.14
Pervious area fraction =  1.000; Impervious fraction =  0.000
```

```
Initial subarea runoff =      4.905(CFS)
Total initial stream area =        3.740(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1432.600(Ft.)
Downstream point/station elevation =  1431.900(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.905(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.905(CFS)
Normal flow depth in pipe =    8.14(In.)
Flow top width inside pipe =   14.94(In.)
Critical Depth =   10.77(In.)
Pipe flow velocity =      7.20(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    18.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.740(Ac.)
Runoff from this stream =      4.905(CFS)
Time of concentration =   18.09 min.
Rainfall intensity =     1.643(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      103.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =  1439.300(Ft.)
Bottom (of initial area) elevation =  1435.900(Ft.)
Difference in elevation =     3.400(Ft.)
Slope =    0.00680  s(percent)=       0.68
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.273 min.
Rainfall intensity =      1.683(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.820
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 =      5.340(CFS)
Total initial stream area =        3.870(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
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```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.870(Ac.)
Runoff from this stream =      5.340(CFS)
Time of concentration =   17.27 min.
Rainfall intensity =     1.683(In/Hr)
Summary of stream data:

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


1        4.905     18.09                  1.643
2        5.340     17.27                  1.683
Largest stream flow has longer or shorter time of concentration
Qp =      5.340 + sum of
          Qa          Tb/Ta
           4.905 *    0.955 =      4.684
Qp =     10.024

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.905       5.340
Area of streams before confluence:
        3.740        3.870
Results of confluence:
Total flow rate =     10.024(CFS)
Time of concentration =    17.273 min.
Effective stream area after confluence =      7.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1431.900(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.024(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    10.024(CFS)
Normal flow depth in pipe =   15.49(In.)
Flow top width inside pipe =   22.96(In.)
Critical Depth =   13.59(In.)
Pipe flow velocity =      4.67(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =    17.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.610(Ac.)
Runoff from this stream =     10.024(CFS)
Time of concentration =   17.99 min.
Rainfall intensity =     1.647(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
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```
Initial area flow distance =   490.000(Ft.)
Top (of initial area) elevation =  1440.600(Ft.)
Bottom (of initial area) elevation =  1436.100(Ft.)
Difference in elevation =     4.500(Ft.)
Slope =    0.00918  s(percent)=       0.92
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.134 min.
Rainfall intensity =      1.745(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.822
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 =      4.004(CFS)
Total initial stream area =        2.790(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1431.900(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.004(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.004(CFS)
Normal flow depth in pipe =    8.54(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =    9.71(In.)
Pipe flow velocity =      5.54(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    16.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.790(Ac.)
Runoff from this stream =      4.004(CFS)
Time of concentration =   16.34 min.
Rainfall intensity =     1.733(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   580.000(Ft.)
Top (of initial area) elevation =  1441.000(Ft.)
Bottom (of initial area) elevation =  1436.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00862  s(percent)=       0.86
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.480 min.
Rainfall intensity =      1.673(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
```

```
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)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.810(CFS)
Total initial stream area =        3.510(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1431.700(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.810(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     4.810(CFS)
Normal flow depth in pipe =   10.55(In.)
Flow top width inside pipe =   17.73(In.)
Critical Depth =   10.11(In.)
Pipe flow velocity =      4.47(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    17.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      3.510(Ac.)
Runoff from this stream =      4.810(CFS)
Time of concentration =   17.85 min.
Rainfall intensity =     1.654(In/Hr)
Summary of stream data:

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


1       10.024     17.99                  1.647
2        4.004     16.34                  1.733
3        4.810     17.85                  1.654
Largest stream flow has longer time of concentration
Qp =     10.024 + sum of
          Qb         Ia/Ib
           4.004 *    0.951 =      3.806
          Qb         Ia/Ib
           4.810 *    0.996 =      4.791
Qp =     18.621

Total of 3 streams to confluence:
Flow rates before confluence point:
      10.024       4.004       4.810
Area of streams before confluence:
        7.610       2.790       3.510
Results of confluence:
Total flow rate =     18.621(CFS)
```

Time of concentration = 17.986 min.
Effective stream area after confluence = 13.910(Ac.)

++
Process from Point/Station 105.000 to Point/Station 110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1431.200(Ft.)
Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 280.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 18.621(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 18.621(CFS)
Normal flow depth in pipe = 21.23(In.)
Flow top width inside pipe = 27.29(In.)
Critical Depth = 17.55(In.)
Pipe flow velocity = 5.01(Ft/s)
Travel time through pipe = 0.93 min.
Time of concentration (TC) = 18.92 min.

++
Process from Point/Station 105.000 to Point/Station 110.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 13.910(Ac.)
Runoff from this stream = 18.621(CFS)
Time of concentration = 18.92 min.
Rainfall intensity = 1.604(In/Hr)

++
Process from Point/Station 111.000 to Point/Station 112.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 560.000(Ft.)
Top (of initial area) elevation = 1441.200(Ft.)
Bottom (of initial area) elevation = 1437.800(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00607 s(percent)= 0.61
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 18.488 min.
Rainfall intensity = 1.624(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.817
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 = 2.733(CFS)
Total initial stream area = 2.060(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 112.000 to Point/Station 110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.800(Ft.)

```
Downstream point/station elevation =  1430.400(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.733(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.733(CFS)
Normal flow depth in pipe =    9.23(In.)
Flow top width inside pipe =   10.11(In.)
Critical Depth =    8.50(In.)
Pipe flow velocity =      4.21(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =    18.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      102.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.060(Ac.)
Runoff from this stream =      2.733(CFS)
Time of concentration =   18.73 min.
Rainfall intensity =     1.613(In/Hr)
Summary of stream data:

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


1       18.621     18.92                  1.604
2        2.733     18.73                  1.613
Largest stream flow has longer time of concentration
Qp =     18.621 + sum of
          Qb          Ia/Ib
           2.733 *    0.995 =      2.718
Qp =     21.339

Total of 2 streams to confluence:
Flow rates before confluence point:
      18.621       2.733
Area of streams before confluence:
       13.910        2.060
Results of confluence:
Total flow rate =     21.339(CFS)
Time of concentration =    18.917 min.
Effective stream area after confluence =     15.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1430.400(Ft.)
Downstream point/station elevation =  1430.200(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.339(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    21.339(CFS)
Normal flow depth in pipe =   23.91(In.)
Flow top width inside pipe =   24.14(In.)
Critical Depth =   18.82(In.)
Pipe flow velocity =      5.09(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    19.15 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      113.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     15.970(Ac.)
Runoff from this stream =     21.339(CFS)
Time of concentration =   19.15 min.
Rainfall intensity =     1.594(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      115.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
Initial area flow distance =   280.000(Ft.)
Top (of initial area) elevation =  1440.300(Ft.)
Bottom (of initial area) elevation =  1438.100(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.00786  s(percent)=       0.79
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.307 min.
Rainfall intensity =      1.933(In/Hr) for a    10.0 year storm
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 = 0.000
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 =      1.058(CFS)
Total initial stream area =        0.660(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1430.600(Ft.)
Downstream point/station elevation =  1430.200(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.058(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.058(CFS)
Normal flow depth in pipe =    6.70(In.)
Flow top width inside pipe =    7.85(In.)
Critical Depth =    5.67(In.)
Pipe flow velocity =      3.00(Ft/s)
Travel time through pipe =    0.44 min.
Time of concentration (TC) =    13.75 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      113.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.660(Ac.)
Runoff from this stream =      1.058(CFS)
```

Time of concentration = 13.75 min.
Rainfall intensity = 1.899(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	21.339	19.15	1.594
2	1.058	13.75	1.899

Largest stream flow has longer time of concentration
Qp = 21.339 + sum of
 Qb Ia/Ib
 1.058 * 0.839 = 0.888
Qp = 22.227

Total of 2 streams to confluence:
Flow rates before confluence point:
 21.339 1.058
Area of streams before confluence:
 15.970 0.660
Results of confluence:
Total flow rate = 22.227(CFS)
Time of concentration = 19.146 min.
Effective stream area after confluence = 16.630(Ac.)

++
Process from Point/Station 113.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.200(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 300.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 22.227(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 22.227(CFS)
Normal flow depth in pipe = 23.06(In.)
Flow top width inside pipe = 25.30(In.)
Critical Depth = 19.24(In.)
Pipe flow velocity = 5.48(Ft/s)
Travel time through pipe = 0.91 min.
Time of concentration (TC) = 20.06 min.

++
Process from Point/Station 113.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 16.630(Ac.)
Runoff from this stream = 22.227(CFS)
Time of concentration = 20.06 min.
Rainfall intensity = 1.555(In/Hr)

++
Process from Point/Station 114.000 to Point/Station 117.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 360.000(Ft.)
Top (of initial area) elevation = 1440.300(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)

Difference in elevation = 3.100(Ft.)
Slope = 0.00861 s(percent)= 0.86
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.447 min.
Rainfall intensity = 1.850(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.826
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 = 3.119(CFS)
Total initial stream area = 2.040(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 117.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____
Upstream point/station elevation = 1429.600(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 90.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.119(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 3.119(CFS)
Normal flow depth in pipe = 9.47(In.)
Flow top width inside pipe = 14.47(In.)
Critical Depth = 8.53(In.)
Pipe flow velocity = 3.82(Ft/s)
Travel time through pipe = 0.39 min.
Time of concentration (TC) = 14.84 min.

++
Process from Point/Station 117.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****
____
Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.040(Ac.)
Runoff from this stream = 3.119(CFS)
Time of concentration = 14.84 min.
Rainfall intensity = 1.824(In/Hr)

++
Process from Point/Station 118.000 to Point/Station 119.000
**** INITIAL AREA EVALUATION ****
____
Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1443.500(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 6.300(Ft.)
Slope = 0.01050 s(percent)= 1.05
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.033 min.
Rainfall intensity = 1.696(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.817
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.040

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.960
RI index for soil(AMC 2)  =  88.56
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.362(CFS)
Total initial stream area =        3.870(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      119.000 to Point/Station      116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1429.600(Ft.)
Downstream point/station elevation =  1429.200(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.362(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.362(CFS)
Normal flow depth in pipe =   11.33(In.)
Flow top width inside pipe =   17.39(In.)
Critical Depth =   10.70(In.)
Pipe flow velocity =      4.58(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    17.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      119.000 to Point/Station      116.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      3.870(Ac.)
Runoff from this stream =      5.362(CFS)
Time of concentration =   17.32 min.
Rainfall intensity =     1.681(In/Hr)
Summary of stream data:

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


1       22.227     20.06                 1.555
2        3.119     14.84                 1.824
3        5.362     17.32                 1.681
Largest stream flow has longer time of concentration
Qp =     22.227 + sum of
          Qb         Ia/Ib
           3.119 *    0.852 =      2.659
          Qb         Ia/Ib
           5.362 *    0.925 =      4.961
Qp =     29.847

Total of 3 streams to confluence:
Flow rates before confluence point:
      22.227       3.119       5.362
Area of streams before confluence:
       16.630        2.040        3.870
Results of confluence:
Total flow rate =     29.847(CFS)
Time of concentration =    20.058 min.
Effective stream area after confluence =     22.540(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1429.200(Ft.)
Downstream point/station elevation =  1427.700(Ft.)
Pipe length  =   510.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.847(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    29.847(CFS)
Normal flow depth in pipe =   28.41(In.)
Flow top width inside pipe =   22.85(In.)
Critical Depth =   21.79(In.)
Pipe flow velocity =      5.48(Ft/s)
Travel time through pipe =    1.55 min.
Time of concentration (TC) =    21.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      120.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     22.540(Ac.)
Runoff from this stream =     29.847(CFS)
Time of concentration =   21.61 min.
Rainfall intensity =     1.495(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      131.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
Initial area flow distance =   470.000(Ft.)
Top (of initial area) elevation =  1438.700(Ft.)
Bottom (of initial area) elevation =  1435.000(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00787  s(percent)=       0.79
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.364 min.
Rainfall intensity =      1.732(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.420
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.580
RI index for soil(AMC 2)  =  84.38
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.175(CFS)
Total initial stream area =        3.060(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      131.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1431.900(Ft.)
Downstream point/station elevation =  1430.400(Ft.)
```

Pipe length = 500.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.175(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.175(CFS)
Normal flow depth in pipe = 11.37(In.)
Flow top width inside pipe = 17.37(In.)
Critical Depth = 9.39(In.)
Pipe flow velocity = 3.55(Ft/s)
Travel time through pipe = 2.35 min.
Time of concentration (TC) = 18.71 min.

++
Process from Point/Station 131.000 to Point/Station 132.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.060(Ac.)
Runoff from this stream = 4.175(CFS)
Time of concentration = 18.71 min.
Rainfall intensity = 1.613(In/Hr)

++
Process from Point/Station 133.000 to Point/Station 134.000
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 480.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1436.000(Ft.)
Difference in elevation = 5.100(Ft.)
Slope = 0.01062 s(percent)= 1.06
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.542 min.
Rainfall intensity = 1.780(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
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) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 4.663(CFS)
Total initial stream area = 3.180(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 134.000 to Point/Station 132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 1430.700(Ft.)
Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.663(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.663(CFS)
Normal flow depth in pipe = 10.34(In.)
Flow top width inside pipe = 17.80(In.)
Critical Depth = 9.94(In.)
Pipe flow velocity = 4.44(Ft/s)
Travel time through pipe = 0.23 min.

Time of concentration (TC) = 15.77 min.

++
Process from Point/Station 134.000 to Point/Station 132.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 3.180(Ac.)
Runoff from this stream = 4.663(CFS)
Time of concentration = 15.77 min.
Rainfall intensity = 1.767(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.175	18.71	1.613
2	4.663	15.77	1.767

Largest stream flow has longer or shorter time of concentration
Qp = 4.663 + sum of
  Qa Tb/Ta
  4.175 * 0.843 = 3.518
Qp = 8.181

Total of 2 streams to confluence:
Flow rates before confluence point:
  4.175 4.663
Area of streams before confluence:
  3.060 3.180
Results of confluence:
Total flow rate = 8.181(CFS)
Time of concentration = 15.767 min.
Effective stream area after confluence = 6.240(Ac.)

++
Process from Point/Station 132.000 to Point/Station 135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.400(Ft.)
Downstream point/station elevation = 1428.500(Ft.)
Pipe length = 650.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.181(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 8.181(CFS)
Normal flow depth in pipe = 16.41(In.)
Flow top width inside pipe = 17.36(In.)
Critical Depth = 12.75(In.)
Pipe flow velocity = 4.05(Ft/s)
Travel time through pipe = 2.67 min.
Time of concentration (TC) = 18.44 min.

++
Process from Point/Station 132.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 6.240(Ac.)
Runoff from this stream = 8.181(CFS)
Time of concentration = 18.44 min.

Rainfall intensity = 1.626(In/Hr)

++
Process from Point/Station 133.000 to Point/Station 136.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 340.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1436.700(Ft.)
Difference in elevation = 4.400(Ft.)
Slope = 0.01294 s(percent)= 1.29
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.016 min.
Rainfall intensity = 1.956(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.830
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 = 3.084(CFS)
Total initial stream area = 1.900(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 136.000 to Point/Station 135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1428.500(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.084(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 3.084(CFS)
Normal flow depth in pipe = 9.02(In.)
Flow top width inside pipe = 14.69(In.)
Critical Depth = 8.47(In.)
Pipe flow velocity = 4.00(Ft/s)
Travel time through pipe = 0.25 min.
Time of concentration (TC) = 13.27 min.

++
Process from Point/Station 136.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.900(Ac.)
Runoff from this stream = 3.084(CFS)
Time of concentration = 13.27 min.
Rainfall intensity = 1.936(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.181	18.44	1.626
2	3.084	13.27	1.936

```
Largest stream flow has longer time of concentration
Qp =      8.181 + sum of
          Qb         Ia/Ib
           3.084 *    0.840 =      2.590
Qp =     10.771

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.181       3.084
Area of streams before confluence:
        6.240       1.900
Results of confluence:
Total flow rate =     10.771(CFS)
Time of concentration =    18.439 min.
Effective stream area after confluence =      8.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1428.500(Ft.)
Downstream point/station elevation =  1427.700(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.771(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    10.771(CFS)
Normal flow depth in pipe =   17.39(In.)
Flow top width inside pipe =   21.44(In.)
Critical Depth =   14.12(In.)
Pipe flow velocity =      4.42(Ft/s)
Travel time through pipe =    1.02 min.
Time of concentration (TC) =    19.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      120.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.140(Ac.)
Runoff from this stream =     10.771(CFS)
Time of concentration =   19.46 min.
Rainfall intensity =     1.580(In/Hr)
Summary of stream data:

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


1       29.847     21.61                  1.495
2       10.771     19.46                  1.580
Largest stream flow has longer time of concentration
Qp =     29.847 + sum of
          Qb         Ia/Ib
          10.771 *    0.946 =     10.189
Qp =     40.036

Total of 2 main streams to confluence:
Flow rates before confluence point:
      29.847      10.771
Area of streams before confluence:
```

22.540 8.140

Results of confluence:
Total flow rate = 40.036(CFS)
Time of concentration = 21.608 min.
Effective stream area after confluence = 30.680(Ac.)

++
Process from Point/Station 120.000 to Point/Station 137.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1427.700(Ft.)
Downstream point/station elevation = 1425.100(Ft.)
Pipe length = 170.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 40.036(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 40.036(CFS)
Normal flow depth in pipe = 23.44(In.)
Flow top width inside pipe = 18.28(In.)
Critical Depth = 25.11(In.)
Pipe flow velocity = 10.92(Ft/s)
Travel time through pipe = 0.26 min.
Time of concentration (TC) = 21.87 min.
End of computations, total study area = 30.68 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 88.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:AREAB10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:AREAB10.OUT

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

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

Program License Serial Number 4010

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 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1438.400(Ft.)
Bottom (of initial area) elevation = 1435.000(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00567 s(percent)= 0.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.907 min.
Rainfall intensity = 2.148(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
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 = 0.100; Impervious fraction = 0.900

AREAB10
Initial subarea runoff = 1.862(CFS)
Total initial stream area = 0.980(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 0.98 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 75.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:AREAC10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:AREAC10.OUT

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

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

Program License Serial Number 4010

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 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 380.000(Ft.)
Top (of initial area) elevation = 1441.500(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 4.300(Ft.)
Slope = 0.01132 s(percent)= 1.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.912 min.
Rainfall intensity = 2.546(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.415
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.585
RI index for soil(AMC 2) = 67.11
Pervious area fraction = 0.100; Impervious fraction = 0.900

AREAC10
Initial subarea runoff = 2.402(CFS)
Total initial stream area = 1.070(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 1.07 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 67.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:AREAD10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:AREAD10.OUT

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

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

Program License Serial Number 4010

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 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1432.900(Ft.)
Difference in elevation = 8.200(Ft.)
Slope = 0.00820 s(percent)= 0.82
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 21.954 min.
Rainfall intensity = 1.482(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.740
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.760
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.240
RI index for soil(AMC 2) = 80.64
Pervious area fraction = 1.000; Impervious fraction = 0.000

AREAD10
Initial subarea runoff = 5.530(CFS)
Total initial stream area = 5.040(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 5.04 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 80.6

100-YEAR HYDROLOGY (RATIONAL METHOD, INTERIM DEVELOPMENT CONDITION)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:AREAA100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:AREAA100.OUT

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

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

Program License Serial Number 4010

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 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 530.000(Ft.)
Top (of initial area) elevation = 1439.200(Ft.)
Bottom (of initial area) elevation = 1435.900(Ft.)
Difference in elevation = 3.300(Ft.)
Slope = 0.00623 s(percent)= 0.62
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.994 min.
Rainfall intensity = 2.461(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.260
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.740
RI index for soil(AMC 2) = 86.14
Pervious area fraction = 1.000; Impervious fraction = 0.000

AREAA100
Initial subarea runoff = 7.620(CFS)
Total initial stream area = 3.740(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 102.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1432.600(Ft.)
Downstream point/station elevation = 1431.900(Ft.)
Pipe length = 40.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.620(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 7.620(CFS)
Normal flow depth in pipe = 11.04(In.)
Flow top width inside pipe = 13.22(In.)
Critical Depth = 13.15(In.)
Pipe flow velocity = 7.87(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 18.08 min.

++
Process from Point/Station 102.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 3.740(Ac.)
Runoff from this stream = 7.620(CFS)
Time of concentration = 18.08 min.
Rainfall intensity = 2.455(In/Hr)

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

Initial area flow distance = 500.000(Ft.)
Top (of initial area) elevation = 1439.300(Ft.)
Bottom (of initial area) elevation = 1435.900(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00680 s(percent)= 0.68
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.273 min.
Rainfall intensity = 2.515(In/Hr) for a 100.0 year storm
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 = 0.000
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 = 8.222(CFS)
Total initial stream area = 3.870(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 104.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.870(Ac.)
Runoff from this stream =      8.222(CFS)
Time of concentration =   17.27 min.
Rainfall intensity =     2.515(In/Hr)
Summary of stream data:

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


1        7.620     18.08                  2.455
2        8.222     17.27                  2.515
Largest stream flow has longer or shorter time of concentration
Qp =      8.222 + sum of
           Qa          Tb/Ta
            7.620 *    0.955 =      7.280
Qp =     15.502

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.620       8.222
Area of streams before confluence:
        3.740        3.870
Results of confluence:
Total flow rate =     15.502(CFS)
Time of concentration =    17.273 min.
Effective stream area after confluence =      7.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1431.900(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.502(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    15.502(CFS)
Normal flow depth in pipe =   19.05(In.)
Flow top width inside pipe =   24.61(In.)
Critical Depth =   16.47(In.)
Pipe flow velocity =      5.17(Ft/s)
Travel time through pipe =    0.64 min.
Time of concentration (TC) =    17.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.610(Ac.)
Runoff from this stream =     15.502(CFS)
Time of concentration =   17.92 min.
Rainfall intensity =     2.467(In/Hr)


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

Initial area flow distance = 490.000(Ft.)
Top (of initial area) elevation = 1440.600(Ft.)
Bottom (of initial area) elevation = 1436.100(Ft.)
Difference in elevation = 4.500(Ft.)
Slope = 0.00918 s(percent)= 0.92
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 16.134 min.
Rainfall intensity = 2.608(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.847
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 = 6.159(CFS)
Total initial stream area = 2.790(Ac.)
Pervious area fraction = 1.000

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

Upstream point/station elevation = 1431.900(Ft.)
Downstream point/station elevation = 1431.200(Ft.)
Pipe length = 70.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.159(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 6.159(CFS)
Normal flow depth in pipe = 11.72(In.)
Flow top width inside pipe = 12.40(In.)
Critical Depth = 12.04(In.)
Pipe flow velocity = 5.99(Ft/s)
Travel time through pipe = 0.19 min.
Time of concentration (TC) = 16.33 min.

++
Process from Point/Station 107.000 to Point/Station 105.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.790(Ac.)
Runoff from this stream = 6.159(CFS)
Time of concentration = 16.33 min.
Rainfall intensity = 2.591(In/Hr)

++
Process from Point/Station 108.000 to Point/Station 109.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 580.000(Ft.)
Top (of initial area) elevation = 1441.000(Ft.)
Bottom (of initial area) elevation = 1436.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00862 s(percent)= 0.86
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.480 min.
Rainfall intensity = 2.499(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea

```
Runoff Coefficient = 0.844
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 =      7.407(CFS)
Total initial stream area =        3.510(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1431.700(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.407(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.407(CFS)
Normal flow depth in pipe =   14.72(In.)
Flow top width inside pipe =   13.90(In.)
Critical Depth =   12.64(In.)
Pipe flow velocity =      4.79(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    17.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      3.510(Ac.)
Runoff from this stream =      7.407(CFS)
Time of concentration =   17.83 min.
Rainfall intensity =     2.473(In/Hr)
Summary of stream data:

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


1       15.502     17.92                 2.467
2        6.159     16.33                 2.591
3        7.407     17.83                 2.473
Largest stream flow has longer time of concentration
Qp =     15.502 + sum of
          Qb         Ia/Ib
           6.159 *    0.952 =      5.863
          Qb         Ia/Ib
           7.407 *    0.997 =      7.387
Qp =     28.752

Total of 3 streams to confluence:
Flow rates before confluence point:
      15.502       6.159       7.407
Area of streams before confluence:
        7.610       2.790       3.510
Results of confluence:
Total flow rate =     28.752(CFS)
```

Time of concentration = 17.918 min.
Effective stream area after confluence = 13.910(Ac.)

++
Process from Point/Station 105.000 to Point/Station 110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1431.200(Ft.)
Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 280.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 28.752(CFS)
Nearest computed pipe diameter = 33.00(In.)
Calculated individual pipe flow = 28.752(CFS)
Normal flow depth in pipe = 27.56(In.)
Flow top width inside pipe = 24.48(In.)
Critical Depth = 21.37(In.)
Pipe flow velocity = 5.42(Ft/s)
Travel time through pipe = 0.86 min.
Time of concentration (TC) = 18.78 min.

++
Process from Point/Station 105.000 to Point/Station 110.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 13.910(Ac.)
Runoff from this stream = 28.752(CFS)
Time of concentration = 18.78 min.
Rainfall intensity = 2.406(In/Hr)

++
Process from Point/Station 111.000 to Point/Station 112.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 560.000(Ft.)
Top (of initial area) elevation = 1441.200(Ft.)
Bottom (of initial area) elevation = 1437.800(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00607 s(percent)= 0.61
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 18.488 min.
Rainfall intensity = 2.426(In/Hr) for a 100.0 year storm
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 = 0.000
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 = 4.212(CFS)
Total initial stream area = 2.060(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 112.000 to Point/Station 110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.800(Ft.)

Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.212(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 4.212(CFS)
Normal flow depth in pipe = 10.14(In.)
Flow top width inside pipe = 14.04(In.)
Critical Depth = 9.97(In.)
Pipe flow velocity = 4.77(Ft/s)
Travel time through pipe = 0.21 min.
Time of concentration (TC) = 18.70 min.

++
Process from Point/Station 112.000 to Point/Station 102.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.060(Ac.)
Runoff from this stream = 4.212(CFS)
Time of concentration = 18.70 min.
Rainfall intensity = 2.412(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	28.752	18.78	2.406
2	4.212	18.70	2.412

Largest stream flow has longer time of concentration
Qp = 28.752 + sum of
Qb Ia/Ib
4.212 * 0.998 = 4.202
Qp = 32.954

Total of 2 streams to confluence:
Flow rates before confluence point:
28.752 4.212
Area of streams before confluence:
13.910 2.060
Results of confluence:
Total flow rate = 32.954(CFS)
Time of concentration = 18.778 min.
Effective stream area after confluence = 15.970(Ac.)

++
Process from Point/Station 110.000 to Point/Station 113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 1430.400(Ft.)
Downstream point/station elevation = 1430.200(Ft.)
Pipe length = 70.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 32.954(CFS)
Nearest computed pipe diameter = 36.00(In.)
Calculated individual pipe flow = 32.954(CFS)
Normal flow depth in pipe = 27.33(In.)
Flow top width inside pipe = 30.79(In.)
Critical Depth = 22.36(In.)
Pipe flow velocity = 5.73(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 18.98 min.

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      113.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     15.970(Ac.)
Runoff from this stream =     32.954(CFS)
Time of concentration =   18.98 min.
Rainfall intensity =     2.392(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      115.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
Initial area flow distance =   280.000(Ft.)
Top (of initial area) elevation =  1440.300(Ft.)
Bottom (of initial area) elevation =  1438.100(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.00786  s(percent)=       0.79
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.307 min.
Rainfall intensity =      2.888(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.851
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 =      1.623(CFS)
Total initial stream area =        0.660(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1430.600(Ft.)
Downstream point/station elevation =  1430.200(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.623(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.623(CFS)
Normal flow depth in pipe =    7.01(In.)
Flow top width inside pipe =   11.83(In.)
Critical Depth =    6.50(In.)
Pipe flow velocity =      3.41(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    13.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      113.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.660(Ac.)
Runoff from this stream =      1.623(CFS)
```

Time of concentration = 13.70 min.
Rainfall intensity = 2.844(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	32.954	18.98	2.392
2	1.623	13.70	2.844

Largest stream flow has longer time of concentration
Qp = 32.954 + sum of
 Qb Ia/Ib
 1.623 * 0.841 = 1.365
Qp = 34.319

Total of 2 streams to confluence:
Flow rates before confluence point:
 32.954 1.623
Area of streams before confluence:
 15.970 0.660
Results of confluence:
Total flow rate = 34.319(CFS)
Time of concentration = 18.982 min.
Effective stream area after confluence = 16.630(Ac.)

++
Process from Point/Station 113.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.200(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 300.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 34.319(CFS)
Nearest computed pipe diameter = 36.00(In.)
Calculated individual pipe flow = 34.319(CFS)
Normal flow depth in pipe = 26.48(In.)
Flow top width inside pipe = 31.75(In.)
Critical Depth = 22.84(In.)
Pipe flow velocity = 6.16(Ft/s)
Travel time through pipe = 0.81 min.
Time of concentration (TC) = 19.79 min.

++
Process from Point/Station 113.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 16.630(Ac.)
Runoff from this stream = 34.319(CFS)
Time of concentration = 19.79 min.
Rainfall intensity = 2.340(In/Hr)

++
Process from Point/Station 114.000 to Point/Station 117.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 360.000(Ft.)
Top (of initial area) elevation = 1440.300(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)

Difference in elevation = 3.100(Ft.)
Slope = 0.00861 s(percent)= 0.86
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.447 min.
Rainfall intensity = 2.765(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.849
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 = 4.791(CFS)
Total initial stream area = 2.040(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 117.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____
Upstream point/station elevation = 1429.600(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 90.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.791(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.791(CFS)
Normal flow depth in pipe = 10.93(In.)
Flow top width inside pipe = 17.58(In.)
Critical Depth = 10.08(In.)
Pipe flow velocity = 4.27(Ft/s)
Travel time through pipe = 0.35 min.
Time of concentration (TC) = 14.80 min.

++
Process from Point/Station 117.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****
____
Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.040(Ac.)
Runoff from this stream = 4.791(CFS)
Time of concentration = 14.80 min.
Rainfall intensity = 2.730(In/Hr)

++
Process from Point/Station 118.000 to Point/Station 119.000
**** INITIAL AREA EVALUATION ****
____
Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1443.500(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 6.300(Ft.)
Slope = 0.01050 s(percent)= 1.05
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.033 min.
Rainfall intensity = 2.534(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.843
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.040

AREAA100
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.960
RI index for soil(AMC 2) = 88.56
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 8.264(CFS)
Total initial stream area = 3.870(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 119.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1429.600(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 80.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.264(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 8.264(CFS)
Normal flow depth in pipe = 13.41(In.)
Flow top width inside pipe = 20.18(In.)
Critical Depth = 12.81(In.)
Pipe flow velocity = 5.09(Ft/s)
Travel time through pipe = 0.26 min.
Time of concentration (TC) = 17.30 min.

++
Process from Point/Station 119.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 3.870(Ac.)
Runoff from this stream = 8.264(CFS)
Time of concentration = 17.30 min.
Rainfall intensity = 2.513(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	34.319	19.79	2.340
2	4.791	14.80	2.730
3	8.264	17.30	2.513

Largest stream flow has longer time of concentration
Qp = 34.319 + sum of
Qb Ia/Ib
4.791 * 0.857 = 4.106
Qb Ia/Ib
8.264 * 0.931 = 7.693
Qp = 46.119

Total of 3 streams to confluence:
Flow rates before confluence point:
34.319 4.791 8.264
Area of streams before confluence:
16.630 2.040 3.870
Results of confluence:
Total flow rate = 46.119(CFS)
Time of concentration = 19.794 min.
Effective stream area after confluence = 22.540(Ac.)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1429.200(Ft.)
Downstream point/station elevation =  1427.700(Ft.)
Pipe length  =   510.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    46.119(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    46.119(CFS)
Normal flow depth in pipe =   33.09(In.)
Flow top width inside pipe =   27.96(In.)
Critical Depth =   25.99(In.)
Pipe flow velocity =      6.14(Ft/s)
Travel time through pipe =    1.38 min.
Time of concentration (TC) =    21.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      120.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     22.540(Ac.)
Runoff from this stream =     46.119(CFS)
Time of concentration =   21.18 min.
Rainfall intensity =     2.258(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      131.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
Initial area flow distance =   470.000(Ft.)
Top (of initial area) elevation =  1438.700(Ft.)
Bottom (of initial area) elevation =  1435.000(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00787  s(percent)=       0.79
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.364 min.
Rainfall intensity =      2.588(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.420
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.580
RI index for soil(AMC 2)  =  84.38
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.507(CFS)
Total initial stream area =        3.060(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      131.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1431.900(Ft.)
Downstream point/station elevation =  1430.400(Ft.)
```

Pipe length = 500.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.507(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 6.507(CFS)
Normal flow depth in pipe = 13.57(In.)
Flow top width inside pipe = 20.08(In.)
Critical Depth = 11.30(In.)
Pipe flow velocity = 3.96(Ft/s)
Travel time through pipe = 2.10 min.
Time of concentration (TC) = 18.47 min.

++
Process from Point/Station 131.000 to Point/Station 132.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.060(Ac.)
Runoff from this stream = 6.507(CFS)
Time of concentration = 18.47 min.
Rainfall intensity = 2.427(In/Hr)

++
Process from Point/Station 133.000 to Point/Station 134.000
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 480.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1436.000(Ft.)
Difference in elevation = 5.100(Ft.)
Slope = 0.01062 s(percent)= 1.06
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.542 min.
Rainfall intensity = 2.660(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.847
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 = 7.169(CFS)
Total initial stream area = 3.180(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 134.000 to Point/Station 132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 1430.700(Ft.)
Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.169(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 7.169(CFS)
Normal flow depth in pipe = 14.23(In.)
Flow top width inside pipe = 14.65(In.)
Critical Depth = 12.45(In.)
Pipe flow velocity = 4.79(Ft/s)
Travel time through pipe = 0.21 min.

Time of concentration (TC) = 15.75 min.

++
Process from Point/Station 134.000 to Point/Station 132.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 3.180(Ac.)
Runoff from this stream = 7.169(CFS)
Time of concentration = 15.75 min.
Rainfall intensity = 2.641(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.507	18.47	2.427
2	7.169	15.75	2.641

Largest stream flow has longer or shorter time of concentration
Qp = 7.169 + sum of
Qa Tb/Ta
6.507 * 0.853 = 5.550
Qp = 12.718

Total of 2 streams to confluence:
Flow rates before confluence point:
6.507 7.169
Area of streams before confluence:
3.060 3.180
Results of confluence:
Total flow rate = 12.718(CFS)
Time of concentration = 15.751 min.
Effective stream area after confluence = 6.240(Ac.)

++
Process from Point/Station 132.000 to Point/Station 135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.400(Ft.)
Downstream point/station elevation = 1428.500(Ft.)
Pipe length = 650.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 12.718(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 12.718(CFS)
Normal flow depth in pipe = 20.67(In.)
Flow top width inside pipe = 16.59(In.)
Critical Depth = 15.39(In.)
Pipe flow velocity = 4.42(Ft/s)
Travel time through pipe = 2.45 min.
Time of concentration (TC) = 18.20 min.

++
Process from Point/Station 132.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 6.240(Ac.)
Runoff from this stream = 12.718(CFS)
Time of concentration = 18.20 min.

Rainfall intensity = 2.446(In/Hr)

++
Process from Point/Station 133.000 to Point/Station 136.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 340.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1436.700(Ft.)
Difference in elevation = 4.400(Ft.)
Slope = 0.01294 s(percent)= 1.29
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.016 min.
Rainfall intensity = 2.922(In/Hr) for a 100.0 year storm
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
Initial subarea runoff = 4.730(CFS)
Total initial stream area = 1.900(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 136.000 to Point/Station 135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1428.500(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.730(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.730(CFS)
Normal flow depth in pipe = 10.43(In.)
Flow top width inside pipe = 17.77(In.)
Critical Depth = 10.03(In.)
Pipe flow velocity = 4.45(Ft/s)
Travel time through pipe = 0.22 min.
Time of concentration (TC) = 13.24 min.

++
Process from Point/Station 136.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.900(Ac.)
Runoff from this stream = 4.730(CFS)
Time of concentration = 13.24 min.
Rainfall intensity = 2.896(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	12.718	18.20	2.446
2	4.730	13.24	2.896

```
Largest stream flow has longer time of concentration
Qp =     12.718 + sum of
          Qb         Ia/Ib
           4.730 *    0.845 =      3.996
Qp =     16.714

Total of 2 streams to confluence:
Flow rates before confluence point:
      12.718       4.730
Area of streams before confluence:
        6.240       1.900
Results of confluence:
Total flow rate =     16.714(CFS)
Time of concentration =    18.201 min.
Effective stream area after confluence =      8.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1428.500(Ft.)
Downstream point/station elevation =  1427.700(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.714(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    16.714(CFS)
Normal flow depth in pipe =   21.94(In.)
Flow top width inside pipe =   21.08(In.)
Critical Depth =   17.11(In.)
Pipe flow velocity =      4.83(Ft/s)
Travel time through pipe =    0.93 min.
Time of concentration (TC) =    19.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      120.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.140(Ac.)
Runoff from this stream =     16.714(CFS)
Time of concentration =   19.13 min.
Rainfall intensity =     2.382(In/Hr)
Summary of stream data:

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


1       46.119     21.18                2.258
2       16.714     19.13                2.382
Largest stream flow has longer time of concentration
Qp =     46.119 + sum of
          Qb         Ia/Ib
          16.714 *    0.948 =     15.838
Qp =     61.957

Total of 2 main streams to confluence:
Flow rates before confluence point:
      46.119      16.714
Area of streams before confluence:
```

AREAA100
22.540 8.140

Results of confluence:
Total flow rate = 61.957(CFS)
Time of concentration = 21.178 min.
Effective stream area after confluence = 30.680(Ac.)

++
Process from Point/Station 120.000 to Point/Station 137.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1427.700(Ft.)
Downstream point/station elevation = 1425.100(Ft.)
Pipe length = 170.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 61.957(CFS)
Nearest computed pipe diameter = 33.00(In.)
Calculated individual pipe flow = 61.957(CFS)
Normal flow depth in pipe = 25.59(In.)
Flow top width inside pipe = 27.54(In.)
Critical Depth = 30.14(In.)
Pipe flow velocity = 12.53(Ft/s)
Travel time through pipe = 0.23 min.
Time of concentration (TC) = 21.40 min.
End of computations, total study area = 30.68 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 88.1

AREAB100

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:AREAB100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:AREAB100.OUT

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

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

Program License Serial Number 4010

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 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1438.400(Ft.)
Bottom (of initial area) elevation = 1435.000(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00567 s(percent)= 0.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.907 min.
Rainfall intensity = 3.209(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 = 0.100; Impervious fraction = 0.900

AREAB100
Initial subarea runoff = 2.796(CFS)
Total initial stream area = 0.980(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 0.98 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 75.0

AREAC100

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:AREAC100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:AREAC100.OUT

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

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

Program License Serial Number 4010

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 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 380.000(Ft.)
Top (of initial area) elevation = 1441.500(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 4.300(Ft.)
Slope = 0.01132 s(percent)= 1.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.912 min.
Rainfall intensity = 3.804(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.415
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.585
RI index for soil(AMC 2) = 67.11
Pervious area fraction = 0.100; Impervious fraction = 0.900

AREAC100
Initial subarea runoff = 3.610(CFS)
Total initial stream area = 1.070(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 1.07 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 67.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:AREAD100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:AREAD100.OUT

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

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

Program License Serial Number 4010

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 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1432.900(Ft.)
Difference in elevation = 8.200(Ft.)
Slope = 0.00820 s(percent)= 0.82
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 21.954 min.
Rainfall intensity = 2.215(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.786
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.760
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.240
RI index for soil(AMC 2) = 80.64
Pervious area fraction = 1.000; Impervious fraction = 0.000

AREAD100
Initial subarea runoff = 8.778(CFS)
Total initial stream area = 5.040(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 5.04 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 80.6

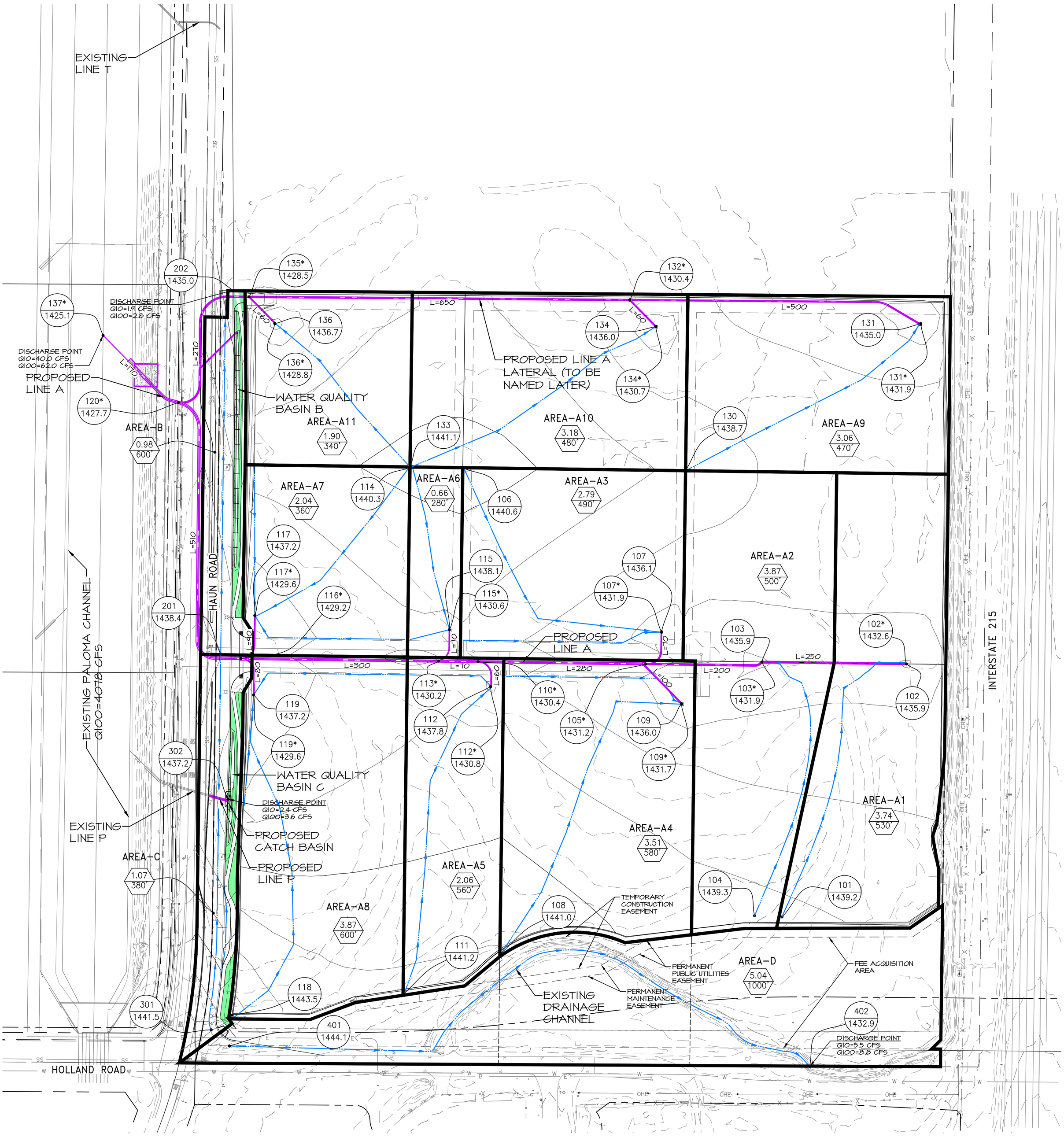
RATIONAL METHOD HYDROLOGY MAP, INTERIM DEVELOPMENT CONDITION

RATIONAL METHOD HYDROLOGY MAP

PROPOSED (INTERIM) CONDITION

TPM 37121, JPN CORPORATION

CITY OF MENIFEE



LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- FLOW DIRECTION
- LANDSCAPING
- 101 / 14xx — NODE DESIGNATION, NODE ELEVATION
- 5.0 / 1000' — WATERSHED AREA (ACRES), LONGEST WATER PATH (FT)

NOTE: IN THE INTERIM CONDITION, AREA-A (INCLUDING SUBAREAS A1 THROUGH A11) WILL BE UNDEVELOPED. IN THE ULTIMATE CONDITION, AREA-A WILL BE COMMERCIAL DEVELOPMENT. ALL OTHER AREAS WILL REMAIN THE SAME IN THE ULTIMATE AS IN THE PROPOSED INTERIM CONDITION.

N W WEBB E S

1" = 80'

40 0 80 160 240

ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256

W.O. 16-0059

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10-YEAR HYDROLOGY (RATIONAL METHOD, ULTIMATE DEVELOPMENT CONDITION)

ULTAREAA10

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:ULTAREAA10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:ULTAREAA10.OUT

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

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

Program License Serial Number 4010

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 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 530.000(Ft.)
Top (of initial area) elevation = 1439.200(Ft.)
Bottom (of initial area) elevation = 1435.900(Ft.)
Difference in elevation = 3.300(Ft.)
Slope = 0.00623 s(percent)= 0.62
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.186 min.
Rainfall intensity = 2.227(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.260
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.740
RI index for soil(AMC 2) = 70.06

Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 7.343(CFS)
Total initial stream area = 3.740(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 102.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1432.600(Ft.)
Downstream point/station elevation = 1431.900(Ft.)
Pipe length = 40.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.343(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 7.343(CFS)
Normal flow depth in pipe = 10.71(In.)
Flow top width inside pipe = 13.56(In.)
Critical Depth = 12.97(In.)
Pipe flow velocity = 7.83(Ft/s)
Travel time through pipe = 0.09 min.
Time of concentration (TC) = 10.27 min.

++
Process from Point/Station 102.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 3.740(Ac.)
Runoff from this stream = 7.343(CFS)
Time of concentration = 10.27 min.
Rainfall intensity = 2.217(In/Hr)

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

Initial area flow distance = 500.000(Ft.)
Top (of initial area) elevation = 1439.300(Ft.)
Bottom (of initial area) elevation = 1435.900(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00680 s(percent)= 0.68
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.777 min.
Rainfall intensity = 2.276(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 7.797(CFS)
Total initial stream area = 3.870(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 104.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.870(Ac.)
Runoff from this stream =      7.797(CFS)
Time of concentration =    9.78 min.
Rainfall intensity =     2.276(In/Hr)
Summary of stream data:

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


1        7.343     10.27                 2.217
2        7.797      9.78                 2.276
Largest stream flow has longer or shorter time of concentration
Qp =      7.797 + sum of
           Qa          Tb/Ta
            7.343 *    0.952 =      6.990
Qp =     14.787

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.343       7.797
Area of streams before confluence:
        3.740        3.870
Results of confluence:
Total flow rate =     14.787(CFS)
Time of concentration =     9.777 min.
Effective stream area after confluence =      7.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1431.900(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.787(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    14.787(CFS)
Normal flow depth in pipe =   18.38(In.)
Flow top width inside pipe =   25.18(In.)
Critical Depth =   16.05(In.)
Pipe flow velocity =      5.13(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =    10.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.610(Ac.)
Runoff from this stream =     14.787(CFS)
Time of concentration =   10.43 min.
Rainfall intensity =     2.199(In/Hr)


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

Initial area flow distance = 490.000(Ft.)
Top (of initial area) elevation = 1440.600(Ft.)
Bottom (of initial area) elevation = 1436.100(Ft.)
Difference in elevation = 4.500(Ft.)
Slope = 0.00918 s(percent)= 0.92
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.133 min.
Rainfall intensity = 2.360(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 5.831(CFS)
Total initial stream area = 2.790(Ac.)
Pervious area fraction = 0.100

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

Upstream point/station elevation = 1431.900(Ft.)
Downstream point/station elevation = 1431.200(Ft.)
Pipe length = 70.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.831(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 5.831(CFS)
Normal flow depth in pipe = 11.16(In.)
Flow top width inside pipe = 13.10(In.)
Critical Depth = 11.73(In.)
Pipe flow velocity = 5.96(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 9.33 min.

++
Process from Point/Station 107.000 to Point/Station 105.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.790(Ac.)
Runoff from this stream = 5.831(CFS)
Time of concentration = 9.33 min.
Rainfall intensity = 2.333(In/Hr)

++
Process from Point/Station 108.000 to Point/Station 109.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 580.000(Ft.)
Top (of initial area) elevation = 1441.000(Ft.)
Bottom (of initial area) elevation = 1436.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00862 s(percent)= 0.86
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.894 min.
Rainfall intensity = 2.261(In/Hr) for a 10.0 year storm

```
COMMERCIAL subarea type
Runoff Coefficient = 0.885
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 =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.027(CFS)
Total initial stream area =        3.510(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1431.700(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.027(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.027(CFS)
Normal flow depth in pipe =   13.95(In.)
Flow top width inside pipe =   15.04(In.)
Critical Depth =   12.30(In.)
Pipe flow velocity =      4.78(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    10.24 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      3.510(Ac.)
Runoff from this stream =      7.027(CFS)
Time of concentration =   10.24 min.
Rainfall intensity =     2.220(In/Hr)
Summary of stream data:

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


1       14.787     10.43                 2.199
2        5.831      9.33                 2.333
3        7.027     10.24                 2.220
Largest stream flow has longer time of concentration
Qp =     14.787 + sum of
          Qb          Ia/Ib
           5.831 *    0.943 =      5.497
          Qb          Ia/Ib
           7.027 *    0.991 =      6.960
Qp =     27.244

Total of 3 streams to confluence:
Flow rates before confluence point:
      14.787       5.831       7.027
Area of streams before confluence:
        7.610       2.790       3.510
Results of confluence:
```

Total flow rate = 27.244(CFS)
Time of concentration = 10.427 min.
Effective stream area after confluence = 13.910(Ac.)

++
Process from Point/Station 105.000 to Point/Station 110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1431.200(Ft.)
Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 280.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 27.244(CFS)
Nearest computed pipe diameter = 33.00(In.)
Calculated individual pipe flow = 27.244(CFS)
Normal flow depth in pipe = 26.02(In.)
Flow top width inside pipe = 26.96(In.)
Critical Depth = 20.81(In.)
Pipe flow velocity = 5.42(Ft/s)
Travel time through pipe = 0.86 min.
Time of concentration (TC) = 11.29 min.

++
Process from Point/Station 105.000 to Point/Station 110.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 13.910(Ac.)
Runoff from this stream = 27.244(CFS)
Time of concentration = 11.29 min.
Rainfall intensity = 2.109(In/Hr)

++
Process from Point/Station 111.000 to Point/Station 112.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 560.000(Ft.)
Top (of initial area) elevation = 1441.200(Ft.)
Bottom (of initial area) elevation = 1437.800(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00607 s(percent)= 0.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.465 min.
Rainfall intensity = 2.195(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.001(CFS)
Total initial stream area = 2.060(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 112.000 to Point/Station 110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

```
Upstream point/station elevation =  1430.800(Ft.)
Downstream point/station elevation =  1430.400(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.001(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.001(CFS)
Normal flow depth in pipe =    9.77(In.)
Flow top width inside pipe =   14.29(In.)
Critical Depth =    9.71(In.)
Pipe flow velocity =      4.73(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    10.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      102.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.060(Ac.)
Runoff from this stream =      4.001(CFS)
Time of concentration =   10.68 min.
Rainfall intensity =     2.172(In/Hr)
Summary of stream data:

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


1       27.244     11.29                  2.109
2        4.001     10.68                  2.172
Largest stream flow has longer time of concentration
Qp =     27.244 + sum of
          Qb         Ia/Ib
           4.001 *    0.971 =      3.885
Qp =     31.129

Total of 2 streams to confluence:
Flow rates before confluence point:
      27.244       4.001
Area of streams before confluence:
       13.910        2.060
Results of confluence:
Total flow rate =     31.129(CFS)
Time of concentration =    11.288 min.
Effective stream area after confluence =     15.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1430.400(Ft.)
Downstream point/station elevation =  1430.200(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.129(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    31.129(CFS)
Normal flow depth in pipe =   26.06(In.)
Flow top width inside pipe =   32.19(In.)
Critical Depth =   21.68(In.)
Pipe flow velocity =      5.69(Ft/s)
Travel time through pipe =    0.21 min.
```

Time of concentration (TC) = 11.49 min.

++
Process from Point/Station 110.000 to Point/Station 113.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 15.970(Ac.)
Runoff from this stream = 31.129(CFS)
Time of concentration = 11.49 min.
Rainfall intensity = 2.089(In/Hr)

++
Process from Point/Station 114.000 to Point/Station 115.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 280.000(Ft.)
Top (of initial area) elevation = 1440.300(Ft.)
Bottom (of initial area) elevation = 1438.100(Ft.)
Difference in elevation = 2.200(Ft.)
Slope = 0.00786 s(percent)= 0.79
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.532 min.
Rainfall intensity = 2.613(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.530(CFS)
Total initial stream area = 0.660(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 115.000 to Point/Station 113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.600(Ft.)
Downstream point/station elevation = 1430.200(Ft.)
Pipe length = 80.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.530(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 1.530(CFS)
Normal flow depth in pipe = 6.75(In.)
Flow top width inside pipe = 11.91(In.)
Critical Depth = 6.29(In.)
Pipe flow velocity = 3.36(Ft/s)
Travel time through pipe = 0.40 min.
Time of concentration (TC) = 7.93 min.

++
Process from Point/Station 115.000 to Point/Station 113.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.660(Ac.)

Runoff from this stream = 1.530(CFS)
Time of concentration = 7.93 min.
Rainfall intensity = 2.543(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	31.129	11.49	2.089
2	1.530	7.93	2.543

Largest stream flow has longer time of concentration
Qp = 31.129 + sum of
 Qb Ia/Ib
 1.530 * 0.821 = 1.256
Qp = 32.386

Total of 2 streams to confluence:
Flow rates before confluence point:
 31.129 1.530
Area of streams before confluence:
 15.970 0.660
Results of confluence:
Total flow rate = 32.386(CFS)
Time of concentration = 11.493 min.
Effective stream area after confluence = 16.630(Ac.)

++
Process from Point/Station 113.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.200(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 300.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 32.386(CFS)
Nearest computed pipe diameter = 33.00(In.)
Calculated individual pipe flow = 32.386(CFS)
Normal flow depth in pipe = 29.44(In.)
Flow top width inside pipe = 20.48(In.)
Critical Depth = 22.71(In.)
Pipe flow velocity = 5.80(Ft/s)
Travel time through pipe = 0.86 min.
Time of concentration (TC) = 12.36 min.

++
Process from Point/Station 113.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 16.630(Ac.)
Runoff from this stream = 32.386(CFS)
Time of concentration = 12.36 min.
Rainfall intensity = 2.010(In/Hr)

++
Process from Point/Station 114.000 to Point/Station 117.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 360.000(Ft.)
Top (of initial area) elevation = 1440.300(Ft.)

Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 3.100(Ft.)
Slope = 0.00861 s(percent)= 0.86
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.178 min.
Rainfall intensity = 2.502(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.524(CFS)
Total initial stream area = 2.040(Ac.)
Pervious area fraction = 0.100

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

Upstream point/station elevation = 1429.600(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 90.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.524(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.524(CFS)
Normal flow depth in pipe = 10.52(In.)
Flow top width inside pipe = 17.74(In.)
Critical Depth = 9.80(In.)
Pipe flow velocity = 4.21(Ft/s)
Travel time through pipe = 0.36 min.
Time of concentration (TC) = 8.53 min.

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

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.040(Ac.)
Runoff from this stream = 4.524(CFS)
Time of concentration = 8.53 min.
Rainfall intensity = 2.446(In/Hr)

++
Process from Point/Station 118.000 to Point/Station 119.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1443.500(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 6.300(Ft.)
Slope = 0.01050 s(percent)= 1.05
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.641 min.
Rainfall intensity = 2.293(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.040
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.960
RI index for soil(AMC 2) = 74.24
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 7.851(CFS)
Total initial stream area = 3.870(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 119.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1429.600(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 80.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.851(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 7.851(CFS)
Normal flow depth in pipe = 12.96(In.)
Flow top width inside pipe = 20.42(In.)
Critical Depth = 12.45(In.)
Pipe flow velocity = 5.04(Ft/s)
Travel time through pipe = 0.26 min.
Time of concentration (TC) = 9.91 min.

++
Process from Point/Station 119.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 3.870(Ac.)
Runoff from this stream = 7.851(CFS)
Time of concentration = 9.91 min.
Rainfall intensity = 2.260(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	32.386	12.36	2.010
2	4.524	8.53	2.446
3	7.851	9.91	2.260

Largest stream flow has longer time of concentration
Qp = 32.386 + sum of
Qb Ia/Ib
4.524 * 0.822 = 3.718
Qb Ia/Ib
7.851 * 0.889 = 6.983
Qp = 43.087

Total of 3 streams to confluence:
Flow rates before confluence point:
32.386 4.524 7.851
Area of streams before confluence:
16.630 2.040 3.870
Results of confluence:
Total flow rate = 43.087(CFS)
Time of concentration = 12.356 min.
Effective stream area after confluence = 22.540(Ac.)

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Process from Point/Station      116.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1429.200(Ft.)
Downstream point/station elevation =  1427.700(Ft.)
Pipe length  =   510.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    43.087(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    43.087(CFS)
Normal flow depth in pipe =   30.70(In.)
Flow top width inside pipe =   31.92(In.)
Critical Depth =   25.08(In.)
Pipe flow velocity =      6.15(Ft/s)
Travel time through pipe =    1.38 min.
Time of concentration (TC) =    13.74 min.


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Process from Point/Station      116.000 to Point/Station      120.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     22.540(Ac.)
Runoff from this stream =     43.087(CFS)
Time of concentration =   13.74 min.
Rainfall intensity =     1.900(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      131.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   470.000(Ft.)
Top (of initial area) elevation =  1438.700(Ft.)
Bottom (of initial area) elevation =  1435.000(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00787  s(percent)=       0.79
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.263 min.
Rainfall intensity =      2.342(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.420
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.580
RI index for soil(AMC 2)  =  67.02
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.308(CFS)
Total initial stream area =        3.060(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      131.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1431.900(Ft.)
```

Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 500.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.308(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 6.308(CFS)
Normal flow depth in pipe = 13.28(In.)
Flow top width inside pipe = 20.25(In.)
Critical Depth = 11.11(In.)
Pipe flow velocity = 3.93(Ft/s)
Travel time through pipe = 2.12 min.
Time of concentration (TC) = 11.38 min.

++
Process from Point/Station 131.000 to Point/Station 132.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.060(Ac.)
Runoff from this stream = 6.308(CFS)
Time of concentration = 11.38 min.
Rainfall intensity = 2.100(In/Hr)

++
Process from Point/Station 133.000 to Point/Station 134.000
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 480.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1436.000(Ft.)
Difference in elevation = 5.100(Ft.)
Slope = 0.01062 s(percent)= 1.06
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.797 min.
Rainfall intensity = 2.407(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 6.781(CFS)
Total initial stream area = 3.180(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 134.000 to Point/Station 132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 1430.700(Ft.)
Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.781(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 6.781(CFS)
Normal flow depth in pipe = 13.52(In.)
Flow top width inside pipe = 15.56(In.)
Critical Depth = 12.09(In.)
Pipe flow velocity = 4.77(Ft/s)

Travel time through pipe = 0.21 min.
Time of concentration (TC) = 9.01 min.

++
Process from Point/Station 134.000 to Point/Station 132.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 3.180(Ac.)
Runoff from this stream = 6.781(CFS)
Time of concentration = 9.01 min.
Rainfall intensity = 2.377(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.308	11.38	2.100
2	6.781	9.01	2.377

Largest stream flow has longer or shorter time of concentration
Qp = 6.781 + sum of
Qa Tb/Ta
6.308 * 0.791 = 4.993
Qp = 11.774

Total of 2 streams to confluence:
Flow rates before confluence point:
6.308 6.781
Area of streams before confluence:
3.060 3.180
Results of confluence:
Total flow rate = 11.774(CFS)
Time of concentration = 9.007 min.
Effective stream area after confluence = 6.240(Ac.)

++
Process from Point/Station 132.000 to Point/Station 135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.400(Ft.)
Downstream point/station elevation = 1428.500(Ft.)
Pipe length = 650.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.774(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 11.774(CFS)
Normal flow depth in pipe = 18.91(In.)
Flow top width inside pipe = 19.62(In.)
Critical Depth = 14.79(In.)
Pipe flow velocity = 4.43(Ft/s)
Travel time through pipe = 2.44 min.
Time of concentration (TC) = 11.45 min.

++
Process from Point/Station 132.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 6.240(Ac.)
Runoff from this stream = 11.774(CFS)

Time of concentration = 11.45 min.
Rainfall intensity = 2.093(In/Hr)

++
Process from Point/Station 133.000 to Point/Station 136.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 340.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1436.700(Ft.)
Difference in elevation = 4.400(Ft.)
Slope = 0.01294 s(percent)= 1.29
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.367 min.
Rainfall intensity = 2.644(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 4.456(CFS)
Total initial stream area = 1.900(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 136.000 to Point/Station 135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1428.500(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.456(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 4.456(CFS)
Normal flow depth in pipe = 11.98(In.)
Flow top width inside pipe = 12.04(In.)
Critical Depth = 10.27(In.)
Pipe flow velocity = 4.24(Ft/s)
Travel time through pipe = 0.24 min.
Time of concentration (TC) = 7.60 min.

++
Process from Point/Station 136.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.900(Ac.)
Runoff from this stream = 4.456(CFS)
Time of concentration = 7.60 min.
Rainfall intensity = 2.600(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	11.774	11.45	2.093

```
2        4.456      7.60                2.600
Largest stream flow has longer time of concentration
Qp =     11.774 + sum of
          Qb         Ia/Ib
           4.456 *    0.805 =      3.587
Qp =     15.360

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.774       4.456
Area of streams before confluence:
        6.240        1.900
Results of confluence:
Total flow rate =     15.360(CFS)
Time of concentration =    11.450 min.
Effective stream area after confluence =      8.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1428.500(Ft.)
Downstream point/station elevation =  1427.700(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.360(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    15.360(CFS)
Normal flow depth in pipe =   20.25(In.)
Flow top width inside pipe =   23.38(In.)
Critical Depth =   16.39(In.)
Pipe flow velocity =      4.81(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =    12.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      120.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.140(Ac.)
Runoff from this stream =     15.360(CFS)
Time of concentration =   12.39 min.
Rainfall intensity =     2.008(In/Hr)
Summary of stream data:

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


1       43.087     13.74                  1.900
2       15.360     12.39                  2.008
Largest stream flow has longer time of concentration
Qp =     43.087 + sum of
          Qb         Ia/Ib
          15.360 *    0.947 =     14.540
Qp =     57.627

Total of 2 main streams to confluence:
Flow rates before confluence point:
      43.087      15.360
```

```
Area of streams before confluence:
       22.540        8.140


Results of confluence:
Total flow rate =     57.627(CFS)
Time of concentration =    13.739 min.
Effective stream area after confluence  =     30.680(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      137.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1427.700(Ft.)
Downstream point/station elevation =  1425.100(Ft.)
Pipe length  =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    57.627(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    57.627(CFS)
Normal flow depth in pipe =   24.05(In.)
Flow top width inside pipe =   29.35(In.)
Critical Depth =   29.47(In.)
Pipe flow velocity =     12.43(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    13.97 min.
End of computations, total study area =           30.68 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  73.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:ULTAREAB10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:ULTAREAB10.OUT

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

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

Program License Serial Number 4010

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 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1438.400(Ft.)
Bottom (of initial area) elevation = 1435.000(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00567 s(percent)= 0.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.907 min.
Rainfall intensity = 2.148(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
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 = 0.100; Impervious fraction = 0.900

ULTAREAB10
Initial subarea runoff = 1.862(CFS)
Total initial stream area = 0.980(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 0.98 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 75.0

Riverside County Rational Hydrology Program

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Rational Hydrology Study Date: 01/18/19 File:ULTAREAC10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:ULTAREAC10.OUT

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

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

Program License Serial Number 4010

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 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 380.000(Ft.)
Top (of initial area) elevation = 1441.500(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 4.300(Ft.)
Slope = 0.01132 s(percent)= 1.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.912 min.
Rainfall intensity = 2.546(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.415
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.585
RI index for soil(AMC 2) = 67.11
Pervious area fraction = 0.100; Impervious fraction = 0.900

ULTAREAC10
Initial subarea runoff = 2.402(CFS)
Total initial stream area = 1.070(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 1.07 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 67.1

Riverside County Rational Hydrology Program

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Rational Hydrology Study Date: 01/18/19 File:ULTAREAD10.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
10-YEAR STORM EVENT
FN:ULTAREAD10.OUT

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

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

Program License Serial Number 4010

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 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1432.900(Ft.)
Difference in elevation = 8.200(Ft.)
Slope = 0.00820 s(percent)= 0.82
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 21.954 min.
Rainfall intensity = 1.482(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.740
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.760
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.240
RI index for soil(AMC 2) = 80.64
Pervious area fraction = 1.000; Impervious fraction = 0.000

ULTAREAD10
Initial subarea runoff = 5.530(CFS)
Total initial stream area = 5.040(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 5.04 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 80.6

100-YEAR HYDROLOGY (RATIONAL METHOD, ULTIMATE DEVELOPMENT CONDITION)

ULTAREAA100

Riverside County Rational Hydrology Program

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Rational Hydrology Study Date: 01/18/19 File:ULTAREAA100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:ULTAREAA100.OUT

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

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

Program License Serial Number 4010

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 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 530.000(Ft.)
Top (of initial area) elevation = 1439.200(Ft.)
Bottom (of initial area) elevation = 1435.900(Ft.)
Difference in elevation = 3.300(Ft.)
Slope = 0.00623 s(percent)= 0.62
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.186 min.
Rainfall intensity = 3.328(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.260
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.740
RI index for soil(AMC 2) = 70.06

Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 11.037(CFS)
Total initial stream area = 3.740(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 102.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1432.600(Ft.)
Downstream point/station elevation = 1431.900(Ft.)
Pipe length = 40.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.037(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 11.037(CFS)
Normal flow depth in pipe = 12.12(In.)
Flow top width inside pipe = 16.89(In.)
Critical Depth = 15.26(In.)
Pipe flow velocity = 8.73(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 10.26 min.

++
Process from Point/Station 102.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 3.740(Ac.)
Runoff from this stream = 11.037(CFS)
Time of concentration = 10.26 min.
Rainfall intensity = 3.314(In/Hr)

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

Initial area flow distance = 500.000(Ft.)
Top (of initial area) elevation = 1439.300(Ft.)
Bottom (of initial area) elevation = 1435.900(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00680 s(percent)= 0.68
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.777 min.
Rainfall intensity = 3.401(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 11.707(CFS)
Total initial stream area = 3.870(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 104.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.870(Ac.)
Runoff from this stream =     11.707(CFS)
Time of concentration =    9.78 min.
Rainfall intensity =     3.401(In/Hr)
Summary of stream data:

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


1       11.037     10.26                  3.314
2       11.707      9.78                  3.401
Largest stream flow has longer or shorter time of concentration
Qp =     11.707 + sum of
          Qa          Tb/Ta
          11.037 *    0.953 =     10.515
Qp =     22.223

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.037      11.707
Area of streams before confluence:
        3.740        3.870
Results of confluence:
Total flow rate =     22.223(CFS)
Time of concentration =     9.777 min.
Effective stream area after confluence =      7.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1431.900(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.223(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    22.223(CFS)
Normal flow depth in pipe =   22.59(In.)
Flow top width inside pipe =   25.87(In.)
Critical Depth =   19.24(In.)
Pipe flow velocity =      5.61(Ft/s)
Travel time through pipe =    0.59 min.
Time of concentration (TC) =    10.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.610(Ac.)
Runoff from this stream =     22.223(CFS)
Time of concentration =   10.37 min.
Rainfall intensity =     3.296(In/Hr)


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

```
Initial area flow distance =   490.000(Ft.)
Top (of initial area) elevation =  1440.600(Ft.)
Bottom (of initial area) elevation =  1436.100(Ft.)
Difference in elevation =     4.500(Ft.)
Slope =    0.00918  s(percent)=       0.92
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.133 min.
Rainfall intensity =      3.526(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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 =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.754(CFS)
Total initial stream area =        2.790(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1431.900(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.754(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.754(CFS)
Normal flow depth in pipe =   12.56(In.)
Flow top width inside pipe =   16.53(In.)
Critical Depth =   13.74(In.)
Pipe flow velocity =      6.65(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     9.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.790(Ac.)
Runoff from this stream =      8.754(CFS)
Time of concentration =    9.31 min.
Rainfall intensity =     3.490(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   580.000(Ft.)
Top (of initial area) elevation =  1441.000(Ft.)
Bottom (of initial area) elevation =  1436.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00862  s(percent)=       0.86
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.894 min.
Rainfall intensity =      3.379(In/Hr) for a   100.0 year storm
```

```
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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 =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     10.551(CFS)
Total initial stream area =        3.510(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1431.700(Ft.)
Downstream point/station elevation =  1431.200(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.551(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    10.551(CFS)
Normal flow depth in pipe =   16.22(In.)
Flow top width inside pipe =   17.61(In.)
Critical Depth =   14.52(In.)
Pipe flow velocity =      5.30(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    10.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      3.510(Ac.)
Runoff from this stream =     10.551(CFS)
Time of concentration =   10.21 min.
Rainfall intensity =     3.324(In/Hr)
Summary of stream data:

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


1       22.223     10.37                  3.296
2        8.754      9.31                  3.490
3       10.551     10.21                  3.324
Largest stream flow has longer time of concentration
Qp =     22.223 + sum of
          Qb          Ia/Ib
           8.754 *    0.944 =      8.266
          Qb          Ia/Ib
          10.551 *    0.992 =     10.463
Qp =     40.952

Total of 3 streams to confluence:
Flow rates before confluence point:
      22.223       8.754      10.551
Area of streams before confluence:
        7.610        2.790        3.510
Results of confluence:
```

```
Total flow rate =     40.952(CFS)
Time of concentration =    10.372 min.
Effective stream area after confluence =     13.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1431.200(Ft.)
Downstream point/station elevation =  1430.400(Ft.)
Pipe length  =   280.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.952(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    40.952(CFS)
Normal flow depth in pipe =   29.72(In.)
Flow top width inside pipe =   33.22(In.)
Critical Depth =   24.44(In.)
Pipe flow velocity =      6.04(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    11.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     13.910(Ac.)
Runoff from this stream =     40.952(CFS)
Time of concentration =   11.14 min.
Rainfall intensity =     3.173(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
Initial area flow distance =   560.000(Ft.)
Top (of initial area) elevation =  1441.200(Ft.)
Bottom (of initial area) elevation =  1437.800(Ft.)
Difference in elevation =     3.400(Ft.)
Slope =    0.00607  s(percent)=       0.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.465 min.
Rainfall intensity =      3.280(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.009(CFS)
Total initial stream area =        2.060(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
```

Upstream point/station elevation = 1430.800(Ft.)
Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.009(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 6.009(CFS)
Normal flow depth in pipe = 11.11(In.)
Flow top width inside pipe = 17.50(In.)
Critical Depth = 11.36(In.)
Pipe flow velocity = 5.25(Ft/s)
Travel time through pipe = 0.19 min.
Time of concentration (TC) = 10.66 min.

++
Process from Point/Station 112.000 to Point/Station 102.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.060(Ac.)
Runoff from this stream = 6.009(CFS)
Time of concentration = 10.66 min.
Rainfall intensity = 3.249(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	40.952	11.14	3.173
2	6.009	10.66	3.249

Largest stream flow has longer time of concentration
Qp = 40.952 + sum of
Qb Ia/Ib
6.009 * 0.977 = 5.868
Qp = 46.819

Total of 2 streams to confluence:
Flow rates before confluence point:
40.952 6.009
Area of streams before confluence:
13.910 2.060
Results of confluence:
Total flow rate = 46.819(CFS)
Time of concentration = 11.144 min.
Effective stream area after confluence = 15.970(Ac.)

++
Process from Point/Station 110.000 to Point/Station 113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 1430.400(Ft.)
Downstream point/station elevation = 1430.200(Ft.)
Pipe length = 70.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 46.819(CFS)
Nearest computed pipe diameter = 39.00(In.)
Calculated individual pipe flow = 46.819(CFS)
Normal flow depth in pipe = 34.69(In.)
Flow top width inside pipe = 24.46(In.)
Critical Depth = 26.17(In.)
Pipe flow velocity = 6.00(Ft/s)
Travel time through pipe = 0.19 min.

Time of concentration (TC) = 11.34 min.

++
Process from Point/Station 110.000 to Point/Station 113.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 15.970(Ac.)
Runoff from this stream = 46.819(CFS)
Time of concentration = 11.34 min.
Rainfall intensity = 3.144(In/Hr)

++
Process from Point/Station 114.000 to Point/Station 115.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 280.000(Ft.)
Top (of initial area) elevation = 1440.300(Ft.)
Bottom (of initial area) elevation = 1438.100(Ft.)
Difference in elevation = 2.200(Ft.)
Slope = 0.00786 s(percent)= 0.79
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.532 min.
Rainfall intensity = 3.905(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.891
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 2.296(CFS)
Total initial stream area = 0.660(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 115.000 to Point/Station 113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.600(Ft.)
Downstream point/station elevation = 1430.200(Ft.)
Pipe length = 80.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.296(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.296(CFS)
Normal flow depth in pipe = 9.00(In.)
Flow top width inside pipe = 10.39(In.)
Critical Depth = 7.77(In.)
Pipe flow velocity = 3.64(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 7.90 min.

++
Process from Point/Station 115.000 to Point/Station 113.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.660(Ac.)

Runoff from this stream = 2.296(CFS)
Time of concentration = 7.90 min.
Rainfall intensity = 3.808(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	46.819	11.34	3.144
2	2.296	7.90	3.808

Largest stream flow has longer time of concentration
Qp = 46.819 + sum of
Qb Ia/Ib
2.296 * 0.826 = 1.895
Qp = 48.715

Total of 2 streams to confluence:
Flow rates before confluence point:
46.819 2.296
Area of streams before confluence:
15.970 0.660
Results of confluence:
Total flow rate = 48.715(CFS)
Time of concentration = 11.338 min.
Effective stream area after confluence = 16.630(Ac.)

++
Process from Point/Station 113.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.200(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 300.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 48.715(CFS)
Nearest computed pipe diameter = 39.00(In.)
Calculated individual pipe flow = 48.715(CFS)
Normal flow depth in pipe = 32.81(In.)
Flow top width inside pipe = 28.50(In.)
Critical Depth = 26.72(In.)
Pipe flow velocity = 6.54(Ft/s)
Travel time through pipe = 0.76 min.
Time of concentration (TC) = 12.10 min.

++
Process from Point/Station 113.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 16.630(Ac.)
Runoff from this stream = 48.715(CFS)
Time of concentration = 12.10 min.
Rainfall intensity = 3.037(In/Hr)

++
Process from Point/Station 114.000 to Point/Station 117.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 360.000(Ft.)
Top (of initial area) elevation = 1440.300(Ft.)

Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 3.100(Ft.)
Slope = 0.00861 s(percent)= 0.86
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.178 min.
Rainfall intensity = 3.738(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 6.791(CFS)
Total initial stream area = 2.040(Ac.)
Pervious area fraction = 0.100

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

Upstream point/station elevation = 1429.600(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 90.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.791(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 6.791(CFS)
Normal flow depth in pipe = 14.30(In.)
Flow top width inside pipe = 14.55(In.)
Critical Depth = 12.11(In.)
Pipe flow velocity = 4.52(Ft/s)
Travel time through pipe = 0.33 min.
Time of concentration (TC) = 8.51 min.

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

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.040(Ac.)
Runoff from this stream = 6.791(CFS)
Time of concentration = 8.51 min.
Rainfall intensity = 3.660(In/Hr)

++
Process from Point/Station 118.000 to Point/Station 119.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1443.500(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 6.300(Ft.)
Slope = 0.01050 s(percent)= 1.05
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.641 min.
Rainfall intensity = 3.426(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.040
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.960
RI index for soil(AMC 2) = 74.24
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 11.790(CFS)
Total initial stream area = 3.870(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 119.000 to Point/Station 116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1429.600(Ft.)
Downstream point/station elevation = 1429.200(Ft.)
Pipe length = 80.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.790(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 11.790(CFS)
Normal flow depth in pipe = 15.33(In.)
Flow top width inside pipe = 23.06(In.)
Critical Depth = 14.79(In.)
Pipe flow velocity = 5.57(Ft/s)
Travel time through pipe = 0.24 min.
Time of concentration (TC) = 9.88 min.

++
Process from Point/Station 119.000 to Point/Station 116.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 3.870(Ac.)
Runoff from this stream = 11.790(CFS)
Time of concentration = 9.88 min.
Rainfall intensity = 3.382(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	48.715	12.10	3.037
2	6.791	8.51	3.660
3	11.790	9.88	3.382

Largest stream flow has longer time of concentration
Qp = 48.715 + sum of
Qb Ia/Ib
6.791 * 0.830 = 5.634
Qb Ia/Ib
11.790 * 0.898 = 10.589
Qp = 64.938

Total of 3 streams to confluence:
Flow rates before confluence point:
48.715 6.791 11.790
Area of streams before confluence:
16.630 2.040 3.870
Results of confluence:
Total flow rate = 64.938(CFS)
Time of concentration = 12.103 min.
Effective stream area after confluence = 22.540(Ac.)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1429.200(Ft.)
Downstream point/station elevation =  1427.700(Ft.)
Pipe length  =   510.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    64.938(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    64.938(CFS)
Normal flow depth in pipe =   36.47(In.)
Flow top width inside pipe =   35.28(In.)
Critical Depth =   29.74(In.)
Pipe flow velocity =      6.77(Ft/s)
Travel time through pipe =    1.26 min.
Time of concentration (TC) =    13.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      120.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     22.540(Ac.)
Runoff from this stream =     64.938(CFS)
Time of concentration =   13.36 min.
Rainfall intensity =     2.882(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      131.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   470.000(Ft.)
Top (of initial area) elevation =  1438.700(Ft.)
Bottom (of initial area) elevation =  1435.000(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00787  s(percent)=       0.79
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.263 min.
Rainfall intensity =      3.499(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.420
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.580
RI index for soil(AMC 2)  =  67.02
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      9.485(CFS)
Total initial stream area =        3.060(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      131.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1431.900(Ft.)
```

Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 500.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.485(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 9.485(CFS)
Normal flow depth in pipe = 15.73(In.)
Flow top width inside pipe = 22.81(In.)
Critical Depth = 13.22(In.)
Pipe flow velocity = 4.35(Ft/s)
Travel time through pipe = 1.92 min.
Time of concentration (TC) = 11.18 min.

++
Process from Point/Station 131.000 to Point/Station 132.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 3.060(Ac.)
Runoff from this stream = 9.485(CFS)
Time of concentration = 11.18 min.
Rainfall intensity = 3.167(In/Hr)

++
Process from Point/Station 133.000 to Point/Station 134.000
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 480.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1436.000(Ft.)
Difference in elevation = 5.100(Ft.)
Slope = 0.01062 s(percent)= 1.06
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.797 min.
Rainfall intensity = 3.596(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 10.179(CFS)
Total initial stream area = 3.180(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 134.000 to Point/Station 132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 1430.700(Ft.)
Downstream point/station elevation = 1430.400(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 10.179(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 10.179(CFS)
Normal flow depth in pipe = 15.70(In.)
Flow top width inside pipe = 18.24(In.)
Critical Depth = 14.26(In.)
Pipe flow velocity = 5.28(Ft/s)

Travel time through pipe = 0.19 min.
Time of concentration (TC) = 8.99 min.

++
Process from Point/Station 134.000 to Point/Station 132.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 3.180(Ac.)
Runoff from this stream = 10.179(CFS)
Time of concentration = 8.99 min.
Rainfall intensity = 3.556(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	9.485	11.18	3.167
2	10.179	8.99	3.556

Largest stream flow has longer or shorter time of concentration
Qp = 10.179 + sum of
Qa Tb/Ta
9.485 * 0.804 = 7.624
Qp = 17.804

Total of 2 streams to confluence:
Flow rates before confluence point:
9.485 10.179
Area of streams before confluence:
3.060 3.180
Results of confluence:
Total flow rate = 17.804(CFS)
Time of concentration = 8.987 min.
Effective stream area after confluence = 6.240(Ac.)

++
Process from Point/Station 132.000 to Point/Station 135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1430.400(Ft.)
Downstream point/station elevation = 1428.500(Ft.)
Pipe length = 650.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 17.804(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 17.804(CFS)
Normal flow depth in pipe = 20.34(In.)
Flow top width inside pipe = 28.03(In.)
Critical Depth = 17.13(In.)
Pipe flow velocity = 5.02(Ft/s)
Travel time through pipe = 2.16 min.
Time of concentration (TC) = 11.14 min.

++
Process from Point/Station 132.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area = 6.240(Ac.)
Runoff from this stream = 17.804(CFS)

Time of concentration = 11.14 min.
Rainfall intensity = 3.173(In/Hr)

++
Process from Point/Station 133.000 to Point/Station 136.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 340.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1436.700(Ft.)
Difference in elevation = 4.400(Ft.)
Slope = 0.01294 s(percent)= 1.29
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.367 min.
Rainfall intensity = 3.951(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.891
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 = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 6.688(CFS)
Total initial stream area = 1.900(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 136.000 to Point/Station 135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1428.500(Ft.)
Pipe length = 60.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.688(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 6.688(CFS)
Normal flow depth in pipe = 13.36(In.)
Flow top width inside pipe = 15.75(In.)
Critical Depth = 12.01(In.)
Pipe flow velocity = 4.76(Ft/s)
Travel time through pipe = 0.21 min.
Time of concentration (TC) = 7.58 min.

++
Process from Point/Station 136.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.900(Ac.)
Runoff from this stream = 6.688(CFS)
Time of concentration = 7.58 min.
Rainfall intensity = 3.892(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	17.804	11.14	3.173

```
2        6.688      7.58                 3.892
Largest stream flow has longer time of concentration
Qp =     17.804 + sum of
          Qb         Ia/Ib
           6.688 *    0.815 =      5.451
Qp =     23.255

Total of 2 streams to confluence:
Flow rates before confluence point:
      17.804       6.688
Area of streams before confluence:
        6.240        1.900
Results of confluence:
Total flow rate =     23.255(CFS)
Time of concentration =    11.144 min.
Effective stream area after confluence =      8.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1428.500(Ft.)
Downstream point/station elevation =  1427.700(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.255(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    23.255(CFS)
Normal flow depth in pipe =   25.88(In.)
Flow top width inside pipe =   20.66(In.)
Critical Depth =   19.71(In.)
Pipe flow velocity =      5.16(Ft/s)
Travel time through pipe =    0.87 min.
Time of concentration (TC) =    12.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      120.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.140(Ac.)
Runoff from this stream =     23.255(CFS)
Time of concentration =   12.02 min.
Rainfall intensity =     3.049(In/Hr)
Summary of stream data:

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


1       64.938     13.36                 2.882
2       23.255     12.02                 3.049
Largest stream flow has longer time of concentration
Qp =     64.938 + sum of
          Qb         Ia/Ib
          23.255 *    0.945 =     21.985
Qp =     86.923

Total of 2 main streams to confluence:
Flow rates before confluence point:
      64.938      23.255
```

Area of streams before confluence:
22.540 8.140

Results of confluence:
Total flow rate = 86.923(CFS)
Time of concentration = 13.358 min.
Effective stream area after confluence = 30.680(Ac.)

++
Process from Point/Station 120.000 to Point/Station 137.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1427.700(Ft.)
Downstream point/station elevation = 1425.100(Ft.)
Pipe length = 170.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 86.923(CFS)
Nearest computed pipe diameter = 36.00(In.)
Calculated individual pipe flow = 86.923(CFS)
Normal flow depth in pipe = 31.69(In.)
Flow top width inside pipe = 23.38(In.)
Critical Depth = 33.89(In.)
Pipe flow velocity = 13.20(Ft/s)
Travel time through pipe = 0.21 min.
Time of concentration (TC) = 13.57 min.
End of computations, total study area = 30.68 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 73.5

ULTAREAB100

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:ULTAREAB100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:ULTAREAB100.OUT

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

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

Program License Serial Number 4010

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 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1438.400(Ft.)
Bottom (of initial area) elevation = 1435.000(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.00567 s(percent)= 0.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.907 min.
Rainfall intensity = 3.209(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 = 0.100; Impervious fraction = 0.900

ULTAREAB100
Initial subarea runoff = 2.796(CFS)
Total initial stream area = 0.980(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 0.98 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 75.0

ULTAREAC100

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:ULTAREAC100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:ULTAREAC100.OUT

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

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

Program License Serial Number 4010

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 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 380.000(Ft.)
Top (of initial area) elevation = 1441.500(Ft.)
Bottom (of initial area) elevation = 1437.200(Ft.)
Difference in elevation = 4.300(Ft.)
Slope = 0.01132 s(percent)= 1.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.912 min.
Rainfall intensity = 3.804(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.415
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.585
RI index for soil(AMC 2) = 67.11
Pervious area fraction = 0.100; Impervious fraction = 0.900

ULTAREAC100
Initial subarea runoff = 3.610(CFS)
Total initial stream area = 1.070(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 1.07 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 67.1

ULTAREAD100

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/18/19 File:ULTAREAD100.out

16-0059 TPM 37121
RATIONAL METHOD HYDROLOGY ANALYSIS
100-YEAR STORM EVENT
FN:ULTAREAD100.OUT

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

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

Program License Serial Number 4010

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 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1441.100(Ft.)
Bottom (of initial area) elevation = 1432.900(Ft.)
Difference in elevation = 8.200(Ft.)
Slope = 0.00820 s(percent)= 0.82
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 21.954 min.
Rainfall intensity = 2.215(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.786
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.760
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.240
RI index for soil(AMC 2) = 80.64
Pervious area fraction = 1.000; Impervious fraction = 0.000

ULTAREAD100
Initial subarea runoff = 8.778(CFS)
Total initial stream area = 5.040(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 5.04 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 80.6

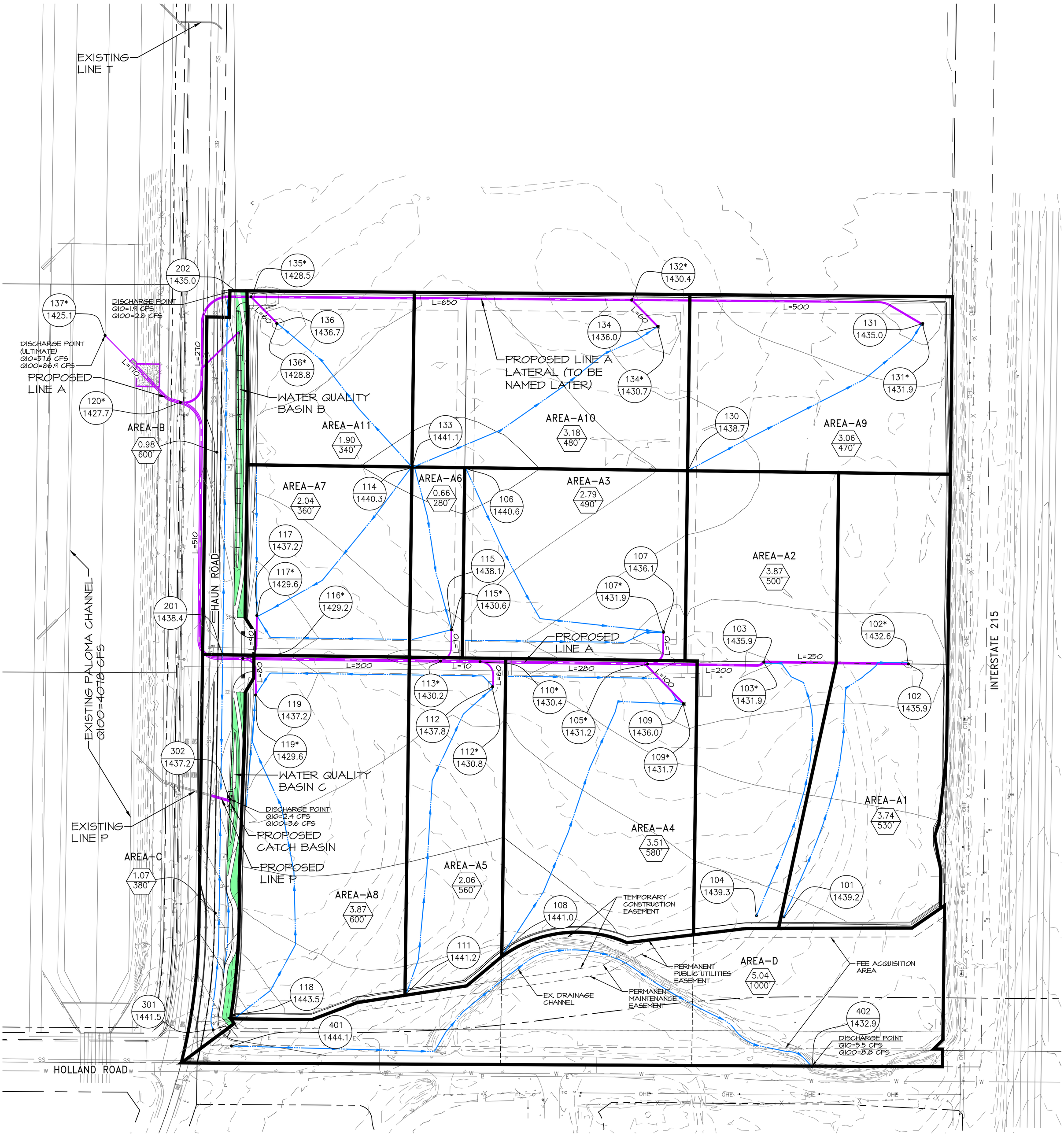
RATIONAL METHOD HYDROLOGY MAP, ULTIMATE DEVELOPMENT CONDITION

RATIONAL METHOD HYDROLOGY MAP

ULTIMATE CONDITION

TPM 37121, JPN CORPORATION

CITY OF MENIFEE



NOTE: IN THE ULTIMATE CONDITION, AREA-A (INCLUDING SUBAREAS A1 THROUGH A11) WILL BE COMMERCIAL DEVELOPMENT. IN THE INTERIM CONDITION, AREA-A WILL BE UNDEVELOPED. ALL OTHER AREAS WILL REMAIN THE SAME IN THE ULTIMATE AS IN THE PROPOSED INTERIM CONDITION.

LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- FLOW DIRECTION
- LANDSCAPING
- 101 / 14xx — NODE DESIGNATION / NODE ELEVATION
- 5.0 / 1000' — WATERSHED AREA (ACRES) / LONGEST WATER PATH (FT)

N W WEBB E S

1" = 80'

40 0 80 160 240

ALBERT A. WEBB ASSOCIATES
ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256

W.O. 16-0059

SHEET | OF | SHEETS

SECTION 3 - HYDRAULIC ANALYSIS

OFF-SITE STORM DRAIN FACILITIES

The project will utilize curb and gutter and curb cuts to convey off-site flows to the proposed bioretention basins. Basin B and Basin C will receive the runoff generated by the widening of Haun Road. The bioretention basins were sized for water quality treatment. Storm drain inlets are proposed at low spots throughout the site. These inlets will connect to a proposed on-site storm drain system, Line A. Ultimately, this storm drain system will connect to the Paloma Wash Channel via a new lateral connection. Further details will be provided during final engineering.

Basin B

Basin B is a bioretention basin. There is not currently a proper drainage source to connect to, however, a new lateral connection to the Paloma Wash Channel is proposed with this project, which is how Basin B will outlet. Basin B will utilize a 2.5' filter media section for water quality treatment. The filter is comprised of 1.5 feet of engineered soil media over a foot of gravel. The basin will receive the water quality flows and then convey them back out once 0.5 feet of ponding is achieved. This design follows the existing drainage pattern. Basin B provides the necessary bottom area required for water quality treatment from Area B.

Water quality basin sizing calculations are included in this section.

Basin C

Basin C is also a bioretention basin and the perforated PVC underdrains are connected to the proposed catch basin. Basin C will utilize a 4' filter media section for water quality treatment. The filter is comprised of 3.0 feet of engineered soil media over a foot of gravel.

Water quality basin sizing calculations are included in this section.

Outlet Structure C

A 2'x3' grated inlet is proposed in Basin C. The top of grate will be set at half a foot to ensure the required water quality volume is forced through the soil media filter for water quality treatment. Once the water quality volume is exceeded, storm water will begin to spill into the grate inlet. Outflow from the basin will be discharged into an existing storm drain line, Lateral Line P.

Curb-Cuts (Area C)

The project proposes to construct curb-cuts on each side of the proposed catch basin to convey the water quality flows into Basin C. The curb-cuts were sized using the water quality flow rate. The bottom slopes of the curb-cuts were set at the water quality water surface elevation to ensure the required water quality volume is forced through the soil media.

Lateral Line P

A portion of the Paloma Wash MDP facility Line P is proposed to be extended with this project. This will serve as the outlet point for Basin C. The storm drain will continue to serve the existing drainage patterns and will provide flood protection from off-site flows.

ON-SITE STORM DRAIN FACILITIES

Line A

Line A is proposed to be built with this project. This will serve as the outlet point for the low points throughout the site. The storm drain will be run throughout the site. Line A will discharge in the existing Paloma Wash Channel via a new lateral connection.

WATER QUALITY BASIN SIZING CALCULATIONS

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Albert A Webb Associates	Date	1/14/2019
Designed by	ABE	Case No	TPM 37121
Company Project Number/Name	JPN Corporation		

BMP Identification

BMP NAME / ID: Basin B

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.58 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
L-B	*6111*	*Ornamental Landscaping*	*0.1*	*0.11*	*675*			
ST-B	*29223*	*Concrete or Asphalt*	*1*	*0.89*	*26066.9*			
BASIN-B	*1379*							
	36713	***Total***			**26741.9**	**0.58**	***1292.5***	***1738***

Notes:

Bioretention Facility - Design Procedure	BMP ID: Basin B	Legend:	Required Entries / Calculated Cells

Company Name:	Albert A. Webb Associates	Date:	1/14/2019
Designed by:	ABE	County/City Case No.:	TPM 37121

Design Volume

Enter the area tributary to this feature	A_T=	0.84	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	1,293	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	7.6	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	958	ft^2
Proposed Surface Area	A=	1,379	ft^2
Minimum Required Length of Bioretention Facility, L	L =	126.1	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Natural Grasses	

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Albert A Webb Associates — Date: 1/14/2019

Designed by: ABE — Case No: TPM 37121

Company Project Number/Name: JPN Corporation

BMP Identification

BMP NAME / ID: Basin C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E — D_{85}= 0.58 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
L-C	*6630*	*Ornamental Landscaping*	*0.1*	*0.11*	*732.3*			
ST-C	*30625*	*Concrete or Asphalt*	*1*	*0.89*	*27317.5*			
BASIN-C	*706*							
	37961	***Total***			**28049.8**	**0.58**	***1355.7***	***1400***

Notes:

****Due to the lack of usable area, Basin C cannot be expanded horizontally to treat the required volume. In order to expand, the basin would have to infringe on private property. However the City does not want to comingle private and public flows. Additionally, the proposed bus stop limits the available land use for water quality. However, by increasing the ponding depth from 0.5' to 0.88', the basin can fully treat the VBMP calculated above. This is shown on the "Post Construction BMP Site Map" exhibit included in Appendix A.***

Bioretention Facility - Design Procedure	BMP ID: Basin C	Legend:	Required Entries / Calculated Cells

Company Name: Albert A. Webb Associates | Date: 1/14/2019

Designed by: ABE | County/City Case No.: TPM 37121

Design Volume

Enter the area tributary to this feature — A_T = 0.87 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 1,356 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 3.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 9.5 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.73 ft

Minimum Surface Area, A_m

$$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$$

A_M = 786 ft^2

Proposed Surface Area — A= 706 ft^2

ERROR, the proposed surface area must be equal to or greater than the minimum surface area

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation: Natural Grasses

Notes: This is due to the lack of area that is available to expand the basin. The ponding depth was increased from 0.5' to 0.88' to attempt to treat as much runoff as possible. This creates the need for a bottom area of 644 square feet. The basin is sized appropriately for a ponding depth of 0.88'.

OUTLET STRUCTURE C

Weir Inlet
Ponding Depth Calculation

ALBERT A WEBB ASSOCIATES
ENGINEERING CONSULTANTS

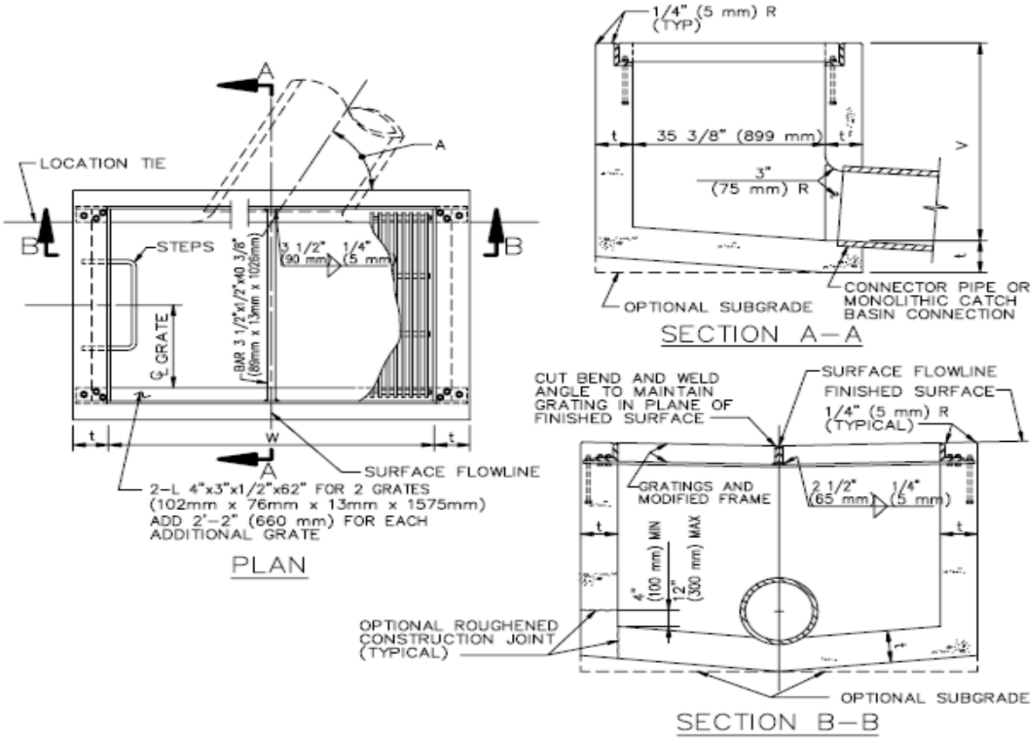
Designer: MJS
Date: 12/18/2017
Project: TPM 37121
Location: Basin C

OUTLET STRUCTURE PONDING DEPTH SPPWC 305-3

DISCHARGE (cfs)		4	
NUMBER OF GRATES		1	
LENGTH (ft)		14.479	
WEIR COEFFICIENT	C	3.3	
WEIR LENGTH	L	14.479	ft^2
HEAD	h	0.19	ft
Flow	Q	4.00	cfs

$$Q = C L (h)^{3/2}$$

Top of Weir Elevation: 1436.5
Water Surface Elevation: 1436.69



CURB-CUTS (AREA C)

Hydraulic Analysis Report

Project Data

Project Title: TPM 37121

Designer:

Project Date: Monday, December 18, 2017

Project Units: U.S. Customary Units

Notes:

Curb and Gutter Analysis: Basin C-Curb Cut on Grade-QBMP

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0090 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 2.0000 ft

Design Flow: 0.5000 cfs

Gutter Result Parameters

Width of Spread: 5.5337 ft

Gutter Depression: 0.0000 in

Area of Flow: 0.3062 ft^2

Eo (Gutter Flow to Total Flow): 0.6981

Gutter Depth at Curb: 1.3281 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Curb Opening

Length of Inlet: 2.0000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 0.1197 cfs

Bypass Flow: 0.3803 cfs

Efficiency: 0.2394

Curb and Gutter Analysis: Basin C-Catch Basin at Sag-Q100

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0090 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 2.0000 ft

Design Flow: 4.0000 cfs

Gutter Result Parameters

Width of Spread: 12.0690 ft

Gutter Depression: 0.0000 in

Area of Flow: 1.4566 ft^2

Eo (Gutter Flow to Total Flow): 0.3835

Gutter Depth at Curb: 2.8966 in

Inlet Input Parameters

Inlet Location: Inlet in Sag

Percent Clogging: 0.0000 %

Inlet Type: Curb Opening

Length of Inlet: 14.0000 ft

Curb opening height: 6.0000 in

Local Depression: 1.5000 in

Inlet Result Parameters

Perimeter: 14.0000 ft

Effective Perimeter: 14.0000 ft

Area: 8.7500 ft^2

Effective Area: 8.7500 ft^2

Depth at curb face (upstream of local depression): 0.2085 ft

Computed Width of Spread at Sag: 10.4274 ft

Flow type: Weir Flow

Efficiency: 1.0000

LATERAL LINE-P (EXTENSION)

***To be sized during Final Engineering**

LINE-A

***To be sized during Final Engineering**

SECTION 4 - **CONCLUSION**

Based on the preliminary analyses and results of this report, the following conclusions were derived from the hydrology and hydraulic results:

- The proposed on-site drainage concept is adequately sized for the ultimate condition.
- The proposed basins will adequately treat off-site flows for water quality. Water quality basins are per City-Approved PWQMP.
- The off-site drainage improvements will adequately protect the site from off-site flow and prevent off-site flows from commingling with on-site flows.
- The proposed project will not impact flooding conditions to upstream or downstream properties