APPENDIX 9.7

HYDROLOGY AND WATER QUALITY TECHNICAL REPORTS

PRELIMINARY DRAINAGE STUDY
FOR
TENTATIVE TRACT
MAP NO. 35853

December 5, 2018

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FOR REVIEW ONLY

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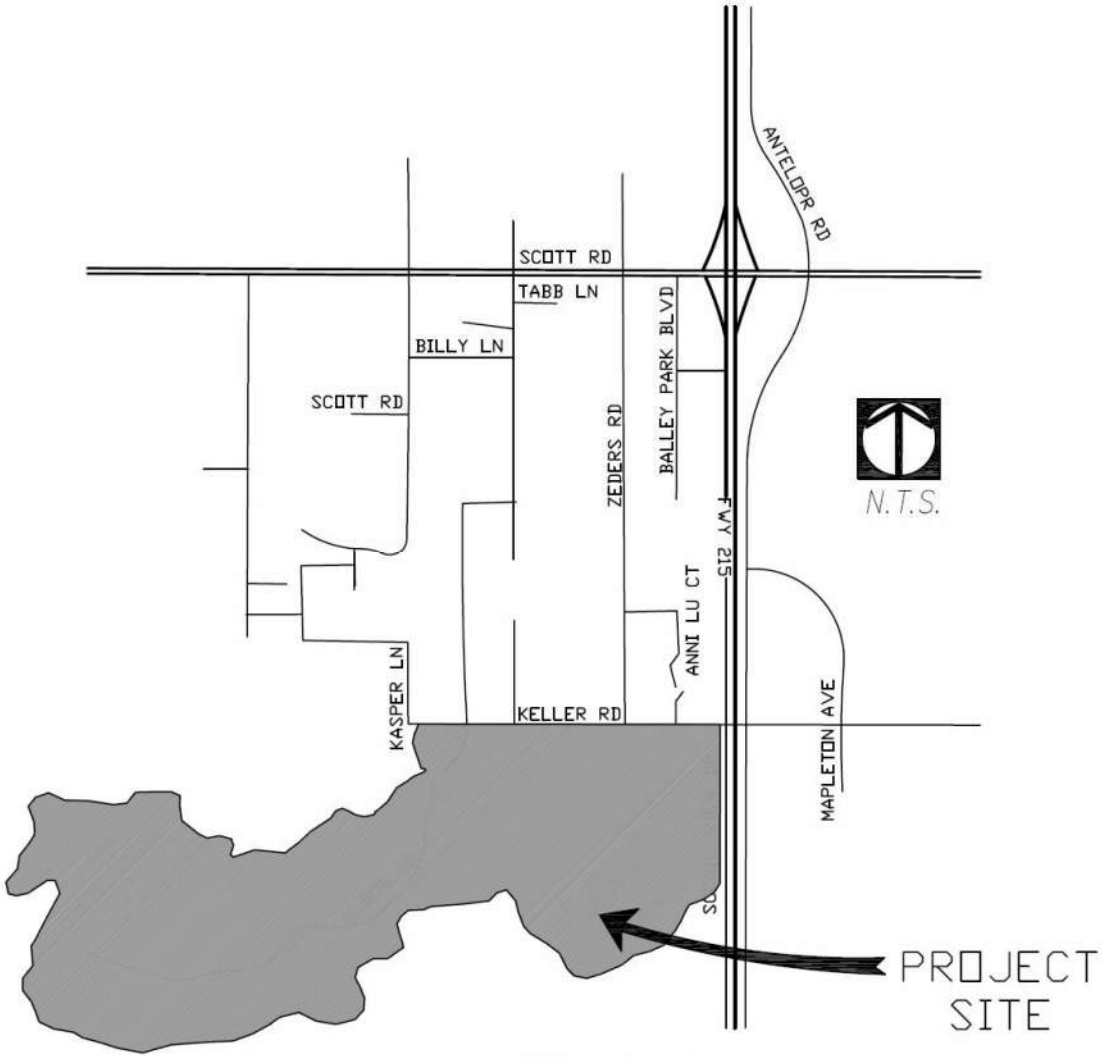
Caltrans As-Builts of Interstate 215 Storm Drain Facilities

Exhibits from AEI-CASC's October 5, 2001, *Hydrology Study, Bluestone Murrieta*

FOR REVIEW ONLY

INTRODUCTION

Tentative Tract Map 35853 is located immediately south of Keller Road and west of Interstate 215 in the city of Murrieta (see Vicinity Map). The tentative tract map by Michael Baker International covers approximately 957 gross acres, and proposes 497 single-family residential lots (5,500 square feet average lot size), 50 executive home sites (10,000 square feet average lot size), 193 multi-family units, a 17.1-acre community commercial area, and nearly 663 acres of open space. The project will also construct McElwain Road along the west side of Interstate 215 from Keller Road to the existing connection at Linnel Lane.



VICINITY MAP

The project site is currently undeveloped and moderately to steeply sloping towards the northeast. Under pre- and post-development conditions, the majority of the storm runoff from the project footprint and tributary area (identified as Major Basin 100 in the existing and proposed condition analyses) will be conveyed to a proposed culvert crossing Keller Road just west of Zeiders Road. This culvert outlets into a minor natural drainage channel (approximately 20-feet wide on average with a generally trapezoidal cross-section) that continues in a northeasterly

direction towards Interstate 215. The flow is conveyed across Interstate 215 in existing Caltrans culverts that are approximately 300 feet and 2,500 feet north of Keller Road. After the flow crosses Interstate 215, it is conveyed either east of towards the Kaiser project (see next paragraph) or northerly in a series of drainage facilities and ultimately enters Salt Creek within the Santa Ana watershed. The flow towards the Kaiser project is ultimately conveyed to the Mapleton project and its debris basin and two detention basins.

The remainder of the project runoff (from existing and proposed Major Basins 200 to 800) is conveyed easterly along or south of Keller Road and is within the Santa Margarita watershed. There are a series of culverts crossing Interstate 215 (the culverts from the Caltrans as-builts are shown on the work maps in the map pocket) that convey the runoff past the freeway. AEI-CASC's October 5, 2001, *Hydrology Study, Bluestone Murrieta,* was prepared for Tract 28533 (Murrieta Highlands), which is on the east side of Interstate 215 north of Keller Road (east of Mapleton Avenue). Relevant exhibits from the report are included in the map pocket and show that much of the flows from this portion TTM 35853 were anticipated to flow to Tract 28533. The exhibits show that Tract 28533 contains debris and detention basins that capture runoff from TTM 35853.

Furthermore, Michael Baker International prepared an August 8, 2016, *Technical Drainage Study Kaiser Permanente Murrieta Medical Center Phase 1,* for the Kaiser project east of Interstate 215 and north of Keller Road. This report references the AEI-CASC study and was designed assuming a 100-year flow rate of 210.8 cubic feet per second from Murrieta Hills towards Keller Road and Interstate 15. This report also accounts for 100 cfs from the Caltrans culvert 300 feet north of Keller Road mentioned in the above paragraph.

This drainage study contains 10- and 100-year existing and proposed condition hydrology and detention analyses for TTM 35853. The preliminary analyses in this report are at the tentative map level. More detailed analyses will be required for final design.

A drainage report was previously accepted by the city of Murrieta for the tentative map. The prior report contained a water quality basin between proposed condition rational method nodes 175 and 176 (Lot L) as well as an adjacent water quality basin between proposed condition rational method nodes 190 and 191 (Lot S). These water quality basins are near the west end of the project just south of Keller Road. Additional infiltration testing was performed at the basin locations and subsequent analyses showed that the Lot L basin could be eliminated and its tributary flows treated by the Lot S basin. This report is the same as the previously accepted report except that the hydrology has been updated to reflect removal of the Lot L basin.

HYDROLOGIC ANALYSES

The Riverside County Flood Control and Water Conservation District's (RCFCWCD) *Hydrology Manual* criteria were the basis for the hydrologic analyses. The CivilDesign rational method program was used to perform the analyses. The input parameters are summarized as follows and the supporting data is included in Appendix A:

- Intensity-Duration curve data: The Murrieta, Temecula, and Rancho California intensity-duration curve was selected

- Hydrologic soil groups: The hydrologic soil groups in the study area are nearly entirely "C" according to the *Hydrologic Soils Group Map for Romoland* and the *Hydrologic Soils Group Map for Murrieta*. There are small areas of B and D soils near the northeasterly corner of the site, which roughly average out to C soil. Based on this, Soil group C was assumed for the entire study area for the preliminary analyses in this report.

- Drainage areas, flow lengths and elevations: For the existing condition analyses, this information was determined from the flown 2-foot contour interval topographic mapping prepared for the site. There are two small tributary drainage areas to the south that are beyond the topographic mapping extents. USGS mapping was used for these areas. For the proposed condition analyses, the grading and drainage improvements proposed on TTM 35853 were used to model the drainage patterns within the development. TTM 35853 includes a dual drainage system in some locations to avoid commingling of natural with developed runoff, where feasible.

  An existing subdivision is located just beyond the easterly side of the southerly property boundary. Runoff from the tributary portion of the subdivision enters an existing basin prior to discharging towards the site. Attenuation from the basin was not modeled, which will yield slightly conservative (i.e., higher flow rates) results.

- Land Uses: The existing condition land uses are undeveloped and have primarily fair cover based on a review of aerial photographs and a site visit. However, the northeasterly portion of the site has been cleared and grubbed for agricultural uses. This area has been modeled with poor cover.

  Several land use categories were used for the proposed condition analyses. The undisturbed areas were modeled as undeveloped with fair cover. The on-site land uses within the single-family development footprint were primarily based on the single-family (1/4-acre) residential category. The parks and other large open areas within the single-family development were modeled as undeveloped with good cover. The apartment category was used for the proposed multi-family area and the commercial category was used for the proposed commercial area. The commercial category was also used for the paving of McElwain Road.

The 10- and 100-year existing and proposed condition rational method results are included in Appendix A and summarized in Table 1. The Rational Method Work Maps are in the map pocket at the back of this report. The overall study area was subdivided into eight major drainage basins under existing and proposed conditions: Major Basins 100, 200, 300, 400, 500, 600, 700, and 800. The rational method node numbers reflect the major basins, e.g., rational method node numbers from 0 to 199 are in Major Basin 100, node numbers in the 200's are in Major Basin 200, node numbers in the 300's are in Major Basin 300, etc. Major Basin 100 is tributary to an existing culvert under Keller Road. Major Basin 200 is tributary to the northeast corner of the site. Runoff from this major basin is ultimately conveyed to the existing debris and detention

basins constructed by the Bluestone Mapleton development. Major Basins 100 and 200 encompass the majority of the Tract 35853 development area.

Major Basin	Exist. Q10, cfs	Prop. Q10, cfs	Exist. Q100, cfs	Prop. Q100, cfs
100	472	489	774	781
200	125	216	196	341
300	205	194	337	319
400	17	18	27	28
500	7	8	11	12
600	30	21	46	32
700	12	20	18	31
800[1]	80	78	125	121

[1]Proposed condition based on sum of flows at Node 834 and 866

Table 1. Summary of Rational Method Results

Major Basins 300 through 800 are tributary to existing culverts along the easterly property line that cross Interstate 215. These major basins encompass the proposed McElwain Road alignment.

For proposed conditions, separate CivilDesign analyses were performed for Major Basin 100 and 200 since each of these major basins contains numerous routing and confluencing routines. A single analysis was performed for proposed condition Major Basins 300 through 800. For existing conditions, the Major Basin 100 through 800 analyses were combined in a single CivilDesign model since each major basin contains straightforward routing.

Table 1 indicates that the project will increase the 10- and 100-year flow rates by a fair amount at Major Basin 200. This is expected since the project will create a residential subdivision, multi-family development, and commercial development on mostly natural, undisturbed terrain within this major basin. The project will not increase the runoff from Major Basin 300, 600, or 800. The project will cause minor increases (less than 2 cubic feet per second during the 100-year event) at Major Basins 400 and 500. The project will cause a moderate increase at Major Basins 100 and 700. The increase in Major Basin 100 is less than 1 percent and can be mitigated by its eight bioretention basins. The increase in Major Basin 700 can be mitigated by directing a portion of the Major Basin 700 runoff to Major Basin 600.

DETENTION ANALYSES

Table 1 indicates that the proposed project will increase the 100-year storm runoff by a relatively large amount at Major Basin 200. Detention basins will be incorporated into the project to mitigate for the increases. The 1-, 3-, 5-, and 24-hour duration for 2-, 5-, and 10-year storms is the standard detention criteria adopted by the City of Murrieta. In order to size the detention basins for tentative map purposes, synthetic hydrograph analyses were used to determine the required 10-year, 24-hour detention volume. The 10-year, 24-hour detention volume typically

requires the largest storage volume of the 12 detention events, so is commonly used for tentative-map level analyses.

The CivilDesign Unit Hydrograph program was used for the synthetic hydrograph analyses. Separate analyses were performed to model the overall 10-year, 1-hour storm event for existing and proposed condition Major Basin 200. The lag time was adjusted in each analysis until the 10-year, 1-hour unit hydrograph peak flow rate matched the 10-year rational method peak flow rate. This calibrates the unit hydrograph results to the rational method results. A 10-year, 24-hour analysis was then performed based on the calibrated lag time for existing and proposed condition Major Basin 200. The 10-year, 24-hour peak flow rates are summarized in Table 2.

Major Basin	Exist. 10-Year, 24-Hour Flow Rate, cfs	Prop. 10-Year, 24-Hour Flow Rate, cfs
200	23.4	48.6[1]

[1]Major Basin 100 and 200 drainage areas can be adjusted during final engineering, if needed.

Table 2. Summary of 10-Year, 24-Hour Synthetic Hydrograph Results

From Table 2, the 10-year, 24-hour storm needs to be attenuated by approximately 25 cfs in Major Basin 200. A series of interconnected basins is proposed above rational method node 234 in Major Basin 200. Synthetic hydrograph analyses were performed to determine the proposed condition 10-year, 24-hour storm at rational method node 234. The same lag time calibration procedure was used as described above and the results indicate that the entire 10-year, 24-hour storm needs to be detained. The 10-year, 24-hour proposed condition synthetic hydrograph results were then input a HEC-1 analysis with minimal outflow (1 cfs) to determine the conceptual detention volume necessary to reduce the flow rate to 1 cfs. The results indicate that at least 8 acre-feet will be required in the detention basins above node 234. The tentative map provides for these volumes. Detention can also be provided by detention basins at nodes 252 and 254. These can be considered during final engineering. The synthetic hydrograph and HEC-1 analyses are included in Appendix B for Major Basin 200. The ultimate storage volume will need to be larger than the idealized conceptual results to account for freeboard and the outlet works design.

The project runoff from Major Basin 200 will be conveyed easterly along Keller Road. Michael Baker International prepared an August 8, 2016, *Technical Drainage Study Kaiser Permanente Murrieta Medical Center Phase 1,* for the Kaiser project east of Interstate 215 and north of Keller Road. The project has been approved and assumes that 210.8 cfs is contributed from Major Basin 200 at Murrieta Hills based on a 2001 AEI-CASC study. The 2001 study accounts for flow bypass due to deficiencies in the existing culverts crossing Interstate 215 along Murrieta Hills. Per Table 1, this current report determined that the existing condition flow rate from Major Basin 200 is 196 cfs, which similar to but slightly lower than the 2001 study. A detention analysis was performed as follows to show that the project can reduce its proposed condition flow rate to the level anticipated by the Kaiser project. A 100-year, 1-hour synthetic hydrograph analysis was performed to generate a hydrograph at rational method node 234. The lag time calibration procedure described in the above paragraph was used to cause the hydrograph peak to

match the rational method peak. A detention analysis was then performed using the hydrograph to verify that Murrieta Hills can detain the proposed condition 100-year flow rate to the level anticipated by the Kaiser project. The analysis assumed that the proposed condition flow rate needs to be detained to the lower 196 cfs value, i.e., the 100-year flow rate from Major Basin 200 must be detained from 341 to 196 cfs or by 145 cfs. The results are included in Appendix B assuming detention within the basins above node 234 and show that 5.5 acre-feet of storage volume is needed. This is less than the 8 acre-feet require for the 10-year, 24-hour detention. Therefore, the 10-year, 24-hour detention volume can also meet the 100-year, 1-hour volume requirement.

There are minor flow increases at Major Basins 400 and 500. As discussed above, the increases are less than 2 cfs for the 100-year event. The increases will be less than this for the 10-year, 24-hour detention criteria. Since the increases are small, conceptual analyses have not been performed. The minor increases can likely be mitigated by bioretention basins serving these areas during final engineering. Finally, as mentioned above, the small percentage increase from Major Basin 100 can be attenuated in its bioretention basins, so additional analyses have not been performed.

CONCLUSION

Hydrologic analyses have been performed for Tentative Tract Map 35853. The analyses determined the existing and proposed condition 10- and 100-year flow rates. Since the analyses showed that development will increase storm runoff, conceptual detention analyses were performed to demonstrate that the project is capable of meeting the storage requirements for Major Basins 200, which has the greatest flow rate increase. The site is a rather large development and provides for detention opportunities at several locations other than those analyzed in this report. During final engineering, additional detention basins can be incorporated at various locations throughout the site as needed or desired so that the developed flows will be equal to or less than that the pre-developed flows when they leave the site (see Table 1 and associated discussion).

During an initial meeting and correspondence with City of Murrieta staff, debris basins were determined to be not required for the smaller hillside areas tributary to the development area. These areas are both south and north of the development area and are 30 acres in size or less. On the other hand, a debris basin is required for the upper portion of the main stream that flows in a northeasterly direction through the middle of the development area. The debris basin will be installed at the stream crossing near rational method node 24. The natural undisturbed area tributary to this location covers just over 190 acres. AEI-CASC Engineering's October 5, 2001, *Hydrology Study, Bluestone Murrieta,* contains debris calculations using the modified Tatum Method. The AEI-CASC study covers the general area in the vicinity of Tract 35853. The analyses are attached following this report text and predict a debris volume of 2.82 acre-feet for a 187-acre area. The proposed debris basin can accommodate this volume. Therefore, the tentative map is capable of capturing the debris flows. During final engineering, a trash/debris rack may be required to be integrated into the debris basin.

The City of Murrieta has also mentioned that a debris basin will be required at proposed condition node 303. In addition, an oversized crossing may be required for animal passage (subject to resource agency and MSHCP permit requirements).

The primary natural watercourse that flows northeasterly through the site supports existing oak trees. The oak trees are concentrated downstream of proposed roadway crossing of the watercourse, which is near the westerly third of the project. The rational method analyses show that the existing and proposed condition 10-year flow rates just downstream of the crossing are 246 cfs (existing condition node 106) and 300 cfs (proposed condition node 26), respectively. The 100-year flow rates are 400 and 470 cfs, respectively. Therefore, the project will not reduce the flow rate along the watercourse. There is a concentration of oak trees along a lateral drainage course between proposed condition nodes 32 and 40. The drainage area tributary to this drainage course is generally being maintained by the project. Based on this, the project will maintain historical flows to the oak trees.

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SHEET ____ OF ____

ENGINEER _____ DATE _____ JOB # _____ CALC. BY _____

SUBJECT _____ CHECKED BY _____

MODIFIED TATUM METHOD

$0.1 < A < 3.0\ mi^2$ ∴ USE EQN# 1

$$LOG\ D_y = 0.65\ (LOG P) + 0.62\ (LOG RR) + 0.18\ (LOG A) + 0.12(FF)$$

WHERE D_y = DEBRIS YIELD (yd^3/mi^2)

P = MAX. 1-HR PRECIPITATION * 100

RR = RELIEF RATIO (ft/mi)

FF = FIRE FACTOR

LENGTH OF LONGEST WATER COURSE = 6,230 ft.

Δ ELEV = 501'

$$RR = \frac{\Delta ELEV}{L} = \frac{501'}{6{,}230} * 5{,}280\ ft/mi = \underline{424.60\ ft/mi}$$

$P = P_{1HR} * 100$

$P = 1.30 * 100 = \underline{130}$

$A = 187\ AC. \approx \underline{0.29\ mi^2}$

$FF = \underline{6.5}$

∴ $LOG\ D_y = 0.65\ LOG\ 130 + 0.62\ LOG\ 424.60 + 0.18\ LOG\ 187 + 0.12 * 6.5$

$LOG\ D_y = 4.19$

$D_y = 15571\ yd^3/mi^2 \approx 15{,}600\ yd^3/mi^2$

$D = D_y A = 15{,}600 * 0.292 = 4555.2\ yd^3 = \underline{2.82\ AC\text{-}FT}$

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SHEET ____ OF ____

ENGINEER _____ DATE _____ JOB # _____ CALC. BY _____

SUBJECT _____ CHECKED BY _____

$0.1 < A < 3.0\ mi^2$ ∴ USE EQN # 1

GIVEN: Δ ELEV = 610.6 ft
L = 11,400 ft = 2.16 mi
A = 481 AC. ≈ 0.752 mi^2
FF = 6.5
P = 130

$$RR = \frac{610.6}{2.16} = 282.8$$

$$\text{LOG } D_Y = 0.65 \text{ LOG } 130 + 0.62 \text{ LOG } 282.8 + 0.18 \text{ LOG } 481 + 0.12 * 6.5$$

$$\text{LOG } D_Y = 4.16$$

$$D_Y = 14{,}347 \approx 14{,}400\ yd^3/mi^2$$

$$D = D_Y A = 14{,}400 * 0.752$$

$$D = 10829\ yd^3 = \underline{6.71\ ac\text{-}ft}$$

FROM: SPLIT FLOW $Q_S = 275$ CFS $Q_T = 684.3$ CFS.

$$D_S = \left(\frac{Q_S}{Q_T}\right) D = \frac{275}{684.3} * 6.71\ ac\text{-}ft.$$

$$D_S = 2.70\ ac\text{-}ft.$$

BULKING FACTOR

$D_Y = 16{,}000$ $F = 1 + \left(\frac{D_Y}{120{,}000}\right) = 1 + \left(\frac{16{,}000}{120{,}000}\right)$ $F = 1.13 \approx \underline{1.15}$

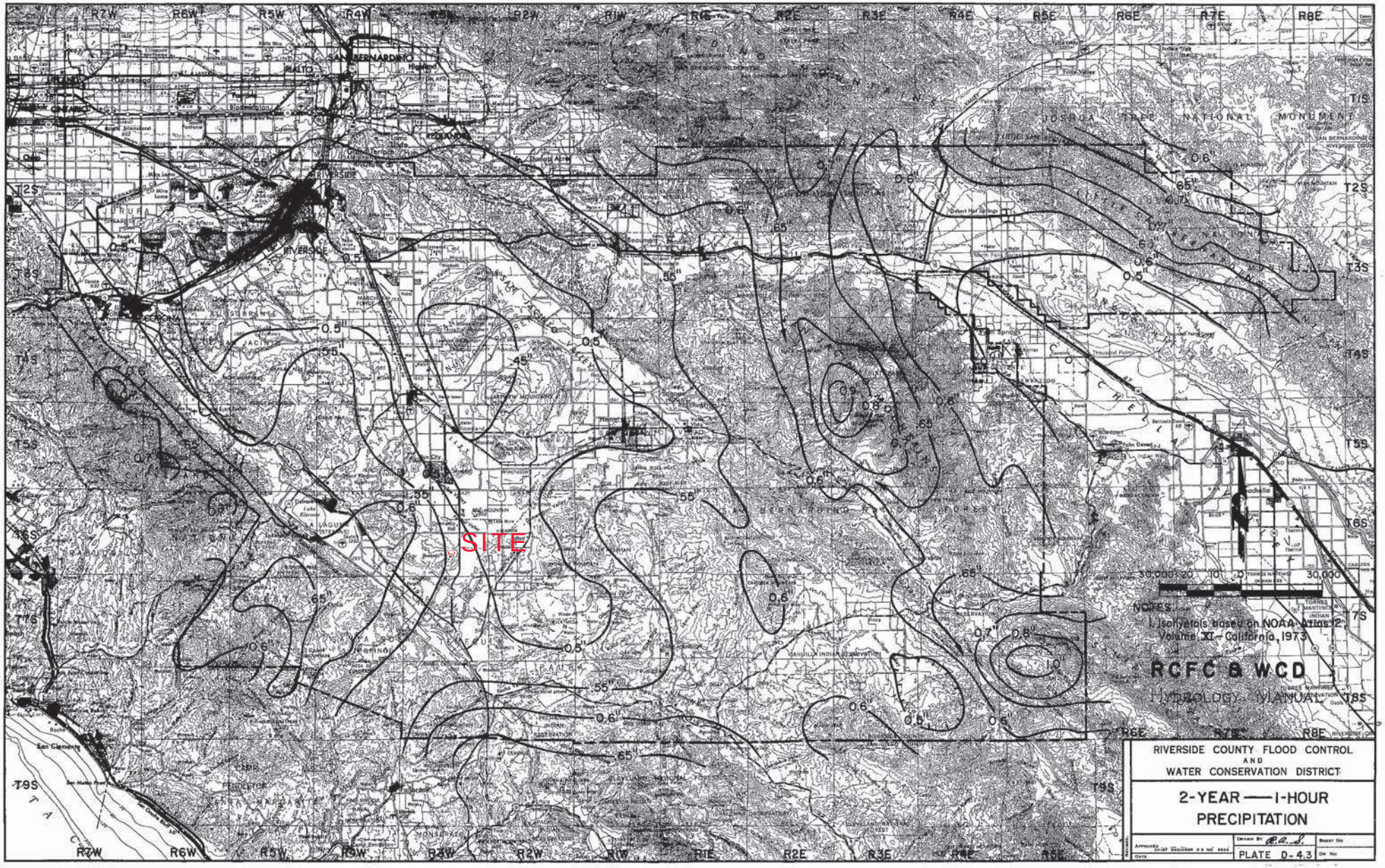
APPENDIX A

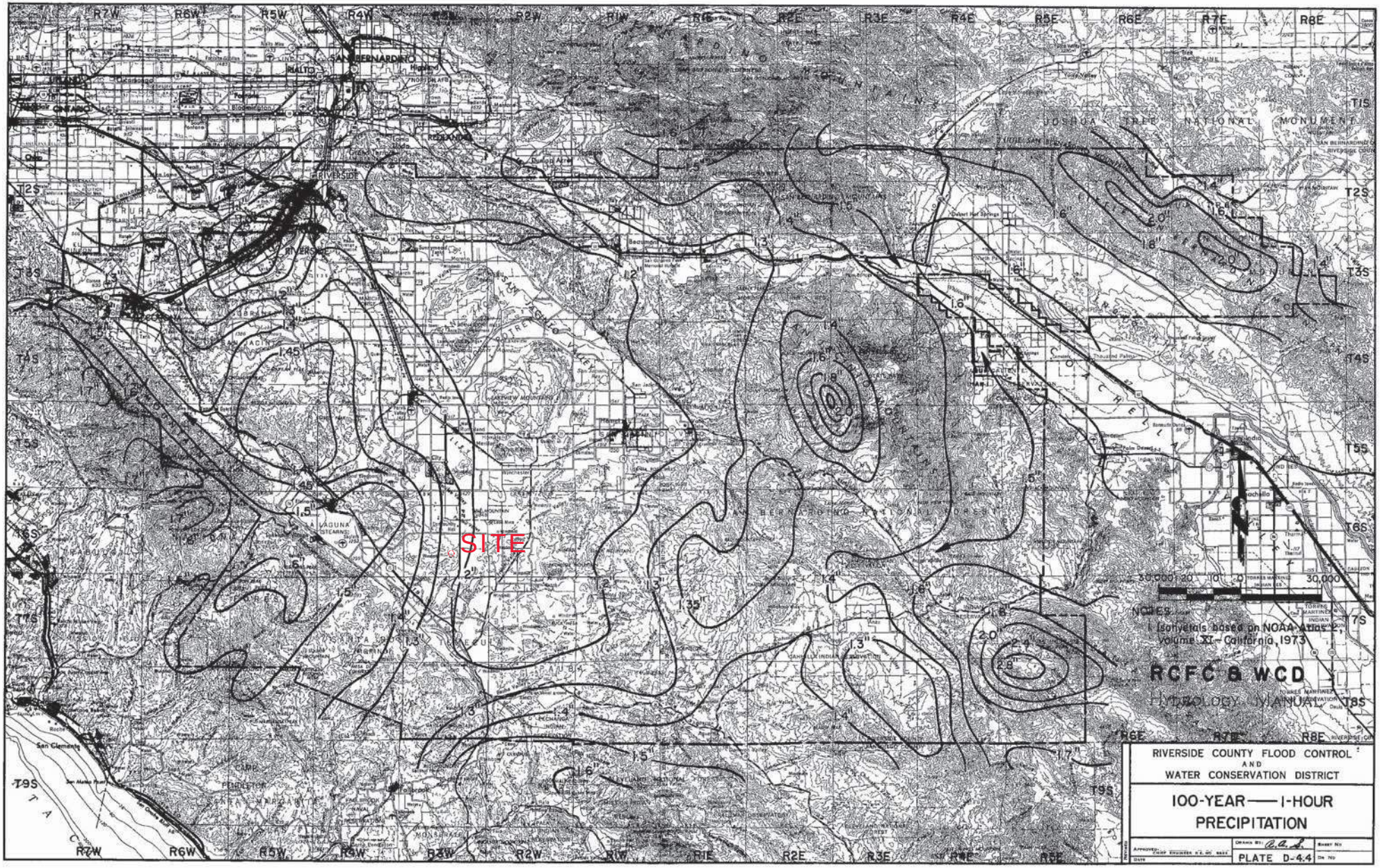
RATIONAL METHOD
SUPPORT MATERIAL AND ANALYSES

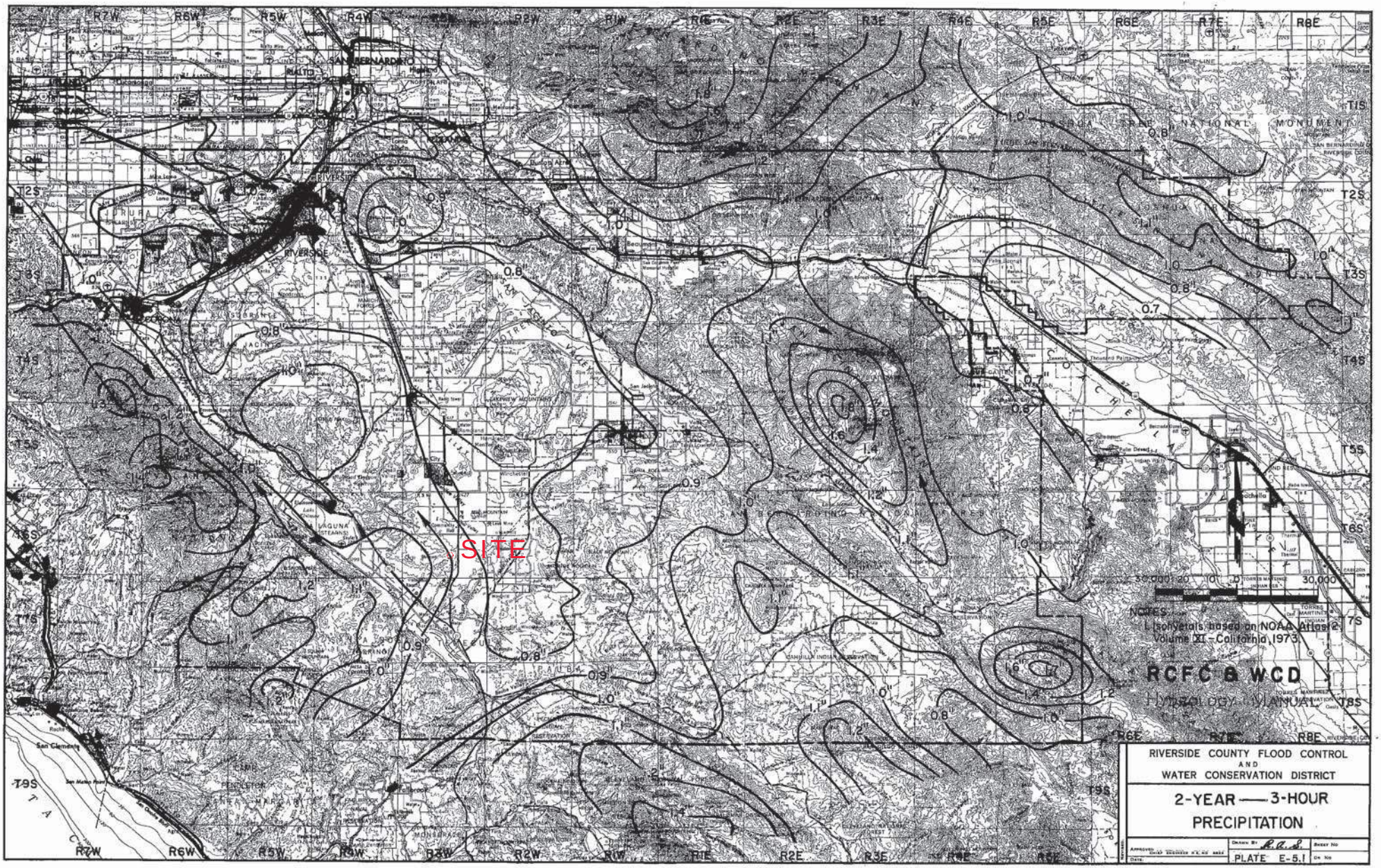
RAINFALL INTENSITY—INCHES PER HOUR

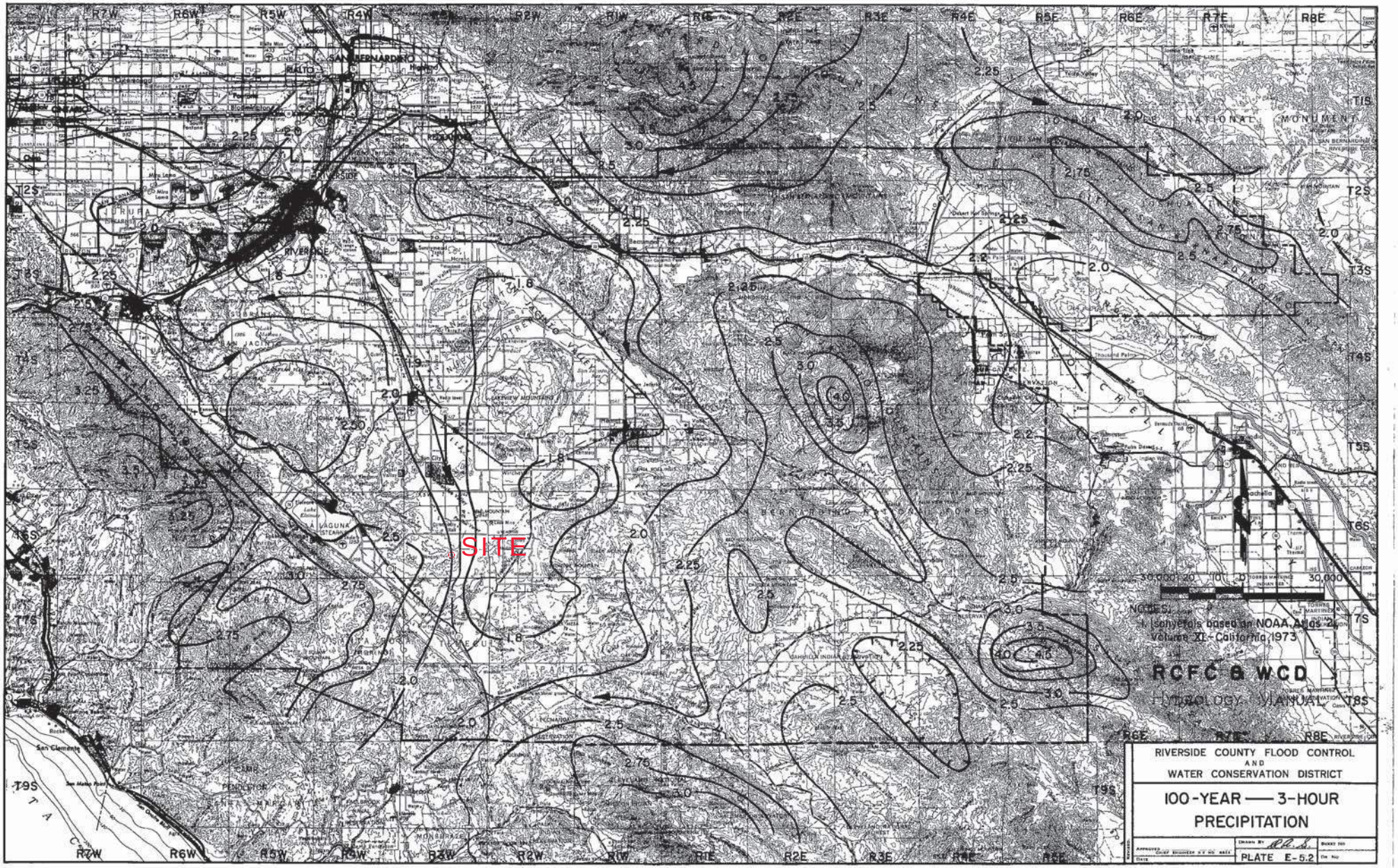
MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

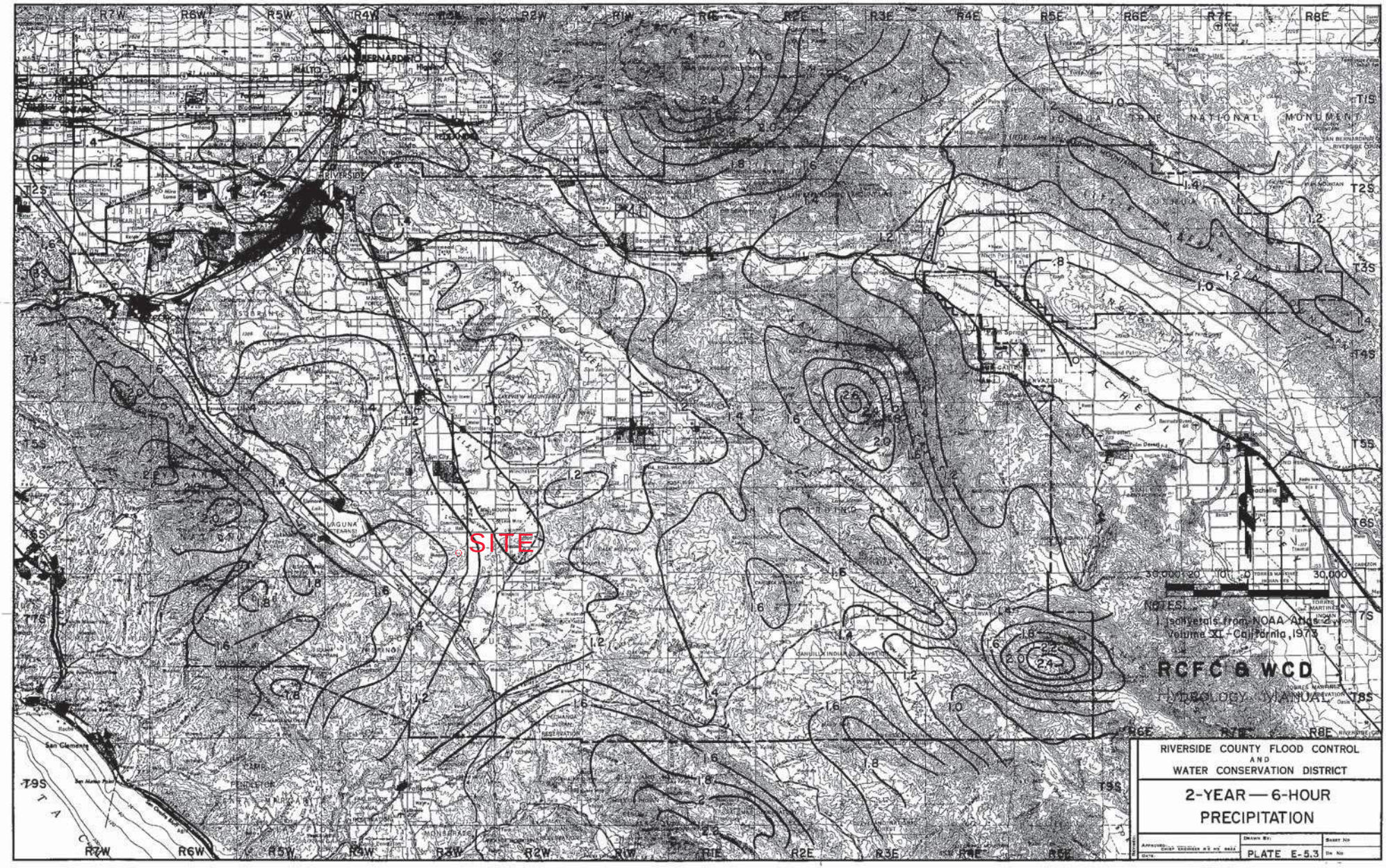
STANDARD
INTENSITY-DURATION
CURVES DATA

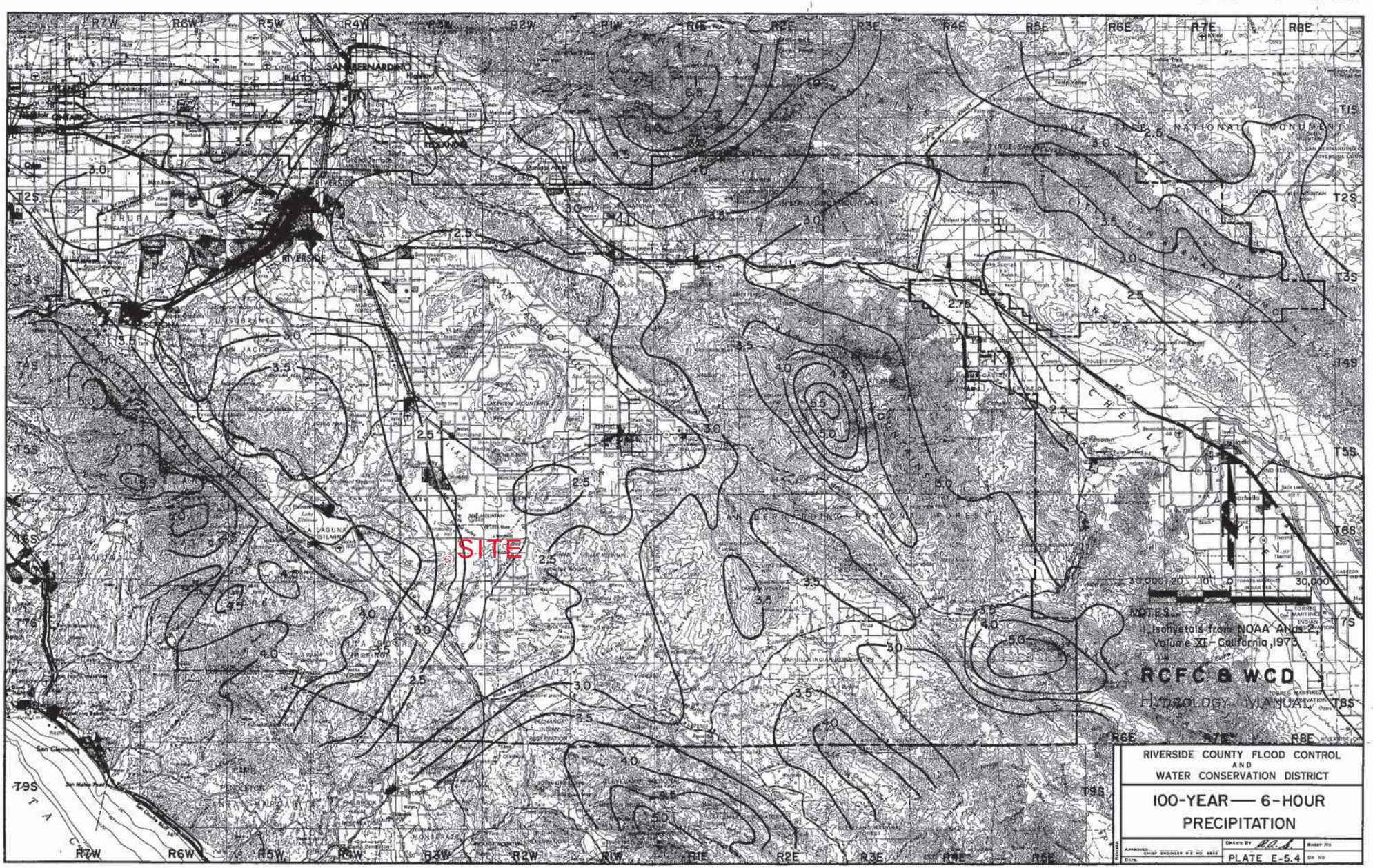

SITE
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3

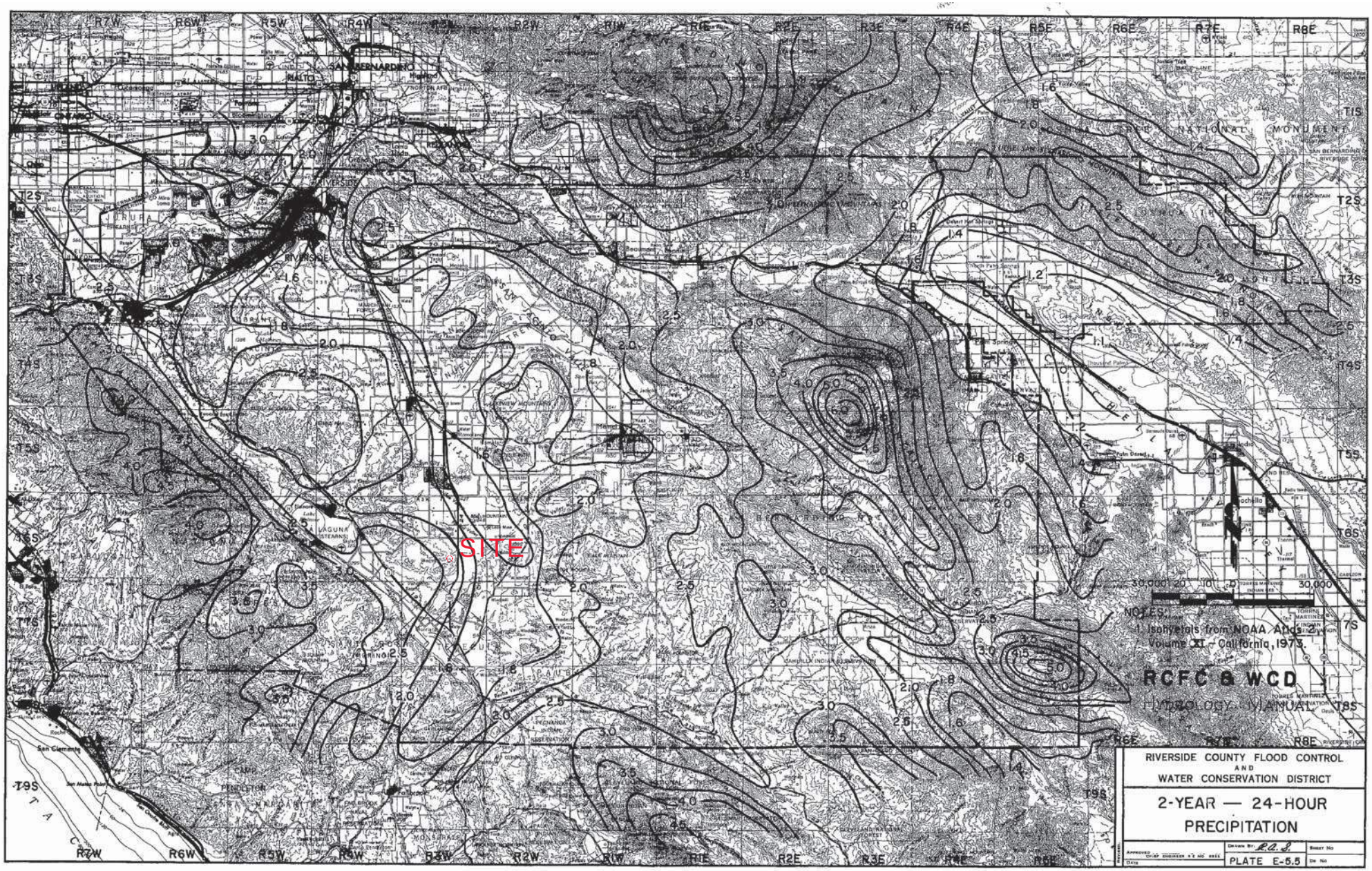

SITE
Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.4

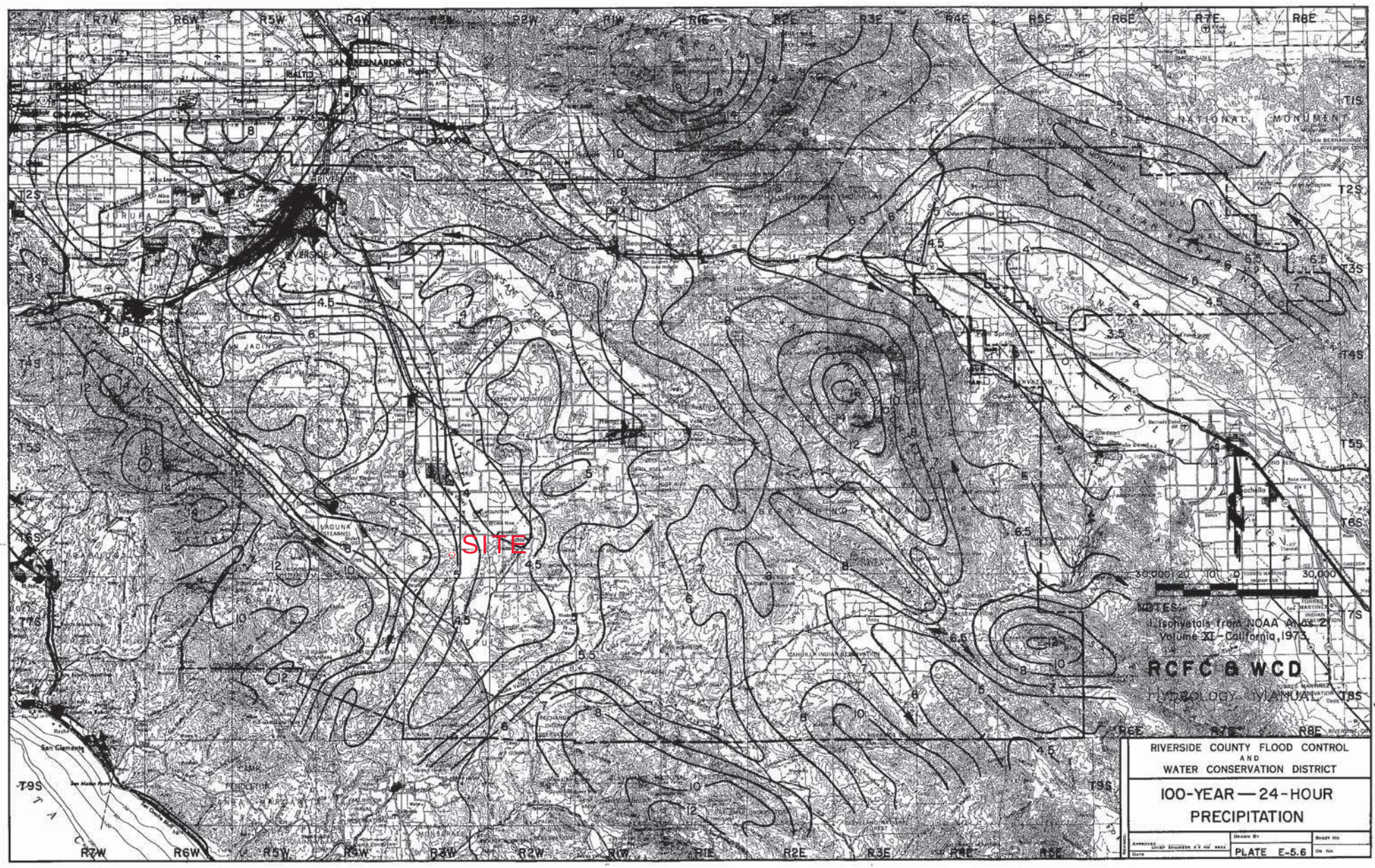

SITE
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 3-HOUR PRECIPITATION
PLATE E-5.1
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973.

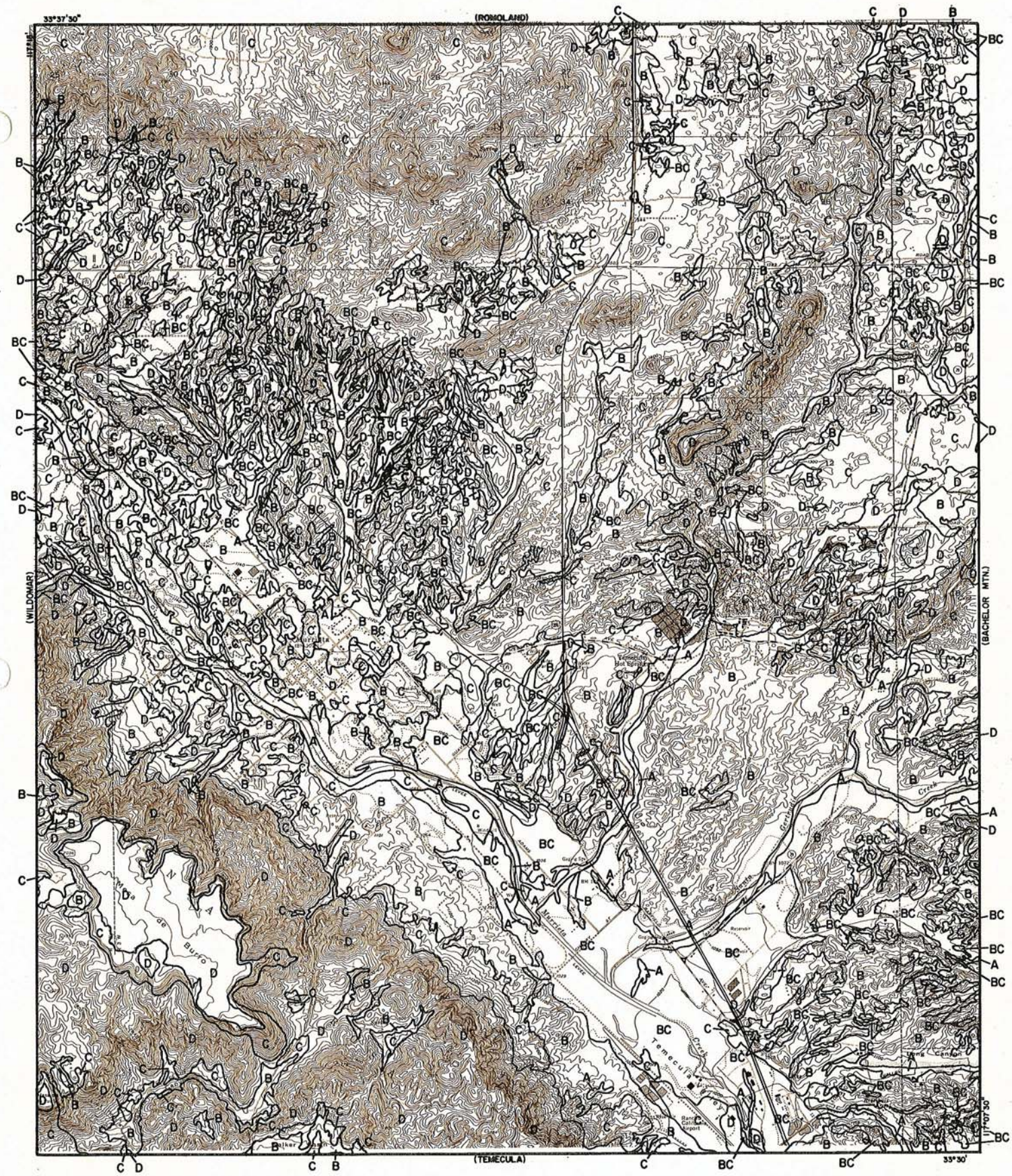

SITE
NOTES:
1. Isohyetals based on NOAA Atlas 2,
Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 3-HOUR
PRECIPITATION
PLATE E-5.2


SITE
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 6-HOUR PRECIPITATION
PLATE E-5.3


SITE
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 6-HOUR PRECIPITATION
PLATE E-5.4
NOTES
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL


SITE
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 24-HOUR PRECIPITATION
PLATE E-5.5


SITE
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 24-HOUR PRECIPITATION
PLATE E-5.6



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR MURRIETA

PLATE C-1.52



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

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 12/06/17 File:ex10.out

Tentative Tract 35853
Existing Conditions
Major Basins 100, 200, 300, 400, 500, 600, 700, and 800
10-Year Flow Rate

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

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

Program License Serial Number 4028

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.880(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 100.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 737.000(Ft.)
Top (of initial area) elevation = 2100.000(Ft.)
Bottom (of initial area) elevation = 1988.000(Ft.)
Difference in elevation = 112.000(Ft.)
Slope = 0.15197 s(percent)= 15.20
TC = k(0.710)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   14.518 min.
Rainfall intensity =      1.921(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.760
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.592(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1988.000(Ft.)
Downstream point elevation =  1838.300(Ft.)
Channel length thru subarea  =  3016.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     58.738(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     58.738(CFS)
Depth of flow =   1.249(Ft.), Average velocity =   6.972(Ft/s)
Channel flow top width =   10.493(Ft.)
Flow Velocity =    6.97(Ft/s)
Travel time  =    7.21 min.
Time of concentration =   21.73 min.

Sub-Channel No. 1 Critical depth =      1.469(Ft.)
  '     '       '     Critical flow top width =     11.813(Ft.)
  '     '       '     Critical flow velocity=    5.400(Ft/s)
  '     '       '     Critical flow area =     10.878(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.731
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.539(In/Hr) for a    10.0 year storm
Subarea runoff =     88.222(CFS) for     78.390(Ac.)
Total runoff =    102.814(CFS)   Total area =      88.390(Ac.)
```

```
Depth of flow =   1.621(Ft.), Average velocity =   8.065(Ft/s)

Sub-Channel No. 1 Critical depth =      1.922(Ft.)
  '     '       '     Critical flow top width =     14.531(Ft.)
  '     '       '     Critical flow velocity=    6.103(Ft/s)
  '     '       '     Critical flow area =     16.846(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      106.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1838.300(Ft.)
Downstream point elevation =  1767.000(Ft.)
Channel length thru subarea  =  2322.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    174.550(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    174.550(CFS)
Depth of flow =   2.290(Ft.), Average velocity =   7.725(Ft/s)
Channel flow top width =   16.738(Ft.)
Flow Velocity =    7.72(Ft/s)
Travel time  =    5.01 min.
Time of concentration =   26.74 min.

Sub-Channel No. 1 Critical depth =      2.469(Ft.)
  '     '       '     Critical flow top width =     17.813(Ft.)
  '     '       '     Critical flow velocity=    6.794(Ft/s)
  '     '       '     Critical flow area =     25.690(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.715
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.373(In/Hr) for a    10.0 year storm
Subarea runoff =    143.416(CFS) for    146.070(Ac.)
Total runoff =    246.229(CFS)   Total area =     234.460(Ac.)
Depth of flow =   2.660(Ft.), Average velocity =   8.429(Ft/s)

Sub-Channel No. 1 Critical depth =      2.891(Ft.)
  '     '       '     Critical flow top width =     20.344(Ft.)
  '     '       '     Critical flow velocity=    7.298(Ft/s)
  '     '       '     Critical flow area =     33.739(Sq.Ft)
```

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Process from Point/Station      106.000 to Point/Station      108.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1767.000(Ft.)
Downstream point elevation =  1592.000(Ft.)
Channel length thru subarea  =  4790.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =    342.531(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    342.531(CFS)
Depth of flow =   2.349(Ft.), Average velocity =   8.709(Ft/s)
Channel flow top width =   28.488(Ft.)
Flow Velocity =    8.71(Ft/s)
Travel time  =    9.17 min.
Time of concentration =   35.90 min.

Sub-Channel No. 1 Critical depth =      2.656(Ft.)
  '     '       '     Critical flow top width =     31.563(Ft.)
  '     '       '     Critical flow velocity=    7.054(Ft/s)
  '     '       '     Critical flow area =     48.560(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.690
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.167(In/Hr) for a    10.0 year storm
Subarea runoff =    192.540(CFS) for    238.950(Ac.)
Total runoff =    438.770(CFS)   Total area =     473.410(Ac.)
Depth of flow =   2.616(Ft.), Average velocity =   9.276(Ft/s)

Sub-Channel No. 1 Critical depth =      2.969(Ft.)
  '     '       '     Critical flow top width =     34.688(Ft.)
  '     '       '     Critical flow velocity=    7.448(Ft/s)
  '     '       '     Critical flow area =     58.911(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    473.410(Ac.)
Runoff from this stream =    438.770(CFS)
Time of concentration =   35.90 min.
Rainfall intensity =     1.167(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   959.000(Ft.)
Top (of initial area) elevation =  1781.000(Ft.)
Bottom (of initial area) elevation =  1654.000(Ft.)
Difference in elevation =   127.000(Ft.)
Slope =    0.13243  s(percent)=      13.24
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.580 min.
Rainfall intensity =      1.785(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.751
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.864(CFS)
Total initial stream area =        8.850(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      114.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1654.000(Ft.)
Downstream point elevation =  1584.300(Ft.)
Channel length thru subarea  =  2050.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     26.753(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     26.753(CFS)
Depth of flow =   0.936(Ft.), Average velocity =   4.923(Ft/s)
Channel flow top width =    8.614(Ft.)
Flow Velocity =    4.92(Ft/s)
Travel time  =    6.94 min.
Time of concentration =   23.52 min.
```

```
Sub-Channel No. 1 Critical depth =      0.984(Ft.)
  '     '       '     Critical flow top width =      8.906(Ft.)
  '     '       '     Critical flow velocity=    4.565(Ft/s)
  '     '       '     Critical flow area =      5.860(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.784
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.473(In/Hr) for a    10.0 year storm
Subarea runoff =     29.693(CFS) for     25.700(Ac.)
Total runoff =     41.557(CFS)   Total area =      34.550(Ac.)
Depth of flow =   1.159(Ft.), Average velocity =   5.537(Ft/s)

Sub-Channel No. 1 Critical depth =      1.234(Ft.)
  '     '       '     Critical flow top width =     10.406(Ft.)
  '     '       '     Critical flow velocity=    5.022(Ft/s)
  '     '       '     Critical flow area =      8.274(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      114.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     34.550(Ac.)
Runoff from this stream =     41.557(CFS)
Time of concentration =   23.52 min.
Rainfall intensity =     1.473(In/Hr)
Summary of stream data:

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


1      438.770     35.90                 1.167
2       41.557     23.52                 1.473
Largest stream flow has longer time of concentration
Qp =    438.770 + sum of
       Qb         Ia/Ib
       41.557 *    0.792 =     32.931
Qp =    471.700

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

```
     438.770      41.557
Area of streams before confluence:
      473.410       34.550
Results of confluence:
Total flow rate =    471.700(CFS)
Time of concentration =    35.904 min.
Effective stream area after confluence =    507.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      204.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   570.000(Ft.)
Top (of initial area) elevation =  2035.000(Ft.)
Bottom (of initial area) elevation =  1812.000(Ft.)
Difference in elevation =   223.000(Ft.)
Slope =    0.39123  s(percent)=      39.12
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.842 min.
Rainfall intensity =      2.255(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.778
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.050(CFS)
Total initial stream area =        4.020(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      210.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1812.000(Ft.)
Downstream point elevation =  1640.000(Ft.)
Channel length thru subarea  =  1640.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     34.490(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     34.490(CFS)
Depth of flow =   0.802(Ft.), Average velocity =   7.951(Ft/s)
Channel flow top width =    7.814(Ft.)
Flow Velocity =    7.95(Ft/s)
Travel time  =    3.44 min.
```

```
Time of concentration =   14.28 min.

Sub-Channel No. 1 Critical depth =      1.117(Ft.)
  '     '       '     Critical flow top width =      9.703(Ft.)
  '     '       '     Critical flow velocity=    4.861(Ft/s)
  '     '       '     Critical flow area =      7.096(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.761
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.938(In/Hr) for a    10.0 year storm
Subarea runoff =     54.780(CFS) for     37.150(Ac.)
Total runoff =     61.831(CFS)   Total area =      41.170(Ac.)
Depth of flow =   1.070(Ft.), Average velocity =   9.306(Ft/s)

Sub-Channel No. 1 Critical depth =      1.500(Ft.)
  '     '       '     Critical flow top width =     12.000(Ft.)
  '     '       '     Critical flow velocity=    5.496(Ft/s)
  '     '       '     Critical flow area =     11.250(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      212.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1640.000(Ft.)
Downstream point elevation =  1580.000(Ft.)
Channel length thru subarea  =  1902.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     82.751(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     82.751(CFS)
Depth of flow =   1.628(Ft.), Average velocity =   6.445(Ft/s)
Channel flow top width =   12.770(Ft.)
Flow Velocity =    6.45(Ft/s)
Travel time  =    4.92 min.
Time of concentration =   19.20 min.

Sub-Channel No. 1 Critical depth =      1.734(Ft.)
  '     '       '     Critical flow top width =     13.406(Ft.)
  '     '       '     Critical flow velocity=    5.816(Ft/s)
  '     '       '     Critical flow area =     14.227(Sq.Ft)
```

```
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.647(In/Hr) for a    10.0 year storm
Subarea runoff =     41.790(CFS) for     31.910(Ac.)
Total runoff =    103.621(CFS)   Total area =      73.080(Ac.)
Depth of flow =   1.804(Ft.), Average velocity =   6.830(Ft/s)

Sub-Channel No. 1 Critical depth =      1.922(Ft.)
  '     '       '     Critical flow top width =     14.531(Ft.)
  '     '       '     Critical flow velocity=    6.151(Ft/s)
  '     '       '     Critical flow area =     16.846(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      212.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     73.080(Ac.)
Runoff from this stream =    103.621(CFS)
Time of concentration =   19.20 min.
Rainfall intensity =     1.647(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      216.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   976.000(Ft.)
Top (of initial area) elevation =  1750.000(Ft.)
Bottom (of initial area) elevation =  1602.000(Ft.)
Difference in elevation =   148.000(Ft.)
Slope =    0.15164  s(percent)=      15.16
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.251 min.
Rainfall intensity =      1.805(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.752
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
```

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Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.619(CFS)
Total initial stream area =        7.820(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      218.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1602.000(Ft.)
Downstream point elevation =  1586.000(Ft.)
Channel length thru subarea  =   678.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     16.083(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     16.083(CFS)
Depth of flow =   0.795(Ft.), Average velocity =   3.754(Ft/s)
Channel flow top width =    7.772(Ft.)
Flow Velocity =    3.75(Ft/s)
Travel time  =    3.01 min.
Time of concentration =   19.26 min.

Sub-Channel No. 1 Critical depth =      0.750(Ft.)
  '     '       '     Critical flow top width =      7.500(Ft.)
  '     '       '     Critical flow velocity=    4.085(Ft/s)
  '     '       '     Critical flow area =      3.938(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.644(In/Hr) for a    10.0 year storm
Subarea runoff =     10.874(CFS) for      8.320(Ac.)
Total runoff =     21.493(CFS)   Total area =      16.140(Ac.)
Depth of flow =   0.919(Ft.), Average velocity =   4.062(Ft/s)

Sub-Channel No. 1 Critical depth =      0.875(Ft.)
  '     '       '     Critical flow top width =      8.250(Ft.)
  '     '       '     Critical flow velocity=    4.367(Ft/s)
  '     '       '     Critical flow area =      4.922(Sq.Ft)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      218.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.140(Ac.)
Runoff from this stream =     21.493(CFS)
Time of concentration =   19.26 min.
Rainfall intensity =     1.644(In/Hr)
Summary of stream data:

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


1      103.621     19.20                1.647
2       21.493     19.26                1.644
Largest stream flow has longer or shorter time of concentration
Qp =    103.621 + sum of
        Qa          Tb/Ta
        21.493 *    0.997 =     21.423
Qp =    125.044

Total of 2 streams to confluence:
Flow rates before confluence point:
     103.621      21.493
Area of streams before confluence:
       73.080       16.140
Results of confluence:
Total flow rate =    125.044(CFS)
Time of concentration =    19.198 min.
Effective stream area after confluence =     89.220(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   527.000(Ft.)
Top (of initial area) elevation =  1950.000(Ft.)
Bottom (of initial area) elevation =  1820.000(Ft.)
Difference in elevation =   130.000(Ft.)
Slope =    0.24668  s(percent)=      24.67
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.523 min.
Rainfall intensity =      2.181(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.770(CFS)
Total initial stream area =        4.010(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1820.000(Ft.)
Downstream point elevation =  1785.000(Ft.)
Channel length thru subarea  =  1235.000(Ft.)
Channel base width    =   24.000(Ft.)
Slope or 'Z' of left channel bank =   0.100
Slope or 'Z' of right channel bank =   0.100
Estimated mean flow rate at midpoint of channel =     17.344(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     17.344(CFS)
Depth of flow =   0.182(Ft.), Average velocity =   3.974(Ft/s)
Channel flow top width =   24.036(Ft.)
Flow Velocity =    3.97(Ft/s)
Travel time  =    5.18 min.
Time of concentration =   16.70 min.

Sub-Channel No. 1 Critical depth =      0.254(Ft.)
  '     '       '     Critical flow top width =     24.051(Ft.)
  '     '       '     Critical flow velocity=    2.843(Ft/s)
  '     '       '     Critical flow area =      6.100(Sq.Ft)

 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.778(In/Hr) for a    10.0 year storm
Subarea runoff =     21.063(CFS) for     15.060(Ac.)
Total runoff =     27.833(CFS)   Total area =      19.070(Ac.)
Depth of flow =   0.242(Ft.), Average velocity =   4.793(Ft/s)

Sub-Channel No. 1 Critical depth =      0.348(Ft.)
  '     '       '     Critical flow top width =     24.070(Ft.)
  '     '       '     Critical flow velocity=    3.331(Ft/s)
  '     '       '     Critical flow area =      8.356(Sq.Ft)
```

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Process from Point/Station      302.000 to Point/Station      304.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1785.000(Ft.)
Downstream point elevation =  1606.000(Ft.)
Channel length thru subarea  =  3891.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    116.347(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    116.347(CFS)
Depth of flow =   1.745(Ft.), Average velocity =   8.095(Ft/s)
Channel flow top width =   13.471(Ft.)
Flow Velocity =    8.09(Ft/s)
Travel time  =    8.01 min.
Time of concentration =   24.71 min.

Sub-Channel No. 1 Critical depth =      2.031(Ft.)
  '     '       '     Critical flow top width =     15.188(Ft.)
  '     '       '     Critical flow velocity=    6.299(Ft/s)
  '     '       '     Critical flow area =     18.472(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.722
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.433(In/Hr) for a    10.0 year storm
Subarea runoff =    176.974(CFS) for    171.110(Ac.)
Total runoff =    204.807(CFS)   Total area =     190.180(Ac.)
Depth of flow =   2.247(Ft.), Average velocity =   9.354(Ft/s)

Sub-Channel No. 1 Critical depth =      2.656(Ft.)
  '     '       '     Critical flow top width =     18.938(Ft.)
  '     '       '     Critical flow velocity=    7.029(Ft/s)
  '     '       '     Critical flow area =     29.136(Sq.Ft)



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Process from Point/Station      400.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   631.000(Ft.)
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Top (of initial area) elevation =  1761.000(Ft.)
Bottom (of initial area) elevation =  1640.000(Ft.)
Difference in elevation =   121.000(Ft.)
Slope =    0.19176  s(percent)=      19.18
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.023 min.
Rainfall intensity =      2.039(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.767
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.441(CFS)
Total initial stream area =        4.760(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      400.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.760(Ac.)
Runoff from this stream =      7.441(CFS)
Time of concentration =   13.02 min.
Rainfall intensity =     2.039(In/Hr)


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Process from Point/Station      404.000 to Point/Station      406.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   746.000(Ft.)
Top (of initial area) elevation =  1821.000(Ft.)
Bottom (of initial area) elevation =  1622.000(Ft.)
Difference in elevation =   199.000(Ft.)
Slope =    0.26676  s(percent)=      26.68
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.036 min.
Rainfall intensity =      2.038(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.767
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.045(CFS)
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Total initial stream area =        6.430(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      404.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.430(Ac.)
Runoff from this stream =     10.045(CFS)
Time of concentration =   13.04 min.
Rainfall intensity =     2.038(In/Hr)
Summary of stream data:

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


1        7.441     13.02                 2.039
2       10.045     13.04                 2.038
Largest stream flow has longer time of concentration
Qp =     10.045 + sum of
        Qb         Ia/Ib
         7.441 *    0.999 =      7.437
Qp =     17.482

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.441      10.045
Area of streams before confluence:
        4.760        6.430
Results of confluence:
Total flow rate =     17.482(CFS)
Time of concentration =    13.036 min.
Effective stream area after confluence =     11.190(Ac.)


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Process from Point/Station      500.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   600.000(Ft.)
Top (of initial area) elevation =  1831.000(Ft.)
Bottom (of initial area) elevation =  1624.000(Ft.)
Difference in elevation =   207.000(Ft.)
Slope =    0.34500  s(percent)=      34.50
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.349 min.
Rainfall intensity =      2.199(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.775
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.818(CFS)
Total initial stream area =        4.000(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      600.000 to Point/Station      602.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  1930.000(Ft.)
Bottom (of initial area) elevation =  1718.000(Ft.)
Difference in elevation =   212.000(Ft.)
Slope =    0.32615  s(percent)=      32.62
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.851 min.
Rainfall intensity =      2.147(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.772
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.424(CFS)
Total initial stream area =        3.270(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      602.000 to Point/Station      604.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1718.000(Ft.)
Downstream point elevation =  1620.000(Ft.)
Channel length thru subarea  =   622.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     17.511(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     17.511(CFS)
Depth of flow =   0.509(Ft.), Average velocity =   7.605(Ft/s)
Channel flow top width =    6.052(Ft.)
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Flow Velocity =    7.60(Ft/s)
Travel time  =    1.36 min.
Time of concentration =   13.21 min.

Sub-Channel No. 1 Critical depth =      0.781(Ft.)
  '     '       '     Critical flow top width =      7.688(Ft.)
  '     '       '     Critical flow velocity=    4.194(Ft/s)
  '     '       '     Critical flow area =      4.175(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.766
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.023(In/Hr) for a    10.0 year storm
Subarea runoff =     24.116(CFS) for     15.570(Ac.)
Total runoff =     29.540(CFS)   Total area =      18.840(Ac.)
Depth of flow =   0.669(Ft.), Average velocity =   8.826(Ft/s)

Sub-Channel No. 1 Critical depth =      1.031(Ft.)
  '     '       '     Critical flow top width =      9.188(Ft.)
  '     '       '     Critical flow velocity=    4.701(Ft/s)
  '     '       '     Critical flow area =      6.284(Sq.Ft)



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Process from Point/Station      700.000 to Point/Station      702.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   982.000(Ft.)
Top (of initial area) elevation =  1921.800(Ft.)
Bottom (of initial area) elevation =  1614.200(Ft.)
Difference in elevation =   307.600(Ft.)
Slope =    0.31324  s(percent)=      31.32
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.091 min.
Rainfall intensity =      1.952(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.762
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.570(CFS)
Total initial stream area =        7.780(Ac.)
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Pervious area fraction = 1.000


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Process from Point/Station      800.000 to Point/Station      802.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   692.000(Ft.)
Top (of initial area) elevation =  1992.200(Ft.)
Bottom (of initial area) elevation =  1712.000(Ft.)
Difference in elevation =   280.200(Ft.)
Slope =    0.40491  s(percent)=      40.49
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.637 min.
Rainfall intensity =      2.169(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      9.346(CFS)
Total initial stream area =        5.570(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      802.000 to Point/Station      804.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1712.000(Ft.)
Downstream point elevation =  1583.500(Ft.)
Channel length thru subarea  =   858.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =     44.652(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     44.652(CFS)
Depth of flow =   0.789(Ft.), Average velocity =   9.190(Ft/s)
Channel flow top width =    9.314(Ft.)
Flow Velocity =    9.19(Ft/s)
Travel time  =    1.56 min.
Time of concentration =   13.19 min.

Sub-Channel No. 1 Critical depth =      1.188(Ft.)
  '     '       '     Critical flow top width =     12.500(Ft.)
  '     '       '     Critical flow velocity=    4.852(Ft/s)
  '     '       '     Critical flow area =      9.203(Sq.Ft)
```

```
 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.766
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.024(In/Hr) for a    10.0 year storm
Subarea runoff =     70.514(CFS) for     45.480(Ac.)
Total runoff =     79.860(CFS)   Total area =      51.050(Ac.)
Depth of flow =   1.041(Ft.), Average velocity =  10.716(Ft/s)

Sub-Channel No. 1 Critical depth =      1.563(Ft.)
  '     '       '     Critical flow top width =     15.500(Ft.)
  '     '       '     Critical flow velocity=    5.525(Ft/s)
  '     '       '     Critical flow area =     14.453(Sq.Ft)



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Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   336.000(Ft.)
Top (of initial area) elevation =  1813.000(Ft.)
Bottom (of initial area) elevation =  1660.000(Ft.)
Difference in elevation =   153.000(Ft.)
Slope =    0.45536  s(percent)=      45.54
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.514 min.
Rainfall intensity =      2.576(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.626(CFS)
Total initial stream area =        2.270(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
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Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     8.51 min.
Rainfall intensity =      2.576(In/Hr) for a    10.0 year storm
Subarea runoff =      0.265(CFS) for      0.130(Ac.)
Total runoff =      4.891(CFS)   Total area =       2.400(Ac.)
End of computations, total study area =          882.62 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.991
Area averaged RI index number =  79.4
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 12/06/17 File:ex.out

Tentative Tract 35853
Existing Conditions
Major Basins 100, 200, 300, 400, 500, 600, 700, and 800
100-Year Flow Rate

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

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

Program License Serial Number 4028

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(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 = 0.5500

++
Process from Point/Station 100.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 737.000(Ft.)
Top (of initial area) elevation = 2100.000(Ft.)
Bottom (of initial area) elevation = 1988.000(Ft.)
Difference in elevation = 112.000(Ft.)
Slope = 0.15197 s(percent)= 15.20
TC = k(0.710)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   14.518 min.
Rainfall intensity =      2.837(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     22.699(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      102.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1988.000(Ft.)
Downstream point elevation =  1838.300(Ft.)
Channel length thru subarea  =  3016.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     93.805(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     93.805(CFS)
Depth of flow =   1.554(Ft.), Average velocity =   7.876(Ft/s)
Channel flow top width =   12.326(Ft.)
Flow Velocity =    7.88(Ft/s)
Travel time  =    6.38 min.
Time of concentration =   20.90 min.

Sub-Channel No. 1 Critical depth =      1.844(Ft.)
  '     '       '     Critical flow top width =     14.063(Ft.)
  '     '       '     Critical flow velocity=    5.964(Ft/s)
  '     '       '     Critical flow area =     15.729(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.781
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.322(In/Hr) for a   100.0 year storm
Subarea runoff =    142.120(CFS) for     78.390(Ac.)
Total runoff =    164.819(CFS)   Total area =      88.390(Ac.)
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Depth of flow =   2.007(Ft.), Average velocity =   9.104(Ft/s)

Sub-Channel No. 1 Critical depth =      2.406(Ft.)
  '     '       '     Critical flow top width =     17.438(Ft.)
  '     '       '     Critical flow velocity=    6.703(Ft/s)
  '     '       '     Critical flow area =     24.589(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      106.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1838.300(Ft.)
Downstream point elevation =  1767.000(Ft.)
Channel length thru subarea  =  2322.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    282.236(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    282.236(CFS)
Depth of flow =   2.821(Ft.), Average velocity =   8.726(Ft/s)
Channel flow top width =   19.929(Ft.)
Flow Velocity =    8.73(Ft/s)
Travel time  =    4.44 min.
Time of concentration =   25.34 min.

Sub-Channel No. 1 Critical depth =      3.063(Ft.)
  '     '       '     Critical flow top width =     21.375(Ft.)
  '     '       '     Critical flow velocity=    7.562(Ft/s)
  '     '       '     Critical flow area =     37.324(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.769
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.089(In/Hr) for a   100.0 year storm
Subarea runoff =    234.754(CFS) for    146.070(Ac.)
Total runoff =    399.573(CFS)   Total area =     234.460(Ac.)
Depth of flow =   3.273(Ft.), Average velocity =   9.526(Ft/s)

Sub-Channel No. 1 Critical depth =      3.594(Ft.)
  '     '       '     Critical flow top width =     24.563(Ft.)
  '     '       '     Critical flow velocity=    8.068(Ft/s)
  '     '       '     Critical flow area =     49.526(Sq.Ft)
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Process from Point/Station      106.000 to Point/Station      108.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1767.000(Ft.)
Downstream point elevation =  1592.000(Ft.)
Channel length thru subarea  =  4790.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =    560.651(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    560.651(CFS)
Depth of flow =   2.907(Ft.), Average velocity =   9.872(Ft/s)
Channel flow top width =   34.071(Ft.)
Flow Velocity =    9.87(Ft/s)
Travel time  =    8.09 min.
Time of concentration =   33.42 min.

Sub-Channel No. 1 Critical depth =      3.328(Ft.)
  '     '       '     Critical flow top width =     38.281(Ft.)
  '     '       '     Critical flow velocity=    7.784(Ft/s)
  '     '       '     Critical flow area =     72.023(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.751
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.794(In/Hr) for a   100.0 year storm
Subarea runoff =    322.063(CFS) for    238.950(Ac.)
Total runoff =    721.636(CFS)   Total area =     473.410(Ac.)
Depth of flow =   3.237(Ft.), Average velocity =  10.523(Ft/s)

Sub-Channel No. 1 Critical depth =      3.719(Ft.)
  '     '       '     Critical flow top width =     42.188(Ft.)
  '     '       '     Critical flow velocity=    8.225(Ft/s)
  '     '       '     Critical flow area =     87.739(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
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```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    473.410(Ac.)
Runoff from this stream =    721.636(CFS)
Time of concentration =   33.42 min.
Rainfall intensity =     1.794(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   959.000(Ft.)
Top (of initial area) elevation =  1781.000(Ft.)
Bottom (of initial area) elevation =  1654.000(Ft.)
Difference in elevation =   127.000(Ft.)
Slope =    0.13243  s(percent)=      13.24
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.580 min.
Rainfall intensity =      2.637(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.793
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     18.517(CFS)
Total initial stream area =        8.850(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      112.000 to Point/Station      114.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1654.000(Ft.)
Downstream point elevation =  1584.300(Ft.)
Channel length thru subarea  =  2050.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     41.899(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     41.899(CFS)
Depth of flow =   1.163(Ft.), Average velocity =   5.549(Ft/s)
Channel flow top width =    9.981(Ft.)
Flow Velocity =    5.55(Ft/s)
Travel time  =    6.16 min.
Time of concentration =   22.74 min.
```

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Sub-Channel No. 1 Critical depth =      1.234(Ft.)
  '     '       '     Critical flow top width =     10.406(Ft.)
  '     '       '     Critical flow velocity=    5.064(Ft/s)
  '     '       '     Critical flow area =      8.274(Sq.Ft)

 Adding area flow to channel
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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.217(In/Hr) for a   100.0 year storm
Subarea runoff =     46.700(CFS) for     25.700(Ac.)
Total runoff =     65.218(CFS)   Total area =      34.550(Ac.)
Depth of flow =   1.434(Ft.), Average velocity =   6.230(Ft/s)

Sub-Channel No. 1 Critical depth =      1.547(Ft.)
  '     '       '     Critical flow top width =     12.281(Ft.)
  '     '       '     Critical flow velocity=    5.518(Ft/s)
  '     '       '     Critical flow area =     11.819(Sq.Ft)



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Process from Point/Station      112.000 to Point/Station      114.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     34.550(Ac.)
Runoff from this stream =     65.218(CFS)
Time of concentration =   22.74 min.
Rainfall intensity =     2.217(In/Hr)
Summary of stream data:

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


1      721.636     33.42                 1.794
2       65.218     22.74                 2.217
Largest stream flow has longer time of concentration
Qp =    721.636 + sum of
       Qb         Ia/Ib
       65.218 *    0.809 =     52.767
Qp =    774.402

Total of 2 streams to confluence:
Flow rates before confluence point:
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```
     721.636      65.218
Area of streams before confluence:
      473.410       34.550
Results of confluence:
Total flow rate =    774.402(CFS)
Time of concentration =    33.422 min.
Effective stream area after confluence =    507.960(Ac.)


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Process from Point/Station      200.000 to Point/Station      204.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   570.000(Ft.)
Top (of initial area) elevation =  2035.000(Ft.)
Bottom (of initial area) elevation =  1812.000(Ft.)
Difference in elevation =   223.000(Ft.)
Slope =    0.39123  s(percent)=      39.12
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.842 min.
Rainfall intensity =      3.331(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.813
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.894(CFS)
Total initial stream area =        4.020(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      204.000 to Point/Station      210.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1812.000(Ft.)
Downstream point elevation =  1640.000(Ft.)
Channel length thru subarea  =  1640.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     54.255(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     54.255(CFS)
Depth of flow =   1.004(Ft.), Average velocity =   8.987(Ft/s)
Channel flow top width =    9.025(Ft.)
Flow Velocity =    8.99(Ft/s)
Travel time  =    3.04 min.
```

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Time of concentration =   13.88 min.

Sub-Channel No. 1 Critical depth =      1.406(Ft.)
  '     '       '     Critical flow top width =     11.438(Ft.)
  '     '       '     Critical flow velocity=    5.345(Ft/s)
  '     '       '     Critical flow area =     10.151(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.908(In/Hr) for a   100.0 year storm
Subarea runoff =     86.656(CFS) for     37.150(Ac.)
Total runoff =     97.549(CFS)   Total area =      41.170(Ac.)
Depth of flow =   1.330(Ft.), Average velocity =  10.494(Ft/s)

Sub-Channel No. 1 Critical depth =      1.875(Ft.)
  '     '       '     Critical flow top width =     14.250(Ft.)
  '     '       '     Critical flow velocity=    6.032(Ft/s)
  '     '       '     Critical flow area =     16.172(Sq.Ft)



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Process from Point/Station      210.000 to Point/Station      212.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1640.000(Ft.)
Downstream point elevation =  1580.000(Ft.)
Channel length thru subarea  =  1902.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    130.635(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    130.635(CFS)
Depth of flow =   2.002(Ft.), Average velocity =   7.247(Ft/s)
Channel flow top width =   15.010(Ft.)
Flow Velocity =    7.25(Ft/s)
Travel time  =    4.37 min.
Time of concentration =   18.26 min.

Sub-Channel No. 1 Critical depth =      2.156(Ft.)
  '     '       '     Critical flow top width =     15.938(Ft.)
  '     '       '     Critical flow velocity=    6.398(Ft/s)
  '     '       '     Critical flow area =     20.417(Sq.Ft)
```

```
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.501(In/Hr) for a   100.0 year storm
Subarea runoff =     66.093(CFS) for     31.910(Ac.)
Total runoff =    163.642(CFS)   Total area =      73.080(Ac.)
Depth of flow =   2.212(Ft.), Average velocity =   7.676(Ft/s)

Sub-Channel No. 1 Critical depth =      2.391(Ft.)
  '     '       '     Critical flow top width =     17.344(Ft.)
  '     '       '     Critical flow velocity=    6.730(Ft/s)
  '     '       '     Critical flow area =     24.317(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      212.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     73.080(Ac.)
Runoff from this stream =    163.642(CFS)
Time of concentration =   18.26 min.
Rainfall intensity =     2.501(In/Hr)


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Process from Point/Station      214.000 to Point/Station      216.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   976.000(Ft.)
Top (of initial area) elevation =  1750.000(Ft.)
Bottom (of initial area) elevation =  1602.000(Ft.)
Difference in elevation =   148.000(Ft.)
Slope =    0.15164  s(percent)=      15.16
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.251 min.
Rainfall intensity =      2.667(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.794
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
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Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     16.565(CFS)
Total initial stream area =        7.820(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      216.000 to Point/Station      218.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1602.000(Ft.)
Downstream point elevation =  1586.000(Ft.)
Channel length thru subarea  =   678.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     25.049(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     25.049(CFS)
Depth of flow =   0.991(Ft.), Average velocity =   4.232(Ft/s)
Channel flow top width =    8.945(Ft.)
Flow Velocity =    4.23(Ft/s)
Travel time  =    2.67 min.
Time of concentration =   18.92 min.

Sub-Channel No. 1 Critical depth =      0.945(Ft.)
  '     '       '     Critical flow top width =      8.672(Ft.)
  '     '       '     Critical flow velocity=    4.540(Ft/s)
  '     '       '     Critical flow area =      5.517(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.453(In/Hr) for a   100.0 year storm
Subarea runoff =     16.871(CFS) for      8.320(Ac.)
Total runoff =     33.436(CFS)   Total area =      16.140(Ac.)
Depth of flow =   1.140(Ft.), Average velocity =   4.570(Ft/s)

Sub-Channel No. 1 Critical depth =      1.102(Ft.)
  '     '       '     Critical flow top width =      9.609(Ft.)
  '     '       '     Critical flow velocity=    4.814(Ft/s)
  '     '       '     Critical flow area =      6.945(Sq.Ft)
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Process from Point/Station      216.000 to Point/Station      218.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.140(Ac.)
Runoff from this stream =     33.436(CFS)
Time of concentration =   18.92 min.
Rainfall intensity =     2.453(In/Hr)
Summary of stream data:

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


1      163.642     18.26                 2.501
2       33.436     18.92                 2.453
Largest stream flow has longer or shorter time of concentration
Qp =    163.642 + sum of
        Qa          Tb/Ta
        33.436 *    0.965 =     32.265
Qp =    195.907

Total of 2 streams to confluence:
Flow rates before confluence point:
     163.642      33.436
Area of streams before confluence:
       73.080       16.140
Results of confluence:
Total flow rate =    195.907(CFS)
Time of concentration =    18.258 min.
Effective stream area after confluence =     89.220(Ac.)


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Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   527.000(Ft.)
Top (of initial area) elevation =  1950.000(Ft.)
Bottom (of initial area) elevation =  1820.000(Ft.)
Difference in elevation =   130.000(Ft.)
Slope =    0.24668  s(percent)=      24.67
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.523 min.
Rainfall intensity =      3.222(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.474(CFS)
Total initial stream area =        4.010(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1820.000(Ft.)
Downstream point elevation =  1785.000(Ft.)
Channel length thru subarea  =  1235.000(Ft.)
Channel base width    =   24.000(Ft.)
Slope or 'Z' of left channel bank =   0.100
Slope or 'Z' of right channel bank =   0.100
Estimated mean flow rate at midpoint of channel =     27.157(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     27.157(CFS)
Depth of flow =   0.238(Ft.), Average velocity =   4.746(Ft/s)
Channel flow top width =   24.048(Ft.)
Flow Velocity =    4.75(Ft/s)
Travel time  =    4.34 min.
Time of concentration =   15.86 min.

Sub-Channel No. 1 Critical depth =      0.340(Ft.)
  '     '       '     Critical flow top width =     24.068(Ft.)
  '     '       '     Critical flow velocity=    3.325(Ft/s)
  '     '       '     Critical flow area =      8.168(Sq.Ft)

 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.703(In/Hr) for a   100.0 year storm
Subarea runoff =     33.307(CFS) for     15.060(Ac.)
Total runoff =     43.781(CFS)   Total area =      19.070(Ac.)
Depth of flow =   0.318(Ft.), Average velocity =   5.730(Ft/s)

Sub-Channel No. 1 Critical depth =      0.469(Ft.)
  '     '       '     Critical flow top width =     24.094(Ft.)
  '     '       '     Critical flow velocity=    3.884(Ft/s)
  '     '       '     Critical flow area =     11.272(Sq.Ft)
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Process from Point/Station      302.000 to Point/Station      304.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1785.000(Ft.)
Downstream point elevation =  1606.000(Ft.)
Channel length thru subarea  =  3891.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    190.226(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    190.226(CFS)
Depth of flow =   2.175(Ft.), Average velocity =   9.180(Ft/s)
Channel flow top width =   16.052(Ft.)
Flow Velocity =    9.18(Ft/s)
Travel time  =    7.06 min.
Time of concentration =   22.92 min.

Sub-Channel No. 1 Critical depth =      2.563(Ft.)
  '     '       '     Critical flow top width =     18.375(Ft.)
  '     '       '     Critical flow velocity=    6.946(Ft/s)
  '     '       '     Critical flow area =     27.387(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.775
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.207(In/Hr) for a   100.0 year storm
Subarea runoff =    292.820(CFS) for    171.110(Ac.)
Total runoff =    336.601(CFS)   Total area =     190.180(Ac.)
Depth of flow =   2.790(Ft.), Average velocity =  10.610(Ft/s)

Sub-Channel No. 1 Critical depth =      3.344(Ft.)
  '     '       '     Critical flow top width =     23.063(Ft.)
  '     '       '     Critical flow velocity=    7.725(Ft/s)
  '     '       '     Critical flow area =     43.573(Sq.Ft)



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Process from Point/Station      400.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   631.000(Ft.)
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Top (of initial area) elevation =  1761.000(Ft.)
Bottom (of initial area) elevation =  1640.000(Ft.)
Difference in elevation =   121.000(Ft.)
Slope =    0.19176  s(percent)=      19.18
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.023 min.
Rainfall intensity =      3.012(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.544(CFS)
Total initial stream area =        4.760(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.760(Ac.)
Runoff from this stream =     11.544(CFS)
Time of concentration =   13.02 min.
Rainfall intensity =     3.012(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      406.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   746.000(Ft.)
Top (of initial area) elevation =  1821.000(Ft.)
Bottom (of initial area) elevation =  1622.000(Ft.)
Difference in elevation =   199.000(Ft.)
Slope =    0.26676  s(percent)=      26.68
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.036 min.
Rainfall intensity =      3.010(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     15.585(CFS)
```

```
Total initial stream area =        6.430(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: 1 in normal stream number 2
Stream flow area =      6.430(Ac.)
Runoff from this stream =     15.585(CFS)
Time of concentration =   13.04 min.
Rainfall intensity =     3.010(In/Hr)
Summary of stream data:

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


1       11.544     13.02                 3.012
2       15.585     13.04                 3.010
Largest stream flow has longer time of concentration
Qp =     15.585 + sum of
       Qb         Ia/Ib
       11.544 *    0.999 =     11.538
Qp =     27.124

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.544      15.585
Area of streams before confluence:
        4.760        6.430
Results of confluence:
Total flow rate =     27.124(CFS)
Time of concentration =    13.036 min.
Effective stream area after confluence =     11.190(Ac.)


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Process from Point/Station      500.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   600.000(Ft.)
Top (of initial area) elevation =  1831.000(Ft.)
Bottom (of initial area) elevation =  1624.000(Ft.)
Difference in elevation =   207.000(Ft.)
Slope =    0.34500  s(percent)=      34.50
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.349 min.
Rainfall intensity =      3.249(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.811
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.545(CFS)
Total initial stream area =        4.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      602.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  1930.000(Ft.)
Bottom (of initial area) elevation =  1718.000(Ft.)
Difference in elevation =   212.000(Ft.)
Slope =    0.32615  s(percent)=      32.62
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.851 min.
Rainfall intensity =      3.172(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.398(CFS)
Total initial stream area =        3.270(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      604.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1718.000(Ft.)
Downstream point elevation =  1620.000(Ft.)
Channel length thru subarea  =   622.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     27.290(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     27.290(CFS)
Depth of flow =   0.642(Ft.), Average velocity =   8.632(Ft/s)
Channel flow top width =    6.851(Ft.)
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Flow Velocity =    8.63(Ft/s)
Travel time  =    1.20 min.
Time of concentration =   13.05 min.

Sub-Channel No. 1 Critical depth =      0.992(Ft.)
  '     '       '     Critical flow top width =      8.953(Ft.)
  '     '       '     Critical flow velocity=    4.602(Ft/s)
  '     '       '     Critical flow area =      5.930(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.008(In/Hr) for a   100.0 year storm
Subarea runoff =     37.711(CFS) for     15.570(Ac.)
Total runoff =     46.109(CFS)   Total area =      18.840(Ac.)
Depth of flow =   0.838(Ft.), Average velocity =   9.979(Ft/s)

Sub-Channel No. 1 Critical depth =      1.297(Ft.)
  '     '       '     Critical flow top width =     10.781(Ft.)
  '     '       '     Critical flow velocity=    5.160(Ft/s)
  '     '       '     Critical flow area =      8.936(Sq.Ft)



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Process from Point/Station      700.000 to Point/Station      702.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   982.000(Ft.)
Top (of initial area) elevation =  1921.800(Ft.)
Bottom (of initial area) elevation =  1614.200(Ft.)
Difference in elevation =   307.600(Ft.)
Slope =    0.31324  s(percent)=      31.32
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.091 min.
Rainfall intensity =      2.884(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     17.985(CFS)
Total initial stream area =        7.780(Ac.)
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Pervious area fraction = 1.000


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Process from Point/Station      800.000 to Point/Station      802.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   692.000(Ft.)
Top (of initial area) elevation =  1992.200(Ft.)
Bottom (of initial area) elevation =  1712.000(Ft.)
Difference in elevation =   280.200(Ft.)
Slope =    0.40491  s(percent)=      40.49
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.637 min.
Rainfall intensity =      3.204(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.463(CFS)
Total initial stream area =        5.570(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      802.000 to Point/Station      804.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1712.000(Ft.)
Downstream point elevation =  1583.500(Ft.)
Channel length thru subarea  =   858.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =     69.655(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     69.655(CFS)
Depth of flow =   0.976(Ft.), Average velocity =  10.339(Ft/s)
Channel flow top width =   10.807(Ft.)
Flow Velocity =   10.34(Ft/s)
Travel time  =    1.38 min.
Time of concentration =   13.02 min.

Sub-Channel No. 1 Critical depth =      1.469(Ft.)
  '     '       '     Critical flow top width =     14.750(Ft.)
  '     '       '     Critical flow velocity=    5.344(Ft/s)
  '     '       '     Critical flow area =     13.035(Sq.Ft)
```

```
 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.012(In/Hr) for a   100.0 year storm
Subarea runoff =    110.318(CFS) for     45.480(Ac.)
Total runoff =    124.781(CFS)   Total area =      51.050(Ac.)
Depth of flow =   1.278(Ft.), Average velocity =  12.034(Ft/s)

Sub-Channel No. 1 Critical depth =      1.938(Ft.)
  '     '       '     Critical flow top width =     18.500(Ft.)
  '     '       '     Critical flow velocity=    5.991(Ft/s)
  '     '       '     Critical flow area =     20.828(Sq.Ft)



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Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   336.000(Ft.)
Top (of initial area) elevation =  1813.000(Ft.)
Bottom (of initial area) elevation =  1660.000(Ft.)
Difference in elevation =   153.000(Ft.)
Slope =    0.45536  s(percent)=      45.54
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.514 min.
Rainfall intensity =      3.805(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.111(CFS)
Total initial stream area =        2.270(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
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Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     8.51 min.
Rainfall intensity =      3.805(In/Hr) for a   100.0 year storm
Subarea runoff =      0.407(CFS) for      0.130(Ac.)
Total runoff =      7.519(CFS)   Total area =       2.400(Ac.)
End of computations, total study area =          882.62 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.991
Area averaged RI index number =  79.4
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 12/05/18 File:pr10010v2.out

Tentative Tract 35853
Proposed Conditions
Major Basin 100
10-Year Flow Rate

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

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

Program License Serial Number 4028

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.880(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 10.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 737.000(Ft.)
Top (of initial area) elevation = 2100.000(Ft.)
Bottom (of initial area) elevation = 1988.000(Ft.)
Difference in elevation = 112.000(Ft.)
Slope = 0.15197 s(percent)= 15.20
TC = k(0.710)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   14.518 min.
Rainfall intensity =      1.921(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.760
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.592(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1988.000(Ft.)
Downstream point elevation =  1838.300(Ft.)
Channel length thru subarea  =  3016.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     54.015(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     54.015(CFS)
Depth of flow =   1.200(Ft.), Average velocity =   6.820(Ft/s)
Channel flow top width =   10.200(Ft.)
Flow Velocity =    6.82(Ft/s)
Travel time  =    7.37 min.
Time of concentration =   21.89 min.

Sub-Channel No. 1 Critical depth =      1.406(Ft.)
  '     '       '     Critical flow top width =     11.438(Ft.)
  '     '       '     Critical flow velocity=    5.321(Ft/s)
  '     '       '     Critical flow area =     10.151(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.731
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.532(In/Hr) for a    10.0 year storm
Subarea runoff =     78.782(CFS) for     70.340(Ac.)
Total runoff =     93.374(CFS)   Total area =      80.340(Ac.)
```

```
Depth of flow =   1.551(Ft.), Average velocity =   7.867(Ft/s)

Sub-Channel No. 1 Critical depth =      1.828(Ft.)
  '     '       '     Critical flow top width =     13.969(Ft.)
  '     '       '     Critical flow velocity=    6.020(Ft/s)
  '     '       '     Critical flow area =     15.510(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     80.340(Ac.)
Runoff from this stream =     93.374(CFS)
Time of concentration =   21.89 min.
Rainfall intensity =     1.532(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   440.000(Ft.)
Top (of initial area) elevation =  1948.500(Ft.)
Bottom (of initial area) elevation =  1893.500(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.12500  s(percent)=      12.50
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.282 min.
Rainfall intensity =      2.106(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.770
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.638(CFS)
Total initial stream area =        1.010(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1894.000(Ft.)
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Downstream point/station elevation =  1877.400(Ft.)
Pipe length  =   394.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.638(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.638(CFS)
Normal flow depth in pipe =    4.41(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    7.06(In.)
Pipe flow velocity =      7.62(Ft/s)
Travel time through pipe =    0.86 min.
Time of concentration (TC) =    13.14 min.


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Process from Point/Station      102.100 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.766
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    13.14 min.
Rainfall intensity =      2.028(In/Hr) for a    10.0 year storm
Subarea runoff =      1.119(CFS) for      0.720(Ac.)
Total runoff =      2.757(CFS)   Total area =       1.730(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1877.400(Ft.)
Downstream point/station elevation =  1871.900(Ft.)
Pipe length  =   537.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.757(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.757(CFS)
Normal flow depth in pipe =    7.86(In.)
Flow top width inside pipe =   11.41(In.)
Critical Depth =    8.54(In.)
Pipe flow velocity =      5.06(Ft/s)
Travel time through pipe =    1.77 min.
Time of concentration (TC) =    14.91 min.


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Process from Point/Station      102.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
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SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.91 min.
Rainfall intensity =      1.892(In/Hr) for a    10.0 year storm
Subarea runoff =     11.148(CFS) for      7.440(Ac.)
Total runoff =     13.905(CFS)   Total area =       9.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1871.900(Ft.)
Downstream point/station elevation =  1866.300(Ft.)
Pipe length  =   641.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.905(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    13.905(CFS)
Normal flow depth in pipe =   16.17(In.)
Flow top width inside pipe =   17.67(In.)
Critical Depth =   16.64(In.)
Pipe flow velocity =      7.00(Ft/s)
Travel time through pipe =    1.53 min.
Time of concentration (TC) =    16.44 min.


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Process from Point/Station      103.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    16.44 min.
Rainfall intensity =      1.794(In/Hr) for a    10.0 year storm
Subarea runoff =      6.821(CFS) for      4.830(Ac.)
Total runoff =     20.726(CFS)   Total area =      14.000(Ac.)


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Process from Point/Station      104.100 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    16.44 min.
Rainfall intensity =      1.794(In/Hr) for a    10.0 year storm
Subarea runoff =      5.395(CFS) for      3.820(Ac.)
Total runoff =     26.120(CFS)   Total area =      17.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1857.600(Ft.)
Downstream point/station elevation =  1857.000(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.120(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    26.120(CFS)
Normal flow depth in pipe =   18.75(In.)
Flow top width inside pipe =   24.87(In.)
Critical Depth =   21.41(In.)
Pipe flow velocity =      8.86(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    16.55 min.


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Process from Point/Station      104.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.713
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    16.55 min.
Rainfall intensity =      1.787(In/Hr) for a    10.0 year storm
Subarea runoff =      0.892(CFS) for      0.700(Ac.)
Total runoff =     27.012(CFS)   Total area =      18.520(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1852.000(Ft.)
Downstream point/station elevation =  1838.300(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.012(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    27.012(CFS)
Normal flow depth in pipe =   11.24(In.)
Flow top width inside pipe =   13.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     27.39(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    16.59 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     18.520(Ac.)
Runoff from this stream =     27.012(CFS)
Time of concentration =   16.59 min.
Rainfall intensity =     1.785(In/Hr)
Summary of stream data:

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


1       93.374     21.89            1.532
2       27.012     16.59            1.785
Largest stream flow has longer time of concentration
Qp =     93.374 + sum of
       Qb         Ia/Ib
       27.012 *    0.859 =     23.192
Qp =    116.566

Total of 2 main streams to confluence:
Flow rates before confluence point:
      93.374      27.012
Area of streams before confluence:
       80.340       18.520


Results of confluence:
Total flow rate =    116.566(CFS)
```

```
Time of concentration =    21.888 min.
Effective stream area after confluence  =     98.860(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1838.300(Ft.)
Downstream point elevation =  1831.000(Ft.)
Channel length thru subarea  =   310.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    116.566(CFS)
Depth of flow =   2.031(Ft.), Average velocity =   6.313(Ft/s)
Channel flow top width =   15.184(Ft.)
Flow Velocity =    6.31(Ft/s)
Travel time  =    0.82 min.
Time of concentration =   22.71 min.

Sub-Channel No. 1 Critical depth =      2.031(Ft.)
  '     '       '     Critical flow top width =     15.188(Ft.)
  '     '       '     Critical flow velocity=    6.311(Ft/s)
  '     '       '     Critical flow area =     18.472(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     98.860(Ac.)
Runoff from this stream =    116.566(CFS)
Time of concentration =   22.71 min.
Rainfall intensity =     1.502(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   130.000(Ft.)
Top (of initial area) elevation =  1880.000(Ft.)
Bottom (of initial area) elevation =  1878.700(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.01000  s(percent)=       1.00
```

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.865 min.
Rainfall intensity =      2.899(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.692(CFS)
Total initial stream area =        0.290(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1878.000(Ft.)
End of street segment elevation =  1869.500(Ft.)
Length of street segment  =   610.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      3.469(CFS)
Depth of flow =   0.344(Ft.), Average velocity =   2.453(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.394(Ft.)
Flow velocity =   2.45(Ft/s)
Travel time =    4.15 min.     TC =   11.01  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.236(In/Hr) for a    10.0 year storm
```

```
Subarea runoff =      5.489(CFS) for      3.050(Ac.)
Total runoff =      6.181(CFS)   Total area =       3.340(Ac.)
Street flow at end of street =      6.181(CFS)
Half street flow at end of street =      6.181(CFS)
Depth of flow =   0.405(Ft.), Average velocity =   2.801(Ft/s)
Flow width (from curb towards crown)=  14.458(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1864.900(Ft.)
Downstream point/station elevation =  1864.000(Ft.)
Pipe length  =    87.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.181(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.181(CFS)
Normal flow depth in pipe =   11.57(In.)
Flow top width inside pipe =   12.60(In.)
Critical Depth =   12.05(In.)
Pipe flow velocity =      6.09(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =    11.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.743
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    11.25 min.
Rainfall intensity =      2.210(In/Hr) for a    10.0 year storm
Subarea runoff =      0.525(CFS) for      0.320(Ac.)
Total runoff =      6.707(CFS)   Total area =       3.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1859.000(Ft.)
Downstream point/station elevation =  1853.000(Ft.)
Pipe length  =    59.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.707(CFS)
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```
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.707(CFS)
Normal flow depth in pipe =    6.63(In.)
Flow top width inside pipe =   11.93(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.06(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    11.31 min.


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Process from Point/Station      110.000 to Point/Station       16.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1853.000(Ft.)
Downstream point elevation =  1831.000(Ft.)
Channel length thru subarea  =   219.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      6.707(CFS)
Depth of flow =   0.332(Ft.), Average velocity =   4.675(Ft/s)
Channel flow top width =    5.653(Ft.)
Flow Velocity =    4.67(Ft/s)
Travel time  =    0.78 min.
Time of concentration =   12.09 min.

Sub-Channel No. 1 Critical depth =      0.438(Ft.)
  '     '       '     Critical flow top width =      6.500(Ft.)
  '     '       '     Critical flow velocity=    3.227(Ft/s)
  '     '       '     Critical flow area =      2.078(Sq.Ft)



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Process from Point/Station      110.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.660(Ac.)
Runoff from this stream =      6.707(CFS)
Time of concentration =   12.09 min.
Rainfall intensity =     2.123(In/Hr)
Summary of stream data:

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

```
1      116.566     22.71            1.502
2        6.707     12.09            2.123
Largest stream flow has longer time of concentration
Qp =    116.566 + sum of
        Qb         Ia/Ib
         6.707 *    0.707 =      4.743
Qp =    121.308

Total of 2 main streams to confluence:
Flow rates before confluence point:
     116.566       6.707
Area of streams before confluence:
       98.860        3.660


Results of confluence:
Total flow rate =    121.308(CFS)
Time of concentration =    22.707 min.
Effective stream area after confluence  =    102.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       18.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1831.000(Ft.)
Downstream point elevation =  1814.000(Ft.)
Channel length thru subarea  =   557.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    129.245(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    129.245(CFS)
Depth of flow =   2.007(Ft.), Average velocity =   7.139(Ft/s)
Channel flow top width =   15.042(Ft.)
Flow Velocity =    7.14(Ft/s)
Travel time  =    1.30 min.
Time of concentration =   24.01 min.

Sub-Channel No. 1 Critical depth =      2.141(Ft.)
  '     '       '     Critical flow top width =     15.844(Ft.)
  '     '       '     Critical flow velocity=    6.408(Ft/s)
  '     '       '     Critical flow area =     20.169(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.724
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
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Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.456(In/Hr) for a    10.0 year storm
Subarea runoff =     15.813(CFS) for     15.000(Ac.)
Total runoff =    137.121(CFS)   Total area =     117.520(Ac.)
Depth of flow =   2.061(Ft.), Average velocity =   7.248(Ft/s)

Sub-Channel No. 1 Critical depth =      2.203(Ft.)
  '     '       '     Critical flow top width =     16.219(Ft.)
  '     '       '     Critical flow velocity=    6.477(Ft/s)
  '     '       '     Critical flow area =     21.171(Sq.Ft)



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Process from Point/Station       16.000 to Point/Station       18.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    117.520(Ac.)
Runoff from this stream =    137.121(CFS)
Time of concentration =   24.01 min.
Rainfall intensity =     1.456(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  2227.000(Ft.)
Bottom (of initial area) elevation =  1929.000(Ft.)
Difference in elevation =   298.000(Ft.)
Slope =    0.29800  s(percent)=      29.80
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.336 min.
Rainfall intensity =      1.934(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.761
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.031(CFS)
Total initial stream area =        5.460(Ac.)
Pervious area fraction = 1.000
```

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Process from Point/Station      112.000 to Point/Station      113.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1929.000(Ft.)
Downstream point elevation =  1862.000(Ft.)
Channel length thru subarea  =  1236.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     28.358(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     28.358(CFS)
Depth of flow =   0.858(Ft.), Average velocity =   5.929(Ft/s)
Channel flow top width =    8.148(Ft.)
Flow Velocity =    5.93(Ft/s)
Travel time  =    3.47 min.
Time of concentration =   17.81 min.

Sub-Channel No. 1 Critical depth =      1.016(Ft.)
  '     '       '     Critical flow top width =      9.094(Ft.)
  '     '       '     Critical flow velocity=    4.618(Ft/s)
  '     '       '     Critical flow area =      6.141(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.746
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.716(In/Hr) for a    10.0 year storm
Subarea runoff =     40.599(CFS) for     31.710(Ac.)
Total runoff =     48.630(CFS)   Total area =      37.170(Ac.)
Depth of flow =   1.117(Ft.), Average velocity =   6.852(Ft/s)

Sub-Channel No. 1 Critical depth =      1.328(Ft.)
  '     '       '     Critical flow top width =     10.969(Ft.)
  '     '       '     Critical flow velocity=    5.243(Ft/s)
  '     '       '     Critical flow area =      9.276(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      114.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1862.000(Ft.)
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Downstream point/station elevation =  1860.500(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.630(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    48.630(CFS)
Normal flow depth in pipe =   22.55(In.)
Flow top width inside pipe =   25.93(In.)
Critical Depth =   27.38(In.)
Pipe flow velocity =     12.30(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    17.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      115.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1860.500(Ft.)
Downstream point elevation =  1850.000(Ft.)
Channel length thru subarea  =   171.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     48.630(CFS)
Depth of flow =   1.084(Ft.), Average velocity =   7.173(Ft/s)
Channel flow top width =    9.506(Ft.)
Flow Velocity =    7.17(Ft/s)
Travel time  =    0.40 min.
Time of concentration =   18.33 min.

Sub-Channel No. 1 Critical depth =      1.328(Ft.)
  '     '       '     Critical flow top width =     10.969(Ft.)
  '     '       '     Critical flow velocity=    5.242(Ft/s)
  '     '       '     Critical flow area =      9.276(Sq.Ft)



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Process from Point/Station      114.000 to Point/Station      115.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     37.170(Ac.)
Runoff from this stream =     48.630(CFS)
Time of concentration =   18.33 min.
Rainfall intensity =     1.689(In/Hr)


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Process from Point/Station      116.000 to Point/Station      117.000
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**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   132.000(Ft.)
Top (of initial area) elevation =  1887.500(Ft.)
Bottom (of initial area) elevation =  1886.200(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.00985  s(percent)=       0.98
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.928 min.
Rainfall intensity =      2.885(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.997(CFS)
Total initial stream area =        0.420(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      117.000 to Point/Station      118.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1885.800(Ft.)
End of street segment elevation =  1872.000(Ft.)
Length of street segment  =   701.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      5.085(CFS)
Depth of flow =   0.365(Ft.), Average velocity =   3.058(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.437(Ft.)
Flow velocity =   3.06(Ft/s)
Travel time =    3.82 min.     TC =   10.75  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.806
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```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.266(In/Hr) for a    10.0 year storm
Subarea runoff =      8.089(CFS) for      4.430(Ac.)
Total runoff =      9.086(CFS)   Total area =       4.850(Ac.)
Street flow at end of street =      9.086(CFS)
Half street flow at end of street =      9.086(CFS)
Depth of flow =   0.431(Ft.), Average velocity =   3.500(Ft/s)
Flow width (from curb towards crown)=  15.746(Ft.)


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Process from Point/Station      118.000 to Point/Station      119.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1864.600(Ft.)
Downstream point/station elevation =  1864.000(Ft.)
Pipe length  =    55.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.086(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.086(CFS)
Normal flow depth in pipe =   12.49(In.)
Flow top width inside pipe =   16.59(In.)
Critical Depth =   13.99(In.)
Pipe flow velocity =      6.94(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    10.88 min.


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Process from Point/Station      118.000 to Point/Station      119.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.745
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.88 min.
Rainfall intensity =      2.251(In/Hr) for a    10.0 year storm
Subarea runoff =      0.620(CFS) for      0.370(Ac.)
Total runoff =      9.706(CFS)   Total area =       5.220(Ac.)


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Process from Point/Station      119.000 to Point/Station      115.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1860.320(Ft.)
Downstream point/station elevation =  1860.000(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.706(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.706(CFS)
Normal flow depth in pipe =   13.66(In.)
Flow top width inside pipe =   15.39(In.)
Critical Depth =   14.43(In.)
Pipe flow velocity =      6.75(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    10.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      119.000 to Point/Station      115.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.220(Ac.)
Runoff from this stream =      9.706(CFS)
Time of concentration =   10.96 min.
Rainfall intensity =     2.242(In/Hr)
Summary of stream data:

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


1       48.630     18.33                1.689
2        9.706     10.96                2.242
Largest stream flow has longer time of concentration
Qp =     48.630 + sum of
        Qb         Ia/Ib
         9.706 *    0.754 =      7.315
Qp =     55.945

Total of 2 streams to confluence:
Flow rates before confluence point:
      48.630       9.706
Area of streams before confluence:
       37.170        5.220
Results of confluence:
Total flow rate =     55.945(CFS)
Time of concentration =    18.328 min.
Effective stream area after confluence =     42.390(Ac.)


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Process from Point/Station      115.000 to Point/Station      120.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1850.000(Ft.)
Downstream point elevation =  1840.000(Ft.)
Channel length thru subarea  =   194.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     58.310(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     58.310(CFS)
Depth of flow =   1.233(Ft.), Average velocity =   7.056(Ft/s)
Channel flow top width =   10.400(Ft.)
Flow Velocity =    7.06(Ft/s)
Travel time  =    0.46 min.
Time of concentration =   18.79 min.

Sub-Channel No. 1 Critical depth =      1.453(Ft.)
  '     '       '     Critical flow top width =     11.719(Ft.)
  '     '       '     Critical flow velocity=    5.453(Ft/s)
  '     '       '     Critical flow area =     10.694(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.742
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.667(In/Hr) for a    10.0 year storm
Subarea runoff =      4.651(CFS) for      3.760(Ac.)
Total runoff =     60.596(CFS)   Total area =      46.150(Ac.)
Depth of flow =   1.256(Ft.), Average velocity =   7.128(Ft/s)

Sub-Channel No. 1 Critical depth =      1.484(Ft.)
  '     '       '     Critical flow top width =     11.906(Ft.)
  '     '       '     Critical flow velocity=    5.477(Ft/s)
  '     '       '     Critical flow area =     11.063(Sq.Ft)



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Process from Point/Station      120.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1840.000(Ft.)
Downstream point/station elevation =  1837.500(Ft.)
Pipe length  =    98.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    60.596(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    60.596(CFS)
Normal flow depth in pipe =   22.78(In.)
Flow top width inside pipe =   25.65(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.15(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    18.89 min.


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Process from Point/Station      120.000 to Point/Station      121.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     46.150(Ac.)
Runoff from this stream =     60.596(CFS)
Time of concentration =   18.89 min.
Rainfall intensity =     1.661(In/Hr)


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Process from Point/Station      122.000 to Point/Station      123.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   130.000(Ft.)
Top (of initial area) elevation =  1869.000(Ft.)
Bottom (of initial area) elevation =  1867.700(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.01000  s(percent)=       1.00
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.865 min.
Rainfall intensity =      2.899(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.740(CFS)
Total initial stream area =        0.310(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      123.000 to Point/Station      124.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1867.000(Ft.)
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End of street segment elevation =  1847.900(Ft.)
Length of street segment  =   427.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      3.036(CFS)
Depth of flow =   0.282(Ft.), Average velocity =   3.761(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.311(Ft.)
Flow velocity =   3.76(Ft/s)
Travel time =    1.89 min.     TC =    8.76  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.814
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.536(In/Hr) for a    10.0 year storm
Subarea runoff =      4.500(CFS) for      2.180(Ac.)
Total runoff =      5.240(CFS)   Total area =       2.490(Ac.)
Street flow at end of street =      5.240(CFS)
Half street flow at end of street =      5.240(CFS)
Depth of flow =   0.328(Ft.), Average velocity =   4.229(Ft/s)
Flow width (from curb towards crown)=  10.596(Ft.)


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Process from Point/Station      124.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1838.100(Ft.)
Downstream point/station elevation =  1837.500(Ft.)
Pipe length  =    55.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.240(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.240(CFS)
Normal flow depth in pipe =    9.94(In.)
Flow top width inside pipe =   14.19(In.)
Critical Depth =   11.14(In.)
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Pipe flow velocity =      6.08(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     8.91 min.


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Process from Point/Station      124.000 to Point/Station      121.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.490(Ac.)
Runoff from this stream =      5.240(CFS)
Time of concentration =    8.91 min.
Rainfall intensity =     2.512(In/Hr)
Summary of stream data:

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


1       60.596     18.89                 1.661
2        5.240      8.91                 2.512
Largest stream flow has longer time of concentration
Qp =     60.596 + sum of
        Qb         Ia/Ib
         5.240 *    0.661 =      3.465
Qp =     64.062

Total of 2 streams to confluence:
Flow rates before confluence point:
      60.596       5.240
Area of streams before confluence:
       46.150        2.490
Results of confluence:
Total flow rate =     64.062(CFS)
Time of concentration =    18.894 min.
Effective stream area after confluence =     48.640(Ac.)


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Process from Point/Station      121.000 to Point/Station      125.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1837.500(Ft.)
Downstream point elevation =  1832.500(Ft.)
Channel length thru subarea  =   264.000(Ft.)
Channel base width    =   15.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     64.062(CFS)
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Depth of flow =   0.867(Ft.), Average velocity =   4.200(Ft/s)
Channel flow top width =   20.199(Ft.)
Flow Velocity =    4.20(Ft/s)
Travel time  =    1.05 min.
Time of concentration =   19.94 min.

Sub-Channel No. 1 Critical depth =      0.781(Ft.)
  '     '       '     Critical flow top width =     19.688(Ft.)
  '     '       '     Critical flow velocity=    4.728(Ft/s)
  '     '       '     Critical flow area =     13.550(Sq.Ft)



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Process from Point/Station      121.000 to Point/Station      125.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     48.640(Ac.)
Runoff from this stream =     64.062(CFS)
Time of concentration =   19.94 min.
Rainfall intensity =     1.613(In/Hr)


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Process from Point/Station      126.000 to Point/Station      127.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   633.000(Ft.)
Top (of initial area) elevation =  2127.000(Ft.)
Bottom (of initial area) elevation =  2033.000(Ft.)
Difference in elevation =    94.000(Ft.)
Slope =    0.14850  s(percent)=      14.85
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.724 min.
Rainfall intensity =      1.981(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.763
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.206(CFS)
Total initial stream area =        2.120(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      127.000 to Point/Station      128.000
**** IMPROVED CHANNEL TRAVEL TIME ****
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Upstream point elevation =  2033.000(Ft.)
Downstream point elevation =  1868.500(Ft.)
Channel length thru subarea  =   735.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      7.730(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =      7.730(CFS)
Depth of flow =   0.296(Ft.), Average velocity =   6.716(Ft/s)
Channel flow top width =    4.776(Ft.)
Flow Velocity =    6.72(Ft/s)
Travel time  =    1.82 min.
Time of concentration =   15.55 min.

Sub-Channel No. 1 Critical depth =      0.496(Ft.)
  '     '       '     Critical flow top width =      5.977(Ft.)
  '     '       '     Critical flow velocity=    3.472(Ft/s)
  '     '       '     Critical flow area =      2.227(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.755
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.849(In/Hr) for a    10.0 year storm
Subarea runoff =      8.954(CFS) for      6.410(Ac.)
Total runoff =     12.160(CFS)   Total area =       8.530(Ac.)
Depth of flow =   0.380(Ft.), Average velocity =   7.723(Ft/s)

Sub-Channel No. 1 Critical depth =      0.641(Ft.)
  '     '       '     Critical flow top width =      6.844(Ft.)
  '     '       '     Critical flow velocity=    3.856(Ft/s)
  '     '       '     Critical flow area =      3.153(Sq.Ft)



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Process from Point/Station      128.000 to Point/Station      129.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1868.500(Ft.)
Downstream point/station elevation =  1852.000(Ft.)
Pipe length  =   161.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.160(CFS)
Nearest computed pipe diameter  =     12.00(In.)
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```
Calculated individual pipe flow  =    12.160(CFS)
Normal flow depth in pipe =   10.80(In.)
Flow top width inside pipe =    7.20(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.33(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    15.71 min.


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Process from Point/Station      129.100 to Point/Station      129.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.71 min.
Rainfall intensity =      1.839(In/Hr) for a    10.0 year storm
Subarea runoff =      0.958(CFS) for      0.660(Ac.)
Total runoff =     13.118(CFS)   Total area =       9.190(Ac.)


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Process from Point/Station      129.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1852.000(Ft.)
Downstream point/station elevation =  1848.000(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.118(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    13.118(CFS)
Normal flow depth in pipe =    8.15(In.)
Flow top width inside pipe =   14.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.25(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.74 min.


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Process from Point/Station      130.000 to Point/Station      131.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1848.000(Ft.)
Downstream point elevation =  1837.000(Ft.)
Channel length thru subarea  =   211.000(Ft.)
```

```
Channel base width    =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     14.375(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     14.375(CFS)
Depth of flow =   0.338(Ft.), Average velocity =   3.859(Ft/s)
Channel flow top width =   12.029(Ft.)
Flow Velocity =    3.86(Ft/s)
Travel time  =    0.91 min.
Time of concentration =   16.65 min.

Sub-Channel No. 1 Critical depth =      0.383(Ft.)
  '     '       '     Critical flow top width =     12.297(Ft.)
  '     '       '     Critical flow velocity=    3.368(Ft/s)
  '     '       '     Critical flow area =      4.268(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.751
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.781(In/Hr) for a    10.0 year storm
Subarea runoff =      2.433(CFS) for      1.820(Ac.)
Total runoff =     15.551(CFS)   Total area =      11.010(Ac.)
Depth of flow =   0.354(Ft.), Average velocity =   3.969(Ft/s)

Sub-Channel No. 1 Critical depth =      0.406(Ft.)
  '     '       '     Critical flow top width =     12.438(Ft.)
  '     '       '     Critical flow velocity=    3.412(Ft/s)
  '     '       '     Critical flow area =      4.558(Sq.Ft)



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Process from Point/Station      131.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1837.000(Ft.)
Downstream point/station elevation =  1836.000(Ft.)
Pipe length  =    91.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.551(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    15.551(CFS)
Normal flow depth in pipe =   16.13(In.)
Flow top width inside pipe =   17.73(In.)
Critical Depth =   17.49(In.)
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Pipe flow velocity =      7.85(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    16.84 min.


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Process from Point/Station      132.000 to Point/Station      125.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1836.000(Ft.)
Downstream point elevation =  1832.500(Ft.)
Channel length thru subarea  =   183.000(Ft.)
Channel base width    =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     15.551(CFS)
Depth of flow =   0.475(Ft.), Average velocity =   2.868(Ft/s)
Channel flow top width =   12.848(Ft.)
Flow Velocity =    2.87(Ft/s)
Travel time  =    1.06 min.
Time of concentration =   17.91 min.

Sub-Channel No. 1 Critical depth =      0.406(Ft.)
  '     '       '     Critical flow top width =     12.438(Ft.)
  '     '       '     Critical flow velocity=    3.412(Ft/s)
  '     '       '     Critical flow area =      4.558(Sq.Ft)



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Process from Point/Station      132.000 to Point/Station      125.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     11.010(Ac.)
Runoff from this stream =     15.551(CFS)
Time of concentration =   17.91 min.
Rainfall intensity =     1.711(In/Hr)
Summary of stream data:

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


1       64.062     19.94                1.613
2       15.551     17.91                1.711
Largest stream flow has longer time of concentration
Qp =     64.062 + sum of
        Qb         Ia/Ib
        15.551 *    0.943 =     14.658
```

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Qp =     78.719

Total of 2 streams to confluence:
Flow rates before confluence point:
      64.062      15.551
Area of streams before confluence:
       48.640       11.010
Results of confluence:
Total flow rate =     78.719(CFS)
Time of concentration =    19.941 min.
Effective stream area after confluence =     59.650(Ac.)


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Process from Point/Station      125.000 to Point/Station      133.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1832.500(Ft.)
Downstream point elevation =  1832.000(Ft.)
Channel length thru subarea  =   161.000(Ft.)
Channel base width    =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     79.692(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     79.692(CFS)
Depth of flow =   1.953(Ft.), Average velocity =   2.573(Ft/s)
Channel flow top width =   21.717(Ft.)
Flow Velocity =    2.57(Ft/s)
Travel time  =    1.04 min.
Time of concentration =   20.98 min.

Sub-Channel No. 1 Critical depth =      1.109(Ft.)
  '     '       '     Critical flow top width =     16.656(Ft.)
  '     '       '     Critical flow velocity=    5.390(Ft/s)
  '     '       '     Critical flow area =     14.786(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.734
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.568(In/Hr) for a    10.0 year storm
Subarea runoff =      1.877(CFS) for      1.630(Ac.)
Total runoff =     80.596(CFS)   Total area =      61.280(Ac.)
Depth of flow =   1.964(Ft.), Average velocity =   2.581(Ft/s)
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Sub-Channel No. 1 Critical depth =      1.125(Ft.)
  '     '       '     Critical flow top width =     16.750(Ft.)
  '     '       '     Critical flow velocity=    5.356(Ft/s)
  '     '       '     Critical flow area =     15.047(Sq.Ft)



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Process from Point/Station      133.000 to Point/Station       18.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1832.000(Ft.)
Downstream point elevation =  1814.000(Ft.)
Channel length thru subarea  =   141.000(Ft.)
Channel base width    =   10.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     80.596(CFS)
Depth of flow =   0.695(Ft.), Average velocity =   9.070(Ft/s)
Channel flow top width =   15.562(Ft.)
Flow Velocity =    9.07(Ft/s)
Travel time  =    0.26 min.
Time of concentration =   21.24 min.

Sub-Channel No. 1 Critical depth =      1.086(Ft.)
  '     '       '     Critical flow top width =     18.688(Ft.)
  '     '       '     Critical flow velocity=    5.174(Ft/s)
  '     '       '     Critical flow area =     15.576(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      133.000 to Point/Station       18.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     61.280(Ac.)
Runoff from this stream =     80.596(CFS)
Time of concentration =   21.24 min.
Rainfall intensity =     1.558(In/Hr)
Summary of stream data:

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


1      137.121     24.01            1.456
2       80.596     21.24            1.558
Largest stream flow has longer time of concentration
```

```
Qp =    137.121 + sum of
        Qb          Ia/Ib
        80.596 *    0.935 =     75.352
Qp =    212.474

Total of 2 main streams to confluence:
Flow rates before confluence point:
     137.121      80.596
Area of streams before confluence:
      117.520       61.280


Results of confluence:
Total flow rate =    212.474(CFS)
Time of concentration =    24.007 min.
Effective stream area after confluence  =    178.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       20.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1814.000(Ft.)
Downstream point elevation =  1789.500(Ft.)
Channel length thru subarea  =   678.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    230.280(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    230.280(CFS)
Depth of flow =   2.494(Ft.), Average velocity =   8.807(Ft/s)
Channel flow top width =   17.966(Ft.)
Flow Velocity =    8.81(Ft/s)
Travel time  =    1.28 min.
Time of concentration =   25.29 min.

Sub-Channel No. 1 Critical depth =      2.813(Ft.)
  '     '       '     Critical flow top width =     19.875(Ft.)
  '     '       '     Critical flow velocity=    7.159(Ft/s)
  '     '       '     Critical flow area =     32.168(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.720
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
```

```
Rainfall intensity =      1.415(In/Hr) for a    10.0 year storm
Subarea runoff =     35.520(CFS) for     34.870(Ac.)
Total runoff =    247.994(CFS)   Total area =     213.670(Ac.)
Depth of flow =   2.576(Ft.), Average velocity =   8.974(Ft/s)

Sub-Channel No. 1 Critical depth =      2.906(Ft.)
  '     '       '     Critical flow top width =     20.438(Ft.)
  '     '       '     Critical flow velocity=    7.282(Ft/s)
  '     '       '     Critical flow area =     34.058(Sq.Ft)



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Process from Point/Station       18.000 to Point/Station       20.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    213.670(Ac.)
Runoff from this stream =    247.994(CFS)
Time of concentration =   25.29 min.
Rainfall intensity =     1.415(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      134.000 to Point/Station      135.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   666.000(Ft.)
Top (of initial area) elevation =  2066.000(Ft.)
Bottom (of initial area) elevation =  1914.000(Ft.)
Difference in elevation =   152.000(Ft.)
Slope =    0.22823  s(percent)=      22.82
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.852 min.
Rainfall intensity =      2.054(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.053(CFS)
Total initial stream area =        3.840(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      135.000 to Point/Station      136.000
```

```
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1914.000(Ft.)
Downstream point elevation =  1834.000(Ft.)
Channel length thru subarea  =   624.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     17.627(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     17.627(CFS)
Depth of flow =   0.539(Ft.), Average velocity =   7.081(Ft/s)
Channel flow top width =    6.235(Ft.)
Flow Velocity =    7.08(Ft/s)
Travel time  =    1.47 min.
Time of concentration =   14.32 min.

Sub-Channel No. 1 Critical depth =      0.781(Ft.)
  '     '       '     Critical flow top width =      7.688(Ft.)
  '     '       '     Critical flow velocity=    4.222(Ft/s)
  '     '       '     Critical flow area =      4.175(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.761
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.935(In/Hr) for a    10.0 year storm
Subarea runoff =     23.094(CFS) for     15.690(Ac.)
Total runoff =     29.147(CFS)   Total area =      19.530(Ac.)
Depth of flow =   0.700(Ft.), Average velocity =   8.163(Ft/s)

Sub-Channel No. 1 Critical depth =      1.023(Ft.)
  '     '       '     Critical flow top width =      9.141(Ft.)
  '     '       '     Critical flow velocity=    4.692(Ft/s)
  '     '       '     Critical flow area =      6.213(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      136.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1834.000(Ft.)
Downstream point/station elevation =  1789.700(Ft.)
Pipe length  =   668.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.147(CFS)
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```
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    29.147(CFS)
Normal flow depth in pipe =   13.13(In.)
Flow top width inside pipe =   20.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.43(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =    14.92 min.


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Process from Point/Station      136.000 to Point/Station       20.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     19.530(Ac.)
Runoff from this stream =     29.147(CFS)
Time of concentration =   14.92 min.
Rainfall intensity =     1.892(In/Hr)
Summary of stream data:

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


1      247.994     25.29            1.415
2       29.147     14.92            1.892
Largest stream flow has longer time of concentration
Qp =    247.994 + sum of
        Qb         Ia/Ib
        29.147 *    0.748 =     21.808
Qp =    269.802

Total of 2 main streams to confluence:
Flow rates before confluence point:
     247.994      29.147
Area of streams before confluence:
      213.670       19.530


Results of confluence:
Total flow rate =    269.802(CFS)
Time of concentration =    25.290 min.
Effective stream area after confluence  =    233.200(Ac.)


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Process from Point/Station       20.000 to Point/Station       22.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1789.700(Ft.)
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Downstream point elevation =  1787.500(Ft.)
Channel length thru subarea  =   206.000(Ft.)
Channel base width    =   80.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    269.802(CFS)
Depth of flow =   0.923(Ft.), Average velocity =   3.573(Ft/s)
Channel flow top width =   83.691(Ft.)
Flow Velocity =    3.57(Ft/s)
Travel time  =    0.96 min.
Time of concentration =   26.25 min.

Sub-Channel No. 1 Critical depth =      0.703(Ft.)
  '     '       '     Critical flow top width =     82.813(Ft.)
  '     '       '     Critical flow velocity=    4.714(Ft/s)
  '     '       '     Critical flow area =     57.239(Sq.Ft)



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Process from Point/Station       20.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    233.200(Ac.)
Runoff from this stream =    269.802(CFS)
Time of concentration =   26.25 min.
Rainfall intensity =     1.387(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      137.000 to Point/Station      138.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   140.000(Ft.)
Top (of initial area) elevation =  1840.800(Ft.)
Bottom (of initial area) elevation =  1839.400(Ft.)
Difference in elevation =     1.400(Ft.)
Slope =    0.01000  s(percent)=       1.00
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.072 min.
Rainfall intensity =      2.853(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
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```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.469(CFS)
Total initial stream area =        0.200(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      138.000 to Point/Station      139.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1840.000(Ft.)
End of street segment elevation =  1832.300(Ft.)
Length of street segment  =   361.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      2.710(CFS)
Depth of flow =   0.303(Ft.), Average velocity =   2.742(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.340(Ft.)
Flow velocity =   2.74(Ft/s)
Travel time =    2.19 min.     TC =    9.27  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.812
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.459(In/Hr) for a    10.0 year storm
Subarea runoff =      4.431(CFS) for      2.220(Ac.)
Total runoff =      4.900(CFS)   Total area =       2.420(Ac.)
Street flow at end of street =      4.900(CFS)
Half street flow at end of street =      4.900(CFS)
Depth of flow =   0.357(Ft.), Average velocity =   3.127(Ft/s)
Flow width (from curb towards crown)=  12.045(Ft.)


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Process from Point/Station      139.000 to Point/Station      140.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1832.300(Ft.)
Downstream point/station elevation =  1799.000(Ft.)
Pipe length  =   414.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.900(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.900(CFS)
Normal flow depth in pipe =    5.89(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =   10.94(In.)
Pipe flow velocity =     12.77(Ft/s)
Travel time through pipe =    0.54 min.
Time of concentration (TC) =     9.81 min.


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Process from Point/Station      139.000 to Point/Station      140.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.81 min.
Rainfall intensity =      2.383(In/Hr) for a    10.0 year storm
Subarea runoff =      6.444(CFS) for      3.340(Ac.)
Total runoff =     11.344(CFS)   Total area =       5.760(Ac.)


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Process from Point/Station      139.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.760(Ac.)
Runoff from this stream =     11.344(CFS)
Time of concentration =    9.81 min.
Rainfall intensity =     2.383(In/Hr)


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Process from Point/Station      141.000 to Point/Station      142.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   130.000(Ft.)
Top (of initial area) elevation =  1860.700(Ft.)
```

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Bottom (of initial area) elevation =  1859.400(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.01000  s(percent)=       1.00
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.865 min.
Rainfall intensity =      2.899(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.597(CFS)
Total initial stream area =        0.250(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      142.000 to Point/Station      143.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1857.000(Ft.)
End of street segment elevation =  1811.000(Ft.)
Length of street segment  =   538.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      4.762(CFS)
Depth of flow =   0.292(Ft.), Average velocity =   5.339(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.807(Ft.)
Flow velocity =   5.34(Ft/s)
Travel time =    1.68 min.     TC =    8.54  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.571(In/Hr) for a    10.0 year storm
Subarea runoff =      8.254(CFS) for      3.940(Ac.)
Total runoff =      8.851(CFS)   Total area =       4.190(Ac.)
Street flow at end of street =      8.851(CFS)
Half street flow at end of street =      8.851(CFS)
Depth of flow =   0.347(Ft.), Average velocity =   6.116(Ft/s)
Flow width (from curb towards crown)=  11.536(Ft.)


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Process from Point/Station      143.000 to Point/Station      140.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1811.000(Ft.)
Downstream point/station elevation =  1800.600(Ft.)
Pipe length  =   336.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.851(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.851(CFS)
Normal flow depth in pipe =    9.95(In.)
Flow top width inside pipe =   14.18(In.)
Critical Depth =   13.79(In.)
Pipe flow velocity =     10.24(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     9.09 min.


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Process from Point/Station      143.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      4.190(Ac.)
Runoff from this stream =      8.851(CFS)
Time of concentration =    9.09 min.
Rainfall intensity =     2.484(In/Hr)
Summary of stream data:

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


1       11.344      9.81                2.383
2        8.851      9.09                2.484
Largest stream flow has longer time of concentration
Qp =     11.344 + sum of
        Qb         Ia/Ib
         8.851 *    0.959 =      8.490
Qp =     19.834
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
      11.344       8.851
Area of streams before confluence:
        5.760        4.190
Results of confluence:
Total flow rate =     19.834(CFS)
Time of concentration =     9.806 min.
Effective stream area after confluence =      9.950(Ac.)


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Process from Point/Station      140.000 to Point/Station      144.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1797.500(Ft.)
Downstream point/station elevation =  1797.000(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.834(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    19.834(CFS)
Normal flow depth in pipe =   16.71(In.)
Flow top width inside pipe =   22.07(In.)
Critical Depth =   19.20(In.)
Pipe flow velocity =      8.49(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     9.89 min.


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Process from Point/Station      144.100 to Point/Station      144.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.89 min.
Rainfall intensity =      2.371(In/Hr) for a    10.0 year storm
Subarea runoff =      6.006(CFS) for      3.130(Ac.)
Total runoff =     25.840(CFS)   Total area =      13.080(Ac.)


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Process from Point/Station      144.000 to Point/Station      144.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
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Runoff Coefficient = 0.752
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     9.89 min.
Rainfall intensity =      2.371(In/Hr) for a    10.0 year storm
Subarea runoff =      3.974(CFS) for      2.230(Ac.)
Total runoff =     29.814(CFS)   Total area =      15.310(Ac.)


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Process from Point/Station      144.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1792.000(Ft.)
Downstream point/station elevation =  1791.600(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.814(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    29.814(CFS)
Normal flow depth in pipe =   20.53(In.)
Flow top width inside pipe =   23.05(In.)
Critical Depth =   22.72(In.)
Pipe flow velocity =      9.20(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     9.96 min.


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Process from Point/Station      144.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     15.310(Ac.)
Runoff from this stream =     29.814(CFS)
Time of concentration =    9.96 min.
Rainfall intensity =     2.363(In/Hr)
Summary of stream data:

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


1      269.802     26.25            1.387
2       29.814      9.96            2.363
Largest stream flow has longer time of concentration
Qp =    269.802 + sum of
        Qb         Ia/Ib
```

```
       29.814 *    0.587 =     17.497
Qp =    287.300

Total of 2 main streams to confluence:
Flow rates before confluence point:
     269.802      29.814
Area of streams before confluence:
      233.200       15.310


Results of confluence:
Total flow rate =    287.300(CFS)
Time of concentration =    26.251 min.
Effective stream area after confluence  =    248.510(Ac.)


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Process from Point/Station       22.000 to Point/Station       24.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1787.500(Ft.)
Downstream point elevation =  1786.500(Ft.)
Channel length thru subarea  =   116.000(Ft.)
Channel base width    =   80.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    287.892(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    287.892(CFS)
Depth of flow =   1.023(Ft.), Average velocity =   3.431(Ft/s)
Channel flow top width =   84.091(Ft.)
Flow Velocity =    3.43(Ft/s)
Travel time  =    0.56 min.
Time of concentration =   26.81 min.

Sub-Channel No. 1 Critical depth =      0.734(Ft.)
  '     '       '     Critical flow top width =     82.938(Ft.)
  '     '       '     Critical flow velocity=    4.812(Ft/s)
  '     '       '     Critical flow area =     59.829(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.671
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.370(In/Hr) for a    10.0 year storm
Subarea runoff =      1.112(CFS) for      1.210(Ac.)
```

```
Total runoff =    288.412(CFS)   Total area =     249.720(Ac.)
Depth of flow =   1.024(Ft.), Average velocity =   3.434(Ft/s)

Sub-Channel No. 1 Critical depth =      0.734(Ft.)
  '     '       '     Critical flow top width =     82.938(Ft.)
  '     '       '     Critical flow velocity=    4.821(Ft/s)
  '     '       '     Critical flow area =     59.829(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station      148.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1786.500(Ft.)
Downstream point/station elevation =  1784.900(Ft.)
Pipe length  =    82.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   288.412(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   288.412(CFS)
Normal flow depth in pipe =   47.25(In.)
Flow top width inside pipe =   35.72(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.56(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    26.88 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station      148.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    249.720(Ac.)
Runoff from this stream =    288.412(CFS)
Time of concentration =   26.88 min.
Rainfall intensity =     1.368(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      145.000 to Point/Station      146.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   672.000(Ft.)
Top (of initial area) elevation =  2068.000(Ft.)
Bottom (of initial area) elevation =  1843.500(Ft.)
Difference in elevation =   224.500(Ft.)
Slope =    0.33408  s(percent)=      33.41
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.952 min.
```

```
Rainfall intensity =      2.137(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.772
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.465(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      146.000 to Point/Station      147.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1843.500(Ft.)
Downstream point/station elevation =  1822.000(Ft.)
Pipe length  =   358.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.465(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.465(CFS)
Normal flow depth in pipe =    6.40(In.)
Flow top width inside pipe =    8.16(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.31(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =    12.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      147.100 to Point/Station      147.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.769
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    12.53 min.
Rainfall intensity =      2.082(In/Hr) for a    10.0 year storm
Subarea runoff =     14.206(CFS) for      8.870(Ac.)
Total runoff =     17.671(CFS)   Total area =      10.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      147.000 to Point/Station      148.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1822.000(Ft.)
Downstream point/station elevation =  1796.800(Ft.)
Pipe length  =   700.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.671(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    17.671(CFS)
Normal flow depth in pipe =   13.20(In.)
Flow top width inside pipe =   15.92(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.74(Ft/s)
Travel time through pipe =    0.92 min.
Time of concentration (TC) =    13.45 min.


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Process from Point/Station       24.000 to Point/Station      148.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     10.970(Ac.)
Runoff from this stream =     17.671(CFS)
Time of concentration =   13.45 min.
Rainfall intensity =     2.003(In/Hr)
Summary of stream data:

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


1      288.412     26.88            1.368
2       17.671     13.45            2.003
Largest stream flow has longer time of concentration
Qp =    288.412 + sum of
       Qb         Ia/Ib
       17.671 *    0.683 =     12.072
Qp =    300.484

Total of 2 main streams to confluence:
Flow rates before confluence point:
     288.412      17.671
Area of streams before confluence:
      249.720       10.970


Results of confluence:
Total flow rate =    300.484(CFS)
Time of concentration =    26.885 min.
Effective stream area after confluence  =    260.690(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      148.000 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1783.000(Ft.)
Downstream point/station elevation =  1780.000(Ft.)
Pipe length  =   146.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   300.484(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   300.484(CFS)
Normal flow depth in pipe =   48.60(In.)
Flow top width inside pipe =   32.40(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.93(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    27.01 min.


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Process from Point/Station       26.000 to Point/Station       28.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1780.000(Ft.)
Downstream point elevation =  1733.500(Ft.)
Channel length thru subarea  =  1063.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    300.484(CFS)
Depth of flow =   2.434(Ft.), Average velocity =  10.037(Ft/s)
Channel flow top width =   19.603(Ft.)
Flow Velocity =   10.04(Ft/s)
Travel time  =    1.77 min.
Time of concentration =   28.77 min.

Sub-Channel No. 1 Critical depth =      2.906(Ft.)
  '     '       '     Critical flow top width =     22.438(Ft.)
  '     '       '     Critical flow velocity=    7.537(Ft/s)
  '     '       '     Critical flow area =     39.870(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       28.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    260.690(Ac.)
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Runoff from this stream =    300.484(CFS)
Time of concentration =   28.77 min.
Rainfall intensity =     1.318(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      149.000 to Point/Station      150.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   593.000(Ft.)
Top (of initial area) elevation =  2000.000(Ft.)
Bottom (of initial area) elevation =  1940.000(Ft.)
Difference in elevation =    60.000(Ft.)
Slope =    0.10118  s(percent)=      10.12
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.930 min.
Rainfall intensity =      2.678(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      1.796(CFS)
Total initial stream area =        0.820(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      150.000 to Point/Station      151.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1940.000(Ft.)
Downstream point elevation =  1844.000(Ft.)
Channel length thru subarea  =   570.000(Ft.)
Channel base width    =   24.000(Ft.)
Slope or 'Z' of left channel bank =   0.100
Slope or 'Z' of right channel bank =   0.100
Estimated mean flow rate at midpoint of channel =      2.642(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      2.642(CFS)
Depth of flow =   0.032(Ft.), Average velocity =   3.421(Ft/s)
Channel flow top width =   24.006(Ft.)
Flow Velocity =    3.42(Ft/s)
Travel time  =    2.78 min.
Time of concentration =   10.71 min.

Sub-Channel No. 1 Critical depth =      0.072(Ft.)
```

```
  '     '       '     Critical flow top width =     24.014(Ft.)
  '     '       '     Critical flow velocity=    1.523(Ft/s)
  '     '       '     Critical flow area =      1.735(Sq.Ft)

 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.271(In/Hr) for a    10.0 year storm
Subarea runoff =      1.611(CFS) for      0.880(Ac.)
Total runoff =      3.407(CFS)   Total area =       1.700(Ac.)
Depth of flow =   0.037(Ft.), Average velocity =   3.787(Ft/s)

Sub-Channel No. 1 Critical depth =      0.086(Ft.)
  '     '       '     Critical flow top width =     24.017(Ft.)
  '     '       '     Critical flow velocity=    1.651(Ft/s)
  '     '       '     Critical flow area =      2.063(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      151.000 to Point/Station      152.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1844.000(Ft.)
End of street segment elevation =  1823.000(Ft.)
Length of street segment  =   467.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      7.384(CFS)
Depth of flow =   0.361(Ft.), Average velocity =   4.579(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.233(Ft.)
Flow velocity =   4.58(Ft/s)
Travel time =    1.70 min.     TC =   12.41  min.
 Adding area flow to street
```

```
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.094(In/Hr) for a    10.0 year storm
Subarea runoff =      7.855(CFS) for      4.690(Ac.)
Total runoff =     11.262(CFS)   Total area =       6.390(Ac.)
Street flow at end of street =     11.262(CFS)
Half street flow at end of street =     11.262(CFS)
Depth of flow =   0.407(Ft.), Average velocity =   5.049(Ft/s)
Flow width (from curb towards crown)=  14.540(Ft.)


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Process from Point/Station      152.000 to Point/Station      153.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1823.000(Ft.)
Downstream point/station elevation =  1801.200(Ft.)
Pipe length  =   585.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.262(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    11.262(CFS)
Normal flow depth in pipe =   11.16(In.)
Flow top width inside pipe =   13.10(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.50(Ft/s)
Travel time through pipe =    0.85 min.
Time of concentration (TC) =    13.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      153.100 to Point/Station      153.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.797
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    13.25 min.
Rainfall intensity =      2.019(In/Hr) for a    10.0 year storm
Subarea runoff =      3.637(CFS) for      2.260(Ac.)
Total runoff =     14.899(CFS)   Total area =       8.650(Ac.)
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Process from Point/Station      153.000 to Point/Station      154.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1801.200(Ft.)
Downstream point/station elevation =  1790.500(Ft.)
Pipe length  =   556.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.899(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    14.899(CFS)
Normal flow depth in pipe =   12.68(In.)
Flow top width inside pipe =   20.54(In.)
Critical Depth =   17.16(In.)
Pipe flow velocity =      9.82(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =    14.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      153.000 to Point/Station      154.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.794
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.20 min.
Rainfall intensity =      1.944(In/Hr) for a    10.0 year storm
Subarea runoff =      4.786(CFS) for      3.100(Ac.)
Total runoff =     19.685(CFS)   Total area =      11.750(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      154.000 to Point/Station      155.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1790.500(Ft.)
Downstream point/station elevation =  1779.500(Ft.)
Pipe length  =   493.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.685(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    19.685(CFS)
Normal flow depth in pipe =   14.63(In.)
Flow top width inside pipe =   19.31(In.)
Critical Depth =   19.08(In.)
Pipe flow velocity =     11.01(Ft/s)
Travel time through pipe =    0.75 min.
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Time of concentration (TC) =    14.94 min.


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Process from Point/Station      155.100 to Point/Station      155.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.94 min.
Rainfall intensity =      1.890(In/Hr) for a    10.0 year storm
Subarea runoff =      1.766(CFS) for      1.180(Ac.)
Total runoff =     21.451(CFS)   Total area =      12.930(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      155.000 to Point/Station      156.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1779.500(Ft.)
Downstream point/station elevation =  1757.000(Ft.)
Pipe length  =    61.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.451(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    21.451(CFS)
Normal flow depth in pipe =    9.75(In.)
Flow top width inside pipe =    9.37(In.)
Critical depth could not be calculated.
Pipe flow velocity =     31.41(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    14.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      155.000 to Point/Station      156.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     12.930(Ac.)
Runoff from this stream =     21.451(CFS)
Time of concentration =   14.98 min.
Rainfall intensity =     1.888(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      157.000 to Point/Station      158.000
```

```
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   146.000(Ft.)
Top (of initial area) elevation =  1830.500(Ft.)
Bottom (of initial area) elevation =  1829.000(Ft.)
Difference in elevation =     1.500(Ft.)
Slope =    0.01027  s(percent)=       1.03
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.153 min.
Rainfall intensity =      2.835(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      1.630(CFS)
Total initial stream area =        0.700(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      158.000 to Point/Station      159.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1827.700(Ft.)
End of street segment elevation =  1777.500(Ft.)
Length of street segment  =  1417.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =     10.034(CFS)
Depth of flow =   0.407(Ft.), Average velocity =   4.486(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.562(Ft.)
Flow velocity =   4.49(Ft/s)
Travel time =    5.26 min.     TC =   12.42  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.800
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.093(In/Hr) for a    10.0 year storm
Subarea runoff =     16.740(CFS) for     10.000(Ac.)
Total runoff =     18.370(CFS)   Total area =      10.700(Ac.)
Street flow at end of street =     18.370(CFS)
Half street flow at end of street =     18.370(CFS)
Depth of flow =   0.487(Ft.), Average velocity =   5.178(Ft/s)
Flow width (from curb towards crown)=  18.525(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      159.000 to Point/Station      156.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1772.000(Ft.)
Downstream point/station elevation =  1757.000(Ft.)
Pipe length  =    95.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.370(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    18.370(CFS)
Normal flow depth in pipe =    9.39(In.)
Flow top width inside pipe =   14.52(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.74(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    12.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      159.000 to Point/Station      156.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     10.700(Ac.)
Runoff from this stream =     18.370(CFS)
Time of concentration =   12.49 min.
Rainfall intensity =     2.086(In/Hr)
Summary of stream data:

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


1       21.451     14.98                1.888
2       18.370     12.49                2.086
Largest stream flow has longer time of concentration
Qp =     21.451 + sum of
```

```
        Qb         Ia/Ib
        18.370 *    0.905 =     16.622
Qp =     38.073

Total of 2 streams to confluence:
Flow rates before confluence point:
      21.451      18.370
Area of streams before confluence:
       12.930       10.700
Results of confluence:
Total flow rate =     38.073(CFS)
Time of concentration =    14.977 min.
Effective stream area after confluence =     23.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      156.000 to Point/Station      156.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.721
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    14.98 min.
Rainfall intensity =      1.888(In/Hr) for a    10.0 year storm
Subarea runoff =      2.287(CFS) for      1.680(Ac.)
Total runoff =     40.360(CFS)   Total area =      25.310(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      156.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1752.000(Ft.)
Downstream point/station elevation =  1736.000(Ft.)
Pipe length  =    59.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.360(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    40.360(CFS)
Normal flow depth in pipe =   11.50(In.)
Flow top width inside pipe =   17.29(In.)
Critical depth could not be calculated.
Pipe flow velocity =     33.86(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.01 min.


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Process from Point/Station      156.000 to Point/Station       28.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     25.310(Ac.)
Runoff from this stream =     40.360(CFS)
Time of concentration =   15.01 min.
Rainfall intensity =     1.886(In/Hr)
Summary of stream data:

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


1      300.484     28.77            1.318
2       40.360     15.01            1.886
Largest stream flow has longer time of concentration
Qp =    300.484 + sum of
        Qb         Ia/Ib
        40.360 *    0.699 =     28.214
Qp =    328.698

Total of 2 main streams to confluence:
Flow rates before confluence point:
     300.484      40.360
Area of streams before confluence:
      260.690       25.310


Results of confluence:
Total flow rate =    328.698(CFS)
Time of concentration =    28.772 min.
Effective stream area after confluence  =    286.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** IMPROVED CHANNEL TRAVEL TIME ****
--------------------------------------------------------------------------------
Upstream point elevation =  1733.500(Ft.)
Downstream point elevation =  1726.000(Ft.)
Channel length thru subarea  =   308.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    333.139(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    333.139(CFS)
Depth of flow =   2.919(Ft.), Average velocity =   8.295(Ft/s)
Channel flow top width =   22.515(Ft.)
```

```
Flow Velocity =    8.30(Ft/s)
Travel time  =    0.62 min.
Time of concentration =   29.39 min.

Sub-Channel No. 1 Critical depth =      3.063(Ft.)
  '     '       '     Critical flow top width =     23.375(Ft.)
  '     '       '     Critical flow velocity=    7.667(Ft/s)
  '     '       '     Critical flow area =     43.449(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.708
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.303(In/Hr) for a    10.0 year storm
Subarea runoff =      8.814(CFS) for      9.560(Ac.)
Total runoff =    337.511(CFS)   Total area =     295.560(Ac.)
Depth of flow =   2.936(Ft.), Average velocity =   8.323(Ft/s)

Sub-Channel No. 1 Critical depth =      3.063(Ft.)
  '     '       '     Critical flow top width =     23.375(Ft.)
  '     '       '     Critical flow velocity=    7.768(Ft/s)
  '     '       '     Critical flow area =     43.449(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    295.560(Ac.)
Runoff from this stream =    337.511(CFS)
Time of concentration =   29.39 min.
Rainfall intensity =     1.303(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      161.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   842.000(Ft.)
Top (of initial area) elevation =  1996.200(Ft.)
Bottom (of initial area) elevation =  1860.000(Ft.)
Difference in elevation =   136.200(Ft.)
Slope =    0.16176  s(percent)=      16.18
```

```
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.122 min.
Rainfall intensity =      1.878(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.757
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.991(CFS)
Total initial stream area =        5.620(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      161.000 to Point/Station      162.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1860.000(Ft.)
Downstream point elevation =  1764.000(Ft.)
Channel length thru subarea  =  1230.000(Ft.)
Channel base width    =    1.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     22.038(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     22.038(CFS)
Depth of flow =   0.712(Ft.), Average velocity =  12.777(Ft/s)
Channel flow top width =    3.847(Ft.)
Flow Velocity =   12.78(Ft/s)
Travel time  =    1.60 min.
Time of concentration =   16.73 min.

Sub-Channel No. 1 Critical depth =      1.250(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    5.185(Ft/s)
  '     '       '     Critical flow area =      4.250(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.750
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.777(In/Hr) for a    10.0 year storm
Subarea runoff =     28.033(CFS) for     21.030(Ac.)
```

```
Total runoff =     36.024(CFS)   Total area =      26.650(Ac.)
Depth of flow =   0.893(Ft.), Average velocity =  14.491(Ft/s)

Sub-Channel No. 1 Critical depth =      1.578(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    6.115(Ft/s)
  '     '       '     Critical flow area =      5.891(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1764.000(Ft.)
Downstream point/station elevation =  1732.000(Ft.)
Pipe length  =   541.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.024(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    36.024(CFS)
Normal flow depth in pipe =   16.10(In.)
Flow top width inside pipe =   17.76(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.21(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =    17.22 min.


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Process from Point/Station      162.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     26.650(Ac.)
Runoff from this stream =     36.024(CFS)
Time of concentration =   17.22 min.
Rainfall intensity =     1.748(In/Hr)
Summary of stream data:

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


1      337.511     29.39            1.303
2       36.024     17.22            1.748
Largest stream flow has longer time of concentration
Qp =    337.511 + sum of
        Qb         Ia/Ib
        36.024 *    0.745 =     26.848
Qp =    364.360
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
     337.511      36.024
Area of streams before confluence:
      295.560       26.650


Results of confluence:
Total flow rate =    364.360(CFS)
Time of concentration =    29.391 min.
Effective stream area after confluence  =    322.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       32.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1726.000(Ft.)
Downstream point elevation =  1677.000(Ft.)
Channel length thru subarea  =  1217.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    368.616(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    368.616(CFS)
Depth of flow =   2.726(Ft.), Average velocity =  10.262(Ft/s)
Channel flow top width =   21.355(Ft.)
Flow Velocity =   10.26(Ft/s)
Travel time  =    1.98 min.
Time of concentration =   31.37 min.

Sub-Channel No. 1 Critical depth =      3.188(Ft.)
  '     '       '     Critical flow top width =     24.125(Ft.)
  '     '       '     Critical flow velocity=    7.941(Ft/s)
  '     '       '     Critical flow area =     46.418(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.702
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.257(In/Hr) for a    10.0 year storm
Subarea runoff =      8.438(CFS) for      9.560(Ac.)
Total runoff =    372.798(CFS)   Total area =     331.770(Ac.)
Depth of flow =   2.740(Ft.), Average velocity =  10.292(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      3.219(Ft.)
  '     '       '     Critical flow top width =     24.313(Ft.)
  '     '       '     Critical flow velocity=    7.902(Ft/s)
  '     '       '     Critical flow area =     47.175(Sq.Ft)


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Process from Point/Station       30.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    331.770(Ac.)
Runoff from this stream =    372.798(CFS)
Time of concentration =   31.37 min.
Rainfall intensity =     1.257(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       36.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   524.000(Ft.)
Top (of initial area) elevation =  2034.000(Ft.)
Bottom (of initial area) elevation =  1848.000(Ft.)
Difference in elevation =   186.000(Ft.)
Slope =    0.35496  s(percent)=      35.50
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.689 min.
Rainfall intensity =      2.273(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.779
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.582(CFS)
Total initial stream area =        4.850(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       36.000 to Point/Station       38.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1848.000(Ft.)
Downstream point elevation =  1746.000(Ft.)
Channel length thru subarea  =   889.000(Ft.)
```

```
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     21.982(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     21.982(CFS)
Depth of flow =   0.623(Ft.), Average velocity =   7.247(Ft/s)
Channel flow top width =    6.738(Ft.)
Flow Velocity =    7.25(Ft/s)
Travel time  =    2.04 min.
Time of concentration =   12.73 min.

Sub-Channel No. 1 Critical depth =      0.883(Ft.)
  '     '       '     Critical flow top width =      8.297(Ft.)
  '     '       '     Critical flow velocity=    4.408(Ft/s)
  '     '       '     Critical flow area =      4.987(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.064(In/Hr) for a    10.0 year storm
Subarea runoff =     26.747(CFS) for     16.870(Ac.)
Total runoff =     35.329(CFS)   Total area =      21.720(Ac.)
Depth of flow =   0.794(Ft.), Average velocity =   8.269(Ft/s)

Sub-Channel No. 1 Critical depth =      1.133(Ft.)
  '     '       '     Critical flow top width =      9.797(Ft.)
  '     '       '     Critical flow velocity=    4.874(Ft/s)
  '     '       '     Critical flow area =      7.248(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.000 to Point/Station       40.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1746.000(Ft.)
Downstream point/station elevation =  1740.000(Ft.)
Pipe length  =    72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.329(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    35.329(CFS)
Normal flow depth in pipe =   13.85(In.)
Flow top width inside pipe =   19.90(In.)
Critical depth could not be calculated.
```

```
Pipe flow velocity =     20.99(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.79 min.


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Process from Point/Station       40.000 to Point/Station       32.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1740.000(Ft.)
Downstream point elevation =  1677.000(Ft.)
Channel length thru subarea  =   675.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     35.329(CFS)
Depth of flow =   0.836(Ft.), Average velocity =   7.671(Ft/s)
Channel flow top width =    8.017(Ft.)
Flow Velocity =    7.67(Ft/s)
Travel time  =    1.47 min.
Time of concentration =   14.26 min.

Sub-Channel No. 1 Critical depth =      1.133(Ft.)
  '     '       '     Critical flow top width =      9.797(Ft.)
  '     '       '     Critical flow velocity=    4.874(Ft/s)
  '     '       '     Critical flow area =      7.248(Sq.Ft)



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Process from Point/Station       40.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     21.720(Ac.)
Runoff from this stream =     35.329(CFS)
Time of concentration =   14.26 min.
Rainfall intensity =     1.940(In/Hr)
Summary of stream data:

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


1      372.798     31.37            1.257
2       35.329     14.26            1.940
Largest stream flow has longer time of concentration
Qp =    372.798 + sum of
        Qb         Ia/Ib
```

```
       35.329 *    0.648 =     22.898
Qp =    395.696

Total of 2 main streams to confluence:
Flow rates before confluence point:
     372.798      35.329
Area of streams before confluence:
      331.770       21.720


Results of confluence:
Total flow rate =    395.696(CFS)
Time of concentration =    31.367 min.
Effective stream area after confluence  =    353.490(Ac.)


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Process from Point/Station       32.000 to Point/Station       42.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1677.000(Ft.)
Downstream point elevation =  1618.000(Ft.)
Channel length thru subarea  =  1080.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    399.601(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    399.601(CFS)
Depth of flow =   2.638(Ft.), Average velocity =  11.733(Ft/s)
Channel flow top width =   20.825(Ft.)
Flow Velocity =   11.73(Ft/s)
Travel time  =    1.53 min.
Time of concentration =   32.90 min.

Sub-Channel No. 1 Critical depth =      3.313(Ft.)
  '     '       '     Critical flow top width =     24.875(Ft.)
  '     '       '     Critical flow velocity=    8.076(Ft/s)
  '     '       '     Critical flow area =     49.480(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.698
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.225(In/Hr) for a    10.0 year storm
Subarea runoff =      7.736(CFS) for      9.050(Ac.)
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```
Total runoff =    403.431(CFS)   Total area =     362.540(Ac.)
Depth of flow =   2.649(Ft.), Average velocity =  11.762(Ft/s)

Sub-Channel No. 1 Critical depth =      3.344(Ft.)
  '     '       '     Critical flow top width =     25.063(Ft.)
  '     '       '     Critical flow velocity=    8.027(Ft/s)
  '     '       '     Critical flow area =     50.261(Sq.Ft)



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Process from Point/Station       32.000 to Point/Station       42.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    362.540(Ac.)
Runoff from this stream =    403.431(CFS)
Time of concentration =   32.90 min.
Rainfall intensity =     1.225(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      163.000 to Point/Station      164.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   745.000(Ft.)
Top (of initial area) elevation =  1993.000(Ft.)
Bottom (of initial area) elevation =  1728.000(Ft.)
Difference in elevation =   265.000(Ft.)
Slope =    0.35570  s(percent)=      35.57
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.104(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.770
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.021(CFS)
Total initial stream area =        4.950(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      164.000 to Point/Station      165.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
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Upstream point elevation =  1728.000(Ft.)
Downstream point elevation =  1651.000(Ft.)
Channel length thru subarea  =   942.000(Ft.)
Channel base width    =    1.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     13.142(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     13.142(CFS)
Depth of flow =   0.550(Ft.), Average velocity =  11.364(Ft/s)
Channel flow top width =    3.202(Ft.)
Flow Velocity =   11.36(Ft/s)
Travel time  =    1.38 min.
Time of concentration =   13.68 min.

Sub-Channel No. 1 Critical depth =      1.000(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    4.381(Ft/s)
  '     '       '     Critical flow area =      3.000(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.764
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.984(In/Hr) for a    10.0 year storm
Subarea runoff =     10.152(CFS) for      6.700(Ac.)
Total runoff =     18.173(CFS)   Total area =      11.650(Ac.)
Depth of flow =   0.643(Ft.), Average velocity =  12.366(Ft/s)

Sub-Channel No. 1 Critical depth =      1.141(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    4.907(Ft/s)
  '     '       '     Critical flow area =      3.703(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      165.000 to Point/Station      166.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1651.000(Ft.)
Downstream point/station elevation =  1636.000(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.173(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    18.173(CFS)
```

```
Normal flow depth in pipe =   10.11(In.)
Flow top width inside pipe =   14.06(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.66(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    13.78 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      166.000 to Point/Station      166.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.763
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    13.78 min.
Rainfall intensity =      1.977(In/Hr) for a    10.0 year storm
Subarea runoff =      1.086(CFS) for      0.720(Ac.)
Total runoff =     19.259(CFS)   Total area =      12.370(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      166.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1629.500(Ft.)
Downstream point/station elevation =  1622.000(Ft.)
Pipe length  =   172.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.259(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    19.259(CFS)
Normal flow depth in pipe =   13.08(In.)
Flow top width inside pipe =   16.05(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.00(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    13.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      166.000 to Point/Station       42.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.370(Ac.)
Runoff from this stream =     19.259(CFS)
```

```
Time of concentration =   13.98 min.
Rainfall intensity =     1.961(In/Hr)
Summary of stream data:

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


1      403.431     32.90            1.225
2       19.259     13.98            1.961
Largest stream flow has longer time of concentration
Qp =    403.431 + sum of
        Qb         Ia/Ib
        19.259 *    0.625 =     12.030
Qp =    415.461

Total of 2 main streams to confluence:
Flow rates before confluence point:
     403.431      19.259
Area of streams before confluence:
      362.540       12.370


Results of confluence:
Total flow rate =    415.461(CFS)
Time of concentration =    32.901 min.
Effective stream area after confluence  =    374.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       44.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1618.000(Ft.)
Downstream point elevation =  1598.000(Ft.)
Channel length thru subarea  =   883.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    415.461(CFS)
Depth of flow =   3.278(Ft.), Average velocity =   8.545(Ft/s)
Channel flow top width =   24.666(Ft.)
Flow Velocity =    8.55(Ft/s)
Travel time  =    1.72 min.
Time of concentration =   34.62 min.

Sub-Channel No. 1 Critical depth =      3.375(Ft.)
  '     '       '     Critical flow top width =     25.250(Ft.)
  '     '       '     Critical flow velocity=    8.139(Ft/s)
  '     '       '     Critical flow area =     51.047(Sq.Ft)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       44.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    374.910(Ac.)
Runoff from this stream =    415.461(CFS)
Time of concentration =   34.62 min.
Rainfall intensity =     1.191(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      167.000 to Point/Station      168.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   214.000(Ft.)
Top (of initial area) elevation =  2127.000(Ft.)
Bottom (of initial area) elevation =  2046.000(Ft.)
Difference in elevation =    81.000(Ft.)
Slope =    0.37850  s(percent)=      37.85
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.376 min.
Rainfall intensity =      2.787(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.798
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.313(CFS)
Total initial stream area =        0.590(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      169.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  2046.000(Ft.)
Downstream point elevation =  1847.000(Ft.)
Channel length thru subarea  =   632.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      5.202(CFS)
```

```
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =      5.202(CFS)
Depth of flow =   0.211(Ft.), Average velocity =   6.422(Ft/s)
Channel flow top width =    4.686(Ft.)
Flow Velocity =    6.42(Ft/s)
Travel time  =    1.64 min.
Time of concentration =    9.02 min.

Sub-Channel No. 1 Critical depth =      0.379(Ft.)
  '     '       '     Critical flow top width =      6.031(Ft.)
  '     '       '     Critical flow velocity=    3.041(Ft/s)
  '     '       '     Critical flow area =      1.711(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.496(In/Hr) for a    10.0 year storm
Subarea runoff =      7.710(CFS) for      3.920(Ac.)
Total runoff =      9.023(CFS)   Total area =       4.510(Ac.)
Depth of flow =   0.286(Ft.), Average velocity =   7.621(Ft/s)

Sub-Channel No. 1 Critical depth =      0.516(Ft.)
  '     '       '     Critical flow top width =      7.125(Ft.)
  '     '       '     Critical flow velocity=    3.457(Ft/s)
  '     '       '     Critical flow area =      2.610(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      169.000 to Point/Station      170.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1847.000(Ft.)
Downstream point/station elevation =  1816.000(Ft.)
Pipe length  =   192.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.023(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     9.023(CFS)
Normal flow depth in pipe =    6.91(In.)
Flow top width inside pipe =   11.86(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.27(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     9.18 min.
```

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Process from Point/Station      170.100 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     9.18 min.
Rainfall intensity =      2.471(In/Hr) for a    10.0 year storm
Subarea runoff =      8.363(CFS) for      4.300(Ac.)
Total runoff =     17.386(CFS)   Total area =       8.810(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      171.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1816.000(Ft.)
Downstream point/station elevation =  1786.000(Ft.)
Pipe length  =   369.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.386(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    17.386(CFS)
Normal flow depth in pipe =   11.60(In.)
Flow top width inside pipe =   12.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.07(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =     9.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      171.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.54 min.
Rainfall intensity =      2.419(In/Hr) for a    10.0 year storm
Subarea runoff =      6.786(CFS) for      3.460(Ac.)
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Total runoff =     24.171(CFS)   Total area =      12.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      171.000 to Point/Station      172.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1786.000(Ft.)
Downstream point/station elevation =  1756.000(Ft.)
Pipe length  =   378.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.171(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    24.171(CFS)
Normal flow depth in pipe =   12.38(In.)
Flow top width inside pipe =   16.69(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.68(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =     9.88 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      172.100 to Point/Station      172.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.783
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     9.88 min.
Rainfall intensity =      2.373(In/Hr) for a    10.0 year storm
Subarea runoff =     12.898(CFS) for      6.940(Ac.)
Total runoff =     37.069(CFS)   Total area =      19.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      172.000 to Point/Station      173.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1756.000(Ft.)
Downstream point/station elevation =  1726.000(Ft.)
Pipe length  =   351.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.069(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    37.069(CFS)
Normal flow depth in pipe =   14.20(In.)
Flow top width inside pipe =   19.65(In.)
Critical depth could not be calculated.
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```
Pipe flow velocity =     21.39(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =    10.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      172.000 to Point/Station      173.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.15 min.
Rainfall intensity =      2.338(In/Hr) for a    10.0 year storm
Subarea runoff =      5.423(CFS) for      2.870(Ac.)
Total runoff =     42.492(CFS)   Total area =      22.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      173.000 to Point/Station      174.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1726.000(Ft.)
Downstream point/station elevation =  1656.000(Ft.)
Pipe length  =   880.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.492(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    42.492(CFS)
Normal flow depth in pipe =   16.36(In.)
Flow top width inside pipe =   17.43(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.14(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =    10.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      173.000 to Point/Station      174.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
```

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Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.85 min.
Rainfall intensity =      2.255(In/Hr) for a    10.0 year storm
Subarea runoff =      9.843(CFS) for      5.420(Ac.)
Total runoff =     52.335(CFS)   Total area =      27.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      174.000 to Point/Station      175.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1656.000(Ft.)
Downstream point/station elevation =  1641.000(Ft.)
Pipe length  =   343.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.335(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    52.335(CFS)
Normal flow depth in pipe =   18.40(In.)
Flow top width inside pipe =   25.16(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.13(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    11.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      174.000 to Point/Station      175.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.16 min.
Rainfall intensity =      2.219(In/Hr) for a    10.0 year storm
Subarea runoff =      3.088(CFS) for      1.730(Ac.)
Total runoff =     55.423(CFS)   Total area =      29.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station      176.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1636.000(Ft.)
Downstream point/station elevation =  1617.000(Ft.)
Pipe length  =   105.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.423(CFS)
Nearest computed pipe diameter  =     21.00(In.)
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```
Calculated individual pipe flow  =    55.423(CFS)
Normal flow depth in pipe =   14.51(In.)
Flow top width inside pipe =   19.41(In.)
Critical depth could not be calculated.
Pipe flow velocity =     31.29(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    11.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      176.000 to Point/Station      176.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.743
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    11.22 min.
Rainfall intensity =      2.213(In/Hr) for a    10.0 year storm
Subarea runoff =      2.844(CFS) for      1.730(Ac.)
Total runoff =     58.267(CFS)   Total area =      30.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station      176.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     30.960(Ac.)
Runoff from this stream =     58.267(CFS)
Time of concentration =   11.22 min.
Rainfall intensity =     2.213(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      177.000 to Point/Station      178.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   110.000(Ft.)
Top (of initial area) elevation =  1837.500(Ft.)
Bottom (of initial area) elevation =  1836.400(Ft.)
Difference in elevation =     1.100(Ft.)
Slope =    0.01000  s(percent)=       1.00
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.421 min.
Rainfall intensity =      3.008(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.825
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.521(CFS)
Total initial stream area =        0.210(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      178.000 to Point/Station      179.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1836.000(Ft.)
End of street segment elevation =  1770.000(Ft.)
Length of street segment  =  1126.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      5.772(CFS)
Depth of flow =   0.325(Ft.), Average velocity =   4.800(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.422(Ft.)
Flow velocity =   4.80(Ft/s)
Travel time =    3.91 min.     TC =   10.33  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.316(In/Hr) for a    10.0 year storm
Subarea runoff =     10.435(CFS) for      5.580(Ac.)
Total runoff =     10.956(CFS)   Total area =       5.790(Ac.)
Street flow at end of street =     10.956(CFS)
Half street flow at end of street =     10.956(CFS)
Depth of flow =   0.389(Ft.), Average velocity =   5.553(Ft/s)
```

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Flow width (from curb towards crown)=  13.626(Ft.)


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Process from Point/Station      179.000 to Point/Station      180.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1770.000(Ft.)
Downstream point/station elevation =  1769.400(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.956(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    10.956(CFS)
Normal flow depth in pipe =   12.70(In.)
Flow top width inside pipe =   20.53(In.)
Critical Depth =   14.81(In.)
Pipe flow velocity =      7.21(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    10.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.100 to Point/Station      180.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.807
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.46 min.
Rainfall intensity =      2.299(In/Hr) for a    10.0 year storm
Subarea runoff =      5.548(CFS) for      2.990(Ac.)
Total runoff =     16.504(CFS)   Total area =       8.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      181.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1769.400(Ft.)
Downstream point/station elevation =  1768.900(Ft.)
Pipe length  =    49.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.504(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    16.504(CFS)
Normal flow depth in pipe =   17.86(In.)
Flow top width inside pipe =   14.98(In.)
Critical Depth =   17.93(In.)
```

```
Pipe flow velocity =      7.57(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    10.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.100 to Point/Station      181.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.807
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.57 min.
Rainfall intensity =      2.286(In/Hr) for a    10.0 year storm
Subarea runoff =      6.455(CFS) for      3.500(Ac.)
Total runoff =     22.959(CFS)   Total area =      12.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station      182.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1768.900(Ft.)
Downstream point/station elevation =  1729.000(Ft.)
Pipe length  =   454.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.959(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    22.959(CFS)
Normal flow depth in pipe =   11.50(In.)
Flow top width inside pipe =   17.29(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.27(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    10.97 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.100 to Point/Station      182.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.744
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
```

```
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.97 min.
Rainfall intensity =      2.241(In/Hr) for a    10.0 year storm
Subarea runoff =      3.286(CFS) for      1.970(Ac.)
Total runoff =     26.245(CFS)   Total area =      14.250(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.000 to Point/Station      183.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1729.000(Ft.)
Downstream point/station elevation =  1726.000(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.245(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    26.245(CFS)
Normal flow depth in pipe =   13.29(In.)
Flow top width inside pipe =   20.25(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.34(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    11.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.000 to Point/Station      183.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.02 min.
Rainfall intensity =      2.234(In/Hr) for a    10.0 year storm
Subarea runoff =      4.028(CFS) for      2.240(Ac.)
Total runoff =     30.274(CFS)   Total area =      16.490(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      183.000 to Point/Station      184.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1726.000(Ft.)
Downstream point/station elevation =  1708.000(Ft.)
Pipe length  =   309.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.274(CFS)
Nearest computed pipe diameter  =     21.00(In.)
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```
Calculated individual pipe flow  =    30.274(CFS)
Normal flow depth in pipe =   14.11(In.)
Flow top width inside pipe =   19.72(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.63(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    11.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.100 to Point/Station      184.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.32 min.
Rainfall intensity =      2.203(In/Hr) for a    10.0 year storm
Subarea runoff =      4.975(CFS) for      2.810(Ac.)
Total runoff =     35.248(CFS)   Total area =      19.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      185.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1708.000(Ft.)
Downstream point/station elevation =  1678.000(Ft.)
Pipe length  =   445.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.248(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    35.248(CFS)
Normal flow depth in pipe =   14.98(In.)
Flow top width inside pipe =   19.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.23(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    11.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      185.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.70 min.
Rainfall intensity =      2.162(In/Hr) for a    10.0 year storm
Subarea runoff =      3.626(CFS) for      2.090(Ac.)
Total runoff =     38.874(CFS)   Total area =      21.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      186.000 to Point/Station      185.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.773
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    11.70 min.
Rainfall intensity =      2.162(In/Hr) for a    10.0 year storm
Subarea runoff =      3.327(CFS) for      1.990(Ac.)
Total runoff =     42.202(CFS)   Total area =      23.380(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      185.000 to Point/Station      187.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1678.000(Ft.)
Downstream point/station elevation =  1664.000(Ft.)
Pipe length  =   233.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.202(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    42.202(CFS)
Normal flow depth in pipe =   15.66(In.)
Flow top width inside pipe =   22.86(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.42(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    11.90 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      187.100 to Point/Station      187.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
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```
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.90 min.
Rainfall intensity =      2.142(In/Hr) for a    10.0 year storm
Subarea runoff =      4.156(CFS) for      2.420(Ac.)
Total runoff =     46.358(CFS)   Total area =      25.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      187.000 to Point/Station      188.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1664.000(Ft.)
Downstream point/station elevation =  1643.000(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    46.358(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    46.358(CFS)
Normal flow depth in pipe =   20.91(In.)
Flow top width inside pipe =   16.08(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.95(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    12.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      187.000 to Point/Station      188.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    12.48 min.
Rainfall intensity =      2.087(In/Hr) for a    10.0 year storm
Subarea runoff =      3.555(CFS) for      2.130(Ac.)
Total runoff =     49.913(CFS)   Total area =      27.930(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      188.000 to Point/Station      176.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =  1643.000(Ft.)
Downstream point/station elevation =  1617.000(Ft.)
Pipe length  =   475.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    49.913(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    49.913(CFS)
Normal flow depth in pipe =   18.56(In.)
Flow top width inside pipe =   20.09(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.16(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =    12.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      188.000 to Point/Station      176.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     27.930(Ac.)
Runoff from this stream =     49.913(CFS)
Time of concentration =   12.89 min.
Rainfall intensity =     2.050(In/Hr)
Summary of stream data:

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


1       58.267     11.22                 2.213
2       49.913     12.89                 2.050
Largest stream flow has longer or shorter time of concentration
Qp =     58.267 + sum of
        Qa          Tb/Ta
        49.913 *    0.870 =     43.438
Qp =    101.705

Total of 2 streams to confluence:
Flow rates before confluence point:
      58.267      49.913
Area of streams before confluence:
       30.960       27.930
Results of confluence:
Total flow rate =    101.705(CFS)
Time of concentration =    11.218 min.
Effective stream area after confluence =     58.890(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      176.000 to Point/Station      189.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =  1617.000(Ft.)
Downstream point/station elevation =  1616.700(Ft.)
Pipe length  =    27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   101.705(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   101.705(CFS)
Normal flow depth in pipe =   33.00(In.)
Flow top width inside pipe =   34.47(In.)
Critical Depth =   37.05(In.)
Pipe flow velocity =     12.55(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    11.25 min.


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Process from Point/Station      176.000 to Point/Station      189.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.25 min.
Rainfall intensity =      2.209(In/Hr) for a    10.0 year storm
Subarea runoff =      4.707(CFS) for      2.650(Ac.)
Total runoff =    106.412(CFS)   Total area =      61.540(Ac.)


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Process from Point/Station      189.000 to Point/Station      190.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1616.700(Ft.)
Downstream point/station elevation =  1607.000(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   106.412(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =   106.412(CFS)
Normal flow depth in pipe =   22.59(In.)
Flow top width inside pipe =   19.96(In.)
Critical depth could not be calculated.
Pipe flow velocity =     29.97(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    11.30 min.


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Process from Point/Station      190.000 to Point/Station      191.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1607.000(Ft.)
Downstream point elevation =  1604.500(Ft.)
Channel length thru subarea  =   487.000(Ft.)
Channel base width    =   70.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    107.831(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =    107.831(CFS)
Depth of flow =   0.719(Ft.), Average velocity =   2.101(Ft/s)
Channel flow top width =   72.874(Ft.)
Flow Velocity =    2.10(Ft/s)
Travel time  =    3.86 min.
Time of concentration =   15.16 min.

Sub-Channel No. 1 Critical depth =      0.418(Ft.)
  '     '       '     Critical flow top width =     71.672(Ft.)
  '     '       '     Critical flow velocity=    3.642(Ft/s)
  '     '       '     Critical flow area =     29.607(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.720
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.875(In/Hr) for a    10.0 year storm
Subarea runoff =      2.741(CFS) for      2.030(Ac.)
Total runoff =    109.153(CFS)   Total area =      63.570(Ac.)
Depth of flow =   0.724(Ft.), Average velocity =   2.111(Ft/s)

Sub-Channel No. 1 Critical depth =      0.422(Ft.)
  '     '       '     Critical flow top width =     71.688(Ft.)
  '     '       '     Critical flow velocity=    3.652(Ft/s)
  '     '       '     Critical flow area =     29.887(Sq.Ft)



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Process from Point/Station      191.000 to Point/Station       44.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1602.000(Ft.)
Downstream point/station elevation =  1598.000(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =   109.153(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =   109.153(CFS)
Normal flow depth in pipe =   23.34(In.)
Flow top width inside pipe =   18.48(In.)
Critical depth could not be calculated.
Pipe flow velocity =     29.88(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    15.18 min.


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Process from Point/Station      191.000 to Point/Station       44.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     63.570(Ac.)
Runoff from this stream =    109.153(CFS)
Time of concentration =   15.18 min.
Rainfall intensity =     1.874(In/Hr)
Summary of stream data:

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


1      415.461     34.62            1.191
2      109.153     15.18            1.874
Largest stream flow has longer time of concentration
Qp =    415.461 + sum of
       Qb         Ia/Ib
      109.153 *    0.636 =     69.367
Qp =    484.827

Total of 2 main streams to confluence:
Flow rates before confluence point:
     415.461     109.153
Area of streams before confluence:
      374.910       63.570


Results of confluence:
Total flow rate =    484.827(CFS)
Time of concentration =    34.624 min.
Effective stream area after confluence  =    438.480(Ac.)


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Process from Point/Station       44.000 to Point/Station       46.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
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```
Upstream point elevation =  1598.000(Ft.)
Downstream point elevation =  1592.000(Ft.)
Channel length thru subarea  =   423.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    487.177(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    487.177(CFS)
Depth of flow =   3.901(Ft.), Average velocity =   7.475(Ft/s)
Channel flow top width =   28.408(Ft.)
Flow Velocity =    7.48(Ft/s)
Travel time  =    0.94 min.
Time of concentration =   35.57 min.

Sub-Channel No. 1 Critical depth =      3.656(Ft.)
  '     '       '     Critical flow top width =     26.938(Ft.)
  '     '       '     Critical flow velocity=    8.344(Ft/s)
  '     '       '     Critical flow area =     58.386(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.691
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.173(In/Hr) for a    10.0 year storm
Subarea runoff =      4.647(CFS) for      5.730(Ac.)
Total runoff =    489.474(CFS)   Total area =     444.210(Ac.)
Depth of flow =   3.909(Ft.), Average velocity =   7.484(Ft/s)

Sub-Channel No. 1 Critical depth =      3.656(Ft.)
  '     '       '     Critical flow top width =     26.938(Ft.)
  '     '       '     Critical flow velocity=    8.383(Ft/s)
  '     '       '     Critical flow area =     58.386(Sq.Ft)



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Process from Point/Station       46.000 to Point/Station       48.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1592.000(Ft.)
Downstream point/station elevation =  1591.400(Ft.)
Pipe length  =    56.00(Ft.)   Manning's N = 0.013
No. of pipes = 3  Required pipe flow  =   489.474(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   163.158(CFS)
```

```
Normal flow depth in pipe =   39.05(In.)
Flow top width inside pipe =   43.21(In.)
Critical Depth =   44.78(In.)
Pipe flow velocity =     14.00(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    35.63 min.
End of computations, total study area =          444.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.883
Area averaged RI index number =  76.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 11/21/17 File:pr20010.out

Tentative Tract 35853
Proposed Conditions
Major Basin 200
10-Year Flow Rate

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

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

Program License Serial Number 4028

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.880(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 570.000(Ft.)
Top (of initial area) elevation = 2035.000(Ft.)
Bottom (of initial area) elevation = 1812.000(Ft.)
Difference in elevation = 223.000(Ft.)
Slope = 0.39123 s(percent)= 39.12
TC = k(0.710)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   10.842 min.
Rainfall intensity =      2.255(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.778
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.050(CFS)
Total initial stream area =        4.020(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1812.000(Ft.)
Downstream point elevation =  1684.000(Ft.)
Channel length thru subarea  =   933.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     17.040(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     17.040(CFS)
Depth of flow =   0.520(Ft.), Average velocity =   7.183(Ft/s)
Channel flow top width =    6.121(Ft.)
Flow Velocity =    7.18(Ft/s)
Travel time  =    2.16 min.
Time of concentration =   13.01 min.

Sub-Channel No. 1 Critical depth =      0.773(Ft.)
  '     '       '     Critical flow top width =      7.641(Ft.)
  '     '       '     Critical flow velocity=    4.141(Ft/s)
  '     '       '     Critical flow area =      4.115(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.767
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.040(In/Hr) for a    10.0 year storm
Subarea runoff =     19.899(CFS) for     12.720(Ac.)
Total runoff =     26.949(CFS)   Total area =      16.740(Ac.)
```

```
Depth of flow =   0.661(Ft.), Average velocity =   8.184(Ft/s)

Sub-Channel No. 1 Critical depth =      0.984(Ft.)
  '     '       '     Critical flow top width =      8.906(Ft.)
  '     '       '     Critical flow velocity=    4.599(Ft/s)
  '     '       '     Critical flow area =      5.860(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1684.000(Ft.)
Downstream point/station elevation =  1681.000(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.949(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    26.949(CFS)
Normal flow depth in pipe =   13.05(In.)
Flow top width inside pipe =   20.37(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.17(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    13.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.798
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    13.06 min.
Rainfall intensity =      2.036(In/Hr) for a    10.0 year storm
Subarea runoff =      4.239(CFS) for      2.610(Ac.)
Total runoff =     31.188(CFS)   Total area =      19.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1681.000(Ft.)
Downstream point/station elevation =  1672.000(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    31.188(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    31.188(CFS)
Normal flow depth in pipe =   13.17(In.)
Flow top width inside pipe =   20.31(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.63(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    13.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1672.000(Ft.)
Downstream point elevation =  1645.000(Ft.)
Channel length thru subarea  =   411.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     33.170(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     33.170(CFS)
Depth of flow =   0.884(Ft.), Average velocity =   6.636(Ft/s)
Channel flow top width =    8.306(Ft.)
Flow Velocity =    6.64(Ft/s)
Travel time  =    1.03 min.
Time of concentration =   14.19 min.

Sub-Channel No. 1 Critical depth =      1.094(Ft.)
  '     '       '     Critical flow top width =      9.563(Ft.)
  '     '       '     Critical flow velocity=    4.828(Ft/s)
  '     '       '     Critical flow area =      6.870(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.761
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.945(In/Hr) for a    10.0 year storm
Subarea runoff =      3.879(CFS) for      2.620(Ac.)
Total runoff =     35.066(CFS)   Total area =      21.970(Ac.)
Depth of flow =   0.909(Ft.), Average velocity =   6.736(Ft/s)

Sub-Channel No. 1 Critical depth =      1.125(Ft.)
  '     '       '     Critical flow top width =      9.750(Ft.)
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  '     '       '     Critical flow velocity=    4.889(Ft/s)
  '     '       '     Critical flow area =      7.172(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     21.970(Ac.)
Runoff from this stream =     35.066(CFS)
Time of concentration =   14.19 min.
Rainfall intensity =     1.945(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   503.000(Ft.)
Top (of initial area) elevation =  1968.000(Ft.)
Bottom (of initial area) elevation =  1850.000(Ft.)
Difference in elevation =   118.000(Ft.)
Slope =    0.23459  s(percent)=      23.46
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.424 min.
Rainfall intensity =      2.191(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.775
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.069(CFS)
Total initial stream area =        0.630(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1850.000(Ft.)
Downstream point elevation =  1736.000(Ft.)
Channel length thru subarea  =   709.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
```

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Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      3.938(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =      3.938(CFS)
Depth of flow =   0.218(Ft.), Average velocity =   4.674(Ft/s)
Channel flow top width =    4.742(Ft.)
Flow Velocity =    4.67(Ft/s)
Travel time  =    2.53 min.
Time of concentration =   13.95 min.

Sub-Channel No. 1 Critical depth =      0.324(Ft.)
  '     '       '     Critical flow top width =      5.594(Ft.)
  '     '       '     Critical flow velocity=    2.827(Ft/s)
  '     '       '     Critical flow area =      1.393(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.762
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.963(In/Hr) for a    10.0 year storm
Subarea runoff =      5.687(CFS) for      3.800(Ac.)
Total runoff =      6.756(CFS)   Total area =       4.430(Ac.)
Depth of flow =   0.293(Ft.), Average velocity =   5.523(Ft/s)

Sub-Channel No. 1 Critical depth =      0.441(Ft.)
  '     '       '     Critical flow top width =      6.531(Ft.)
  '     '       '     Critical flow velocity=    3.212(Ft/s)
  '     '       '     Critical flow area =      2.104(Sq.Ft)



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Process from Point/Station      208.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1736.000(Ft.)
Downstream point/station elevation =  1705.000(Ft.)
Pipe length  =   196.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.756(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.756(CFS)
Normal flow depth in pipe =    5.84(In.)
Flow top width inside pipe =   12.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.83(Ft/s)
Travel time through pipe =    0.18 min.
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Time of concentration (TC) =    14.14 min.


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Process from Point/Station      209.100 to Point/Station      209.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.726
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    14.14 min.
Rainfall intensity =      1.949(In/Hr) for a    10.0 year storm
Subarea runoff =      0.495(CFS) for      0.350(Ac.)
Total runoff =      7.251(CFS)   Total area =       4.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      210.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1705.000(Ft.)
Downstream point/station elevation =  1696.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.251(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.251(CFS)
Normal flow depth in pipe =    7.92(In.)
Flow top width inside pipe =   11.37(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.18(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    14.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      210.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.794
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.30 min.
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```
Rainfall intensity =      1.937(In/Hr) for a    10.0 year storm
Subarea runoff =      5.795(CFS) for      3.770(Ac.)
Total runoff =     13.045(CFS)   Total area =       8.550(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1696.000(Ft.)
Downstream point/station elevation =  1684.000(Ft.)
Pipe length  =   340.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.045(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    13.045(CFS)
Normal flow depth in pipe =   10.69(In.)
Flow top width inside pipe =   17.68(In.)
Critical Depth =   16.24(In.)
Pipe flow velocity =     11.93(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =    14.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.100 to Point/Station      211.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.77 min.
Rainfall intensity =      1.902(In/Hr) for a    10.0 year storm
Subarea runoff =      3.511(CFS) for      2.330(Ac.)
Total runoff =     16.556(CFS)   Total area =      10.880(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1684.000(Ft.)
Downstream point/station elevation =  1680.000(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.556(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.556(CFS)
Normal flow depth in pipe =   10.91(In.)
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```
Flow top width inside pipe =   17.59(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.77(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    14.86 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.86 min.
Rainfall intensity =      1.896(In/Hr) for a    10.0 year storm
Subarea runoff =      4.445(CFS) for      2.960(Ac.)
Total runoff =     21.001(CFS)   Total area =      13.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1680.000(Ft.)
Downstream point/station elevation =  1656.000(Ft.)
Pipe length  =   134.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.001(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    21.001(CFS)
Normal flow depth in pipe =    9.86(In.)
Flow top width inside pipe =   14.24(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.56(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    14.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      205.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     13.840(Ac.)
Runoff from this stream =     21.001(CFS)
Time of concentration =   14.95 min.
```

```
Rainfall intensity =     1.890(In/Hr)
Summary of stream data:

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


1       35.066     14.19            1.945
2       21.001     14.95            1.890
Largest stream flow has longer or shorter time of concentration
Qp =     35.066 + sum of
        Qa          Tb/Ta
        21.001 *    0.949 =     19.935
Qp =     55.002

Total of 2 main streams to confluence:
Flow rates before confluence point:
      35.066      21.001
Area of streams before confluence:
       21.970       13.840


Results of confluence:
Total flow rate =     55.002(CFS)
Time of concentration =    14.192 min.
Effective stream area after confluence  =     35.810(Ac.)


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Process from Point/Station      205.000 to Point/Station      213.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1656.000(Ft.)
Downstream point/station elevation =  1655.000(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.002(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    55.002(CFS)
Normal flow depth in pipe =   25.92(In.)
Flow top width inside pipe =   27.09(In.)
Critical Depth =   29.00(In.)
Pipe flow velocity =     11.00(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    14.32 min.


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Process from Point/Station      205.000 to Point/Station      213.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
```

```
Stream flow area =     35.810(Ac.)
Runoff from this stream =     55.002(CFS)
Time of concentration =   14.32 min.
Rainfall intensity =     1.935(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      214.000 to Point/Station      215.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   895.000(Ft.)
Top (of initial area) elevation =  1941.000(Ft.)
Bottom (of initial area) elevation =  1704.000(Ft.)
Difference in elevation =   237.000(Ft.)
Slope =    0.26480  s(percent)=      26.48
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.041 min.
Rainfall intensity =      1.956(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.762
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.422(CFS)
Total initial stream area =        4.980(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1704.000(Ft.)
Downstream point elevation =  1698.000(Ft.)
Channel length thru subarea  =   267.000(Ft.)
Channel base width    =    1.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      9.757(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      9.757(CFS)
Depth of flow =   0.650(Ft.), Average velocity =   6.524(Ft/s)
Channel flow top width =    3.601(Ft.)
Flow Velocity =    6.52(Ft/s)
Travel time  =    0.68 min.
Time of concentration =   14.72 min.
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```
Sub-Channel No. 1 Critical depth =      0.867(Ft.)
  '     '       '     Critical flow top width =      4.469(Ft.)
  '     '       '     Critical flow velocity=    4.115(Ft/s)
  '     '       '     Critical flow area =      2.371(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.759
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.906(In/Hr) for a    10.0 year storm
Subarea runoff =      4.599(CFS) for      3.180(Ac.)
Total runoff =     12.021(CFS)   Total area =       8.160(Ac.)
Depth of flow =   0.717(Ft.), Average velocity =   6.885(Ft/s)

Sub-Channel No. 1 Critical depth =      0.953(Ft.)
  '     '       '     Critical flow top width =      4.813(Ft.)
  '     '       '     Critical flow velocity=    4.340(Ft/s)
  '     '       '     Critical flow area =      2.770(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1698.000(Ft.)
Downstream point/station elevation =  1696.000(Ft.)
Pipe length  =   113.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.021(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    12.021(CFS)
Normal flow depth in pipe =   12.87(In.)
Flow top width inside pipe =   16.25(In.)
Critical Depth =   15.78(In.)
Pipe flow velocity =      8.89(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    14.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      217.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.94 min.
Rainfall intensity =      1.891(In/Hr) for a    10.0 year storm
Subarea runoff =      5.285(CFS) for      3.530(Ac.)
Total runoff =     17.306(CFS)   Total area =      11.690(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      218.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1696.000(Ft.)
Downstream point/station elevation =  1686.700(Ft.)
Pipe length  =   285.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.306(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    17.306(CFS)
Normal flow depth in pipe =   13.50(In.)
Flow top width inside pipe =   15.59(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.17(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    15.33 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      218.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.33 min.
Rainfall intensity =      1.864(In/Hr) for a    10.0 year storm
Subarea runoff =      6.868(CFS) for      4.660(Ac.)
Total runoff =     24.174(CFS)   Total area =      16.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1686.700(Ft.)
Downstream point/station elevation =  1683.000(Ft.)
```

```
Pipe length  =   336.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.174(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    24.174(CFS)
Normal flow depth in pipe =   20.11(In.)
Flow top width inside pipe =   17.69(In.)
Critical Depth =   20.87(In.)
Pipe flow velocity =      8.61(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =    15.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.98 min.
Rainfall intensity =      1.822(In/Hr) for a    10.0 year storm
Subarea runoff =      3.837(CFS) for      2.670(Ac.)
Total runoff =     28.010(CFS)   Total area =      19.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      213.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_______________________________________________________________________________
Upstream point/station elevation =  1683.000(Ft.)
Downstream point/station elevation =  1665.900(Ft.)
Pipe length  =   830.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.010(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    28.010(CFS)
Normal flow depth in pipe =   17.20(In.)
Flow top width inside pipe =   21.63(In.)
Critical Depth =   21.94(In.)
Pipe flow velocity =     11.63(Ft/s)
Travel time through pipe =    1.19 min.
Time of concentration (TC) =    17.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      213.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
```

```
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.710
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    17.17 min.
Rainfall intensity =      1.751(In/Hr) for a    10.0 year storm
Subarea runoff =      7.139(CFS) for      5.740(Ac.)
Total runoff =     35.149(CFS)   Total area =      24.760(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      213.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     24.760(Ac.)
Runoff from this stream =     35.149(CFS)
Time of concentration =   17.17 min.
Rainfall intensity =     1.751(In/Hr)
Summary of stream data:

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


1       55.002     14.32            1.935
2       35.149     17.17            1.751
Largest stream flow has longer or shorter time of concentration
Qp =     55.002 + sum of
       Qa          Tb/Ta
       35.149 *    0.834 =     29.324
Qp =     84.326

Total of 2 main streams to confluence:
Flow rates before confluence point:
      55.002      35.149
Area of streams before confluence:
       35.810       24.760


Results of confluence:
Total flow rate =     84.326(CFS)
Time of concentration =    14.321 min.
Effective stream area after confluence  =     60.570(Ac.)


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Process from Point/Station      213.000 to Point/Station      221.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1660.000(Ft.)
Downstream point/station elevation =  1632.000(Ft.)
Pipe length  =    74.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    84.326(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    84.326(CFS)
Normal flow depth in pipe =   15.07(In.)
Flow top width inside pipe =   18.91(In.)
Critical depth could not be calculated.
Pipe flow velocity =     45.60(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    14.35 min.


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Process from Point/Station      221.000 to Point/Station      222.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1632.000(Ft.)
Downstream point elevation =  1630.000(Ft.)
Channel length thru subarea  =   376.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     85.989(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     85.989(CFS)
Depth of flow =   1.510(Ft.), Average velocity =   5.976(Ft/s)
Channel flow top width =   14.059(Ft.)
Flow Velocity =    5.98(Ft/s)
Travel time  =    1.05 min.
Time of concentration =   15.40 min.

Sub-Channel No. 1 Critical depth =      1.547(Ft.)
  '     '       '     Critical flow top width =     14.281(Ft.)
  '     '       '     Critical flow velocity=    5.766(Ft/s)
  '     '       '     Critical flow area =     14.913(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.756
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.859(In/Hr) for a    10.0 year storm
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Subarea runoff =      3.359(CFS) for      2.390(Ac.)
Total runoff =     87.685(CFS)   Total area =      62.960(Ac.)
Depth of flow =   1.524(Ft.), Average velocity =   6.008(Ft/s)

Sub-Channel No. 1 Critical depth =      1.563(Ft.)
  '     '       '     Critical flow top width =     14.375(Ft.)
  '     '       '     Critical flow velocity=    5.793(Ft/s)
  '     '       '     Critical flow area =     15.137(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1630.000(Ft.)
Downstream point/station elevation =  1629.400(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    87.685(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    87.685(CFS)
Normal flow depth in pipe =   27.47(In.)
Flow top width inside pipe =   30.62(In.)
Critical Depth =   33.97(In.)
Pipe flow velocity =     15.16(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.43 min.


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Process from Point/Station      222.000 to Point/Station      223.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.790
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.43 min.
Rainfall intensity =      1.857(In/Hr) for a    10.0 year storm
Subarea runoff =      3.185(CFS) for      2.170(Ac.)
Total runoff =     90.870(CFS)   Total area =      65.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      224.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1629.400(Ft.)
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Downstream point/station elevation =  1627.000(Ft.)
Pipe length  =    94.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    90.870(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    90.870(CFS)
Normal flow depth in pipe =   25.55(In.)
Flow top width inside pipe =   32.68(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.93(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    15.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      225.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1627.000(Ft.)
Downstream point elevation =  1625.700(Ft.)
Channel length thru subarea  =   260.000(Ft.)
Channel base width    =  150.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     91.692(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     91.692(CFS)
Depth of flow =   0.417(Ft.), Average velocity =   1.459(Ft/s)
Channel flow top width =  151.667(Ft.)
Flow Velocity =    1.46(Ft/s)
Travel time  =    2.97 min.
Time of concentration =   18.49 min.

Sub-Channel No. 1 Critical depth =      0.227(Ft.)
  '     '       '     Critical flow top width =    150.906(Ft.)
  '     '       '     Critical flow velocity=    2.690(Ft/s)
  '     '       '     Critical flow area =     34.087(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.704
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.681(In/Hr) for a    10.0 year storm
Subarea runoff =      1.574(CFS) for      1.330(Ac.)
Total runoff =     92.444(CFS)   Total area =      66.460(Ac.)
Depth of flow =   0.419(Ft.), Average velocity =   1.464(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.227(Ft.)
  '     '       '     Critical flow top width =    150.906(Ft.)
  '     '       '     Critical flow velocity=    2.712(Ft/s)
  '     '       '     Critical flow area =     34.087(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1625.700(Ft.)
Downstream point/station elevation =  1610.000(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    92.444(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    92.444(CFS)
Normal flow depth in pipe =   19.13(In.)
Flow top width inside pipe =   19.31(In.)
Critical depth could not be calculated.
Pipe flow velocity =     34.47(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    18.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.000 to Point/Station      226.100
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1610.000(Ft.)
Downstream point elevation =  1608.810(Ft.)
Channel length thru subarea  =   238.000(Ft.)
Channel base width    =  150.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     93.466(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     93.466(CFS)
Depth of flow =   0.422(Ft.), Average velocity =   1.470(Ft/s)
Channel flow top width =  151.686(Ft.)
Flow Velocity =    1.47(Ft/s)
Travel time  =    2.70 min.
Time of concentration =   21.23 min.

Sub-Channel No. 1 Critical depth =      0.230(Ft.)
  '     '       '     Critical flow top width =    150.922(Ft.)
  '     '       '     Critical flow velocity=    2.695(Ft/s)
  '     '       '     Critical flow area =     34.677(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
```

```
Runoff Coefficient = 0.692
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.558(In/Hr) for a    10.0 year storm
Subarea runoff =      1.973(CFS) for      1.830(Ac.)
Total runoff =     94.417(CFS)   Total area =      68.290(Ac.)
Depth of flow =   0.424(Ft.), Average velocity =   1.476(Ft/s)

Sub-Channel No. 1 Critical depth =      0.230(Ft.)
  '     '       '     Critical flow top width =    150.922(Ft.)
  '     '       '     Critical flow velocity=    2.723(Ft/s)
  '     '       '     Critical flow area =     34.677(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.100 to Point/Station      227.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1608.810(Ft.)
Downstream point/station elevation =  1594.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    94.417(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    94.417(CFS)
Normal flow depth in pipe =   17.39(In.)
Flow top width inside pipe =   21.44(In.)
Critical depth could not be calculated.
Pipe flow velocity =     38.75(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    21.26 min.


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Process from Point/Station      227.000 to Point/Station      228.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1594.000(Ft.)
Downstream point elevation =  1593.360(Ft.)
Channel length thru subarea  =   129.000(Ft.)
Channel base width    =  150.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     94.741(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     94.741(CFS)
Depth of flow =   0.426(Ft.), Average velocity =   1.474(Ft/s)
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Channel flow top width =  151.704(Ft.)
Flow Velocity =    1.47(Ft/s)
Travel time  =    1.46 min.
Time of concentration =   22.72 min.

Sub-Channel No. 1 Critical depth =      0.230(Ft.)
  '     '       '     Critical flow top width =    150.922(Ft.)
  '     '       '     Critical flow velocity=    2.732(Ft/s)
  '     '       '     Critical flow area =     34.677(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.686
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.501(In/Hr) for a    10.0 year storm
Subarea runoff =      0.597(CFS) for      0.580(Ac.)
Total runoff =     95.014(CFS)   Total area =      68.870(Ac.)
Depth of flow =   0.427(Ft.), Average velocity =   1.476(Ft/s)

Sub-Channel No. 1 Critical depth =      0.230(Ft.)
  '     '       '     Critical flow top width =    150.922(Ft.)
  '     '       '     Critical flow velocity=    2.740(Ft/s)
  '     '       '     Critical flow area =     34.677(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      228.000 to Point/Station      233.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1593.360(Ft.)
Downstream point/station elevation =  1588.000(Ft.)
Pipe length  =   129.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    95.014(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    95.014(CFS)
Normal flow depth in pipe =   24.05(In.)
Flow top width inside pipe =   29.35(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.48(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    22.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      228.000 to Point/Station      233.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     68.870(Ac.)
Runoff from this stream =     95.014(CFS)
Time of concentration =   22.82 min.
Rainfall intensity =     1.497(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      230.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   111.000(Ft.)
Top (of initial area) elevation =  1668.400(Ft.)
Bottom (of initial area) elevation =  1667.300(Ft.)
Difference in elevation =     1.100(Ft.)
Slope =    0.00991  s(percent)=       0.99
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.456 min.
Rainfall intensity =      2.999(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.825
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.198(CFS)
Total initial stream area =        0.080(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      230.000 to Point/Station      231.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1666.500(Ft.)
End of street segment elevation =  1634.000(Ft.)
Length of street segment  =   754.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
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 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      4.574(CFS)
Depth of flow =   0.318(Ft.), Average velocity =   4.045(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.071(Ft.)
Flow velocity =   4.05(Ft/s)
Travel time =    3.11 min.     TC =    9.56  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.416(In/Hr) for a    10.0 year storm
Subarea runoff =      8.833(CFS) for      4.510(Ac.)
Total runoff =      9.031(CFS)   Total area =       4.590(Ac.)
Street flow at end of street =      9.031(CFS)
Half street flow at end of street =      9.031(CFS)
Depth of flow =   0.384(Ft.), Average velocity =   4.719(Ft/s)
Flow width (from curb towards crown)=  13.408(Ft.)


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Process from Point/Station      231.000 to Point/Station      232.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1633.500(Ft.)
Downstream point/station elevation =  1623.000(Ft.)
Pipe length  =   209.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.031(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     9.031(CFS)
Normal flow depth in pipe =    8.58(In.)
Flow top width inside pipe =   14.84(In.)
Critical Depth =   13.88(In.)
Pipe flow velocity =     12.44(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     9.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      232.100 to Point/Station      232.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.84 min.
Rainfall intensity =      2.378(In/Hr) for a    10.0 year storm
Subarea runoff =      7.566(CFS) for      3.930(Ac.)
Total runoff =     16.597(CFS)   Total area =       8.520(Ac.)


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Process from Point/Station      232.000 to Point/Station      232.200
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1623.000(Ft.)
Downstream point/station elevation =  1607.000(Ft.)
Pipe length  =   379.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.597(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.597(CFS)
Normal flow depth in pipe =   11.84(In.)
Flow top width inside pipe =   17.08(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.47(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =    10.31 min.


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Process from Point/Station      232.000 to Point/Station      232.200
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.749
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.31 min.
Rainfall intensity =      2.318(In/Hr) for a    10.0 year storm
Subarea runoff =      7.463(CFS) for      4.300(Ac.)
Total runoff =     24.060(CFS)   Total area =      12.820(Ac.)


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Process from Point/Station      232.200 to Point/Station      233.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1600.000(Ft.)
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Downstream point/station elevation =  1588.000(Ft.)
Pipe length  =   124.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.060(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    24.060(CFS)
Normal flow depth in pipe =   11.48(In.)
Flow top width inside pipe =   17.30(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.22(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    10.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      232.200 to Point/Station      233.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.820(Ac.)
Runoff from this stream =     24.060(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     2.306(In/Hr)
Summary of stream data:

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


1       95.014     22.82            1.497
2       24.060     10.41            2.306
Largest stream flow has longer time of concentration
Qp =     95.014 + sum of
        Qb         Ia/Ib
        24.060 *    0.649 =     15.626
Qp =    110.641

Total of 2 main streams to confluence:
Flow rates before confluence point:
      95.014      24.060
Area of streams before confluence:
       68.870       12.820


Results of confluence:
Total flow rate =    110.641(CFS)
Time of concentration =    22.825 min.
Effective stream area after confluence  =     81.690(Ac.)


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Process from Point/Station      233.000 to Point/Station      234.000
```

```
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1588.000(Ft.)
Downstream point elevation =  1587.110(Ft.)
Channel length thru subarea  =   178.000(Ft.)
Channel base width    =   50.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    111.236(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    111.236(CFS)
Depth of flow =   0.901(Ft.), Average velocity =   2.383(Ft/s)
Channel flow top width =   53.605(Ft.)
Flow Velocity =    2.38(Ft/s)
Travel time  =    1.24 min.
Time of concentration =   24.07 min.

Sub-Channel No. 1 Critical depth =      0.531(Ft.)
  '     '       '     Critical flow top width =     52.125(Ft.)
  '     '       '     Critical flow velocity=    4.101(Ft/s)
  '     '       '     Critical flow area =     27.127(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.681
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.454(In/Hr) for a    10.0 year storm
Subarea runoff =      1.138(CFS) for      1.150(Ac.)
Total runoff =    111.779(CFS)   Total area =      82.840(Ac.)
Depth of flow =   0.904(Ft.), Average velocity =   2.387(Ft/s)

Sub-Channel No. 1 Critical depth =      0.531(Ft.)
  '     '       '     Critical flow top width =     52.125(Ft.)
  '     '       '     Critical flow velocity=    4.121(Ft/s)
  '     '       '     Critical flow area =     27.127(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      234.000 to Point/Station      235.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1585.300(Ft.)
Downstream point/station elevation =  1580.000(Ft.)
Pipe length  =   530.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   111.779(CFS)
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```
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   111.779(CFS)
Normal flow depth in pipe =   34.13(In.)
Flow top width inside pipe =   38.53(In.)
Critical Depth =   38.53(In.)
Pipe flow velocity =     12.43(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =    24.78 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      234.000 to Point/Station      235.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     82.840(Ac.)
Runoff from this stream =    111.779(CFS)
Time of concentration =   24.78 min.
Rainfall intensity =     1.431(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      236.000 to Point/Station      237.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   939.000(Ft.)
Top (of initial area) elevation =  1777.000(Ft.)
Bottom (of initial area) elevation =  1746.500(Ft.)
Difference in elevation =    30.500(Ft.)
Slope =    0.03248  s(percent)=       3.25
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.962 min.
Rainfall intensity =      2.136(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.801
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      4.383(CFS)
Total initial stream area =        2.560(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      237.000 to Point/Station      238.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
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Top of street segment elevation =  1746.500(Ft.)
End of street segment elevation =  1715.500(Ft.)
Length of street segment  =   617.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      6.963(CFS)
Depth of flow =   0.350(Ft.), Average velocity =   4.716(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.663(Ft.)
Flow velocity =   4.72(Ft/s)
Travel time =    2.18 min.     TC =   14.14  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.794
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.948(In/Hr) for a    10.0 year storm
Subarea runoff =      5.091(CFS) for      3.290(Ac.)
Total runoff =      9.474(CFS)   Total area =       5.850(Ac.)
Street flow at end of street =      9.474(CFS)
Half street flow at end of street =      9.474(CFS)
Depth of flow =   0.381(Ft.), Average velocity =   5.061(Ft/s)
Flow width (from curb towards crown)=  13.251(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      239.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1715.500(Ft.)
Downstream point/station elevation =  1705.100(Ft.)
Pipe length  =   186.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.474(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     9.474(CFS)
Normal flow depth in pipe =    8.55(In.)
Flow top width inside pipe =   14.85(In.)
```

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Critical Depth =   14.04(In.)
Pipe flow velocity =     13.11(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =    14.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      239.100 to Point/Station      239.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.793
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.38 min.
Rainfall intensity =      1.931(In/Hr) for a    10.0 year storm
Subarea runoff =      5.653(CFS) for      3.690(Ac.)
Total runoff =     15.127(CFS)   Total area =       9.540(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      239.000 to Point/Station      240.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_______________________________________________________________________________
Upstream point/station elevation =  1705.100(Ft.)
Downstream point/station elevation =  1664.000(Ft.)
Pipe length  =   597.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.127(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    15.127(CFS)
Normal flow depth in pipe =   11.04(In.)
Flow top width inside pipe =   13.22(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.61(Ft/s)
Travel time through pipe =    0.64 min.
Time of concentration (TC) =    15.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      239.000 to Point/Station      240.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
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RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.02 min.
Rainfall intensity =      1.885(In/Hr) for a    10.0 year storm
Subarea runoff =      3.059(CFS) for      2.050(Ac.)
Total runoff =     18.186(CFS)   Total area =      11.590(Ac.)


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Process from Point/Station      240.000 to Point/Station      241.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1664.000(Ft.)
Downstream point/station elevation =  1631.000(Ft.)
Pipe length  =   417.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.186(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    18.186(CFS)
Normal flow depth in pipe =   15.00(In.)
Flow top width inside pipe =    0.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.81(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =    15.49 min.


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Process from Point/Station      240.000 to Point/Station      241.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     11.590(Ac.)
Runoff from this stream =     18.186(CFS)
Time of concentration =   15.49 min.
Rainfall intensity =     1.854(In/Hr)


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Process from Point/Station      242.000 to Point/Station      243.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   212.000(Ft.)
Top (of initial area) elevation =  1702.100(Ft.)
Bottom (of initial area) elevation =  1700.000(Ft.)
Difference in elevation =     2.100(Ft.)
Slope =    0.00991  s(percent)=       0.99
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.364 min.
Rainfall intensity =      2.601(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.816
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.382(CFS)
Total initial stream area =        0.180(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      243.000 to Point/Station      244.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1700.000(Ft.)
End of street segment elevation =  1676.000(Ft.)
Length of street segment  =   546.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      3.467(CFS)
Depth of flow =   0.294(Ft.), Average velocity =   3.840(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.868(Ft.)
Flow velocity =   3.84(Ft/s)
Travel time =    2.37 min.     TC =   10.73  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.268(In/Hr) for a    10.0 year storm
Subarea runoff =      6.104(CFS) for      3.340(Ac.)
Total runoff =      6.486(CFS)   Total area =       3.520(Ac.)
Street flow at end of street =      6.486(CFS)
Half street flow at end of street =      6.486(CFS)
Depth of flow =   0.349(Ft.), Average velocity =   4.407(Ft/s)
Flow width (from curb towards crown)=  11.643(Ft.)
```

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Process from Point/Station      244.000 to Point/Station      245.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1676.000(Ft.)
Downstream point/station elevation =  1651.000(Ft.)
Pipe length  =   358.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.486(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.486(CFS)
Normal flow depth in pipe =    7.32(In.)
Flow top width inside pipe =   11.70(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.93(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =    11.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      244.000 to Point/Station      245.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.20 min.
Rainfall intensity =      2.216(In/Hr) for a    10.0 year storm
Subarea runoff =      3.991(CFS) for      2.240(Ac.)
Total runoff =     10.477(CFS)   Total area =       5.760(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      246.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1645.000(Ft.)
Downstream point/station elevation =  1640.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.477(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    10.477(CFS)
Normal flow depth in pipe =    9.49(In.)
Flow top width inside pipe =    9.76(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.73(Ft/s)
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```
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    11.25 min.


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Process from Point/Station      245.000 to Point/Station      246.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.743
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    11.25 min.
Rainfall intensity =      2.209(In/Hr) for a    10.0 year storm
Subarea runoff =      0.509(CFS) for      0.310(Ac.)
Total runoff =     10.986(CFS)   Total area =       6.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      246.000 to Point/Station      241.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1640.000(Ft.)
Downstream point/station elevation =  1631.000(Ft.)
Pipe length  =   117.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.986(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.986(CFS)
Normal flow depth in pipe =    8.48(In.)
Flow top width inside pipe =   14.87(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.33(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    11.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      246.000 to Point/Station      241.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      6.070(Ac.)
Runoff from this stream =     10.986(CFS)
Time of concentration =   11.38 min.
Rainfall intensity =     2.196(In/Hr)
Summary of stream data:

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


1       18.186     15.49                 1.854
2       10.986     11.38                 2.196
Largest stream flow has longer time of concentration
Qp =     18.186 + sum of
        Qb         Ia/Ib
        10.986 *    0.844 =      9.274
Qp =     27.459

Total of 2 streams to confluence:
Flow rates before confluence point:
      18.186      10.986
Area of streams before confluence:
       11.590        6.070
Results of confluence:
Total flow rate =     27.459(CFS)
Time of concentration =    15.486 min.
Effective stream area after confluence =     17.660(Ac.)


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Process from Point/Station      241.000 to Point/Station      247.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1631.000(Ft.)
Downstream point/station elevation =  1622.000(Ft.)
Pipe length  =   168.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.459(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    27.459(CFS)
Normal flow depth in pipe =   13.55(In.)
Flow top width inside pipe =   20.10(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.73(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    15.65 min.


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Process from Point/Station      247.100 to Point/Station      247.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.790
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
```

```
Time of concentration =    15.65 min.
Rainfall intensity =      1.843(In/Hr) for a    10.0 year storm
Subarea runoff =      8.264(CFS) for      5.680(Ac.)
Total runoff =     35.723(CFS)   Total area =      23.340(Ac.)


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Process from Point/Station      247.000 to Point/Station      248.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1622.000(Ft.)
Downstream point/station elevation =  1617.600(Ft.)
Pipe length  =   126.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.723(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    35.723(CFS)
Normal flow depth in pipe =   16.92(In.)
Flow top width inside pipe =   21.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.09(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    15.79 min.


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Process from Point/Station      247.000 to Point/Station      248.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.79 min.
Rainfall intensity =      1.834(In/Hr) for a    10.0 year storm
Subarea runoff =      2.605(CFS) for      1.800(Ac.)
Total runoff =     38.328(CFS)   Total area =      25.140(Ac.)


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Process from Point/Station      248.100 to Point/Station      248.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.79 min.
Rainfall intensity =      1.834(In/Hr) for a    10.0 year storm
Subarea runoff =      7.076(CFS) for      4.890(Ac.)
Total runoff =     45.404(CFS)   Total area =      30.030(Ac.)


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Process from Point/Station      248.000 to Point/Station      249.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1617.600(Ft.)
Downstream point/station elevation =  1612.000(Ft.)
Pipe length  =   181.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    45.404(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    45.404(CFS)
Normal flow depth in pipe =   18.84(In.)
Flow top width inside pipe =   24.79(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.33(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    15.99 min.


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Process from Point/Station      249.100 to Point/Station      249.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.99 min.
Rainfall intensity =      1.821(In/Hr) for a    10.0 year storm
Subarea runoff =      2.542(CFS) for      1.770(Ac.)
Total runoff =     47.947(CFS)   Total area =      31.800(Ac.)


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Process from Point/Station      249.200 to Point/Station      249.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.716
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.99 min.
Rainfall intensity =      1.821(In/Hr) for a    10.0 year storm
Subarea runoff =      3.468(CFS) for      2.660(Ac.)
Total runoff =     51.414(CFS)   Total area =      34.460(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      249.000 to Point/Station      250.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1612.000(Ft.)
Downstream point/station elevation =  1592.000(Ft.)
Pipe length  =   607.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    51.414(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    51.414(CFS)
Normal flow depth in pipe =   20.30(In.)
Flow top width inside pipe =   23.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.03(Ft/s)
Travel time through pipe =    0.63 min.
Time of concentration (TC) =    16.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      249.000 to Point/Station      250.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    16.62 min.
Rainfall intensity =      1.783(In/Hr) for a    10.0 year storm
Subarea runoff =      4.657(CFS) for      3.320(Ac.)
Total runoff =     56.072(CFS)   Total area =      37.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      251.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1585.000(Ft.)
Downstream point/station elevation =  1583.000(Ft.)
```

```
Pipe length  =    43.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.072(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    56.072(CFS)
Normal flow depth in pipe =   18.94(In.)
Flow top width inside pipe =   24.71(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.82(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    16.66 min.


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Process from Point/Station      251.000 to Point/Station      252.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1583.000(Ft.)
Downstream point elevation =  1581.130(Ft.)
Channel length thru subarea  =   374.000(Ft.)
Channel base width    =  140.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     57.407(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     57.407(CFS)
Depth of flow =   0.328(Ft.), Average velocity =   1.244(Ft/s)
Channel flow top width =  141.312(Ft.)
Flow Velocity =    1.24(Ft/s)
Travel time  =    5.01 min.
Time of concentration =   21.67 min.

Sub-Channel No. 1 Critical depth =      0.174(Ft.)
  '     '       '     Critical flow top width =    140.695(Ft.)
  '     '       '     Critical flow velocity=    2.353(Ft/s)
  '     '       '     Critical flow area =     24.396(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.690
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.541(In/Hr) for a    10.0 year storm
Subarea runoff =      2.606(CFS) for      2.450(Ac.)
Total runoff =     58.677(CFS)   Total area =      40.230(Ac.)
Depth of flow =   0.332(Ft.), Average velocity =   1.255(Ft/s)

Sub-Channel No. 1 Critical depth =      0.176(Ft.)
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```
  '     '       '     Critical flow top width =    140.703(Ft.)
  '     '       '     Critical flow velocity=    2.378(Ft/s)
  '     '       '     Critical flow area =     24.671(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.100 to Point/Station      252.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    21.67 min.
Rainfall intensity =      1.541(In/Hr) for a    10.0 year storm
Subarea runoff =      3.685(CFS) for      3.090(Ac.)
Total runoff =     62.363(CFS)   Total area =      43.320(Ac.)


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Process from Point/Station      252.200 to Point/Station      252.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    21.67 min.
Rainfall intensity =      1.541(In/Hr) for a    10.0 year storm
Subarea runoff =      2.159(CFS) for      1.810(Ac.)
Total runoff =     64.522(CFS)   Total area =      45.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.000 to Point/Station      235.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1581.130(Ft.)
Downstream point/station elevation =  1580.350(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    64.522(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    64.522(CFS)
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```
Normal flow depth in pipe =   28.50(In.)
Flow top width inside pipe =   29.24(In.)
Critical Depth =   30.91(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    21.79 min.


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Process from Point/Station      252.000 to Point/Station      235.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     45.130(Ac.)
Runoff from this stream =     64.522(CFS)
Time of concentration =   21.79 min.
Rainfall intensity =     1.536(In/Hr)
Summary of stream data:

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


1      111.779     24.78            1.431
2       64.522     21.79            1.536
Largest stream flow has longer time of concentration
Qp =    111.779 + sum of
        Qb         Ia/Ib
        64.522 *    0.932 =     60.112
Qp =    171.892

Total of 2 main streams to confluence:
Flow rates before confluence point:
     111.779      64.522
Area of streams before confluence:
       82.840       45.130


Results of confluence:
Total flow rate =    171.892(CFS)
Time of concentration =    24.780 min.
Effective stream area after confluence  =    127.970(Ac.)


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Process from Point/Station      235.000 to Point/Station      253.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1580.350(Ft.)
Downstream point/station elevation =  1573.270(Ft.)
Pipe length  =   708.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =   171.892(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   171.892(CFS)
Normal flow depth in pipe =   42.66(In.)
Flow top width inside pipe =   37.73(In.)
Critical Depth =   45.62(In.)
Pipe flow velocity =     13.56(Ft/s)
Travel time through pipe =    0.87 min.
Time of concentration (TC) =    25.65 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      254.000 to Point/Station      253.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    25.65 min.
Rainfall intensity =      1.404(In/Hr) for a    10.0 year storm
Subarea runoff =     32.221(CFS) for     26.280(Ac.)
Total runoff =    204.113(CFS)   Total area =     154.250(Ac.)


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Process from Point/Station      254.100 to Point/Station      253.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.719
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    25.65 min.
Rainfall intensity =      1.404(In/Hr) for a    10.0 year storm
Subarea runoff =     12.221(CFS) for     12.110(Ac.)
Total runoff =    216.334(CFS)   Total area =     166.360(Ac.)


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Process from Point/Station      253.000 to Point/Station      255.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1573.270(Ft.)
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Downstream point/station elevation =  1565.000(Ft.)
Pipe length  =   678.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   216.334(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   216.334(CFS)
Normal flow depth in pipe =   44.06(In.)
Flow top width inside pipe =   41.85(In.)
Critical Depth =   49.57(In.)
Pipe flow velocity =     15.57(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =    26.38 min.
End of computations, total study area =          166.36 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.639
Area averaged RI index number =  72.4
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 12/05/17 File:pr380010.out

Tentative Tract 35853
Proposed Conditions
Major Basin 300, 400, 500, 600, 700, and 800
10-Year Flow Rate

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

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

Program License Serial Number 4028

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.880(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 527.000(Ft.)
Top (of initial area) elevation = 1950.000(Ft.)
Bottom (of initial area) elevation = 1820.000(Ft.)
Difference in elevation = 130.000(Ft.)
Slope = 0.24668 s(percent)= 24.67
TC = k(0.710)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   11.523 min.
Rainfall intensity =      2.181(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.770(CFS)
Total initial stream area =        4.010(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1820.000(Ft.)
Downstream point elevation =  1785.000(Ft.)
Channel length thru subarea  =  1235.000(Ft.)
Channel base width    =   24.000(Ft.)
Slope or 'Z' of left channel bank =   0.100
Slope or 'Z' of right channel bank =   0.100
Estimated mean flow rate at midpoint of channel =     17.344(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     17.344(CFS)
Depth of flow =   0.182(Ft.), Average velocity =   3.974(Ft/s)
Channel flow top width =   24.036(Ft.)
Flow Velocity =    3.97(Ft/s)
Travel time  =    5.18 min.
Time of concentration =   16.70 min.

Sub-Channel No. 1 Critical depth =      0.254(Ft.)
  '     '       '     Critical flow top width =     24.051(Ft.)
  '     '       '     Critical flow velocity=    2.843(Ft/s)
  '     '       '     Critical flow area =      6.100(Sq.Ft)

 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.778(In/Hr) for a    10.0 year storm
Subarea runoff =     21.063(CFS) for     15.060(Ac.)
Total runoff =     27.833(CFS)   Total area =      19.070(Ac.)
```

```
Depth of flow =   0.242(Ft.), Average velocity =   4.793(Ft/s)

Sub-Channel No. 1 Critical depth =      0.348(Ft.)
  '     '       '     Critical flow top width =     24.070(Ft.)
  '     '       '     Critical flow velocity=    3.331(Ft/s)
  '     '       '     Critical flow area =      8.356(Sq.Ft)



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Process from Point/Station      302.000 to Point/Station      303.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1784.000(Ft.)
Downstream point elevation =  1612.000(Ft.)
Channel length thru subarea  =  3736.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    106.393(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    106.393(CFS)
Depth of flow =   1.460(Ft.), Average velocity =   7.769(Ft/s)
Channel flow top width =   13.760(Ft.)
Flow Velocity =    7.77(Ft/s)
Travel time  =    8.02 min.
Time of concentration =   24.72 min.

Sub-Channel No. 1 Critical depth =      1.719(Ft.)
  '     '       '     Critical flow top width =     15.313(Ft.)
  '     '       '     Critical flow velocity=    6.095(Ft/s)
  '     '       '     Critical flow area =     17.456(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.722
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.433(In/Hr) for a    10.0 year storm
Subarea runoff =    157.029(CFS) for    151.840(Ac.)
Total runoff =    184.862(CFS)   Total area =     170.910(Ac.)
Depth of flow =   1.912(Ft.), Average velocity =   9.006(Ft/s)

Sub-Channel No. 1 Critical depth =      2.281(Ft.)
  '     '       '     Critical flow top width =     18.688(Ft.)
  '     '       '     Critical flow velocity=    6.842(Ft/s)
  '     '       '     Critical flow area =     27.019(Sq.Ft)
```

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Process from Point/Station      302.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    170.910(Ac.)
Runoff from this stream =    184.862(CFS)
Time of concentration =   24.72 min.
Rainfall intensity =     1.433(In/Hr)


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Process from Point/Station      304.000 to Point/Station      305.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Initial area flow distance =   590.000(Ft.)
Top (of initial area) elevation =  1677.500(Ft.)
Bottom (of initial area) elevation =  1654.700(Ft.)
Difference in elevation =    22.800(Ft.)
Slope =    0.03864  s(percent)=       3.86
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.380 min.
Rainfall intensity =      2.786(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.143(CFS)
Total initial stream area =        0.870(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station      305.000 to Point/Station      306.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1654.700(Ft.)
End of street segment elevation =  1631.300(Ft.)
Length of street segment  =   514.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
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```
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      4.282(CFS)
Depth of flow =   0.310(Ft.), Average velocity =   4.074(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.669(Ft.)
Flow velocity =   4.07(Ft/s)
Travel time =    2.10 min.     TC =    9.48  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.427(In/Hr) for a    10.0 year storm
Subarea runoff =      4.197(CFS) for      1.960(Ac.)
Total runoff =      6.340(CFS)   Total area =       2.830(Ac.)
Street flow at end of street =      6.340(CFS)
Half street flow at end of street =      6.340(CFS)
Depth of flow =   0.345(Ft.), Average velocity =   4.444(Ft/s)
Flow width (from curb towards crown)=  11.447(Ft.)


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Process from Point/Station      306.000 to Point/Station      307.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1626.000(Ft.)
Downstream point/station elevation =  1625.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.340(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.340(CFS)
Normal flow depth in pipe =    9.79(In.)
Flow top width inside pipe =   14.29(In.)
Critical Depth =   12.19(In.)
Pipe flow velocity =      7.48(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     9.62 min.


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Process from Point/Station      307.000 to Point/Station      308.000
**** IMPROVED CHANNEL TRAVEL TIME ****
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```
Upstream point elevation =  1625.000(Ft.)
Downstream point elevation =  1624.000(Ft.)
Channel length thru subarea  =   200.000(Ft.)
Channel base width    =   20.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     10.203(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     10.203(CFS)
Depth of flow =   0.372(Ft.), Average velocity =   1.321(Ft/s)
Channel flow top width =   21.489(Ft.)
Flow Velocity =    1.32(Ft/s)
Travel time  =    2.52 min.
Time of concentration =   12.14 min.

Sub-Channel No. 1 Critical depth =      0.199(Ft.)
  '     '       '     Critical flow top width =     20.797(Ft.)
  '     '       '     Critical flow velocity=    2.511(Ft/s)
  '     '       '     Critical flow area =      4.064(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.771
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.119(In/Hr) for a    10.0 year storm
Subarea runoff =      7.630(CFS) for      4.670(Ac.)
Total runoff =     13.971(CFS)   Total area =       7.500(Ac.)
Depth of flow =   0.449(Ft.), Average velocity =   1.488(Ft/s)

Sub-Channel No. 1 Critical depth =      0.246(Ft.)
  '     '       '     Critical flow top width =     20.984(Ft.)
  '     '       '     Critical flow velocity=    2.770(Ft/s)
  '     '       '     Critical flow area =      5.043(Sq.Ft)



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Process from Point/Station      308.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1624.000(Ft.)
Downstream point/station elevation =  1614.000(Ft.)
Pipe length  =    48.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.971(CFS)
Nearest computed pipe diameter  =     12.00(In.)
```

```
Calculated individual pipe flow  =    13.971(CFS)
Normal flow depth in pipe =    8.57(In.)
Flow top width inside pipe =   10.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.28(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    12.17 min.


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Process from Point/Station      308.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.500(Ac.)
Runoff from this stream =     13.971(CFS)
Time of concentration =   12.17 min.
Rainfall intensity =     2.116(In/Hr)
Summary of stream data:

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


1      184.862     24.72                 1.433
2       13.971     12.17                 2.116
Largest stream flow has longer time of concentration
Qp =    184.862 + sum of
        Qb         Ia/Ib
        13.971 *    0.677 =      9.464
Qp =    194.326

Total of 2 streams to confluence:
Flow rates before confluence point:
     184.862      13.971
Area of streams before confluence:
      170.910        7.500
Results of confluence:
Total flow rate =    194.326(CFS)
Time of concentration =    24.717 min.
Effective stream area after confluence =    178.410(Ac.)


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Process from Point/Station      303.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1614.000(Ft.)
Downstream point/station elevation =  1606.000(Ft.)
Pipe length  =   161.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   194.326(CFS)
Nearest computed pipe diameter  =     39.00(In.)
```

```
Calculated individual pipe flow  =   194.326(CFS)
Normal flow depth in pipe =   34.41(In.)
Flow top width inside pipe =   25.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.08(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    24.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   544.000(Ft.)
Top (of initial area) elevation =  1761.000(Ft.)
Bottom (of initial area) elevation =  1653.000(Ft.)
Difference in elevation =   108.000(Ft.)
Slope =    0.19853  s(percent)=      19.85
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.188 min.
Rainfall intensity =      2.114(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.771
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.275(CFS)
Total initial stream area =        3.850(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      401.000 to Point/Station      402.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1653.000(Ft.)
Downstream point/station elevation =  1634.000(Ft.)
Pipe length  =   138.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.275(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.275(CFS)
Normal flow depth in pipe =    5.82(In.)
Flow top width inside pipe =   11.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.61(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    12.33 min.
```

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Process from Point/Station      401.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.850(Ac.)
Runoff from this stream =      6.275(CFS)
Time of concentration =   12.33 min.
Rainfall intensity =     2.101(In/Hr)


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Process from Point/Station      403.000 to Point/Station      404.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   461.000(Ft.)
Top (of initial area) elevation =  1677.500(Ft.)
Bottom (of initial area) elevation =  1664.000(Ft.)
Difference in elevation =    13.500(Ft.)
Slope =    0.02928  s(percent)=       2.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.068 min.
Rainfall intensity =      2.853(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.968(CFS)
Total initial stream area =        0.780(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station      404.000 to Point/Station      405.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1664.000(Ft.)
Downstream point/station elevation =  1663.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.968(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.968(CFS)
Normal flow depth in pipe =    7.07(In.)
Flow top width inside pipe =    7.39(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =      5.29(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     7.27 min.
```

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Process from Point/Station      405.000 to Point/Station      402.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1660.000(Ft.)
Downstream point elevation =  1634.000(Ft.)
Channel length thru subarea  =    75.000(Ft.)
Channel base width    =   12.000(Ft.)
Slope or 'Z' of left channel bank =   0.100
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.968(CFS)
Depth of flow =   0.035(Ft.), Average velocity =   4.665(Ft/s)
Channel flow top width =   12.074(Ft.)
Flow Velocity =    4.67(Ft/s)
Travel time  =    0.27 min.
Time of concentration =    7.54 min.

Sub-Channel No. 1 Critical depth =      0.094(Ft.)
  '     '       '     Critical flow top width =     12.197(Ft.)
  '     '       '     Critical flow velocity=    1.735(Ft/s)
  '     '       '     Critical flow area =      1.134(Sq.Ft)



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Process from Point/Station      405.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.780(Ac.)
Runoff from this stream =      1.968(CFS)
Time of concentration =    7.54 min.
Rainfall intensity =     2.754(In/Hr)
Summary of stream data:

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


1        6.275     12.33                2.101
2        1.968      7.54                2.754
Largest stream flow has longer time of concentration
Qp =      6.275 + sum of
        Qb         Ia/Ib
         1.968 *    0.763 =      1.502
Qp =      7.777

Total of 2 streams to confluence:
```

```
Flow rates before confluence point:
       6.275       1.968
Area of streams before confluence:
        3.850        0.780
Results of confluence:
Total flow rate =      7.777(CFS)
Time of concentration =    12.326 min.
Effective stream area after confluence =      4.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.630(Ac.)
Runoff from this stream =      7.777(CFS)
Time of concentration =   12.33 min.
Rainfall intensity =     2.101(In/Hr)


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Process from Point/Station      406.000 to Point/Station      407.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   645.000(Ft.)
Top (of initial area) elevation =  1821.000(Ft.)
Bottom (of initial area) elevation =  1637.000(Ft.)
Difference in elevation =   184.000(Ft.)
Slope =    0.28527  s(percent)=      28.53
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.135 min.
Rainfall intensity =      2.120(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.771
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.329(CFS)
Total initial stream area =        6.320(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      407.000 to Point/Station      408.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1637.000(Ft.)
Downstream point/station elevation =  1618.000(Ft.)
```

```
Pipe length  =   147.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.329(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    10.329(CFS)
Normal flow depth in pipe =    8.17(In.)
Flow top width inside pipe =   11.19(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.15(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    12.27 min.


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Process from Point/Station      407.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.320(Ac.)
Runoff from this stream =     10.329(CFS)
Time of concentration =   12.27 min.
Rainfall intensity =     2.107(In/Hr)
Summary of stream data:

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


1        7.777     12.33                2.101
2       10.329     12.27                2.107
Largest stream flow has longer or shorter time of concentration
Qp =     10.329 + sum of
       Qa          Tb/Ta
        7.777 *    0.995 =      7.741
Qp =     18.070

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.777      10.329
Area of streams before confluence:
        4.630        6.320
Results of confluence:
Total flow rate =     18.070(CFS)
Time of concentration =    12.270 min.
Effective stream area after confluence =     10.950(Ac.)


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Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   524.000(Ft.)
Top (of initial area) elevation =  1830.000(Ft.)
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Bottom (of initial area) elevation =  1646.000(Ft.)
Difference in elevation =   184.000(Ft.)
Slope =    0.35115  s(percent)=      35.11
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.713 min.
Rainfall intensity =      2.270(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.778
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.453(CFS)
Total initial stream area =        2.520(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      501.000 to Point/Station      502.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1646.000(Ft.)
Downstream point/station elevation =  1643.000(Ft.)
Pipe length  =   139.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.453(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.453(CFS)
Normal flow depth in pipe =    8.51(In.)
Flow top width inside pipe =   10.90(In.)
Critical Depth =   10.60(In.)
Pipe flow velocity =      7.48(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    11.02 min.


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Process from Point/Station      502.100 to Point/Station      502.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    11.02 min.
Rainfall intensity =      2.235(In/Hr) for a    10.0 year storm
Subarea runoff =      1.111(CFS) for      0.640(Ac.)
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Total runoff =      5.564(CFS)   Total area =       3.160(Ac.)


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Process from Point/Station      502.000 to Point/Station      503.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1638.000(Ft.)
Downstream point/station elevation =  1632.000(Ft.)
Pipe length  =    41.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.564(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     5.564(CFS)
Normal flow depth in pipe =    6.55(In.)
Flow top width inside pipe =    8.01(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.16(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    11.06 min.


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Process from Point/Station      502.000 to Point/Station      503.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.160(Ac.)
Runoff from this stream =      5.564(CFS)
Time of concentration =   11.06 min.
Rainfall intensity =     2.230(In/Hr)


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Process from Point/Station      504.000 to Point/Station      505.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   776.000(Ft.)
Top (of initial area) elevation =  1664.000(Ft.)
Bottom (of initial area) elevation =  1646.000(Ft.)
Difference in elevation =    18.000(Ft.)
Slope =    0.02320  s(percent)=       2.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.120 min.
Rainfall intensity =      2.480(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
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```
Initial subarea runoff =      2.605(CFS)
Total initial stream area =        1.190(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station      505.000 to Point/Station      506.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1641.000(Ft.)
Downstream point/station elevation =  1635.000(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.605(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.605(CFS)
Normal flow depth in pipe =    4.80(In.)
Flow top width inside pipe =    8.98(In.)
Critical Depth =    8.40(In.)
Pipe flow velocity =     10.88(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.23 min.


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Process from Point/Station      505.000 to Point/Station      506.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.190(Ac.)
Runoff from this stream =      2.605(CFS)
Time of concentration =    9.23 min.
Rainfall intensity =     2.463(In/Hr)
Summary of stream data:

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


1        5.564     11.06                2.230
2        2.605      9.23                2.463
Largest stream flow has longer time of concentration
Qp =      5.564 + sum of
       Qb         Ia/Ib
        2.605 *    0.905 =      2.358
Qp =      7.922

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.564       2.605
Area of streams before confluence:
        3.160        1.190
Results of confluence:
```

```
Total flow rate =      7.922(CFS)
Time of concentration =    11.064 min.
Effective stream area after confluence =      4.350(Ac.)


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Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   699.000(Ft.)
Top (of initial area) elevation =  1930.000(Ft.)
Bottom (of initial area) elevation =  1704.000(Ft.)
Difference in elevation =   226.000(Ft.)
Slope =    0.32332  s(percent)=      32.33
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.221 min.
Rainfall intensity =      2.111(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.771
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.857(CFS)
Total initial stream area =        3.600(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      601.000 to Point/Station      602.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1704.000(Ft.)
Downstream point elevation =  1625.500(Ft.)
Channel length thru subarea  =   472.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     11.549(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     11.549(CFS)
Depth of flow =   0.401(Ft.), Average velocity =   6.855(Ft/s)
Channel flow top width =    5.405(Ft.)
Flow Velocity =    6.86(Ft/s)
Travel time  =    1.15 min.
Time of concentration =   13.37 min.

Sub-Channel No. 1 Critical depth =      0.625(Ft.)
  '     '       '     Critical flow top width =      6.750(Ft.)
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  '     '       '     Critical flow velocity=    3.791(Ft/s)
  '     '       '     Critical flow area =      3.047(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.765
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.010(In/Hr) for a    10.0 year storm
Subarea runoff =     11.301(CFS) for      7.350(Ac.)
Total runoff =     17.158(CFS)   Total area =      10.950(Ac.)
Depth of flow =   0.496(Ft.), Average velocity =   7.706(Ft/s)

Sub-Channel No. 1 Critical depth =      0.773(Ft.)
  '     '       '     Critical flow top width =      7.641(Ft.)
  '     '       '     Critical flow velocity=    4.170(Ft/s)
  '     '       '     Critical flow area =      4.115(Sq.Ft)



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Process from Point/Station      602.000 to Point/Station      603.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1625.500(Ft.)
Downstream point/station elevation =  1614.000(Ft.)
Pipe length  =   112.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.158(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    17.158(CFS)
Normal flow depth in pipe =   10.42(In.)
Flow top width inside pipe =   13.82(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.86(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    13.47 min.


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Process from Point/Station      602.000 to Point/Station      603.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.950(Ac.)
Runoff from this stream =     17.158(CFS)
Time of concentration =   13.47 min.
Rainfall intensity =     2.001(In/Hr)
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Process from Point/Station      604.000 to Point/Station      605.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   770.000(Ft.)
Top (of initial area) elevation =  1646.000(Ft.)
Bottom (of initial area) elevation =  1626.400(Ft.)
Difference in elevation =    19.600(Ft.)
Slope =    0.02545  s(percent)=       2.55
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.924 min.
Rainfall intensity =      2.510(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.614(CFS)
Total initial stream area =        1.180(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station      605.000 to Point/Station      605.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     8.92 min.
Rainfall intensity =      2.510(In/Hr) for a    10.0 year storm
Subarea runoff =      0.218(CFS) for      0.110(Ac.)
Total runoff =      2.832(CFS)   Total area =       1.290(Ac.)


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Process from Point/Station      605.000 to Point/Station      606.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1621.000(Ft.)
Downstream point/station elevation =  1620.300(Ft.)
Pipe length  =    68.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.832(CFS)
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```
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.832(CFS)
Normal flow depth in pipe =    7.99(In.)
Flow top width inside pipe =   11.32(In.)
Critical Depth =    8.65(In.)
Pipe flow velocity =      5.09(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     9.15 min.


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Process from Point/Station      605.000 to Point/Station      606.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.290(Ac.)
Runoff from this stream =      2.832(CFS)
Time of concentration =    9.15 min.
Rainfall intensity =     2.476(In/Hr)


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Process from Point/Station      610.000 to Point/Station      612.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   497.000(Ft.)
Top (of initial area) elevation =  1727.000(Ft.)
Bottom (of initial area) elevation =  1624.000(Ft.)
Difference in elevation =   103.000(Ft.)
Slope =    0.20724  s(percent)=      20.72
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.655 min.
Rainfall intensity =      2.167(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.773
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.190(CFS)
Total initial stream area =        0.710(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      612.000 to Point/Station      614.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1624.000(Ft.)
Downstream point/station elevation =  1612.000(Ft.)
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```
Pipe length  =    95.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.190(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.190(CFS)
Normal flow depth in pipe =    3.34(In.)
Flow top width inside pipe =    5.96(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.60(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    11.80 min.


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Process from Point/Station      612.000 to Point/Station      614.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.710(Ac.)
Runoff from this stream =      1.190(CFS)
Time of concentration =   11.80 min.
Rainfall intensity =     2.152(In/Hr)
Summary of stream data:

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


1       17.158     13.47                2.001
2        2.832      9.15                2.476
3        1.190     11.80                2.152
Largest stream flow has longer time of concentration
Qp =     17.158 + sum of
        Qb         Ia/Ib
         2.832 *    0.808 =      2.289
        Qb         Ia/Ib
         1.190 *    0.930 =      1.107
Qp =     20.554

Total of 3 streams to confluence:
Flow rates before confluence point:
      17.158       2.832       1.190
Area of streams before confluence:
       10.950        1.290        0.710
Results of confluence:
Total flow rate =     20.554(CFS)
Time of concentration =    13.468 min.
Effective stream area after confluence =     12.950(Ac.)


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Process from Point/Station      700.000 to Point/Station      702.000
**** INITIAL AREA EVALUATION ****
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```
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1966.300(Ft.)
Bottom (of initial area) elevation =  1623.500(Ft.)
Difference in elevation =   342.800(Ft.)
Slope =    0.34280  s(percent)=      34.28
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.940 min.
Rainfall intensity =      1.964(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.762
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      9.059(CFS)
Total initial stream area =        6.050(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      702.000 to Point/Station      704.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1623.500(Ft.)
Downstream point/station elevation =  1623.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.059(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.059(CFS)
Normal flow depth in pipe =   14.48(In.)
Flow top width inside pipe =   14.27(In.)
Critical Depth =   13.96(In.)
Pipe flow velocity =      5.94(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    14.12 min.


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Process from Point/Station      702.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      6.050(Ac.)
Runoff from this stream =      9.059(CFS)
Time of concentration =   14.12 min.
Rainfall intensity =     1.950(In/Hr)


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Process from Point/Station      710.000 to Point/Station      712.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Initial area flow distance =   903.000(Ft.)
Top (of initial area) elevation =  1966.500(Ft.)
Bottom (of initial area) elevation =  1620.000(Ft.)
Difference in elevation =   346.500(Ft.)
Slope =    0.38372  s(percent)=      38.37
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.084 min.
Rainfall intensity =      2.034(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.766
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.959(CFS)
Total initial stream area =        2.540(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      712.000 to Point/Station      714.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1620.000(Ft.)
Downstream point/station elevation =  1614.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.959(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.959(CFS)
Normal flow depth in pipe =    5.64(In.)
Flow top width inside pipe =    8.71(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.58(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    13.15 min.


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Process from Point/Station      712.000 to Point/Station      714.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.540(Ac.)
Runoff from this stream =      3.959(CFS)
Time of concentration =   13.15 min.
Rainfall intensity =     2.028(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      720.000 to Point/Station      722.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   938.000(Ft.)
Top (of initial area) elevation =  1922.000(Ft.)
Bottom (of initial area) elevation =  1617.000(Ft.)
Difference in elevation =   305.000(Ft.)
Slope =    0.32516  s(percent)=      32.52
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.732 min.
Rainfall intensity =      1.980(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.763
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.606(CFS)
Total initial stream area =        4.370(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      722.000 to Point/Station      724.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1617.000(Ft.)
Downstream point/station elevation =  1614.000(Ft.)
Pipe length  =    56.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.606(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.606(CFS)
Normal flow depth in pipe =    8.13(In.)
Flow top width inside pipe =   11.22(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.67(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    13.81 min.


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Process from Point/Station      722.000 to Point/Station      724.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      4.370(Ac.)
Runoff from this stream =      6.606(CFS)
Time of concentration =   13.81 min.
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Rainfall intensity =     1.974(In/Hr)


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Process from Point/Station      730.000 to Point/Station      732.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   798.000(Ft.)
Top (of initial area) elevation =  1627.500(Ft.)
Bottom (of initial area) elevation =  1618.500(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01128  s(percent)=       1.13
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   25.212 min.
Rainfall intensity =      1.418(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.720
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.378(CFS)
Total initial stream area =        0.370(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      732.000 to Point/Station      734.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1618.500(Ft.)
Downstream point/station elevation =  1618.000(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.378(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.378(CFS)
Normal flow depth in pipe =    3.01(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    3.75(In.)
Pipe flow velocity =      3.83(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    25.33 min.


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Process from Point/Station      734.000 to Point/Station      734.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.873
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    25.33 min.
Rainfall intensity =      1.414(In/Hr) for a    10.0 year storm
Subarea runoff =      0.914(CFS) for      0.740(Ac.)
Total runoff =      1.291(CFS)   Total area =       1.110(Ac.)


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Process from Point/Station      734.000 to Point/Station      736.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1618.000(Ft.)
Downstream point/station elevation =  1617.500(Ft.)
Pipe length  =    22.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.291(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.291(CFS)
Normal flow depth in pipe =    4.59(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    6.28(In.)
Pipe flow velocity =      5.69(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    25.40 min.


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Process from Point/Station      734.000 to Point/Station      736.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      1.110(Ac.)
Runoff from this stream =      1.291(CFS)
Time of concentration =   25.40 min.
Rainfall intensity =     1.412(In/Hr)
Summary of stream data:

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


1        9.059     14.12                1.950
2        3.959     13.15                2.028
3        6.606     13.81                1.974
4        1.291     25.40                1.412
Largest stream flow has longer or shorter time of concentration
Qp =      9.059 + sum of
       Qb         Ia/Ib
```

```
         3.959 *    0.962 =      3.807
        Qb         Ia/Ib
         6.606 *    0.988 =      6.526
        Qa          Tb/Ta
         1.291 *    0.556 =      0.718
Qp =     20.109

Total of 4 streams to confluence:
Flow rates before confluence point:
       9.059       3.959       6.606       1.291
Area of streams before confluence:
        6.050        2.540        4.370        1.110
Results of confluence:
Total flow rate =     20.109(CFS)
Time of concentration =    14.122 min.
Effective stream area after confluence =     14.070(Ac.)


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Process from Point/Station      800.000 to Point/Station      802.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   506.000(Ft.)
Top (of initial area) elevation =  1963.000(Ft.)
Bottom (of initial area) elevation =  1722.000(Ft.)
Difference in elevation =   241.000(Ft.)
Slope =    0.47628  s(percent)=      47.63
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.939 min.
Rainfall intensity =      2.366(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.783
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      9.128(CFS)
Total initial stream area =        4.930(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      802.000 to Point/Station      804.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1722.000(Ft.)
Downstream point elevation =  1595.600(Ft.)
Channel length thru subarea  =   878.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
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```
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =     22.163(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     22.163(CFS)
Depth of flow =   0.563(Ft.), Average velocity =   7.487(Ft/s)
Channel flow top width =    7.507(Ft.)
Flow Velocity =    7.49(Ft/s)
Travel time  =    1.95 min.
Time of concentration =   11.89 min.

Sub-Channel No. 1 Critical depth =      0.836(Ft.)
  '     '       '     Critical flow top width =      9.688(Ft.)
  '     '       '     Critical flow velocity=    4.179(Ft/s)
  '     '       '     Critical flow area =      5.303(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.772
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.143(In/Hr) for a    10.0 year storm
Subarea runoff =     26.018(CFS) for     15.720(Ac.)
Total runoff =     35.146(CFS)   Total area =      20.650(Ac.)
Depth of flow =   0.709(Ft.), Average velocity =   8.493(Ft/s)

Sub-Channel No. 1 Critical depth =      1.055(Ft.)
  '     '       '     Critical flow top width =     11.438(Ft.)
  '     '       '     Critical flow velocity=    4.616(Ft/s)
  '     '       '     Critical flow area =      7.614(Sq.Ft)



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Process from Point/Station      804.000 to Point/Station      806.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1595.600(Ft.)
Downstream point/station elevation =  1592.600(Ft.)
Pipe length  =    79.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.146(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    35.146(CFS)
Normal flow depth in pipe =   16.20(In.)
Flow top width inside pipe =   22.49(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.58(Ft/s)
Travel time through pipe =    0.08 min.
```

```
Time of concentration (TC) =    11.98 min.


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Process from Point/Station      804.000 to Point/Station      806.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.650(Ac.)
Runoff from this stream =     35.146(CFS)
Time of concentration =   11.98 min.
Rainfall intensity =     2.135(In/Hr)


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Process from Point/Station      810.000 to Point/Station      812.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   626.000(Ft.)
Top (of initial area) elevation =  1972.200(Ft.)
Bottom (of initial area) elevation =  1652.000(Ft.)
Difference in elevation =   320.200(Ft.)
Slope =    0.51150  s(percent)=      51.15
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.669 min.
Rainfall intensity =      2.275(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.779
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.874(CFS)
Total initial stream area =        3.880(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      812.000 to Point/Station      814.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1652.000(Ft.)
Downstream point elevation =  1591.000(Ft.)
Channel length thru subarea  =   542.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =     11.077(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
```

```
Flow(q) thru subarea =     11.077(CFS)
Depth of flow =   0.420(Ft.), Average velocity =   5.636(Ft/s)
Channel flow top width =    6.360(Ft.)
Flow Velocity =    5.64(Ft/s)
Travel time  =    1.60 min.
Time of concentration =   12.27 min.

Sub-Channel No. 1 Critical depth =      0.578(Ft.)
  '     '       '     Critical flow top width =      7.625(Ft.)
  '     '       '     Critical flow velocity=    3.607(Ft/s)
  '     '       '     Critical flow area =      3.071(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.770
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.107(In/Hr) for a    10.0 year storm
Subarea runoff =      8.309(CFS) for      5.120(Ac.)
Total runoff =     15.183(CFS)   Total area =       9.000(Ac.)
Depth of flow =   0.495(Ft.), Average velocity =   6.165(Ft/s)

Sub-Channel No. 1 Critical depth =      0.688(Ft.)
  '     '       '     Critical flow top width =      8.500(Ft.)
  '     '       '     Critical flow velocity=    3.841(Ft/s)
  '     '       '     Critical flow area =      3.953(Sq.Ft)



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Process from Point/Station      814.000 to Point/Station      816.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1591.000(Ft.)
Downstream point/station elevation =  1584.000(Ft.)
Pipe length  =    56.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.183(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    15.183(CFS)
Normal flow depth in pipe =    8.94(In.)
Flow top width inside pipe =   14.72(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.91(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    12.32 min.


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Process from Point/Station      814.000 to Point/Station      816.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      9.000(Ac.)
Runoff from this stream =     15.183(CFS)
Time of concentration =   12.32 min.
Rainfall intensity =     2.102(In/Hr)


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Process from Point/Station      820.000 to Point/Station      822.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   692.000(Ft.)
Top (of initial area) elevation =  1992.300(Ft.)
Bottom (of initial area) elevation =  1712.000(Ft.)
Difference in elevation =   280.300(Ft.)
Slope =    0.40506  s(percent)=      40.51
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.636 min.
Rainfall intensity =      2.169(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      9.346(CFS)
Total initial stream area =        5.570(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      822.000 to Point/Station      824.000
**** IMPROVED CHANNEL TRAVEL TIME ****
____________________________________________________________________________
Upstream point elevation =  1712.000(Ft.)
Downstream point elevation =  1583.700(Ft.)
Channel length thru subarea  =   918.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =     17.950(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     17.950(CFS)
Depth of flow =   0.510(Ft.), Average velocity =   6.985(Ft/s)
Channel flow top width =    7.079(Ft.)
Flow Velocity =    6.99(Ft/s)
```

```
Travel time  =    2.19 min.
Time of concentration =   13.83 min.

Sub-Channel No. 1 Critical depth =      0.750(Ft.)
  '     '       '     Critical flow top width =      9.000(Ft.)
  '     '       '     Critical flow velocity=    3.989(Ft/s)
  '     '       '     Critical flow area =      4.500(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.763
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.973(In/Hr) for a    10.0 year storm
Subarea runoff =     17.143(CFS) for     11.390(Ac.)
Total runoff =     26.489(CFS)   Total area =      16.960(Ac.)
Depth of flow =   0.621(Ft.), Average velocity =   7.780(Ft/s)

Sub-Channel No. 1 Critical depth =      0.914(Ft.)
  '     '       '     Critical flow top width =     10.313(Ft.)
  '     '       '     Critical flow velocity=    4.354(Ft/s)
  '     '       '     Critical flow area =      6.084(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      824.000 to Point/Station      826.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1583.700(Ft.)
Downstream point/station elevation =  1583.000(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.489(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    26.489(CFS)
Normal flow depth in pipe =   21.60(In.)
Flow top width inside pipe =   14.40(In.)
Critical Depth =   21.56(In.)
Pipe flow velocity =      8.89(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    13.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      824.000 to Point/Station      826.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
```

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Stream flow area =     16.960(Ac.)
Runoff from this stream =     26.489(CFS)
Time of concentration =   13.93 min.
Rainfall intensity =     1.964(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      830.000 to Point/Station      832.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   528.000(Ft.)
Top (of initial area) elevation =  1702.800(Ft.)
Bottom (of initial area) elevation =  1594.000(Ft.)
Difference in elevation =   108.800(Ft.)
Slope =    0.20606  s(percent)=      20.61
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.954 min.
Rainfall intensity =      2.137(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.772
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.920(CFS)
Total initial stream area =        1.770(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      832.000 to Point/Station      834.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1594.000(Ft.)
Downstream point/station elevation =  1585.000(Ft.)
Pipe length  =    55.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.920(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.920(CFS)
Normal flow depth in pipe =    4.16(In.)
Flow top width inside pipe =    8.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.63(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      832.000 to Point/Station      834.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      1.770(Ac.)
Runoff from this stream =      2.920(CFS)
Time of concentration =   12.02 min.
Rainfall intensity =     2.131(In/Hr)
Summary of stream data:

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


1       35.146     11.98                2.135
2       15.183     12.32                2.102
3       26.489     13.93                1.964
4        2.920     12.02                2.131
Largest stream flow has longer or shorter time of concentration
Qp =     35.146 + sum of
        Qa          Tb/Ta
        15.183 *    0.972 =     14.763
        Qa          Tb/Ta
        26.489 *    0.860 =     22.769
        Qa          Tb/Ta
         2.920 *    0.997 =      2.911
Qp =     75.589

Total of 4 streams to confluence:
Flow rates before confluence point:
      35.146      15.183      26.489       2.920
Area of streams before confluence:
       20.650        9.000       16.960        1.770
Results of confluence:
Total flow rate =     75.589(CFS)
Time of concentration =    11.978 min.
Effective stream area after confluence =     48.380(Ac.)


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Process from Point/Station      800.000 to Point/Station      834.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     48.380(Ac.)
Runoff from this stream =     75.589(CFS)
Time of concentration =   11.98 min.
Rainfall intensity =     2.135(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      840.000 to Point/Station      842.000
```

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**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   802.000(Ft.)
Top (of initial area) elevation =  1618.000(Ft.)
Bottom (of initial area) elevation =  1600.000(Ft.)
Difference in elevation =    18.000(Ft.)
Slope =    0.02244  s(percent)=       2.24
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   22.014 min.
Rainfall intensity =      1.527(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.730
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.792(CFS)
Total initial stream area =        0.710(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      842.000 to Point/Station      844.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1600.000(Ft.)
Downstream point/station elevation =  1599.500(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.792(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.792(CFS)
Normal flow depth in pipe =    4.80(In.)
Flow top width inside pipe =    4.79(In.)
Critical Depth =    5.31(In.)
Pipe flow velocity =      4.70(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    22.10 min.


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Process from Point/Station      842.000 to Point/Station      844.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
```

```
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    22.10 min.
Rainfall intensity =      1.524(In/Hr) for a    10.0 year storm
Subarea runoff =      1.066(CFS) for      0.800(Ac.)
Total runoff =      1.859(CFS)   Total area =       1.510(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      844.000 to Point/Station      846.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1599.500(Ft.)
Downstream point/station elevation =  1597.000(Ft.)
Pipe length  =    11.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.859(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.859(CFS)
Normal flow depth in pipe =    3.68(In.)
Flow top width inside pipe =    5.84(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.72(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    22.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      844.000 to Point/Station      846.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.510(Ac.)
Runoff from this stream =      1.859(CFS)
Time of concentration =   22.11 min.
Rainfall intensity =     1.524(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      850.000 to Point/Station      852.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Initial area flow distance =   295.000(Ft.)
Top (of initial area) elevation =  1596.000(Ft.)
Bottom (of initial area) elevation =  1593.800(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.00746  s(percent)=       0.75
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.394 min.
Rainfall intensity =      1.686(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.744
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.201(CFS)
Total initial stream area =        0.160(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      852.000 to Point/Station      854.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1593.800(Ft.)
Downstream point/station elevation =  1593.300(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.201(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.201(CFS)
Normal flow depth in pipe =    2.03(In.)
Flow top width inside pipe =    5.68(In.)
Critical Depth =    2.69(In.)
Pipe flow velocity =      3.42(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    18.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      852.000 to Point/Station      854.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    18.51 min.
Rainfall intensity =      1.680(In/Hr) for a    10.0 year storm
Subarea runoff =      0.618(CFS) for      0.420(Ac.)
Total runoff =      0.819(CFS)   Total area =       0.580(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      854.000 to Point/Station      856.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1593.300(Ft.)
Downstream point/station elevation =  1585.000(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
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```
No. of pipes = 1  Required pipe flow  =     0.819(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.819(CFS)
Normal flow depth in pipe =    1.94(In.)
Flow top width inside pipe =    5.61(In.)
Critical Depth =    5.37(In.)
Pipe flow velocity =     14.89(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    18.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      854.000 to Point/Station      856.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.580(Ac.)
Runoff from this stream =      0.819(CFS)
Time of concentration =   18.53 min.
Rainfall intensity =     1.679(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      860.000 to Point/Station      862.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   371.000(Ft.)
Top (of initial area) elevation =  1595.000(Ft.)
Bottom (of initial area) elevation =  1590.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.01348  s(percent)=       1.35
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.910 min.
Rainfall intensity =      1.711(In/Hr) for a    10.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.746
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.344(CFS)
Total initial stream area =        0.270(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      862.000 to Point/Station      864.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1590.000(Ft.)
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Downstream point/station elevation =  1589.500(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.344(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.344(CFS)
Normal flow depth in pipe =    2.74(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    3.57(In.)
Pipe flow velocity =      3.96(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    18.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      862.000 to Point/Station      864.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    18.01 min.
Rainfall intensity =      1.706(In/Hr) for a    10.0 year storm
Subarea runoff =      0.867(CFS) for      0.580(Ac.)
Total runoff =      1.212(CFS)   Total area =       0.850(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      864.000 to Point/Station      866.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1589.500(Ft.)
Downstream point/station elevation =  1583.900(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.212(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.212(CFS)
Normal flow depth in pipe =    2.21(In.)
Flow top width inside pipe =    5.79(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.50(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    18.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      840.000 to Point/Station      866.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.850(Ac.)
Runoff from this stream =      1.212(CFS)
Time of concentration =   18.02 min.
Rainfall intensity =     1.705(In/Hr)
Summary of stream data:

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


1        1.859     22.11                1.524
2        0.819     18.53                1.679
3        1.212     18.02                1.705
Largest stream flow has longer time of concentration
Qp =      1.859 + sum of
        Qb         Ia/Ib
         0.819 *    0.907 =      0.743
        Qb         Ia/Ib
         1.212 *    0.894 =      1.083
Qp =      3.685

Total of 3 streams to confluence:
Flow rates before confluence point:
       1.859       0.819       1.212
Area of streams before confluence:
        1.510        0.580        0.850
Results of confluence:
Total flow rate =      3.685(CFS)
Time of concentration =    22.112 min.
Effective stream area after confluence =      2.940(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      840.000 to Point/Station      866.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.940(Ac.)
Runoff from this stream =      3.685(CFS)
Time of concentration =   22.11 min.
Rainfall intensity =     1.524(In/Hr)
Summary of stream data:

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


1       75.589     11.98            2.135
2        3.685     22.11            1.524
```

```
Largest stream flow has longer or shorter time of concentration
Qp =     75.589 + sum of
       Qa          Tb/Ta
        3.685 *    0.542 =      1.996
Qp =     77.585

Total of 2 main streams to confluence:
Flow rates before confluence point:
      75.589       3.685
Area of streams before confluence:
       48.380        2.940


Results of confluence:
Total flow rate =     77.585(CFS)
Time of concentration =    11.978 min.
Effective stream area after confluence  =     51.320(Ac.)
End of computations, total study area =          272.05 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.944
Area averaged RI index number =  78.1
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 12/05/18 File:pr100v2.out

Tentative Tract 35853
Proposed Conditions
Major Basin 100
100-Year Flow Rate

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

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

Program License Serial Number 4028

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(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 = 0.5500

++
Process from Point/Station 10.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 737.000(Ft.)
Top (of initial area) elevation = 2100.000(Ft.)
Bottom (of initial area) elevation = 1988.000(Ft.)
Difference in elevation = 112.000(Ft.)
Slope = 0.15197 s(percent)= 15.20
TC = k(0.710)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   14.518 min.
Rainfall intensity =      2.837(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     22.699(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       12.000 to Point/Station       14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1988.000(Ft.)
Downstream point elevation =  1838.300(Ft.)
Channel length thru subarea  =  3016.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     86.238(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     86.238(CFS)
Depth of flow =   1.495(Ft.), Average velocity =   7.706(Ft/s)
Channel flow top width =   11.970(Ft.)
Flow Velocity =    7.71(Ft/s)
Travel time  =    6.52 min.
Time of concentration =   21.04 min.

Sub-Channel No. 1 Critical depth =      1.766(Ft.)
  '     '       '     Critical flow top width =     13.594(Ft.)
  '     '       '     Critical flow velocity=    5.887(Ft/s)
  '     '       '     Critical flow area =     14.649(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.780
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.313(In/Hr) for a   100.0 year storm
Subarea runoff =    126.994(CFS) for     70.340(Ac.)
Total runoff =    149.693(CFS)   Total area =      80.340(Ac.)
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```
Depth of flow =   1.922(Ft.), Average velocity =   8.883(Ft/s)

Sub-Channel No. 1 Critical depth =      2.297(Ft.)
  '     '       '     Critical flow top width =     16.781(Ft.)
  '     '       '     Critical flow velocity=    6.589(Ft/s)
  '     '       '     Critical flow area =     22.718(Sq.Ft)



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Process from Point/Station       12.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     80.340(Ac.)
Runoff from this stream =    149.693(CFS)
Time of concentration =   21.04 min.
Rainfall intensity =     2.313(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   440.000(Ft.)
Top (of initial area) elevation =  1948.500(Ft.)
Bottom (of initial area) elevation =  1893.500(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.12500  s(percent)=      12.50
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.282 min.
Rainfall intensity =      3.111(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.538(CFS)
Total initial stream area =        1.010(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1894.000(Ft.)
```

```
Downstream point/station elevation =  1877.400(Ft.)
Pipe length  =   394.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.538(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.538(CFS)
Normal flow depth in pipe =    5.80(In.)
Flow top width inside pipe =    8.62(In.)
Critical Depth =    8.35(In.)
Pipe flow velocity =      8.43(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =    13.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.100 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    13.06 min.
Rainfall intensity =      3.007(In/Hr) for a   100.0 year storm
Subarea runoff =      1.743(CFS) for      0.720(Ac.)
Total runoff =      4.281(CFS)   Total area =       1.730(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1877.400(Ft.)
Downstream point/station elevation =  1871.900(Ft.)
Pipe length  =   537.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.281(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.281(CFS)
Normal flow depth in pipe =    8.85(In.)
Flow top width inside pipe =   14.76(In.)
Critical Depth =   10.05(In.)
Pipe flow velocity =      5.68(Ft/s)
Travel time through pipe =    1.58 min.
Time of concentration (TC) =    14.64 min.


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Process from Point/Station      102.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
```

```
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.64 min.
Rainfall intensity =      2.824(In/Hr) for a   100.0 year storm
Subarea runoff =     17.258(CFS) for      7.440(Ac.)
Total runoff =     21.539(CFS)   Total area =       9.170(Ac.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1871.900(Ft.)
Downstream point/station elevation =  1866.300(Ft.)
Pipe length  =   641.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.539(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    21.539(CFS)
Normal flow depth in pipe =   20.11(In.)
Flow top width inside pipe =   17.69(In.)
Critical Depth =   19.93(In.)
Pipe flow velocity =      7.67(Ft/s)
Travel time through pipe =    1.39 min.
Time of concentration (TC) =    16.03 min.


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Process from Point/Station      103.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    16.03 min.
Rainfall intensity =      2.687(In/Hr) for a   100.0 year storm
Subarea runoff =     10.614(CFS) for      4.830(Ac.)
Total runoff =     32.154(CFS)   Total area =      14.000(Ac.)


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Process from Point/Station      104.100 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    16.03 min.
Rainfall intensity =      2.687(In/Hr) for a   100.0 year storm
Subarea runoff =      8.395(CFS) for      3.820(Ac.)
Total runoff =     40.548(CFS)   Total area =      17.820(Ac.)


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Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1857.600(Ft.)
Downstream point/station elevation =  1857.000(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.548(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    40.548(CFS)
Normal flow depth in pipe =   23.86(In.)
Flow top width inside pipe =   24.21(In.)
Critical Depth =   25.69(In.)
Pipe flow velocity =      9.68(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    16.13 min.


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Process from Point/Station      104.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.766
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    16.13 min.
Rainfall intensity =      2.677(In/Hr) for a   100.0 year storm
Subarea runoff =      1.436(CFS) for      0.700(Ac.)
Total runoff =     41.984(CFS)   Total area =      18.520(Ac.)
```

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Process from Point/Station      105.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1852.000(Ft.)
Downstream point/station elevation =  1838.300(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    41.984(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    41.984(CFS)
Normal flow depth in pipe =   12.98(In.)
Flow top width inside pipe =   16.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     30.74(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    16.17 min.


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Process from Point/Station      105.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     18.520(Ac.)
Runoff from this stream =     41.984(CFS)
Time of concentration =   16.17 min.
Rainfall intensity =     2.674(In/Hr)
Summary of stream data:

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


1      149.693     21.04            2.313
2       41.984     16.17            2.674
Largest stream flow has longer time of concentration
Qp =    149.693 + sum of
        Qb         Ia/Ib
        41.984 *    0.865 =     36.318
Qp =    186.011

Total of 2 main streams to confluence:
Flow rates before confluence point:
     149.693      41.984
Area of streams before confluence:
       80.340       18.520


Results of confluence:
Total flow rate =    186.011(CFS)
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Time of concentration =    21.040 min.
Effective stream area after confluence  =     98.860(Ac.)


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Process from Point/Station       14.000 to Point/Station       16.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1838.300(Ft.)
Downstream point elevation =  1831.000(Ft.)
Channel length thru subarea  =   310.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    186.011(CFS)
Depth of flow =   2.495(Ft.), Average velocity =   7.111(Ft/s)
Channel flow top width =   17.970(Ft.)
Flow Velocity =    7.11(Ft/s)
Travel time  =    0.73 min.
Time of concentration =   21.77 min.

Sub-Channel No. 1 Critical depth =      2.531(Ft.)
  '     '       '     Critical flow top width =     18.188(Ft.)
  '     '       '     Critical flow velocity=    6.937(Ft/s)
  '     '       '     Critical flow area =     26.815(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     98.860(Ac.)
Runoff from this stream =    186.011(CFS)
Time of concentration =   21.77 min.
Rainfall intensity =     2.271(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   130.000(Ft.)
Top (of initial area) elevation =  1880.000(Ft.)
Bottom (of initial area) elevation =  1878.700(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.01000  s(percent)=       1.00
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```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.865 min.
Rainfall intensity =      4.283(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.845
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      1.049(CFS)
Total initial stream area =        0.290(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      107.000 to Point/Station      108.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1878.000(Ft.)
End of street segment elevation =  1869.500(Ft.)
Length of street segment  =   610.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      5.371(CFS)
Depth of flow =   0.389(Ft.), Average velocity =   2.711(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.656(Ft.)
Flow velocity =   2.71(Ft/s)
Travel time =    3.75 min.     TC =   10.62  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.370(In/Hr) for a   100.0 year storm
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Subarea runoff =      8.553(CFS) for      3.050(Ac.)
Total runoff =      9.603(CFS)   Total area =       3.340(Ac.)
Street flow at end of street =      9.603(CFS)
Half street flow at end of street =      9.603(CFS)
Depth of flow =   0.461(Ft.), Average velocity =   3.109(Ft/s)
Flow width (from curb towards crown)=  17.241(Ft.)


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Process from Point/Station      108.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1864.900(Ft.)
Downstream point/station elevation =  1864.000(Ft.)
Pipe length  =    87.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.603(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.603(CFS)
Normal flow depth in pipe =   13.34(In.)
Flow top width inside pipe =   15.77(In.)
Critical Depth =   14.36(In.)
Pipe flow velocity =      6.84(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    10.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.83 min.
Rainfall intensity =      3.334(In/Hr) for a   100.0 year storm
Subarea runoff =      0.842(CFS) for      0.320(Ac.)
Total runoff =     10.445(CFS)   Total area =       3.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1859.000(Ft.)
Downstream point/station elevation =  1853.000(Ft.)
Pipe length  =    59.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.445(CFS)
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```
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    10.445(CFS)
Normal flow depth in pipe =    9.07(In.)
Flow top width inside pipe =   10.31(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.41(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    10.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station       16.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1853.000(Ft.)
Downstream point elevation =  1831.000(Ft.)
Channel length thru subarea  =   219.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     10.445(CFS)
Depth of flow =   0.420(Ft.), Average velocity =   5.322(Ft/s)
Channel flow top width =    6.356(Ft.)
Flow Velocity =    5.32(Ft/s)
Travel time  =    0.69 min.
Time of concentration =   11.57 min.

Sub-Channel No. 1 Critical depth =      0.563(Ft.)
  '     '       '     Critical flow top width =      7.500(Ft.)
  '     '       '     Critical flow velocity=    3.537(Ft/s)
  '     '       '     Critical flow area =      2.953(Sq.Ft)



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Process from Point/Station      110.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.660(Ac.)
Runoff from this stream =     10.445(CFS)
Time of concentration =   11.57 min.
Rainfall intensity =     3.214(In/Hr)
Summary of stream data:

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

```
1      186.011     21.77            2.271
2       10.445     11.57            3.214
Largest stream flow has longer time of concentration
Qp =    186.011 + sum of
        Qb         Ia/Ib
        10.445 *    0.706 =      7.379
Qp =    193.390

Total of 2 main streams to confluence:
Flow rates before confluence point:
     186.011      10.445
Area of streams before confluence:
       98.860        3.660


Results of confluence:
Total flow rate =    193.390(CFS)
Time of concentration =    21.767 min.
Effective stream area after confluence  =    102.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       18.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1831.000(Ft.)
Downstream point elevation =  1814.000(Ft.)
Channel length thru subarea  =   557.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    206.267(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    206.267(CFS)
Depth of flow =   2.467(Ft.), Average velocity =   8.041(Ft/s)
Channel flow top width =   17.799(Ft.)
Flow Velocity =    8.04(Ft/s)
Travel time  =    1.15 min.
Time of concentration =   22.92 min.

Sub-Channel No. 1 Critical depth =      2.656(Ft.)
  '     '       '     Critical flow top width =     18.938(Ft.)
  '     '       '     Critical flow velocity=    7.080(Ft/s)
  '     '       '     Critical flow area =     29.136(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.775
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
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Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.207(In/Hr) for a   100.0 year storm
Subarea runoff =     25.671(CFS) for     15.000(Ac.)
Total runoff =    219.061(CFS)   Total area =     117.520(Ac.)
Depth of flow =   2.532(Ft.), Average velocity =   8.165(Ft/s)

Sub-Channel No. 1 Critical depth =      2.750(Ft.)
  '     '       '     Critical flow top width =     19.500(Ft.)
  '     '       '     Critical flow velocity=    7.081(Ft/s)
  '     '       '     Critical flow area =     30.938(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       18.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    117.520(Ac.)
Runoff from this stream =    219.061(CFS)
Time of concentration =   22.92 min.
Rainfall intensity =     2.207(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  2227.000(Ft.)
Bottom (of initial area) elevation =  1929.000(Ft.)
Difference in elevation =   298.000(Ft.)
Slope =    0.29800  s(percent)=      29.80
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.336 min.
Rainfall intensity =      2.857(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.801
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     12.489(CFS)
Total initial stream area =        5.460(Ac.)
Pervious area fraction = 1.000
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Process from Point/Station      112.000 to Point/Station      113.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------------
Upstream point elevation =  1929.000(Ft.)
Downstream point elevation =  1862.000(Ft.)
Channel length thru subarea  =  1236.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     44.717(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     44.717(CFS)
Depth of flow =   1.073(Ft.), Average velocity =   6.701(Ft/s)
Channel flow top width =    9.438(Ft.)
Flow Velocity =    6.70(Ft/s)
Travel time  =    3.07 min.
Time of concentration =   17.41 min.

Sub-Channel No. 1 Critical depth =      1.281(Ft.)
  '     '       '     Critical flow top width =     10.688(Ft.)
  '     '       '     Critical flow velocity=    5.100(Ft/s)
  '     '       '     Critical flow area =      8.769(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.567(In/Hr) for a   100.0 year storm
Subarea runoff =     64.382(CFS) for     31.710(Ac.)
Total runoff =     76.872(CFS)   Total area =      37.170(Ac.)
Depth of flow =   1.388(Ft.), Average velocity =   7.727(Ft/s)

Sub-Channel No. 1 Critical depth =      1.672(Ft.)
  '     '       '     Critical flow top width =     13.031(Ft.)
  '     '       '     Critical flow velocity=    5.736(Ft/s)
  '     '       '     Critical flow area =     13.401(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      114.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1862.000(Ft.)
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Downstream point/station elevation =  1860.500(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    76.872(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    76.872(CFS)
Normal flow depth in pipe =   26.39(In.)
Flow top width inside pipe =   31.85(In.)
Critical Depth =   32.88(In.)
Pipe flow velocity =     13.84(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    17.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      115.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1860.500(Ft.)
Downstream point elevation =  1850.000(Ft.)
Channel length thru subarea  =   171.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     76.872(CFS)
Depth of flow =   1.348(Ft.), Average velocity =   8.092(Ft/s)
Channel flow top width =   11.091(Ft.)
Flow Velocity =    8.09(Ft/s)
Travel time  =    0.35 min.
Time of concentration =   17.87 min.

Sub-Channel No. 1 Critical depth =      1.672(Ft.)
  '     '       '     Critical flow top width =     13.031(Ft.)
  '     '       '     Critical flow velocity=    5.736(Ft/s)
  '     '       '     Critical flow area =     13.401(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      115.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     37.170(Ac.)
Runoff from this stream =     76.872(CFS)
Time of concentration =   17.87 min.
Rainfall intensity =     2.531(In/Hr)


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Process from Point/Station      116.000 to Point/Station      117.000
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**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   132.000(Ft.)
Top (of initial area) elevation =  1887.500(Ft.)
Bottom (of initial area) elevation =  1886.200(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.00985  s(percent)=       0.98
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.928 min.
Rainfall intensity =      4.262(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.845
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      1.512(CFS)
Total initial stream area =        0.420(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      117.000 to Point/Station      118.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1885.800(Ft.)
End of street segment elevation =  1872.000(Ft.)
Length of street segment  =   701.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      7.835(CFS)
Depth of flow =   0.413(Ft.), Average velocity =   3.380(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.838(Ft.)
Flow velocity =   3.38(Ft/s)
Travel time =    3.46 min.     TC =   10.38  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.833
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.411(In/Hr) for a   100.0 year storm
Subarea runoff =     12.585(CFS) for      4.430(Ac.)
Total runoff =     14.097(CFS)   Total area =       4.850(Ac.)
Street flow at end of street =     14.097(CFS)
Half street flow at end of street =     14.097(CFS)
Depth of flow =   0.491(Ft.), Average velocity =   3.886(Ft/s)
Flow width (from curb towards crown)=  18.737(Ft.)


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Process from Point/Station      118.000 to Point/Station      119.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1864.600(Ft.)
Downstream point/station elevation =  1864.000(Ft.)
Pipe length  =    55.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.097(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    14.097(CFS)
Normal flow depth in pipe =   14.91(In.)
Flow top width inside pipe =   19.06(In.)
Critical Depth =   16.75(In.)
Pipe flow velocity =      7.73(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    10.50 min.


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Process from Point/Station      118.000 to Point/Station      119.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.50 min.
Rainfall intensity =      3.390(In/Hr) for a   100.0 year storm
Subarea runoff =      0.992(CFS) for      0.370(Ac.)
Total runoff =     15.088(CFS)   Total area =       5.220(Ac.)


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Process from Point/Station      119.000 to Point/Station      115.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1860.320(Ft.)
Downstream point/station elevation =  1860.000(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.088(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    15.088(CFS)
Normal flow depth in pipe =   16.38(In.)
Flow top width inside pipe =   17.39(In.)
Critical Depth =   17.26(In.)
Pipe flow velocity =      7.50(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    10.57 min.


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Process from Point/Station      119.000 to Point/Station      115.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.220(Ac.)
Runoff from this stream =     15.088(CFS)
Time of concentration =   10.57 min.
Rainfall intensity =     3.377(In/Hr)
Summary of stream data:

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


1       76.872     17.87                2.531
2       15.088     10.57                3.377
Largest stream flow has longer time of concentration
Qp =     76.872 + sum of
       Qb         Ia/Ib
       15.088 *    0.749 =     11.306
Qp =     88.178

Total of 2 streams to confluence:
Flow rates before confluence point:
      76.872      15.088
Area of streams before confluence:
       37.170        5.220
Results of confluence:
Total flow rate =     88.178(CFS)
Time of concentration =    17.869 min.
Effective stream area after confluence =     42.390(Ac.)


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Process from Point/Station      115.000 to Point/Station      120.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1850.000(Ft.)
Downstream point elevation =  1840.000(Ft.)
Channel length thru subarea  =   194.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     91.908(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     91.908(CFS)
Depth of flow =   1.526(Ft.), Average velocity =   7.945(Ft/s)
Channel flow top width =   12.158(Ft.)
Flow Velocity =    7.95(Ft/s)
Travel time  =    0.41 min.
Time of concentration =   18.28 min.

Sub-Channel No. 1 Critical depth =      1.813(Ft.)
  '     '       '     Critical flow top width =     13.875(Ft.)
  '     '       '     Critical flow velocity=    6.010(Ft/s)
  '     '       '     Critical flow area =     15.293(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.500(In/Hr) for a   100.0 year storm
Subarea runoff =      7.409(CFS) for      3.760(Ac.)
Total runoff =     95.587(CFS)   Total area =      46.150(Ac.)
Depth of flow =   1.554(Ft.), Average velocity =   8.026(Ft/s)

Sub-Channel No. 1 Critical depth =      1.859(Ft.)
  '     '       '     Critical flow top width =     14.156(Ft.)
  '     '       '     Critical flow velocity=    5.993(Ft/s)
  '     '       '     Critical flow area =     15.950(Sq.Ft)



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Process from Point/Station      120.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1840.000(Ft.)
Downstream point/station elevation =  1837.500(Ft.)
Pipe length  =    98.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =    95.587(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    95.587(CFS)
Normal flow depth in pipe =   26.63(In.)
Flow top width inside pipe =   31.60(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.05(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    18.37 min.


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Process from Point/Station      120.000 to Point/Station      121.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     46.150(Ac.)
Runoff from this stream =     95.587(CFS)
Time of concentration =   18.37 min.
Rainfall intensity =     2.493(In/Hr)


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Process from Point/Station      122.000 to Point/Station      123.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   130.000(Ft.)
Top (of initial area) elevation =  1869.000(Ft.)
Bottom (of initial area) elevation =  1867.700(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.01000  s(percent)=       1.00
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.865 min.
Rainfall intensity =      4.283(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.845
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      1.122(CFS)
Total initial stream area =        0.310(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      123.000 to Point/Station      124.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1867.000(Ft.)
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End of street segment elevation =  1847.900(Ft.)
Length of street segment  =   427.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      4.613(CFS)
Depth of flow =   0.317(Ft.), Average velocity =   4.112(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.028(Ft.)
Flow velocity =   4.11(Ft/s)
Travel time =    1.73 min.     TC =    8.60  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.839
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
Subarea runoff =      6.919(CFS) for      2.180(Ac.)
Total runoff =      8.041(CFS)   Total area =       2.490(Ac.)
Street flow at end of street =      8.041(CFS)
Half street flow at end of street =      8.041(CFS)
Depth of flow =   0.370(Ft.), Average velocity =   4.660(Ft/s)
Flow width (from curb towards crown)=  12.686(Ft.)


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Process from Point/Station      124.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1838.100(Ft.)
Downstream point/station elevation =  1837.500(Ft.)
Pipe length  =    55.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.041(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.041(CFS)
Normal flow depth in pipe =   11.45(In.)
Flow top width inside pipe =   17.32(In.)
Critical Depth =   13.18(In.)
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Pipe flow velocity =      6.78(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.73 min.


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Process from Point/Station      124.000 to Point/Station      121.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.490(Ac.)
Runoff from this stream =      8.041(CFS)
Time of concentration =    8.73 min.
Rainfall intensity =     3.753(In/Hr)
Summary of stream data:

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


1       95.587     18.37                2.493
2        8.041      8.73                3.753
Largest stream flow has longer time of concentration
Qp =     95.587 + sum of
        Qb         Ia/Ib
         8.041 *    0.664 =      5.341
Qp =    100.927

Total of 2 streams to confluence:
Flow rates before confluence point:
      95.587       8.041
Area of streams before confluence:
       46.150        2.490
Results of confluence:
Total flow rate =    100.927(CFS)
Time of concentration =    18.372 min.
Effective stream area after confluence =     48.640(Ac.)


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Process from Point/Station      121.000 to Point/Station      125.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1837.500(Ft.)
Downstream point elevation =  1832.500(Ft.)
Channel length thru subarea  =   264.000(Ft.)
Channel base width    =   15.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    100.927(CFS)
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Depth of flow =   1.124(Ft.), Average velocity =   4.886(Ft/s)
Channel flow top width =   21.746(Ft.)
Flow Velocity =    4.89(Ft/s)
Travel time  =    0.90 min.
Time of concentration =   19.27 min.

Sub-Channel No. 1 Critical depth =      1.047(Ft.)
  '     '       '     Critical flow top width =     21.281(Ft.)
  '     '       '     Critical flow velocity=    5.314(Ft/s)
  '     '       '     Critical flow area =     18.991(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      121.000 to Point/Station      125.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     48.640(Ac.)
Runoff from this stream =    100.927(CFS)
Time of concentration =   19.27 min.
Rainfall intensity =     2.428(In/Hr)


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Process from Point/Station      126.000 to Point/Station      127.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   633.000(Ft.)
Top (of initial area) elevation =  2127.000(Ft.)
Bottom (of initial area) elevation =  2033.000(Ft.)
Difference in elevation =    94.000(Ft.)
Slope =    0.14850  s(percent)=      14.85
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.724 min.
Rainfall intensity =      2.926(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.803
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.980(CFS)
Total initial stream area =        2.120(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      127.000 to Point/Station      128.000
**** IMPROVED CHANNEL TRAVEL TIME ****
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Upstream point elevation =  2033.000(Ft.)
Downstream point elevation =  1868.500(Ft.)
Channel length thru subarea  =   735.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     12.053(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     12.053(CFS)
Depth of flow =   0.378(Ft.), Average velocity =   7.703(Ft/s)
Channel flow top width =    5.270(Ft.)
Flow Velocity =    7.70(Ft/s)
Travel time  =    1.59 min.
Time of concentration =   15.31 min.

Sub-Channel No. 1 Critical depth =      0.641(Ft.)
  '     '       '     Critical flow top width =      6.844(Ft.)
  '     '       '     Critical flow velocity=    3.823(Ft/s)
  '     '       '     Critical flow area =      3.153(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.797
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.755(In/Hr) for a   100.0 year storm
Subarea runoff =     14.082(CFS) for      6.410(Ac.)
Total runoff =     19.062(CFS)   Total area =       8.530(Ac.)
Depth of flow =   0.485(Ft.), Average velocity =   8.828(Ft/s)

Sub-Channel No. 1 Critical depth =      0.820(Ft.)
  '     '       '     Critical flow top width =      7.922(Ft.)
  '     '       '     Critical flow velocity=    4.255(Ft/s)
  '     '       '     Critical flow area =      4.480(Sq.Ft)



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Process from Point/Station      128.000 to Point/Station      129.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1868.500(Ft.)
Downstream point/station elevation =  1852.000(Ft.)
Pipe length  =   161.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.062(CFS)
Nearest computed pipe diameter  =     15.00(In.)
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Calculated individual pipe flow  =    19.062(CFS)
Normal flow depth in pipe =   11.36(In.)
Flow top width inside pipe =   12.87(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.12(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    15.45 min.


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Process from Point/Station      129.100 to Point/Station      129.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.45 min.
Rainfall intensity =      2.741(In/Hr) for a   100.0 year storm
Subarea runoff =      1.482(CFS) for      0.660(Ac.)
Total runoff =     20.544(CFS)   Total area =       9.190(Ac.)


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Process from Point/Station      129.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1852.000(Ft.)
Downstream point/station elevation =  1848.000(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.544(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    20.544(CFS)
Normal flow depth in pipe =   11.12(In.)
Flow top width inside pipe =   13.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.06(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.48 min.


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Process from Point/Station      130.000 to Point/Station      131.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1848.000(Ft.)
Downstream point elevation =  1837.000(Ft.)
Channel length thru subarea  =   211.000(Ft.)
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Channel base width    =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     22.498(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     22.498(CFS)
Depth of flow =   0.440(Ft.), Average velocity =   4.522(Ft/s)
Channel flow top width =   12.637(Ft.)
Flow Velocity =    4.52(Ft/s)
Travel time  =    0.78 min.
Time of concentration =   16.26 min.

Sub-Channel No. 1 Critical depth =      0.512(Ft.)
  '     '       '     Critical flow top width =     13.070(Ft.)
  '     '       '     Critical flow velocity=    3.812(Ft/s)
  '     '       '     Critical flow area =      5.903(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.794
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.666(In/Hr) for a   100.0 year storm
Subarea runoff =      3.854(CFS) for      1.820(Ac.)
Total runoff =     24.399(CFS)   Total area =      11.010(Ac.)
Depth of flow =   0.461(Ft.), Average velocity =   4.652(Ft/s)

Sub-Channel No. 1 Critical depth =      0.539(Ft.)
  '     '       '     Critical flow top width =     13.234(Ft.)
  '     '       '     Critical flow velocity=    3.896(Ft/s)
  '     '       '     Critical flow area =      6.262(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      131.000 to Point/Station      132.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1837.000(Ft.)
Downstream point/station elevation =  1836.000(Ft.)
Pipe length  =    91.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.399(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    24.399(CFS)
Normal flow depth in pipe =   20.34(In.)
Flow top width inside pipe =   17.25(In.)
Critical Depth =   20.94(In.)
```

```
Pipe flow velocity =      8.59(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    16.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      132.000 to Point/Station      125.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1836.000(Ft.)
Downstream point elevation =  1832.500(Ft.)
Channel length thru subarea  =   183.000(Ft.)
Channel base width    =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     24.399(CFS)
Depth of flow =   0.616(Ft.), Average velocity =   3.344(Ft/s)
Channel flow top width =   13.695(Ft.)
Flow Velocity =    3.34(Ft/s)
Travel time  =    0.91 min.
Time of concentration =   17.35 min.

Sub-Channel No. 1 Critical depth =      0.539(Ft.)
  '     '       '     Critical flow top width =     13.234(Ft.)
  '     '       '     Critical flow velocity=    3.896(Ft/s)
  '     '       '     Critical flow area =      6.262(Sq.Ft)



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Process from Point/Station      132.000 to Point/Station      125.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     11.010(Ac.)
Runoff from this stream =     24.399(CFS)
Time of concentration =   17.35 min.
Rainfall intensity =     2.573(In/Hr)
Summary of stream data:

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


1      100.927     19.27                2.428
2       24.399     17.35                2.573
Largest stream flow has longer time of concentration
Qp =    100.927 + sum of
        Qb         Ia/Ib
        24.399 *    0.944 =     23.026
```

```
Qp =    123.953

Total of 2 streams to confluence:
Flow rates before confluence point:
     100.927      24.399
Area of streams before confluence:
       48.640       11.010
Results of confluence:
Total flow rate =    123.953(CFS)
Time of concentration =    19.273 min.
Effective stream area after confluence =     59.650(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      133.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1832.500(Ft.)
Downstream point elevation =  1832.000(Ft.)
Channel length thru subarea  =   161.000(Ft.)
Channel base width    =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    125.509(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =    125.509(CFS)
Depth of flow =   2.468(Ft.), Average velocity =   2.922(Ft/s)
Channel flow top width =   24.807(Ft.)
Flow Velocity =    2.92(Ft/s)
Travel time  =    0.92 min.
Time of concentration =   20.19 min.

Sub-Channel No. 1 Critical depth =      1.453(Ft.)
  '     '       '     Critical flow top width =     18.719(Ft.)
  '     '       '     Critical flow velocity=    6.015(Ft/s)
  '     '       '     Critical flow area =     20.866(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.783
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.366(In/Hr) for a   100.0 year storm
Subarea runoff =      3.019(CFS) for      1.630(Ac.)
Total runoff =    126.972(CFS)   Total area =      61.280(Ac.)
Depth of flow =   2.482(Ft.), Average velocity =   2.932(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      1.469(Ft.)
  '     '       '     Critical flow top width =     18.813(Ft.)
  '     '       '     Critical flow velocity=    6.001(Ft/s)
  '     '       '     Critical flow area =     21.159(Sq.Ft)



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Process from Point/Station      133.000 to Point/Station       18.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1832.000(Ft.)
Downstream point elevation =  1814.000(Ft.)
Channel length thru subarea  =   141.000(Ft.)
Channel base width    =   10.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =    126.972(CFS)
Depth of flow =   0.895(Ft.), Average velocity =  10.454(Ft/s)
Channel flow top width =   17.156(Ft.)
Flow Velocity =   10.45(Ft/s)
Travel time  =    0.22 min.
Time of concentration =   20.42 min.

Sub-Channel No. 1 Critical depth =      1.406(Ft.)
  '     '       '     Critical flow top width =     21.250(Ft.)
  '     '       '     Critical flow velocity=    5.779(Ft/s)
  '     '       '     Critical flow area =     21.973(Sq.Ft)



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Process from Point/Station      133.000 to Point/Station       18.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     61.280(Ac.)
Runoff from this stream =    126.972(CFS)
Time of concentration =   20.42 min.
Rainfall intensity =     2.352(In/Hr)
Summary of stream data:

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


1      219.061     22.92            2.207
2      126.972     20.42            2.352
Largest stream flow has longer time of concentration
```

```
Qp =    219.061 + sum of
        Qb          Ia/Ib
       126.972 *    0.938 =    119.139
Qp =    338.200

Total of 2 main streams to confluence:
Flow rates before confluence point:
     219.061     126.972
Area of streams before confluence:
      117.520       61.280


Results of confluence:
Total flow rate =    338.200(CFS)
Time of concentration =    22.921 min.
Effective stream area after confluence  =    178.800(Ac.)


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Process from Point/Station       18.000 to Point/Station       20.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1814.000(Ft.)
Downstream point elevation =  1789.500(Ft.)
Channel length thru subarea  =   678.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    367.176(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    367.176(CFS)
Depth of flow =   3.050(Ft.), Average velocity =   9.910(Ft/s)
Channel flow top width =   21.298(Ft.)
Flow Velocity =    9.91(Ft/s)
Travel time  =    1.14 min.
Time of concentration =   24.06 min.

Sub-Channel No. 1 Critical depth =      3.469(Ft.)
  '     '       '     Critical flow top width =     23.813(Ft.)
  '     '       '     Critical flow velocity=    7.896(Ft/s)
  '     '       '     Critical flow area =     46.503(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.773
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
```

```
Rainfall intensity =      2.149(In/Hr) for a   100.0 year storm
Subarea runoff =     57.888(CFS) for     34.870(Ac.)
Total runoff =    396.088(CFS)   Total area =     213.670(Ac.)
Depth of flow =   3.150(Ft.), Average velocity =  10.101(Ft/s)

Sub-Channel No. 1 Critical depth =      3.594(Ft.)
  '     '       '     Critical flow top width =     24.563(Ft.)
  '     '       '     Critical flow velocity=    7.998(Ft/s)
  '     '       '     Critical flow area =     49.526(Sq.Ft)



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Process from Point/Station       18.000 to Point/Station       20.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    213.670(Ac.)
Runoff from this stream =    396.088(CFS)
Time of concentration =   24.06 min.
Rainfall intensity =     2.149(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      134.000 to Point/Station      135.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   666.000(Ft.)
Top (of initial area) elevation =  2066.000(Ft.)
Bottom (of initial area) elevation =  1914.000(Ft.)
Difference in elevation =   152.000(Ft.)
Slope =    0.22823  s(percent)=      22.82
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.852 min.
Rainfall intensity =      3.034(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      9.388(CFS)
Total initial stream area =        3.840(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      135.000 to Point/Station      136.000
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**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1914.000(Ft.)
Downstream point elevation =  1834.000(Ft.)
Channel length thru subarea  =   624.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     27.514(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     27.514(CFS)
Depth of flow =   0.680(Ft.), Average velocity =   8.033(Ft/s)
Channel flow top width =    7.078(Ft.)
Flow Velocity =    8.03(Ft/s)
Travel time  =    1.29 min.
Time of concentration =   14.15 min.

Sub-Channel No. 1 Critical depth =      0.992(Ft.)
  '     '       '     Critical flow top width =      8.953(Ft.)
  '     '       '     Critical flow velocity=    4.640(Ft/s)
  '     '       '     Critical flow area =      5.930(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.801
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.878(In/Hr) for a   100.0 year storm
Subarea runoff =     36.182(CFS) for     15.690(Ac.)
Total runoff =     45.570(CFS)   Total area =      19.530(Ac.)
Depth of flow =   0.877(Ft.), Average velocity =   9.228(Ft/s)

Sub-Channel No. 1 Critical depth =      1.289(Ft.)
  '     '       '     Critical flow top width =     10.734(Ft.)
  '     '       '     Critical flow velocity=    5.148(Ft/s)
  '     '       '     Critical flow area =      8.852(Sq.Ft)



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Process from Point/Station      136.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1834.000(Ft.)
Downstream point/station elevation =  1789.700(Ft.)
Pipe length  =   668.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    45.570(CFS)
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```
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    45.570(CFS)
Normal flow depth in pipe =   15.98(In.)
Flow top width inside pipe =   22.64(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.52(Ft/s)
Travel time through pipe =    0.54 min.
Time of concentration (TC) =    14.69 min.


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Process from Point/Station      136.000 to Point/Station       20.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     19.530(Ac.)
Runoff from this stream =     45.570(CFS)
Time of concentration =   14.69 min.
Rainfall intensity =     2.819(In/Hr)
Summary of stream data:

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


1      396.088     24.06            2.149
2       45.570     14.69            2.819
Largest stream flow has longer time of concentration
Qp =    396.088 + sum of
       Qb         Ia/Ib
       45.570 *    0.762 =     34.738
Qp =    430.826

Total of 2 main streams to confluence:
Flow rates before confluence point:
     396.088      45.570
Area of streams before confluence:
      213.670       19.530


Results of confluence:
Total flow rate =    430.826(CFS)
Time of concentration =    24.062 min.
Effective stream area after confluence  =    233.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1789.700(Ft.)
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Downstream point elevation =  1787.500(Ft.)
Channel length thru subarea  =   206.000(Ft.)
Channel base width    =   80.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    430.826(CFS)
Depth of flow =   1.221(Ft.), Average velocity =   4.281(Ft/s)
Channel flow top width =   84.883(Ft.)
Flow Velocity =    4.28(Ft/s)
Travel time  =    0.80 min.
Time of concentration =   24.86 min.

Sub-Channel No. 1 Critical depth =      0.953(Ft.)
  '     '       '     Critical flow top width =     83.813(Ft.)
  '     '       '     Critical flow velocity=    5.519(Ft/s)
  '     '       '     Critical flow area =     78.067(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    233.200(Ac.)
Runoff from this stream =    430.826(CFS)
Time of concentration =   24.86 min.
Rainfall intensity =     2.110(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      137.000 to Point/Station      138.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   140.000(Ft.)
Top (of initial area) elevation =  1840.800(Ft.)
Bottom (of initial area) elevation =  1839.400(Ft.)
Difference in elevation =     1.400(Ft.)
Slope =    0.01000  s(percent)=       1.00
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.072 min.
Rainfall intensity =      4.214(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.844
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
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```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.711(CFS)
Total initial stream area =        0.200(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      138.000 to Point/Station      139.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1840.000(Ft.)
End of street segment elevation =  1832.300(Ft.)
Length of street segment  =   361.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      4.161(CFS)
Depth of flow =   0.341(Ft.), Average velocity =   3.013(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.246(Ft.)
Flow velocity =   3.01(Ft/s)
Travel time =    2.00 min.     TC =    9.07  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.837
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.675(In/Hr) for a   100.0 year storm
Subarea runoff =      6.829(CFS) for      2.220(Ac.)
Total runoff =      7.540(CFS)   Total area =       2.420(Ac.)
Street flow at end of street =      7.540(CFS)
Half street flow at end of street =      7.540(CFS)
Depth of flow =   0.404(Ft.), Average velocity =   3.455(Ft/s)
Flow width (from curb towards crown)=  14.375(Ft.)


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Process from Point/Station      139.000 to Point/Station      140.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1832.300(Ft.)
Downstream point/station elevation =  1799.000(Ft.)
Pipe length  =   414.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.540(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.540(CFS)
Normal flow depth in pipe =    7.72(In.)
Flow top width inside pipe =   11.49(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.10(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =     9.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      139.000 to Point/Station      140.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.56 min.
Rainfall intensity =      3.571(In/Hr) for a   100.0 year storm
Subarea runoff =      9.962(CFS) for      3.340(Ac.)
Total runoff =     17.502(CFS)   Total area =       5.760(Ac.)


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Process from Point/Station      139.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.760(Ac.)
Runoff from this stream =     17.502(CFS)
Time of concentration =    9.56 min.
Rainfall intensity =     3.571(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      141.000 to Point/Station      142.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   130.000(Ft.)
Top (of initial area) elevation =  1860.700(Ft.)
```

```
Bottom (of initial area) elevation =  1859.400(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.01000  s(percent)=       1.00
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.865 min.
Rainfall intensity =      4.283(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.845
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.905(CFS)
Total initial stream area =        0.250(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      142.000 to Point/Station      143.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1857.000(Ft.)
End of street segment elevation =  1811.000(Ft.)
Length of street segment  =   538.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      7.270(CFS)
Depth of flow =   0.328(Ft.), Average velocity =   5.852(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.611(Ft.)
Flow velocity =   5.85(Ft/s)
Travel time =    1.53 min.     TC =    8.40  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.839
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.834(In/Hr) for a   100.0 year storm
Subarea runoff =     12.677(CFS) for      3.940(Ac.)
Total runoff =     13.581(CFS)   Total area =       4.190(Ac.)
Street flow at end of street =     13.581(CFS)
Half street flow at end of street =     13.581(CFS)
Depth of flow =   0.392(Ft.), Average velocity =   6.748(Ft/s)
Flow width (from curb towards crown)=  13.771(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      143.000 to Point/Station      140.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1811.000(Ft.)
Downstream point/station elevation =  1800.600(Ft.)
Pipe length  =   336.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.581(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    13.581(CFS)
Normal flow depth in pipe =   11.46(In.)
Flow top width inside pipe =   17.31(In.)
Critical Depth =   16.44(In.)
Pipe flow velocity =     11.43(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =     8.89 min.


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Process from Point/Station      143.000 to Point/Station      140.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      4.190(Ac.)
Runoff from this stream =     13.581(CFS)
Time of concentration =    8.89 min.
Rainfall intensity =     3.716(In/Hr)
Summary of stream data:

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


1       17.502      9.56                3.571
2       13.581      8.89                3.716
Largest stream flow has longer time of concentration
Qp =     17.502 + sum of
        Qb         Ia/Ib
        13.581 *    0.961 =     13.049
Qp =     30.551
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
      17.502      13.581
Area of streams before confluence:
        5.760        4.190
Results of confluence:
Total flow rate =     30.551(CFS)
Time of concentration =     9.558 min.
Effective stream area after confluence =      9.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      140.000 to Point/Station      144.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1797.500(Ft.)
Downstream point/station elevation =  1797.000(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.551(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    30.551(CFS)
Normal flow depth in pipe =   20.72(In.)
Flow top width inside pipe =   22.82(In.)
Critical Depth =   22.93(In.)
Pipe flow velocity =      9.33(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     9.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      144.100 to Point/Station      144.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.64 min.
Rainfall intensity =      3.554(In/Hr) for a   100.0 year storm
Subarea runoff =      9.290(CFS) for      3.130(Ac.)
Total runoff =     39.841(CFS)   Total area =      13.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      144.000 to Point/Station      144.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
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```
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     9.64 min.
Rainfall intensity =      3.554(In/Hr) for a   100.0 year storm
Subarea runoff =      6.302(CFS) for      2.230(Ac.)
Total runoff =     46.143(CFS)   Total area =      15.310(Ac.)


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Process from Point/Station      144.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1792.000(Ft.)
Downstream point/station elevation =  1791.600(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    46.143(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    46.143(CFS)
Normal flow depth in pipe =   23.16(In.)
Flow top width inside pipe =   30.20(In.)
Critical Depth =   26.99(In.)
Pipe flow velocity =     10.37(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.70 min.


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Process from Point/Station      144.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     15.310(Ac.)
Runoff from this stream =     46.143(CFS)
Time of concentration =    9.70 min.
Rainfall intensity =     3.542(In/Hr)
Summary of stream data:

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


1      430.826     24.86            2.110
2       46.143      9.70            3.542
Largest stream flow has longer time of concentration
Qp =    430.826 + sum of
        Qb         Ia/Ib
```

```
       46.143 *    0.596 =     27.492
Qp =    458.318

Total of 2 main streams to confluence:
Flow rates before confluence point:
     430.826      46.143
Area of streams before confluence:
      233.200       15.310


Results of confluence:
Total flow rate =    458.318(CFS)
Time of concentration =    24.864 min.
Effective stream area after confluence  =    248.510(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       24.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1787.500(Ft.)
Downstream point elevation =  1786.500(Ft.)
Channel length thru subarea  =   116.000(Ft.)
Channel base width    =   80.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    459.293(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    459.293(CFS)
Depth of flow =   1.352(Ft.), Average velocity =   4.108(Ft/s)
Channel flow top width =   85.408(Ft.)
Flow Velocity =    4.11(Ft/s)
Travel time  =    0.47 min.
Time of concentration =   25.33 min.

Sub-Channel No. 1 Critical depth =      1.000(Ft.)
  '     '       '     Critical flow top width =     84.000(Ft.)
  '     '       '     Critical flow velocity=    5.601(Ft/s)
  '     '       '     Critical flow area =     82.000(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.735
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.089(In/Hr) for a   100.0 year storm
Subarea runoff =      1.858(CFS) for      1.210(Ac.)
```

```
Total runoff =    460.176(CFS)   Total area =     249.720(Ac.)
Depth of flow =   1.354(Ft.), Average velocity =   4.111(Ft/s)

Sub-Channel No. 1 Critical depth =      1.000(Ft.)
  '     '       '     Critical flow top width =     84.000(Ft.)
  '     '       '     Critical flow velocity=    5.612(Ft/s)
  '     '       '     Critical flow area =     82.000(Sq.Ft)



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Process from Point/Station       24.000 to Point/Station      148.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1786.500(Ft.)
Downstream point/station elevation =  1784.900(Ft.)
Pipe length  =    82.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   460.176(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =   460.176(CFS)
Normal flow depth in pipe =   52.97(In.)
Flow top width inside pipe =   52.55(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.50(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    25.40 min.


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Process from Point/Station       24.000 to Point/Station      148.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    249.720(Ac.)
Runoff from this stream =    460.176(CFS)
Time of concentration =   25.40 min.
Rainfall intensity =     2.086(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      145.000 to Point/Station      146.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   672.000(Ft.)
Top (of initial area) elevation =  2068.000(Ft.)
Bottom (of initial area) elevation =  1843.500(Ft.)
Difference in elevation =   224.500(Ft.)
Slope =    0.33408  s(percent)=      33.41
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.952 min.
```

```
Rainfall intensity =      3.157(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.365(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      146.000 to Point/Station      147.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1843.500(Ft.)
Downstream point/station elevation =  1822.000(Ft.)
Pipe length  =   358.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.365(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.365(CFS)
Normal flow depth in pipe =    6.80(In.)
Flow top width inside pipe =   11.89(In.)
Critical Depth =   11.20(In.)
Pipe flow velocity =     11.68(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =    12.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      147.100 to Point/Station      147.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.807
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    12.46 min.
Rainfall intensity =      3.086(In/Hr) for a   100.0 year storm
Subarea runoff =     22.095(CFS) for      8.870(Ac.)
Total runoff =     27.460(CFS)   Total area =      10.970(Ac.)


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Process from Point/Station      147.000 to Point/Station      148.000
```

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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1822.000(Ft.)
Downstream point/station elevation =  1796.800(Ft.)
Pipe length  =   700.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.460(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    27.460(CFS)
Normal flow depth in pipe =   15.77(In.)
Flow top width inside pipe =   18.16(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.17(Ft/s)
Travel time through pipe =    0.82 min.
Time of concentration (TC) =    13.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station      148.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     10.970(Ac.)
Runoff from this stream =     27.460(CFS)
Time of concentration =   13.29 min.
Rainfall intensity =     2.979(In/Hr)
Summary of stream data:

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


1      460.176     25.40            2.086
2       27.460     13.29            2.979
Largest stream flow has longer time of concentration
Qp =    460.176 + sum of
       Qb         Ia/Ib
       27.460 *    0.700 =     19.229
Qp =    479.405

Total of 2 main streams to confluence:
Flow rates before confluence point:
     460.176      27.460
Area of streams before confluence:
      249.720       10.970


Results of confluence:
Total flow rate =    479.405(CFS)
Time of concentration =    25.395 min.
Effective stream area after confluence  =    260.690(Ac.)
```

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Process from Point/Station      148.000 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1783.000(Ft.)
Downstream point/station elevation =  1780.000(Ft.)
Pipe length  =   146.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   479.405(CFS)
Nearest computed pipe diameter  =     66.00(In.)
Calculated individual pipe flow  =   479.405(CFS)
Normal flow depth in pipe =   53.81(In.)
Flow top width inside pipe =   51.22(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.10(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    25.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       28.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1780.000(Ft.)
Downstream point elevation =  1733.500(Ft.)
Channel length thru subarea  =  1063.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    479.405(CFS)
Depth of flow =   3.015(Ft.), Average velocity =  11.323(Ft/s)
Channel flow top width =   23.088(Ft.)
Flow Velocity =   11.32(Ft/s)
Travel time  =    1.56 min.
Time of concentration =   27.07 min.

Sub-Channel No. 1 Critical depth =      3.625(Ft.)
  '     '       '     Critical flow top width =     26.750(Ft.)
  '     '       '     Critical flow velocity=    8.331(Ft/s)
  '     '       '     Critical flow area =     57.547(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       28.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    260.690(Ac.)
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```
Runoff from this stream =    479.405(CFS)
Time of concentration =   27.07 min.
Rainfall intensity =     2.014(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      149.000 to Point/Station      150.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   593.000(Ft.)
Top (of initial area) elevation =  2000.000(Ft.)
Bottom (of initial area) elevation =  1940.000(Ft.)
Difference in elevation =    60.000(Ft.)
Slope =    0.10118  s(percent)=      10.12
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.930 min.
Rainfall intensity =      3.957(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.841
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      2.728(CFS)
Total initial stream area =        0.820(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station      150.000 to Point/Station      151.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1940.000(Ft.)
Downstream point elevation =  1844.000(Ft.)
Channel length thru subarea  =   570.000(Ft.)
Channel base width    =   24.000(Ft.)
Slope or 'Z' of left channel bank =   0.100
Slope or 'Z' of right channel bank =   0.100
Estimated mean flow rate at midpoint of channel =      4.012(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      4.012(CFS)
Depth of flow =   0.041(Ft.), Average velocity =   4.042(Ft/s)
Channel flow top width =   24.008(Ft.)
Flow Velocity =    4.04(Ft/s)
Travel time  =    2.35 min.
Time of concentration =   10.28 min.

Sub-Channel No. 1 Critical depth =      0.096(Ft.)
```

```
  '     '       '     Critical flow top width =     24.019(Ft.)
  '     '       '     Critical flow velocity=    1.746(Ft/s)
  '     '       '     Critical flow area =      2.298(Sq.Ft)

 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.833
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.430(In/Hr) for a   100.0 year storm
Subarea runoff =      2.515(CFS) for      0.880(Ac.)
Total runoff =      5.243(CFS)   Total area =       1.700(Ac.)
Depth of flow =   0.049(Ft.), Average velocity =   4.498(Ft/s)

Sub-Channel No. 1 Critical depth =      0.113(Ft.)
  '     '       '     Critical flow top width =     24.023(Ft.)
  '     '       '     Critical flow velocity=    1.928(Ft/s)
  '     '       '     Critical flow area =      2.720(Sq.Ft)



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Process from Point/Station      151.000 to Point/Station      152.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1844.000(Ft.)
End of street segment elevation =  1823.000(Ft.)
Length of street segment  =   467.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =     11.451(CFS)
Depth of flow =   0.409(Ft.), Average velocity =   5.069(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.638(Ft.)
Flow velocity =   5.07(Ft/s)
Travel time =    1.54 min.     TC =   11.82  min.
 Adding area flow to street
```

```
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.177(In/Hr) for a   100.0 year storm
Subarea runoff =     12.348(CFS) for      4.690(Ac.)
Total runoff =     17.591(CFS)   Total area =       6.390(Ac.)
Street flow at end of street =     17.591(CFS)
Half street flow at end of street =     17.591(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   5.611(Ft/s)
Flow width (from curb towards crown)=  17.375(Ft.)


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Process from Point/Station      152.000 to Point/Station      153.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1823.000(Ft.)
Downstream point/station elevation =  1801.200(Ft.)
Pipe length  =   585.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.591(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    17.591(CFS)
Normal flow depth in pipe =   12.96(In.)
Flow top width inside pipe =   16.16(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.92(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =    12.57 min.


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Process from Point/Station      153.100 to Point/Station      153.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    12.57 min.
Rainfall intensity =      3.071(In/Hr) for a   100.0 year storm
Subarea runoff =      5.737(CFS) for      2.260(Ac.)
Total runoff =     23.328(CFS)   Total area =       8.650(Ac.)
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Process from Point/Station      153.000 to Point/Station      154.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1801.200(Ft.)
Downstream point/station elevation =  1790.500(Ft.)
Pipe length  =   556.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.328(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    23.328(CFS)
Normal flow depth in pipe =   15.42(In.)
Flow top width inside pipe =   23.00(In.)
Critical Depth =   20.59(In.)
Pipe flow velocity =     10.95(Ft/s)
Travel time through pipe =    0.85 min.
Time of concentration (TC) =    13.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      153.000 to Point/Station      154.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.824
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    13.42 min.
Rainfall intensity =      2.963(In/Hr) for a   100.0 year storm
Subarea runoff =      7.571(CFS) for      3.100(Ac.)
Total runoff =     30.899(CFS)   Total area =      11.750(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      154.000 to Point/Station      155.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1790.500(Ft.)
Downstream point/station elevation =  1779.500(Ft.)
Pipe length  =   493.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.899(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    30.899(CFS)
Normal flow depth in pipe =   18.05(In.)
Flow top width inside pipe =   20.73(In.)
Critical Depth =   22.51(In.)
Pipe flow velocity =     12.20(Ft/s)
Travel time through pipe =    0.67 min.
```

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Time of concentration (TC) =    14.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      155.100 to Point/Station      155.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.09 min.
Rainfall intensity =      2.884(In/Hr) for a   100.0 year storm
Subarea runoff =      2.800(CFS) for      1.180(Ac.)
Total runoff =     33.699(CFS)   Total area =      12.930(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      155.000 to Point/Station      156.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1779.500(Ft.)
Downstream point/station elevation =  1757.000(Ft.)
Pipe length  =    61.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.699(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    33.699(CFS)
Normal flow depth in pipe =   10.71(In.)
Flow top width inside pipe =   13.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     35.94(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    14.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      155.000 to Point/Station      156.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     12.930(Ac.)
Runoff from this stream =     33.699(CFS)
Time of concentration =   14.12 min.
Rainfall intensity =     2.881(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      157.000 to Point/Station      158.000
```

```
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   146.000(Ft.)
Top (of initial area) elevation =  1830.500(Ft.)
Bottom (of initial area) elevation =  1829.000(Ft.)
Difference in elevation =     1.500(Ft.)
Slope =    0.01027  s(percent)=       1.03
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.153 min.
Rainfall intensity =      4.188(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.844
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      2.473(CFS)
Total initial stream area =        0.700(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      158.000 to Point/Station      159.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1827.700(Ft.)
End of street segment elevation =  1777.500(Ft.)
Length of street segment  =  1417.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =     15.633(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   4.982(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.384(Ft.)
Flow velocity =   4.98(Ft/s)
Travel time =    4.74 min.     TC =   11.89  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.828
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.166(In/Hr) for a   100.0 year storm
Subarea runoff =     26.227(CFS) for     10.000(Ac.)
Total runoff =     28.700(CFS)   Total area =      10.700(Ac.)
Street flow at end of street =     28.700(CFS)
Half street flow at end of street =     28.700(CFS)
Depth of flow =   0.556(Ft.), Average velocity =   5.761(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    2.78(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      159.000 to Point/Station      156.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1772.000(Ft.)
Downstream point/station elevation =  1757.000(Ft.)
Pipe length  =    95.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.700(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    28.700(CFS)
Normal flow depth in pipe =   10.97(In.)
Flow top width inside pipe =   17.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.46(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    11.96 min.


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Process from Point/Station      159.000 to Point/Station      156.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     10.700(Ac.)
Runoff from this stream =     28.700(CFS)
Time of concentration =   11.96 min.
Rainfall intensity =     3.157(In/Hr)
Summary of stream data:

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


1       33.699     14.12                2.881
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```
2       28.700     11.96                 3.157
Largest stream flow has longer time of concentration
Qp =     33.699 + sum of
        Qb         Ia/Ib
        28.700 *    0.913 =     26.192
Qp =     59.891

Total of 2 streams to confluence:
Flow rates before confluence point:
      33.699      28.700
Area of streams before confluence:
       12.930       10.700
Results of confluence:
Total flow rate =     59.891(CFS)
Time of concentration =    14.119 min.
Effective stream area after confluence =     23.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      156.000 to Point/Station      156.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    14.12 min.
Rainfall intensity =      2.881(In/Hr) for a   100.0 year storm
Subarea runoff =      3.747(CFS) for      1.680(Ac.)
Total runoff =     63.637(CFS)   Total area =      25.310(Ac.)


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Process from Point/Station      156.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1752.000(Ft.)
Downstream point/station elevation =  1736.000(Ft.)
Pipe length  =    59.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    63.637(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    63.637(CFS)
Normal flow depth in pipe =   13.84(In.)
Flow top width inside pipe =   19.91(In.)
Critical depth could not be calculated.
Pipe flow velocity =     37.86(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    14.14 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      156.000 to Point/Station       28.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     25.310(Ac.)
Runoff from this stream =     63.637(CFS)
Time of concentration =   14.14 min.
Rainfall intensity =     2.878(In/Hr)
Summary of stream data:

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


1      479.405     27.07            2.014
2       63.637     14.14            2.878
Largest stream flow has longer time of concentration
Qp =    479.405 + sum of
        Qb         Ia/Ib
        63.637 *    0.700 =     44.536
Qp =    523.941

Total of 2 main streams to confluence:
Flow rates before confluence point:
     479.405      63.637
Area of streams before confluence:
      260.690       25.310


Results of confluence:
Total flow rate =    523.941(CFS)
Time of concentration =    27.065 min.
Effective stream area after confluence  =    286.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1733.500(Ft.)
Downstream point elevation =  1726.000(Ft.)
Channel length thru subarea  =   308.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    531.262(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
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```
Flow(q) thru subarea =    531.262(CFS)
Depth of flow =   3.598(Ft.), Average velocity =   9.348(Ft/s)
Channel flow top width =   26.590(Ft.)
Flow Velocity =    9.35(Ft/s)
Travel time  =    0.55 min.
Time of concentration =   27.61 min.

Sub-Channel No. 1 Critical depth =      3.813(Ft.)
  '     '       '     Critical flow top width =     27.875(Ft.)
  '     '       '     Critical flow velocity=    8.477(Ft/s)
  '     '       '     Critical flow area =     62.668(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.764
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.992(In/Hr) for a   100.0 year storm
Subarea runoff =     14.551(CFS) for      9.560(Ac.)
Total runoff =    538.492(CFS)   Total area =     295.560(Ac.)
Depth of flow =   3.620(Ft.), Average velocity =   9.380(Ft/s)

Sub-Channel No. 1 Critical depth =      3.813(Ft.)
  '     '       '     Critical flow top width =     27.875(Ft.)
  '     '       '     Critical flow velocity=    8.593(Ft/s)
  '     '       '     Critical flow area =     62.668(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    295.560(Ac.)
Runoff from this stream =    538.492(CFS)
Time of concentration =   27.61 min.
Rainfall intensity =     1.992(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      161.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   842.000(Ft.)
Top (of initial area) elevation =  1996.200(Ft.)
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```
Bottom (of initial area) elevation =  1860.000(Ft.)
Difference in elevation =   136.200(Ft.)
Slope =    0.16176  s(percent)=      16.18
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.122 min.
Rainfall intensity =      2.774(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.798
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     12.442(CFS)
Total initial stream area =        5.620(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      161.000 to Point/Station      162.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1860.000(Ft.)
Downstream point elevation =  1764.000(Ft.)
Channel length thru subarea  =  1230.000(Ft.)
Channel base width    =    1.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     34.507(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     34.507(CFS)
Depth of flow =   0.875(Ft.), Average velocity =  14.333(Ft/s)
Channel flow top width =    4.501(Ft.)
Flow Velocity =   14.33(Ft/s)
Travel time  =    1.43 min.
Time of concentration =   16.55 min.

Sub-Channel No. 1 Critical depth =      1.547(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    6.018(Ft/s)
  '     '       '     Critical flow area =      5.734(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.793
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
```

```
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.640(In/Hr) for a   100.0 year storm
Subarea runoff =     44.047(CFS) for     21.030(Ac.)
Total runoff =     56.490(CFS)   Total area =      26.650(Ac.)
Depth of flow =   1.076(Ft.), Average velocity =  16.722(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      1.984(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    7.131(Ft/s)
  '     '       '     Critical flow area =      7.922(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1764.000(Ft.)
Downstream point/station elevation =  1732.000(Ft.)
Pipe length  =   541.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.490(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    56.490(CFS)
Normal flow depth in pipe =   20.30(In.)
Flow top width inside pipe =   17.34(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.93(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    17.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     26.650(Ac.)
Runoff from this stream =     56.490(CFS)
Time of concentration =   17.00 min.
Rainfall intensity =     2.601(In/Hr)
Summary of stream data:

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


1      538.492     27.61            1.992
2       56.490     17.00            2.601
Largest stream flow has longer time of concentration
```

```
Qp =    538.492 + sum of
        Qb          Ia/Ib
        56.490 *    0.766 =     43.267
Qp =    581.759

Total of 2 main streams to confluence:
Flow rates before confluence point:
     538.492      56.490
Area of streams before confluence:
      295.560       26.650


Results of confluence:
Total flow rate =    581.759(CFS)
Time of concentration =    27.614 min.
Effective stream area after confluence  =    322.210(Ac.)


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Process from Point/Station       30.000 to Point/Station       32.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1726.000(Ft.)
Downstream point elevation =  1677.000(Ft.)
Channel length thru subarea  =  1217.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    588.781(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    588.781(CFS)
Depth of flow =   3.368(Ft.), Average velocity =  11.572(Ft/s)
Channel flow top width =   25.210(Ft.)
Flow Velocity =   11.57(Ft/s)
Travel time  =    1.75 min.
Time of concentration =   29.37 min.

Sub-Channel No. 1 Critical depth =      4.000(Ft.)
  '     '       '     Critical flow top width =     29.000(Ft.)
  '     '       '     Critical flow velocity=    8.659(Ft/s)
  '     '       '     Critical flow area =     68.000(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.760
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
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```
Rainfall intensity =      1.926(In/Hr) for a   100.0 year storm
Subarea runoff =     13.994(CFS) for      9.560(Ac.)
Total runoff =    595.753(CFS)   Total area =     331.770(Ac.)
Depth of flow =   3.386(Ft.), Average velocity =  11.607(Ft/s)

Sub-Channel No. 1 Critical depth =      4.000(Ft.)
  '     '       '     Critical flow top width =     29.000(Ft.)
  '     '       '     Critical flow velocity=    8.761(Ft/s)
  '     '       '     Critical flow area =     68.000(Sq.Ft)



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Process from Point/Station       30.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    331.770(Ac.)
Runoff from this stream =    595.753(CFS)
Time of concentration =   29.37 min.
Rainfall intensity =     1.926(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       36.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   524.000(Ft.)
Top (of initial area) elevation =  2034.000(Ft.)
Bottom (of initial area) elevation =  1848.000(Ft.)
Difference in elevation =   186.000(Ft.)
Slope =    0.35496  s(percent)=      35.50
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.689 min.
Rainfall intensity =      3.357(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     13.256(CFS)
Total initial stream area =        4.850(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       36.000 to Point/Station       38.000
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**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1848.000(Ft.)
Downstream point elevation =  1746.000(Ft.)
Channel length thru subarea  =   889.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     34.267(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     34.267(CFS)
Depth of flow =   0.782(Ft.), Average velocity =   8.200(Ft/s)
Channel flow top width =    7.691(Ft.)
Flow Velocity =    8.20(Ft/s)
Travel time  =    1.81 min.
Time of concentration =   12.50 min.

Sub-Channel No. 1 Critical depth =      1.109(Ft.)
  '     '       '     Critical flow top width =      9.656(Ft.)
  '     '       '     Critical flow velocity=    4.881(Ft/s)
  '     '       '     Critical flow area =      7.020(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.807
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.081(In/Hr) for a   100.0 year storm
Subarea runoff =     41.953(CFS) for     16.870(Ac.)
Total runoff =     55.209(CFS)   Total area =      21.720(Ac.)
Depth of flow =   0.991(Ft.), Average velocity =   9.331(Ft/s)

Sub-Channel No. 1 Critical depth =      1.422(Ft.)
  '     '       '     Critical flow top width =     11.531(Ft.)
  '     '       '     Critical flow velocity=    5.344(Ft/s)
  '     '       '     Critical flow area =     10.331(Sq.Ft)



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Process from Point/Station       38.000 to Point/Station       40.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1746.000(Ft.)
Downstream point/station elevation =  1740.000(Ft.)
Pipe length  =    72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.209(CFS)
```

```
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    55.209(CFS)
Normal flow depth in pipe =   16.92(In.)
Flow top width inside pipe =   21.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.31(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    12.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       32.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1740.000(Ft.)
Downstream point elevation =  1677.000(Ft.)
Channel length thru subarea  =   675.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     55.209(CFS)
Depth of flow =   1.042(Ft.), Average velocity =   8.651(Ft/s)
Channel flow top width =    9.251(Ft.)
Flow Velocity =    8.65(Ft/s)
Travel time  =    1.30 min.
Time of concentration =   13.85 min.

Sub-Channel No. 1 Critical depth =      1.422(Ft.)
  '     '       '     Critical flow top width =     11.531(Ft.)
  '     '       '     Critical flow velocity=    5.344(Ft/s)
  '     '       '     Critical flow area =     10.331(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     21.720(Ac.)
Runoff from this stream =     55.209(CFS)
Time of concentration =   13.85 min.
Rainfall intensity =     2.912(In/Hr)
Summary of stream data:

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

```
1      595.753     29.37            1.926
2       55.209     13.85            2.912
Largest stream flow has longer time of concentration
Qp =    595.753 + sum of
        Qb         Ia/Ib
        55.209 *    0.661 =     36.513
Qp =    632.266

Total of 2 main streams to confluence:
Flow rates before confluence point:
     595.753      55.209
Area of streams before confluence:
      331.770       21.720


Results of confluence:
Total flow rate =    632.266(CFS)
Time of concentration =    29.367 min.
Effective stream area after confluence  =    353.490(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       42.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1677.000(Ft.)
Downstream point elevation =  1618.000(Ft.)
Channel length thru subarea  =  1080.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    638.727(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    638.727(CFS)
Depth of flow =   3.263(Ft.), Average velocity =  13.237(Ft/s)
Channel flow top width =   24.577(Ft.)
Flow Velocity =   13.24(Ft/s)
Travel time  =    1.36 min.
Time of concentration =   30.73 min.

Sub-Channel No. 1 Critical depth =      4.156(Ft.)
  '     '       '     Critical flow top width =     29.938(Ft.)
  '     '       '     Critical flow velocity=    8.797(Ft/s)
  '     '       '     Critical flow area =     72.604(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.757
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
```

```
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.878(In/Hr) for a   100.0 year storm
Subarea runoff =     12.871(CFS) for      9.050(Ac.)
Total runoff =    645.137(CFS)   Total area =     362.540(Ac.)
Depth of flow =   3.277(Ft.), Average velocity =  13.271(Ft/s)

Sub-Channel No. 1 Critical depth =      4.156(Ft.)
  '     '       '     Critical flow top width =     29.938(Ft.)
  '     '       '     Critical flow velocity=    8.886(Ft/s)
  '     '       '     Critical flow area =     72.604(Sq.Ft)



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Process from Point/Station       32.000 to Point/Station       42.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    362.540(Ac.)
Runoff from this stream =    645.137(CFS)
Time of concentration =   30.73 min.
Rainfall intensity =     1.878(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      163.000 to Point/Station      164.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   745.000(Ft.)
Top (of initial area) elevation =  1993.000(Ft.)
Bottom (of initial area) elevation =  1728.000(Ft.)
Difference in elevation =   265.000(Ft.)
Slope =    0.35570  s(percent)=      35.57
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.300 min.
Rainfall intensity =      3.108(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     12.429(CFS)
Total initial stream area =        4.950(Ac.)
Pervious area fraction = 1.000
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      164.000 to Point/Station      165.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1728.000(Ft.)
Downstream point elevation =  1651.000(Ft.)
Channel length thru subarea  =   942.000(Ft.)
Channel base width    =    1.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     20.396(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     20.396(CFS)
Depth of flow =   0.679(Ft.), Average velocity =  12.741(Ft/s)
Channel flow top width =    3.716(Ft.)
Flow Velocity =   12.74(Ft/s)
Travel time  =    1.23 min.
Time of concentration =   13.53 min.

Sub-Channel No. 1 Critical depth =      1.203(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    5.079(Ft/s)
  '     '       '     Critical flow area =      4.016(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.803
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.949(In/Hr) for a   100.0 year storm
Subarea runoff =     15.875(CFS) for      6.700(Ac.)
Total runoff =     28.303(CFS)   Total area =      11.650(Ac.)
Depth of flow =   0.791(Ft.), Average velocity =  13.861(Ft/s)

Sub-Channel No. 1 Critical depth =      1.398(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    5.670(Ft/s)
  '     '       '     Critical flow area =      4.992(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      165.000 to Point/Station      166.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1651.000(Ft.)
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Downstream point/station elevation =  1636.000(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.303(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    28.303(CFS)
Normal flow depth in pipe =   11.77(In.)
Flow top width inside pipe =   17.13(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.14(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    13.62 min.


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Process from Point/Station      166.000 to Point/Station      166.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.803
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    13.62 min.
Rainfall intensity =      2.939(In/Hr) for a   100.0 year storm
Subarea runoff =      1.699(CFS) for      0.720(Ac.)
Total runoff =     30.003(CFS)   Total area =      12.370(Ac.)


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Process from Point/Station      166.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1629.500(Ft.)
Downstream point/station elevation =  1622.000(Ft.)
Pipe length  =   172.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.003(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    30.003(CFS)
Normal flow depth in pipe =   15.68(In.)
Flow top width inside pipe =   18.27(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.58(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    13.80 min.


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Process from Point/Station      166.000 to Point/Station       42.000
**** CONFLUENCE OF MAIN STREAMS ****
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```
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.370(Ac.)
Runoff from this stream =     30.003(CFS)
Time of concentration =   13.80 min.
Rainfall intensity =     2.917(In/Hr)
Summary of stream data:

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


1      645.137     30.73            1.878
2       30.003     13.80            2.917
Largest stream flow has longer time of concentration
Qp =    645.137 + sum of
        Qb         Ia/Ib
        30.003 *    0.644 =     19.320
Qp =    664.457

Total of 2 main streams to confluence:
Flow rates before confluence point:
     645.137      30.003
Area of streams before confluence:
      362.540       12.370


Results of confluence:
Total flow rate =    664.457(CFS)
Time of concentration =    30.727 min.
Effective stream area after confluence  =    374.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       44.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1618.000(Ft.)
Downstream point elevation =  1598.000(Ft.)
Channel length thru subarea  =   883.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    664.457(CFS)
Depth of flow =   4.034(Ft.), Average velocity =   9.631(Ft/s)
Channel flow top width =   29.204(Ft.)
Flow Velocity =    9.63(Ft/s)
Travel time  =    1.53 min.
Time of concentration =   32.25 min.
```

```
Sub-Channel No. 1 Critical depth =      4.219(Ft.)
  '     '       '     Critical flow top width =     30.313(Ft.)
  '     '       '     Critical flow velocity=    8.920(Ft/s)
  '     '       '     Critical flow area =     74.487(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       44.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    374.910(Ac.)
Runoff from this stream =    664.457(CFS)
Time of concentration =   32.25 min.
Rainfall intensity =     1.829(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      167.000 to Point/Station      168.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   214.000(Ft.)
Top (of initial area) elevation =  2127.000(Ft.)
Bottom (of initial area) elevation =  2046.000(Ft.)
Difference in elevation =    81.000(Ft.)
Slope =    0.37850  s(percent)=      37.85
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.376 min.
Rainfall intensity =      4.117(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.013(CFS)
Total initial stream area =        0.590(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      169.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  2046.000(Ft.)
Downstream point elevation =  1847.000(Ft.)
```

```
Channel length thru subarea  =   632.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      8.076(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =      8.076(CFS)
Depth of flow =   0.269(Ft.), Average velocity =   7.367(Ft/s)
Channel flow top width =    5.152(Ft.)
Flow Velocity =    7.37(Ft/s)
Travel time  =    1.43 min.
Time of concentration =    8.81 min.

Sub-Channel No. 1 Critical depth =      0.484(Ft.)
  '     '       '     Critical flow top width =      6.875(Ft.)
  '     '       '     Critical flow velocity=    3.377(Ft/s)
  '     '       '     Critical flow area =      2.392(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.735(In/Hr) for a   100.0 year storm
Subarea runoff =     12.036(CFS) for      3.920(Ac.)
Total runoff =     14.049(CFS)   Total area =       4.510(Ac.)
Depth of flow =   0.363(Ft.), Average velocity =   8.698(Ft/s)

Sub-Channel No. 1 Critical depth =      0.656(Ft.)
  '     '       '     Critical flow top width =      8.250(Ft.)
  '     '       '     Critical flow velocity=    3.806(Ft/s)
  '     '       '     Critical flow area =      3.691(Sq.Ft)



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Process from Point/Station      169.000 to Point/Station      170.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1847.000(Ft.)
Downstream point/station elevation =  1816.000(Ft.)
Pipe length  =   192.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.049(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    14.049(CFS)
Normal flow depth in pipe =    9.63(In.)
Flow top width inside pipe =    9.55(In.)
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Critical depth could not be calculated.
Pipe flow velocity =     20.78(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     8.96 min.


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Process from Point/Station      170.100 to Point/Station      170.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     8.96 min.
Rainfall intensity =      3.700(In/Hr) for a   100.0 year storm
Subarea runoff =     13.066(CFS) for      4.300(Ac.)
Total runoff =     27.115(CFS)   Total area =       8.810(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      171.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1816.000(Ft.)
Downstream point/station elevation =  1786.000(Ft.)
Pipe length  =   369.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.115(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    27.115(CFS)
Normal flow depth in pipe =   13.41(In.)
Flow top width inside pipe =   15.70(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.19(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     9.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      171.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.836
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.28 min.
Rainfall intensity =      3.629(In/Hr) for a   100.0 year storm
Subarea runoff =     10.500(CFS) for      3.460(Ac.)
Total runoff =     37.615(CFS)   Total area =      12.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      171.000 to Point/Station      172.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1786.000(Ft.)
Downstream point/station elevation =  1756.000(Ft.)
Pipe length  =   378.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.615(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    37.615(CFS)
Normal flow depth in pipe =   14.77(In.)
Flow top width inside pipe =   19.19(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.80(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     9.58 min.


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Process from Point/Station      172.100 to Point/Station      172.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     9.58 min.
Rainfall intensity =      3.565(In/Hr) for a   100.0 year storm
Subarea runoff =     20.256(CFS) for      6.940(Ac.)
Total runoff =     57.870(CFS)   Total area =      19.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      172.000 to Point/Station      173.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1756.000(Ft.)
Downstream point/station elevation =  1726.000(Ft.)
Pipe length  =   351.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    57.870(CFS)
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Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    57.870(CFS)
Normal flow depth in pipe =   17.39(In.)
Flow top width inside pipe =   21.44(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.73(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     9.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      172.000 to Point/Station      173.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.83 min.
Rainfall intensity =      3.516(In/Hr) for a   100.0 year storm
Subarea runoff =      8.421(CFS) for      2.870(Ac.)
Total runoff =     66.291(CFS)   Total area =      22.080(Ac.)


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Process from Point/Station      173.000 to Point/Station      174.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1726.000(Ft.)
Downstream point/station elevation =  1656.000(Ft.)
Pipe length  =   880.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.291(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    66.291(CFS)
Normal flow depth in pipe =   20.63(In.)
Flow top width inside pipe =   16.69(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.07(Ft/s)
Travel time through pipe =    0.64 min.
Time of concentration (TC) =    10.47 min.


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Process from Point/Station      173.000 to Point/Station      174.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.833
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```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.47 min.
Rainfall intensity =      3.397(In/Hr) for a   100.0 year storm
Subarea runoff =     15.327(CFS) for      5.420(Ac.)
Total runoff =     81.618(CFS)   Total area =      27.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      174.000 to Point/Station      175.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1656.000(Ft.)
Downstream point/station elevation =  1641.000(Ft.)
Pipe length  =   343.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    81.618(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    81.618(CFS)
Normal flow depth in pipe =   23.39(In.)
Flow top width inside pipe =   24.87(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.89(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    10.75 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      174.000 to Point/Station      175.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.75 min.
Rainfall intensity =      3.347(In/Hr) for a   100.0 year storm
Subarea runoff =      4.815(CFS) for      1.730(Ac.)
Total runoff =     86.433(CFS)   Total area =      29.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station      176.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
```

```
Upstream point/station elevation =  1636.000(Ft.)
Downstream point/station elevation =  1617.000(Ft.)
Pipe length  =   105.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    86.433(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    86.433(CFS)
Normal flow depth in pipe =   17.77(In.)
Flow top width inside pipe =   21.05(In.)
Critical depth could not be calculated.
Pipe flow velocity =     34.66(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    10.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      176.000 to Point/Station      176.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.80 min.
Rainfall intensity =      3.338(In/Hr) for a   100.0 year storm
Subarea runoff =      4.557(CFS) for      1.730(Ac.)
Total runoff =     90.991(CFS)   Total area =      30.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      175.000 to Point/Station      176.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     30.960(Ac.)
Runoff from this stream =     90.991(CFS)
Time of concentration =   10.80 min.
Rainfall intensity =     3.338(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      177.000 to Point/Station      178.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   110.000(Ft.)
Top (of initial area) elevation =  1837.500(Ft.)
Bottom (of initial area) elevation =  1836.400(Ft.)
Difference in elevation =     1.100(Ft.)
Slope =    0.01000  s(percent)=       1.00
```

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.421 min.
Rainfall intensity =      4.444(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.847
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.790(CFS)
Total initial stream area =        0.210(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      178.000 to Point/Station      179.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1836.000(Ft.)
End of street segment elevation =  1770.000(Ft.)
Length of street segment  =  1126.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      8.957(CFS)
Depth of flow =   0.367(Ft.), Average velocity =   5.301(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.544(Ft.)
Flow velocity =   5.30(Ft/s)
Travel time =    3.54 min.     TC =    9.96  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.490(In/Hr) for a   100.0 year storm
```

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Subarea runoff =     16.244(CFS) for      5.580(Ac.)
Total runoff =     17.034(CFS)   Total area =       5.790(Ac.)
Street flow at end of street =     17.034(CFS)
Half street flow at end of street =     17.034(CFS)
Depth of flow =   0.442(Ft.), Average velocity =   6.160(Ft/s)
Flow width (from curb towards crown)=  16.276(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      179.000 to Point/Station      180.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1770.000(Ft.)
Downstream point/station elevation =  1769.400(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.034(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    17.034(CFS)
Normal flow depth in pipe =   15.38(In.)
Flow top width inside pipe =   23.03(In.)
Critical Depth =   17.85(In.)
Pipe flow velocity =      8.02(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    10.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.100 to Point/Station      180.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.08 min.
Rainfall intensity =      3.467(In/Hr) for a   100.0 year storm
Subarea runoff =      8.643(CFS) for      2.990(Ac.)
Total runoff =     25.677(CFS)   Total area =       8.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      180.000 to Point/Station      181.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1769.400(Ft.)
Downstream point/station elevation =  1768.900(Ft.)
Pipe length  =    49.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.677(CFS)
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Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    25.677(CFS)
Normal flow depth in pipe =   18.61(In.)
Flow top width inside pipe =   24.99(In.)
Critical Depth =   21.24(In.)
Pipe flow velocity =      8.78(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    10.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.100 to Point/Station      181.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.833
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.18 min.
Rainfall intensity =      3.450(In/Hr) for a   100.0 year storm
Subarea runoff =     10.063(CFS) for      3.500(Ac.)
Total runoff =     35.739(CFS)   Total area =      12.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      181.000 to Point/Station      182.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1768.900(Ft.)
Downstream point/station elevation =  1729.000(Ft.)
Pipe length  =   454.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.739(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    35.739(CFS)
Normal flow depth in pipe =   13.71(In.)
Flow top width inside pipe =   19.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.50(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    10.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.100 to Point/Station      182.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.791
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.53 min.
Rainfall intensity =      3.386(In/Hr) for a   100.0 year storm
Subarea runoff =      5.273(CFS) for      1.970(Ac.)
Total runoff =     41.013(CFS)   Total area =      14.250(Ac.)


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Process from Point/Station      182.000 to Point/Station      183.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1729.000(Ft.)
Downstream point/station elevation =  1726.000(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    41.013(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    41.013(CFS)
Normal flow depth in pipe =   16.20(In.)
Flow top width inside pipe =   22.49(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.18(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    10.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      182.000 to Point/Station      183.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.58 min.
Rainfall intensity =      3.376(In/Hr) for a   100.0 year storm
Subarea runoff =      6.294(CFS) for      2.240(Ac.)
Total runoff =     47.306(CFS)   Total area =      16.490(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      183.000 to Point/Station      184.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
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Upstream point/station elevation =  1726.000(Ft.)
Downstream point/station elevation =  1708.000(Ft.)
Pipe length  =   309.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.306(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    47.306(CFS)
Normal flow depth in pipe =   17.25(In.)
Flow top width inside pipe =   21.58(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.57(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =    10.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.100 to Point/Station      184.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.831
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.84 min.
Rainfall intensity =      3.331(In/Hr) for a   100.0 year storm
Subarea runoff =      7.782(CFS) for      2.810(Ac.)
Total runoff =     55.089(CFS)   Total area =      19.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      185.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1708.000(Ft.)
Downstream point/station elevation =  1678.000(Ft.)
Pipe length  =   445.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.089(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    55.089(CFS)
Normal flow depth in pipe =   18.47(In.)
Flow top width inside pipe =   20.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.26(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    11.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      184.000 to Point/Station      185.000
```

```
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.19 min.
Rainfall intensity =      3.274(In/Hr) for a   100.0 year storm
Subarea runoff =      5.681(CFS) for      2.090(Ac.)
Total runoff =     60.770(CFS)   Total area =      21.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      186.000 to Point/Station      185.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.812
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    11.19 min.
Rainfall intensity =      3.274(In/Hr) for a   100.0 year storm
Subarea runoff =      5.290(CFS) for      1.990(Ac.)
Total runoff =     66.060(CFS)   Total area =      23.380(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      185.000 to Point/Station      187.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1678.000(Ft.)
Downstream point/station elevation =  1664.000(Ft.)
Pipe length  =   233.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.060(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    66.060(CFS)
Normal flow depth in pipe =   19.48(In.)
Flow top width inside pipe =   24.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.51(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    11.37 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      187.100 to Point/Station      187.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.37 min.
Rainfall intensity =      3.245(In/Hr) for a   100.0 year storm
Subarea runoff =      6.517(CFS) for      2.420(Ac.)
Total runoff =     72.577(CFS)   Total area =      25.800(Ac.)


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Process from Point/Station      187.000 to Point/Station      188.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1664.000(Ft.)
Downstream point/station elevation =  1643.000(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    72.577(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    72.577(CFS)
Normal flow depth in pipe =   22.36(In.)
Flow top width inside pipe =   26.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.49(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =    11.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      187.000 to Point/Station      188.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    11.87 min.
Rainfall intensity =      3.170(In/Hr) for a   100.0 year storm
Subarea runoff =      5.593(CFS) for      2.130(Ac.)
Total runoff =     78.170(CFS)   Total area =      27.930(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      188.000 to Point/Station      176.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1643.000(Ft.)
Downstream point/station elevation =  1617.000(Ft.)
Pipe length  =   475.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    78.170(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    78.170(CFS)
Normal flow depth in pipe =   20.58(In.)
Flow top width inside pipe =   27.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.79(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =    12.23 min.


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Process from Point/Station      188.000 to Point/Station      176.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     27.930(Ac.)
Runoff from this stream =     78.170(CFS)
Time of concentration =   12.23 min.
Rainfall intensity =     3.117(In/Hr)
Summary of stream data:

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


1       90.991     10.80                 3.338
2       78.170     12.23                 3.117
Largest stream flow has longer or shorter time of concentration
Qp =     90.991 + sum of
        Qa          Tb/Ta
        78.170 *    0.883 =     69.038
Qp =    160.029

Total of 2 streams to confluence:
Flow rates before confluence point:
      90.991      78.170
Area of streams before confluence:
       30.960       27.930
Results of confluence:
Total flow rate =    160.029(CFS)
Time of concentration =    10.803 min.
Effective stream area after confluence =     58.890(Ac.)
```

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Process from Point/Station      176.000 to Point/Station      189.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1617.000(Ft.)
Downstream point/station elevation =  1616.700(Ft.)
Pipe length  =    27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   160.029(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   160.029(CFS)
Normal flow depth in pipe =   42.38(In.)
Flow top width inside pipe =   30.88(In.)
Critical Depth =   43.99(In.)
Pipe flow velocity =     13.62(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    10.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      176.000 to Point/Station      189.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.831
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.84 min.
Rainfall intensity =      3.332(In/Hr) for a   100.0 year storm
Subarea runoff =      7.342(CFS) for      2.650(Ac.)
Total runoff =    167.371(CFS)   Total area =      61.540(Ac.)


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Process from Point/Station      189.000 to Point/Station      190.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1616.700(Ft.)
Downstream point/station elevation =  1607.000(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   167.371(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =   167.371(CFS)
Normal flow depth in pipe =   25.36(In.)
Flow top width inside pipe =   27.84(In.)
Critical depth could not be calculated.
Pipe flow velocity =     34.19(Ft/s)
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Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.88 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      190.000 to Point/Station      191.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1607.000(Ft.)
Downstream point elevation =  1604.500(Ft.)
Channel length thru subarea  =   487.000(Ft.)
Channel base width    =   70.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    169.666(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =    169.666(CFS)
Depth of flow =   0.942(Ft.), Average velocity =   2.505(Ft/s)
Channel flow top width =   73.769(Ft.)
Flow Velocity =    2.50(Ft/s)
Travel time  =    3.24 min.
Time of concentration =   14.12 min.

Sub-Channel No. 1 Critical depth =      0.563(Ft.)
  '     '       '     Critical flow top width =     72.250(Ft.)
  '     '       '     Critical flow velocity=    4.241(Ft/s)
  '     '       '     Critical flow area =     40.008(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.881(In/Hr) for a   100.0 year storm
Subarea runoff =      4.527(CFS) for      2.030(Ac.)
Total runoff =    171.898(CFS)   Total area =      63.570(Ac.)
Depth of flow =   0.950(Ft.), Average velocity =   2.517(Ft/s)

Sub-Channel No. 1 Critical depth =      0.570(Ft.)
  '     '       '     Critical flow top width =     72.281(Ft.)
  '     '       '     Critical flow velocity=    4.237(Ft/s)
  '     '       '     Critical flow area =     40.572(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      191.000 to Point/Station       44.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1602.000(Ft.)
Downstream point/station elevation =  1598.000(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   171.898(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =   171.898(CFS)
Normal flow depth in pipe =   25.97(In.)
Flow top width inside pipe =   27.03(In.)
Critical depth could not be calculated.
Pipe flow velocity =     34.28(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    14.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      191.000 to Point/Station       44.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     63.570(Ac.)
Runoff from this stream =    171.898(CFS)
Time of concentration =   14.14 min.
Rainfall intensity =     2.879(In/Hr)
Summary of stream data:

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


1      664.457     32.25            1.829
2      171.898     14.14            2.879
Largest stream flow has longer time of concentration
Qp =    664.457 + sum of
       Qb         Ia/Ib
      171.898 *    0.635 =    109.198
Qp =    773.654

Total of 2 main streams to confluence:
Flow rates before confluence point:
     664.457     171.898
Area of streams before confluence:
      374.910       63.570


Results of confluence:
Total flow rate =    773.654(CFS)
Time of concentration =    32.255 min.
Effective stream area after confluence  =    438.480(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       44.000 to Point/Station       46.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1598.000(Ft.)
Downstream point elevation =  1592.000(Ft.)
Channel length thru subarea  =   423.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    777.577(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    777.577(CFS)
Depth of flow =   4.779(Ft.), Average velocity =   8.416(Ft/s)
Channel flow top width =   33.671(Ft.)
Flow Velocity =    8.42(Ft/s)
Travel time  =    0.84 min.
Time of concentration =   33.09 min.

Sub-Channel No. 1 Critical depth =      4.563(Ft.)
  '     '       '     Critical flow top width =     32.375(Ft.)
  '     '       '     Critical flow velocity=    9.120(Ft/s)
  '     '       '     Critical flow area =     85.262(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.752
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.803(In/Hr) for a   100.0 year storm
Subarea runoff =      7.772(CFS) for      5.730(Ac.)
Total runoff =    781.427(CFS)   Total area =     444.210(Ac.)
Depth of flow =   4.789(Ft.), Average velocity =   8.426(Ft/s)

Sub-Channel No. 1 Critical depth =      4.563(Ft.)
  '     '       '     Critical flow top width =     32.375(Ft.)
  '     '       '     Critical flow velocity=    9.165(Ft/s)
  '     '       '     Critical flow area =     85.262(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       46.000 to Point/Station       48.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1592.000(Ft.)
```

```
Downstream point/station elevation =  1591.400(Ft.)
Pipe length  =    56.00(Ft.)   Manning's N = 0.013
No. of pipes = 3  Required pipe flow  =   781.427(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   260.476(CFS)
Normal flow depth in pipe =   47.44(In.)
Flow top width inside pipe =   48.82(In.)
Critical Depth =   53.86(In.)
Pipe flow velocity =     15.64(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    33.15 min.
End of computations, total study area =          444.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.883
Area averaged RI index number =  76.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 11/21/17 File:pr200.out

Tentative Tract 35853
Proposed Conditions
Major Basin 200
100-Year Flow Rate

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

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

Program License Serial Number 4028

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(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 = 0.5500

++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 570.000(Ft.)
Top (of initial area) elevation = 2035.000(Ft.)
Bottom (of initial area) elevation = 1812.000(Ft.)
Difference in elevation = 223.000(Ft.)
Slope = 0.39123 s(percent)= 39.12
TC = k(0.710)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   10.842 min.
Rainfall intensity =      3.331(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.813
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.894(CFS)
Total initial stream area =        4.020(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1812.000(Ft.)
Downstream point elevation =  1684.000(Ft.)
Channel length thru subarea  =   933.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     26.545(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     26.545(CFS)
Depth of flow =   0.656(Ft.), Average velocity =   8.149(Ft/s)
Channel flow top width =    6.935(Ft.)
Flow Velocity =    8.15(Ft/s)
Travel time  =    1.91 min.
Time of concentration =   12.75 min.

Sub-Channel No. 1 Critical depth =      0.977(Ft.)
  '     '       '     Critical flow top width =      8.859(Ft.)
  '     '       '     Critical flow velocity=    4.584(Ft/s)
  '     '       '     Critical flow area =      5.791(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.047(In/Hr) for a   100.0 year storm
Subarea runoff =     31.248(CFS) for     12.720(Ac.)
Total runoff =     42.142(CFS)   Total area =      16.740(Ac.)
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Depth of flow =   0.829(Ft.), Average velocity =   9.259(Ft/s)

Sub-Channel No. 1 Critical depth =      1.234(Ft.)
  '     '       '     Critical flow top width =     10.406(Ft.)
  '     '       '     Critical flow velocity=    5.093(Ft/s)
  '     '       '     Critical flow area =      8.274(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1684.000(Ft.)
Downstream point/station elevation =  1681.000(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.142(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    42.142(CFS)
Normal flow depth in pipe =   15.87(In.)
Flow top width inside pipe =   22.72(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.10(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    12.80 min.


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Process from Point/Station      202.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    12.80 min.
Rainfall intensity =      3.041(In/Hr) for a   100.0 year storm
Subarea runoff =      6.556(CFS) for      2.610(Ac.)
Total runoff =     48.698(CFS)   Total area =      19.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1681.000(Ft.)
Downstream point/station elevation =  1672.000(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =    48.698(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    48.698(CFS)
Normal flow depth in pipe =   16.03(In.)
Flow top width inside pipe =   22.61(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.84(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    12.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1672.000(Ft.)
Downstream point elevation =  1645.000(Ft.)
Channel length thru subarea  =   411.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     51.793(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     51.793(CFS)
Depth of flow =   1.100(Ft.), Average velocity =   7.477(Ft/s)
Channel flow top width =    9.598(Ft.)
Flow Velocity =    7.48(Ft/s)
Travel time  =    0.92 min.
Time of concentration =   13.80 min.

Sub-Channel No. 1 Critical depth =      1.375(Ft.)
  '     '       '     Critical flow top width =     11.250(Ft.)
  '     '       '     Critical flow velocity=    5.287(Ft/s)
  '     '       '     Critical flow area =      9.797(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.917(In/Hr) for a   100.0 year storm
Subarea runoff =      6.133(CFS) for      2.620(Ac.)
Total runoff =     54.831(CFS)   Total area =      21.970(Ac.)
Depth of flow =   1.130(Ft.), Average velocity =   7.591(Ft/s)

Sub-Channel No. 1 Critical depth =      1.414(Ft.)
  '     '       '     Critical flow top width =     11.484(Ft.)
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  '     '       '     Critical flow velocity=    5.354(Ft/s)
  '     '       '     Critical flow area =     10.241(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     21.970(Ac.)
Runoff from this stream =     54.831(CFS)
Time of concentration =   13.80 min.
Rainfall intensity =     2.917(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   503.000(Ft.)
Top (of initial area) elevation =  1968.000(Ft.)
Bottom (of initial area) elevation =  1850.000(Ft.)
Difference in elevation =   118.000(Ft.)
Slope =    0.23459  s(percent)=      23.46
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.424 min.
Rainfall intensity =      3.237(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.654(CFS)
Total initial stream area =        0.630(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1850.000(Ft.)
Downstream point elevation =  1736.000(Ft.)
Channel length thru subarea  =   709.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
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```
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      6.171(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =      6.171(CFS)
Depth of flow =   0.279(Ft.), Average velocity =   5.374(Ft/s)
Channel flow top width =    5.232(Ft.)
Flow Velocity =    5.37(Ft/s)
Travel time  =    2.20 min.
Time of concentration =   13.62 min.

Sub-Channel No. 1 Critical depth =      0.418(Ft.)
  '     '       '     Critical flow top width =      6.344(Ft.)
  '     '       '     Critical flow velocity=    3.160(Ft/s)
  '     '       '     Critical flow area =      1.953(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.803
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.938(In/Hr) for a   100.0 year storm
Subarea runoff =      8.967(CFS) for      3.800(Ac.)
Total runoff =     10.621(CFS)   Total area =       4.430(Ac.)
Depth of flow =   0.374(Ft.), Average velocity =   6.319(Ft/s)

Sub-Channel No. 1 Critical depth =      0.566(Ft.)
  '     '       '     Critical flow top width =      7.531(Ft.)
  '     '       '     Critical flow velocity=    3.561(Ft/s)
  '     '       '     Critical flow area =      2.982(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1736.000(Ft.)
Downstream point/station elevation =  1705.000(Ft.)
Pipe length  =   196.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.621(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    10.621(CFS)
Normal flow depth in pipe =    7.75(In.)
Flow top width inside pipe =   11.48(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.79(Ft/s)
Travel time through pipe =    0.17 min.
```

```
Time of concentration (TC) =    13.79 min.


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Process from Point/Station      209.100 to Point/Station      209.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.776
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    13.79 min.
Rainfall intensity =      2.919(In/Hr) for a   100.0 year storm
Subarea runoff =      0.792(CFS) for      0.350(Ac.)
Total runoff =     11.413(CFS)   Total area =       4.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      210.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1705.000(Ft.)
Downstream point/station elevation =  1696.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.413(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    11.413(CFS)
Normal flow depth in pipe =    9.00(In.)
Flow top width inside pipe =   14.70(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.85(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    13.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      210.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    13.93 min.
```

```
Rainfall intensity =      2.902(In/Hr) for a   100.0 year storm
Subarea runoff =      9.004(CFS) for      3.770(Ac.)
Total runoff =     20.417(CFS)   Total area =       8.550(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1696.000(Ft.)
Downstream point/station elevation =  1684.000(Ft.)
Pipe length  =   340.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.417(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    20.417(CFS)
Normal flow depth in pipe =   12.77(In.)
Flow top width inside pipe =   20.50(In.)
Critical Depth =   19.29(In.)
Pipe flow velocity =     13.33(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =    14.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.100 to Point/Station      211.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.36 min.
Rainfall intensity =      2.854(In/Hr) for a   100.0 year storm
Subarea runoff =      5.466(CFS) for      2.330(Ac.)
Total runoff =     25.883(CFS)   Total area =      10.880(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1684.000(Ft.)
Downstream point/station elevation =  1680.000(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.883(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    25.883(CFS)
Normal flow depth in pipe =   13.03(In.)
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```
Flow top width inside pipe =   20.38(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.49(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    14.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.43 min.
Rainfall intensity =      2.846(In/Hr) for a   100.0 year storm
Subarea runoff =      6.923(CFS) for      2.960(Ac.)
Total runoff =     32.806(CFS)   Total area =      13.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1680.000(Ft.)
Downstream point/station elevation =  1656.000(Ft.)
Pipe length  =   134.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.806(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    32.806(CFS)
Normal flow depth in pipe =   11.51(In.)
Flow top width inside pipe =   17.29(In.)
Critical depth could not be calculated.
Pipe flow velocity =     27.52(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    14.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      205.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     13.840(Ac.)
Runoff from this stream =     32.806(CFS)
Time of concentration =   14.52 min.
```

```
Rainfall intensity =     2.837(In/Hr)
Summary of stream data:

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


1       54.831     13.80            2.917
2       32.806     14.52            2.837
Largest stream flow has longer or shorter time of concentration
Qp =     54.831 + sum of
        Qa          Tb/Ta
        32.806 *    0.951 =     31.196
Qp =     86.027

Total of 2 main streams to confluence:
Flow rates before confluence point:
      54.831      32.806
Area of streams before confluence:
       21.970       13.840


Results of confluence:
Total flow rate =     86.027(CFS)
Time of concentration =    13.804 min.
Effective stream area after confluence  =     35.810(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      213.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1656.000(Ft.)
Downstream point/station elevation =  1655.000(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    86.027(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    86.027(CFS)
Normal flow depth in pipe =   30.66(In.)
Flow top width inside pipe =   31.99(In.)
Critical Depth =   34.64(In.)
Pipe flow velocity =     12.29(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    13.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      213.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
```

```
Stream flow area =     35.810(Ac.)
Runoff from this stream =     86.027(CFS)
Time of concentration =   13.92 min.
Rainfall intensity =     2.904(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      215.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   895.000(Ft.)
Top (of initial area) elevation =  1941.000(Ft.)
Bottom (of initial area) elevation =  1704.000(Ft.)
Difference in elevation =   237.000(Ft.)
Slope =    0.26480  s(percent)=      26.48
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.041 min.
Rainfall intensity =      2.890(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.537(CFS)
Total initial stream area =        4.980(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1704.000(Ft.)
Downstream point elevation =  1698.000(Ft.)
Channel length thru subarea  =   267.000(Ft.)
Channel base width    =    1.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     15.173(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     15.173(CFS)
Depth of flow =   0.799(Ft.), Average velocity =   7.309(Ft/s)
Channel flow top width =    4.196(Ft.)
Flow Velocity =    7.31(Ft/s)
Travel time  =    0.61 min.
Time of concentration =   14.65 min.
```

```
Sub-Channel No. 1 Critical depth =      1.063(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    4.581(Ft/s)
  '     '       '     Critical flow area =      3.313(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.823(In/Hr) for a   100.0 year storm
Subarea runoff =      7.178(CFS) for      3.180(Ac.)
Total runoff =     18.715(CFS)   Total area =       8.160(Ac.)
Depth of flow =   0.880(Ft.), Average velocity =   7.712(Ft/s)

Sub-Channel No. 1 Critical depth =      1.156(Ft.)
  '     '       '     Critical flow top width =      5.000(Ft.)
  '     '       '     Critical flow velocity=    4.949(Ft/s)
  '     '       '     Critical flow area =      3.781(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1698.000(Ft.)
Downstream point/station elevation =  1696.000(Ft.)
Pipe length  =   113.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.715(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    18.715(CFS)
Normal flow depth in pipe =   15.40(In.)
Flow top width inside pipe =   18.57(In.)
Critical Depth =   18.79(In.)
Pipe flow velocity =      9.90(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    14.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      217.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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```
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.84 min.
Rainfall intensity =      2.803(In/Hr) for a   100.0 year storm
Subarea runoff =      8.121(CFS) for      3.530(Ac.)
Total runoff =     26.836(CFS)   Total area =      11.690(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      218.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1696.000(Ft.)
Downstream point/station elevation =  1686.700(Ft.)
Pipe length  =   285.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.836(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    26.836(CFS)
Normal flow depth in pipe =   16.15(In.)
Flow top width inside pipe =   17.70(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.53(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    15.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      218.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.820
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.19 min.
Rainfall intensity =      2.767(In/Hr) for a   100.0 year storm
Subarea runoff =     10.573(CFS) for      4.660(Ac.)
Total runoff =     37.410(CFS)   Total area =      16.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1686.700(Ft.)
Downstream point/station elevation =  1683.000(Ft.)
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Pipe length  =   336.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.410(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    37.410(CFS)
Normal flow depth in pipe =   21.61(In.)
Flow top width inside pipe =   26.93(In.)
Critical Depth =   24.82(In.)
Pipe flow velocity =      9.87(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    15.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.76 min.
Rainfall intensity =      2.712(In/Hr) for a   100.0 year storm
Subarea runoff =      5.927(CFS) for      2.670(Ac.)
Total runoff =     43.337(CFS)   Total area =      19.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      213.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_______________________________________________________________________________
Upstream point/station elevation =  1683.000(Ft.)
Downstream point/station elevation =  1665.900(Ft.)
Pipe length  =   830.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    43.337(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    43.337(CFS)
Normal flow depth in pipe =   21.56(In.)
Flow top width inside pipe =   21.66(In.)
Critical Depth =   25.54(In.)
Pipe flow velocity =     12.74(Ft/s)
Travel time through pipe =    1.09 min.
Time of concentration (TC) =    16.84 min.


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Process from Point/Station      219.000 to Point/Station      213.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
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UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.763
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    16.84 min.
Rainfall intensity =      2.614(In/Hr) for a   100.0 year storm
Subarea runoff =     11.454(CFS) for      5.740(Ac.)
Total runoff =     54.791(CFS)   Total area =      24.760(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      213.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     24.760(Ac.)
Runoff from this stream =     54.791(CFS)
Time of concentration =   16.84 min.
Rainfall intensity =     2.614(In/Hr)
Summary of stream data:

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


1       86.027     13.92            2.904
2       54.791     16.84            2.614
Largest stream flow has longer or shorter time of concentration
Qp =     86.027 + sum of
       Qa          Tb/Ta
       54.791 *    0.826 =     45.276
Qp =    131.303

Total of 2 main streams to confluence:
Flow rates before confluence point:
      86.027      54.791
Area of streams before confluence:
       35.810       24.760


Results of confluence:
Total flow rate =    131.303(CFS)
Time of concentration =    13.919 min.
Effective stream area after confluence  =     60.570(Ac.)


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Process from Point/Station      213.000 to Point/Station      221.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1660.000(Ft.)
Downstream point/station elevation =  1632.000(Ft.)
Pipe length  =    74.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   131.303(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =   131.303(CFS)
Normal flow depth in pipe =   18.56(In.)
Flow top width inside pipe =   20.09(In.)
Critical depth could not be calculated.
Pipe flow velocity =     50.38(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    13.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      222.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1632.000(Ft.)
Downstream point elevation =  1630.000(Ft.)
Channel length thru subarea  =   376.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    133.934(CFS)
Manning's 'N'    = 0.018
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    133.934(CFS)
Depth of flow =   1.874(Ft.), Average velocity =   6.728(Ft/s)
Channel flow top width =   16.244(Ft.)
Flow Velocity =    6.73(Ft/s)
Travel time  =    0.93 min.
Time of concentration =   14.87 min.

Sub-Channel No. 1 Critical depth =      1.938(Ft.)
  '     '       '     Critical flow top width =     16.625(Ft.)
  '     '       '     Critical flow velocity=    6.393(Ft/s)
  '     '       '     Critical flow area =     20.949(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.799
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.799(In/Hr) for a   100.0 year storm
```

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Subarea runoff =      5.345(CFS) for      2.390(Ac.)
Total runoff =    136.648(CFS)   Total area =      62.960(Ac.)
Depth of flow =   1.892(Ft.), Average velocity =   6.764(Ft/s)

Sub-Channel No. 1 Critical depth =      1.969(Ft.)
  '     '       '     Critical flow top width =     16.813(Ft.)
  '     '       '     Critical flow velocity=    6.364(Ft/s)
  '     '       '     Critical flow area =     21.472(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1630.000(Ft.)
Downstream point/station elevation =  1629.400(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   136.648(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   136.648(CFS)
Normal flow depth in pipe =   33.00(In.)
Flow top width inside pipe =   34.47(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.84(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    14.90 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.90 min.
Rainfall intensity =      2.796(In/Hr) for a   100.0 year storm
Subarea runoff =      4.980(CFS) for      2.170(Ac.)
Total runoff =    141.628(CFS)   Total area =      65.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      224.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1629.400(Ft.)
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Downstream point/station elevation =  1627.000(Ft.)
Pipe length  =    94.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   141.628(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   141.628(CFS)
Normal flow depth in pipe =   30.61(In.)
Flow top width inside pipe =   37.34(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.86(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    14.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      225.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1627.000(Ft.)
Downstream point elevation =  1625.700(Ft.)
Channel length thru subarea  =   260.000(Ft.)
Channel base width    =  150.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    142.961(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    142.961(CFS)
Depth of flow =   0.544(Ft.), Average velocity =   1.740(Ft/s)
Channel flow top width =  152.175(Ft.)
Flow Velocity =    1.74(Ft/s)
Travel time  =    2.49 min.
Time of concentration =   17.48 min.

Sub-Channel No. 1 Critical depth =      0.305(Ft.)
  '     '       '     Critical flow top width =    151.219(Ft.)
  '     '       '     Critical flow velocity=    3.115(Ft/s)
  '     '       '     Critical flow area =     45.889(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.761
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.562(In/Hr) for a   100.0 year storm
Subarea runoff =      2.592(CFS) for      1.330(Ac.)
Total runoff =    144.220(CFS)   Total area =      66.460(Ac.)
Depth of flow =   0.547(Ft.), Average velocity =   1.746(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      0.305(Ft.)
  '     '       '     Critical flow top width =    151.219(Ft.)
  '     '       '     Critical flow velocity=    3.143(Ft/s)
  '     '       '     Critical flow area =     45.889(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1625.700(Ft.)
Downstream point/station elevation =  1610.000(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   144.220(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =   144.220(CFS)
Normal flow depth in pipe =   21.00(In.)
Flow top width inside pipe =   27.50(In.)
Critical depth could not be calculated.
Pipe flow velocity =     39.30(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    17.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.000 to Point/Station      226.100
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1610.000(Ft.)
Downstream point elevation =  1608.810(Ft.)
Channel length thru subarea  =   238.000(Ft.)
Channel base width    =  150.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    145.911(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    145.911(CFS)
Depth of flow =   0.551(Ft.), Average velocity =   1.754(Ft/s)
Channel flow top width =  152.202(Ft.)
Flow Velocity =    1.75(Ft/s)
Travel time  =    2.26 min.
Time of concentration =   19.78 min.

Sub-Channel No. 1 Critical depth =      0.309(Ft.)
  '     '       '     Critical flow top width =    151.234(Ft.)
  '     '       '     Critical flow velocity=    3.139(Ft/s)
  '     '       '     Critical flow area =     46.480(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
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```
Runoff Coefficient = 0.753
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.394(In/Hr) for a   100.0 year storm
Subarea runoff =      3.297(CFS) for      1.830(Ac.)
Total runoff =    147.517(CFS)   Total area =      68.290(Ac.)
Depth of flow =   0.554(Ft.), Average velocity =   1.762(Ft/s)

Sub-Channel No. 1 Critical depth =      0.313(Ft.)
  '     '       '     Critical flow top width =    151.250(Ft.)
  '     '       '     Critical flow velocity=    3.134(Ft/s)
  '     '       '     Critical flow area =     47.070(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.100 to Point/Station      227.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1608.810(Ft.)
Downstream point/station elevation =  1594.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   147.517(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =   147.517(CFS)
Normal flow depth in pipe =   22.08(In.)
Flow top width inside pipe =   20.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     42.38(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    19.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      227.000 to Point/Station      228.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1594.000(Ft.)
Downstream point elevation =  1593.360(Ft.)
Channel length thru subarea  =   129.000(Ft.)
Channel base width    =  150.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    148.050(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    148.050(CFS)
Depth of flow =   0.557(Ft.), Average velocity =   1.760(Ft/s)
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Channel flow top width =  152.227(Ft.)
Flow Velocity =    1.76(Ft/s)
Travel time  =    1.22 min.
Time of concentration =   21.02 min.

Sub-Channel No. 1 Critical depth =      0.313(Ft.)
  '     '       '     Critical flow top width =    151.250(Ft.)
  '     '       '     Critical flow velocity=    3.145(Ft/s)
  '     '       '     Critical flow area =     47.070(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.748
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.314(In/Hr) for a   100.0 year storm
Subarea runoff =      1.005(CFS) for      0.580(Ac.)
Total runoff =    148.522(CFS)   Total area =      68.870(Ac.)
Depth of flow =   0.558(Ft.), Average velocity =   1.762(Ft/s)

Sub-Channel No. 1 Critical depth =      0.313(Ft.)
  '     '       '     Critical flow top width =    151.250(Ft.)
  '     '       '     Critical flow velocity=    3.155(Ft/s)
  '     '       '     Critical flow area =     47.070(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      228.000 to Point/Station      233.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1593.360(Ft.)
Downstream point/station elevation =  1588.000(Ft.)
Pipe length  =   129.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   148.522(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   148.522(CFS)
Normal flow depth in pipe =   28.45(In.)
Flow top width inside pipe =   34.65(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.90(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    21.12 min.


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Process from Point/Station      228.000 to Point/Station      233.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     68.870(Ac.)
Runoff from this stream =    148.522(CFS)
Time of concentration =   21.12 min.
Rainfall intensity =     2.309(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      230.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   111.000(Ft.)
Top (of initial area) elevation =  1668.400(Ft.)
Bottom (of initial area) elevation =  1667.300(Ft.)
Difference in elevation =     1.100(Ft.)
Slope =    0.00991  s(percent)=       0.99
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.456 min.
Rainfall intensity =      4.430(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.846
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.300(CFS)
Total initial stream area =        0.080(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      231.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1666.500(Ft.)
End of street segment elevation =  1634.000(Ft.)
Length of street segment  =   754.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
```

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 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      7.114(CFS)
Depth of flow =   0.359(Ft.), Average velocity =   4.467(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.151(Ft.)
Flow velocity =   4.47(Ft/s)
Travel time =    2.81 min.     TC =    9.27  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.836
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.631(In/Hr) for a   100.0 year storm
Subarea runoff =     13.695(CFS) for      4.510(Ac.)
Total runoff =     13.995(CFS)   Total area =       4.590(Ac.)
Street flow at end of street =     13.995(CFS)
Half street flow at end of street =     13.995(CFS)
Depth of flow =   0.436(Ft.), Average velocity =   5.229(Ft/s)
Flow width (from curb towards crown)=  16.001(Ft.)


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Process from Point/Station      231.000 to Point/Station      232.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1633.500(Ft.)
Downstream point/station elevation =  1623.000(Ft.)
Pipe length  =   209.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.995(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    13.995(CFS)
Normal flow depth in pipe =   11.86(In.)
Flow top width inside pipe =   12.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.44(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     9.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      232.100 to Point/Station      232.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =     9.53 min.
Rainfall intensity =      3.576(In/Hr) for a   100.0 year storm
Subarea runoff =     11.743(CFS) for      3.930(Ac.)
Total runoff =     25.738(CFS)   Total area =       8.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      232.000 to Point/Station      232.200
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1623.000(Ft.)
Downstream point/station elevation =  1607.000(Ft.)
Pipe length  =   379.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.738(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    25.738(CFS)
Normal flow depth in pipe =   14.09(In.)
Flow top width inside pipe =   19.74(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.01(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =     9.95 min.


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Process from Point/Station      232.000 to Point/Station      232.200
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.794
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     9.95 min.
Rainfall intensity =      3.492(In/Hr) for a   100.0 year storm
Subarea runoff =     11.917(CFS) for      4.300(Ac.)
Total runoff =     37.655(CFS)   Total area =      12.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      232.200 to Point/Station      233.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1600.000(Ft.)
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Downstream point/station elevation =  1588.000(Ft.)
Pipe length  =   124.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.655(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    37.655(CFS)
Normal flow depth in pipe =   13.75(In.)
Flow top width inside pipe =   19.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.57(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    10.04 min.


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Process from Point/Station      232.200 to Point/Station      233.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.820(Ac.)
Runoff from this stream =     37.655(CFS)
Time of concentration =   10.04 min.
Rainfall intensity =     3.475(In/Hr)
Summary of stream data:

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


1      148.522     21.12            2.309
2       37.655     10.04            3.475
Largest stream flow has longer time of concentration
Qp =    148.522 + sum of
        Qb         Ia/Ib
        37.655 *    0.664 =     25.018
Qp =    173.539

Total of 2 main streams to confluence:
Flow rates before confluence point:
     148.522      37.655
Area of streams before confluence:
       68.870       12.820


Results of confluence:
Total flow rate =    173.539(CFS)
Time of concentration =    21.118 min.
Effective stream area after confluence  =     81.690(Ac.)


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Process from Point/Station      233.000 to Point/Station      234.000
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**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1588.000(Ft.)
Downstream point elevation =  1587.110(Ft.)
Channel length thru subarea  =   178.000(Ft.)
Channel base width    =   50.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =    174.534(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    174.534(CFS)
Depth of flow =   1.179(Ft.), Average velocity =   2.828(Ft/s)
Channel flow top width =   54.716(Ft.)
Flow Velocity =    2.83(Ft/s)
Travel time  =    1.05 min.
Time of concentration =   22.17 min.

Sub-Channel No. 1 Critical depth =      0.719(Ft.)
  '     '       '     Critical flow top width =     52.875(Ft.)
  '     '       '     Critical flow velocity=    4.721(Ft/s)
  '     '       '     Critical flow area =     36.971(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.745
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.248(In/Hr) for a   100.0 year storm
Subarea runoff =      1.925(CFS) for      1.150(Ac.)
Total runoff =    175.464(CFS)   Total area =      82.840(Ac.)
Depth of flow =   1.183(Ft.), Average velocity =   2.833(Ft/s)

Sub-Channel No. 1 Critical depth =      0.719(Ft.)
  '     '       '     Critical flow top width =     52.875(Ft.)
  '     '       '     Critical flow velocity=    4.746(Ft/s)
  '     '       '     Critical flow area =     36.971(Sq.Ft)



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Process from Point/Station      234.000 to Point/Station      235.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1585.300(Ft.)
Downstream point/station elevation =  1580.000(Ft.)
Pipe length  =   530.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   175.464(CFS)
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Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   175.464(CFS)
Normal flow depth in pipe =   43.88(In.)
Flow top width inside pipe =   35.36(In.)
Critical Depth =   45.94(In.)
Pipe flow velocity =     13.52(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =    22.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      234.000 to Point/Station      235.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     82.840(Ac.)
Runoff from this stream =    175.464(CFS)
Time of concentration =   22.82 min.
Rainfall intensity =     2.212(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      236.000 to Point/Station      237.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   939.000(Ft.)
Top (of initial area) elevation =  1777.000(Ft.)
Bottom (of initial area) elevation =  1746.500(Ft.)
Difference in elevation =    30.500(Ft.)
Slope =    0.03248  s(percent)=       3.25
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.962 min.
Rainfall intensity =      3.156(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      6.691(CFS)
Total initial stream area =        2.560(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      237.000 to Point/Station      238.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
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Top of street segment elevation =  1746.500(Ft.)
End of street segment elevation =  1715.500(Ft.)
Length of street segment  =   617.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =     10.666(CFS)
Depth of flow =   0.394(Ft.), Average velocity =   5.202(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.907(Ft.)
Flow velocity =   5.20(Ft/s)
Travel time =    1.98 min.     TC =   13.94  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.901(In/Hr) for a   100.0 year storm
Subarea runoff =      7.856(CFS) for      3.290(Ac.)
Total runoff =     14.547(CFS)   Total area =       5.850(Ac.)
Street flow at end of street =     14.547(CFS)
Half street flow at end of street =     14.547(CFS)
Depth of flow =   0.431(Ft.), Average velocity =   5.595(Ft/s)
Flow width (from curb towards crown)=  15.760(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      239.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1715.500(Ft.)
Downstream point/station elevation =  1705.100(Ft.)
Pipe length  =   186.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.547(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    14.547(CFS)
Normal flow depth in pipe =   11.70(In.)
Flow top width inside pipe =   12.43(In.)
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Critical depth could not be calculated.
Pipe flow velocity =     14.17(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =    14.16 min.


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Process from Point/Station      239.100 to Point/Station      239.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.16 min.
Rainfall intensity =      2.877(In/Hr) for a   100.0 year storm
Subarea runoff =      8.730(CFS) for      3.690(Ac.)
Total runoff =     23.277(CFS)   Total area =       9.540(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      239.000 to Point/Station      240.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1705.100(Ft.)
Downstream point/station elevation =  1664.000(Ft.)
Pipe length  =   597.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.277(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    23.277(CFS)
Normal flow depth in pipe =   12.68(In.)
Flow top width inside pipe =   16.43(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.49(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    14.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      239.000 to Point/Station      240.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
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RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    14.73 min.
Rainfall intensity =      2.815(In/Hr) for a   100.0 year storm
Subarea runoff =      4.738(CFS) for      2.050(Ac.)
Total runoff =     28.015(CFS)   Total area =      11.590(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      241.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1664.000(Ft.)
Downstream point/station elevation =  1631.000(Ft.)
Pipe length  =   417.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.015(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    28.015(CFS)
Normal flow depth in pipe =   13.97(In.)
Flow top width inside pipe =   15.01(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.02(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    15.09 min.


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Process from Point/Station      240.000 to Point/Station      241.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     11.590(Ac.)
Runoff from this stream =     28.015(CFS)
Time of concentration =   15.09 min.
Rainfall intensity =     2.777(In/Hr)


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Process from Point/Station      242.000 to Point/Station      243.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   212.000(Ft.)
Top (of initial area) elevation =  1702.100(Ft.)
Bottom (of initial area) elevation =  1700.000(Ft.)
Difference in elevation =     2.100(Ft.)
Slope =    0.00991  s(percent)=       0.99
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.364 min.
Rainfall intensity =      3.842(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.839
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.580(CFS)
Total initial stream area =        0.180(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      243.000 to Point/Station      244.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1700.000(Ft.)
End of street segment elevation =  1676.000(Ft.)
Length of street segment  =   546.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      5.334(CFS)
Depth of flow =   0.331(Ft.), Average velocity =   4.217(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.716(Ft.)
Flow velocity =   4.22(Ft/s)
Travel time =    2.16 min.     TC =   10.52  min.
 Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      3.387(In/Hr) for a   100.0 year storm
Subarea runoff =      9.415(CFS) for      3.340(Ac.)
Total runoff =      9.996(CFS)   Total area =       3.520(Ac.)
Street flow at end of street =      9.996(CFS)
Half street flow at end of street =      9.996(CFS)
Depth of flow =   0.395(Ft.), Average velocity =   4.868(Ft/s)
Flow width (from curb towards crown)=  13.918(Ft.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      244.000 to Point/Station      245.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1676.000(Ft.)
Downstream point/station elevation =  1651.000(Ft.)
Pipe length  =   358.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.996(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     9.996(CFS)
Normal flow depth in pipe =    8.25(In.)
Flow top width inside pipe =   14.92(In.)
Critical Depth =   14.21(In.)
Pipe flow velocity =     14.46(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =    10.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      244.000 to Point/Station      245.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.831
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    10.93 min.
Rainfall intensity =      3.316(In/Hr) for a   100.0 year storm
Subarea runoff =      6.173(CFS) for      2.240(Ac.)
Total runoff =     16.169(CFS)   Total area =       5.760(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      246.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1645.000(Ft.)
Downstream point/station elevation =  1640.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.169(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    16.169(CFS)
Normal flow depth in pipe =   10.36(In.)
Flow top width inside pipe =   13.87(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.88(Ft/s)
```

```
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    10.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      246.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.98 min.
Rainfall intensity =      3.307(In/Hr) for a   100.0 year storm
Subarea runoff =      0.808(CFS) for      0.310(Ac.)
Total runoff =     16.977(CFS)   Total area =       6.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      246.000 to Point/Station      241.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1640.000(Ft.)
Downstream point/station elevation =  1631.000(Ft.)
Pipe length  =   117.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.977(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    16.977(CFS)
Normal flow depth in pipe =   11.65(In.)
Flow top width inside pipe =   12.50(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.61(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    11.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      246.000 to Point/Station      241.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      6.070(Ac.)
Runoff from this stream =     16.977(CFS)
Time of concentration =   11.10 min.
Rainfall intensity =     3.288(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.       (CFS)       (min)                 (In/Hr)


1       28.015     15.09                 2.777
2       16.977     11.10                 3.288
Largest stream flow has longer time of concentration
Qp =     28.015 + sum of
        Qb         Ia/Ib
        16.977 *    0.845 =     14.340
Qp =     42.355

Total of 2 streams to confluence:
Flow rates before confluence point:
      28.015      16.977
Area of streams before confluence:
       11.590        6.070
Results of confluence:
Total flow rate =     42.355(CFS)
Time of concentration =    15.092 min.
Effective stream area after confluence =     17.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      241.000 to Point/Station      247.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1631.000(Ft.)
Downstream point/station elevation =  1622.000(Ft.)
Pipe length  =   168.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.355(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    42.355(CFS)
Normal flow depth in pipe =   16.36(In.)
Flow top width inside pipe =   22.36(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.55(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    15.24 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      247.100 to Point/Station      247.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.820
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
```

```
Time of concentration =    15.24 min.
Rainfall intensity =      2.762(In/Hr) for a   100.0 year storm
Subarea runoff =     12.862(CFS) for      5.680(Ac.)
Total runoff =     55.216(CFS)   Total area =      23.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      247.000 to Point/Station      248.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1622.000(Ft.)
Downstream point/station elevation =  1617.600(Ft.)
Pipe length  =   126.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.216(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    55.216(CFS)
Normal flow depth in pipe =   21.09(In.)
Flow top width inside pipe =   22.32(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.57(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    15.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      247.000 to Point/Station      248.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.37 min.
Rainfall intensity =      2.750(In/Hr) for a   100.0 year storm
Subarea runoff =      4.056(CFS) for      1.800(Ac.)
Total runoff =     59.272(CFS)   Total area =      25.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      248.100 to Point/Station      248.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.37 min.
Rainfall intensity =      2.750(In/Hr) for a   100.0 year storm
Subarea runoff =     11.018(CFS) for      4.890(Ac.)
Total runoff =     70.291(CFS)   Total area =      30.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      248.000 to Point/Station      249.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1617.600(Ft.)
Downstream point/station elevation =  1612.000(Ft.)
Pipe length  =   181.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    70.291(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    70.291(CFS)
Normal flow depth in pipe =   23.91(In.)
Flow top width inside pipe =   24.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.75(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    15.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      249.100 to Point/Station      249.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    15.55 min.
Rainfall intensity =      2.732(In/Hr) for a   100.0 year storm
Subarea runoff =      3.961(CFS) for      1.770(Ac.)
Total runoff =     74.251(CFS)   Total area =      31.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      249.200 to Point/Station      249.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.55 min.
Rainfall intensity =      2.732(In/Hr) for a   100.0 year storm
Subarea runoff =      5.583(CFS) for      2.660(Ac.)
Total runoff =     79.834(CFS)   Total area =      34.460(Ac.)


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Process from Point/Station      249.000 to Point/Station      250.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1612.000(Ft.)
Downstream point/station elevation =  1592.000(Ft.)
Pipe length  =   607.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    79.834(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    79.834(CFS)
Normal flow depth in pipe =   22.97(In.)
Flow top width inside pipe =   30.36(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.08(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    16.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      249.000 to Point/Station      250.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    16.11 min.
Rainfall intensity =      2.679(In/Hr) for a   100.0 year storm
Subarea runoff =      7.275(CFS) for      3.320(Ac.)
Total runoff =     87.109(CFS)   Total area =      37.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      251.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1585.000(Ft.)
Downstream point/station elevation =  1583.000(Ft.)
```

```
Pipe length  =    43.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    87.109(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    87.109(CFS)
Normal flow depth in pipe =   24.19(In.)
Flow top width inside pipe =   23.71(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.54(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    16.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      251.000 to Point/Station      252.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1583.000(Ft.)
Downstream point elevation =  1581.130(Ft.)
Channel length thru subarea  =   374.000(Ft.)
Channel base width    =  140.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     89.317(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     89.317(CFS)
Depth of flow =   0.427(Ft.), Average velocity =   1.483(Ft/s)
Channel flow top width =  141.710(Ft.)
Flow Velocity =    1.48(Ft/s)
Travel time  =    4.20 min.
Time of concentration =   20.35 min.

Sub-Channel No. 1 Critical depth =      0.232(Ft.)
  '     '       '     Critical flow top width =    140.930(Ft.)
  '     '       '     Critical flow velocity=    2.736(Ft/s)
  '     '       '     Critical flow area =     32.647(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.751
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.356(In/Hr) for a   100.0 year storm
Subarea runoff =      4.334(CFS) for      2.450(Ac.)
Total runoff =     91.443(CFS)   Total area =      40.230(Ac.)
Depth of flow =   0.434(Ft.), Average velocity =   1.497(Ft/s)

Sub-Channel No. 1 Critical depth =      0.236(Ft.)
```

```
  '     '       '     Critical flow top width =    140.945(Ft.)
  '     '       '     Critical flow velocity=    2.755(Ft/s)
  '     '       '     Critical flow area =     33.198(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.100 to Point/Station      252.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    20.35 min.
Rainfall intensity =      2.356(In/Hr) for a   100.0 year storm
Subarea runoff =      5.889(CFS) for      3.090(Ac.)
Total runoff =     97.332(CFS)   Total area =      43.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.200 to Point/Station      252.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Time of concentration =    20.35 min.
Rainfall intensity =      2.356(In/Hr) for a   100.0 year storm
Subarea runoff =      3.450(CFS) for      1.810(Ac.)
Total runoff =    100.782(CFS)   Total area =      45.130(Ac.)


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Process from Point/Station      252.000 to Point/Station      235.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1581.130(Ft.)
Downstream point/station elevation =  1580.350(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   100.782(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   100.782(CFS)
```

```
Normal flow depth in pipe =   34.50(In.)
Flow top width inside pipe =   32.17(In.)
Critical Depth =   36.91(In.)
Pipe flow velocity =     11.92(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    20.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.000 to Point/Station      235.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     45.130(Ac.)
Runoff from this stream =    100.782(CFS)
Time of concentration =   20.46 min.
Rainfall intensity =     2.350(In/Hr)
Summary of stream data:

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


1      175.464     22.82            2.212
2      100.782     20.46            2.350
Largest stream flow has longer time of concentration
Qp =    175.464 + sum of
        Qb         Ia/Ib
       100.782 *    0.942 =     94.896
Qp =    270.360

Total of 2 main streams to confluence:
Flow rates before confluence point:
     175.464     100.782
Area of streams before confluence:
       82.840       45.130


Results of confluence:
Total flow rate =    270.360(CFS)
Time of concentration =    22.821 min.
Effective stream area after confluence  =    127.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      235.000 to Point/Station      253.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1580.350(Ft.)
Downstream point/station elevation =  1573.270(Ft.)
Pipe length  =   708.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =   270.360(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   270.360(CFS)
Normal flow depth in pipe =   51.56(In.)
Flow top width inside pipe =   41.72(In.)
Critical Depth =   54.47(In.)
Pipe flow velocity =     15.07(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =    23.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      254.000 to Point/Station      253.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    23.60 min.
Rainfall intensity =      2.172(In/Hr) for a   100.0 year storm
Subarea runoff =     50.252(CFS) for     26.280(Ac.)
Total runoff =    320.612(CFS)   Total area =     154.250(Ac.)


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Process from Point/Station      254.100 to Point/Station      253.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.774
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    23.60 min.
Rainfall intensity =      2.172(In/Hr) for a   100.0 year storm
Subarea runoff =     20.347(CFS) for     12.110(Ac.)
Total runoff =    340.960(CFS)   Total area =     166.360(Ac.)


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Process from Point/Station      253.000 to Point/Station      255.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1573.270(Ft.)
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```
Downstream point/station elevation =  1565.000(Ft.)
Pipe length  =   678.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   340.960(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   340.960(CFS)
Normal flow depth in pipe =   54.38(In.)
Flow top width inside pipe =   43.31(In.)
Critical Depth =   58.91(In.)
Pipe flow velocity =     17.18(Ft/s)
Travel time through pipe =    0.66 min.
Time of concentration (TC) =    24.26 min.
End of computations, total study area =          166.36 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.639
Area averaged RI index number =  72.4
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 12/05/17 File:pr3800.out

Tentative Tract 35853
Proposed Conditions
Major Basin 300, 400, 500, 600, 700, and 800
100-Year Flow Rate

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

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

Program License Serial Number 4028

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(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 = 0.5500

++
Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 527.000(Ft.)
Top (of initial area) elevation = 1950.000(Ft.)
Bottom (of initial area) elevation = 1820.000(Ft.)
Difference in elevation = 130.000(Ft.)
Slope = 0.24668 s(percent)= 24.67

```
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.523 min.
Rainfall intensity =      3.222(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.474(CFS)
Total initial stream area =        4.010(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1820.000(Ft.)
Downstream point elevation =  1785.000(Ft.)
Channel length thru subarea  =  1235.000(Ft.)
Channel base width    =   24.000(Ft.)
Slope or 'Z' of left channel bank =   0.100
Slope or 'Z' of right channel bank =   0.100
Estimated mean flow rate at midpoint of channel =     27.157(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     27.157(CFS)
Depth of flow =   0.238(Ft.), Average velocity =   4.746(Ft/s)
Channel flow top width =   24.048(Ft.)
Flow Velocity =    4.75(Ft/s)
Travel time  =    4.34 min.
Time of concentration =   15.86 min.

Sub-Channel No. 1 Critical depth =      0.340(Ft.)
  '     '       '     Critical flow top width =     24.068(Ft.)
  '     '       '     Critical flow velocity=    3.325(Ft/s)
  '     '       '     Critical flow area =      8.168(Sq.Ft)

 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.703(In/Hr) for a   100.0 year storm
Subarea runoff =     33.307(CFS) for     15.060(Ac.)
```

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Total runoff =     43.781(CFS)   Total area =      19.070(Ac.)
Depth of flow =   0.318(Ft.), Average velocity =   5.730(Ft/s)

Sub-Channel No. 1 Critical depth =      0.469(Ft.)
  '     '       '     Critical flow top width =     24.094(Ft.)
  '     '       '     Critical flow velocity=    3.884(Ft/s)
  '     '       '     Critical flow area =     11.272(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1784.000(Ft.)
Downstream point elevation =  1612.000(Ft.)
Channel length thru subarea  =  3736.000(Ft.)
Channel base width    =    5.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =    173.867(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =    173.867(CFS)
Depth of flow =   1.856(Ft.), Average velocity =   8.861(Ft/s)
Channel flow top width =   16.139(Ft.)
Flow Velocity =    8.86(Ft/s)
Travel time  =    7.03 min.
Time of concentration =   22.89 min.

Sub-Channel No. 1 Critical depth =      2.219(Ft.)
  '     '       '     Critical flow top width =     18.313(Ft.)
  '     '       '     Critical flow velocity=    6.723(Ft/s)
  '     '       '     Critical flow area =     25.862(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.776
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.209(In/Hr) for a   100.0 year storm
Subarea runoff =    260.109(CFS) for    151.840(Ac.)
Total runoff =    303.890(CFS)   Total area =     170.910(Ac.)
Depth of flow =   2.418(Ft.), Average velocity =  10.258(Ft/s)

Sub-Channel No. 1 Critical depth =      2.906(Ft.)
  '     '       '     Critical flow top width =     22.438(Ft.)
  '     '       '     Critical flow velocity=    7.622(Ft/s)
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```
  '     '       '     Critical flow area =     39.870(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    170.910(Ac.)
Runoff from this stream =    303.890(CFS)
Time of concentration =   22.89 min.
Rainfall intensity =     2.209(In/Hr)


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Process from Point/Station      304.000 to Point/Station      305.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   590.000(Ft.)
Top (of initial area) elevation =  1677.500(Ft.)
Bottom (of initial area) elevation =  1654.700(Ft.)
Difference in elevation =    22.800(Ft.)
Slope =    0.03864  s(percent)=       3.86
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.380 min.
Rainfall intensity =      4.116(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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.182(CFS)
Total initial stream area =        0.870(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station      305.000 to Point/Station      306.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1654.700(Ft.)
End of street segment elevation =  1631.300(Ft.)
Length of street segment  =   514.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  12.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
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Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.875(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      6.361(CFS)
Depth of flow =   0.346(Ft.), Average velocity =   4.447(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.463(Ft.)
Flow velocity =   4.45(Ft/s)
Travel time =    1.93 min.     TC =    9.31  min.
 Adding area flow to street
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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      3.623(In/Hr) for a   100.0 year storm
Subarea runoff =      6.301(CFS) for      1.960(Ac.)
Total runoff =      9.483(CFS)   Total area =       2.830(Ac.)
Street flow at end of street =      9.483(CFS)
Half street flow at end of street =      9.483(CFS)
Depth of flow =   0.387(Ft.), Average velocity =   4.874(Ft/s)
Flow width (from curb towards crown)=  13.526(Ft.)


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Process from Point/Station      306.000 to Point/Station      307.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1626.000(Ft.)
Downstream point/station elevation =  1625.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.483(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.483(CFS)
Normal flow depth in pipe =   11.09(In.)
Flow top width inside pipe =   17.51(In.)
Critical Depth =   14.27(In.)
Pipe flow velocity =      8.30(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     9.43 min.


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Process from Point/Station      307.000 to Point/Station      308.000
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**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1625.000(Ft.)
Downstream point elevation =  1624.000(Ft.)
Channel length thru subarea  =   200.000(Ft.)
Channel base width    =   20.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     15.595(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    3.000(Ft.)
Flow(q) thru subarea =     15.595(CFS)
Depth of flow =   0.480(Ft.), Average velocity =   1.551(Ft/s)
Channel flow top width =   21.918(Ft.)
Flow Velocity =    1.55(Ft/s)
Travel time  =    2.15 min.
Time of concentration =   11.57 min.

Sub-Channel No. 1 Critical depth =      0.266(Ft.)
  '     '       '     Critical flow top width =     21.063(Ft.)
  '     '       '     Critical flow velocity=    2.860(Ft/s)
  '     '       '     Critical flow area =      5.454(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.214(In/Hr) for a   100.0 year storm
Subarea runoff =     12.165(CFS) for      4.670(Ac.)
Total runoff =     21.648(CFS)   Total area =       7.500(Ac.)
Depth of flow =   0.583(Ft.), Average velocity =   1.754(Ft/s)

Sub-Channel No. 1 Critical depth =      0.328(Ft.)
  '     '       '     Critical flow top width =     21.313(Ft.)
  '     '       '     Critical flow velocity=    3.194(Ft/s)
  '     '       '     Critical flow area =      6.778(Sq.Ft)



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Process from Point/Station      308.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1624.000(Ft.)
Downstream point/station elevation =  1614.000(Ft.)
Pipe length  =    48.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.648(CFS)
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Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    21.648(CFS)
Normal flow depth in pipe =    9.55(In.)
Flow top width inside pipe =   14.43(In.)
Critical depth could not be calculated.
Pipe flow velocity =     26.26(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    11.61 min.


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Process from Point/Station      308.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.500(Ac.)
Runoff from this stream =     21.648(CFS)
Time of concentration =   11.61 min.
Rainfall intensity =     3.209(In/Hr)
Summary of stream data:

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


1      303.890     22.89                 2.209
2       21.648     11.61                 3.209
Largest stream flow has longer time of concentration
Qp =    303.890 + sum of
        Qb         Ia/Ib
        21.648 *    0.688 =     14.901
Qp =    318.791

Total of 2 streams to confluence:
Flow rates before confluence point:
     303.890      21.648
Area of streams before confluence:
      170.910        7.500
Results of confluence:
Total flow rate =    318.791(CFS)
Time of concentration =    22.887 min.
Effective stream area after confluence =    178.410(Ac.)


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Process from Point/Station      303.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1614.000(Ft.)
Downstream point/station elevation =  1606.000(Ft.)
Pipe length  =   161.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   318.791(CFS)
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Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   318.791(CFS)
Normal flow depth in pipe =   39.19(In.)
Flow top width inside pipe =   37.17(In.)
Critical depth could not be calculated.
Pipe flow velocity =     29.05(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    22.98 min.


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Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   544.000(Ft.)
Top (of initial area) elevation =  1761.000(Ft.)
Bottom (of initial area) elevation =  1653.000(Ft.)
Difference in elevation =   108.000(Ft.)
Slope =    0.19853  s(percent)=      19.85
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.188 min.
Rainfall intensity =      3.124(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      9.721(CFS)
Total initial stream area =        3.850(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      401.000 to Point/Station      402.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1653.000(Ft.)
Downstream point/station elevation =  1634.000(Ft.)
Pipe length  =   138.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.721(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     9.721(CFS)
Normal flow depth in pipe =    7.65(In.)
Flow top width inside pipe =   11.54(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.40(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    12.31 min.
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Process from Point/Station      401.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.850(Ac.)
Runoff from this stream =      9.721(CFS)
Time of concentration =   12.31 min.
Rainfall intensity =     3.106(In/Hr)


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Process from Point/Station      403.000 to Point/Station      404.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
Initial area flow distance =   461.000(Ft.)
Top (of initial area) elevation =  1677.500(Ft.)
Bottom (of initial area) elevation =  1664.000(Ft.)
Difference in elevation =    13.500(Ft.)
Slope =    0.02928  s(percent)=       2.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.068 min.
Rainfall intensity =      4.215(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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.922(CFS)
Total initial stream area =        0.780(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station      404.000 to Point/Station      405.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1664.000(Ft.)
Downstream point/station elevation =  1663.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.922(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.922(CFS)
Normal flow depth in pipe =    7.13(In.)
Flow top width inside pipe =   11.79(In.)
Critical Depth =    8.79(In.)
Pipe flow velocity =      6.01(Ft/s)
Travel time through pipe =    0.18 min.
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Time of concentration (TC) =     7.25 min.


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Process from Point/Station      405.000 to Point/Station      402.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1660.000(Ft.)
Downstream point elevation =  1634.000(Ft.)
Channel length thru subarea  =    75.000(Ft.)
Channel base width    =   12.000(Ft.)
Slope or 'Z' of left channel bank =   0.100
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.922(CFS)
Depth of flow =   0.044(Ft.), Average velocity =   5.459(Ft/s)
Channel flow top width =   12.093(Ft.)
Flow Velocity =    5.46(Ft/s)
Travel time  =    0.23 min.
Time of concentration =    7.48 min.

Sub-Channel No. 1 Critical depth =      0.122(Ft.)
  '     '       '     Critical flow top width =     12.256(Ft.)
  '     '       '     Critical flow velocity=    1.974(Ft/s)
  '     '       '     Critical flow area =      1.480(Sq.Ft)



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Process from Point/Station      405.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.780(Ac.)
Runoff from this stream =      2.922(CFS)
Time of concentration =    7.48 min.
Rainfall intensity =     4.087(In/Hr)
Summary of stream data:

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


1        9.721     12.31                3.106
2        2.922      7.48                4.087
Largest stream flow has longer time of concentration
Qp =      9.721 + sum of
        Qb         Ia/Ib
         2.922 *    0.760 =      2.221
Qp =     11.942
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       9.721       2.922
Area of streams before confluence:
        3.850        0.780
Results of confluence:
Total flow rate =     11.942(CFS)
Time of concentration =    12.313 min.
Effective stream area after confluence =      4.630(Ac.)


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Process from Point/Station      402.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.630(Ac.)
Runoff from this stream =     11.942(CFS)
Time of concentration =   12.31 min.
Rainfall intensity =     3.106(In/Hr)


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Process from Point/Station      406.000 to Point/Station      407.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   645.000(Ft.)
Top (of initial area) elevation =  1821.000(Ft.)
Bottom (of initial area) elevation =  1637.000(Ft.)
Difference in elevation =   184.000(Ft.)
Slope =    0.28527  s(percent)=      28.53
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.135 min.
Rainfall intensity =      3.131(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     15.999(CFS)
Total initial stream area =        6.320(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      407.000 to Point/Station      408.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1637.000(Ft.)
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Downstream point/station elevation =  1618.000(Ft.)
Pipe length  =   147.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.999(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    15.999(CFS)
Normal flow depth in pipe =    9.15(In.)
Flow top width inside pipe =   14.63(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.41(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    12.25 min.


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Process from Point/Station      407.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.320(Ac.)
Runoff from this stream =     15.999(CFS)
Time of concentration =   12.25 min.
Rainfall intensity =     3.114(In/Hr)
Summary of stream data:

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


1       11.942     12.31                3.106
2       15.999     12.25                3.114
Largest stream flow has longer or shorter time of concentration
Qp =     15.999 + sum of
       Qa          Tb/Ta
       11.942 *    0.995 =     11.885
Qp =     27.884

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.942      15.999
Area of streams before confluence:
        4.630        6.320
Results of confluence:
Total flow rate =     27.884(CFS)
Time of concentration =    12.255 min.
Effective stream area after confluence =     10.950(Ac.)


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Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   524.000(Ft.)
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Top (of initial area) elevation =  1830.000(Ft.)
Bottom (of initial area) elevation =  1646.000(Ft.)
Difference in elevation =   184.000(Ft.)
Slope =    0.35115  s(percent)=      35.11
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.713 min.
Rainfall intensity =      3.353(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.878(CFS)
Total initial stream area =        2.520(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      501.000 to Point/Station      502.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1646.000(Ft.)
Downstream point/station elevation =  1643.000(Ft.)
Pipe length  =   139.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.878(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.878(CFS)
Normal flow depth in pipe =    9.47(In.)
Flow top width inside pipe =   14.47(In.)
Critical Depth =   12.62(In.)
Pipe flow velocity =      8.43(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =    10.99 min.


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Process from Point/Station      502.100 to Point/Station      502.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.813
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.99 min.
Rainfall intensity =      3.307(In/Hr) for a   100.0 year storm
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Subarea runoff =      1.720(CFS) for      0.640(Ac.)
Total runoff =      8.599(CFS)   Total area =       3.160(Ac.)


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Process from Point/Station      502.000 to Point/Station      503.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1638.000(Ft.)
Downstream point/station elevation =  1632.000(Ft.)
Pipe length  =    41.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.599(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     8.599(CFS)
Normal flow depth in pipe =    6.91(In.)
Flow top width inside pipe =   11.86(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.35(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    11.02 min.


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Process from Point/Station      502.000 to Point/Station      503.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.160(Ac.)
Runoff from this stream =      8.599(CFS)
Time of concentration =   11.02 min.
Rainfall intensity =     3.301(In/Hr)


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Process from Point/Station      504.000 to Point/Station      505.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   776.000(Ft.)
Top (of initial area) elevation =  1664.000(Ft.)
Bottom (of initial area) elevation =  1646.000(Ft.)
Difference in elevation =    18.000(Ft.)
Slope =    0.02320  s(percent)=       2.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.120 min.
Rainfall intensity =      3.664(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
```

```
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.869(CFS)
Total initial stream area =        1.190(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      505.000 to Point/Station      506.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1641.000(Ft.)
Downstream point/station elevation =  1635.000(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.869(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.869(CFS)
Normal flow depth in pipe =    6.24(In.)
Flow top width inside pipe =    8.30(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.84(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      505.000 to Point/Station      506.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.190(Ac.)
Runoff from this stream =      3.869(CFS)
Time of concentration =    9.23 min.
Rainfall intensity =     3.641(In/Hr)
Summary of stream data:

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


1        8.599     11.02                 3.301
2        3.869      9.23                 3.641
Largest stream flow has longer time of concentration
Qp =      8.599 + sum of
        Qb         Ia/Ib
         3.869 *    0.907 =      3.508
Qp =     12.107

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.599       3.869
Area of streams before confluence:
        3.160        1.190
```

```
Results of confluence:
Total flow rate =     12.107(CFS)
Time of concentration =    11.025 min.
Effective stream area after confluence =      4.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   699.000(Ft.)
Top (of initial area) elevation =  1930.000(Ft.)
Bottom (of initial area) elevation =  1704.000(Ft.)
Difference in elevation =   226.000(Ft.)
Slope =    0.32332  s(percent)=      32.33
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.221 min.
Rainfall intensity =      3.119(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      9.074(CFS)
Total initial stream area =        3.600(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      601.000 to Point/Station      602.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1704.000(Ft.)
Downstream point elevation =  1625.500(Ft.)
Channel length thru subarea  =   472.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     17.930(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     17.930(CFS)
Depth of flow =   0.508(Ft.), Average velocity =   7.805(Ft/s)
Channel flow top width =    6.047(Ft.)
Flow Velocity =    7.81(Ft/s)
Travel time  =    1.01 min.
Time of concentration =   13.23 min.

Sub-Channel No. 1 Critical depth =      0.797(Ft.)
```

```
  '     '       '     Critical flow top width =      7.781(Ft.)
  '     '       '     Critical flow velocity=    4.174(Ft/s)
  '     '       '     Critical flow area =      4.296(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.986(In/Hr) for a   100.0 year storm
Subarea runoff =     17.656(CFS) for      7.350(Ac.)
Total runoff =     26.730(CFS)   Total area =      10.950(Ac.)
Depth of flow =   0.626(Ft.), Average velocity =   8.750(Ft/s)

Sub-Channel No. 1 Critical depth =      0.984(Ft.)
  '     '       '     Critical flow top width =      8.906(Ft.)
  '     '       '     Critical flow velocity=    4.561(Ft/s)
  '     '       '     Critical flow area =      5.860(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      603.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1625.500(Ft.)
Downstream point/station elevation =  1614.000(Ft.)
Pipe length  =   112.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.730(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    26.730(CFS)
Normal flow depth in pipe =   12.12(In.)
Flow top width inside pipe =   16.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.14(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    13.32 min.


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Process from Point/Station      602.000 to Point/Station      603.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.950(Ac.)
Runoff from this stream =     26.730(CFS)
Time of concentration =   13.32 min.
Rainfall intensity =     2.975(In/Hr)
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Process from Point/Station      604.000 to Point/Station      605.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   770.000(Ft.)
Top (of initial area) elevation =  1646.000(Ft.)
Bottom (of initial area) elevation =  1626.400(Ft.)
Difference in elevation =    19.600(Ft.)
Slope =    0.02545  s(percent)=       2.55
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.924 min.
Rainfall intensity =      3.708(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 = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.883(CFS)
Total initial stream area =        1.180(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      605.000 to Point/Station      605.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     8.92 min.
Rainfall intensity =      3.708(In/Hr) for a   100.0 year storm
Subarea runoff =      0.335(CFS) for      0.110(Ac.)
Total runoff =      4.218(CFS)   Total area =       1.290(Ac.)


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Process from Point/Station      605.000 to Point/Station      606.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1621.000(Ft.)
Downstream point/station elevation =  1620.300(Ft.)
Pipe length  =    68.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =     4.218(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.218(CFS)
Normal flow depth in pipe =    8.75(In.)
Flow top width inside pipe =   14.79(In.)
Critical Depth =    9.97(In.)
Pipe flow velocity =      5.67(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     9.12 min.


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Process from Point/Station      605.000 to Point/Station      606.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.290(Ac.)
Runoff from this stream =      4.218(CFS)
Time of concentration =    9.12 min.
Rainfall intensity =     3.663(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      610.000 to Point/Station      612.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   497.000(Ft.)
Top (of initial area) elevation =  1727.000(Ft.)
Bottom (of initial area) elevation =  1624.000(Ft.)
Difference in elevation =   103.000(Ft.)
Slope =    0.20724  s(percent)=      20.72
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.655 min.
Rainfall intensity =      3.201(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.842(CFS)
Total initial stream area =        0.710(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      612.000 to Point/Station      614.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1624.000(Ft.)
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Downstream point/station elevation =  1612.000(Ft.)
Pipe length  =    95.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.842(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.842(CFS)
Normal flow depth in pipe =    4.55(In.)
Flow top width inside pipe =    5.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.53(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    11.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      612.000 to Point/Station      614.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.710(Ac.)
Runoff from this stream =      1.842(CFS)
Time of concentration =   11.79 min.
Rainfall intensity =     3.181(In/Hr)
Summary of stream data:

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


1       26.730     13.32                2.975
2        4.218      9.12                3.663
3        1.842     11.79                3.181
Largest stream flow has longer time of concentration
Qp =     26.730 + sum of
        Qb         Ia/Ib
         4.218 *    0.812 =      3.426
        Qb         Ia/Ib
         1.842 *    0.935 =      1.723
Qp =     31.879

Total of 3 streams to confluence:
Flow rates before confluence point:
      26.730       4.218       1.842
Area of streams before confluence:
       10.950        1.290        0.710
Results of confluence:
Total flow rate =     31.879(CFS)
Time of concentration =    13.318 min.
Effective stream area after confluence =     12.950(Ac.)


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Process from Point/Station      700.000 to Point/Station      702.000
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```
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1966.300(Ft.)
Bottom (of initial area) elevation =  1623.500(Ft.)
Difference in elevation =   342.800(Ft.)
Slope =    0.34280  s(percent)=      34.28
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.940 min.
Rainfall intensity =      2.901(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.078(CFS)
Total initial stream area =        6.050(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      702.000 to Point/Station      704.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1623.500(Ft.)
Downstream point/station elevation =  1623.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.078(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    14.078(CFS)
Normal flow depth in pipe =   17.48(In.)
Flow top width inside pipe =   15.68(In.)
Critical Depth =   16.72(In.)
Pipe flow velocity =      6.58(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    14.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      702.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      6.050(Ac.)
Runoff from this stream =     14.078(CFS)
Time of concentration =   14.10 min.
Rainfall intensity =     2.883(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      710.000 to Point/Station      712.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   903.000(Ft.)
Top (of initial area) elevation =  1966.500(Ft.)
Bottom (of initial area) elevation =  1620.000(Ft.)
Difference in elevation =   346.500(Ft.)
Slope =    0.38372  s(percent)=      38.37
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.084 min.
Rainfall intensity =      3.004(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.143(CFS)
Total initial stream area =        2.540(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      712.000 to Point/Station      714.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1620.000(Ft.)
Downstream point/station elevation =  1614.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.143(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.143(CFS)
Normal flow depth in pipe =    6.12(In.)
Flow top width inside pipe =   12.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.25(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    13.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      712.000 to Point/Station      714.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.540(Ac.)
Runoff from this stream =      6.143(CFS)
Time of concentration =   13.14 min.
Rainfall intensity =     2.997(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      720.000 to Point/Station      722.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   938.000(Ft.)
Top (of initial area) elevation =  1922.000(Ft.)
Bottom (of initial area) elevation =  1617.000(Ft.)
Difference in elevation =   305.000(Ft.)
Slope =    0.32516  s(percent)=      32.52
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.732 min.
Rainfall intensity =      2.925(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.803
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.262(CFS)
Total initial stream area =        4.370(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      722.000 to Point/Station      724.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1617.000(Ft.)
Downstream point/station elevation =  1614.000(Ft.)
Pipe length  =    56.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.262(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.262(CFS)
Normal flow depth in pipe =    9.13(In.)
Flow top width inside pipe =   14.64(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.13(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    13.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      722.000 to Point/Station      724.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      4.370(Ac.)
Runoff from this stream =     10.262(CFS)
```

```
Time of concentration =   13.80 min.
Rainfall intensity =     2.917(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      730.000 to Point/Station      732.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   798.000(Ft.)
Top (of initial area) elevation =  1627.500(Ft.)
Bottom (of initial area) elevation =  1618.500(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01128  s(percent)=       1.13
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   25.212 min.
Rainfall intensity =      2.094(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.770
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.596(CFS)
Total initial stream area =        0.370(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      732.000 to Point/Station      734.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1618.500(Ft.)
Downstream point/station elevation =  1618.000(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.596(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.596(CFS)
Normal flow depth in pipe =    4.04(In.)
Flow top width inside pipe =    5.63(In.)
Critical Depth =    4.71(In.)
Pipe flow velocity =      4.24(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    25.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      734.000 to Point/Station      734.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
```

```
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    25.32 min.
Rainfall intensity =      2.089(In/Hr) for a   100.0 year storm
Subarea runoff =      1.360(CFS) for      0.740(Ac.)
Total runoff =      1.957(CFS)   Total area =       1.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      734.000 to Point/Station      736.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1618.000(Ft.)
Downstream point/station elevation =  1617.500(Ft.)
Pipe length  =    22.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.957(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.957(CFS)
Normal flow depth in pipe =    6.00(In.)
Flow top width inside pipe =    8.49(In.)
Critical Depth =    7.64(In.)
Pipe flow velocity =      6.25(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    25.38 min.


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Process from Point/Station      734.000 to Point/Station      736.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      1.110(Ac.)
Runoff from this stream =      1.957(CFS)
Time of concentration =   25.38 min.
Rainfall intensity =     2.087(In/Hr)
Summary of stream data:

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


1       14.078     14.10                2.883
2        6.143     13.14                2.997
3       10.262     13.80                2.917
4        1.957     25.38                2.087
Largest stream flow has longer or shorter time of concentration
Qp =     14.078 + sum of
```

```
        Qb          Ia/Ib
         6.143 *    0.962 =      5.909
        Qb          Ia/Ib
        10.262 *    0.988 =     10.141
        Qa          Tb/Ta
         1.957 *    0.556 =      1.087
Qp =     31.215

Total of 4 streams to confluence:
Flow rates before confluence point:
      14.078       6.143      10.262       1.957
Area of streams before confluence:
        6.050        2.540        4.370        1.110
Results of confluence:
Total flow rate =     31.215(CFS)
Time of concentration =    14.104 min.
Effective stream area after confluence =     14.070(Ac.)


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Process from Point/Station      800.000 to Point/Station      802.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   506.000(Ft.)
Top (of initial area) elevation =  1963.000(Ft.)
Bottom (of initial area) elevation =  1722.000(Ft.)
Difference in elevation =   241.000(Ft.)
Slope =    0.47628  s(percent)=      47.63
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.939 min.
Rainfall intensity =      3.495(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.077(CFS)
Total initial stream area =        4.930(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      802.000 to Point/Station      804.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1722.000(Ft.)
Downstream point elevation =  1595.600(Ft.)
Channel length thru subarea  =   878.000(Ft.)
Channel base width    =    3.000(Ft.)
```

```
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =     34.485(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     34.485(CFS)
Depth of flow =   0.702(Ft.), Average velocity =   8.450(Ft/s)
Channel flow top width =    8.620(Ft.)
Flow Velocity =    8.45(Ft/s)
Travel time  =    1.73 min.
Time of concentration =   11.67 min.

Sub-Channel No. 1 Critical depth =      1.047(Ft.)
  '     '       '     Critical flow top width =     11.375(Ft.)
  '     '       '     Critical flow velocity=    4.583(Ft/s)
  '     '       '     Critical flow area =      7.524(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.199(In/Hr) for a   100.0 year storm
Subarea runoff =     40.746(CFS) for     15.720(Ac.)
Total runoff =     54.823(CFS)   Total area =      20.650(Ac.)
Depth of flow =   0.879(Ft.), Average velocity =   9.566(Ft/s)

Sub-Channel No. 1 Critical depth =      1.313(Ft.)
  '     '       '     Critical flow top width =     13.500(Ft.)
  '     '       '     Critical flow velocity=    5.063(Ft/s)
  '     '       '     Critical flow area =     10.828(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      806.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1595.600(Ft.)
Downstream point/station elevation =  1592.600(Ft.)
Pipe length  =    79.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.823(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    54.823(CFS)
Normal flow depth in pipe =   20.18(In.)
Flow top width inside pipe =   23.46(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.20(Ft/s)
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```
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    11.75 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      806.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.650(Ac.)
Runoff from this stream =     54.823(CFS)
Time of concentration =   11.75 min.
Rainfall intensity =     3.188(In/Hr)


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Process from Point/Station      810.000 to Point/Station      812.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   626.000(Ft.)
Top (of initial area) elevation =  1972.200(Ft.)
Bottom (of initial area) elevation =  1652.000(Ft.)
Difference in elevation =   320.200(Ft.)
Slope =    0.51150  s(percent)=      51.15
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.669 min.
Rainfall intensity =      3.361(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.617(CFS)
Total initial stream area =        3.880(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      812.000 to Point/Station      814.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1652.000(Ft.)
Downstream point elevation =  1591.000(Ft.)
Channel length thru subarea  =   542.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =     17.146(CFS)
Manning's 'N'    = 0.040
```

```
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     17.146(CFS)
Depth of flow =   0.526(Ft.), Average velocity =   6.379(Ft/s)
Channel flow top width =    7.212(Ft.)
Flow Velocity =    6.38(Ft/s)
Travel time  =    1.42 min.
Time of concentration =   12.09 min.

Sub-Channel No. 1 Critical depth =      0.727(Ft.)
  '     '       '     Critical flow top width =      8.813(Ft.)
  '     '       '     Critical flow velocity=    3.996(Ft/s)
  '     '       '     Critical flow area =      4.291(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.138(In/Hr) for a   100.0 year storm
Subarea runoff =     12.994(CFS) for      5.120(Ac.)
Total runoff =     23.610(CFS)   Total area =       9.000(Ac.)
Depth of flow =   0.619(Ft.), Average velocity =   6.969(Ft/s)

Sub-Channel No. 1 Critical depth =      0.859(Ft.)
  '     '       '     Critical flow top width =      9.875(Ft.)
  '     '       '     Critical flow velocity=    4.268(Ft/s)
  '     '       '     Critical flow area =      5.532(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      814.000 to Point/Station      816.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1591.000(Ft.)
Downstream point/station elevation =  1584.000(Ft.)
Pipe length  =    56.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.610(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    23.610(CFS)
Normal flow depth in pipe =   10.42(In.)
Flow top width inside pipe =   17.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.26(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    12.13 min.
```

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Process from Point/Station      814.000 to Point/Station      816.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      9.000(Ac.)
Runoff from this stream =     23.610(CFS)
Time of concentration =   12.13 min.
Rainfall intensity =     3.132(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      820.000 to Point/Station      822.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Initial area flow distance =   692.000(Ft.)
Top (of initial area) elevation =  1992.300(Ft.)
Bottom (of initial area) elevation =  1712.000(Ft.)
Difference in elevation =   280.300(Ft.)
Slope =    0.40506  s(percent)=      40.51
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.636 min.
Rainfall intensity =      3.204(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.464(CFS)
Total initial stream area =        5.570(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      822.000 to Point/Station      824.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1712.000(Ft.)
Downstream point elevation =  1583.700(Ft.)
Channel length thru subarea  =   918.000(Ft.)
Channel base width    =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =     27.975(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     27.975(CFS)
Depth of flow =   0.638(Ft.), Average velocity =   7.897(Ft/s)
Channel flow top width =    8.104(Ft.)
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Flow Velocity =    7.90(Ft/s)
Travel time  =    1.94 min.
Time of concentration =   13.57 min.

Sub-Channel No. 1 Critical depth =      0.938(Ft.)
  '     '       '     Critical flow top width =     10.500(Ft.)
  '     '       '     Critical flow velocity=    4.421(Ft/s)
  '     '       '     Critical flow area =      6.328(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.803
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.944(In/Hr) for a   100.0 year storm
Subarea runoff =     26.937(CFS) for     11.390(Ac.)
Total runoff =     41.401(CFS)   Total area =      16.960(Ac.)
Depth of flow =   0.774(Ft.), Average velocity =   8.780(Ft/s)

Sub-Channel No. 1 Critical depth =      1.141(Ft.)
  '     '       '     Critical flow top width =     12.125(Ft.)
  '     '       '     Critical flow velocity=    4.800(Ft/s)
  '     '       '     Critical flow area =      8.626(Sq.Ft)



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Process from Point/Station      824.000 to Point/Station      826.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1583.700(Ft.)
Downstream point/station elevation =  1583.000(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    41.401(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    41.401(CFS)
Normal flow depth in pipe =   22.64(In.)
Flow top width inside pipe =   25.82(In.)
Critical Depth =   25.90(In.)
Pipe flow velocity =     10.41(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    13.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      824.000 to Point/Station      826.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
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Along Main Stream number: 1 in normal stream number 3
Stream flow area =     16.960(Ac.)
Runoff from this stream =     41.401(CFS)
Time of concentration =   13.67 min.
Rainfall intensity =     2.933(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      830.000 to Point/Station      832.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   528.000(Ft.)
Top (of initial area) elevation =  1702.800(Ft.)
Bottom (of initial area) elevation =  1594.000(Ft.)
Difference in elevation =   108.800(Ft.)
Slope =    0.20606  s(percent)=      20.61
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.954 min.
Rainfall intensity =      3.157(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair 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 = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.522(CFS)
Total initial stream area =        1.770(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      832.000 to Point/Station      834.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1594.000(Ft.)
Downstream point/station elevation =  1585.000(Ft.)
Pipe length  =    55.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.522(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.522(CFS)
Normal flow depth in pipe =    5.42(In.)
Flow top width inside pipe =    8.81(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.26(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.01 min.


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Process from Point/Station      832.000 to Point/Station      834.000
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```
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      1.770(Ac.)
Runoff from this stream =      4.522(CFS)
Time of concentration =   12.01 min.
Rainfall intensity =     3.149(In/Hr)
Summary of stream data:

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


1       54.823     11.75                 3.188
2       23.610     12.13                 3.132
3       41.401     13.67                 2.933
4        4.522     12.01                 3.149
Largest stream flow has longer or shorter time of concentration
Qp =     54.823 + sum of
        Qa          Tb/Ta
        23.610 *    0.969 =     22.871
        Qa          Tb/Ta
        41.401 *    0.860 =     35.588
        Qa          Tb/Ta
         4.522 *    0.978 =      4.423
Qp =    117.705

Total of 4 streams to confluence:
Flow rates before confluence point:
      54.823      23.610      41.401       4.522
Area of streams before confluence:
       20.650        9.000       16.960        1.770
Results of confluence:
Total flow rate =    117.705(CFS)
Time of concentration =    11.747 min.
Effective stream area after confluence =     48.380(Ac.)


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Process from Point/Station      800.000 to Point/Station      834.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     48.380(Ac.)
Runoff from this stream =    117.705(CFS)
Time of concentration =   11.75 min.
Rainfall intensity =     3.188(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      840.000 to Point/Station      842.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Initial area flow distance =   802.000(Ft.)
Top (of initial area) elevation =  1618.000(Ft.)
Bottom (of initial area) elevation =  1600.000(Ft.)
Difference in elevation =    18.000(Ft.)
Slope =    0.02244  s(percent)=       2.24
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   22.014 min.
Rainfall intensity =      2.257(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.778
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.246(CFS)
Total initial stream area =        0.710(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      842.000 to Point/Station      844.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1600.000(Ft.)
Downstream point/station elevation =  1599.500(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.246(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.246(CFS)
Normal flow depth in pipe =    4.62(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    6.17(In.)
Pipe flow velocity =      5.46(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    22.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      842.000 to Point/Station      844.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    22.09 min.
Rainfall intensity =      2.252(In/Hr) for a   100.0 year storm
Subarea runoff =      1.588(CFS) for      0.800(Ac.)
Total runoff =      2.834(CFS)   Total area =       1.510(Ac.)


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Process from Point/Station      844.000 to Point/Station      846.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1599.500(Ft.)
Downstream point/station elevation =  1597.000(Ft.)
Pipe length  =    11.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.834(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.834(CFS)
Normal flow depth in pipe =    3.73(In.)
Flow top width inside pipe =    8.87(In.)
Critical Depth =    8.55(In.)
Pipe flow velocity =     16.39(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    22.10 min.


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Process from Point/Station      844.000 to Point/Station      846.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.510(Ac.)
Runoff from this stream =      2.834(CFS)
Time of concentration =   22.10 min.
Rainfall intensity =     2.252(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      850.000 to Point/Station      852.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   295.000(Ft.)
Top (of initial area) elevation =  1596.000(Ft.)
Bottom (of initial area) elevation =  1593.800(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.00746  s(percent)=       0.75
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.394 min.
Rainfall intensity =      2.491(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.314(CFS)
Total initial stream area =        0.160(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      852.000 to Point/Station      854.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1593.800(Ft.)
Downstream point/station elevation =  1593.300(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.314(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.314(CFS)
Normal flow depth in pipe =    2.59(In.)
Flow top width inside pipe =    5.94(In.)
Critical Depth =    3.40(In.)
Pipe flow velocity =      3.86(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    18.50 min.


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Process from Point/Station      852.000 to Point/Station      854.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    18.50 min.
Rainfall intensity =      2.483(In/Hr) for a   100.0 year storm
Subarea runoff =      0.920(CFS) for      0.420(Ac.)
Total runoff =      1.234(CFS)   Total area =       0.580(Ac.)


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Process from Point/Station      854.000 to Point/Station      856.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1593.300(Ft.)
Downstream point/station elevation =  1585.000(Ft.)
```

```
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.234(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.234(CFS)
Normal flow depth in pipe =    2.42(In.)
Flow top width inside pipe =    5.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.67(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    18.52 min.


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Process from Point/Station      854.000 to Point/Station      856.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.580(Ac.)
Runoff from this stream =      1.234(CFS)
Time of concentration =   18.52 min.
Rainfall intensity =     2.482(In/Hr)


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Process from Point/Station      860.000 to Point/Station      862.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   371.000(Ft.)
Top (of initial area) elevation =  1595.000(Ft.)
Bottom (of initial area) elevation =  1590.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.01348  s(percent)=       1.35
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.910 min.
Rainfall intensity =      2.528(In/Hr) for a   100.0 year storm
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.539(CFS)
Total initial stream area =        0.270(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station      862.000 to Point/Station      864.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
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```
Upstream point/station elevation =  1590.000(Ft.)
Downstream point/station elevation =  1589.500(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.539(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.539(CFS)
Normal flow depth in pipe =    3.57(In.)
Flow top width inside pipe =    5.89(In.)
Critical Depth =    4.49(In.)
Pipe flow velocity =      4.41(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    18.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      862.000 to Point/Station      864.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    18.00 min.
Rainfall intensity =      2.521(In/Hr) for a   100.0 year storm
Subarea runoff =      1.291(CFS) for      0.580(Ac.)
Total runoff =      1.829(CFS)   Total area =       0.850(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      864.000 to Point/Station      866.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1589.500(Ft.)
Downstream point/station elevation =  1583.900(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.829(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.829(CFS)
Normal flow depth in pipe =    2.77(In.)
Flow top width inside pipe =    5.98(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.65(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    18.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      840.000 to Point/Station      866.000
```

```
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.850(Ac.)
Runoff from this stream =      1.829(CFS)
Time of concentration =   18.01 min.
Rainfall intensity =     2.520(In/Hr)
Summary of stream data:

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


1        2.834     22.10                2.252
2        1.234     18.52                2.482
3        1.829     18.01                2.520
Largest stream flow has longer time of concentration
Qp =      2.834 + sum of
        Qb         Ia/Ib
         1.234 *    0.907 =      1.120
        Qb         Ia/Ib
         1.829 *    0.894 =      1.634
Qp =      5.588

Total of 3 streams to confluence:
Flow rates before confluence point:
       2.834       1.234       1.829
Area of streams before confluence:
        1.510        0.580        0.850
Results of confluence:
Total flow rate =      5.588(CFS)
Time of concentration =    22.099 min.
Effective stream area after confluence =      2.940(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      840.000 to Point/Station      866.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.940(Ac.)
Runoff from this stream =      5.588(CFS)
Time of concentration =   22.10 min.
Rainfall intensity =     2.252(In/Hr)
Summary of stream data:

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


1      117.705     11.75            3.188
```

```
2        5.588     22.10            2.252
Largest stream flow has longer or shorter time of concentration
Qp =    117.705 + sum of
       Qa          Tb/Ta
        5.588 *    0.532 =      2.971
Qp =    120.676

Total of 2 main streams to confluence:
Flow rates before confluence point:
     117.705       5.588
Area of streams before confluence:
       48.380        2.940


Results of confluence:
Total flow rate =    120.676(CFS)
Time of concentration =    11.747 min.
Effective stream area after confluence  =     51.320(Ac.)
End of computations, total study area =          272.05 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.944
Area averaged RI index number =  78.1
```

APPENDIX B

MAJOR BASIN 200
10-YEAR SYNTHETIC HYDROGRAPH ANALYSES

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

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Study date 12/15/17 File: e200110.out

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

Program License Serial Number 4028

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

English Units used in output format

Tentative Tract 35853
Existing Conditions
10-Year, 1-Hour Storm
Basin 200

Drainage Area = 89.22(Ac.) = 0.139 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 89.22(Ac.)=0.139 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.204 Hr.
Lag time = 12.24 Min.
25% of lag time = 3.06 Min.
40% of lag time = 4.90 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
89.22	0.54	48.18

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
89.22	1.26	112.42

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 0.540(In)
Area Averaged 100-Year Rainfall = 1.260(In)

Point rain (area averaged) = 0.836(In)
Areal adjustment factor = 99.92 %
Adjusted average point rain = 0.836(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
89.220	81.00	0.000

Total Area Entered = 89.22(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
81.0	81.0	0.233	0.000	0.233	1.000	0.233

Sum (F) = 0.233

Area averaged mean soil loss (F) (In/Hr) = 0.233
Minimum soil loss rate ((In/Hr)) = 0.116
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

Slope of intensity-duration curve for a 1 hour storm =0.5500

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	40.850	3.225	2.900
2	0.167	81.699	12.277	11.039
3	0.250	122.549	32.515	29.237
4	0.333	163.399	21.507	19.338
5	0.417	204.248	9.805	8.816
6	0.500	245.098	6.505	5.849
7	0.583	285.948	4.625	4.159
8	0.667	326.797	3.309	2.975
9	0.750	367.647	2.268	2.039
10	0.833	408.497	1.508	1.356
11	0.917	449.346	0.703	0.632
12	1.000	490.196	0.451	0.405
13	1.083	531.046	0.361	0.325
14	1.167	571.895	0.262	0.235
15	1.250	612.745	0.310	0.279
16	1.333	653.595	0.202	0.181
17	1.417	694.444	0.116	0.104
18	1.500	735.294	0.052	0.047

```
                                   Sum = 100.000   Sum=      89.917
------------------------------------------------------------------------
```

The following loss rate calculations reflect use of the minimum calculated loss
rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	3.30	0.331	0.233	(0.298)	0.098
2	0.17	4.20	0.421	0.233	(0.379)	0.189
3	0.25	4.40	0.441	0.233	(0.397)	0.209
4	0.33	4.80	0.481	0.233	(0.433)	0.249
5	0.42	5.20	0.521	0.233	(0.469)	0.289
6	0.50	6.20	0.622	0.233	(0.559)	0.389
7	0.58	6.80	0.682	0.233	(0.614)	0.449
8	0.67	8.80	0.882	0.233	(0.794)	0.650
9	0.75	13.90	1.394	0.233	(1.254)	1.161
10	0.83	31.40	3.148	0.233	(2.833)	2.916
11	0.92	7.20	0.722	0.233	(0.650)	0.489
12	1.00	3.80	0.381	0.233	(0.343)	0.148

(Loss Rate Not Used)

Sum = 100.0 Sum = 7.2

```
 Flood volume = Effective rainfall      0.60(In)
  times area      89.2(Ac.)/[(In)/(Ft.)] =       4.5(Ac.Ft)
 Total soil loss =      0.23(In)
 Total soil loss =     1.729(Ac.Ft)
 Total rainfall =      0.84(In)
 Flood volume =      195272.6 Cubic Feet
 Total soil loss =       75331.8 Cubic Feet
 ---------------------------------------------------------------------
  Peak flow rate of this hydrograph =    125.378(CFS)
 ---------------------------------------------------------------------
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                     1 - H O U R    S T O R M
                R u n o f f      H y d r o g r a p h
 ---------------------------------------------------------------------
             Hydrograph in   5   Minute intervals ((CFS))

 ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       50.0     100.0     150.0     200.0
---------------------------------------------------------------------------
  0+ 5       0.0020      0.29  Q         |         |         |         |
  0+10       0.0132      1.63  Q         |         |         |         |
  0+15       0.0515      5.56  VQ        |         |         |         |
  0+20       0.1234     10.44  |VQ       |         |         |         |
  0+25       0.2212     14.20  |VQ       |         |         |         |
  0+30       0.3443     17.87  |  Q      |         |         |         |
  0+35       0.4972     22.21  |   Q     |         |         |         |
  0+40       0.6922     28.30  |    QV   |         |         |         |
```

```
0+45       0.9459     36.84  |      QV |          |          |          |
0+50       1.3335     56.28  |         |Q         |          |          |
0+55       1.9470     89.08  |         |      Q   |          |          |
1+ 0       2.8105    125.38  |         |          |    Q     |          |
1+ 5       3.4345     90.60  |         |        Q |          V          |
1+10       3.7917     51.87  |         Q          |          |  V       |
1+15       4.0182     32.88  |     Q    |         |          |    V     |
1+20       4.1715     22.26  |   Q      |         |          |      V   |
1+25       4.2785     15.53  |  Q       |         |          |       V  |
1+30       4.3509     10.52  | Q        |         |          |       V  |
1+35       4.3976      6.79  |Q         |         |          |        V |
1+40       4.4238      3.79  Q          |         |          |        V |
1+45       4.4407      2.46  Q          |         |          |        V |
1+50       4.4533      1.83  Q          |         |          |        V |
1+55       4.4630      1.41  Q          |         |          |        V |
2+ 0       4.4718      1.28  Q          |         |          |        V |
2+ 5       4.4777      0.85  Q          |         |          |        V |
2+10       4.4811      0.49  Q          |         |          |        V |
2+15       4.4825      0.21  Q          |         |          |        V |
2+20       4.4828      0.04  Q          |         |          |        V |
2+25       4.4828      0.01  Q          |         |          |        V |
-------------------------------------------------------------------------
```

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

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Study date 12/15/17 File: e2002410.out

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

Program License Serial Number 4028

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

English Units used in output format

Tentative Tract 35853
Existing Conditions
10-Year, 24-Hour Storm
Basin 200

Drainage Area = 89.22(Ac.) = 0.139 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 89.22(Ac.)=0.139 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.204 Hr.
Lag time = 12.24 Min.
25% of lag time = 3.06 Min.
40% of lag time = 4.90 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
89.22	2.28	203.42

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
89.22	5.20	463.94

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 2.280(In)
Area Averaged 100-Year Rainfall = 5.200(In)

Point rain (area averaged) = 3.481(In)
Areal adjustment factor = 99.98 %
Adjusted average point rain = 3.481(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
89.220	81.00	0.000

Total Area Entered = 89.22(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
81.0	81.0	0.233	0.000	0.233	1.000	0.233

Sum (F) = 0.233

Area averaged mean soil loss (F) (In/Hr) = 0.233
Minimum soil loss rate ((In/Hr)) = 0.116
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	40.850	3.225	2.900
2	0.167	81.699	12.277	11.039
3	0.250	122.549	32.515	29.237
4	0.333	163.399	21.507	19.338
5	0.417	204.248	9.805	8.816
6	0.500	245.098	6.505	5.849
7	0.583	285.948	4.625	4.159
8	0.667	326.797	3.309	2.975
9	0.750	367.647	2.268	2.039
10	0.833	408.497	1.508	1.356
11	0.917	449.346	0.703	0.632
12	1.000	490.196	0.451	0.405
13	1.083	531.046	0.361	0.325
14	1.167	571.895	0.262	0.235
15	1.250	612.745	0.310	0.279
16	1.333	653.595	0.202	0.181
17	1.417	694.444	0.116	0.104
18	1.500	735.294	0.052	0.047
			Sum = 100.000	Sum= 89.917

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.028	(0.412)	0.025	0.003
2	0.17	0.07	0.028	(0.411)	0.025	0.003
3	0.25	0.07	0.028	(0.409)	0.025	0.003
4	0.33	0.10	0.042	(0.408)	0.038	0.004
5	0.42	0.10	0.042	(0.406)	0.038	0.004
6	0.50	0.10	0.042	(0.404)	0.038	0.004
7	0.58	0.10	0.042	(0.403)	0.038	0.004
8	0.67	0.10	0.042	(0.401)	0.038	0.004
9	0.75	0.10	0.042	(0.400)	0.038	0.004
10	0.83	0.13	0.056	(0.398)	0.050	0.006
11	0.92	0.13	0.056	(0.397)	0.050	0.006
12	1.00	0.13	0.056	(0.395)	0.050	0.006
13	1.08	0.10	0.042	(0.393)	0.038	0.004
14	1.17	0.10	0.042	(0.392)	0.038	0.004
15	1.25	0.10	0.042	(0.390)	0.038	0.004
16	1.33	0.10	0.042	(0.389)	0.038	0.004
17	1.42	0.10	0.042	(0.387)	0.038	0.004
18	1.50	0.10	0.042	(0.386)	0.038	0.004
19	1.58	0.10	0.042	(0.384)	0.038	0.004
20	1.67	0.10	0.042	(0.383)	0.038	0.004
21	1.75	0.10	0.042	(0.381)	0.038	0.004
22	1.83	0.13	0.056	(0.379)	0.050	0.006
23	1.92	0.13	0.056	(0.378)	0.050	0.006
24	2.00	0.13	0.056	(0.376)	0.050	0.006
25	2.08	0.13	0.056	(0.375)	0.050	0.006
26	2.17	0.13	0.056	(0.373)	0.050	0.006
27	2.25	0.13	0.056	(0.372)	0.050	0.006
28	2.33	0.13	0.056	(0.370)	0.050	0.006
29	2.42	0.13	0.056	(0.369)	0.050	0.006
30	2.50	0.13	0.056	(0.367)	0.050	0.006
31	2.58	0.17	0.070	(0.366)	0.063	0.007
32	2.67	0.17	0.070	(0.364)	0.063	0.007
33	2.75	0.17	0.070	(0.363)	0.063	0.007
34	2.83	0.17	0.070	(0.361)	0.063	0.007
35	2.92	0.17	0.070	(0.360)	0.063	0.007
36	3.00	0.17	0.070	(0.358)	0.063	0.007
37	3.08	0.17	0.070	(0.357)	0.063	0.007
38	3.17	0.17	0.070	(0.355)	0.063	0.007
39	3.25	0.17	0.070	(0.354)	0.063	0.007
40	3.33	0.17	0.070	(0.352)	0.063	0.007
41	3.42	0.17	0.070	(0.351)	0.063	0.007
42	3.50	0.17	0.070	(0.350)	0.063	0.007
43	3.58	0.17	0.070	(0.348)	0.063	0.007

44	3.67	0.17	0.070	(0.347)	0.063	0.007
45	3.75	0.17	0.070	(0.345)	0.063	0.007
46	3.83	0.20	0.084	(0.344)	0.075	0.008
47	3.92	0.20	0.084	(0.342)	0.075	0.008
48	4.00	0.20	0.084	(0.341)	0.075	0.008
49	4.08	0.20	0.084	(0.339)	0.075	0.008
50	4.17	0.20	0.084	(0.338)	0.075	0.008
51	4.25	0.20	0.084	(0.336)	0.075	0.008
52	4.33	0.23	0.097	(0.335)	0.088	0.010
53	4.42	0.23	0.097	(0.334)	0.088	0.010
54	4.50	0.23	0.097	(0.332)	0.088	0.010
55	4.58	0.23	0.097	(0.331)	0.088	0.010
56	4.67	0.23	0.097	(0.329)	0.088	0.010
57	4.75	0.23	0.097	(0.328)	0.088	0.010
58	4.83	0.27	0.111	(0.326)	0.100	0.011
59	4.92	0.27	0.111	(0.325)	0.100	0.011
60	5.00	0.27	0.111	(0.324)	0.100	0.011
61	5.08	0.20	0.084	(0.322)	0.075	0.008
62	5.17	0.20	0.084	(0.321)	0.075	0.008
63	5.25	0.20	0.084	(0.319)	0.075	0.008
64	5.33	0.23	0.097	(0.318)	0.088	0.010
65	5.42	0.23	0.097	(0.317)	0.088	0.010
66	5.50	0.23	0.097	(0.315)	0.088	0.010
67	5.58	0.27	0.111	(0.314)	0.100	0.011
68	5.67	0.27	0.111	(0.313)	0.100	0.011
69	5.75	0.27	0.111	(0.311)	0.100	0.011
70	5.83	0.27	0.111	(0.310)	0.100	0.011
71	5.92	0.27	0.111	(0.308)	0.100	0.011
72	6.00	0.27	0.111	(0.307)	0.100	0.011
73	6.08	0.30	0.125	(0.306)	0.113	0.013
74	6.17	0.30	0.125	(0.304)	0.113	0.013
75	6.25	0.30	0.125	(0.303)	0.113	0.013
76	6.33	0.30	0.125	(0.302)	0.113	0.013
77	6.42	0.30	0.125	(0.300)	0.113	0.013
78	6.50	0.30	0.125	(0.299)	0.113	0.013
79	6.58	0.33	0.139	(0.298)	0.125	0.014
80	6.67	0.33	0.139	(0.296)	0.125	0.014
81	6.75	0.33	0.139	(0.295)	0.125	0.014
82	6.83	0.33	0.139	(0.294)	0.125	0.014
83	6.92	0.33	0.139	(0.292)	0.125	0.014
84	7.00	0.33	0.139	(0.291)	0.125	0.014
85	7.08	0.33	0.139	(0.290)	0.125	0.014
86	7.17	0.33	0.139	(0.288)	0.125	0.014
87	7.25	0.33	0.139	(0.287)	0.125	0.014
88	7.33	0.37	0.153	(0.286)	0.138	0.015
89	7.42	0.37	0.153	(0.284)	0.138	0.015
90	7.50	0.37	0.153	(0.283)	0.138	0.015
91	7.58	0.40	0.167	(0.282)	0.150	0.017
92	7.67	0.40	0.167	(0.280)	0.150	0.017
93	7.75	0.40	0.167	(0.279)	0.150	0.017
94	7.83	0.43	0.181	(0.278)	0.163	0.018
95	7.92	0.43	0.181	(0.277)	0.163	0.018

96	8.00	0.43	0.181	(0.275)	0.163	0.018
97	8.08	0.50	0.209	(0.274)	0.188	0.021
98	8.17	0.50	0.209	(0.273)	0.188	0.021
99	8.25	0.50	0.209	(0.271)	0.188	0.021
100	8.33	0.50	0.209	(0.270)	0.188	0.021
101	8.42	0.50	0.209	(0.269)	0.188	0.021
102	8.50	0.50	0.209	(0.268)	0.188	0.021
103	8.58	0.53	0.223	(0.266)	0.200	0.022
104	8.67	0.53	0.223	(0.265)	0.200	0.022
105	8.75	0.53	0.223	(0.264)	0.200	0.022
106	8.83	0.57	0.237	(0.263)	0.213	0.024
107	8.92	0.57	0.237	(0.261)	0.213	0.024
108	9.00	0.57	0.237	(0.260)	0.213	0.024
109	9.08	0.63	0.265	(0.259)	0.238	0.026
110	9.17	0.63	0.265	(0.258)	0.238	0.026
111	9.25	0.63	0.265	(0.256)	0.238	0.026
112	9.33	0.67	0.278	(0.255)	0.251	0.028
113	9.42	0.67	0.278	(0.254)	0.251	0.028
114	9.50	0.67	0.278	(0.253)	0.251	0.028
115	9.58	0.70	0.292	0.252	(0.263)	0.041
116	9.67	0.70	0.292	0.250	(0.263)	0.042
117	9.75	0.70	0.292	0.249	(0.263)	0.043
118	9.83	0.73	0.306	0.248	(0.276)	0.058
119	9.92	0.73	0.306	0.247	(0.276)	0.059
120	10.00	0.73	0.306	0.246	(0.276)	0.061
121	10.08	0.50	0.209	(0.244)	0.188	0.021
122	10.17	0.50	0.209	(0.243)	0.188	0.021
123	10.25	0.50	0.209	(0.242)	0.188	0.021
124	10.33	0.50	0.209	(0.241)	0.188	0.021
125	10.42	0.50	0.209	(0.240)	0.188	0.021
126	10.50	0.50	0.209	(0.239)	0.188	0.021
127	10.58	0.67	0.278	0.237	(0.251)	0.041
128	10.67	0.67	0.278	0.236	(0.251)	0.042
129	10.75	0.67	0.278	0.235	(0.251)	0.043
130	10.83	0.67	0.278	0.234	(0.251)	0.045
131	10.92	0.67	0.278	0.233	(0.251)	0.046
132	11.00	0.67	0.278	0.232	(0.251)	0.047
133	11.08	0.63	0.265	0.230	(0.238)	0.034
134	11.17	0.63	0.265	0.229	(0.238)	0.035
135	11.25	0.63	0.265	0.228	(0.238)	0.036
136	11.33	0.63	0.265	0.227	(0.238)	0.037
137	11.42	0.63	0.265	0.226	(0.238)	0.039
138	11.50	0.63	0.265	0.225	(0.238)	0.040
139	11.58	0.57	0.237	(0.224)	0.213	0.024
140	11.67	0.57	0.237	(0.223)	0.213	0.024
141	11.75	0.57	0.237	(0.222)	0.213	0.024
142	11.83	0.60	0.251	0.220	(0.226)	0.030
143	11.92	0.60	0.251	0.219	(0.226)	0.031
144	12.00	0.60	0.251	0.218	(0.226)	0.032
145	12.08	0.83	0.348	0.217	(0.313)	0.131
146	12.17	0.83	0.348	0.216	(0.313)	0.132
147	12.25	0.83	0.348	0.215	(0.313)	0.133

148	12.33	0.87	0.362	0.214	(0.326)	0.148
149	12.42	0.87	0.362	0.213	(0.326)	0.149
150	12.50	0.87	0.362	0.212	(0.326)	0.150
151	12.58	0.93	0.390	0.211	(0.351)	0.179
152	12.67	0.93	0.390	0.210	(0.351)	0.180
153	12.75	0.93	0.390	0.209	(0.351)	0.181
154	12.83	0.97	0.404	0.207	(0.363)	0.196
155	12.92	0.97	0.404	0.206	(0.363)	0.197
156	13.00	0.97	0.404	0.205	(0.363)	0.198
157	13.08	1.13	0.473	0.204	(0.426)	0.269
158	13.17	1.13	0.473	0.203	(0.426)	0.270
159	13.25	1.13	0.473	0.202	(0.426)	0.271
160	13.33	1.13	0.473	0.201	(0.426)	0.272
161	13.42	1.13	0.473	0.200	(0.426)	0.273
162	13.50	1.13	0.473	0.199	(0.426)	0.274
163	13.58	0.77	0.320	0.198	(0.288)	0.122
164	13.67	0.77	0.320	0.197	(0.288)	0.123
165	13.75	0.77	0.320	0.196	(0.288)	0.124
166	13.83	0.77	0.320	0.195	(0.288)	0.125
167	13.92	0.77	0.320	0.194	(0.288)	0.126
168	14.00	0.77	0.320	0.193	(0.288)	0.127
169	14.08	0.90	0.376	0.192	(0.338)	0.184
170	14.17	0.90	0.376	0.191	(0.338)	0.185
171	14.25	0.90	0.376	0.190	(0.338)	0.186
172	14.33	0.87	0.362	0.189	(0.326)	0.173
173	14.42	0.87	0.362	0.188	(0.326)	0.174
174	14.50	0.87	0.362	0.187	(0.326)	0.175
175	14.58	0.87	0.362	0.186	(0.326)	0.176
176	14.67	0.87	0.362	0.185	(0.326)	0.177
177	14.75	0.87	0.362	0.184	(0.326)	0.178
178	14.83	0.83	0.348	0.184	(0.313)	0.165
179	14.92	0.83	0.348	0.183	(0.313)	0.165
180	15.00	0.83	0.348	0.182	(0.313)	0.166
181	15.08	0.80	0.334	0.181	(0.301)	0.153
182	15.17	0.80	0.334	0.180	(0.301)	0.154
183	15.25	0.80	0.334	0.179	(0.301)	0.155
184	15.33	0.77	0.320	0.178	(0.288)	0.142
185	15.42	0.77	0.320	0.177	(0.288)	0.143
186	15.50	0.77	0.320	0.176	(0.288)	0.144
187	15.58	0.63	0.265	0.175	(0.238)	0.089
188	15.67	0.63	0.265	0.174	(0.238)	0.090
189	15.75	0.63	0.265	0.173	(0.238)	0.091
190	15.83	0.63	0.265	0.173	(0.238)	0.092
191	15.92	0.63	0.265	0.172	(0.238)	0.093
192	16.00	0.63	0.265	0.171	(0.238)	0.094
193	16.08	0.13	0.056	(0.170)	0.050	0.006
194	16.17	0.13	0.056	(0.169)	0.050	0.006
195	16.25	0.13	0.056	(0.168)	0.050	0.006
196	16.33	0.13	0.056	(0.167)	0.050	0.006
197	16.42	0.13	0.056	(0.166)	0.050	0.006
198	16.50	0.13	0.056	(0.166)	0.050	0.006
199	16.58	0.10	0.042	(0.165)	0.038	0.004

200	16.67	0.10	0.042	(0.164)	0.038	0.004
201	16.75	0.10	0.042	(0.163)	0.038	0.004
202	16.83	0.10	0.042	(0.162)	0.038	0.004
203	16.92	0.10	0.042	(0.161)	0.038	0.004
204	17.00	0.10	0.042	(0.161)	0.038	0.004
205	17.08	0.17	0.070	(0.160)	0.063	0.007
206	17.17	0.17	0.070	(0.159)	0.063	0.007
207	17.25	0.17	0.070	(0.158)	0.063	0.007
208	17.33	0.17	0.070	(0.157)	0.063	0.007
209	17.42	0.17	0.070	(0.157)	0.063	0.007
210	17.50	0.17	0.070	(0.156)	0.063	0.007
211	17.58	0.17	0.070	(0.155)	0.063	0.007
212	17.67	0.17	0.070	(0.154)	0.063	0.007
213	17.75	0.17	0.070	(0.154)	0.063	0.007
214	17.83	0.13	0.056	(0.153)	0.050	0.006
215	17.92	0.13	0.056	(0.152)	0.050	0.006
216	18.00	0.13	0.056	(0.151)	0.050	0.006
217	18.08	0.13	0.056	(0.151)	0.050	0.006
218	18.17	0.13	0.056	(0.150)	0.050	0.006
219	18.25	0.13	0.056	(0.149)	0.050	0.006
220	18.33	0.13	0.056	(0.148)	0.050	0.006
221	18.42	0.13	0.056	(0.148)	0.050	0.006
222	18.50	0.13	0.056	(0.147)	0.050	0.006
223	18.58	0.10	0.042	(0.146)	0.038	0.004
224	18.67	0.10	0.042	(0.145)	0.038	0.004
225	18.75	0.10	0.042	(0.145)	0.038	0.004
226	18.83	0.07	0.028	(0.144)	0.025	0.003
227	18.92	0.07	0.028	(0.143)	0.025	0.003
228	19.00	0.07	0.028	(0.143)	0.025	0.003
229	19.08	0.10	0.042	(0.142)	0.038	0.004
230	19.17	0.10	0.042	(0.141)	0.038	0.004
231	19.25	0.10	0.042	(0.141)	0.038	0.004
232	19.33	0.13	0.056	(0.140)	0.050	0.006
233	19.42	0.13	0.056	(0.139)	0.050	0.006
234	19.50	0.13	0.056	(0.139)	0.050	0.006
235	19.58	0.10	0.042	(0.138)	0.038	0.004
236	19.67	0.10	0.042	(0.138)	0.038	0.004
237	19.75	0.10	0.042	(0.137)	0.038	0.004
238	19.83	0.07	0.028	(0.136)	0.025	0.003
239	19.92	0.07	0.028	(0.136)	0.025	0.003
240	20.00	0.07	0.028	(0.135)	0.025	0.003
241	20.08	0.10	0.042	(0.134)	0.038	0.004
242	20.17	0.10	0.042	(0.134)	0.038	0.004
243	20.25	0.10	0.042	(0.133)	0.038	0.004
244	20.33	0.10	0.042	(0.133)	0.038	0.004
245	20.42	0.10	0.042	(0.132)	0.038	0.004
246	20.50	0.10	0.042	(0.132)	0.038	0.004
247	20.58	0.10	0.042	(0.131)	0.038	0.004
248	20.67	0.10	0.042	(0.130)	0.038	0.004
249	20.75	0.10	0.042	(0.130)	0.038	0.004
250	20.83	0.07	0.028	(0.129)	0.025	0.003
251	20.92	0.07	0.028	(0.129)	0.025	0.003

252	21.00	0.07	0.028	(0.128)	0.025	0.003
253	21.08	0.10	0.042	(0.128)	0.038	0.004
254	21.17	0.10	0.042	(0.127)	0.038	0.004
255	21.25	0.10	0.042	(0.127)	0.038	0.004
256	21.33	0.07	0.028	(0.126)	0.025	0.003
257	21.42	0.07	0.028	(0.126)	0.025	0.003
258	21.50	0.07	0.028	(0.125)	0.025	0.003
259	21.58	0.10	0.042	(0.125)	0.038	0.004
260	21.67	0.10	0.042	(0.125)	0.038	0.004
261	21.75	0.10	0.042	(0.124)	0.038	0.004
262	21.83	0.07	0.028	(0.124)	0.025	0.003
263	21.92	0.07	0.028	(0.123)	0.025	0.003
264	22.00	0.07	0.028	(0.123)	0.025	0.003
265	22.08	0.10	0.042	(0.122)	0.038	0.004
266	22.17	0.10	0.042	(0.122)	0.038	0.004
267	22.25	0.10	0.042	(0.122)	0.038	0.004
268	22.33	0.07	0.028	(0.121)	0.025	0.003
269	22.42	0.07	0.028	(0.121)	0.025	0.003
270	22.50	0.07	0.028	(0.121)	0.025	0.003
271	22.58	0.07	0.028	(0.120)	0.025	0.003
272	22.67	0.07	0.028	(0.120)	0.025	0.003
273	22.75	0.07	0.028	(0.120)	0.025	0.003
274	22.83	0.07	0.028	(0.119)	0.025	0.003
275	22.92	0.07	0.028	(0.119)	0.025	0.003
276	23.00	0.07	0.028	(0.119)	0.025	0.003
277	23.08	0.07	0.028	(0.118)	0.025	0.003
278	23.17	0.07	0.028	(0.118)	0.025	0.003
279	23.25	0.07	0.028	(0.118)	0.025	0.003
280	23.33	0.07	0.028	(0.118)	0.025	0.003
281	23.42	0.07	0.028	(0.117)	0.025	0.003
282	23.50	0.07	0.028	(0.117)	0.025	0.003
283	23.58	0.07	0.028	(0.117)	0.025	0.003
284	23.67	0.07	0.028	(0.117)	0.025	0.003
285	23.75	0.07	0.028	(0.117)	0.025	0.003
286	23.83	0.07	0.028	(0.116)	0.025	0.003
287	23.92	0.07	0.028	(0.116)	0.025	0.003
288	24.00	0.07	0.028	(0.116)	0.025	0.003

(Loss Rate Not Used)

Sum = 100.0 Sum = 10.7

Flood volume = Effective rainfall 0.89(In)
times area 89.2(Ac.)/[(In)/(Ft.)] = 6.6(Ac.Ft)
Total soil loss = 2.59(In)
Total soil loss = 19.275(Ac.Ft)
Total rainfall = 3.48(In)
Flood volume = 287657.6 Cubic Feet
Total soil loss = 839633.5 Cubic Feet

Peak flow rate of this hydrograph = 23.388(CFS)

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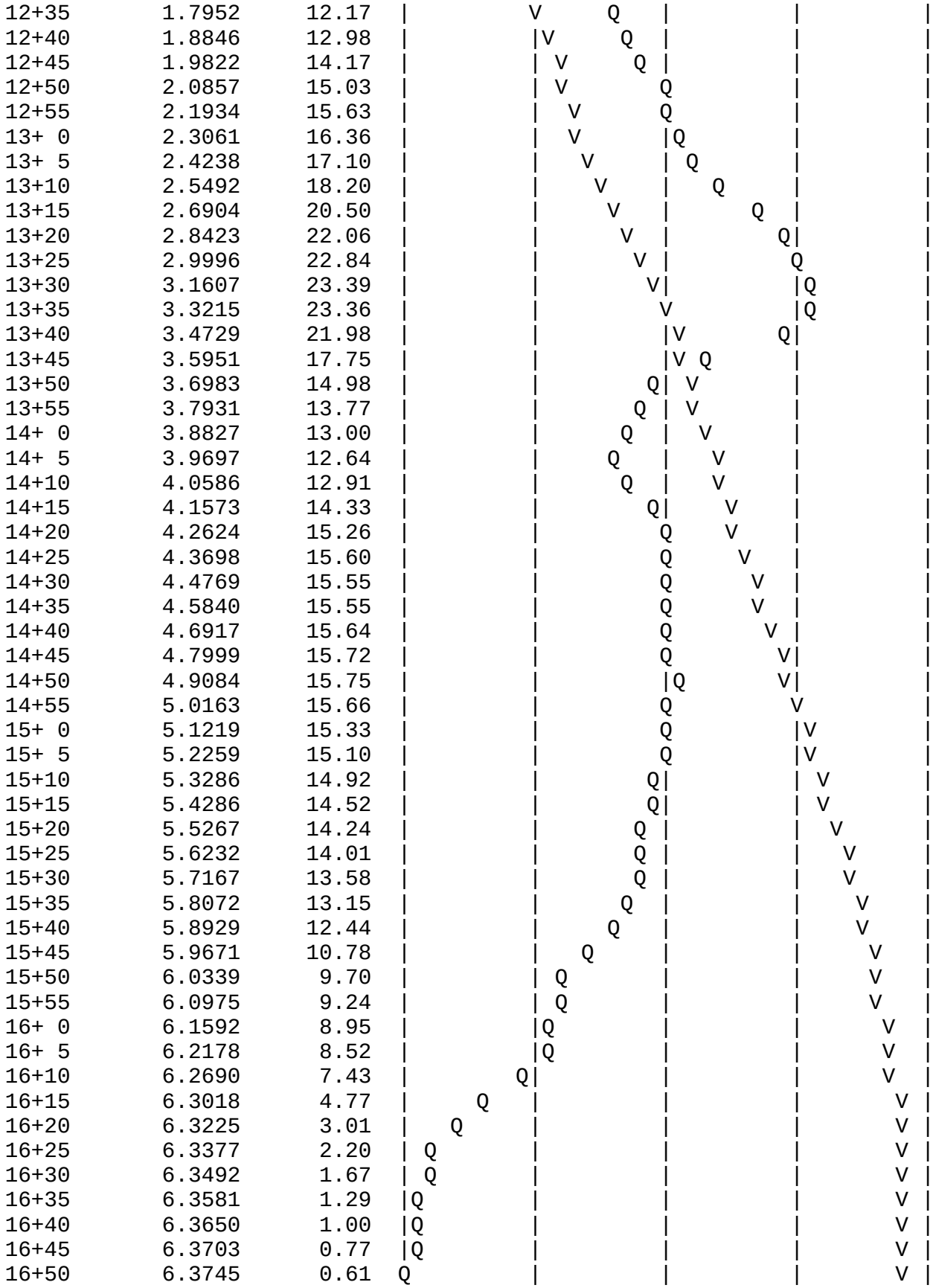
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0001	0.01	Q	|	|	|	|
0+10	0.0003	0.04	Q	|	|	|	|
0+15	0.0012	0.12	Q	|	|	|	|
0+20	0.0024	0.18	Q	|	|	|	|
0+25	0.0039	0.22	Q	|	|	|	|
0+30	0.0058	0.28	Q	|	|	|	|
0+35	0.0079	0.31	Q	|	|	|	|
0+40	0.0102	0.33	Q	|	|	|	|
0+45	0.0126	0.35	Q	|	|	|	|
0+50	0.0151	0.36	Q	|	|	|	|
0+55	0.0178	0.38	Q	|	|	|	|
1+ 0	0.0207	0.43	Q	|	|	|	|
1+ 5	0.0238	0.45	Q	|	|	|	|
1+10	0.0269	0.45	Q	|	|	|	|
1+15	0.0298	0.42	Q	|	|	|	|
1+20	0.0326	0.40	Q	|	|	|	|
1+25	0.0353	0.39	Q	|	|	|	|
1+30	0.0380	0.39	Q	|	|	|	|
1+35	0.0406	0.38	Q	|	|	|	|
1+40	0.0433	0.38	Q	|	|	|	|
1+45	0.0459	0.38	Q	|	|	|	|
1+50	0.0485	0.38	Q	|	|	|	|
1+55	0.0512	0.40	Q	|	|	|	|
2+ 0	0.0542	0.44	Q	|	|	|	|
2+ 5	0.0574	0.46	Q	|	|	|	|
2+10	0.0607	0.48	Q	|	|	|	|
2+15	0.0640	0.48	Q	|	|	|	|
2+20	0.0674	0.49	Q	|	|	|	|
2+25	0.0708	0.49	Q	|	|	|	|
2+30	0.0742	0.50	Q	|	|	|	|
2+35	0.0777	0.50	Q	|	|	|	|
2+40	0.0812	0.52	Q	|	|	|	|
2+45	0.0851	0.56	Q	|	|	|	|
2+50	0.0891	0.59	Q	|	|	|	|
2+55	0.0933	0.60	Q	|	|	|	|
3+ 0	0.0975	0.61	Q	|	|	|	|
3+ 5	0.1017	0.61	Q	|	|	|	|
3+10	0.1059	0.62	Q	|	|	|	|
3+15	0.1102	0.62	Q	|	|	|	|
3+20	0.1145	0.62	Q	|	|	|	|
3+25	0.1188	0.62	Q	|	|	|	|
3+30	0.1231	0.62	Q	|	|	|	|
3+35	0.1274	0.63	Q	|	|	|	|
3+40	0.1317	0.63	Q	|	|	|	|
3+45	0.1360	0.63	Q	|	|	|	|
3+50	0.1404	0.63	Q	|	|	|	|

3+55	0.1448	0.65	Q	|	|	|	|
4+ 0	0.1496	0.69	Q	|	|	|	|
4+ 5	0.1545	0.71	Q	|	|	|	|
4+10	0.1595	0.73	Q	|	|	|	|
4+15	0.1645	0.73	Q	|	|	|	|
4+20	0.1696	0.74	QV	|	|	|	|
4+25	0.1749	0.76	|Q	|	|	|	|
4+30	0.1804	0.81	|Q	|	|	|	|
4+35	0.1862	0.84	|Q	|	|	|	|
4+40	0.1920	0.85	|Q	|	|	|	|
4+45	0.1980	0.86	|Q	|	|	|	|
4+50	0.2039	0.87	|Q	|	|	|	|
4+55	0.2100	0.89	|Q	|	|	|	|
5+ 0	0.2165	0.93	|Q	|	|	|	|
5+ 5	0.2230	0.95	|Q	|	|	|	|
5+10	0.2295	0.94	|Q	|	|	|	|
5+15	0.2354	0.86	|Q	|	|	|	|
5+20	0.2410	0.82	|Q	|	|	|	|
5+25	0.2466	0.81	|Q	|	|	|	|
5+30	0.2524	0.84	|Q	|	|	|	|
5+35	0.2584	0.86	|Q	|	|	|	|
5+40	0.2645	0.88	|Q	|	|	|	|
5+45	0.2709	0.93	|Q	|	|	|	|
5+50	0.2774	0.96	|Q	|	|	|	|
5+55	0.2841	0.97	|Q	|	|	|	|
6+ 0	0.2909	0.98	|Q	|	|	|	|
6+ 5	0.2977	0.99	|Q	|	|	|	|
6+10	0.3047	1.01	|Q	|	|	|	|
6+15	0.3120	1.06	|Q	|	|	|	|
6+20	0.3195	1.09	|Q	|	|	|	|
6+25	0.3270	1.10	|Q	|	|	|	|
6+30	0.3347	1.11	|QV	|	|	|	|
6+35	0.3424	1.12	|QV	|	|	|	|
6+40	0.3502	1.14	|QV	|	|	|	|
6+45	0.3583	1.18	|QV	|	|	|	|
6+50	0.3667	1.21	|QV	|	|	|	|
6+55	0.3751	1.22	|QV	|	|	|	|
7+ 0	0.3836	1.23	|QV	|	|	|	|
7+ 5	0.3921	1.24	|QV	|	|	|	|
7+10	0.4007	1.24	|QV	|	|	|	|
7+15	0.4093	1.25	|QV	|	|	|	|
7+20	0.4179	1.25	|QV	|	|	|	|
7+25	0.4267	1.27	|QV	|	|	|	|
7+30	0.4357	1.31	|QV	|	|	|	|
7+35	0.4450	1.34	|QV	|	|	|	|
7+40	0.4544	1.37	|QV	|	|	|	|
7+45	0.4642	1.42	|QV	|	|	|	|
7+50	0.4742	1.46	|QV	|	|	|	|
7+55	0.4845	1.49	|QV	|	|	|	|
8+ 0	0.4951	1.54	| Q	|	|	|	|
8+ 5	0.5060	1.58	| QV	|	|	|	|
8+10	0.5172	1.63	| QV	|	|	|	|

8+15	0.5291	1.72	QV				
8+20	0.5414	1.79	QV				
8+25	0.5539	1.82	QV				
8+30	0.5665	1.84	QV				
8+35	0.5793	1.85	QV				
8+40	0.5922	1.88	QV				
8+45	0.6055	1.93	QV				
8+50	0.6190	1.96	QV				
8+55	0.6328	1.99	QV				
9+ 0	0.6468	2.04	QV				
9+ 5	0.6612	2.08	Q V				
9+10	0.6759	2.13	Q V				
9+15	0.6912	2.23	Q V				
9+20	0.7070	2.29	QV				
9+25	0.7231	2.34	QV				
9+30	0.7396	2.40	QV				
9+35	0.7567	2.48	QV				
9+40	0.7749	2.64	QV				
9+45	0.7959	3.05	Q				
9+50	0.8193	3.41	Q				
9+55	0.8452	3.76	Q				
10+ 0	0.8750	4.33	Q				
10+ 5	0.9069	4.63	VQ				
10+10	0.9374	4.43	Q				
10+15	0.9610	3.43	QV				
10+20	0.9800	2.76	Q V				
10+25	0.9971	2.48	Q V				
10+30	1.0129	2.29	Q V				
10+35	1.0282	2.22	Q V				
10+40	1.0444	2.35	Q V				
10+45	1.0642	2.88	Q V				
10+50	1.0868	3.28	Q V				
10+55	1.1110	3.51	Q V				
11+ 0	1.1365	3.70	Q V				
11+ 5	1.1628	3.82	Q V				
11+10	1.1891	3.82	Q V				
11+15	1.2134	3.54	Q V				
11+20	1.2368	3.39	Q V				
11+25	1.2600	3.37	Q V				
11+30	1.2834	3.40	Q V				
11+35	1.3068	3.40	Q V				
11+40	1.3293	3.27	Q V				
11+45	1.3487	2.83	Q V				
11+50	1.3663	2.55	Q V				
11+55	1.3835	2.50	Q V				
12+ 0	1.4016	2.62	Q V				
12+ 5	1.4224	3.02	Q V				
12+10	1.4511	4.18	Q V				
12+15	1.5001	7.11	Q				
12+20	1.5629	9.13	V Q				
12+25	1.6334	10.24	V Q				
12+30	1.7114	11.31	V Q				


12+35 1.7952 12.17
12+40 1.8846 12.98
12+45 1.9822 14.17
12+50 2.0857 15.03
12+55 2.1934 15.63
13+ 0 2.3061 16.36
13+ 5 2.4238 17.10
13+10 2.5492 18.20
13+15 2.6904 20.50
13+20 2.8423 22.06
13+25 2.9996 22.84
13+30 3.1607 23.39
13+35 3.3215 23.36
13+40 3.4729 21.98
13+45 3.5951 17.75
13+50 3.6983 14.98
13+55 3.7931 13.77
14+ 0 3.8827 13.00
14+ 5 3.9697 12.64
14+10 4.0586 12.91
14+15 4.1573 14.33
14+20 4.2624 15.26
14+25 4.3698 15.60
14+30 4.4769 15.55
14+35 4.5840 15.55
14+40 4.6917 15.64
14+45 4.7999 15.72
14+50 4.9084 15.75
14+55 5.0163 15.66
15+ 0 5.1219 15.33
15+ 5 5.2259 15.10
15+10 5.3286 14.92
15+15 5.4286 14.52
15+20 5.5267 14.24
15+25 5.6232 14.01
15+30 5.7167 13.58
15+35 5.8072 13.15
15+40 5.8929 12.44
15+45 5.9671 10.78
15+50 6.0339 9.70
15+55 6.0975 9.24
16+ 0 6.1592 8.95
16+ 5 6.2178 8.52
16+10 6.2690 7.43
16+15 6.3018 4.77
16+20 6.3225 3.01
16+25 6.3377 2.20
16+30 6.3492 1.67
16+35 6.3581 1.29
16+40 6.3650 1.00
16+45 6.3703 0.77
16+50 6.3745 0.61

16+55	6.3782	0.54	Q	|	|	|	V |
17+ 0	6.3816	0.50	Q	|	|	|	V |
17+ 5	6.3849	0.47	Q	|	|	|	V |
17+10	6.3881	0.48	Q	|	|	|	V |
17+15	6.3918	0.53	Q	|	|	|	V |
17+20	6.3957	0.57	Q	|	|	|	V |
17+25	6.3997	0.58	Q	|	|	|	V |
17+30	6.4038	0.59	Q	|	|	|	V |
17+35	6.4079	0.60	Q	|	|	|	V |
17+40	6.4121	0.61	Q	|	|	|	V |
17+45	6.4164	0.62	Q	|	|	|	V |
17+50	6.4206	0.62	Q	|	|	|	V |
17+55	6.4248	0.60	Q	|	|	|	V |
18+ 0	6.4287	0.56	Q	|	|	|	V |
18+ 5	6.4324	0.54	Q	|	|	|	V |
18+10	6.4360	0.53	Q	|	|	|	V |
18+15	6.4395	0.52	Q	|	|	|	V|
18+20	6.4431	0.51	Q	|	|	|	V|
18+25	6.4466	0.51	Q	|	|	|	V|
18+30	6.4501	0.51	Q	|	|	|	V|
18+35	6.4535	0.50	Q	|	|	|	V|
18+40	6.4568	0.48	Q	|	|	|	V|
18+45	6.4599	0.44	Q	|	|	|	V|
18+50	6.4627	0.41	Q	|	|	|	V|
18+55	6.4654	0.38	Q	|	|	|	V|
19+ 0	6.4676	0.33	Q	|	|	|	V|
19+ 5	6.4697	0.30	Q	|	|	|	V|
19+10	6.4718	0.30	Q	|	|	|	V|
19+15	6.4741	0.33	Q	|	|	|	V|
19+20	6.4766	0.36	Q	|	|	|	V|
19+25	6.4792	0.38	Q	|	|	|	V|
19+30	6.4821	0.42	Q	|	|	|	V|
19+35	6.4852	0.45	Q	|	|	|	V|
19+40	6.4883	0.45	Q	|	|	|	V|
19+45	6.4912	0.42	Q	|	|	|	V|
19+50	6.4940	0.40	Q	|	|	|	V|
19+55	6.4965	0.37	Q	|	|	|	V|
20+ 0	6.4988	0.33	Q	|	|	|	V|
20+ 5	6.5009	0.30	Q	|	|	|	V|
20+10	6.5029	0.30	Q	|	|	|	V|
20+15	6.5052	0.33	Q	|	|	|	V|
20+20	6.5076	0.35	Q	|	|	|	V|
20+25	6.5101	0.36	Q	|	|	|	V|
20+30	6.5126	0.36	Q	|	|	|	V|
20+35	6.5151	0.37	Q	|	|	|	V|
20+40	6.5177	0.37	Q	|	|	|	V|
20+45	6.5203	0.37	Q	|	|	|	V|
20+50	6.5228	0.37	Q	|	|	|	V|
20+55	6.5253	0.36	Q	|	|	|	V|
21+ 0	6.5274	0.31	Q	|	|	|	V|
21+ 5	6.5294	0.29	Q	|	|	|	V|
21+10	6.5315	0.30	Q	|	|	|	V|

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21+15       6.5337      0.33  Q          |           |           |          V|
21+20       6.5361      0.35  Q          |           |           |          V|
21+25       6.5384      0.34  Q          |           |           |          V|
21+30       6.5405      0.30  Q          |           |           |          V|
21+35       6.5425      0.28  Q          |           |           |          V|
21+40       6.5445      0.29  Q          |           |           |          V|
21+45       6.5467      0.33  Q          |           |           |          V|
21+50       6.5491      0.34  Q          |           |           |          V|
21+55       6.5514      0.34  Q          |           |           |          V|
22+ 0       6.5535      0.30  Q          |           |           |          V|
22+ 5       6.5554      0.28  Q          |           |           |          V|
22+10       6.5574      0.29  Q          |           |           |          V|
22+15       6.5597      0.32  Q          |           |           |          V|
22+20       6.5620      0.34  Q          |           |           |          V|
22+25       6.5643      0.34  Q          |           |           |          V|
22+30       6.5664      0.30  Q          |           |           |          V|
22+35       6.5683      0.28  Q          |           |           |          V|
22+40       6.5702      0.27  Q          |           |           |          V|
22+45       6.5720      0.26  Q          |           |           |          V|
22+50       6.5738      0.26  Q          |           |           |          V|
22+55       6.5756      0.26  Q          |           |           |          V|
23+ 0       6.5773      0.25  Q          |           |           |          V|
23+ 5       6.5791      0.25  Q          |           |           |          V|
23+10       6.5808      0.25  Q          |           |           |          V|
23+15       6.5825      0.25  Q          |           |           |          V|
23+20       6.5843      0.25  Q          |           |           |          V|
23+25       6.5860      0.25  Q          |           |           |          V|
23+30       6.5877      0.25  Q          |           |           |          V|
23+35       6.5895      0.25  Q          |           |           |          V|
23+40       6.5912      0.25  Q          |           |           |          V|
23+45       6.5929      0.25  Q          |           |           |          V|
23+50       6.5946      0.25  Q          |           |           |          V|
23+55       6.5964      0.25  Q          |           |           |          V|
24+ 0       6.5981      0.25  Q          |           |           |          V|
24+ 5       6.5998      0.24  Q          |           |           |          V|
24+10       6.6012      0.21  Q          |           |           |          V|
24+15       6.6021      0.13  Q          |           |           |          V|
24+20       6.6026      0.08  Q          |           |           |          V|
24+25       6.6030      0.05  Q          |           |           |          V|
24+30       6.6032      0.04  Q          |           |           |          V|
24+35       6.6034      0.02  Q          |           |           |          V|
24+40       6.6035      0.02  Q          |           |           |          V|
24+45       6.6036      0.01  Q          |           |           |          V|
24+50       6.6036      0.01  Q          |           |           |          V|
24+55       6.6036      0.00  Q          |           |           |          V|
25+ 0       6.6037      0.00  Q          |           |           |          V|
25+ 5       6.6037      0.00  Q          |           |           |          V|
25+10       6.6037      0.00  Q          |           |           |          V|
25+15       6.6037      0.00  Q          |           |           |          V|
25+20       6.6037      0.00  Q          |           |           |          V|
25+25       6.6037      0.00  Q          |           |           |           V
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 12/15/17 File: p200110.out

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

Program License Serial Number 4028

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

English Units used in output format

Tentative Tract 35853
Proposed Conditions
10-Year, 1-Hour Storm
Basin 200

Drainage Area = 166.36(Ac.) = 0.260 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 166.36(Ac.)=0.260 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.227 Hr.
Lag time = 13.62 Min.
25% of lag time = 3.41 Min.
40% of lag time = 5.45 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
166.36	0.54	89.83

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
166.36	1.26	209.61

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 0.540(In)
Area Averaged 100-Year Rainfall = 1.260(In)

Point rain (area averaged) = 0.836(In)
Areal adjustment factor = 99.85 %
Adjusted average point rain = 0.835(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
60.750	81.00	0.000
79.330	69.00	0.500
8.800	69.00	0.800
17.480	69.00	0.900

Total Area Entered = 166.36(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
81.0	81.0	0.233	0.000	0.233	0.365	0.085
69.0	69.0	0.373	0.500	0.205	0.477	0.098
69.0	69.0	0.373	0.800	0.104	0.053	0.006
69.0	69.0	0.373	0.900	0.071	0.105	0.007
					Sum (F) =	0.196

Area averaged mean soil loss (F) (In/Hr) = 0.196
Minimum soil loss rate ((In/Hr)) = 0.098
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.600

Slope of intensity-duration curve for a 1 hour storm =0.5500

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	36.711	2.790	4.678
2	0.167	73.421	9.936	16.659
3	0.250	110.132	25.795	43.247
4	0.333	146.843	26.111	43.777
5	0.417	183.554	10.796	18.101
6	0.500	220.264	7.100	11.904
7	0.583	256.975	5.084	8.523
8	0.667	293.686	3.745	6.278
9	0.750	330.396	2.800	4.694
10	0.833	367.107	1.953	3.274
11	0.917	403.818	1.371	2.299
12	1.000	440.529	0.686	1.151

13	1.083	477.239	0.420	0.705
14	1.167	513.950	0.359	0.602
15	1.250	550.661	0.248	0.417
16	1.333	587.372	0.258	0.433
17	1.417	624.082	0.262	0.439
18	1.500	660.793	0.152	0.255
19	1.583	697.504	0.092	0.154
20	1.667	734.214	0.042	0.070
		Sum = 100.000	Sum=	167.660

The following loss rate calculations reflect use of the minimum calculated loss
rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	3.30	0.331	0.196	(0.198)	0.135
2	0.17	4.20	0.421	0.196	(0.252)	0.225
3	0.25	4.40	0.441	0.196	(0.265)	0.245
4	0.33	4.80	0.481	0.196	(0.289)	0.285
5	0.42	5.20	0.521	0.196	(0.313)	0.325
6	0.50	6.20	0.621	0.196	(0.373)	0.426
7	0.58	6.80	0.681	0.196	(0.409)	0.486
8	0.67	8.80	0.882	0.196	(0.529)	0.686
9	0.75	13.90	1.393	0.196	(0.836)	1.197
10	0.83	31.40	3.146	0.196	(1.888)	2.950
11	0.92	7.20	0.721	0.196	(0.433)	0.526
12	1.00	3.80	0.381	0.196	(0.228)	0.185
	(Loss Rate Not Used)					
Sum =		100.0			Sum =	7.7

Flood volume = Effective rainfall 0.64(In)
times area 166.4(Ac.)/[(In)/(Ft.)] = 8.9(Ac.Ft)
Total soil loss = 0.20(In)
Total soil loss = 2.713(Ac.Ft)
Total rainfall = 0.83(In)
Flood volume = 386049.8 Cubic Feet
Total soil loss = 118167.4 Cubic Feet

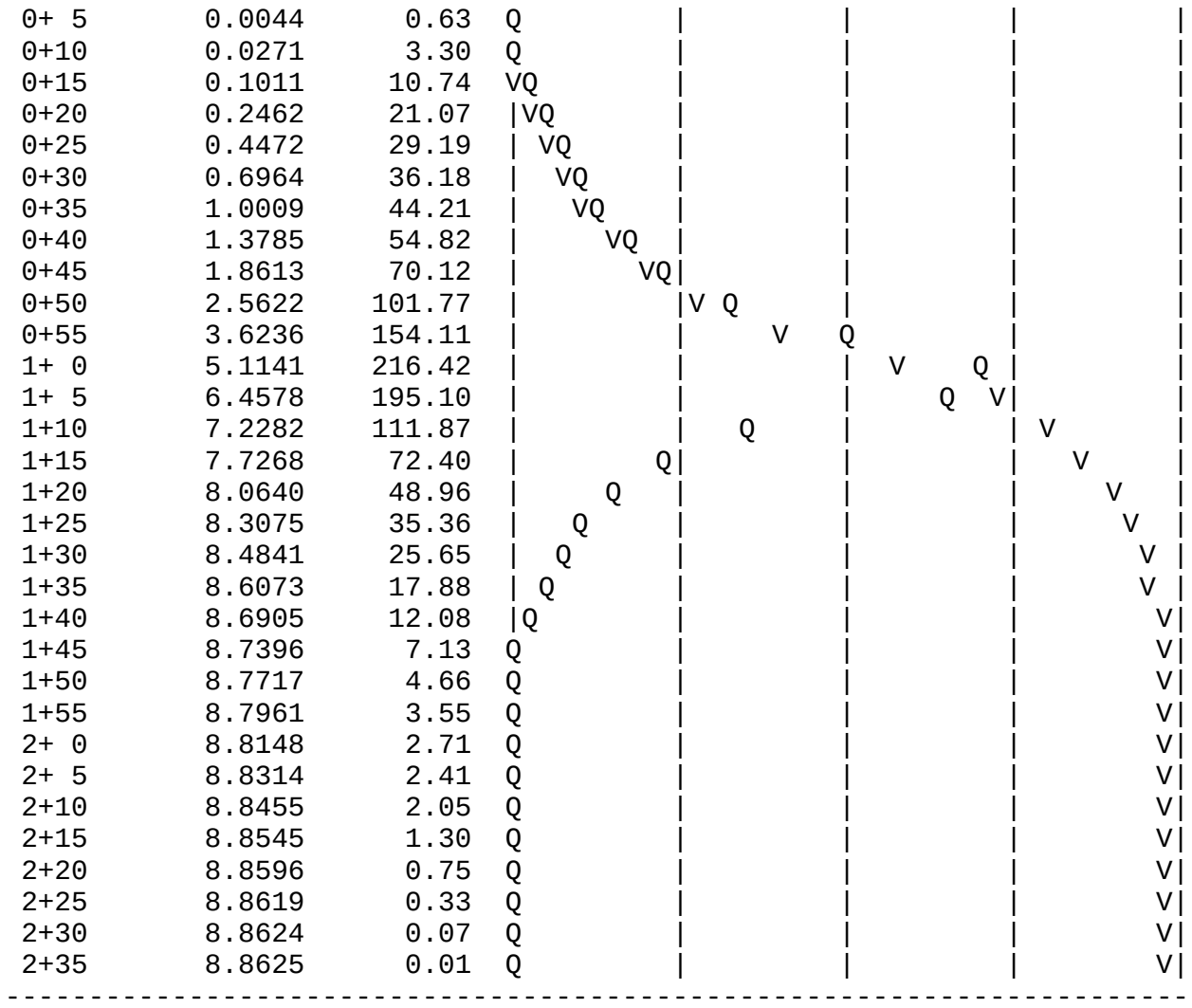
Peak flow rate of this hydrograph = 216.417(CFS)

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1 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	75.0	150.0	225.0	300.0


0+ 5 0.0044 0.63
0+10 0.0271 3.30
0+15 0.1011 10.74
0+20 0.2462 21.07
0+25 0.4472 29.19
0+30 0.6964 36.18
0+35 1.0009 44.21
0+40 1.3785 54.82
0+45 1.8613 70.12
0+50 2.5622 101.77
0+55 3.6236 154.11
1+ 0 5.1141 216.42
1+ 5 6.4578 195.10
1+10 7.2282 111.87
1+15 7.7268 72.40
1+20 8.0640 48.96
1+25 8.3075 35.36
1+30 8.4841 25.65
1+35 8.6073 17.88
1+40 8.6905 12.08
1+45 8.7396 7.13
1+50 8.7717 4.66
1+55 8.7961 3.55
2+ 0 8.8148 2.71
2+ 5 8.8314 2.41
2+10 8.8455 2.05
2+15 8.8545 1.30
2+20 8.8596 0.75
2+25 8.8619 0.33
2+30 8.8624 0.07
2+35 8.8625 0.01

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

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Study date 12/15/17 File: p2002410.out

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

Program License Serial Number 4028

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

English Units used in output format

Tentative Tract 35853
Proposed Conditions
10-Year, 24-Hour Storm
Basin 200

Drainage Area = 166.36(Ac.) = 0.260 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 166.36(Ac.)=0.260 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.227 Hr.
Lag time = 13.62 Min.
25% of lag time = 3.41 Min.
40% of lag time = 5.45 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
166.36	2.28	379.30

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
166.36	5.20	865.07

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 2.280(In)
Area Averaged 100-Year Rainfall = 5.200(In)

Point rain (area averaged) = 3.481(In)
Areal adjustment factor = 99.97 %
Adjusted average point rain = 3.480(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
60.750	81.00	0.000
79.330	69.00	0.500
8.800	69.00	0.800
17.480	69.00	0.900

Total Area Entered = 166.36(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
81.0	81.0	0.233	0.000	0.233	0.365	0.085
69.0	69.0	0.373	0.500	0.205	0.477	0.098
69.0	69.0	0.373	0.800	0.104	0.053	0.006
69.0	69.0	0.373	0.900	0.071	0.105	0.007
					Sum (F) =	0.196

Area averaged mean soil loss (F) (In/Hr) = 0.196
Minimum soil loss rate ((In/Hr)) = 0.098
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.600

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	36.711	2.790	4.678
2	0.167	73.421	9.936	16.659
3	0.250	110.132	25.795	43.247
4	0.333	146.843	26.111	43.777
5	0.417	183.554	10.796	18.101
6	0.500	220.264	7.100	11.904
7	0.583	256.975	5.084	8.523
8	0.667	293.686	3.745	6.278
9	0.750	330.396	2.800	4.694
10	0.833	367.107	1.953	3.274
11	0.917	403.818	1.371	2.299
12	1.000	440.529	0.686	1.151
13	1.083	477.239	0.420	0.705
14	1.167	513.950	0.359	0.602

15	1.250	550.661	0.248	0.417
16	1.333	587.372	0.258	0.433
17	1.417	624.082	0.262	0.439
18	1.500	660.793	0.152	0.255
19	1.583	697.504	0.092	0.154
20	1.667	734.214	0.042	0.070
			Sum = 100.000	Sum= 167.660

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.028	(0.347)	0.017	0.011
2	0.17	0.07	0.028	(0.346)	0.017	0.011
3	0.25	0.07	0.028	(0.344)	0.017	0.011
4	0.33	0.10	0.042	(0.343)	0.025	0.017
5	0.42	0.10	0.042	(0.342)	0.025	0.017
6	0.50	0.10	0.042	(0.340)	0.025	0.017
7	0.58	0.10	0.042	(0.339)	0.025	0.017
8	0.67	0.10	0.042	(0.338)	0.025	0.017
9	0.75	0.10	0.042	(0.336)	0.025	0.017
10	0.83	0.13	0.056	(0.335)	0.033	0.022
11	0.92	0.13	0.056	(0.334)	0.033	0.022
12	1.00	0.13	0.056	(0.332)	0.033	0.022
13	1.08	0.10	0.042	(0.331)	0.025	0.017
14	1.17	0.10	0.042	(0.330)	0.025	0.017
15	1.25	0.10	0.042	(0.328)	0.025	0.017
16	1.33	0.10	0.042	(0.327)	0.025	0.017
17	1.42	0.10	0.042	(0.326)	0.025	0.017
18	1.50	0.10	0.042	(0.324)	0.025	0.017
19	1.58	0.10	0.042	(0.323)	0.025	0.017
20	1.67	0.10	0.042	(0.322)	0.025	0.017
21	1.75	0.10	0.042	(0.321)	0.025	0.017
22	1.83	0.13	0.056	(0.319)	0.033	0.022
23	1.92	0.13	0.056	(0.318)	0.033	0.022
24	2.00	0.13	0.056	(0.317)	0.033	0.022
25	2.08	0.13	0.056	(0.315)	0.033	0.022
26	2.17	0.13	0.056	(0.314)	0.033	0.022
27	2.25	0.13	0.056	(0.313)	0.033	0.022
28	2.33	0.13	0.056	(0.312)	0.033	0.022
29	2.42	0.13	0.056	(0.310)	0.033	0.022
30	2.50	0.13	0.056	(0.309)	0.033	0.022
31	2.58	0.17	0.070	(0.308)	0.042	0.028
32	2.67	0.17	0.070	(0.307)	0.042	0.028
33	2.75	0.17	0.070	(0.305)	0.042	0.028
34	2.83	0.17	0.070	(0.304)	0.042	0.028
35	2.92	0.17	0.070	(0.303)	0.042	0.028

36	3.00	0.17	0.070	(0.301)	0.042	0.028
37	3.08	0.17	0.070	(0.300)	0.042	0.028
38	3.17	0.17	0.070	(0.299)	0.042	0.028
39	3.25	0.17	0.070	(0.298)	0.042	0.028
40	3.33	0.17	0.070	(0.297)	0.042	0.028
41	3.42	0.17	0.070	(0.295)	0.042	0.028
42	3.50	0.17	0.070	(0.294)	0.042	0.028
43	3.58	0.17	0.070	(0.293)	0.042	0.028
44	3.67	0.17	0.070	(0.292)	0.042	0.028
45	3.75	0.17	0.070	(0.290)	0.042	0.028
46	3.83	0.20	0.084	(0.289)	0.050	0.033
47	3.92	0.20	0.084	(0.288)	0.050	0.033
48	4.00	0.20	0.084	(0.287)	0.050	0.033
49	4.08	0.20	0.084	(0.285)	0.050	0.033
50	4.17	0.20	0.084	(0.284)	0.050	0.033
51	4.25	0.20	0.084	(0.283)	0.050	0.033
52	4.33	0.23	0.097	(0.282)	0.058	0.039
53	4.42	0.23	0.097	(0.281)	0.058	0.039
54	4.50	0.23	0.097	(0.279)	0.058	0.039
55	4.58	0.23	0.097	(0.278)	0.058	0.039
56	4.67	0.23	0.097	(0.277)	0.058	0.039
57	4.75	0.23	0.097	(0.276)	0.058	0.039
58	4.83	0.27	0.111	(0.275)	0.067	0.045
59	4.92	0.27	0.111	(0.273)	0.067	0.045
60	5.00	0.27	0.111	(0.272)	0.067	0.045
61	5.08	0.20	0.084	(0.271)	0.050	0.033
62	5.17	0.20	0.084	(0.270)	0.050	0.033
63	5.25	0.20	0.084	(0.269)	0.050	0.033
64	5.33	0.23	0.097	(0.268)	0.058	0.039
65	5.42	0.23	0.097	(0.266)	0.058	0.039
66	5.50	0.23	0.097	(0.265)	0.058	0.039
67	5.58	0.27	0.111	(0.264)	0.067	0.045
68	5.67	0.27	0.111	(0.263)	0.067	0.045
69	5.75	0.27	0.111	(0.262)	0.067	0.045
70	5.83	0.27	0.111	(0.261)	0.067	0.045
71	5.92	0.27	0.111	(0.259)	0.067	0.045
72	6.00	0.27	0.111	(0.258)	0.067	0.045
73	6.08	0.30	0.125	(0.257)	0.075	0.050
74	6.17	0.30	0.125	(0.256)	0.075	0.050
75	6.25	0.30	0.125	(0.255)	0.075	0.050
76	6.33	0.30	0.125	(0.254)	0.075	0.050
77	6.42	0.30	0.125	(0.253)	0.075	0.050
78	6.50	0.30	0.125	(0.251)	0.075	0.050
79	6.58	0.33	0.139	(0.250)	0.084	0.056
80	6.67	0.33	0.139	(0.249)	0.084	0.056
81	6.75	0.33	0.139	(0.248)	0.084	0.056
82	6.83	0.33	0.139	(0.247)	0.084	0.056
83	6.92	0.33	0.139	(0.246)	0.084	0.056
84	7.00	0.33	0.139	(0.245)	0.084	0.056
85	7.08	0.33	0.139	(0.244)	0.084	0.056
86	7.17	0.33	0.139	(0.242)	0.084	0.056
87	7.25	0.33	0.139	(0.241)	0.084	0.056

88	7.33	0.37	0.153	(0.240)	0.092	0.061
89	7.42	0.37	0.153	(0.239)	0.092	0.061
90	7.50	0.37	0.153	(0.238)	0.092	0.061
91	7.58	0.40	0.167	(0.237)	0.100	0.067
92	7.67	0.40	0.167	(0.236)	0.100	0.067
93	7.75	0.40	0.167	(0.235)	0.100	0.067
94	7.83	0.43	0.181	(0.234)	0.109	0.072
95	7.92	0.43	0.181	(0.233)	0.109	0.072
96	8.00	0.43	0.181	(0.232)	0.109	0.072
97	8.08	0.50	0.209	(0.231)	0.125	0.084
98	8.17	0.50	0.209	(0.229)	0.125	0.084
99	8.25	0.50	0.209	(0.228)	0.125	0.084
100	8.33	0.50	0.209	(0.227)	0.125	0.084
101	8.42	0.50	0.209	(0.226)	0.125	0.084
102	8.50	0.50	0.209	(0.225)	0.125	0.084
103	8.58	0.53	0.223	(0.224)	0.134	0.089
104	8.67	0.53	0.223	(0.223)	0.134	0.089
105	8.75	0.53	0.223	(0.222)	0.134	0.089
106	8.83	0.57	0.237	(0.221)	0.142	0.095
107	8.92	0.57	0.237	(0.220)	0.142	0.095
108	9.00	0.57	0.237	(0.219)	0.142	0.095
109	9.08	0.63	0.264	(0.218)	0.159	0.106
110	9.17	0.63	0.264	(0.217)	0.159	0.106
111	9.25	0.63	0.264	(0.216)	0.159	0.106
112	9.33	0.67	0.278	(0.215)	0.167	0.111
113	9.42	0.67	0.278	(0.214)	0.167	0.111
114	9.50	0.67	0.278	(0.213)	0.167	0.111
115	9.58	0.70	0.292	(0.212)	0.175	0.117
116	9.67	0.70	0.292	(0.211)	0.175	0.117
117	9.75	0.70	0.292	(0.210)	0.175	0.117
118	9.83	0.73	0.306	(0.209)	0.184	0.123
119	9.92	0.73	0.306	(0.208)	0.184	0.123
120	10.00	0.73	0.306	(0.207)	0.184	0.123
121	10.08	0.50	0.209	(0.206)	0.125	0.084
122	10.17	0.50	0.209	(0.205)	0.125	0.084
123	10.25	0.50	0.209	(0.204)	0.125	0.084
124	10.33	0.50	0.209	(0.203)	0.125	0.084
125	10.42	0.50	0.209	(0.202)	0.125	0.084
126	10.50	0.50	0.209	(0.201)	0.125	0.084
127	10.58	0.67	0.278	(0.200)	0.167	0.111
128	10.67	0.67	0.278	(0.199)	0.167	0.111
129	10.75	0.67	0.278	(0.198)	0.167	0.111
130	10.83	0.67	0.278	(0.197)	0.167	0.111
131	10.92	0.67	0.278	(0.196)	0.167	0.111
132	11.00	0.67	0.278	(0.195)	0.167	0.111
133	11.08	0.63	0.264	(0.194)	0.159	0.106
134	11.17	0.63	0.264	(0.193)	0.159	0.106
135	11.25	0.63	0.264	(0.192)	0.159	0.106
136	11.33	0.63	0.264	(0.191)	0.159	0.106
137	11.42	0.63	0.264	(0.190)	0.159	0.106
138	11.50	0.63	0.264	(0.189)	0.159	0.106
139	11.58	0.57	0.237	(0.188)	0.142	0.095

140	11.67	0.57	0.237	(0.187)	0.142	0.095
141	11.75	0.57	0.237	(0.186)	0.142	0.095
142	11.83	0.60	0.251	(0.185)	0.150	0.100
143	11.92	0.60	0.251	(0.185)	0.150	0.100
144	12.00	0.60	0.251	(0.184)	0.150	0.100
145	12.08	0.83	0.348	0.183	(0.209)	0.165
146	12.17	0.83	0.348	0.182	(0.209)	0.166
147	12.25	0.83	0.348	0.181	(0.209)	0.167
148	12.33	0.87	0.362	0.180	(0.217)	0.182
149	12.42	0.87	0.362	0.179	(0.217)	0.183
150	12.50	0.87	0.362	0.178	(0.217)	0.184
151	12.58	0.93	0.390	0.177	(0.234)	0.213
152	12.67	0.93	0.390	0.176	(0.234)	0.213
153	12.75	0.93	0.390	0.175	(0.234)	0.214
154	12.83	0.97	0.404	0.175	(0.242)	0.229
155	12.92	0.97	0.404	0.174	(0.242)	0.230
156	13.00	0.97	0.404	0.173	(0.242)	0.231
157	13.08	1.13	0.473	0.172	(0.284)	0.301
158	13.17	1.13	0.473	0.171	(0.284)	0.302
159	13.25	1.13	0.473	0.170	(0.284)	0.303
160	13.33	1.13	0.473	0.169	(0.284)	0.304
161	13.42	1.13	0.473	0.168	(0.284)	0.305
162	13.50	1.13	0.473	0.168	(0.284)	0.306
163	13.58	0.77	0.320	0.167	(0.192)	0.153
164	13.67	0.77	0.320	0.166	(0.192)	0.154
165	13.75	0.77	0.320	0.165	(0.192)	0.155
166	13.83	0.77	0.320	0.164	(0.192)	0.156
167	13.92	0.77	0.320	0.163	(0.192)	0.157
168	14.00	0.77	0.320	0.163	(0.192)	0.158
169	14.08	0.90	0.376	0.162	(0.226)	0.214
170	14.17	0.90	0.376	0.161	(0.226)	0.215
171	14.25	0.90	0.376	0.160	(0.226)	0.216
172	14.33	0.87	0.362	0.159	(0.217)	0.203
173	14.42	0.87	0.362	0.158	(0.217)	0.204
174	14.50	0.87	0.362	0.158	(0.217)	0.204
175	14.58	0.87	0.362	0.157	(0.217)	0.205
176	14.67	0.87	0.362	0.156	(0.217)	0.206
177	14.75	0.87	0.362	0.155	(0.217)	0.207
178	14.83	0.83	0.348	0.154	(0.209)	0.194
179	14.92	0.83	0.348	0.154	(0.209)	0.194
180	15.00	0.83	0.348	0.153	(0.209)	0.195
181	15.08	0.80	0.334	0.152	(0.200)	0.182
182	15.17	0.80	0.334	0.151	(0.200)	0.183
183	15.25	0.80	0.334	0.150	(0.200)	0.184
184	15.33	0.77	0.320	0.150	(0.192)	0.170
185	15.42	0.77	0.320	0.149	(0.192)	0.171
186	15.50	0.77	0.320	0.148	(0.192)	0.172
187	15.58	0.63	0.264	0.147	(0.159)	0.117
188	15.67	0.63	0.264	0.147	(0.159)	0.118
189	15.75	0.63	0.264	0.146	(0.159)	0.119
190	15.83	0.63	0.264	0.145	(0.159)	0.119
191	15.92	0.63	0.264	0.144	(0.159)	0.120

192	16.00	0.63	0.264	0.144	(0.159)	0.121
193	16.08	0.13	0.056	(0.143)	0.033	0.022
194	16.17	0.13	0.056	(0.142)	0.033	0.022
195	16.25	0.13	0.056	(0.142)	0.033	0.022
196	16.33	0.13	0.056	(0.141)	0.033	0.022
197	16.42	0.13	0.056	(0.140)	0.033	0.022
198	16.50	0.13	0.056	(0.139)	0.033	0.022
199	16.58	0.10	0.042	(0.139)	0.025	0.017
200	16.67	0.10	0.042	(0.138)	0.025	0.017
201	16.75	0.10	0.042	(0.137)	0.025	0.017
202	16.83	0.10	0.042	(0.137)	0.025	0.017
203	16.92	0.10	0.042	(0.136)	0.025	0.017
204	17.00	0.10	0.042	(0.135)	0.025	0.017
205	17.08	0.17	0.070	(0.134)	0.042	0.028
206	17.17	0.17	0.070	(0.134)	0.042	0.028
207	17.25	0.17	0.070	(0.133)	0.042	0.028
208	17.33	0.17	0.070	(0.132)	0.042	0.028
209	17.42	0.17	0.070	(0.132)	0.042	0.028
210	17.50	0.17	0.070	(0.131)	0.042	0.028
211	17.58	0.17	0.070	(0.130)	0.042	0.028
212	17.67	0.17	0.070	(0.130)	0.042	0.028
213	17.75	0.17	0.070	(0.129)	0.042	0.028
214	17.83	0.13	0.056	(0.129)	0.033	0.022
215	17.92	0.13	0.056	(0.128)	0.033	0.022
216	18.00	0.13	0.056	(0.127)	0.033	0.022
217	18.08	0.13	0.056	(0.127)	0.033	0.022
218	18.17	0.13	0.056	(0.126)	0.033	0.022
219	18.25	0.13	0.056	(0.125)	0.033	0.022
220	18.33	0.13	0.056	(0.125)	0.033	0.022
221	18.42	0.13	0.056	(0.124)	0.033	0.022
222	18.50	0.13	0.056	(0.124)	0.033	0.022
223	18.58	0.10	0.042	(0.123)	0.025	0.017
224	18.67	0.10	0.042	(0.122)	0.025	0.017
225	18.75	0.10	0.042	(0.122)	0.025	0.017
226	18.83	0.07	0.028	(0.121)	0.017	0.011
227	18.92	0.07	0.028	(0.121)	0.017	0.011
228	19.00	0.07	0.028	(0.120)	0.017	0.011
229	19.08	0.10	0.042	(0.120)	0.025	0.017
230	19.17	0.10	0.042	(0.119)	0.025	0.017
231	19.25	0.10	0.042	(0.118)	0.025	0.017
232	19.33	0.13	0.056	(0.118)	0.033	0.022
233	19.42	0.13	0.056	(0.117)	0.033	0.022
234	19.50	0.13	0.056	(0.117)	0.033	0.022
235	19.58	0.10	0.042	(0.116)	0.025	0.017
236	19.67	0.10	0.042	(0.116)	0.025	0.017
237	19.75	0.10	0.042	(0.115)	0.025	0.017
238	19.83	0.07	0.028	(0.115)	0.017	0.011
239	19.92	0.07	0.028	(0.114)	0.017	0.011
240	20.00	0.07	0.028	(0.114)	0.017	0.011
241	20.08	0.10	0.042	(0.113)	0.025	0.017
242	20.17	0.10	0.042	(0.113)	0.025	0.017
243	20.25	0.10	0.042	(0.112)	0.025	0.017

244	20.33	0.10	0.042	(0.112)	0.025	0.017
245	20.42	0.10	0.042	(0.111)	0.025	0.017
246	20.50	0.10	0.042	(0.111)	0.025	0.017
247	20.58	0.10	0.042	(0.110)	0.025	0.017
248	20.67	0.10	0.042	(0.110)	0.025	0.017
249	20.75	0.10	0.042	(0.109)	0.025	0.017
250	20.83	0.07	0.028	(0.109)	0.017	0.011
251	20.92	0.07	0.028	(0.108)	0.017	0.011
252	21.00	0.07	0.028	(0.108)	0.017	0.011
253	21.08	0.10	0.042	(0.108)	0.025	0.017
254	21.17	0.10	0.042	(0.107)	0.025	0.017
255	21.25	0.10	0.042	(0.107)	0.025	0.017
256	21.33	0.07	0.028	(0.106)	0.017	0.011
257	21.42	0.07	0.028	(0.106)	0.017	0.011
258	21.50	0.07	0.028	(0.106)	0.017	0.011
259	21.58	0.10	0.042	(0.105)	0.025	0.017
260	21.67	0.10	0.042	(0.105)	0.025	0.017
261	21.75	0.10	0.042	(0.104)	0.025	0.017
262	21.83	0.07	0.028	(0.104)	0.017	0.011
263	21.92	0.07	0.028	(0.104)	0.017	0.011
264	22.00	0.07	0.028	(0.103)	0.017	0.011
265	22.08	0.10	0.042	(0.103)	0.025	0.017
266	22.17	0.10	0.042	(0.103)	0.025	0.017
267	22.25	0.10	0.042	(0.102)	0.025	0.017
268	22.33	0.07	0.028	(0.102)	0.017	0.011
269	22.42	0.07	0.028	(0.102)	0.017	0.011
270	22.50	0.07	0.028	(0.101)	0.017	0.011
271	22.58	0.07	0.028	(0.101)	0.017	0.011
272	22.67	0.07	0.028	(0.101)	0.017	0.011
273	22.75	0.07	0.028	(0.101)	0.017	0.011
274	22.83	0.07	0.028	(0.100)	0.017	0.011
275	22.92	0.07	0.028	(0.100)	0.017	0.011
276	23.00	0.07	0.028	(0.100)	0.017	0.011
277	23.08	0.07	0.028	(0.100)	0.017	0.011
278	23.17	0.07	0.028	(0.099)	0.017	0.011
279	23.25	0.07	0.028	(0.099)	0.017	0.011
280	23.33	0.07	0.028	(0.099)	0.017	0.011
281	23.42	0.07	0.028	(0.099)	0.017	0.011
282	23.50	0.07	0.028	(0.099)	0.017	0.011
283	23.58	0.07	0.028	(0.098)	0.017	0.011
284	23.67	0.07	0.028	(0.098)	0.017	0.011
285	23.75	0.07	0.028	(0.098)	0.017	0.011
286	23.83	0.07	0.028	(0.098)	0.017	0.011
287	23.92	0.07	0.028	(0.098)	0.017	0.011
288	24.00	0.07	0.028	(0.098)	0.017	0.011

(Loss Rate Not Used)

Sum = 100.0 Sum = 19.2

Flood volume = Effective rainfall 1.60(In)

times area 166.4(Ac.)/[(In)/(Ft.)] = 22.2(Ac.Ft)

Total soil loss = 1.88(In)

Total soil loss = 26.061(Ac.Ft)

Total rainfall = 3.48(In)

Flood volume = 966412.6 Cubic Feet
Total soil loss = 1135222.4 Cubic Feet

Peak flow rate of this hydrograph = 48.562(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	12.5	25.0	37.5	50.0
0+ 5	0.0004	0.05	Q				
0+10	0.0020	0.24	Q				
0+15	0.0070	0.72	Q				
0+20	0.0154	1.23	Q				
0+25	0.0260	1.53	VQ				
0+30	0.0391	1.90	VQ				
0+35	0.0545	2.24	VQ				
0+40	0.0711	2.41	VQ				
0+45	0.0885	2.53	V Q				
0+50	0.1067	2.64	V Q				
0+55	0.1259	2.79	V Q				
1+ 0	0.1471	3.07	V Q				
1+ 5	0.1700	3.32	V Q				
1+10	0.1930	3.34	V Q				
1+15	0.2149	3.18	V Q				
1+20	0.2355	2.99	V Q				
1+25	0.2557	2.94	V Q				
1+30	0.2757	2.90	V Q				
1+35	0.2955	2.88	V Q				
1+40	0.3152	2.86	V Q				
1+45	0.3347	2.84	V Q				
1+50	0.3544	2.85	V Q				
1+55	0.3746	2.93	V Q				
2+ 0	0.3964	3.17	V Q				
2+ 5	0.4199	3.41	V Q				
2+10	0.4441	3.51	V Q				
2+15	0.4688	3.58	V Q				
2+20	0.4938	3.63	V Q				
2+25	0.5189	3.66	V Q				
2+30	0.5443	3.68	V Q				
2+35	0.5700	3.73	|VQ				
2+40	0.5964	3.83	|V Q				
2+45	0.6245	4.08	|V Q				
2+50	0.6543	4.33	|V Q				
2+55	0.6848	4.43	|V Q				
3+ 0	0.7158	4.50	|V Q				
3+ 5	0.7471	4.55	|V Q				
3+10	0.7787	4.59	|V Q				

```
3+15       0.8105      4.61  |V Q      |          |          |          |
3+20       0.8424      4.63  |V Q      |          |          |          |
3+25       0.8744      4.65  |V Q      |          |          |          |
3+30       0.9064      4.65  |V Q      |          |          |          |
3+35       0.9385      4.66  |V Q      |          |          |          |
3+40       0.9706      4.66  |V Q      |          |          |          |
3+45       1.0027      4.66  |V Q      |          |          |          |
3+50       1.0350      4.69  |V Q      |          |          |          |
3+55       1.0680      4.79  |V Q      |          |          |          |
4+ 0       1.1026      5.03  |V  Q     |          |          |          |
4+ 5       1.1389      5.27  | V Q     |          |          |          |
4+10       1.1759      5.37  | V Q     |          |          |          |
4+15       1.2134      5.44  | V Q     |          |          |          |
4+20       1.2514      5.51  | V Q     |          |          |          |
4+25       1.2903      5.64  | V Q     |          |          |          |
4+30       1.3310      5.91  | V Q     |          |          |          |
4+35       1.3735      6.17  | V Q     |          |          |          |
4+40       1.4168      6.29  | V  Q    |          |          |          |
4+45       1.4605      6.36  | V  Q    |          |          |          |
4+50       1.5049      6.44  | V  Q    |          |          |          |
4+55       1.5501      6.57  | V  Q    |          |          |          |
5+ 0       1.5972      6.84  | V  Q    |          |          |          |
5+ 5       1.6457      7.05  | V  Q    |          |          |          |
5+10       1.6938      6.98  |  V Q    |          |          |          |
5+15       1.7390      6.57  |  V Q    |          |          |          |
5+20       1.7815      6.16  |  VQ     |          |          |          |
5+25       1.8234      6.09  |  VQ     |          |          |          |
5+30       1.8663      6.23  |  VQ     |          |          |          |
5+35       1.9106      6.42  |  V Q    |          |          |          |
5+40       1.9558      6.56  |  V Q    |          |          |          |
5+45       2.0028      6.83  |  V Q    |          |          |          |
5+50       2.0516      7.09  |  V Q    |          |          |          |
5+55       2.1012      7.20  |  V Q    |          |          |          |
6+ 0       2.1513      7.28  |  V Q    |          |          |          |
6+ 5       2.2020      7.37  |  V Q    |          |          |          |
6+10       2.2537      7.50  |   V Q   |          |          |          |
6+15       2.3073      7.77  |   V Q   |          |          |          |
6+20       2.3626      8.04  |   V Q   |          |          |          |
6+25       2.4187      8.15  |   V Q   |          |          |          |
6+30       2.4754      8.22  |   V Q   |          |          |          |
6+35       2.5325      8.30  |   V Q   |          |          |          |
6+40       2.5906      8.43  |   V Q   |          |          |          |
6+45       2.6505      8.70  |   V Q   |          |          |          |
6+50       2.7123      8.97  |   V  Q  |          |          |          |
6+55       2.7749      9.08  |    V Q  |          |          |          |
7+ 0       2.8379      9.16  |    V Q  |          |          |          |
7+ 5       2.9014      9.21  |    V Q  |          |          |          |
7+10       2.9651      9.25  |    V Q  |          |          |          |
7+15       3.0290      9.28  |    V Q  |          |          |          |
7+20       3.0932      9.33  |    V Q  |          |          |          |
7+25       3.1582      9.43  |    V Q  |          |          |          |
7+30       3.2249      9.68  |    V Q  |          |          |          |
```

7+35	3.2934	9.96	V Q				
7+40	3.3634	10.15	V Q				
7+45	3.4354	10.46	V Q				
7+50	3.5097	10.78	V Q				
7+55	3.5856	11.01	V Q				
8+ 0	3.6637	11.35	V Q				
8+ 5	3.7444	11.71	V Q				
8+10	3.8273	12.05	V Q				
8+15	3.9143	12.63	V Q				
8+20	4.0051	13.18	V Q				
8+25	4.0977	13.44	V Q				
8+30	4.1914	13.61	V Q				
8+35	4.2861	13.75	V Q				
8+40	4.3820	13.93	V Q				
8+45	4.4801	14.24	V Q				
8+50	4.5803	14.55	V Q				
8+55	4.6820	14.77	V Q				
9+ 0	4.7860	15.10	V Q				
9+ 5	4.8924	15.45	V Q				
9+10	5.0011	15.78	V Q				
9+15	5.1138	16.36	V Q				
9+20	5.2306	16.95	V Q				
9+25	5.3497	17.30	V Q				
9+30	5.4716	17.71	V Q				
9+35	5.5963	18.10	V Q				
9+40	5.7228	18.38	V Q				
9+45	5.8519	18.74	V Q				
9+50	5.9835	19.10	V Q				
9+55	6.1168	19.36	V Q				
10+ 0	6.2526	19.71	V Q				
10+ 5	6.3893	19.85	V Q				
10+10	6.5227	19.36	V Q				
10+15	6.6451	17.78	V Q				
10+20	6.7563	16.15	Q				
10+25	6.8631	15.50	Q				
10+30	6.9669	15.07	Q				
10+35	7.0695	14.90	QV				
10+40	7.1737	15.13	Q				
10+45	7.2850	16.17	QV				
10+50	7.4039	17.27	Q				
10+55	7.5257	17.69	VQ				
11+ 0	7.6495	17.98	VQ				
11+ 5	7.7746	18.16	Q				
11+10	7.9002	18.22	Q				
11+15	8.0248	18.10	Q				
11+20	8.1483	17.93	Q				
11+25	8.2714	17.88	Q				
11+30	8.3942	17.83	QV				
11+35	8.5165	17.75	QV				
11+40	8.6373	17.54	QV				
11+45	8.7547	17.04	Q V				
11+50	8.8688	16.58	Q V				

```
11+55       8.9822     16.47  |         |  Q  V   |         |         |
12+ 0       9.0964     16.58  |         |  Q  V   |         |         |
12+ 5       9.2137     17.03  |         |  Q  V   |         |         |
12+10       9.3387     18.15  |         |   Q V   |         |         |
12+15       9.4833     21.00  |         |     QV  |         |         |
12+20       9.6485     23.98  |         |      V Q|         |         |
12+25       9.8241     25.50  |         |      V  Q         |         |
12+30      10.0101     27.01  |         |       V |Q        |         |
12+35      10.2059     28.44  |         |       V | Q       |         |
12+40      10.4105     29.70  |         |       V |  Q      |         |
12+45      10.6276     31.52  |         |        V|    Q    |         |
12+50      10.8567     33.27  |         |        V|     Q   |         |
12+55      11.0936     34.39  |         |         V      Q  |         |
13+ 0      11.3388     35.61  |         |         V       Q |         |
13+ 5      11.5938     37.02  |         |         V        Q|         |
13+10      11.8612     38.83  |         |         |V        |Q        |
13+15      12.1527     42.33  |         |         |V        |  Q      |
13+20      12.4679     45.77  |         |         | V       |     Q   |
13+25      12.7941     47.36  |         |         |  V      |      Q  |
13+30      13.1278     48.46  |         |         |  V      |       Q |
13+35      13.4623     48.56  |         |         |   V     |       Q |
13+40      13.7836     46.65  |         |         |   V     |      Q  |
13+45      14.0627     40.53  |         |         |    V    | Q       |
13+50      14.2983     34.22  |         |         |    V Q  |         |
13+55      14.5171     31.77  |         |         |    QV   |         |
14+ 0      14.7249     30.18  |         |         |   Q V   |         |
14+ 5      14.9270     29.33  |         |         |  Q  V   |         |
14+10      15.1301     29.49  |         |         |  Q   V  |         |
14+15      15.3460     31.35  |         |         |    Q V  |         |
14+20      15.5761     33.40  |         |         |     Q V |         |
14+25      15.8102     33.99  |         |         |      QV |         |
14+30      16.0446     34.03  |         |         |      QV |         |
14+35      16.2783     33.94  |         |         |      Q V|         |
14+40      16.5131     34.09  |         |         |      Q V|         |
14+45      16.7490     34.26  |         |         |      Q  V         |
14+50      16.9854     34.32  |         |         |      Q  V         |
14+55      17.2209     34.20  |         |         |      Q  |V        |
15+ 0      17.4530     33.69  |         |         |     Q   |V        |
15+ 5      17.6811     33.12  |         |         |     Q   |V        |
15+10      17.9067     32.76  |         |         |     Q   | V       |
15+15      18.1280     32.13  |         |         |    Q    | V       |
15+20      18.3448     31.49  |         |         |    Q    |  V      |
15+25      18.5588     31.06  |         |         |   Q     |  V      |
15+30      18.7679     30.37  |         |         |   Q     |  V      |
15+35      18.9708     29.46  |         |         |  Q      |   V     |
15+40      19.1657     28.29  |         |         | Q       |   V     |
15+45      19.3431     25.76  |         |         Q         |   V     |
15+50      19.5034     23.27  |         |       Q |         |    V    |
15+55      19.6567     22.26  |         |      Q  |         |    V    |
16+ 0      19.8057     21.64  |         |      Q  |         |    V    |
16+ 5      19.9487     20.76  |         |     Q   |         |    V    |
16+10      20.0784     18.83  |         |    Q    |         |     V   |
```

16+15	20.1773	14.36	|	|Q	|	|	V |
16+20	20.2454	9.89	|	Q |	|	|	V |
16+25	20.3005	7.99	|	Q |	|	|	V |
16+30	20.3471	6.77	|	Q |	|	|	V |
16+35	20.3875	5.87	|	Q |	|	|	V |
16+40	20.4228	5.13	|	Q |	|	|	V |
16+45	20.4532	4.41	|	Q |	|	|	V |
16+50	20.4794	3.82	|	Q |	|	|	V |
16+55	20.5033	3.47	|	Q |	|	|	V |
17+ 0	20.5259	3.28	|	Q |	|	|	V |
17+ 5	20.5480	3.20	|	Q |	|	|	V |
17+10	20.5706	3.29	|	Q |	|	|	V |
17+15	20.5962	3.71	|	Q |	|	|	V |
17+20	20.6247	4.14	|	Q |	|	|	V |
17+25	20.6541	4.28	|	Q |	|	|	V |
17+30	20.6843	4.38	|	Q |	|	|	V |
17+35	20.7150	4.46	|	Q |	|	|	V |
17+40	20.7462	4.52	|	Q |	|	|	V |
17+45	20.7776	4.57	|	Q |	|	|	V |
17+50	20.8091	4.58	|	Q |	|	|	V |
17+55	20.8402	4.51	|	Q |	|	|	V |
18+ 0	20.8696	4.28	|	Q |	|	|	V |
18+ 5	20.8975	4.04	|	Q |	|	|	V |
18+10	20.9246	3.95	|	Q |	|	|	V |
18+15	20.9514	3.88	|	Q |	|	|	V |
18+20	20.9779	3.84	|	Q |	|	|	V |
18+25	21.0041	3.81	|	Q |	|	|	V |
18+30	21.0302	3.79	|	Q |	|	|	V |
18+35	21.0560	3.75	|	Q |	|	|	V |
18+40	21.0811	3.64	|	Q |	|	|	V |
18+45	21.1044	3.39	|	Q |	|	|	V |
18+50	21.1259	3.12	|	Q |	|	|	V |
18+55	21.1461	2.92	|	Q |	|	|	V |
19+ 0	21.1641	2.61	|	Q |	|	|	V |
19+ 5	21.1802	2.35	|	|Q |	|	|	V |
19+10	21.1960	2.30	|	|Q |	|	|	V |
19+15	21.2129	2.45	|	|Q |	|	|	V |
19+20	21.2312	2.65	|	Q |	|	|	V |
19+25	21.2504	2.80	|	Q |	|	|	V |
19+30	21.2716	3.07	|	Q |	|	|	V |
19+35	21.2944	3.31	|	Q |	|	|	V |
19+40	21.3174	3.34	|	Q |	|	|	V |
19+45	21.3393	3.18	|	Q |	|	|	V |
19+50	21.3598	2.97	|	Q |	|	|	V |
19+55	21.3792	2.82	|	Q |	|	|	V |
20+ 0	21.3967	2.54	|	Q |	|	|	V |
20+ 5	21.4125	2.30	|	|Q |	|	|	V |
20+10	21.4281	2.27	|	|Q |	|	|	V |
20+15	21.4448	2.42	|	|Q |	|	|	V |
20+20	21.4628	2.61	|	Q |	|	|	V |
20+25	21.4811	2.66	|	Q |	|	|	V |
20+30	21.4997	2.70	|	Q |	|	|	V |

20+35	21.5185	2.73	| Q	|	|	|	V |
20+40	21.5375	2.75	| Q	|	|	|	V |
20+45	21.5566	2.77	| Q	|	|	|	V |
20+50	21.5756	2.76	| Q	|	|	|	V |
20+55	21.5940	2.67	| Q	|	|	|	V |
21+ 0	21.6107	2.43	|Q	|	|	|	V |
21+ 5	21.6260	2.22	|Q	|	|	|	V |
21+10	21.6412	2.21	|Q	|	|	|	V|
21+15	21.6576	2.38	|Q	|	|	|	V|
21+20	21.6752	2.56	| Q	|	|	|	V|
21+25	21.6927	2.53	| Q	|	|	|	V|
21+30	21.7087	2.33	|Q	|	|	|	V|
21+35	21.7235	2.14	|Q	|	|	|	V|
21+40	21.7384	2.16	|Q	|	|	|	V|
21+45	21.7546	2.35	|Q	|	|	|	V|
21+50	21.7721	2.54	| Q	|	|	|	V|
21+55	21.7894	2.52	| Q	|	|	|	V|
22+ 0	21.8055	2.32	|Q	|	|	|	V|
22+ 5	21.8202	2.14	|Q	|	|	|	V|
22+10	21.8350	2.15	|Q	|	|	|	V|
22+15	21.8512	2.35	|Q	|	|	|	V|
22+20	21.8686	2.53	| Q	|	|	|	V|
22+25	21.8859	2.52	| Q	|	|	|	V|
22+30	21.9019	2.32	|Q	|	|	|	V|
22+35	21.9165	2.11	|Q	|	|	|	V|
22+40	21.9305	2.03	|Q	|	|	|	V|
22+45	21.9442	1.99	|Q	|	|	|	V|
22+50	21.9576	1.96	|Q	|	|	|	V|
22+55	21.9710	1.93	|Q	|	|	|	V|
23+ 0	21.9841	1.91	|Q	|	|	|	V|
23+ 5	21.9972	1.90	|Q	|	|	|	V|
23+10	22.0102	1.88	|Q	|	|	|	V|
23+15	22.0231	1.88	|Q	|	|	|	V|
23+20	22.0360	1.88	|Q	|	|	|	V|
23+25	22.0489	1.88	|Q	|	|	|	V|
23+30	22.0618	1.87	|Q	|	|	|	V|
23+35	22.0747	1.87	|Q	|	|	|	V|
23+40	22.0876	1.87	|Q	|	|	|	V|
23+45	22.1005	1.87	|Q	|	|	|	V|
23+50	22.1134	1.87	|Q	|	|	|	V|
23+55	22.1262	1.87	|Q	|	|	|	V|
24+ 0	22.1391	1.87	|Q	|	|	|	V|
24+ 5	22.1516	1.82	|Q	|	|	|	V|
24+10	22.1628	1.63	|Q	|	|	|	V|
24+15	22.1708	1.15	Q	|	|	|	V|
24+20	22.1753	0.66	Q	|	|	|	V|
24+25	22.1785	0.46	Q	|	|	|	V|
24+30	22.1807	0.33	Q	|	|	|	V|
24+35	22.1823	0.23	Q	|	|	|	V|
24+40	22.1834	0.16	Q	|	|	|	V|
24+45	22.1842	0.11	Q	|	|	|	V|
24+50	22.1847	0.07	Q	|	|	|	V|

```
24+55      22.1850      0.05  Q          |          |          |         V|
25+ 0      22.1852      0.03  Q          |          |          |         V|
25+ 5      22.1854      0.03  Q          |          |          |         V|
25+10      22.1855      0.02  Q          |          |          |         V|
25+15      22.1857      0.02  Q          |          |          |         V|
25+20      22.1857      0.01  Q          |          |          |         V|
25+25      22.1858      0.01  Q          |          |          |         V|
25+30      22.1858      0.00  Q          |          |          |         V|
25+35      22.1858      0.00  Q          |          |          |          V
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 12/15/17 File: d234110.out

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

Program License Serial Number 4028

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

English Units used in output format

Tentative Tract 35853
Proposed Conditions
10-Year, 1-Hour Storm
Area Tributary to Rational Method Node 234

Drainage Area = 82.84(Ac.) = 0.129 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 82.84(Ac.)=0.129 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.216 Hr.
Lag time = 12.96 Min.
25% of lag time = 3.24 Min.
40% of lag time = 5.18 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
82.84	0.54	44.73

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
82.84	1.26	104.38

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 0.540(In)
Area Averaged 100-Year Rainfall = 1.260(In)

Point rain (area averaged) = 0.836(In)
Areal adjustment factor = 99.92 %
Adjusted average point rain = 0.836(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
43.530	81.00	0.000
39.310	69.00	0.500

Total Area Entered = 82.84(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
81.0	81.0	0.233	0.000	0.233	0.525	0.122
69.0	69.0	0.373	0.500	0.205	0.475	0.097
					Sum (F) =	0.220

Area averaged mean soil loss (F) (In/Hr) = 0.220
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.710

Slope of intensity-duration curve for a 1 hour storm =0.5500

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	38.580	2.983	2.490
2	0.167	77.160	10.930	9.126
3	0.250	115.741	29.079	24.277
4	0.333	154.321	23.996	20.033
5	0.417	192.901	10.269	8.573
6	0.500	231.481	6.860	5.727
7	0.583	270.062	4.851	4.050
8	0.667	308.642	3.560	2.972
9	0.750	347.222	2.558	2.135
10	0.833	385.802	1.756	1.466
11	0.917	424.383	1.078	0.900
12	1.000	462.963	0.500	0.418
13	1.083	501.543	0.403	0.336
14	1.167	540.123	0.303	0.253
15	1.250	578.704	0.253	0.211
16	1.333	617.284	0.291	0.243

17	1.417	655.864	0.177	0.148
18	1.500	694.444	0.105	0.088
19	1.583	733.025	0.050	0.041
		Sum = 100.000	Sum=	83.487

The following loss rate calculations reflect use of the minimum calculated loss
rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	3.30	0.331	0.220	(0.235)	0.111
2	0.17	4.20	0.421	0.220	(0.299)	0.202
3	0.25	4.40	0.441	0.220	(0.313)	0.222
4	0.33	4.80	0.481	0.220	(0.342)	0.262
5	0.42	5.20	0.521	0.220	(0.370)	0.302
6	0.50	6.20	0.622	0.220	(0.441)	0.402
7	0.58	6.80	0.682	0.220	(0.484)	0.462
8	0.67	8.80	0.882	0.220	(0.626)	0.663
9	0.75	13.90	1.394	0.220	(0.990)	1.174
10	0.83	31.40	3.148	0.220	(2.235)	2.929
11	0.92	7.20	0.722	0.220	(0.513)	0.502
12	1.00	3.80	0.381	0.220	(0.271)	0.162

(Loss Rate Not Used)

Sum = 100.0 Sum = 7.4

Flood volume = Effective rainfall 0.62(In)
times area 82.8(Ac.)/[(In)/(Ft.)] = 4.3(Ac.Ft)
Total soil loss = 0.22(In)
Total soil loss = 1.515(Ac.Ft)
Total rainfall = 0.84(In)
Flood volume = 185256.1 Cubic Feet
Total soil loss = 66012.3 Cubic Feet

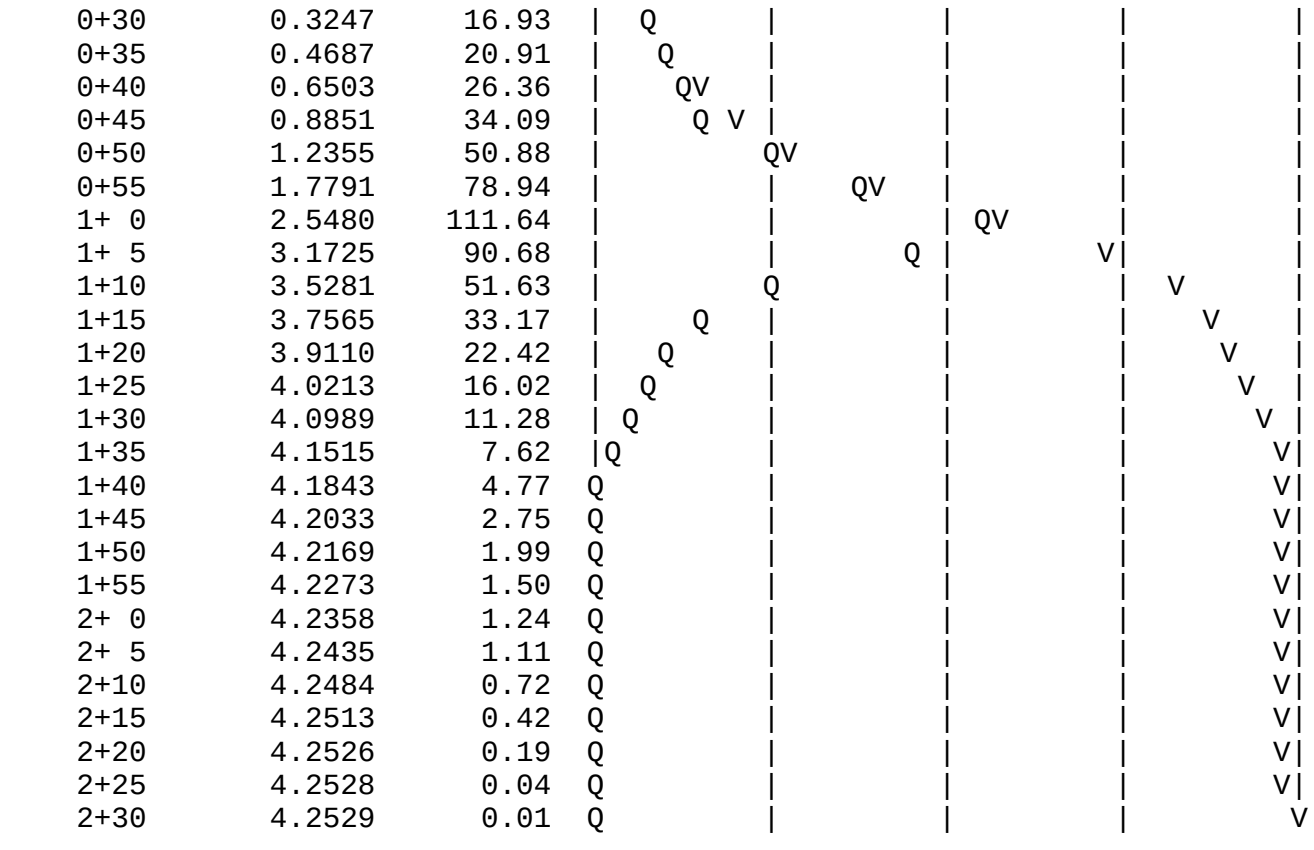
Peak flow rate of this hydrograph = 111.644(CFS)

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1 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	50.0	100.0	150.0	200.0
0+ 5	0.0019	0.28	Q				
0+10	0.0124	1.52	Q				
0+15	0.0475	5.10	VQ				
0+20	0.1150	9.81	|Q				
0+25	0.2081	13.52	|VQ				


0+30 0.3247 16.93
0+35 0.4687 20.91
0+40 0.6503 26.36
0+45 0.8851 34.09
0+50 1.2355 50.88
0+55 1.7791 78.94
1+ 0 2.5480 111.64
1+ 5 3.1725 90.68
1+10 3.5281 51.63
1+15 3.7565 33.17
1+20 3.9110 22.42
1+25 4.0213 16.02
1+30 4.0989 11.28
1+35 4.1515 7.62
1+40 4.1843 4.77
1+45 4.2033 2.75
1+50 4.2169 1.99
1+55 4.2273 1.50
2+ 0 4.2358 1.24
2+ 5 4.2435 1.11
2+10 4.2484 0.72
2+15 4.2513 0.42
2+20 4.2526 0.19
2+25 4.2528 0.04
2+30 4.2529 0.01

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

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Study date 12/15/17 File: d2342410.out

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

Program License Serial Number 4028

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

English Units used in output format

Tentative Tract 35853
Proposed Conditions
10-Year, 24-Hour Storm
Area Tributary to Rational Method Node 234

Drainage Area = 82.84(Ac.) = 0.129 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 82.84(Ac.)=0.129 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.216 Hr.
Lag time = 12.96 Min.
25% of lag time = 3.24 Min.
40% of lag time = 5.18 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
82.84	2.28	188.88

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
82.84	5.20	430.77

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 2.280(In)
Area Averaged 100-Year Rainfall = 5.200(In)

Point rain (area averaged) = 3.481(In)
Areal adjustment factor = 99.98 %
Adjusted average point rain = 3.481(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
43.530	81.00	0.000
39.310	69.00	0.500

Total Area Entered = 82.84(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
81.0	81.0	0.233	0.000	0.233	0.525	0.122
69.0	69.0	0.373	0.500	0.205	0.475	0.097
					Sum (F) =	0.220

Area averaged mean soil loss (F) (In/Hr) = 0.220
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.710

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	38.580	2.983	2.490
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4	0.333	154.321	23.996	20.033
5	0.417	192.901	10.269	8.573
6	0.500	231.481	6.860	5.727
7	0.583	270.062	4.851	4.050
8	0.667	308.642	3.560	2.972
9	0.750	347.222	2.558	2.135
10	0.833	385.802	1.756	1.466
11	0.917	424.383	1.078	0.900
12	1.000	462.963	0.500	0.418
13	1.083	501.543	0.403	0.336
14	1.167	540.123	0.303	0.253
15	1.250	578.704	0.253	0.211
16	1.333	617.284	0.291	0.243
17	1.417	655.864	0.177	0.148
18	1.500	694.444	0.105	0.088

19	1.583	733.025	0.050		0.041
			Sum = 100.000	Sum=	83.487

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.028	(0.389)	0.020	0.008
2	0.17	0.07	0.028	(0.388)	0.020	0.008
3	0.25	0.07	0.028	(0.386)	0.020	0.008
4	0.33	0.10	0.042	(0.385)	0.030	0.012
5	0.42	0.10	0.042	(0.383)	0.030	0.012
6	0.50	0.10	0.042	(0.382)	0.030	0.012
7	0.58	0.10	0.042	(0.380)	0.030	0.012
8	0.67	0.10	0.042	(0.379)	0.030	0.012
9	0.75	0.10	0.042	(0.377)	0.030	0.012
10	0.83	0.13	0.056	(0.376)	0.040	0.016
11	0.92	0.13	0.056	(0.374)	0.040	0.016
12	1.00	0.13	0.056	(0.373)	0.040	0.016
13	1.08	0.10	0.042	(0.371)	0.030	0.012
14	1.17	0.10	0.042	(0.370)	0.030	0.012
15	1.25	0.10	0.042	(0.368)	0.030	0.012
16	1.33	0.10	0.042	(0.367)	0.030	0.012
17	1.42	0.10	0.042	(0.365)	0.030	0.012
18	1.50	0.10	0.042	(0.364)	0.030	0.012
19	1.58	0.10	0.042	(0.363)	0.030	0.012
20	1.67	0.10	0.042	(0.361)	0.030	0.012
21	1.75	0.10	0.042	(0.360)	0.030	0.012
22	1.83	0.13	0.056	(0.358)	0.040	0.016
23	1.92	0.13	0.056	(0.357)	0.040	0.016
24	2.00	0.13	0.056	(0.355)	0.040	0.016
25	2.08	0.13	0.056	(0.354)	0.040	0.016
26	2.17	0.13	0.056	(0.352)	0.040	0.016
27	2.25	0.13	0.056	(0.351)	0.040	0.016
28	2.33	0.13	0.056	(0.350)	0.040	0.016
29	2.42	0.13	0.056	(0.348)	0.040	0.016
30	2.50	0.13	0.056	(0.347)	0.040	0.016
31	2.58	0.17	0.070	(0.345)	0.049	0.020
32	2.67	0.17	0.070	(0.344)	0.049	0.020
33	2.75	0.17	0.070	(0.342)	0.049	0.020
34	2.83	0.17	0.070	(0.341)	0.049	0.020
35	2.92	0.17	0.070	(0.340)	0.049	0.020
36	3.00	0.17	0.070	(0.338)	0.049	0.020
37	3.08	0.17	0.070	(0.337)	0.049	0.020
38	3.17	0.17	0.070	(0.335)	0.049	0.020
39	3.25	0.17	0.070	(0.334)	0.049	0.020
40	3.33	0.17	0.070	(0.333)	0.049	0.020

41	3.42	0.17	0.070	(0.331)	0.049	0.020
42	3.50	0.17	0.070	(0.330)	0.049	0.020
43	3.58	0.17	0.070	(0.328)	0.049	0.020
44	3.67	0.17	0.070	(0.327)	0.049	0.020
45	3.75	0.17	0.070	(0.326)	0.049	0.020
46	3.83	0.20	0.084	(0.324)	0.059	0.024
47	3.92	0.20	0.084	(0.323)	0.059	0.024
48	4.00	0.20	0.084	(0.322)	0.059	0.024
49	4.08	0.20	0.084	(0.320)	0.059	0.024
50	4.17	0.20	0.084	(0.319)	0.059	0.024
51	4.25	0.20	0.084	(0.318)	0.059	0.024
52	4.33	0.23	0.097	(0.316)	0.069	0.028
53	4.42	0.23	0.097	(0.315)	0.069	0.028
54	4.50	0.23	0.097	(0.313)	0.069	0.028
55	4.58	0.23	0.097	(0.312)	0.069	0.028
56	4.67	0.23	0.097	(0.311)	0.069	0.028
57	4.75	0.23	0.097	(0.309)	0.069	0.028
58	4.83	0.27	0.111	(0.308)	0.079	0.032
59	4.92	0.27	0.111	(0.307)	0.079	0.032
60	5.00	0.27	0.111	(0.305)	0.079	0.032
61	5.08	0.20	0.084	(0.304)	0.059	0.024
62	5.17	0.20	0.084	(0.303)	0.059	0.024
63	5.25	0.20	0.084	(0.301)	0.059	0.024
64	5.33	0.23	0.097	(0.300)	0.069	0.028
65	5.42	0.23	0.097	(0.299)	0.069	0.028
66	5.50	0.23	0.097	(0.298)	0.069	0.028
67	5.58	0.27	0.111	(0.296)	0.079	0.032
68	5.67	0.27	0.111	(0.295)	0.079	0.032
69	5.75	0.27	0.111	(0.294)	0.079	0.032
70	5.83	0.27	0.111	(0.292)	0.079	0.032
71	5.92	0.27	0.111	(0.291)	0.079	0.032
72	6.00	0.27	0.111	(0.290)	0.079	0.032
73	6.08	0.30	0.125	(0.288)	0.089	0.036
74	6.17	0.30	0.125	(0.287)	0.089	0.036
75	6.25	0.30	0.125	(0.286)	0.089	0.036
76	6.33	0.30	0.125	(0.285)	0.089	0.036
77	6.42	0.30	0.125	(0.283)	0.089	0.036
78	6.50	0.30	0.125	(0.282)	0.089	0.036
79	6.58	0.33	0.139	(0.281)	0.099	0.040
80	6.67	0.33	0.139	(0.280)	0.099	0.040
81	6.75	0.33	0.139	(0.278)	0.099	0.040
82	6.83	0.33	0.139	(0.277)	0.099	0.040
83	6.92	0.33	0.139	(0.276)	0.099	0.040
84	7.00	0.33	0.139	(0.275)	0.099	0.040
85	7.08	0.33	0.139	(0.273)	0.099	0.040
86	7.17	0.33	0.139	(0.272)	0.099	0.040
87	7.25	0.33	0.139	(0.271)	0.099	0.040
88	7.33	0.37	0.153	(0.270)	0.109	0.044
89	7.42	0.37	0.153	(0.268)	0.109	0.044
90	7.50	0.37	0.153	(0.267)	0.109	0.044
91	7.58	0.40	0.167	(0.266)	0.119	0.048
92	7.67	0.40	0.167	(0.265)	0.119	0.048

93	7.75	0.40	0.167	(0.263)	0.119	0.048
94	7.83	0.43	0.181	(0.262)	0.129	0.052
95	7.92	0.43	0.181	(0.261)	0.129	0.052
96	8.00	0.43	0.181	(0.260)	0.129	0.052
97	8.08	0.50	0.209	(0.259)	0.148	0.061
98	8.17	0.50	0.209	(0.257)	0.148	0.061
99	8.25	0.50	0.209	(0.256)	0.148	0.061
100	8.33	0.50	0.209	(0.255)	0.148	0.061
101	8.42	0.50	0.209	(0.254)	0.148	0.061
102	8.50	0.50	0.209	(0.253)	0.148	0.061
103	8.58	0.53	0.223	(0.251)	0.158	0.065
104	8.67	0.53	0.223	(0.250)	0.158	0.065
105	8.75	0.53	0.223	(0.249)	0.158	0.065
106	8.83	0.57	0.237	(0.248)	0.168	0.069
107	8.92	0.57	0.237	(0.247)	0.168	0.069
108	9.00	0.57	0.237	(0.246)	0.168	0.069
109	9.08	0.63	0.265	(0.244)	0.188	0.077
110	9.17	0.63	0.265	(0.243)	0.188	0.077
111	9.25	0.63	0.265	(0.242)	0.188	0.077
112	9.33	0.67	0.278	(0.241)	0.198	0.081
113	9.42	0.67	0.278	(0.240)	0.198	0.081
114	9.50	0.67	0.278	(0.239)	0.198	0.081
115	9.58	0.70	0.292	(0.237)	0.208	0.085
116	9.67	0.70	0.292	(0.236)	0.208	0.085
117	9.75	0.70	0.292	(0.235)	0.208	0.085
118	9.83	0.73	0.306	(0.234)	0.217	0.089
119	9.92	0.73	0.306	(0.233)	0.217	0.089
120	10.00	0.73	0.306	(0.232)	0.217	0.089
121	10.08	0.50	0.209	(0.231)	0.148	0.061
122	10.17	0.50	0.209	(0.230)	0.148	0.061
123	10.25	0.50	0.209	(0.228)	0.148	0.061
124	10.33	0.50	0.209	(0.227)	0.148	0.061
125	10.42	0.50	0.209	(0.226)	0.148	0.061
126	10.50	0.50	0.209	(0.225)	0.148	0.061
127	10.58	0.67	0.278	(0.224)	0.198	0.081
128	10.67	0.67	0.278	(0.223)	0.198	0.081
129	10.75	0.67	0.278	(0.222)	0.198	0.081
130	10.83	0.67	0.278	(0.221)	0.198	0.081
131	10.92	0.67	0.278	(0.220)	0.198	0.081
132	11.00	0.67	0.278	(0.219)	0.198	0.081
133	11.08	0.63	0.265	(0.218)	0.188	0.077
134	11.17	0.63	0.265	(0.216)	0.188	0.077
135	11.25	0.63	0.265	(0.215)	0.188	0.077
136	11.33	0.63	0.265	(0.214)	0.188	0.077
137	11.42	0.63	0.265	(0.213)	0.188	0.077
138	11.50	0.63	0.265	(0.212)	0.188	0.077
139	11.58	0.57	0.237	(0.211)	0.168	0.069
140	11.67	0.57	0.237	(0.210)	0.168	0.069
141	11.75	0.57	0.237	(0.209)	0.168	0.069
142	11.83	0.60	0.251	(0.208)	0.178	0.073
143	11.92	0.60	0.251	(0.207)	0.178	0.073
144	12.00	0.60	0.251	(0.206)	0.178	0.073

145	12.08	0.83	0.348	0.205	(0.247)	0.143
146	12.17	0.83	0.348	0.204	(0.247)	0.144
147	12.25	0.83	0.348	0.203	(0.247)	0.145
148	12.33	0.87	0.362	0.202	(0.257)	0.160
149	12.42	0.87	0.362	0.201	(0.257)	0.161
150	12.50	0.87	0.362	0.200	(0.257)	0.162
151	12.58	0.93	0.390	0.199	(0.277)	0.191
152	12.67	0.93	0.390	0.198	(0.277)	0.192
153	12.75	0.93	0.390	0.197	(0.277)	0.193
154	12.83	0.97	0.404	0.196	(0.287)	0.208
155	12.92	0.97	0.404	0.195	(0.287)	0.209
156	13.00	0.97	0.404	0.194	(0.287)	0.210
157	13.08	1.13	0.473	0.193	(0.336)	0.281
158	13.17	1.13	0.473	0.192	(0.336)	0.281
159	13.25	1.13	0.473	0.191	(0.336)	0.282
160	13.33	1.13	0.473	0.190	(0.336)	0.283
161	13.42	1.13	0.473	0.189	(0.336)	0.284
162	13.50	1.13	0.473	0.188	(0.336)	0.285
163	13.58	0.77	0.320	0.187	(0.227)	0.133
164	13.67	0.77	0.320	0.186	(0.227)	0.134
165	13.75	0.77	0.320	0.185	(0.227)	0.135
166	13.83	0.77	0.320	0.184	(0.227)	0.136
167	13.92	0.77	0.320	0.183	(0.227)	0.137
168	14.00	0.77	0.320	0.182	(0.227)	0.138
169	14.08	0.90	0.376	0.181	(0.267)	0.195
170	14.17	0.90	0.376	0.180	(0.267)	0.195
171	14.25	0.90	0.376	0.180	(0.267)	0.196
172	14.33	0.87	0.362	0.179	(0.257)	0.183
173	14.42	0.87	0.362	0.178	(0.257)	0.184
174	14.50	0.87	0.362	0.177	(0.257)	0.185
175	14.58	0.87	0.362	0.176	(0.257)	0.186
176	14.67	0.87	0.362	0.175	(0.257)	0.187
177	14.75	0.87	0.362	0.174	(0.257)	0.188
178	14.83	0.83	0.348	0.173	(0.247)	0.175
179	14.92	0.83	0.348	0.172	(0.247)	0.176
180	15.00	0.83	0.348	0.171	(0.247)	0.177
181	15.08	0.80	0.334	0.171	(0.237)	0.164
182	15.17	0.80	0.334	0.170	(0.237)	0.164
183	15.25	0.80	0.334	0.169	(0.237)	0.165
184	15.33	0.77	0.320	0.168	(0.227)	0.152
185	15.42	0.77	0.320	0.167	(0.227)	0.153
186	15.50	0.77	0.320	0.166	(0.227)	0.154
187	15.58	0.63	0.265	0.165	(0.188)	0.099
188	15.67	0.63	0.265	0.165	(0.188)	0.100
189	15.75	0.63	0.265	0.164	(0.188)	0.101
190	15.83	0.63	0.265	0.163	(0.188)	0.102
191	15.92	0.63	0.265	0.162	(0.188)	0.103
192	16.00	0.63	0.265	0.161	(0.188)	0.103
193	16.08	0.13	0.056	(0.160)	0.040	0.016
194	16.17	0.13	0.056	(0.160)	0.040	0.016
195	16.25	0.13	0.056	(0.159)	0.040	0.016
196	16.33	0.13	0.056	(0.158)	0.040	0.016

197	16.42	0.13	0.056	(0.157)	0.040	0.016
198	16.50	0.13	0.056	(0.156)	0.040	0.016
199	16.58	0.10	0.042	(0.156)	0.030	0.012
200	16.67	0.10	0.042	(0.155)	0.030	0.012
201	16.75	0.10	0.042	(0.154)	0.030	0.012
202	16.83	0.10	0.042	(0.153)	0.030	0.012
203	16.92	0.10	0.042	(0.152)	0.030	0.012
204	17.00	0.10	0.042	(0.152)	0.030	0.012
205	17.08	0.17	0.070	(0.151)	0.049	0.020
206	17.17	0.17	0.070	(0.150)	0.049	0.020
207	17.25	0.17	0.070	(0.149)	0.049	0.020
208	17.33	0.17	0.070	(0.149)	0.049	0.020
209	17.42	0.17	0.070	(0.148)	0.049	0.020
210	17.50	0.17	0.070	(0.147)	0.049	0.020
211	17.58	0.17	0.070	(0.146)	0.049	0.020
212	17.67	0.17	0.070	(0.146)	0.049	0.020
213	17.75	0.17	0.070	(0.145)	0.049	0.020
214	17.83	0.13	0.056	(0.144)	0.040	0.016
215	17.92	0.13	0.056	(0.143)	0.040	0.016
216	18.00	0.13	0.056	(0.143)	0.040	0.016
217	18.08	0.13	0.056	(0.142)	0.040	0.016
218	18.17	0.13	0.056	(0.141)	0.040	0.016
219	18.25	0.13	0.056	(0.141)	0.040	0.016
220	18.33	0.13	0.056	(0.140)	0.040	0.016
221	18.42	0.13	0.056	(0.139)	0.040	0.016
222	18.50	0.13	0.056	(0.139)	0.040	0.016
223	18.58	0.10	0.042	(0.138)	0.030	0.012
224	18.67	0.10	0.042	(0.137)	0.030	0.012
225	18.75	0.10	0.042	(0.137)	0.030	0.012
226	18.83	0.07	0.028	(0.136)	0.020	0.008
227	18.92	0.07	0.028	(0.135)	0.020	0.008
228	19.00	0.07	0.028	(0.135)	0.020	0.008
229	19.08	0.10	0.042	(0.134)	0.030	0.012
230	19.17	0.10	0.042	(0.133)	0.030	0.012
231	19.25	0.10	0.042	(0.133)	0.030	0.012
232	19.33	0.13	0.056	(0.132)	0.040	0.016
233	19.42	0.13	0.056	(0.132)	0.040	0.016
234	19.50	0.13	0.056	(0.131)	0.040	0.016
235	19.58	0.10	0.042	(0.130)	0.030	0.012
236	19.67	0.10	0.042	(0.130)	0.030	0.012
237	19.75	0.10	0.042	(0.129)	0.030	0.012
238	19.83	0.07	0.028	(0.129)	0.020	0.008
239	19.92	0.07	0.028	(0.128)	0.020	0.008
240	20.00	0.07	0.028	(0.127)	0.020	0.008
241	20.08	0.10	0.042	(0.127)	0.030	0.012
242	20.17	0.10	0.042	(0.126)	0.030	0.012
243	20.25	0.10	0.042	(0.126)	0.030	0.012
244	20.33	0.10	0.042	(0.125)	0.030	0.012
245	20.42	0.10	0.042	(0.125)	0.030	0.012
246	20.50	0.10	0.042	(0.124)	0.030	0.012
247	20.58	0.10	0.042	(0.124)	0.030	0.012
248	20.67	0.10	0.042	(0.123)	0.030	0.012

249	20.75	0.10	0.042	(0.123)	0.030	0.012
250	20.83	0.07	0.028	(0.122)	0.020	0.008
251	20.92	0.07	0.028	(0.122)	0.020	0.008
252	21.00	0.07	0.028	(0.121)	0.020	0.008
253	21.08	0.10	0.042	(0.121)	0.030	0.012
254	21.17	0.10	0.042	(0.120)	0.030	0.012
255	21.25	0.10	0.042	(0.120)	0.030	0.012
256	21.33	0.07	0.028	(0.119)	0.020	0.008
257	21.42	0.07	0.028	(0.119)	0.020	0.008
258	21.50	0.07	0.028	(0.118)	0.020	0.008
259	21.58	0.10	0.042	(0.118)	0.030	0.012
260	21.67	0.10	0.042	(0.118)	0.030	0.012
261	21.75	0.10	0.042	(0.117)	0.030	0.012
262	21.83	0.07	0.028	(0.117)	0.020	0.008
263	21.92	0.07	0.028	(0.116)	0.020	0.008
264	22.00	0.07	0.028	(0.116)	0.020	0.008
265	22.08	0.10	0.042	(0.116)	0.030	0.012
266	22.17	0.10	0.042	(0.115)	0.030	0.012
267	22.25	0.10	0.042	(0.115)	0.030	0.012
268	22.33	0.07	0.028	(0.114)	0.020	0.008
269	22.42	0.07	0.028	(0.114)	0.020	0.008
270	22.50	0.07	0.028	(0.114)	0.020	0.008
271	22.58	0.07	0.028	(0.113)	0.020	0.008
272	22.67	0.07	0.028	(0.113)	0.020	0.008
273	22.75	0.07	0.028	(0.113)	0.020	0.008
274	22.83	0.07	0.028	(0.112)	0.020	0.008
275	22.92	0.07	0.028	(0.112)	0.020	0.008
276	23.00	0.07	0.028	(0.112)	0.020	0.008
277	23.08	0.07	0.028	(0.112)	0.020	0.008
278	23.17	0.07	0.028	(0.111)	0.020	0.008
279	23.25	0.07	0.028	(0.111)	0.020	0.008
280	23.33	0.07	0.028	(0.111)	0.020	0.008
281	23.42	0.07	0.028	(0.111)	0.020	0.008
282	23.50	0.07	0.028	(0.111)	0.020	0.008
283	23.58	0.07	0.028	(0.110)	0.020	0.008
284	23.67	0.07	0.028	(0.110)	0.020	0.008
285	23.75	0.07	0.028	(0.110)	0.020	0.008
286	23.83	0.07	0.028	(0.110)	0.020	0.008
287	23.92	0.07	0.028	(0.110)	0.020	0.008
288	24.00	0.07	0.028	(0.110)	0.020	0.008

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.6

Flood volume = Effective rainfall 1.30(In)
times area 82.8(Ac.)/[(In)/(Ft.)] = 8.9(Ac.Ft)
Total soil loss = 2.18(In)
Total soil loss = 15.082(Ac.Ft)
Total rainfall = 3.48(In)
Flood volume = 389710.2 Cubic Feet
Total soil loss = 656982.9 Cubic Feet

Peak flow rate of this hydrograph = 22.546(CFS)

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24 - H O U R S T O R M

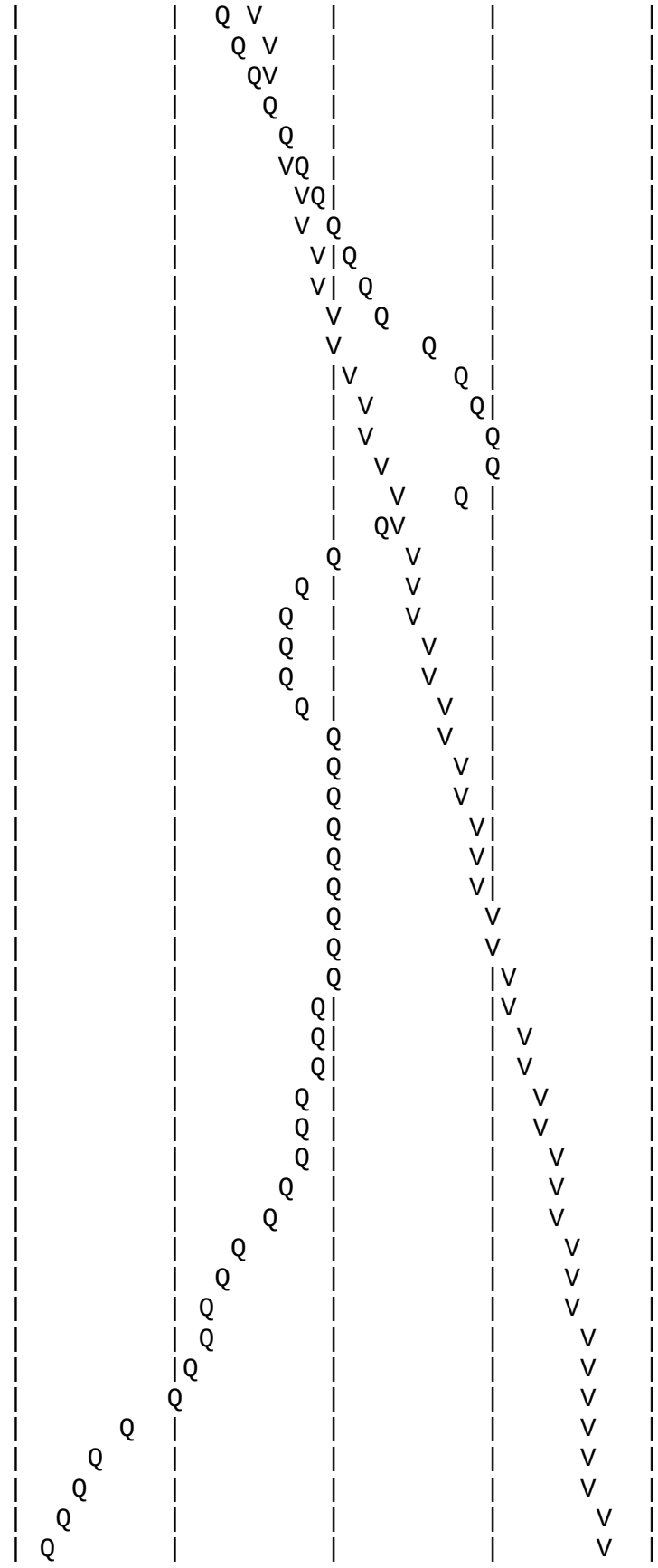
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0001	0.02	Q				
0+10	0.0008	0.09	Q				
0+15	0.0028	0.29	Q				
0+20	0.0060	0.46	Q				
0+25	0.0099	0.57	Q				
0+30	0.0148	0.71	Q				
0+35	0.0205	0.83	VQ				
0+40	0.0266	0.88	VQ				
0+45	0.0329	0.93	VQ				
0+50	0.0396	0.96	VQ				
0+55	0.0466	1.02	VQ				
1+ 0	0.0544	1.13	VQ				
1+ 5	0.0627	1.21	VQ				
1+10	0.0710	1.21	VQ				
1+15	0.0789	1.14	VQ				
1+20	0.0863	1.08	VQ				
1+25	0.0936	1.06	VQ				
1+30	0.1008	1.05	VQ				
1+35	0.1080	1.04	VQ				
1+40	0.1151	1.03	VQ				
1+45	0.1221	1.02	VQ				
1+50	0.1292	1.03	VQ				
1+55	0.1365	1.06	VQ				
2+ 0	0.1445	1.16	VQ				
2+ 5	0.1531	1.24	VQ				
2+10	0.1618	1.27	VQ				
2+15	0.1708	1.30	VQ				
2+20	0.1798	1.31	VQ				
2+25	0.1889	1.32	VQ				
2+30	0.1981	1.33	VQ				
2+35	0.2074	1.35	VQ				
2+40	0.2170	1.39	VQ				
2+45	0.2272	1.49	|Q				
2+50	0.2380	1.57	|VQ				
2+55	0.2491	1.61	|VQ				
3+ 0	0.2603	1.63	|VQ				
3+ 5	0.2717	1.65	|VQ				
3+10	0.2831	1.66	|VQ				
3+15	0.2946	1.67	|VQ				
3+20	0.3062	1.68	|VQ				
3+25	0.3177	1.68	|VQ				
3+30	0.3293	1.68	|VQ				
3+35	0.3409	1.68	|VQ				

3+40	0.3525	1.68	VQ				
3+45	0.3641	1.68	VQ				
3+50	0.3758	1.70	VQ				
3+55	0.3877	1.73	VQ				
4+ 0	0.4003	1.83	VQ				
4+ 5	0.4135	1.91	VQ				
4+10	0.4269	1.95	VQ				
4+15	0.4405	1.97	VQ				
4+20	0.4542	2.00	Q				
4+25	0.4683	2.05	Q				
4+30	0.4831	2.15	Q				
4+35	0.4985	2.24	Q				
4+40	0.5142	2.28	VQ				
4+45	0.5301	2.30	VQ				
4+50	0.5461	2.33	VQ				
4+55	0.5625	2.38	VQ				
5+ 0	0.5796	2.49	VQ				
5+ 5	0.5972	2.55	VQ				
5+10	0.6146	2.52	VQ				
5+15	0.6308	2.35	VQ				
5+20	0.6460	2.22	Q				
5+25	0.6611	2.20	Q				
5+30	0.6767	2.26	Q				
5+35	0.6927	2.32	Q				
5+40	0.7090	2.37	Q				
5+45	0.7261	2.48	Q				
5+50	0.7438	2.57	Q				
5+55	0.7617	2.61	Q				
6+ 0	0.7799	2.64	Q				
6+ 5	0.7983	2.67	Q				
6+10	0.8170	2.72	Q				
6+15	0.8364	2.83	Q				
6+20	0.8565	2.91	Q				
6+25	0.8768	2.95	Q				
6+30	0.8973	2.97	QV				
6+35	0.9180	3.00	Q				
6+40	0.9390	3.05	Q				
6+45	0.9608	3.16	Q				
6+50	0.9832	3.25	Q				
6+55	1.0058	3.29	Q				
7+ 0	1.0286	3.31	Q				
7+ 5	1.0516	3.33	Q				
7+10	1.0746	3.34	Q				
7+15	1.0977	3.35	Q				
7+20	1.1209	3.37	QV				
7+25	1.1444	3.41	QV				
7+30	1.1686	3.51	QV				
7+35	1.1934	3.60	QV				
7+40	1.2188	3.68	QV				
7+45	1.2449	3.80	Q				
7+50	1.2718	3.91	Q				
7+55	1.2993	3.99	Q				

8+ 0	1.3277	4.12	Q				
8+ 5	1.3570	4.25	QV				
8+10	1.3871	4.37	QV				
8+15	1.4187	4.60	Q				
8+20	1.4517	4.78	Q				
8+25	1.4852	4.87	Q				
8+30	1.5192	4.93	Q				
8+35	1.5535	4.98	Q				
8+40	1.5882	5.05	QV				
8+45	1.6238	5.16	QV				
8+50	1.6600	5.27	Q				
8+55	1.6969	5.35	Q				
9+ 0	1.7346	5.47	Q				
9+ 5	1.7731	5.60	Q				
9+10	1.8125	5.72	QV				
9+15	1.8535	5.95	QV				
9+20	1.8958	6.15	Q				
9+25	1.9390	6.27	Q				
9+30	1.9832	6.42	Q				
9+35	2.0284	6.56	QV				
9+40	2.0742	6.66	QV				
9+45	2.1210	6.80	Q				
9+50	2.1686	6.92	Q				
9+55	2.2169	7.01	Q				
10+ 0	2.2661	7.14	QV				
10+ 5	2.3156	7.18	QV				
10+10	2.3636	6.98	QV				
10+15	2.4072	6.33	Q V				
10+20	2.4470	5.78	Q V				
10+25	2.4853	5.56	Q V				
10+30	2.5226	5.41	Q V				
10+35	2.5595	5.35	Q V				
10+40	2.5971	5.46	Q V				
10+45	2.6376	5.89	Q V				
10+50	2.6807	6.26	Q V				
10+55	2.7249	6.41	Q V				
11+ 0	2.7697	6.51	Q V				
11+ 5	2.8150	6.58	Q V				
11+10	2.8604	6.59	Q V				
11+15	2.9054	6.53	Q V				
11+20	2.9500	6.47	Q V				
11+25	2.9944	6.45	Q V				
11+30	3.0387	6.44	Q V				
11+35	3.0829	6.41	Q V				
11+40	3.1264	6.32	Q V				
11+45	3.1686	6.12	Q V				
11+50	3.2097	5.97	Q V				
11+55	3.2506	5.94	Q V				
12+ 0	3.2919	5.99	Q V				
12+ 5	3.3347	6.21	Q V				
12+10	3.3820	6.87	Q V				
12+15	3.4412	8.60	Q V				

12+20	3.5107	10.09	
12+25	3.5856	10.88	
12+30	3.6661	11.69	
12+35	3.7515	12.40	
12+40	3.8414	13.06	
12+45	3.9382	14.04	
12+50	4.0406	14.88	
12+55	4.1469	15.43	
13+ 0	4.2575	16.07	
13+ 5	4.3729	16.76	
13+10	4.4949	17.71	
13+15	4.6302	19.64	
13+20	4.7765	21.24	
13+25	4.9280	22.00	
13+30	5.0831	22.53	
13+35	5.2384	22.55	
13+40	5.3862	21.46	
13+45	5.5100	17.98	
13+50	5.6140	15.10	
13+55	5.7100	13.94	
14+ 0	5.8008	13.18	
14+ 5	5.8889	12.80	
14+10	5.9782	12.95	
14+15	6.0751	14.07	
14+20	6.1786	15.03	
14+25	6.2841	15.33	
14+30	6.3897	15.33	
14+35	6.4950	15.30	
14+40	6.6010	15.38	
14+45	6.7075	15.47	
14+50	6.8143	15.50	
14+55	6.9205	15.43	
15+ 0	7.0249	15.15	
15+ 5	7.1275	14.90	
15+10	7.2289	14.73	
15+15	7.3281	14.39	
15+20	7.4252	14.11	
15+25	7.5209	13.90	
15+30	7.6140	13.52	
15+35	7.7042	13.10	
15+40	7.7902	12.49	
15+45	7.8666	11.09	
15+50	7.9352	9.96	
15+55	8.0006	9.50	
16+ 0	8.0641	9.21	
16+ 5	8.1247	8.81	
16+10	8.1791	7.89	
16+15	8.2182	5.68	
16+20	8.2448	3.87	
16+25	8.2660	3.08	
16+30	8.2837	2.56	
16+35	8.2987	2.19	

16+40	8.3117	1.88	Q				V
16+45	8.3226	1.58	Q				V
16+50	8.3320	1.36	Q				V
16+55	8.3406	1.24	Q				V
17+ 0	8.3487	1.18	Q				V
17+ 5	8.3566	1.15	Q				V
17+10	8.3649	1.19	Q				V
17+15	8.3742	1.36	Q				V
17+20	8.3846	1.50	Q				V
17+25	8.3952	1.55	Q				V
17+30	8.4062	1.59	Q				V
17+35	8.4173	1.62	Q				V
17+40	8.4286	1.64	Q				V
17+45	8.4400	1.66	Q				V
17+50	8.4514	1.66	Q				V
17+55	8.4626	1.63	Q				V
18+ 0	8.4731	1.53	Q				V
18+ 5	8.4831	1.45	Q				V
18+10	8.4929	1.42	Q				V
18+15	8.5026	1.40	Q				V
18+20	8.5121	1.38	Q				V
18+25	8.5215	1.37	Q				V
18+30	8.5309	1.37	Q				V
18+35	8.5402	1.35	Q				V
18+40	8.5493	1.31	Q				V
18+45	8.5576	1.21	Q				V
18+50	8.5653	1.12	Q				V
18+55	8.5725	1.04	Q				V
19+ 0	8.5788	0.92	Q				V
19+ 5	8.5846	0.83	Q				V
19+10	8.5903	0.82	Q				V
19+15	8.5964	0.89	Q				V
19+20	8.6030	0.96	Q				V
19+25	8.6100	1.01	Q				V
19+30	8.6177	1.13	Q				V
19+35	8.6260	1.21	Q				V
19+40	8.6343	1.21	Q				V
19+45	8.6422	1.14	Q				V
19+50	8.6496	1.07	Q				V
19+55	8.6566	1.01	Q				V
20+ 0	8.6628	0.90	Q				V
20+ 5	8.6684	0.82	Q				V
20+10	8.6740	0.81	Q				V
20+15	8.6801	0.88	Q				V
20+20	8.6866	0.94	Q				V
20+25	8.6932	0.96	Q				V
20+30	8.7000	0.98	Q				V
20+35	8.7068	0.99	Q				V
20+40	8.7136	1.00	Q				V
20+45	8.7205	1.00	Q				V
20+50	8.7274	1.00	Q				V
20+55	8.7340	0.96	Q				V

21+ 0	8.7400	0.86	|Q	|	|	|	V|
21+ 5	8.7454	0.79	|Q	|	|	|	V|
21+10	8.7509	0.80	|Q	|	|	|	V|
21+15	8.7569	0.87	|Q	|	|	|	V|
21+20	8.7633	0.93	|Q	|	|	|	V|
21+25	8.7696	0.91	|Q	|	|	|	V|
21+30	8.7753	0.83	|Q	|	|	|	V|
21+35	8.7806	0.77	|Q	|	|	|	V|
21+40	8.7859	0.78	|Q	|	|	|	V|
21+45	8.7919	0.86	|Q	|	|	|	V|
21+50	8.7982	0.92	|Q	|	|	|	V|
21+55	8.8045	0.91	|Q	|	|	|	V|
22+ 0	8.8102	0.83	|Q	|	|	|	V|
22+ 5	8.8155	0.77	|Q	|	|	|	V|
22+10	8.8208	0.78	|Q	|	|	|	V|
22+15	8.8267	0.86	|Q	|	|	|	V|
22+20	8.8331	0.92	|Q	|	|	|	V|
22+25	8.8393	0.91	|Q	|	|	|	V|
22+30	8.8450	0.83	|Q	|	|	|	V|
22+35	8.8502	0.76	|Q	|	|	|	V|
22+40	8.8553	0.73	Q	|	|	|	V|
22+45	8.8602	0.71	Q	|	|	|	V|
22+50	8.8650	0.70	Q	|	|	|	V|
22+55	8.8698	0.70	Q	|	|	|	V|
23+ 0	8.8746	0.69	Q	|	|	|	V|
23+ 5	8.8793	0.68	Q	|	|	|	V|
23+10	8.8839	0.68	Q	|	|	|	V|
23+15	8.8886	0.68	Q	|	|	|	V|
23+20	8.8933	0.68	Q	|	|	|	V|
23+25	8.8979	0.68	Q	|	|	|	V|
23+30	8.9026	0.68	Q	|	|	|	V|
23+35	8.9072	0.68	Q	|	|	|	V|
23+40	8.9119	0.68	Q	|	|	|	V|
23+45	8.9165	0.67	Q	|	|	|	V|
23+50	8.9212	0.67	Q	|	|	|	V|
23+55	8.9258	0.67	Q	|	|	|	V|
24+ 0	8.9305	0.67	Q	|	|	|	V|
24+ 5	8.9350	0.65	Q	|	|	|	V|
24+10	8.9390	0.58	Q	|	|	|	V|
24+15	8.9416	0.38	Q	|	|	|	V|
24+20	8.9432	0.22	Q	|	|	|	V|
24+25	8.9442	0.15	Q	|	|	|	V|
24+30	8.9450	0.11	Q	|	|	|	V|
24+35	8.9455	0.07	Q	|	|	|	V|
24+40	8.9458	0.05	Q	|	|	|	V|
24+45	8.9460	0.03	Q	|	|	|	V|
24+50	8.9462	0.02	Q	|	|	|	V|
24+55	8.9463	0.01	Q	|	|	|	V|
25+ 0	8.9464	0.01	Q	|	|	|	V|
25+ 5	8.9464	0.01	Q	|	|	|	V|
25+10	8.9465	0.01	Q	|	|	|	V|
25+15	8.9465	0.00	Q	|	|	|	V|

```
25+20       8.9465      0.00  Q         |         |         |         V|
25+25       8.9465      0.00  Q         |         |         |         V|
25+30       8.9465      0.00  Q         |         |         |         V|
-------------------------------------------------------------------------
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   15DEC17  TIME  23:02:22   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X        XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                       *DIAGRAM
*** FREE ***
              1        ID   Tentative Tract 35853
              2        ID   Proposed Conditions
              3        ID   Estimate storage volume needed to detain proposed 10-year, 24-hour
              4        ID   storm to existing 10-year, 24-hour storm
              5        ID   Major Basin 200 - Detention at Node 234
              6        ID   Hydrograph from Riverside S-Curve method
              7        IO        1       2
              8        IT        5                   300

              9        KK  BSN234
             10        KM   FOOTHILL S-Curve
             11        BA    0.13
             12        QI     0.0     0.1     0.3     0.5     0.6     0.7     0.8     0.9     0.9     1.0
             13        QI     1.0     1.1     1.2     1.2     1.1     1.1     1.1     1.0     1.0     1.0
             14        QI     1.0     1.0     1.1     1.2     1.2     1.3     1.3     1.3     1.3     1.3
             15        QI     1.3     1.4     1.5     1.6     1.6     1.6     1.6     1.7     1.7     1.7
             16        QI     1.7     1.7     1.7     1.7     1.7     1.7     1.7     1.8     1.9     1.9
             17        QI     2.0     2.0     2.0     2.2     2.2     2.3     2.3     2.3     2.4     2.5
             18        QI     2.6     2.5     2.3     2.2     2.2     2.3     2.3     2.4     2.5     2.6
             19        QI     2.6     2.6     2.7     2.7     2.8     2.9     2.9     3.0     3.0     3.1
             20        QI     3.2     3.2     3.3     3.3     3.3     3.3     3.4     3.4     3.4     3.5
             21        QI     3.6     3.7     3.8     3.9     4.0     4.1     4.2     4.4     4.6     4.8
             22        QI     4.9     4.9     5.0     5.0     5.2     5.3     5.3     5.5     5.6     5.7
             23        QI     5.9     6.1     6.3     6.4     6.6     6.7     6.8     6.9     7.0     7.1
             24        QI     7.2     7.0     6.3     5.8     5.6     5.4     5.4     5.5     5.9     6.3
             25        QI     6.4     6.5     6.6     6.6     6.5     6.5     6.5     6.4     6.4     6.3
             26        QI     6.1     6.0     5.9     6.0     6.2     6.9     8.6    10.1    10.9    11.7
             27        QI    12.4    13.1    14.0    14.9    15.4    16.1    16.8    17.7    19.6    21.2
             28        QI    22.0    22.5    22.5    21.5    18.0    15.1    13.9    13.2    12.8    13.0
             29        QI    14.1    15.0    15.3    15.3    15.3    15.4    15.5    15.5    15.4    15.1
             30        QI    14.9    14.7    14.4    14.1    13.9    13.5    13.1    12.5    11.1    10.0
             31        QI     9.5     9.2     8.8     7.9     5.7     3.9     3.1     2.6     2.2     1.9
             32        QI     1.6     1.4     1.2     1.2     1.2     1.2     1.4     1.5     1.6     1.6
             33        QI     1.6     1.6     1.7     1.7     1.6     1.5     1.5     1.4     1.4     1.4
             34        QI     1.4     1.4     1.3     1.3     1.2     1.1     1.0     0.9     0.8     0.8
             35        QI     0.9     1.0     1.0     1.1     1.2     1.2     1.1     1.1     1.0     0.9
             36        QI     0.8     0.8     0.9     0.9     1.0     1.0     1.0     1.0     1.0     1.0
             37        QI     1.0     0.9     0.8     0.8     0.9     0.9     0.9     0.8     0.8     0.8
             38        QI     0.9     0.9     0.9     0.8     0.8     0.8     0.9     0.9     0.9     0.8
             39        QI     0.8     0.7     0.7     0.7     0.7     0.7     0.7     0.7     0.7     0.7
             40        QI     0.7     0.7     0.7     0.7     0.7     0.7     0.7     0.7     0.7     0.6
             41        QI     0.4     0.2     0.2     0.1     0.1     0.1     0.0     0.0     0.0     0.0

             42        KK  DETAIN
             43        RS        1    STOR      -1
             44        SV        0       8
             45        SQ        0       1
             46        SE      100     101
             47        ZZ



                  SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    9      BSN234
               V
               V
   42      DETAIN

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   15DEC17  TIME  23:02:22   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

Tentative Tract 35853
Proposed Conditions
Estimate storage volume needed to detain proposed 10-year, 24-hour storm to existing 10-year, 24-hour storm
Major Basin 200 - Detention at Node 234
Hydrograph from Riverside S-Curve method

```
  7 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          2  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2    0  ENDING DATE
                    NDTIME        0055  ENDING TIME
                    ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS
            DRAINAGE AREA         SQUARE MILES
            PRECIPITATION DEPTH   INCHES
            LENGTH, ELEVATION     FEET
            FLOW                  CUBIC FEET PER SECOND
            STORAGE VOLUME        ACRE-FEET
            SURFACE AREA          ACRES
            TEMPERATURE           DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
  9 KK    *    BSN234  *
          *            *
          **************
                      FOOTHILL S-Curve

             SUBBASIN RUNOFF DATA

 11 BA          SUBBASIN CHARACTERISTICS
                     TAREA        .13  SUBBASIN AREA

                                                    ***

*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION   BSN234

*****************************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3.	1		1230	151	12.	1		1845	226	1.
1		0005	2	0.	1		0620	77	3.	1		1235	152	13.	1		1850	227	1.
1		0010	3	0.	1		0625	78	3.	1		1240	153	14.	1		1855	228	1.
1		0015	4	1.	1		0630	79	3.	1		1245	154	15.	1		1900	229	1.
1		0020	5	1.	1		0635	80	3.	1		1250	155	15.	1		1905	230	1.
1		0025	6	1.	1		0640	81	3.	1		1255	156	16.	1		1910	231	1.
1		0030	7	1.	1		0645	82	3.	1		1300	157	17.	1		1915	232	1.
1		0035	8	1.	1		0650	83	3.	1		1305	158	18.	1		1920	233	1.
1		0040	9	1.	1		0655	84	3.	1		1310	159	20.	1		1925	234	1.
1		0045	10	1.	1		0700	85	3.	1		1315	160	21.	1		1930	235	1.
1		0050	11	1.	1		0705	86	3.	1		1320	161	22.	1		1935	236	1.
1		0055	12	1.	1		0710	87	3.	1		1325	162	23.	1		1940	237	1.
1		0100	13	1.	1		0715	88	3.	1		1330	163	23.	1		1945	238	1.
1		0105	14	1.	1		0720	89	3.	1		1335	164	22.	1		1950	239	1.
1		0110	15	1.	1		0725	90	4.	1		1340	165	18.	1		1955	240	1.
1		0115	16	1.	1		0730	91	4.	1		1345	166	15.	1		2000	241	1.
1		0120	17	1.	1		0735	92	4.	1		1350	167	14.	1		2005	242	1.
1		0125	18	1.	1		0740	93	4.	1		1355	168	13.	1		2010	243	1.
1		0130	19	1.	1		0745	94	4.	1		1400	169	13.	1		2015	244	1.
1		0135	20	1.	1		0750	95	4.	1		1405	170	13.	1		2020	245	1.
1		0140	21	1.	1		0755	96	4.	1		1410	171	14.	1		2025	246	1.
1		0145	22	1.	1		0800	97	4.	1		1415	172	15.	1		2030	247	1.
1		0150	23	1.	1		0805	98	4.	1		1420	173	15.	1		2035	248	1.
1		0155	24	1.	1		0810	99	5.	1		1425	174	15.	1		2040	249	1.
1		0200	25	1.	1		0815	100	5.	1		1430	175	15.	1		2045	250	1.
1		0205	26	1.	1		0820	101	5.	1		1435	176	15.	1		2050	251	1.
1		0210	27	1.	1		0825	102	5.	1		1440	177	16.	1		2055	252	1.
1		0215	28	1.	1		0830	103	5.	1		1445	178	16.	1		2100	253	1.
1		0220	29	1.	1		0835	104	5.	1		1450	179	15.	1		2105	254	1.
1		0225	30	1.	1		0840	105	5.	1		1455	180	15.	1		2110	255	1.
1		0230	31	1.	1		0845	106	5.	1		1500	181	15.	1		2115	256	1.
1		0235	32	1.	1		0850	107	5.	1		1505	182	15.	1		2120	257	1.
1		0240	33	2.	1		0855	108	6.	1		1510	183	14.	1		2125	258	1.
1		0245	34	2.	1		0900	109	6.	1		1515	184	14.	1		2130	259	1.
1		0250	35	2.	1		0905	110	6.	1		1520	185	14.	1		2135	260	1.
1		0255	36	2.	1		0910	111	6.	1		1525	186	14.	1		2140	261	1.
1		0300	37	2.	1		0915	112	6.	1		1530	187	13.	1		2145	262	1.
1		0305	38	2.	1		0920	113	6.	1		1535	188	13.	1		2150	263	1.
1		0310	39	2.	1		0925	114	6.	1		1540	189	11.	1		2155	264	1.
1		0315	40	2.	1		0930	115	7.	1		1545	190	10.	1		2200	265	1.
1		0320	41	2.	1		0935	116	7.	1		1550	191	10.	1		2205	266	1.
1		0325	42	2.	1		0940	117	7.	1		1555	192	9.	1		2210	267	1.
1		0330	43	2.	1		0945	118	7.	1		1600	193	9.	1		2215	268	1.
1		0335	44	2.	1		0950	119	7.	1		1605	194	8.	1		2220	269	1.
1		0340	45	2.	1		0955	120	7.	1		1610	195	6.	1		2225	270	1.
1		0345	46	2.	1		1000	121	7.	1		1615	196	4.	1		2230	271	1.
1		0350	47	2.	1		1005	122	7.	1		1620	197	3.	1		2235	272	1.
1		0355	48	2.	1		1010	123	6.	1		1625	198	3.	1		2240	273	1.
1		0400	49	2.	1		1015	124	6.	1		1630	199	2.	1		2245	274	1.
1		0405	50	2.	1		1020	125	6.	1		1635	200	2.	1		2250	275	1.
1		0410	51	2.	1		1025	126	5.	1		1640	201	2.	1		2255	276	1.
1		0415	52	2.	1		1030	127	5.	1		1645	202	1.	1		2300	277	1.
1		0420	53	2.	1		1035	128	6.	1		1650	203	1.	1		2305	278	1.
1		0425	54	2.	1		1040	129	6.	1		1655	204	1.	1		2310	279	1.
1		0430	55	2.	1		1045	130	6.	1		1700	205	1.	1		2315	280	1.
1		0435	56	2.	1		1050	131	6.	1		1705	206	1.	1		2320	281	1.
1		0440	57	2.	1		1055	132	7.	1		1710	207	1.	1		2325	282	1.
1		0445	58	2.	1		1100	133	7.	1		1715	208	2.	1		2330	283	1.
1		0450	59	2.	1		1105	134	7.	1		1720	209	2.	1		2335	284	1.
1		0455	60	3.	1		1110	135	7.	1		1725	210	2.	1		2340	285	1.
1		0500	61	3.	1		1115	136	7.	1		1730	211	2.	1		2345	286	1.
1		0505	62	3.	1		1120	137	7.	1		1735	212	2.	1		2350	287	1.
1		0510	63	2.	1		1125	138	6.	1		1740	213	2.	1		2355	288	1.
1		0515	64	2.	1		1130	139	6.	1		1745	214	2.	2		0000	289	1.
1		0520	65	2.	1		1135	140	6.	1		1750	215	2.	2		0005	290	1.
1		0525	66	2.	1		1140	141	6.	1		1755	216	2.	2		0010	291	0.
1		0530	67	2.	1		1145	142	6.	1		1800	217	2.	2		0015	292	0.
1		0535	68	2.	1		1150	143	6.	1		1805	218	1.	2		0020	293	0.

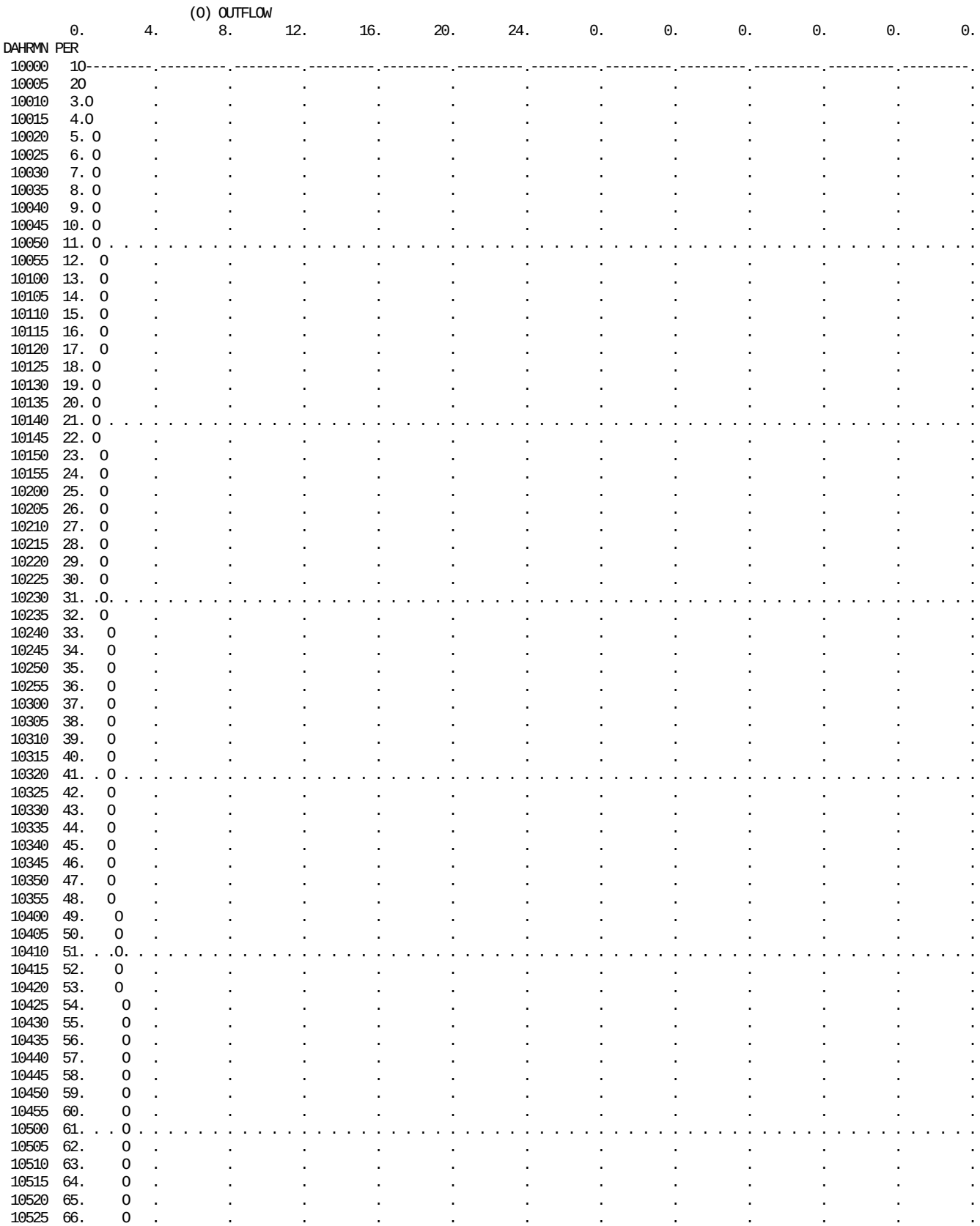
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1	0545	70	3.	*	1	1200	145	6.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	3.	*	1	1205	146	7.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	3.	*	1	1210	147	9.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	3.	*	1	1215	148	10.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	3.	*	1	1220	149	11.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	3.	*	1	1225	150	12.	*	1	1840	225	1.	*	2	0055	300	0.
				*					*					*				

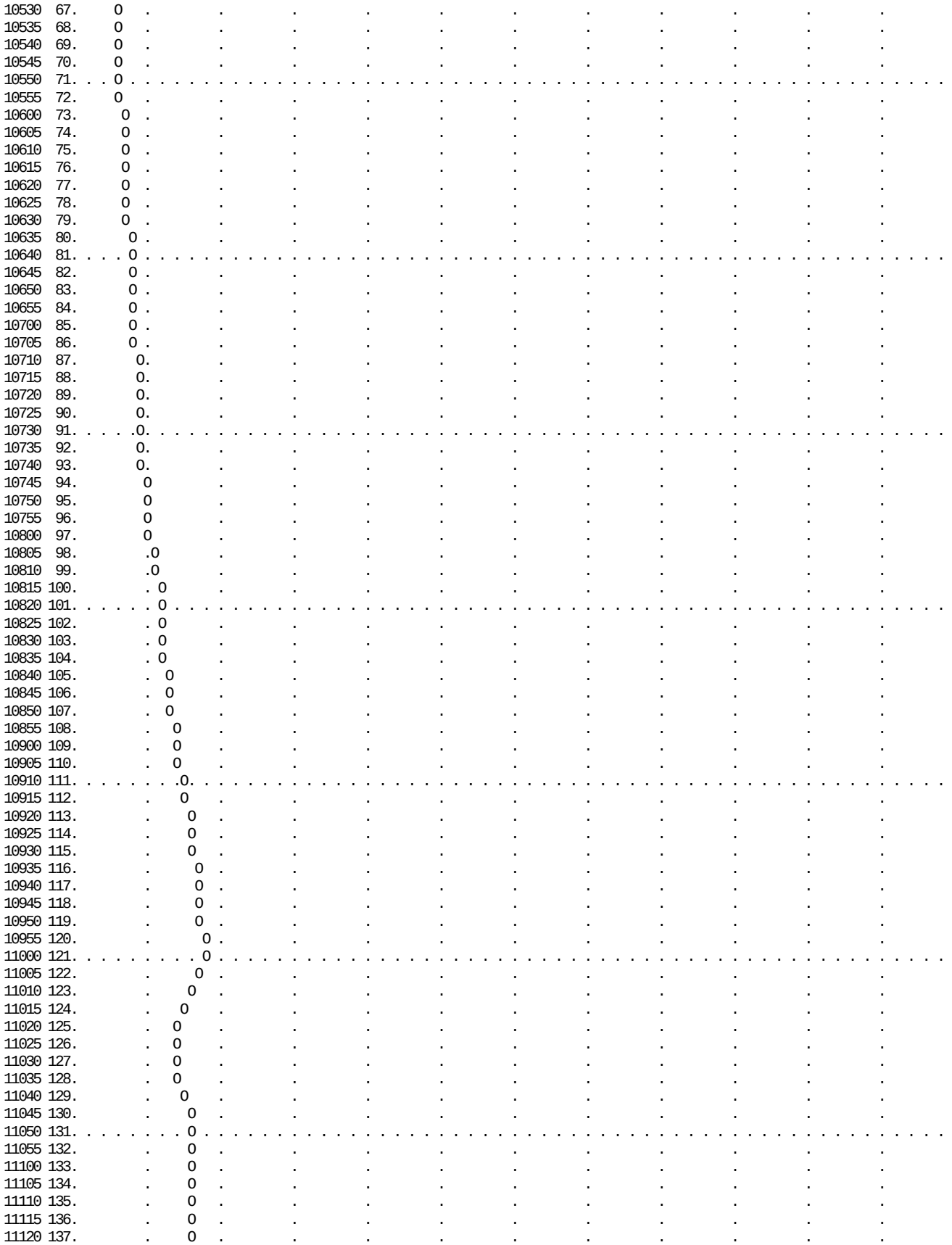
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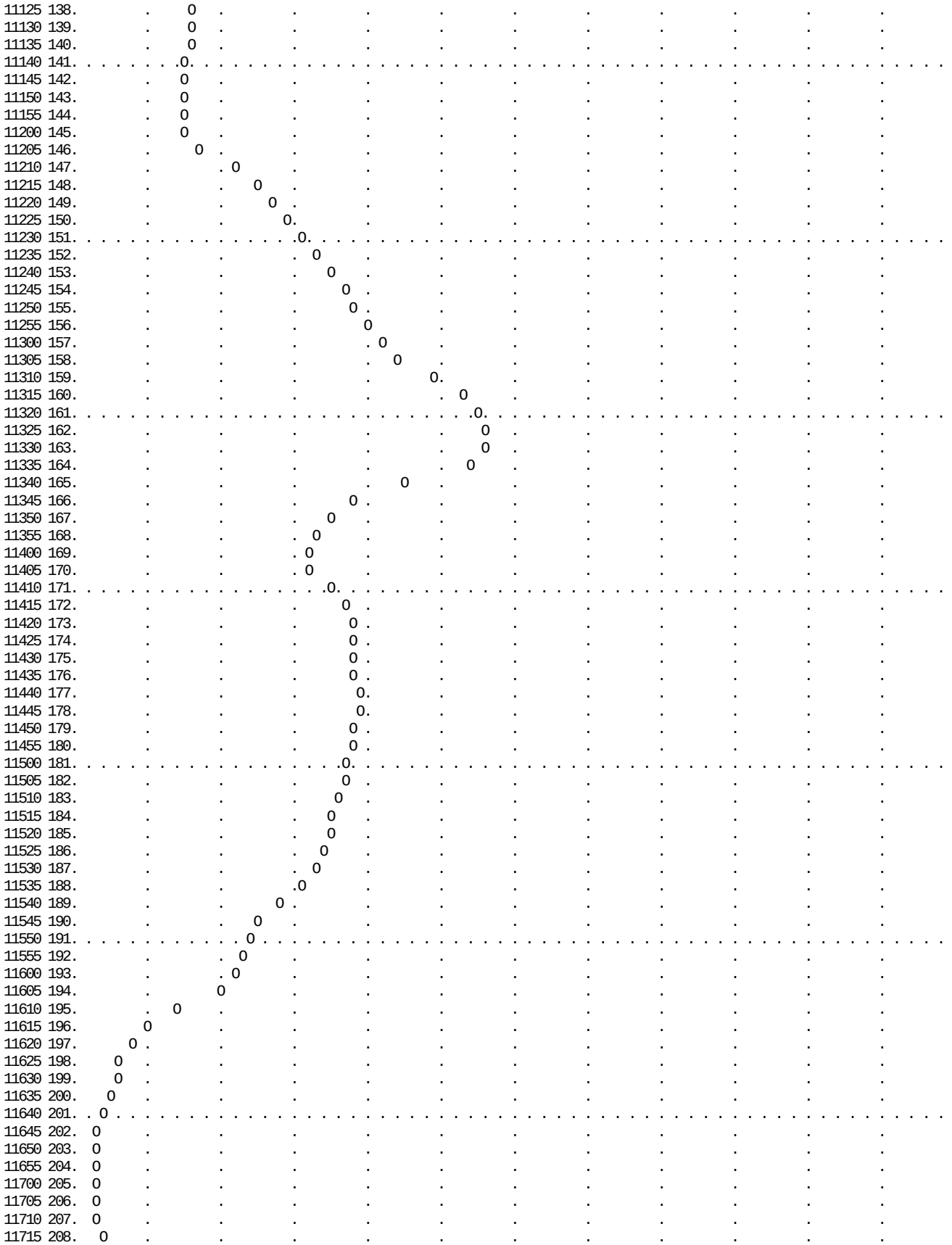
PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 23.	13.42		12.	5.	4.	4.
		(INCHES)	.839	1.290	1.291	1.291
		(AC-FT)	6.	9.	9.	9.

CUMULATIVE AREA = .13 SQ MI

STATION BSN234







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11720 209.   0    .       .       .       .       .       .       .       .       .       .       .       .
11725 210.   0    .       .       .       .       .       .       .       .       .       .       .       .
11730 211. . 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11735 212.   0    .       .       .       .       .       .       .       .       .       .       .       .
11740 213.   0    .       .       .       .       .       .       .       .       .       .       .       .
11745 214.   0    .       .       .       .       .       .       .       .       .       .       .       .
11750 215.   0    .       .       .       .       .       .       .       .       .       .       .       .
11755 216.   0    .       .       .       .       .       .       .       .       .       .       .       .
11800 217.   0    .       .       .       .       .       .       .       .       .       .       .       .
11805 218.  0     .       .       .       .       .       .       .       .       .       .       .       .
11810 219.  0     .       .       .       .       .       .       .       .       .       .       .       .
11815 220.  0     .       .       .       .       .       .       .       .       .       .       .       .
11820 221. .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11825 222.  0     .       .       .       .       .       .       .       .       .       .       .       .
11830 223.  0     .       .       .       .       .       .       .       .       .       .       .       .
11835 224.  0     .       .       .       .       .       .       .       .       .       .       .       .
11840 225.  0     .       .       .       .       .       .       .       .       .       .       .       .
11845 226.  0     .       .       .       .       .       .       .       .       .       .       .       .
11850 227. 0      .       .       .       .       .       .       .       .       .       .       .       .
11855 228. 0      .       .       .       .       .       .       .       .       .       .       .       .
11900 229. 0      .       .       .       .       .       .       .       .       .       .       .       .
11905 230. 0      .       .       .       .       .       .       .       .       .       .       .       .
11910 231. 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11915 232. 0      .       .       .       .       .       .       .       .       .       .       .       .
11920 233. 0      .       .       .       .       .       .       .       .       .       .       .       .
11925 234.  0     .       .       .       .       .       .       .       .       .       .       .       .
11930 235.  0     .       .       .       .       .       .       .       .       .       .       .       .
11935 236.  0     .       .       .       .       .       .       .       .       .       .       .       .
11940 237.  0     .       .       .       .       .       .       .       .       .       .       .       .
11945 238.  0     .       .       .       .       .       .       .       .       .       .       .       .
11950 239. 0      .       .       .       .       .       .       .       .       .       .       .       .
11955 240. 0      .       .       .       .       .       .       .       .       .       .       .       .
12000 241. 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12005 242. 0      .       .       .       .       .       .       .       .       .       .       .       .
12010 243. 0      .       .       .       .       .       .       .       .       .       .       .       .
12015 244. 0      .       .       .       .       .       .       .       .       .       .       .       .
12020 245. 0      .       .       .       .       .       .       .       .       .       .       .       .
12025 246. 0      .       .       .       .       .       .       .       .       .       .       .       .
12030 247. 0      .       .       .       .       .       .       .       .       .       .       .       .
12035 248. 0      .       .       .       .       .       .       .       .       .       .       .       .
12040 249. 0      .       .       .       .       .       .       .       .       .       .       .       .
12045 250. 0      .       .       .       .       .       .       .       .       .       .       .       .
12050 251. 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12055 252. 0      .       .       .       .       .       .       .       .       .       .       .       .
12100 253. 0      .       .       .       .       .       .       .       .       .       .       .       .
12105 254. 0      .       .       .       .       .       .       .       .       .       .       .       .
12110 255. 0      .       .       .       .       .       .       .       .       .       .       .       .
12115 256. 0      .       .       .       .       .       .       .       .       .       .       .       .
12120 257. 0      .       .       .       .       .       .       .       .       .       .       .       .
12125 258. 0      .       .       .       .       .       .       .       .       .       .       .       .
12130 259. 0      .       .       .       .       .       .       .       .       .       .       .       .
12135 260. 0      .       .       .       .       .       .       .       .       .       .       .       .
12140 261. 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12145 262. 0      .       .       .       .       .       .       .       .       .       .       .       .
12150 263. 0      .       .       .       .       .       .       .       .       .       .       .       .
12155 264. 0      .       .       .       .       .       .       .       .       .       .       .       .
12200 265. 0      .       .       .       .       .       .       .       .       .       .       .       .
12205 266. 0      .       .       .       .       .       .       .       .       .       .       .       .
12210 267. 0      .       .       .       .       .       .       .       .       .       .       .       .
12215 268. 0      .       .       .       .       .       .       .       .       .       .       .       .
12220 269. 0      .       .       .       .       .       .       .       .       .       .       .       .
12225 270. 0      .       .       .       .       .       .       .       .       .       .       .       .
12230 271. 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
12235 272. 0      .       .       .       .       .       .       .       .       .       .       .       .
12240 273. 0      .       .       .       .       .       .       .       .       .       .       .       .
12245 274. 0      .       .       .       .       .       .       .       .       .       .       .       .
12250 275. 0      .       .       .       .       .       .       .       .       .       .       .       .
12255 276. 0      .       .       .       .       .       .       .       .       .       .       .       .
12300 277. 0      .       .       .       .       .       .       .       .       .       .       .       .
12305 278. 0      .       .       .       .       .       .       .       .       .       .       .       .
12310 279. 0      .       .       .       .       .       .       .       .       .       .       .       .
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12315 280. 0
12320 281. 0
12325 282. 0
12330 283. 0
12335 284. 0
12340 285. 0
12345 286. 0
12350 287. 0
12355 288. 0
20000 289. 0
20005 290. 0
20010 291.0.
20015 292.0
20020 293.0
20025 2940
20030 2950
20035 2960
20040 2970
20045 2980
20050 2990
20055 3000

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          **************
          *            *
 42 KK    *    DETAIN  *
          *            *
          **************

             HYDROGRAPH ROUTING DATA

 43 RS       STORAGE ROUTING
                  NSTPS          1  NUMBER OF SUBREACHES
                   ITYP       STOR  TYPE OF INITIAL CONDITION
                 RSVRIC      -1.00  INITIAL CONDITION
                      X        .00 WORKING R AND D COEFFICIENT

 44 SV         STORAGE          .0      8.0

 45 SQ         DISCHARGE        0.       1.

 46 SE         ELEVATION     100.00   101.00

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HYDROGRAPH AT STATION DETAIN

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	100.0	1		0820	101	0.	1.4	100.2	1		1640	201	1.	7.9	101.0
1		0005	2	0.	.0	100.0	1		0825	102	0.	1.5	100.2	1		1645	202	1.	7.9	101.0
1		0010	3	0.	.0	100.0	1		0830	103	0.	1.5	100.2	1		1650	203	1.	7.9	101.0
1		0015	4	0.	.0	100.0	1		0835	104	0.	1.5	100.2	1		1655	204	1.	7.9	101.0
1		0020	5	0.	.0	100.0	1		0840	105	0.	1.6	100.2	1		1700	205	1.	7.9	101.0
1		0025	6	0.	.0	100.0	1		0845	106	0.	1.6	100.2	1		1705	206	1.	7.9	101.0
1		0030	7	0.	.0	100.0	1		0850	107	0.	1.6	100.2	1		1710	207	1.	7.9	101.0
1		0035	8	0.	.0	100.0	1		0855	108	0.	1.7	100.2	1		1715	208	1.	7.9	101.0
1		0040	9	0.	.0	100.0	1		0900	109	0.	1.7	100.2	1		1720	209	1.	7.9	101.0
1		0045	10	0.	.0	100.0	1		0905	110	0.	1.7	100.2	1		1725	210	1.	7.9	101.0
1		0050	11	0.	.0	100.0	1		0910	111	0.	1.8	100.2	1		1730	211	1.	7.9	101.0
1		0055	12	0.	.1	100.0	1		0915	112	0.	1.8	100.2	1		1735	212	1.	7.9	101.0
1		0100	13	0.	.1	100.0	1		0920	113	0.	1.9	100.2	1		1740	213	1.	7.9	101.0
1		0105	14	0.	.1	100.0	1		0925	114	0.	1.9	100.2	1		1745	214	1.	7.9	101.0
1		0110	15	0.	.1	100.0	1		0930	115	0.	1.9	100.2	1		1750	215	1.	8.0	101.0
1		0115	16	0.	.1	100.0	1		0935	116	0.	2.0	100.2	1		1755	216	1.	8.0	101.0
1		0120	17	0.	.1	100.0	1		0940	117	0.	2.0	100.3	1		1800	217	1.	8.0	101.0
1		0125	18	0.	.1	100.0	1		0945	118	0.	2.1	100.3	1		1805	218	1.	8.0	101.0
1		0130	19	0.	.1	100.0	1		0950	119	0.	2.1	100.3	1		1810	219	1.	8.0	101.0
1		0135	20	0.	.1	100.0	1		0955	120	0.	2.2	100.3	1		1815	220	1.	8.0	101.0
1		0140	21	0.	.1	100.0	1		1000	121	0.	2.2	100.3	1		1820	221	1.	8.0	101.0
1		0145	22	0.	.1	100.0	1		1005	122	0.	2.3	100.3	1		1825	222	1.	8.0	101.0
1		0150	23	0.	.1	100.0	1		1010	123	0.	2.3	100.3	1		1830	223	1.	8.0	101.0
1		0155	24	0.	.1	100.0	1		1015	124	0.	2.3	100.3	1		1835	224	1.	8.0	101.0
1		0200	25	0.	.1	100.0	1		1020	125	0.	2.4	100.3	1		1840	225	1.	8.0	101.0
1		0205	26	0.	.2	100.0	1		1025	126	0.	2.4	100.3	1		1845	226	1.	8.0	101.0
1		0210	27	0.	.2	100.0	1		1030	127	0.	2.5	100.3	1		1850	227	1.	8.0	101.0
1		0215	28	0.	.2	100.0	1		1035	128	0.	2.5	100.3	1		1855	228	1.	8.0	101.0
1		0220	29	0.	.2	100.0	1		1040	129	0.	2.5	100.3	1		1900	229	1.	8.0	101.0
1		0225	30	0.	.2	100.0	1		1045	130	0.	2.6	100.3	1		1905	230	1.	8.0	101.0
1		0230	31	0.	.2	100.0	1		1050	131	0.	2.6	100.3	1		1910	231	1.	8.0	101.0
1		0235	32	0.	.2	100.0	1		1055	132	0.	2.6	100.3	1		1915	232	1.	8.0	101.0
1		0240	33	0.	.2	100.0	1		1100	133	0.	2.7	100.3	1		1920	233	1.	8.0	101.0
1		0245	34	0.	.2	100.0	1		1105	134	0.	2.7	100.3	1		1925	234	1.	8.0	101.0
1		0250	35	0.	.2	100.0	1		1110	135	0.	2.8	100.3	1		1930	235	1.	8.0	101.0
1		0255	36	0.	.3	100.0	1		1115	136	0.	2.8	100.4	1		1935	236	1.	8.0	101.0
1		0300	37	0.	.3	100.0	1		1120	137	0.	2.9	100.4	1		1940	237	1.	8.0	101.0
1		0305	38	0.	.3	100.0	1		1125	138	0.	2.9	100.4	1		1945	238	1.	8.0	101.0

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  1    0310  39      0.      .3   100.0 *  1    1130 139      0.      2.9   100.4 *  1    1950 239      1.      8.0   101.0
  1    0315  40      0.      .3   100.0 *  1    1135 140      0.      3.0   100.4 *  1    1955 240      1.      8.0   101.0
  1    0320  41      0.      .3   100.0 *  1    1140 141      0.      3.0   100.4 *  1    2000 241      1.      8.0   101.0
  1    0325  42      0.      .3   100.0 *  1    1145 142      0.      3.1   100.4 *  1    2005 242      1.      8.0   101.0
  1    0330  43      0.      .3   100.0 *  1    1150 143      0.      3.1   100.4 *  1    2010 243      1.      8.0   101.0
  1    0335  44      0.      .3   100.0 *  1    1155 144      0.      3.1   100.4 *  1    2015 244      1.      8.0   101.0
  1    0340  45      0.      .4   100.0 *  1    1200 145      0.      3.2   100.4 *  1    2020 245      1.      8.0   101.0
  1    0345  46      0.      .4   100.0 *  1    1205 146      0.      3.2   100.4 *  1    2025 246      1.      8.0   101.0
  1    0350  47      0.      .4   100.0 *  1    1210 147      0.      3.3   100.4 *  1    2030 247      1.      8.0   101.0
  1    0355  48      0.      .4   100.0 *  1    1215 148      0.      3.3   100.4 *  1    2035 248      1.      8.0   101.0
  1    0400  49      0.      .4   100.0 *  1    1220 149      0.      3.4   100.4 *  1    2040 249      1.      8.0   101.0
  1    0405  50      0.      .4   100.1 *  1    1225 150      0.      3.5   100.4 *  1    2045 250      1.      8.0   101.0
  1    0410  51      0.      .4   100.1 *  1    1230 151      0.      3.6   100.4 *  1    2050 251      1.      8.0   101.0
  1    0415  52      0.      .4   100.1 *  1    1235 152      0.      3.6   100.5 *  1    2055 252      1.      8.0   101.0
  1    0420  53      0.      .5   100.1 *  1    1240 153      0.      3.7   100.5 *  1    2100 253      1.      8.0   101.0
  1    0425  54      0.      .5   100.1 *  1    1245 154      0.      3.8   100.5 *  1    2105 254      1.      8.0   101.0
  1    0430  55      0.      .5   100.1 *  1    1250 155      0.      3.9   100.5 *  1    2110 255      1.      8.0   101.0
  1    0435  56      0.      .5   100.1 *  1    1255 156      1.      4.0   100.5 *  1    2115 256      1.      8.0   101.0
  1    0440  57      0.      .5   100.1 *  1    1300 157      1.      4.1   100.5 *  1    2120 257      1.      8.0   101.0
  1    0445  58      0.      .5   100.1 *  1    1305 158      1.      4.3   100.5 *  1    2125 258      1.      8.0   101.0
  1    0450  59      0.      .5   100.1 *  1    1310 159      1.      4.4   100.5 *  1    2130 259      1.      8.0   101.0
  1    0455  60      0.      .6   100.1 *  1    1315 160      1.      4.5   100.6 *  1    2135 260      1.      8.0   101.0
  1    0500  61      0.      .6   100.1 *  1    1320 161      1.      4.7   100.6 *  1    2140 261      1.      8.0   101.0
  1    0505  62      0.      .6   100.1 *  1    1325 162      1.      4.8   100.6 *  1    2145 262      1.      8.0   101.0
  1    0510  63      0.      .6   100.1 *  1    1330 163      1.      5.0   100.6 *  1    2150 263      1.      8.0   101.0
  1    0515  64      0.      .6   100.1 *  1    1335 164      1.      5.1   100.6 *  1    2155 264      1.      8.0   101.0
  1    0520  65      0.      .6   100.1 *  1    1340 165      1.      5.2   100.7 *  1    2200 265      1.      8.0   101.0
  1    0525  66      0.      .7   100.1 *  1    1345 166      1.      5.4   100.7 *  1    2205 266      1.      8.0   101.0
  1    0530  67      0.      .7   100.1 *  1    1350 167      1.      5.5   100.7 *  1    2210 267      1.      8.0   101.0
  1    0535  68      0.      .7   100.1 *  1    1355 168      1.      5.5   100.7 *  1    2215 268      1.      8.0   101.0
  1    0540  69      0.      .7   100.1 *  1    1400 169      1.      5.6   100.7 *  1    2220 269      1.      8.0   101.0
  1    0545  70      0.      .7   100.1 *  1    1405 170      1.      5.7   100.7 *  1    2225 270      1.      8.0   101.0
  1    0550  71      0.      .7   100.1 *  1    1410 171      1.      5.8   100.7 *  1    2230 271      1.      8.0   101.0
  1    0555  72      0.      .8   100.1 *  1    1415 172      1.      5.9   100.7 *  1    2235 272      1.      8.0   101.0
  1    0600  73      0.      .8   100.1 *  1    1420 173      1.      6.0   100.7 *  1    2240 273      1.      8.0   101.0
  1    0605  74      0.      .8   100.1 *  1    1425 174      1.      6.1   100.8 *  1    2245 274      1.      8.0   101.0
  1    0610  75      0.      .8   100.1 *  1    1430 175      1.      6.2   100.8 *  1    2250 275      1.      7.9   101.0
  1    0615  76      0.      .8   100.1 *  1    1435 176      1.      6.3   100.8 *  1    2255 276      1.      7.9   101.0
  1    0620  77      0.      .8   100.1 *  1    1440 177      1.      6.4   100.8 *  1    2300 277      1.      7.9   101.0
  1    0625  78      0.      .9   100.1 *  1    1445 178      1.      6.5   100.8 *  1    2305 278      1.      7.9   101.0
  1    0630  79      0.      .9   100.1 *  1    1450 179      1.      6.6   100.8 *  1    2310 279      1.      7.9   101.0
  1    0635  80      0.      .9   100.1 *  1    1455 180      1.      6.7   100.8 *  1    2315 280      1.      7.9   101.0
  1    0640  81      0.      .9   100.1 *  1    1500 181      1.      6.8   100.8 *  1    2320 281      1.      7.9   101.0
  1    0645  82      0.      .9   100.1 *  1    1505 182      1.      6.9   100.9 *  1    2325 282      1.      7.9   101.0
  1    0650  83      0.     1.0   100.1 *  1    1510 183      1.      7.0   100.9 *  1    2330 283      1.      7.9   101.0
  1    0655  84      0.     1.0   100.1 *  1    1515 184      1.      7.1   100.9 *  1    2335 284      1.      7.9   101.0
  1    0700  85      0.     1.0   100.1 *  1    1520 185      1.      7.2   100.9 *  1    2340 285      1.      7.9   101.0
  1    0705  86      0.     1.0   100.1 *  1    1525 186      1.      7.3   100.9 *  1    2345 286      1.      7.9   101.0
  1    0710  87      0.     1.1   100.1 *  1    1530 187      1.      7.3   100.9 *  1    2350 287      1.      7.9   101.0
  1    0715  88      0.     1.1   100.1 *  1    1535 188      1.      7.4   100.9 *  1    2355 288      1.      7.9   101.0
  1    0720  89      0.     1.1   100.1 *  1    1540 189      1.      7.5   100.9 *  2    0000 289      1.      7.9   101.0
  1    0725  90      0.     1.1   100.1 *  1    1545 190      1.      7.6   100.9 *  2    0005 290      1.      7.9   101.0
  1    0730  91      0.     1.1   100.1 *  1    1550 191      1.      7.6   101.0 *  2    0010 291      1.      7.9   101.0
  1    0735  92      0.     1.2   100.1 *  1    1555 192      1.      7.7   101.0 *  2    0015 292      1.      7.9   101.0
  1    0740  93      0.     1.2   100.1 *  1    1600 193      1.      7.7   101.0 *  2    0020 293      1.      7.9   101.0
  1    0745  94      0.     1.2   100.2 *  1    1605 194      1.      7.8   101.0 *  2    0025 294      1.      7.9   101.0
  1    0750  95      0.     1.2   100.2 *  1    1610 195      1.      7.8   101.0 *  2    0030 295      1.      7.9   101.0
  1    0755  96      0.     1.3   100.2 *  1    1615 196      1.      7.9   101.0 *  2    0035 296      1.      7.9   101.0
  1    0800  97      0.     1.3   100.2 *  1    1620 197      1.      7.9   101.0 *  2    0040 297      1.      7.9   101.0
  1    0805  98      0.     1.3   100.2 *  1    1625 198      1.      7.9   101.0 *  2    0045 298      1.      7.9   101.0
  1    0810  99      0.     1.4   100.2 *  1    1630 199      1.      7.9   101.0 *  2    0050 299      1.      7.9   101.0
  1    0815 100      0.     1.4   100.2 *  1    1635 200      1.      7.9   101.0 *  2    0055 300      1.      7.9   101.0
                                           *                                        *
 ********************************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                  6-HR         24-HR         72-HR      24.92-HR
+   (CFS)        (HR)
                          (CFS)
+       1.      18.67                1.           1.           1.           1.
                          (INCHES)   .071         .157         .157         .157
```

		(AC-FT)	0.	1.	1.	1.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
8.	19.83		8.	4.	4.	4.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)					
101.00	19.83		101.00	100.55	100.53	100.53

CUMULATIVE AREA = .13 SQ MI

STATION DETAIN

(I) INFLOW, (O) OUTFLOW

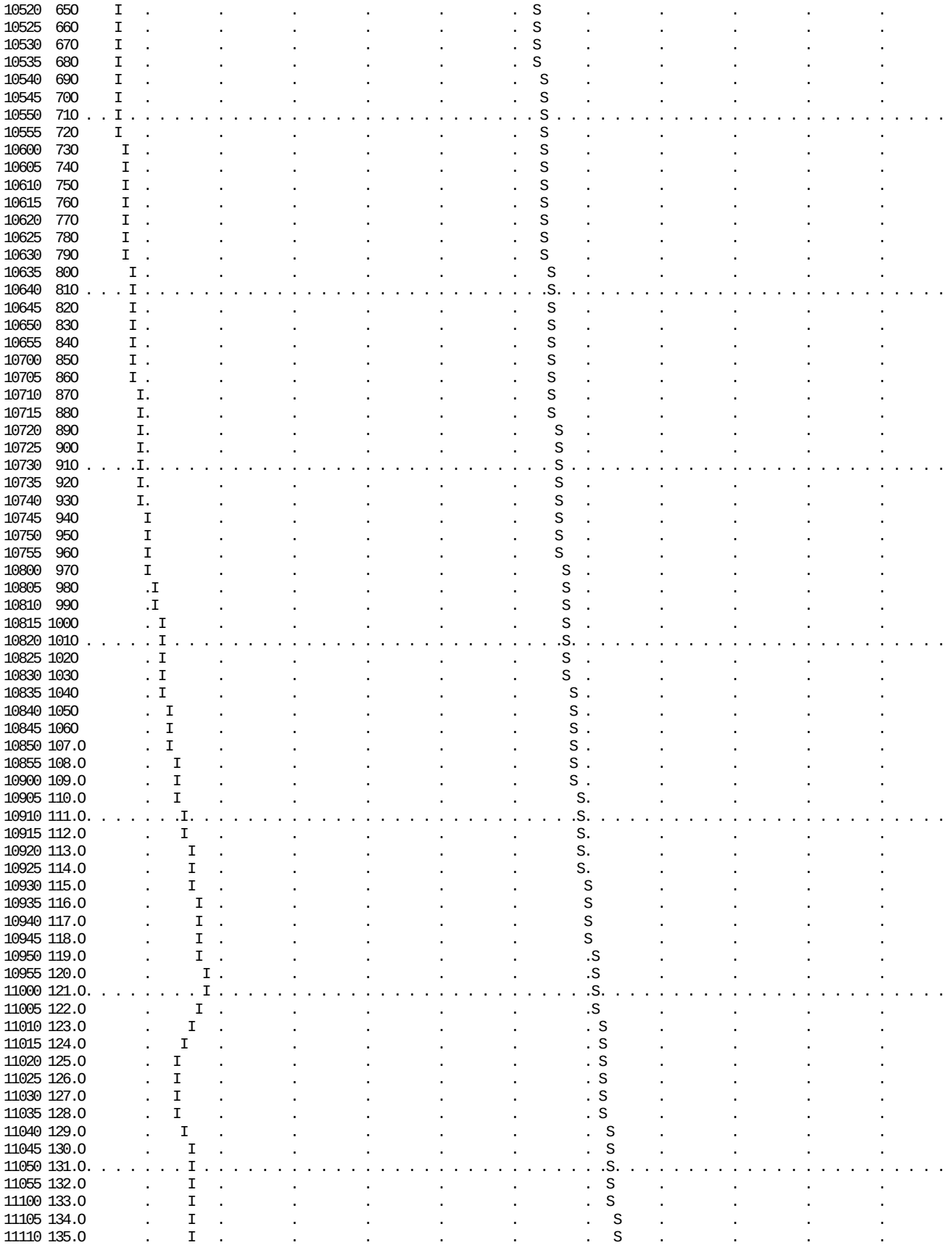
0. 4. 8. 12. 16. 20. 24. 0. 0. 0. 0. 0. 0.

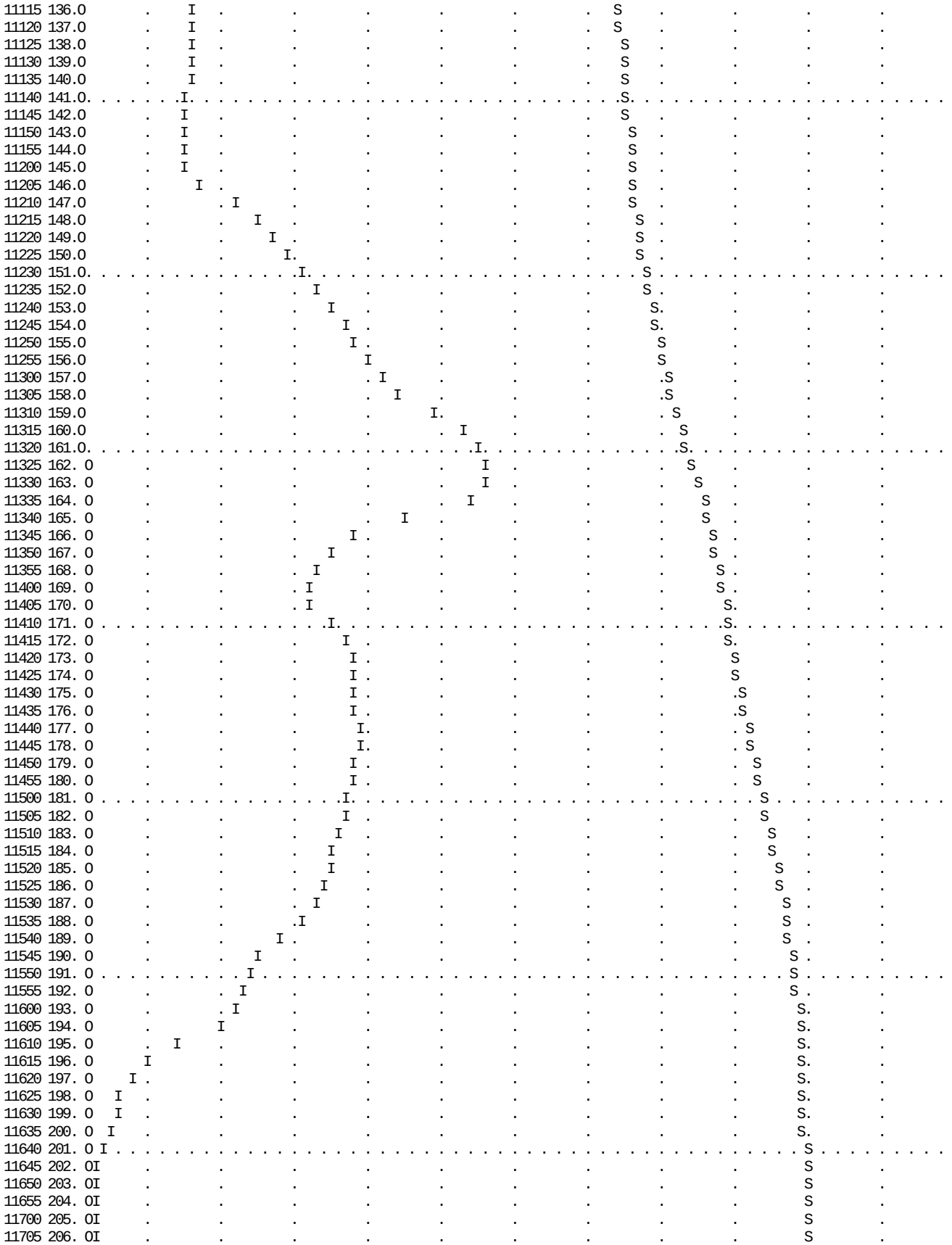
(S) STORAGE

0. 0. 0. 0. 0. 0. 0. 2. 4. 6. 8. 0. 0.

DAHRMN PER

```
10000   1I---------.---------.---------.---------.---------.---------S---------.---------.---------.---------.---------.---------.
10005   2I         .         .         .         .         .         S         .         .         .         .         .         .
10010   30I        .         .         .         .         .         S         .         .         .         .         .         .
10015   40I        .         .         .         .         .         S         .         .         .         .         .         .
10020   50 I       .         .         .         .         .         S         .         .         .         .         .         .
10025   60 I       .         .         .         .         .         S         .         .         .         .         .         .
10030   70 I       .         .         .         .         .         S         .         .         .         .         .         .
10035   80 I       .         .         .         .         .         S         .         .         .         .         .         .
10040   90 I       .         .         .         .         .         S         .         .         .         .         .         .
10045  100 I       .         .         .         .         .         S         .         .         .         .         .         .
10050  110 I. . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10055  120  I      .         .         .         .         .         S         .         .         .         .         .         .
10100  130  I      .         .         .         .         .         S         .         .         .         .         .         .
10105  140  I      .         .         .         .         .         S         .         .         .         .         .         .
10110  150  I      .         .         .         .         .         S         .         .         .         .         .         .
10115  160  I      .         .         .         .         .         S         .         .         .         .         .         .
10120  170  I      .         .         .         .         .         S         .         .         .         .         .         .
10125  180 I       .         .         .         .         .         S         .         .         .         .         .         .
10130  190 I       .         .         .         .         .        .S         .         .         .         .         .         .
10135  200 I       .         .         .         .         .        .S         .         .         .         .         .         .
10140  210 I. . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10145  220 I       .         .         .         .         .        .S         .         .         .         .         .         .
10150  230  I      .         .         .         .         .        .S         .         .         .         .         .         .
10155  240  I      .         .         .         .         .        .S         .         .         .         .         .         .
10200  250  I      .         .         .         .         .        .S         .         .         .         .         .         .
10205  260  I      .         .         .         .         .        .S         .         .         .         .         .         .
10210  270  I      .         .         .         .         .        .S         .         .         .         .         .         .
10215  280  I      .         .         .         .         .        .S         .         .         .         .         .         .
10220  290  I      .         .         .         .         .        .S         .         .         .         .         .         .
10225  300  I      .         .         .         .         .        .S         .         .         .         .         .         .
10230  310 .I. . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10235  320  I      .         .         .         .         .        .S         .         .         .         .         .         .
10240  330   I     .         .         .         .         .        .S         .         .         .         .         .         .
10245  340   I     .         .         .         .         .        .S         .         .         .         .         .         .
10250  350   I     .         .         .         .         .        .S         .         .         .         .         .         .
10255  360   I     .         .         .         .         .        .S         .         .         .         .         .         .
10300  370   I     .         .         .         .         .        .S         .         .         .         .         .         .
10305  380   I     .         .         .         .         .        .S         .         .         .         .         .         .
10310  390   I     .         .         .         .         .        .S         .         .         .         .         .         .
10315  400   I     .         .         .         .         .        .S         .         .         .         .         .         .
10320  410 . I. . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10325  420   I     .         .         .         .         .        . S         .         .         .         .         .         .
10330  430   I     .         .         .         .         .        . S         .         .         .         .         .         .
10335  440   I     .         .         .         .         .        . S         .         .         .         .         .         .
10340  450   I     .         .         .         .         .        . S         .         .         .         .         .         .
10345  460   I     .         .         .         .         .        . S         .         .         .         .         .         .
10350  470   I     .         .         .         .         .        . S         .         .         .         .         .         .
10355  480   I     .         .         .         .         .        . S         .         .         .         .         .         .
10400  490    I    .         .         .         .         .        . S         .         .         .         .         .         .
10405  500    I    .         .         .         .         .        . S         .         .         .         .         .         .
10410  510 . .I. . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10415  520    I    .         .         .         .         .        . S         .         .         .         .         .         .
10420  530    I    .         .         .         .         .        . S         .         .         .         .         .         .
10425  540     I   .         .         .         .         .        . S         .         .         .         .         .         .
10430  550     I   .         .         .         .         .        . S         .         .         .         .         .         .
10435  560     I   .         .         .         .         .        . S         .         .         .         .         .         .
10440  570     I   .         .         .         .         .        .  S         .         .         .         .         .         .
10445  580     I   .         .         .         .         .        .  S         .         .         .         .         .         .
10450  590     I   .         .         .         .         .        .  S         .         .         .         .         .         .
10455  600     I   .         .         .         .         .        .  S         .         .         .         .         .         .
10500  610 . . I. . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10505  620     I   .         .         .         .         .        .  S         .         .         .         .         .         .
10510  630     I   .         .         .         .         .        .  S         .         .         .         .         .         .
10515  640     I   .         .         .         .         .        .  S         .         .         .         .         .         .
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11710 207. OI      .         .         .         .         .         .         .         .         .         S         .         .
11715 208. O I     .         .         .         .         .         .         .         .         .         S         .         .
11720 209. O I     .         .         .         .         .         .         .         .         .         S         .         .
11725 210. O I     .         .         .         .         .         .         .         .         .         S         .         .
11730 211. O I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
11735 212. O I     .         .         .         .         .         .         .         .         .         S         .         .
11740 213. O I     .         .         .         .         .         .         .         .         .         S         .         .
11745 214. O I     .         .         .         .         .         .         .         .         .         S         .         .
11750 215. O I     .         .         .         .         .         .         .         .         .         S         .         .
11755 216. O I     .         .         .         .         .         .         .         .         .         S         .         .
11800 217. O I     .         .         .         .         .         .         .         .         .         S         .         .
11805 218. OI      .         .         .         .         .         .         .         .         .         S         .         .
11810 219. OI      .         .         .         .         .         .         .         .         .         S         .         .
11815 220. OI      .         .         .         .         .         .         .         .         .         S         .         .
11820 221. OI. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
11825 222. OI      .         .         .         .         .         .         .         .         .         S         .         .
11830 223. OI      .         .         .         .         .         .         .         .         .         S         .         .
11835 224. OI      .         .         .         .         .         .         .         .         .         S         .         .
11840 225. OI      .         .         .         .         .         .         .         .         .         S         .         .
11845 226. OI      .         .         .         .         .         .         .         .         .         S         .         .
11850 227. I       .         .         .         .         .         .         .         .         .         S         .         .
11855 228. I       .         .         .         .         .         .         .         .         .         S         .         .
11900 229. I       .         .         .         .         .         .         .         .         .         S         .         .
11905 230. I       .         .         .         .         .         .         .         .         .         S         .         .
11910 231. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
11915 232. I       .         .         .         .         .         .         .         .         .         S         .         .
11920 233. I       .         .         .         .         .         .         .         .         .         S         .         .
11925 234. OI      .         .         .         .         .         .         .         .         .         S         .         .
11930 235. OI      .         .         .         .         .         .         .         .         .         S         .         .
11935 236. OI      .         .         .         .         .         .         .         .         .         S         .         .
11940 237. OI      .         .         .         .         .         .         .         .         .         S         .         .
11945 238. OI      .         .         .         .         .         .         .         .         .         S         .         .
11950 239. I       .         .         .         .         .         .         .         .         .         S         .         .
11955 240. I       .         .         .         .         .         .         .         .         .         S         .         .
12000 241. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
12005 242. I       .         .         .         .         .         .         .         .         .         S         .         .
12010 243. I       .         .         .         .         .         .         .         .         .         S         .         .
12015 244. I       .         .         .         .         .         .         .         .         .         S         .         .
12020 245. I       .         .         .         .         .         .         .         .         .         S         .         .
12025 246. I       .         .         .         .         .         .         .         .         .         S         .         .
12030 247. I       .         .         .         .         .         .         .         .         .         S         .         .
12035 248. I       .         .         .         .         .         .         .         .         .         S         .         .
12040 249. I       .         .         .         .         .         .         .         .         .         S         .         .
12045 250. I       .         .         .         .         .         .         .         .         .         S         .         .
12050 251. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
12055 252. I       .         .         .         .         .         .         .         .         .         S         .         .
12100 253. I       .         .         .         .         .         .         .         .         .         S         .         .
12105 254. I       .         .         .         .         .         .         .         .         .         S         .         .
12110 255. I       .         .         .         .         .         .         .         .         .         S         .         .
12115 256. I       .         .         .         .         .         .         .         .         .         S         .         .
12120 257. I       .         .         .         .         .         .         .         .         .         S         .         .
12125 258. I       .         .         .         .         .         .         .         .         .         S         .         .
12130 259. I       .         .         .         .         .         .         .         .         .         S         .         .
12135 260. I       .         .         .         .         .         .         .         .         .         S         .         .
12140 261. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
12145 262. I       .         .         .         .         .         .         .         .         .         S         .         .
12150 263. I       .         .         .         .         .         .         .         .         .         S         .         .
12155 264. I       .         .         .         .         .         .         .         .         .         S         .         .
12200 265. I       .         .         .         .         .         .         .         .         .         S         .         .
12205 266. I       .         .         .         .         .         .         .         .         .         S         .         .
12210 267. I       .         .         .         .         .         .         .         .         .         S         .         .
12215 268. I       .         .         .         .         .         .         .         .         .         S         .         .
12220 269. I       .         .         .         .         .         .         .         .         .         S         .         .
12225 270. I       .         .         .         .         .         .         .         .         .         S         .         .
12230 271. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
12235 272. I       .         .         .         .         .         .         .         .         .         S         .         .
12240 273. I       .         .         .         .         .         .         .         .         .         S         .         .
12245 274. I       .         .         .         .         .         .         .         .         .         S         .         .
12250 275. I       .         .         .         .         .         .         .         .         .         S         .         .
12255 276. I       .         .         .         .         .         .         .         .         .         S         .         .
12300 277. I       .         .         .         .         .         .         .         .         .         S         .         .
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12305 278. I      .         .         .         .         .         .         .         .         .         S         .         .
12310 279. I      .         .         .         .         .         .         .         .         .         S         .         .
12315 280. I      .         .         .         .         .         .         .         .         .         S         .         .
12320 281. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
12325 282. I      .         .         .         .         .         .         .         .         .         S         .         .
12330 283. I      .         .         .         .         .         .         .         .         .         S         .         .
12335 284. I      .         .         .         .         .         .         .         .         .         S         .         .
12340 285. I      .         .         .         .         .         .         .         .         .         S         .         .
12345 286. I      .         .         .         .         .         .         .         .         .         S         .         .
12350 287. I      .         .         .         .         .         .         .         .         .         S         .         .
12355 288. I      .         .         .         .         .         .         .         .         .         S         .         .
20000 289. I      .         .         .         .         .         .         .         .         .         S         .         .
20005 290. I      .         .         .         .         .         .         .         .         .         S         .         .
20010 291.IO . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . .
20015 292.IO      .         .         .         .         .         .         .         .         .         S         .         .
20020 293.IO      .         .         .         .         .         .         .         .         .         S         .         .
20025 294I O      .         .         .         .         .         .         .         .         .        S.         .         .
20030 295I O      .         .         .         .         .         .         .         .         .        S.         .         .
20035 296I O      .         .         .         .         .         .         .         .         .        S.         .         .
20040 297I O      .         .         .         .         .         .         .         .         .        S.         .         .
20045 298I O      .         .         .         .         .         .         .         .         .        S.         .         .
20050 299I O      .         .         .         .         .         .         .         .         .        S.         .         .
20055 300I-O-------.---------.---------.---------.---------.---------.---------.---------.---------.--------S.---------.---------.
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+										
	HYDROGRAPH AT									
+		BSN234	23.	13.42	12.	5.	4.	.13		
	ROUTED TO									
+		DETAIN	1.	18.67	1.	1.	1.	.13		
+									101.00	19.83

*** NORMAL END OF HEC-1 ***

APPENDIX C

MAJOR BASIN 200
100-YEAR SYNTHETIC HYDROGRAPH ANALYSES

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

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
Study date 12/16/17 File: d234h1100.out

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

Program License Serial Number 4028

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

English Units used in output format

Tentative Tract 35853
Proposed Conditions
100-Year, 1-Hour Storm
Area Tributary to Rational Method Node 234

Drainage Area = 82.84(Ac.) = 0.129 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 82.84(Ac.)=0.129 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.218 Hr.
Lag time = 13.08 Min.
25% of lag time = 3.27 Min.
40% of lag time = 5.23 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
82.84	0.54	44.73

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
82.84	1.26	104.38

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.540(In)
Area Averaged 100-Year Rainfall = 1.260(In)

Point rain (area averaged) = 1.260(In)
Areal adjustment factor = 99.92 %
Adjusted average point rain = 1.259(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
43.530	81.00	0.000
39.310	69.00	0.500

Total Area Entered = 82.84(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
81.0	81.0	0.233	0.000	0.233	0.525	0.122
69.0	69.0	0.373	0.500	0.205	0.475	0.097
					Sum (F) =	0.220

Area averaged mean soil loss (F) (In/Hr) = 0.220
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.710

Slope of intensity-duration curve for a 1 hour storm =0.5500

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	38.226	2.946	2.459
2	0.167	76.453	10.735	8.962
3	0.250	114.679	28.489	23.785
4	0.333	152.905	24.391	20.364
5	0.417	191.131	10.359	8.648
6	0.500	229.358	6.909	5.768
7	0.583	267.584	4.891	4.084
8	0.667	305.810	3.598	3.004
9	0.750	344.037	2.602	2.172
10	0.833	382.263	1.795	1.498
11	0.917	420.489	1.137	0.949
12	1.000	458.716	0.523	0.436
13	1.083	496.942	0.405	0.338
14	1.167	535.168	0.318	0.265
15	1.250	573.394	0.244	0.204
16	1.333	611.621	0.293	0.245

```
       17   1.417        649.847          0.190              0.159
       18   1.500        688.073          0.115              0.096
       19   1.583        726.300          0.062              0.052
                                  Sum = 100.000   Sum=      83.487
-----------------------------------------------------------------------
```

The following loss rate calculations reflect use of the minimum calculated loss
rate subtracted from the Storm Rain to produce the maximum Effective Rain value

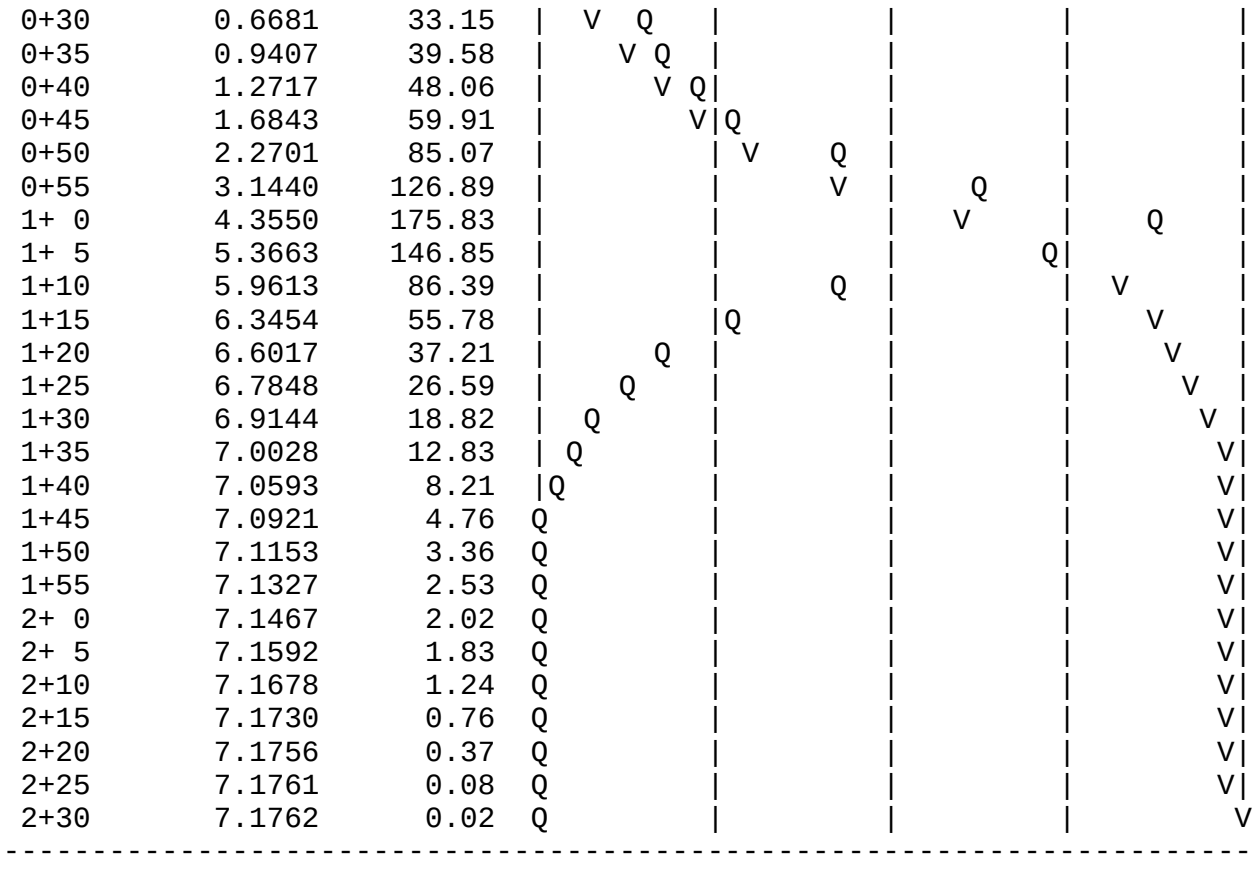
Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	3.30	0.499	0.220	(0.354)	0.279
2	0.17	4.20	0.635	0.220	(0.451)	0.415
3	0.25	4.40	0.665	0.220	(0.472)	0.445
4	0.33	4.80	0.725	0.220	(0.515)	0.506
5	0.42	5.20	0.786	0.220	(0.558)	0.566
6	0.50	6.20	0.937	0.220	(0.665)	0.717
7	0.58	6.80	1.027	0.220	(0.729)	0.808
8	0.67	8.80	1.330	0.220	(0.944)	1.110
9	0.75	13.90	2.100	0.220	(1.491)	1.881
10	0.83	31.40	4.744	0.220	(3.368)	4.525
11	0.92	7.20	1.088	0.220	(0.772)	0.868
12	1.00	3.80	0.574	0.220	(0.408)	0.355

(Loss Rate Not Used)

Sum = 100.0 Sum = 12.5

```
Flood volume = Effective rainfall      1.04(In)
 times area      82.8(Ac.)/[(In)/(Ft.)] =       7.2(Ac.Ft)
Total soil loss =      0.22(In)
Total soil loss =     1.515(Ac.Ft)
Total rainfall =      1.26(In)
Flood volume =      312596.9 Cubic Feet
Total soil loss =       66012.3 Cubic Feet
-----------------------------------------------------------------------
 Peak flow rate of this hydrograph =    175.826(CFS)
-----------------------------------------------------------------------
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                    1 - H O U R    S T O R M
                 R u n o f f      H y d r o g r a p h
-----------------------------------------------------------------------
             Hydrograph in   5   Minute intervals ((CFS))

-----------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       50.0     100.0     150.0     200.0
-----------------------------------------------------------------------
  0+ 5       0.0047      0.69  Q         |         |         |         |
  0+10       0.0290      3.52  Q         |         |         |         |
  0+15       0.1079     11.46  V Q       |         |         |         |
  0+20       0.2512     20.80  |V  Q     |         |         |         |
  0+25       0.4398     27.39  | V  Q    |         |         |         |
```


0+30 0.6681 33.15
0+35 0.9407 39.58
0+40 1.2717 48.06
0+45 1.6843 59.91
0+50 2.2701 85.07
0+55 3.1440 126.89
1+ 0 4.3550 175.83
1+ 5 5.3663 146.85
1+10 5.9613 86.39
1+15 6.3454 55.78
1+20 6.6017 37.21
1+25 6.7848 26.59
1+30 6.9144 18.82
1+35 7.0028 12.83
1+40 7.0593 8.21
1+45 7.0921 4.76
1+50 7.1153 3.36
1+55 7.1327 2.53
2+ 0 7.1467 2.02
2+ 5 7.1592 1.83
2+10 7.1678 1.24
2+15 7.1730 0.76
2+20 7.1756 0.37
2+25 7.1761 0.08
2+30 7.1762 0.02

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   16DEC17  TIME  13:51:58   *
*                                       *
*****************************************
```


```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X       XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.....10

                       *DIAGRAM
*** FREE ***
              1        ID   Tentative Tract 35853
              2        ID   Proposed Conditions
              3        ID   Estimate storage volume needed to detain proposed 100-year, 1-hour
              4        ID   storm to existing 100-year, 1-hour storm
              5        ID   Major Basin 200 - Detention at Node 234
              6        ID   Hydrograph from Riverside S-Curve method
              7        IO        1       2
              8        IT        5                    30

              9        KK  BSN234
             10        KM   FOOTHILL S-Curve
             11        BA    0.13
             12        QI     0.7     3.5    11.5    20.8    27.4    33.1    39.6    48.1    59.9    85.1
             13        QI   126.9   175.8   146.8    86.4    55.8    37.2    26.6    18.8    12.8     8.2
             14        QI     4.8     3.4     2.5     2.0     1.8     1.2     0.8     0.4     0.1     0.0
             15        QI     0.0

             16        KK  DETAIN
             17        RS        1    STOR      -1
             18        SV        0     5.5
             19        SQ        0      30
             20        SE      100     101
             21        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    9      BSN234
               V
               V
   16      DETAIN

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   16DEC17  TIME  13:51:58   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

Tentative Tract 35853
Proposed Conditions
Estimate storage volume needed to detain proposed 100-year, 1-hour storm to existing 100-year, 1-hour storm
Major Basin 200 - Detention at Node 234
Hydrograph from Riverside S-Curve method

```
  7 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          2  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ          30  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1    0  ENDING DATE
                    NDTIME        0225  ENDING TIME
                    ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE    2.42 HOURS

        ENGLISH UNITS
            DRAINAGE AREA         SQUARE MILES
            PRECIPITATION DEPTH   INCHES
            LENGTH, ELEVATION     FEET
            FLOW                  CUBIC FEET PER SECOND
            STORAGE VOLUME        ACRE-FEET
            SURFACE AREA          ACRES
            TEMPERATURE           DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
  9 KK    *    BSN234  *
          *            *
          **************
                       FOOTHILL S-Curve

            SUBBASIN RUNOFF DATA

 11 BA          SUBBASIN CHARACTERISTICS
                     TAREA         .13  SUBBASIN AREA

                                                    ***

*********************************************************************************************************************************************

                                                HYDROGRAPH AT STATION   BSN234

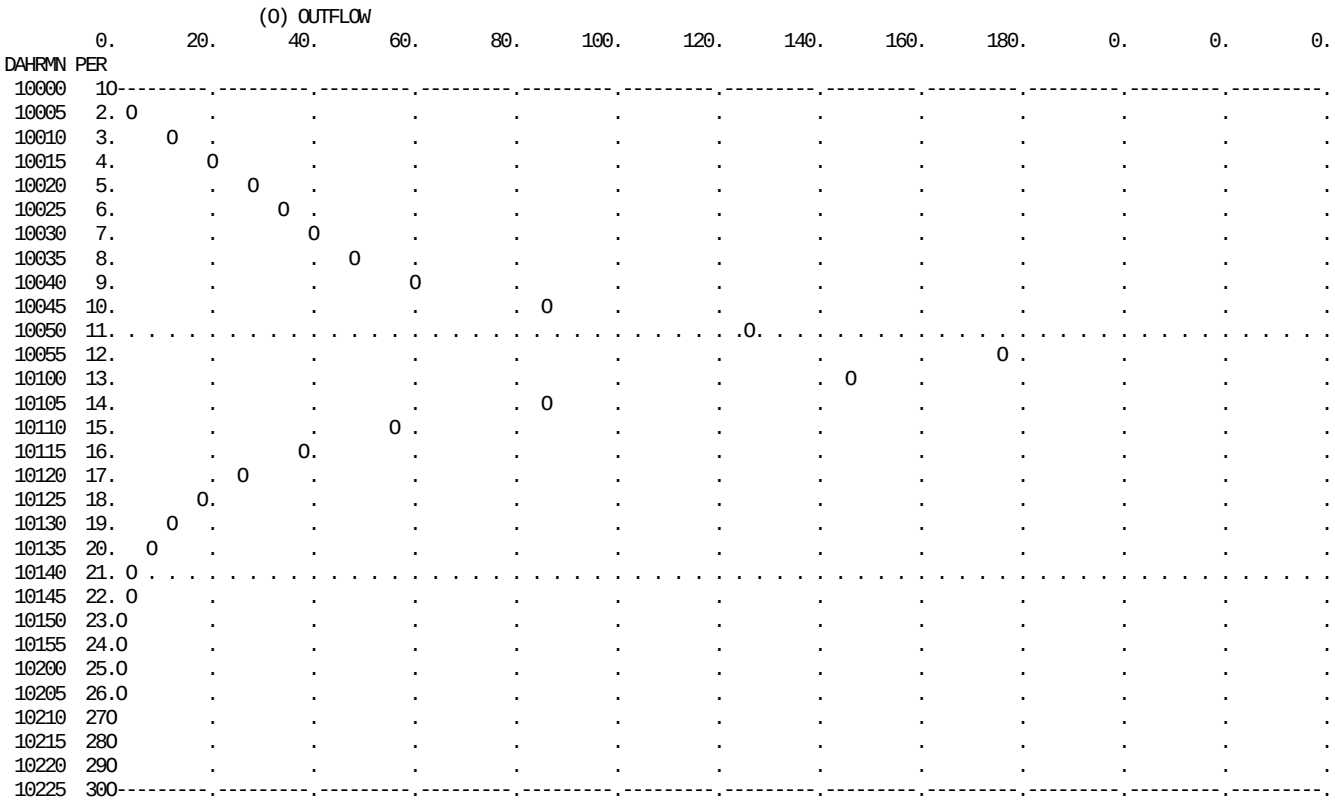
*********************************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	1.	1		0040	9	60.	1		0120	17	27.	1		0200	25	2.
1		0005	2	4.	1		0045	10	85.	1		0125	18	19.	1		0205	26	1.
1		0010	3	12.	1		0050	11	127.	1		0130	19	13.	1		0210	27	1.
1		0015	4	21.	1		0055	12	176.	1		0135	20	8.	1		0215	28	0.
1		0020	5	27.	1		0100	13	147.	1		0140	21	5.	1		0220	29	0.
1		0025	6	33.	1		0105	14	86.	1		0145	22	3.	1		0225	30	0.
1		0030	7	40.	1		0110	15	56.	1		0150	23	3.					
1		0035	8	48.	1		0115	16	37.	1		0155	24	2.					

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	2.42-HR
+ (CFS)	(HR)				
		(CFS)			
+ 176.	.92	36.	36.	36.	36.
		(INCHES) 1.035	1.035	1.035	1.035
		(AC-FT) 7.	7.	7.	7.

CUMULATIVE AREA = .13 SQ MI

STATION BSN234



*** ***

```
          **************
          *            *
  16 KK   *    DETAIN  *
          *            *
          **************
```

HYDROGRAPH ROUTING DATA

```
  17 RS     STORAGE ROUTING
                 NSTPS          1  NUMBER OF SUBREACHES
                  ITYP       STOR  TYPE OF INITIAL CONDITION
                 RSVRIC      -1.00  INITIAL CONDITION
                     X         .00 WORKING R AND D COEFFICIENT

  18 SV       STORAGE          .0      5.5

  19 SQ       DISCHARGE        0.      30.

  20 SE       ELEVATION     100.00   101.00
```

***

****

HYDROGRAPH AT STATION DETAIN

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	1.	.1	100.0	1		0050	11	14.	2.5	100.5	1		0140	21	28.	5.1	100.9
1		0005	2	1.	.1	100.0	1		0055	12	19.	3.5	100.6	1		0145	22	27.	4.9	100.9
1		0010	3	1.	.2	100.0	1		0100	13	24.	4.4	100.8	1		0150	23	26.	4.7	100.9
1		0015	4	2.	.3	100.1	1		0105	14	27.	5.0	100.9	1		0155	24	25.	4.6	100.8
1		0020	5	2.	.4	100.1	1		0110	15	29.	5.3	101.0	1		0200	25	24.	4.4	100.8
1		0025	6	3.	.6	100.1	1		0115	16	30.	5.5	101.0	1		0205	26	23.	4.3	100.8
1		0030	7	5.	.8	100.2	1		0120	17	30.	5.5	101.0	1		0210	27	22.	4.1	100.7
1		0035	8	6.	1.1	100.2	1		0125	18	30.	5.4	101.0	1		0215	28	22.	4.0	100.7
1		0040	9	8.	1.4	100.3	1		0130	19	29.	5.3	101.0	1		0220	29	21.	3.8	100.7
1		0045	10	10.	1.9	100.3	1		0135	20	28.	5.2	100.9	1		0225	30	20.	3.7	100.7

****

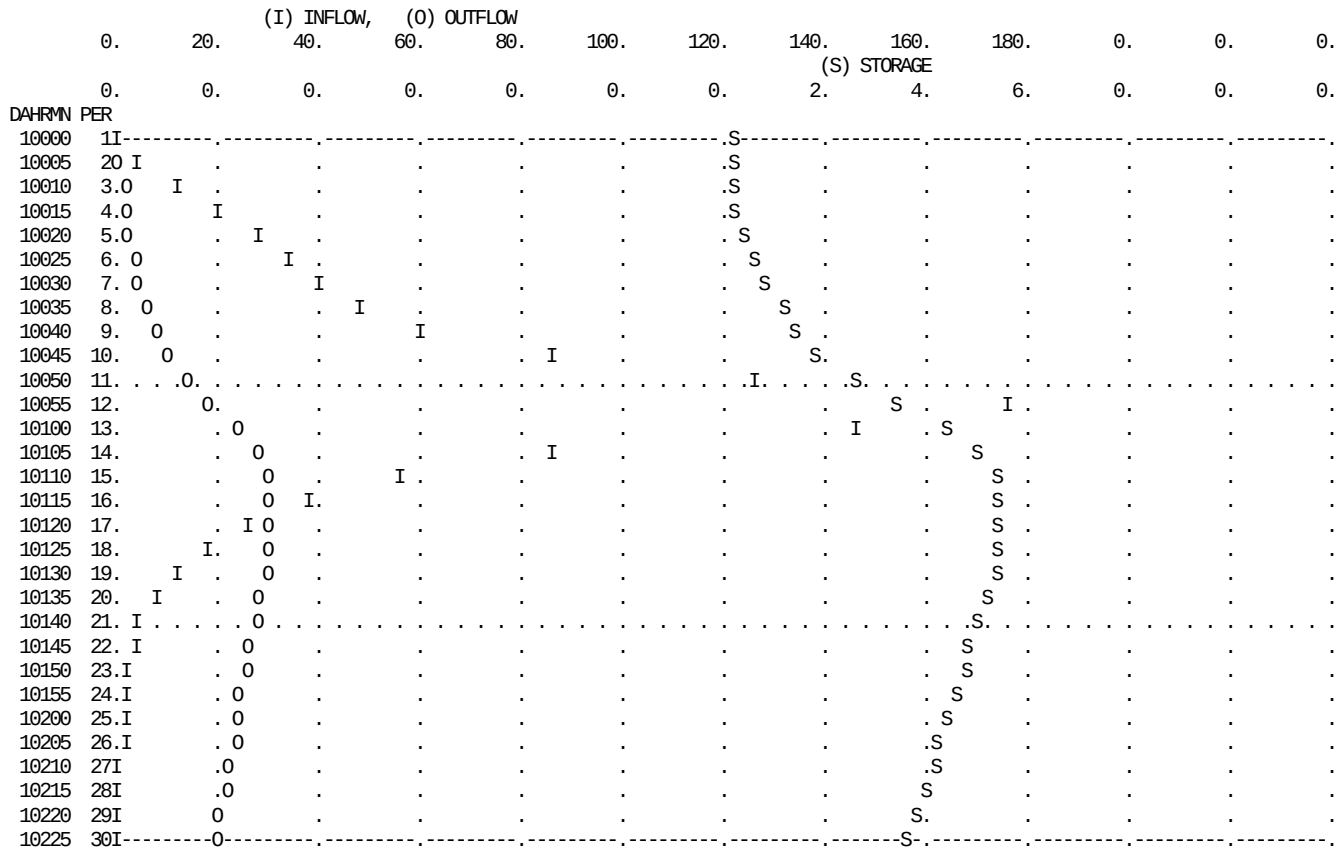
PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	2.42-HR
+ (CFS)	(HR)					
		(CFS)				
+ 30.	1.33		18.	18.	18.	18.
		(INCHES)	.522	.522	.522	.522
		(AC-FT)	4.	4.	4.	4.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	2.42-HR
+ (AC-FT)	(HR)				
5.	1.33	3.	3.	3.	3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	2.42-HR
+ (FEET)	(HR)				
100.99	1.33	100.60	100.60	100.60	100.60

CUMULATIVE AREA = .13 SQ MI

STATION DETAIN



RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	BSN234	176.	.92	36.	36.	36.	.13		
+	ROUTED TO	DETAIN	30.	1.33	18.	18.	18.	.13		
+									100.99	1.33

*** NORMAL END OF HEC-1 ***

APPROVED AS TO IMPACT ON STATE FACILITIES AND CONFORMANCE WITH APPLICABLE STATE STANDARDS AND PRACTICES AND THAT TECHNICAL OVERSIGHT WAS PERFORMED.

CONSULTANT DESIGN ENGINEER	CALTRANS DESIGN OVERSIGHT APPROVAL	REGISTRATION No.	LICENSE Exp DATE	DATE SIGNED
JEFFREY G. CHAPMAN	JON BUMPS	41849	03/31/12	

INDEX OF PLANS

SHEET No.	DESCRIPTION
1	TITLE AND LOCATION MAP
2-6	TYPICAL CROSS SECTIONS
7	KEY MAP AND LINE INDEX
8-62	LAYOUTS AND PROFILES
63-67	CONSTRUCTION DETAILS (63r)
68-92	TEMPORARY WATER POLLUTION CONTROL PLANS AND QUANTITIES
93-144	DRAINAGE PLANS, PROFILES, DETAILS AND QUANTITIES
145	CONSTRUCTION AREA SIGNS
146-179	STAGE CONSTRUCTION, TRAFFIC HANDLING PLANS AND QUANTITIES
180-186	DETOUR PLANS
187-217	PAVEMENT DELINEATION, SIGN PLANS AND QUANTITIES
218-220	SUMMARY OF QUANTITIES
221-236	ELECTRICAL PLANS
	STRUCTURE PLANS
237-248	KELLER ROAD UC

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN RIVERSIDE COUNTY
NEAR MURRIETA FROM 0.2 MILE SOUTH OF MURRIETA HOT SPRINGS ROAD OVERCROSSING TO SCOTT ROAD OVERCROSSING

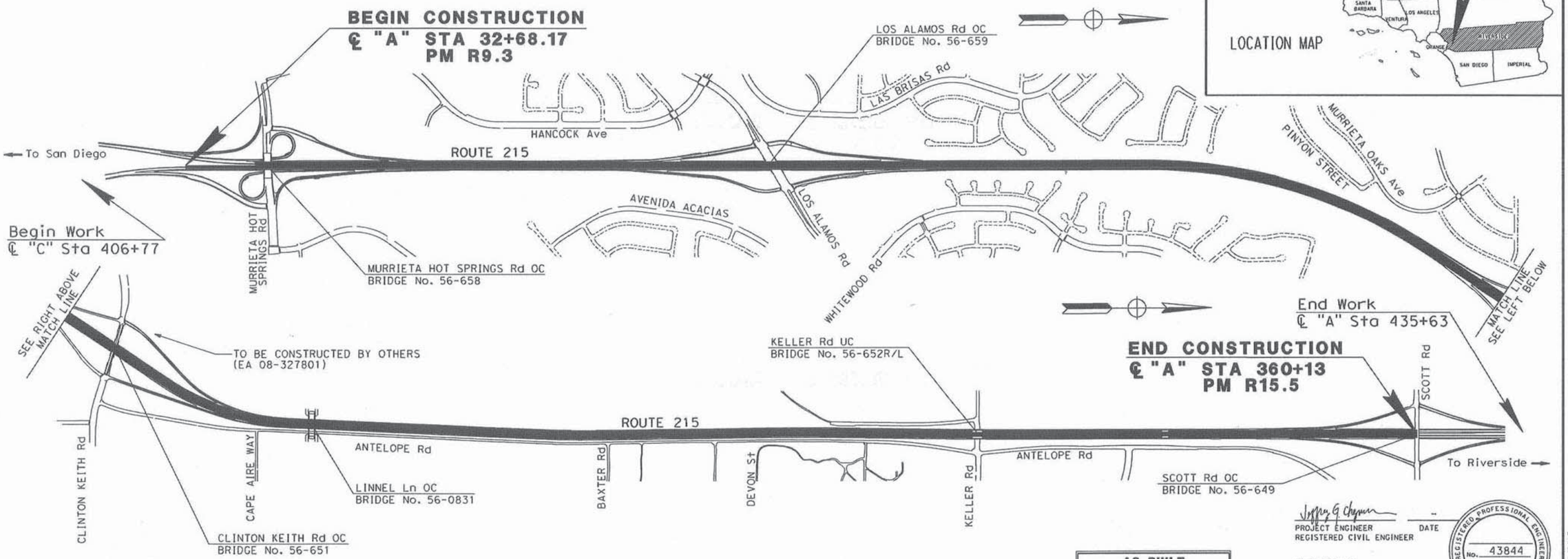
TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	Riv	215	R8.2/R16.0	1	248

NEW NUMBER OF TOTAL SHEETS-249
SEE INDEX OF PLANS FOR ADDED/REVISED SHEET NUMBERS



LOCATION MAP



PART "D"

NO SCALE

AS BUILT
CONTRACT No. OF1614
C.C.A. DATE 11-07-12
R.E. NAME AMR ABUELHASSAN
R.E. Signature for final approval of as-built information

Jeffrey G. Chapman — PROJECT ENGINEER / REGISTERED CIVIL ENGINEER — DATE

REGISTERED PROFESSIONAL ENGINEER No. 43844 Exp. 6/30/11 CIVIL STATE OF CALIFORNIA

7/15/10
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

URS CORPORATION
2020 EAST FIRST STREET,
SUITE 400
SANTA ANA, CA 92705

RIVERSIDE COUNTY
TRANSPORTATION COMMISSION
4080 LEMON STREET 3rd FLOOR
RIVERSIDE, CA 92502

PROJECT No. **0800000115**

CONTRACT No. **11-31-001-00**

LAST REVISION 00-00-00 DATE PLOTTED => 2/14/2013 TIME PLOTTED => 12:53:48 PM

NOTE:

FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA,
SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	Riv	215	R8.2/R16.0	107	248

Stephanie Hillebrand 7-15-10
REGISTERED CIVIL ENGINEER DATE

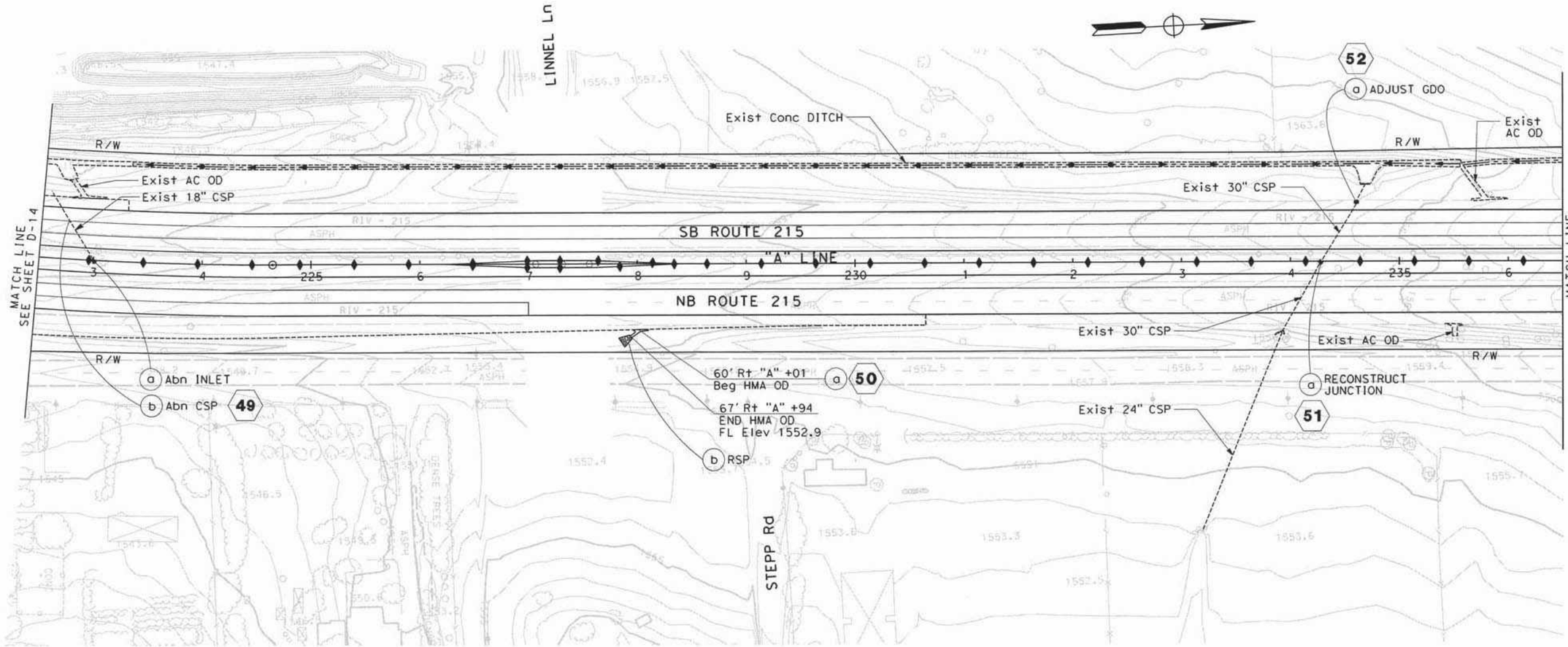
7-15-10
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
STEPHANIE HILLEBRAND
No. 65410
Exp. 9/30/11
CIVIL
STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

URS CORPORATION
2020 EAST FIRST STREET,
SUITE 400
SANTA ANA, CA 92705

RIVERSIDE COUNTY
TRANSPORTATION COMMISSION
4080 LEMON STREET 3rd FLOOR
RIVERSIDE, CA 92502



AS BUILT
CONTRACT No. 0F1614
C.C.A. DATE 11-07-12
R.E. NAME AMR ABUELHASSAN

THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY

DRAINAGE PLAN

SCALE 1"= 50' **D-15**

LAST REVISION DATE PLOTTED => 2/14/2013

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
CONSULTANT FUNCTIONAL SUPERVISOR: JEFFREY G. CHAPMAN
CALCULATED-DESIGNED BY: LESLEY WANG
CHECKED BY: STEPHANIE HILLEBRAND
REVISED BY | DATE REVISED

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => jesus_diaz
DGN FILE => ...\080F1614_0107.dgn

CU 08250

EA 0F1614

NOTE:

FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA,
SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	Riv	215	R8.2/R16.0	108	248

Stephanie Hillebrand 7-15-10
REGISTERED CIVIL ENGINEER DATE

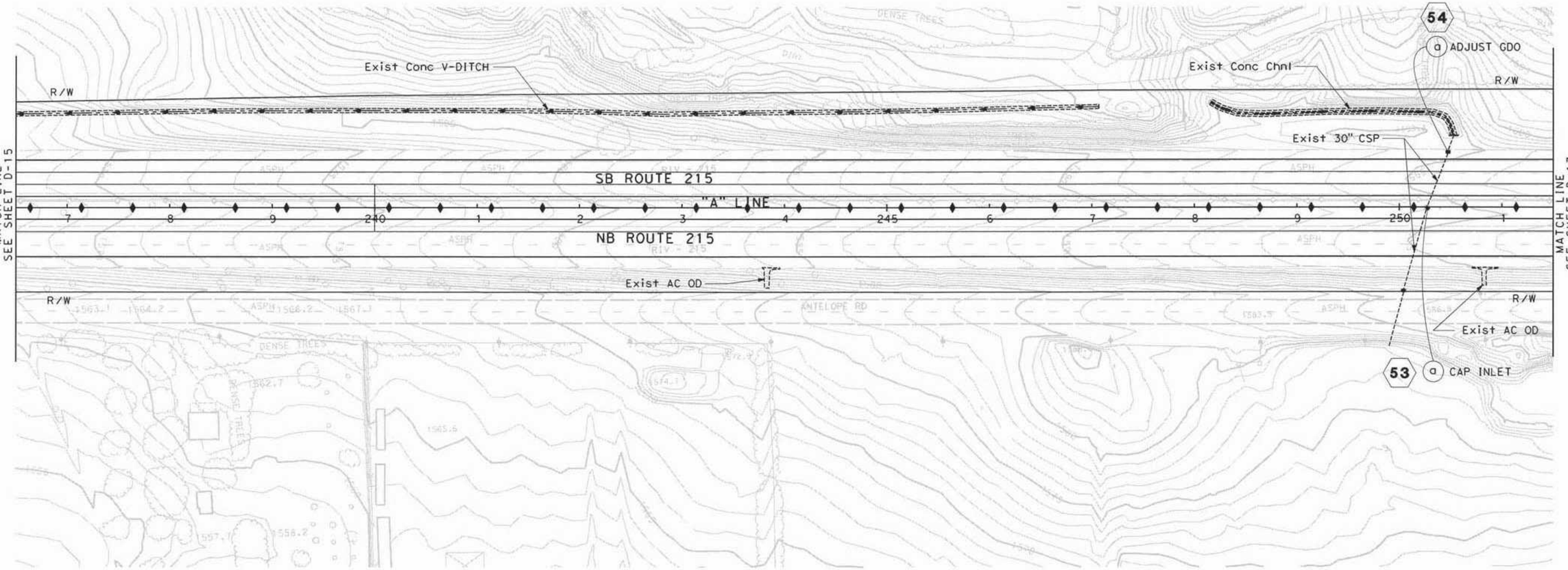
7-15-10
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
STEPHANIE HILLEBRAND
No. 65410
Exp. 9/30/11
CIVIL
STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

URS CORPORATION
2020 EAST FIRST STREET,
SUITE 400
SANTA ANA, CA 92705

RIVERSIDE COUNTY
TRANSPORTATION COMMISSION
4080 LEMON STREET 3rd FLOOR
RIVERSIDE, CA 92502



AS BUILT
CONTRACT No. OF1614
C.C.A. DATE 11-07-12
R.E. NAME AMR ABUELHASSAN

THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY

DRAINAGE PLAN

SCALE 1"= 50' **D-16**

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
CONSULTANT FUNCTIONAL SUPERVISOR: JEFFREY G. CHAPMAN
CALCULATED-DESIGNED BY: LESLEY WANG
CHECKED BY: STEPHANIE HILLEBRAND
REVISED BY | DATE REVISED

LAST REVISION | DATE PLOTTED => 2/14/2013

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => jesus_diaz
DGN FILE => ...\080F1614_0108.dgn

CU 08250

EA 0F1614

NOTE:

FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	Riv	215	R8.2/R16.0	109	248

Stephanie Hillebrand 7-15-10
REGISTERED CIVIL ENGINEER DATE

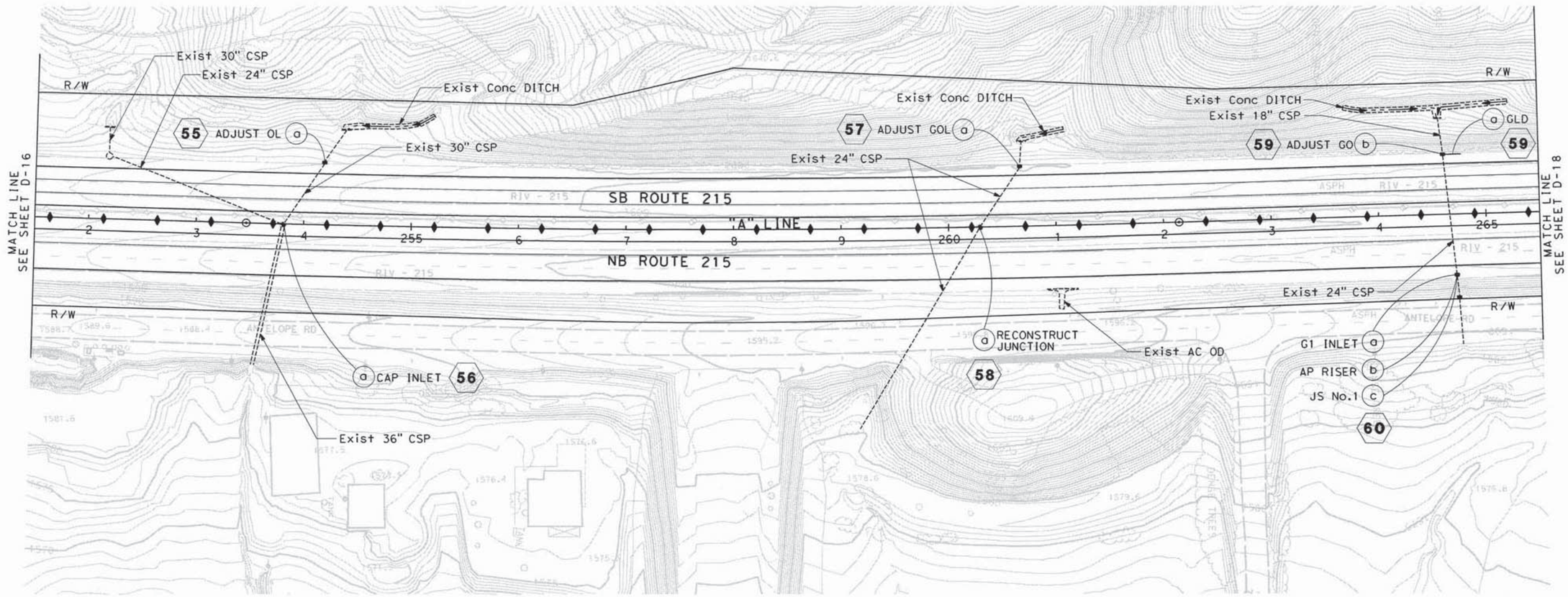
7-15-10
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — STEPHANIE HILLEBRAND No. 65410 Exp. 9/30/11 CIVIL — STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

URS CORPORATION
2020 EAST FIRST STREET,
SUITE 400
SANTA ANA, CA 92705

RIVERSIDE COUNTY
TRANSPORTATION COMMISSION
4080 LEMON STREET 3rd FLOOR
RIVERSIDE, CA 92502



AS BUILT
CONTRACT No. 0F1614
C.C.A. DATE 11-07-12
R.E. NAME AMR ABUELHASSAN

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DRAINAGE PLAN

SCALE 1"= 50'

D-17

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NOTE:

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
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Stephanie Hillebrand 7-15-10
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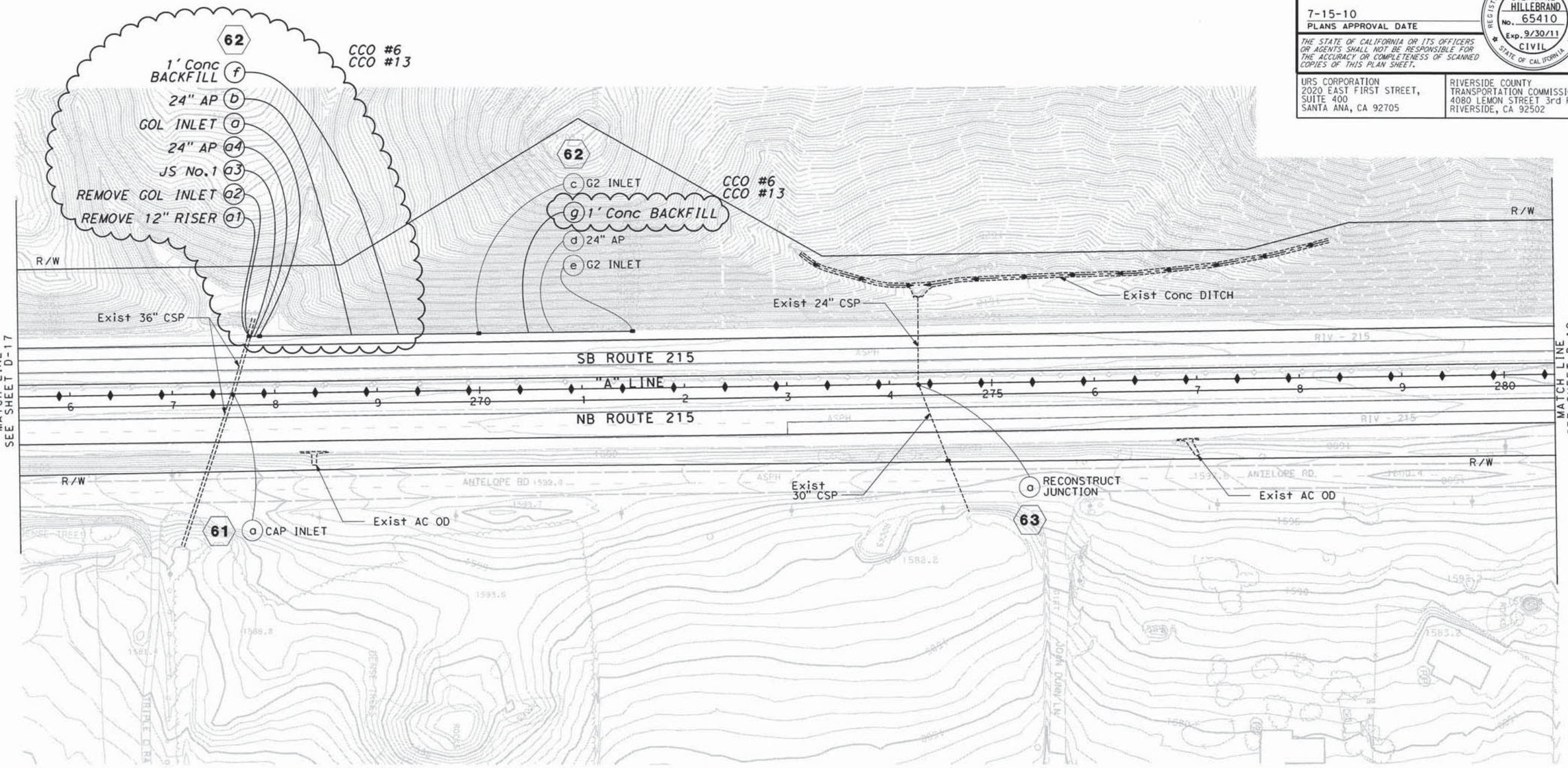
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RIVERSIDE COUNTY
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RIVERSIDE, CA 92502



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Stephanie Hillebrand 7-15-10
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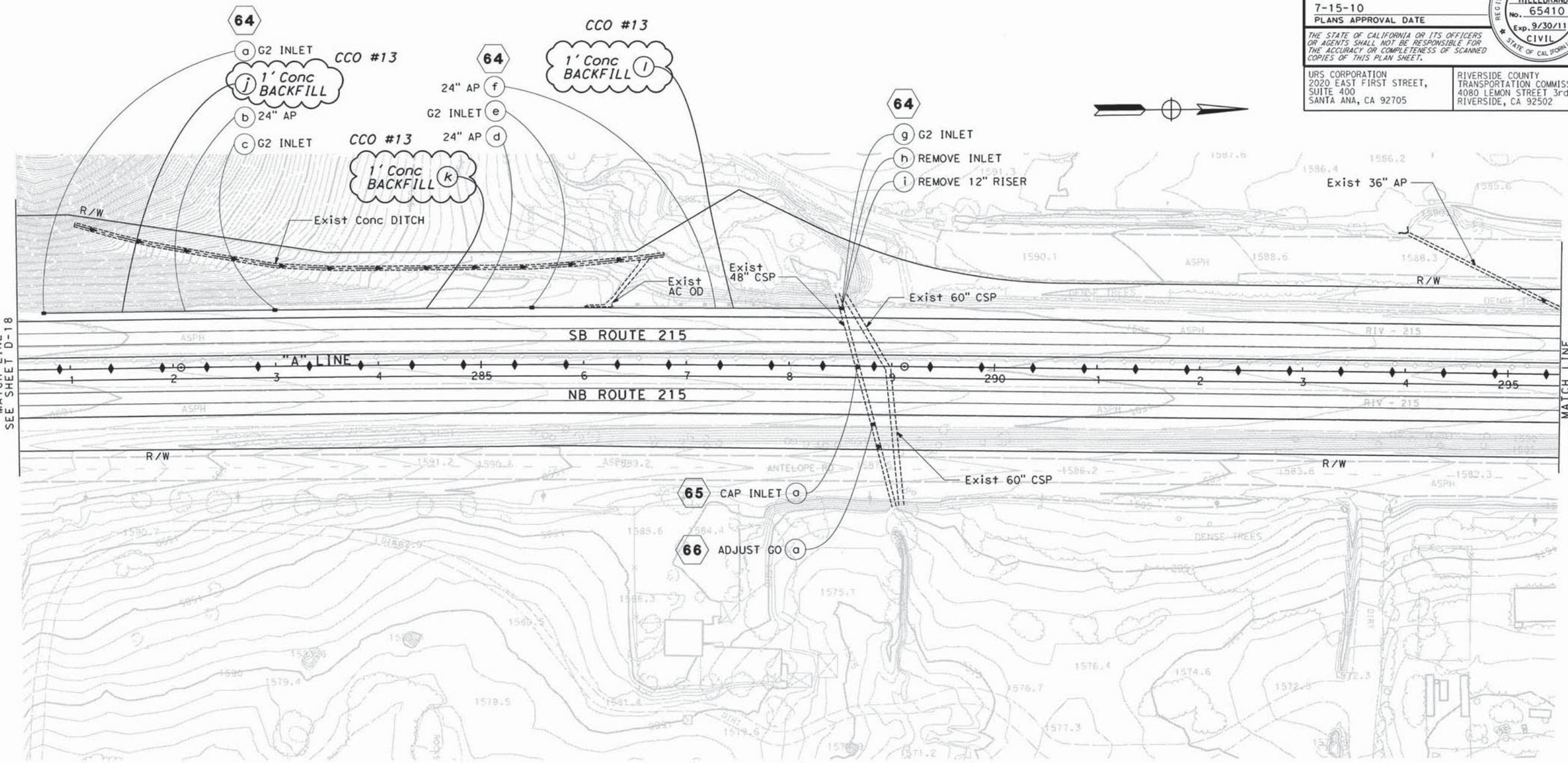
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C.C.A. DATE 11-07-12
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DRAINAGE PLAN

SCALE 1"= 50' **D-19**

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STEPHANIE HILLEBRAND — CHECKED BY
JEFFREY G. CHAPMAN — CONSULTANT FUNCTIONAL SUPERVISOR
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Gibbons

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08	Riv	215	R8.2/R16.0	112	248

Stephanie Hillebrand 7-15-10
REGISTERED CIVIL ENGINEER DATE

7-15-10
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SANTA ANA, CA 92705

RIVERSIDE COUNTY TRANSPORTATION COMMISSION
4080 LEMON STREET 3rd FLOOR
RIVERSIDE, CA 92502

75
CCO #13
1' Conc BACKFILL (k)
Abn CSP (j)
Abn INLET (i)
Abn CSP (h)
REMOVE CSP (g)
ADJUST G1 (a)

106' Rt "A" +71
END GRADED DITCH
FL Elev 1569.6

106' Lt "A" +59
END BFS
Beg GRADED DITCH
FL Elev 1570.1

70 (a) 99' Lt "A" +59
Beg BFS
FL Elev 1571.8

(a) ADJUST GO 67

MATCH LINE SEE SHEET D-19

R/W

Exist 36" CSP

SCENIC VIEW DR

SB ROUTE 215

"A" LINE

NB ROUTE 215

Exist 12" CSP

Exist 4' x3' RCB

Exist 24" CSP

Exist 12" CSP

72
(a) CAP INLET

KELLER Rd

(a) CAP INLET 68

Exist 36" CSP

ANTELOPE RD

(a) ADJUST GO 69

73A
G1 INLET (a)
18" CSP (b)
18" CSP (c)
18" CSP (d)
FES (e)
RSP (f)

(g) REMOVE DOWNDRAIN

(h) REMOVE ENTRANCE TAPER

Exist 18' AP

Exist 4' x3' RCB

71 (a) 113' Rt "A" +05
Beg BFS
FL Elev 1566.8

170' Rt "A" +88
END BFS
Beg GRADED DITCH
FL Elev 1565.2

177' Rt "A" +97
END GRADED DITCH
FL Elev 1565.1

Exist 18" CSP

73

(b) 18" CSP 75
(c) G1 INLET
(d) 18" CSP
(e) 18" CSP
(f) 18" CSP

CCO #13 78
(l) 1' Conc BACKFILL
(a) ADJUST GO

Exist Conc Chnl
Exist 6' x 3' RCB
Exist 12" CSP
Exist 18" CSP

MATCH LINE SEE SHEET D-21

76 (a) CAP INLET

Exist 12" CSP

(a) ADJUST G1 74

(a) ADJUST GO 77

(a) G1 INLET
(b) 18" AP
(c) G1 INLET
(d) 18" CSP
(e) 18" CSP
(f) 18" CSP
(g) FES
(h) RSP

AS BUILT
CONTRACT No. 0F1614
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R.E. NAME AMR ABUELHASSAN

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DRAINAGE PLAN

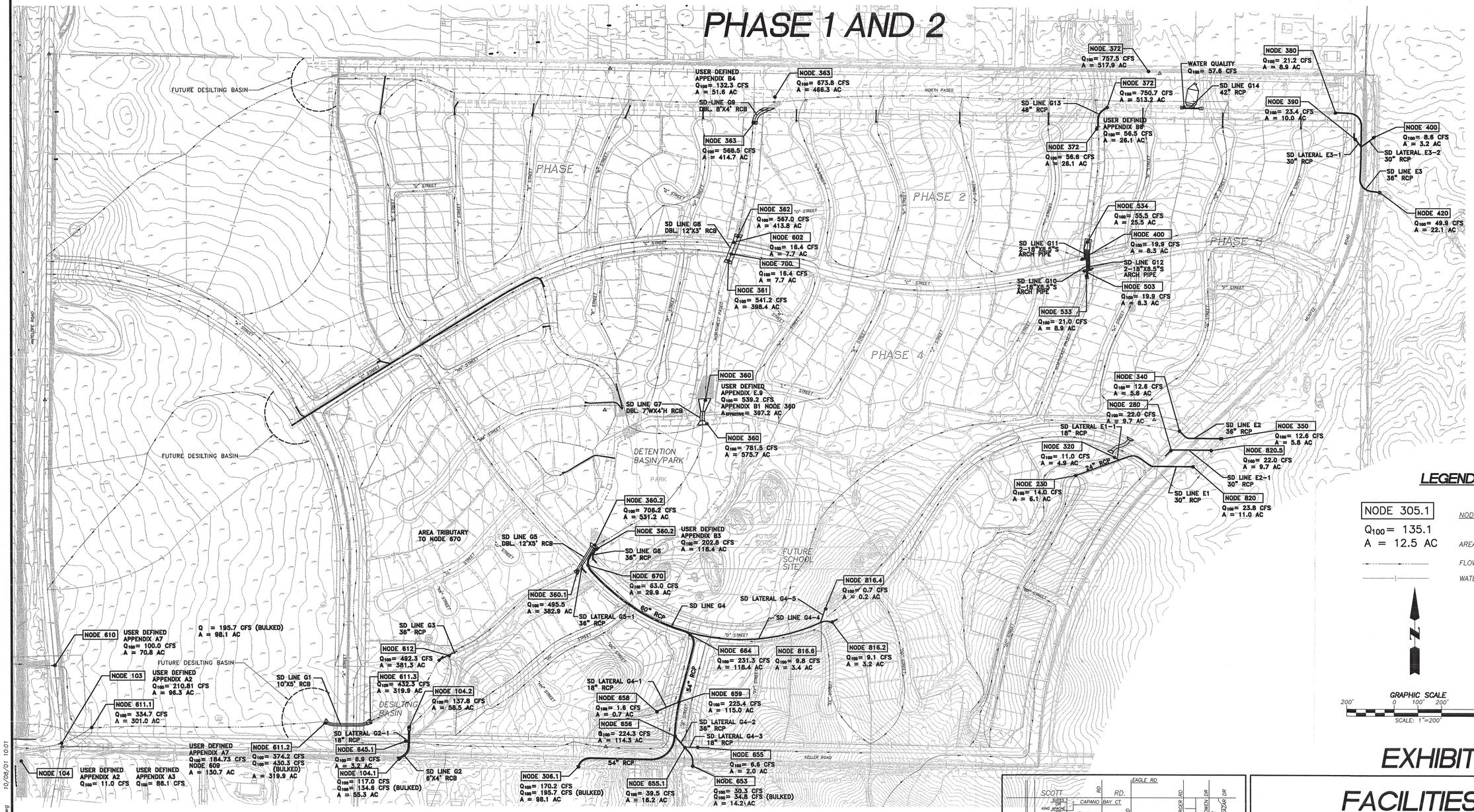
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DATE REVISED

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CU 08250
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MURRIETA HIGHLANDS
INFRASTRUCTURE FACILITIES MAP
PHASE 1 AND 2

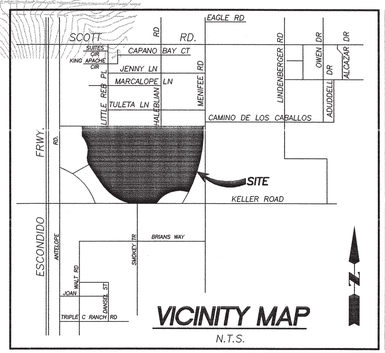


LEGEND:

NODE 305.1 Q100= 135.1 A = 12.5 AC	NODE/CONCENTRATION POINT FLOW RATE
	AREA IN ACRES
	FLOWLINES
	WATERSHED BOUNDARY

N

GRAPHIC SCALE
200' 0 100' 200' 300'
SCALE: 1"=200'



VICINITY MAP
N.T.S.

EXHIBIT E

FACILITIES MAP

MURRIETA HIGHLANDS PHASE 1 AND 2

AEI·CASC ENGINEERING
937 SOUTH VIA LATA – SUITE 500
COLTON, CALIFORNIA 92324
(909) 783-0101 – FAX (909) 783-0108

BLUESTONE COMMUNITIES
1300 NORTH BRISTOL STREET – SUITE 214
NEWPORT BEACH, CALIFORNIA 92660
(949) 475-4110 – FAX (949) 475-4110

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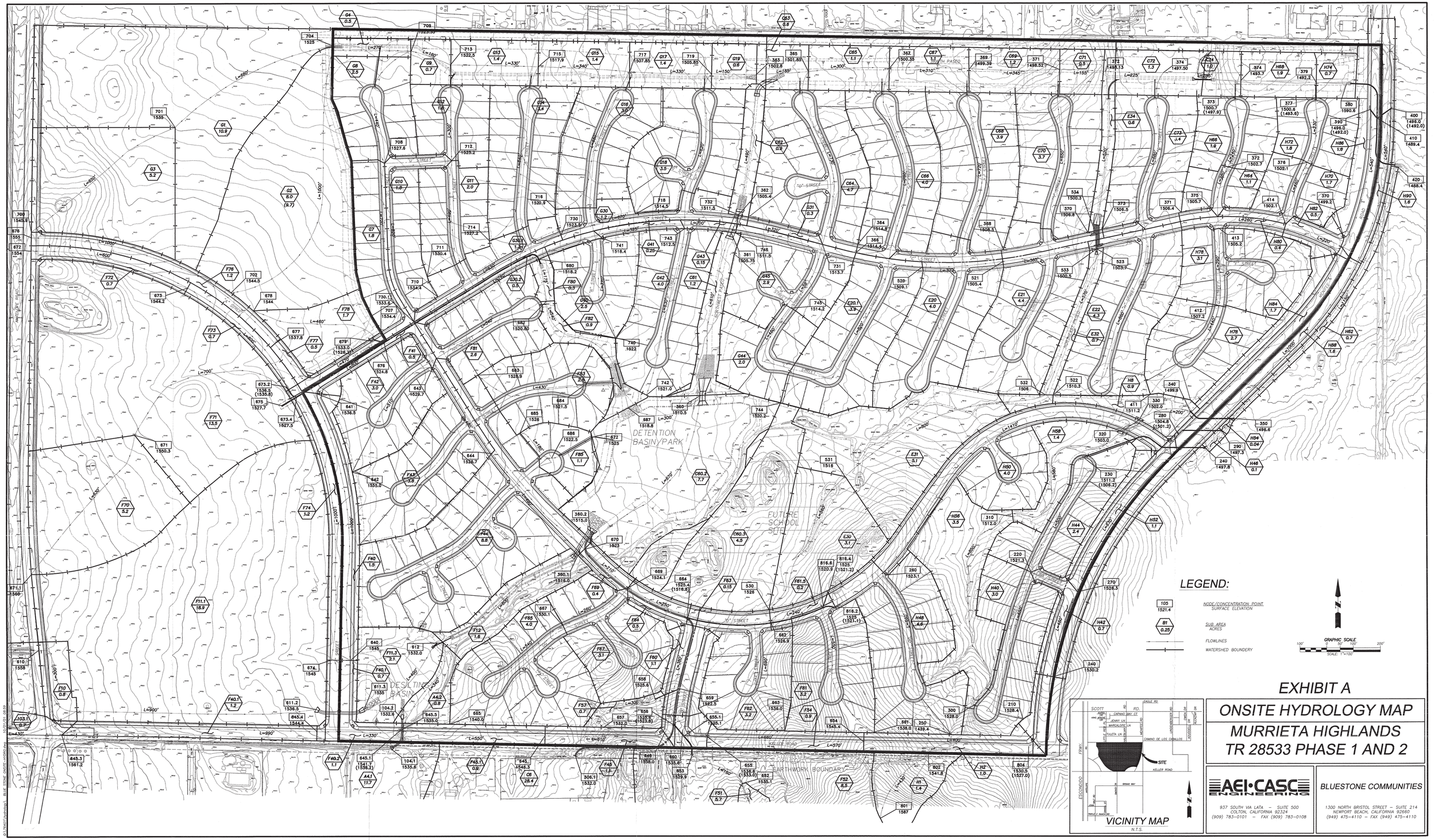


EXHIBIT A

ONSITE HYDROLOGY MAP

MURRIETA HIGHLANDS
TR 28533 PHASE 1 AND 2

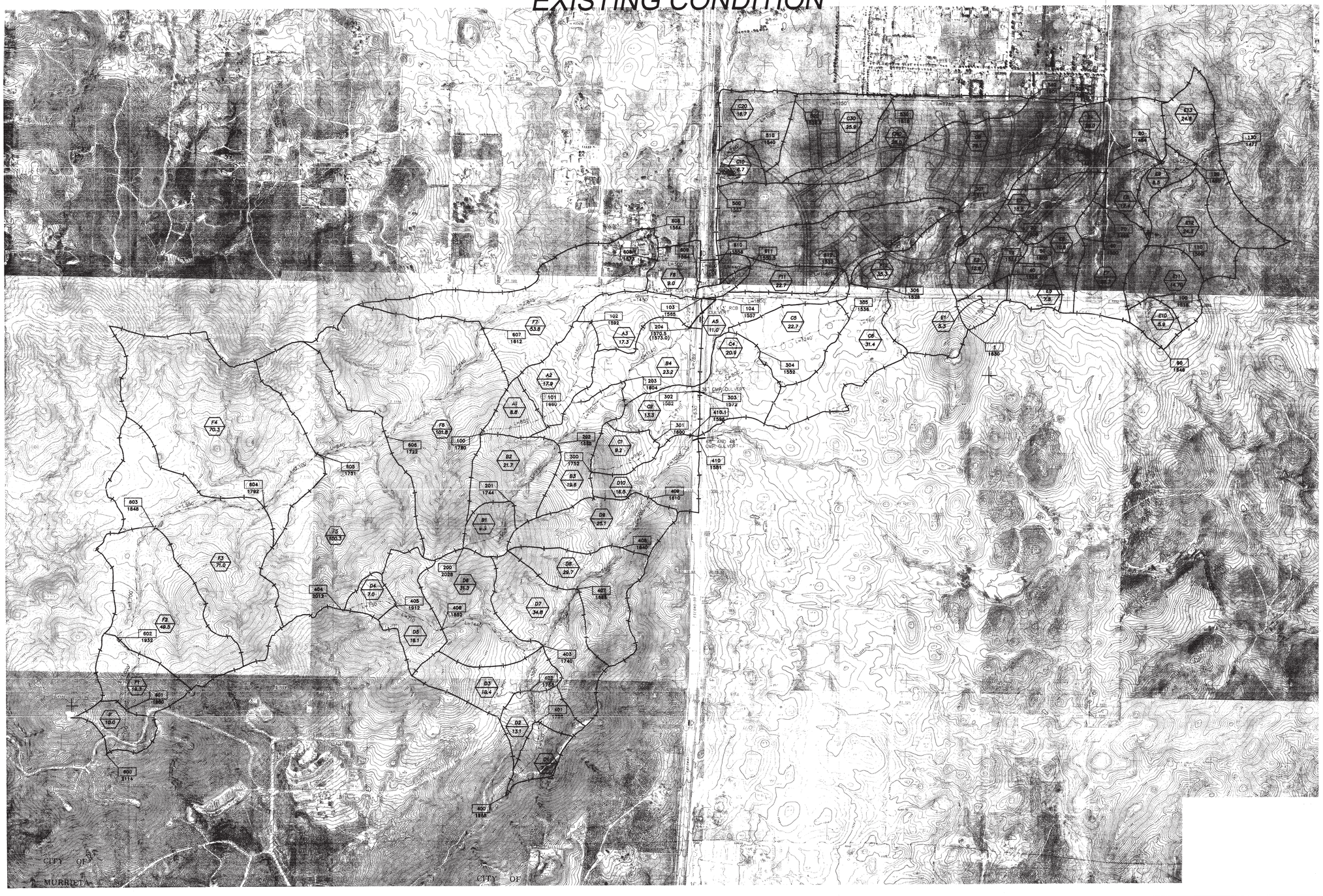
AEI·CASC ENGINEERING

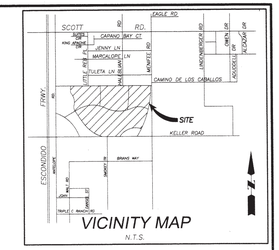
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NEWPORT BEACH, CALIFORNIA 92660
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HYDROLOGY MAP
EXISTING CONDITION





VICINITY MAP
N.T.S.

LEGEND:

- 6 / 886.58 — NODE/CONCENTRATION POINT, SURFACE ELEVATION
- B1 / 0.25 — SUB AREA, ACRES
- FLOWLINES
- WATERSHED BOUNDERY

GRAPHIC SCALE
400' 0 200' 400' 800'
SCALE: 1"=400'

EXHIBIT B

EXISTING CONDITION HYDROLOGY MAP

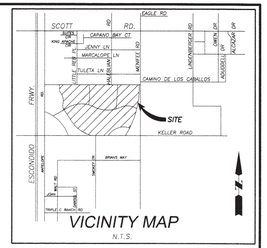
MURRIETA HIGHLANDS TR 28533 PHASE 1 AND 2

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MURRIETA HIGHLANDS
EXISTING WATERSHED DESIGNATION





VICINITY MAP
N.T.S.

LEGEND:

- FLOWLINES
- WATERSHED BOUNDERY
- WATERSHED SUB-BOUNDERY

GRAPHIC SCALE
400' 0 200' 400' 800'
SCALE: 1"=400'

EXHIBIT I

EXISTING WATERSHED DESIGNATION

MURRIETA HIGHLANDS PHASE 1 AND 2

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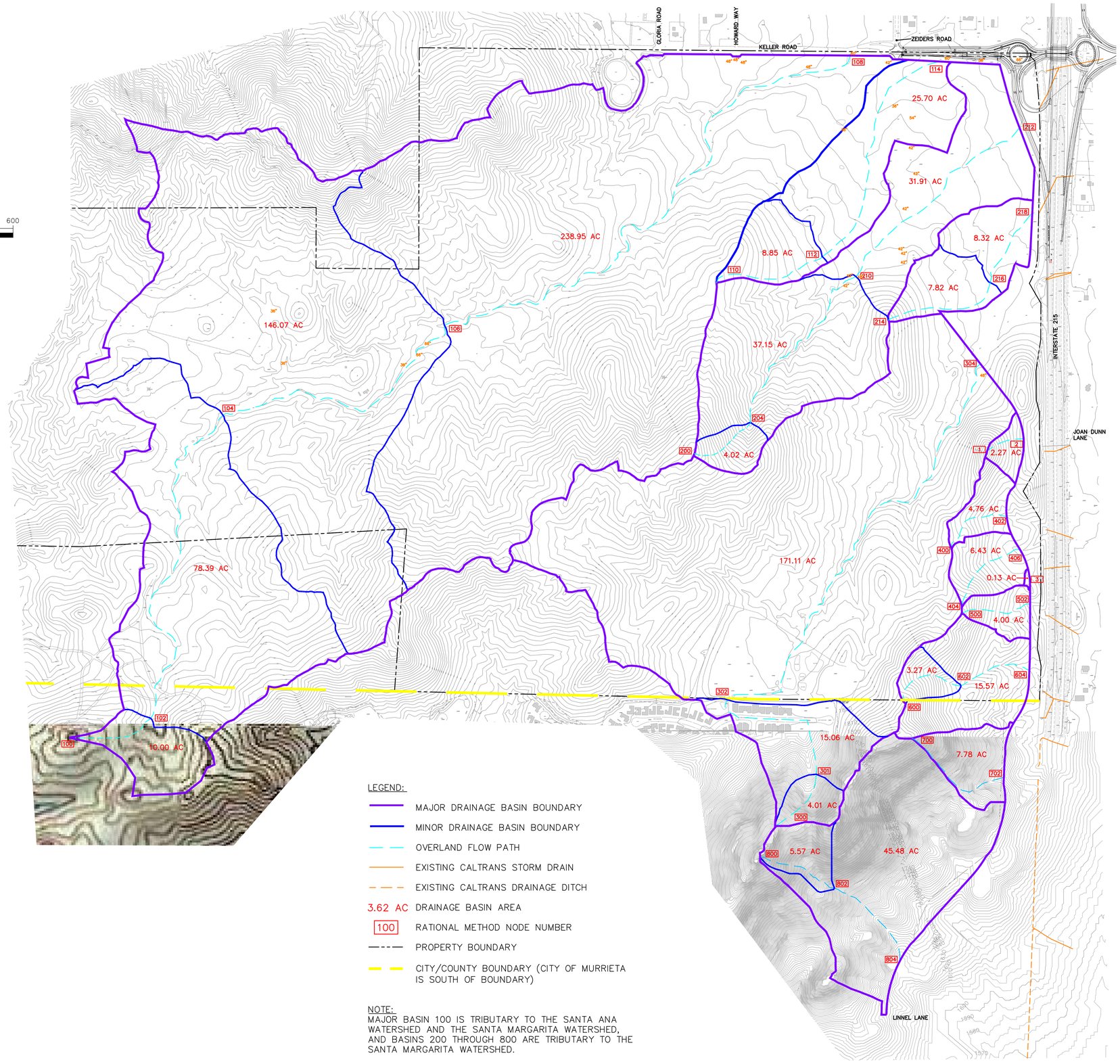
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GRAPHIC SCALE

300 0 150 300 600

1 INCH = 300 FEET



LEGEND:

- MAJOR DRAINAGE BASIN BOUNDARY
- MINOR DRAINAGE BASIN BOUNDARY
- OVERLAND FLOW PATH
- EXISTING CALTRANS STORM DRAIN
- EXISTING CALTRANS DRAINAGE DITCH
- 3.62 AC DRAINAGE BASIN AREA
- 100 RATIONAL METHOD NODE NUMBER
- PROPERTY BOUNDARY
- CITY/COUNTY BOUNDARY (CITY OF MURRIETA IS SOUTH OF BOUNDARY)

NOTE:
MAJOR BASIN 100 IS TRIBUTARY TO THE SANTA ANA WATERSHED AND THE SANTA MARGARITA WATERSHED, AND BASINS 200 THROUGH 800 ARE TRIBUTARY TO THE SANTA MARGARITA WATERSHED.

EXISTING CONDITION
RATIONAL METHOD WORK MAP

GLORIA ROAD

HOWARD WAY

KELLER ROAD

ZEIDERS ROAD

INTERSTATE 215

JOAN DUNN LANE

LINNEL LANE

DEBRIS BASIN



GRAPHIC SCALE

200 0 100 200 400

1 INCH = 200 FEET

Rational Method Summary

Major Basin	Exist. Area, ac	Prop. Area, ac	Exist. Q10, cfs	Prop. Q10, cfs	Exist. Q100, cfs	Prop. Q100, cfs
100	507.96	444.21	472	489	774	781
200	89.22	166.36	125	216	196	341
300	190.18	178.41	205	194	337	319
400	11.19	10.95	17	18	27	28
500	4.00	4.35	7	8	11	12
600	18.84	12.95	30	21	46	32
700	7.78	14.07	12	20	18	31
800	51.05	51.32	80	78	125	121

NOTE:
THE TABULATED VALUES ARE UNDETAINED FLOW RATES. PER THE DRAINAGE STUDY, THE FLOW RATES WILL BE DETAINED PER CITY OF MURRIETA CRITERIA.

LEGEND:

- MAJOR DRAINAGE BASIN BOUNDARY
- MINOR DRAINAGE BASIN BOUNDARY
- OVERLAND FLOW PATH
- PROPOSED STORM DRAIN
- EXISTING CALTRANS STORM DRAIN
- EXISTING CALTRANS DRAINAGE DITCH
- 3.62 AC — DRAINAGE BASIN AREA
- 100 — RATIONAL METHOD NODE NUMBER
- 36" — PROPOSED STORM DRAIN SIZE (36" AND GREATER)
- PROPERTY BOUNDARY
- CITY/COUNTY BOUNDARY (CITY OF MURRIETA IS SOUTH OF BOUNDARY)

NOTE:
MAJOR BASIN 100 IS TRIBUTARY TO THE SANTA ANA WATERSHED AND BASINS 200 THROUGH 800 ARE TRIBUTARY TO THE SANTA MARGARITA WATERSHED.

PROPOSED CONDITION
RATIONAL METHOD WORK MAP

Project Specific Water Quality Management Plan

*A Template for preparing Project Specific WQMPs for Priority Development Projects located within the **Santa Margarita Region** of **Riverside County**. This template does not apply to projects in other watersheds within Riverside County. It does not apply to projects in San Diego or Orange County.*

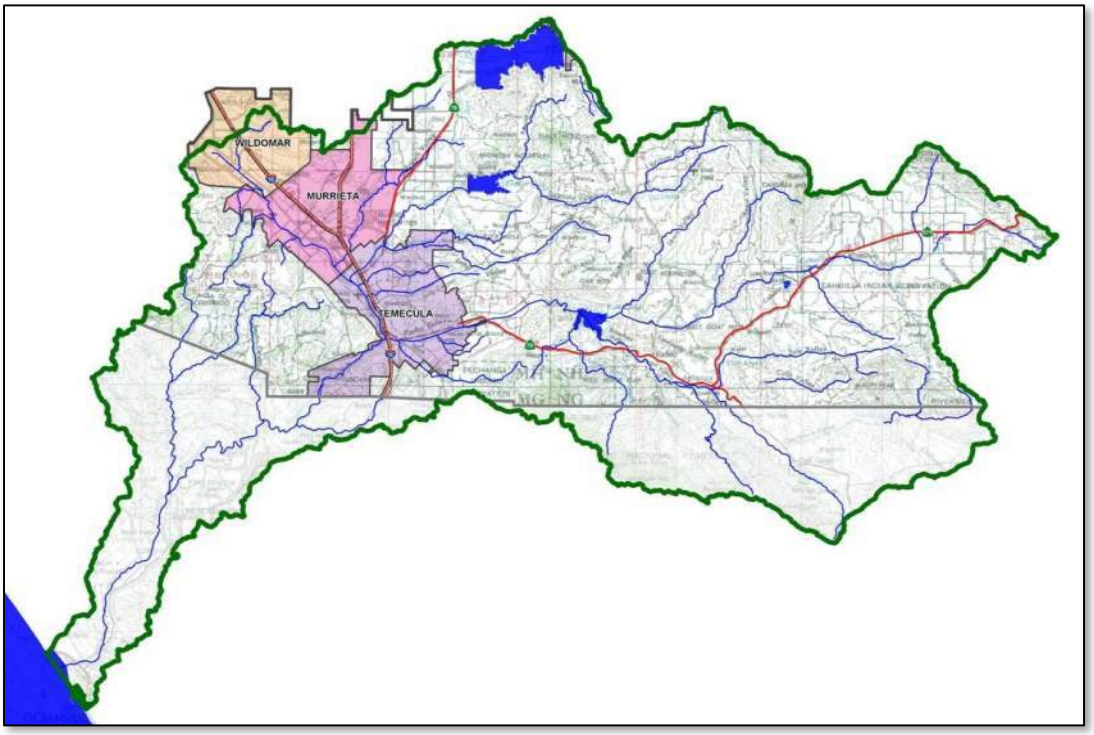
Project Title: Murrieta Hills

Development No: Tentative Tract Map No. 35853

Design Review/Case No: TTM-013-3311

Prepared for:
Benchmark Pacific/Pulte Group
450 Laguna Drive, Suite B
Carlsbad, CA 92008
(760) 450-0444

Prepared by:
Chang Consultants
P.O. Box 9496
Rancho Santa Fe, CA 92067
(858) 692-0760



☒ **Preliminary**
☐ **Final**

Original Date Prepared: January 28, 2013

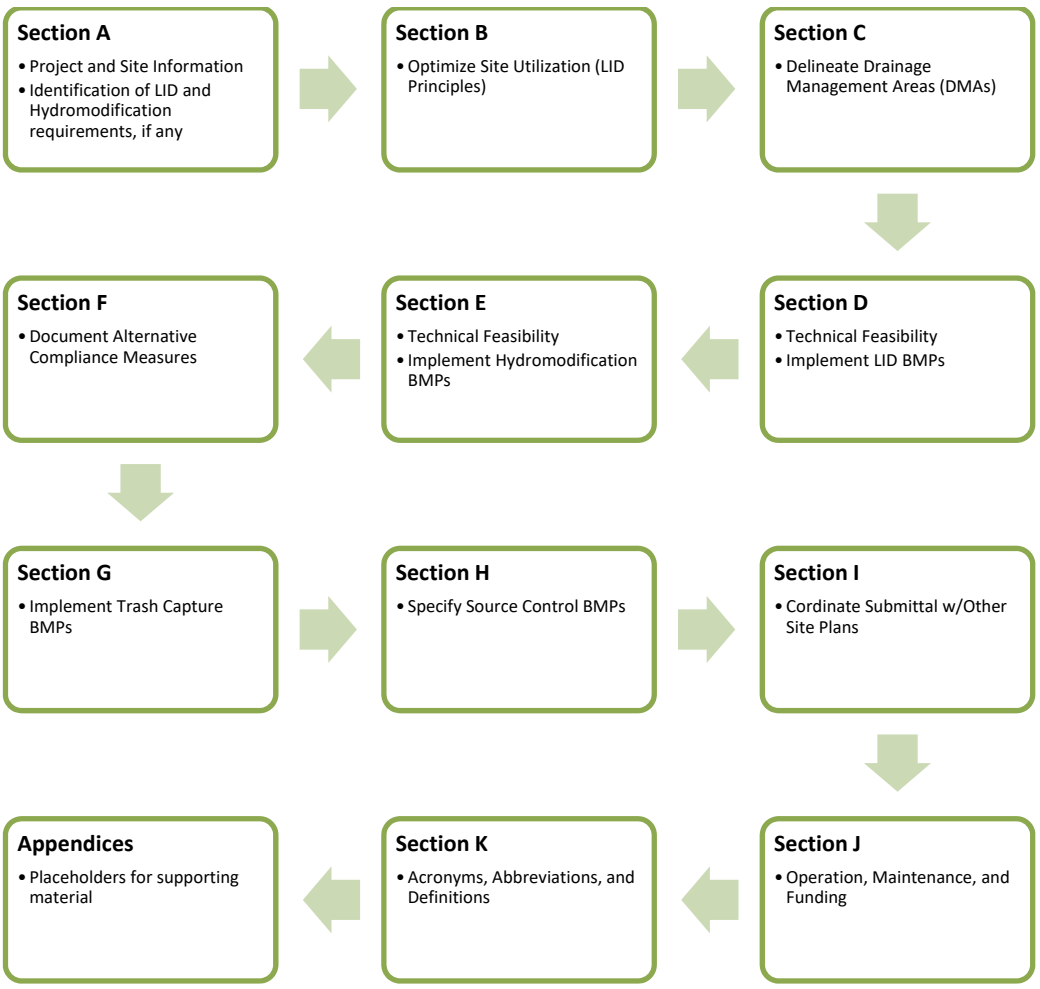
Revision Date(s): December 1, 2014; December 14, 2017; June 6, 2018; September 25, 2018; December 5, 2018

Prepared for Compliance with Regional Board Order No. **R9-2013-0001** *as amended by Order No.* **R9-2015-0001** *and Order No.* **R9-2015-0100**

FOR REVIEW ONLY

A Brief Introduction

The Regional Municipal Separate Stormwater Sewer System (MS4) Permit[1] requires that a Project-Specific WQMP be prepared for all development projects within the Santa Margarita Region (SMR) that meet the 'Priority Development Project' categories and thresholds listed in the SMR Water Quality Management Plan (WQPM). This Project-Specific WQMP Template for Development Projects in the **Santa Margarita Region** has been prepared to help document compliance and prepare a WQMP submittal. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



[1] Order No. R9-2013-0001 as amended by Order Nos. R9-2015-0001 and R9-2015-0100, NPDES No. CAS0109266, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the MS4s Draining the Watersheds within the San Diego Region, California Regional Water Quality Control Board, May 8, 2013.

OWNER'S CERTIFICATION

This Project-Specific WQMP has been prepared for Benchmark Pacific by Chang Consultants for the Tentative Tract Map No. 35853 project.

This WQMP is intended to comply with the requirements of City of Murrieta Stormwater and Runoff Management and Discharge Controls Municipal Code Section 8.36.320, Water Quality Management Plan, which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater Best Management Practices until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under the City of Murrieta Stormwater and Runoff Management and Discharge Controls (Municipal Code Section 8.36).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

To be signed upon approval	
Owner's Signature	Date
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control Best Management Practices in this plan meet the requirements of Regional Water Quality Control Board Order No. **R9-2013-0001** as amended by Order Nos. **R9-2015-0001 and R9-2015-0100**."

To be signed upon approval	
Preparer's Signature	Date
Wayne W. Chang	Principal
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

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Appendix 6: BMP Design Details

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Appendix 9: O&M

Appendix 10: Educational Materials

Section A: Project and Site Information

Use the table below to compile and summarize basic site information that will be important for completing subsequent steps. Subsections A.1 through A.4 provide additional detail on documentation of additional project and site information.

PROJECT INFORMATION	
Type of PDP:	New Development
Type of Project:	Single-family residential, mass grading of pads at northeast for future commercial and multi-family development. Future commercial and multi-family development will be subject to their own separate site-specific WQMPs in the future. The tentative tract map by Michael Baker International covers approximately 957 gross acres, and proposes 497 single-family residential lots (5,500 square feet average lot size), 50 executive home sites (10,000 square feet average lot size), 193 multi-family units, a 17.1-acre community commercial area, and nearly 663 acres of open space. The project will also construct McElwain Road along the west side of Interstate 215 from Keller Road to the southerly property boundary.
Planning Area:	Currently in Riverside County. Will be annexed into the city of Murrieta.
Community Name:	Murrieta Hills
Development Name:	Tentative Tract Map No. 35853
PROJECT LOCATION	
Latitude & Longitude (DMS):	Latitude 33°37'16", Longitude 117°10'57"
Project Watershed and Sub-Watershed:	Santa Ana River and Santa Margarita Watershed; Perris Hydrologic Area (802.10), Menifee Hydrologic Subarea (802.12); Murrieta Hydrologic Area (902.30), French Valley Hydrologic Subarea (902.33)
24-Hour 85th Percentile Storm Depth (inches):	0.59 inches
Is project subject to Hydromodification requirements?	☒ Y ☐ N (Select based on Section A.3)
APN(s):	384-190-001, 384-190-003, 384-190-005, 384-190-006, 384-190-007, 384-190-008, 384-190-009, 384-190-010, 384-190-011, 384-190-012, 384-190-013, 384-190-014, 384-210-001, 384-210-003, 384-200-006, 384-200-007, 384-200-008, 384-200-009, 384-200-010, 384-200-012, 384-200-013, 384-200-014, 384-200-015, 384-200-016, 384-200-017
Map Book and Page No.:	Page 898, Grid B3-B5, C3-C5, D3-D5, and E3-E5
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Single-family residential
Proposed or Potential SIC Code(s)	23721 Land Subdivision
Existing Impervious Area of Project Footprint (SF)	None
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	Approx. 4.1 million
Total Project Area (ac)	957 gross, 256 net
Does the project consist of off-site road improvements?	☒ Y ☐ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
Is the project exempt from Hydromodification Performance Standards?	☐ Y ☒ N

Does the project propose the use of Alternative Compliance to satisfy BMP requirements? (note, alternative compliance is not allowed for coarse sediment performance standards)	☐ Y ☒ N
Has preparation of Project-Specific WQMP included coordination with other site plans?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Is the project located within any Multi-Species Habitat Conservation Plan area (MSHCP Criteria Cell?)	☒ Y ☐ N 5252-5255, 5355-5358
Are there any natural hydrologic features on the project site?	☒ Y ☐ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the Natural Resources Conservation Service (NRCS) soils type(s) present on the site (A, B, C and/or D)	Primarily C, small areas of B and D.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the Project vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Vicinity and location maps
- Parcel Boundary and Project Footprint
- Existing and Proposed Topography
- Drainage Management Areas (DMAs)
- Proposed Structural Best Management Practices (BMPs)
- Drainage Paths
- Drainage infrastructure, inlets, overflows
- Source Control BMPs
- Site Design BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Pervious Surfaces (i.e. Landscaping)
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Copermittee plan reviewer must be able to easily analyze your Project utilizing this template and its associated site plans and maps. Complete the checklists in Appendix 1 to verify that all exhibits and components are included.

A.2 Identify Receiving Waters

Using Table A-1 below, list in order of upstream to downstream, the Receiving Waters that the Project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated Beneficial Uses, and proximity, if any, to a RARE Beneficial Use. Include a map of the Receiving Waters in Appendix 1. This map should identify the path of the stormwater discharged from the site all the way to the outlet of the Santa Margarita River to the Pacific Ocean. Use the most recent 303(d) list available from the State Water Resources Control Board Website.
(http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/)

Table A-1 Identification of Receiving Waters

Portion of Site Tributary to Keller Road Culverts (Santa Ana Watershed)

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Drainage Facilities and Minor Streams	None	None	
Salt Creek	None	None	
Canyon Lake (Railroad Canyon Reservoir)	Nutrients, Pathogens	MUN, AGR, GWR, REC1, REC2, WARM, WILD	
San Jacinto River (Reach 1)	None	MUN, AGR, GWR, REC1, REC2, WARM, WILD	
Lake Elsinore	Nutrients, PCBs, Organic Enrichments/Low Dissolved Oxygen, Sediment Toxicity, Unknown Toxicity	REC1, REC2, WARM, WILD	
Temescal Creek (Reach 6)	Indicator Bacteria	GWR, REC1, REC2, WARM, WILD	
Temescal Creek (Reach 5)	None	AGR, GWR, REC1, REC2, WARM, WILD, RARE	Distance from project to nearest RARE waterbody is approx. 24 miles (Temescal Creek, Reach 5)
Temescal Creek (Reach 4)	None	AGR, GWR, REC1, REC2, WARM, WILD, RARE	
Temescal Creek (Reach 3) Lee Lake	None	AGR, IND, GWR, REC1, REC2, WARM, WILD	
Temescal Creek (Reach 2)	None	AGR, IND, GWR, REC1, REC2 WARM, LWRM	
Temescal Creek (Reach 1)	pH	REC1, REC2, WARM, WILD	
Santa Ana River (Reach 3)	Copper, Lead, Pathogens	AGR, GWR, REC1, REC2, WARM, WILD, RARE, SPWN	
Prado Basin Management Zone	None	REC1, REC2, WARM, WILD, RARE	
Santa Ana River (Reach 2)	Indicator Bacteria	AGR, GWR, REC1, REC2, WARM, WILD, RARE	
Santa Ana River (Reach 1)	None	REC1, REC2, WARM, WILD	
Tidal Prism of Santa Ana River (to within 1,000' of Victoria Street) and Newport Slough	None	REC1, REC2, COMM, WILD, RARE, MAR	

Portion of Site Tributary to Interstate 215 (Santa Margarita Watershed)

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Drainage Facilities and Minor Streams	None	None	
Warm Springs Creek	Chlorpyrifos, E. Coli, Fecal Coliform, Iron, Manganese, Phosphorus, Total Nitrogen as N	MUN, AGR, IND, PROC, REC1, REC2, WARM, WILD	N/A
Murrieta Creek	Chlorpyrifos, Copper, Iron, Manganese, Nitrogen, Phosphorus, Toxicity	MUN, AGR, IND, PROC, REC1, REC2, WARM, WILD	N/A
Santa Margarita River (Upper)	Phosphorus, Toxicity	MUN, AGR, IND, REC1, REC2, WARM, COLD, WILD, RARE	Has been designated in the River, not location-specific
Santa Margarita River (Lower)	Enterococcus, Fecal Coliform, Phosphorus, Total Nitrogen as N	MUN, AGR, IND, PROC, REC1, REC2, WARM, COLD, WILD, RARE	Has been designated in the River, not location-specific

A.3 Drainage System Susceptibility to Hydromodification

Using Table A-2 below, list in order of the point of discharge at the project site down to the Santa Margarita River[2], each drainage system or receiving water that the project site is tributary to. Continue to fill each row with the material of the drainage system, and any exemption (if applicable). Based on the results, summarize the applicable hydromodification performance standards that will be documented in Section E. Exempted categories of receiving waters include:

- Existing storm drains that discharge directly to water storage reservoirs, lakes, or enclosed embayments, or
- Conveyance channels whose bed and bank are concrete lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- Other water bodies identified in an approved WMAA (See Exhibit G to the WQMP)

Include a map exhibiting each drainage system and the associated susceptibility in Appendix 1.

Table A-2 Identification of Susceptibility to Hydromodification

Drainage System	Drainage System Material	Hydromodification Exemption	Hydromodification Exempt
Public/Caltrans Storm Drain System (approximately 1 mile)	RCP and CMP (non-erodible)	None	☐ Y ☒ N

[2] Refer to Exhibit G of the WQMP for a map of exempt and potentially exempt areas. These maps are from the Draft SMR WMAA as of January 5, 2018 and will be replaced upon acceptance of the SMR WMAA.

Drainage System	Drainage System Material	Hydromodification Exemption	Hydromodification Exempt
Minor unnamed streams (approximately 1 mile)	Natural bed and banks	None	☐ Y ☒ N
Warm Springs Creek (approximately 6 miles)	Natural bed and banks	None	☐ Y ☒ N
Murrieta Creek (approximately 5 miles)	Natural bed and banks	None	☐ Y ☒ N
Summary of Performance Standards			
☐ **Hydromodification Exempt** – Select if "Y" is selected in the Hydromodification Exempt column above, project is exempt from hydromodification requirements. ☒ **Not Exempt**-Select if "N" is selected in any row of the Hydromodification Exempt column above. Project is subject to hydrologic control requirements and may be subject to sediment supply requirements.			

A.4 Additional Permits/Approvals required for the Project:

Table A-3 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☒ Y	☐ N
State Water Resources Control Board, Clean Water Act Section 401 Water Quality Certification	☒ Y	☐ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☒ Y	☐ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☒ Y	☐ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☒ Y	☐ N
Other *(please list in the space below as required)* N/A	☐ Y	☒ N

If yes is answered to any of the questions above, the Copermittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Summary

The project site is currently undeveloped and moderately to steeply sloping towards the northeast. Under pre- and post-development conditions, the majority of the storm runoff from the project footprint and tributary area will be conveyed to a culvert crossing Keller Road just west of Zeiders Road. This culvert outlets into a minor natural drainage that continues in a northeasterly direction towards Interstate 215. The flow is conveyed across Interstate 215 in existing Caltrans culverts that are approximately 300 feet and 2,500 feet north of Keller Road. After the flow crosses Interstate 215, it is conveyed either east of towards the Kaiser site or northerly in a series of drainage facilities and ultimately enters Salt Creek within the Santa Ana watershed. The flow towards the Kaiser site is ultimately conveyed to the Mapleton project

and its debris basin and two detention basins. The remainder of the project runoff is conveyed easterly along or south of Keller Road and is within the Santa Margarita watershed. There are a series of culverts crossing Interstate 215 that convey the runoff past the freeway. The project has been designed to bypass natural area flows through the development area and McElwain Road without commingling with on-site runoff to the extent possible.

The project proposes ten biofiltration basins (with no infiltration) and one bioretention basin as the primary structural (treatment and hydromodification) BMPs. The biofiltration (BMP 1 through 7 and 9 through 11 on the BMP Site Plan) and bioretention (BMP 8) basins will be spread throughout the site and each sized for its tributary area. Gravel trenches (BMP 12) will be used along McElwain Road since these BMPs do not require irrigation. Individual residential lots shall utilize low impact development BMPs such as disconnected downspouts, permeable pavement, bioretention planter areas, etc. The property owner (and HOA) is responsible to implement and maintain the WQMP (a copy shall be kept on-site), perform inspections and maintenance, and make documentation available to the city of Murrieta and Regional Water Quality Control Board upon request.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, constraints might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. Opportunities might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for LID Bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your Low Impact Development (LID) design and explain your design decisions to others.

Apply the following LID Principles to the layout of the PDP to the extent they are applicable and feasible. Putting thought upfront about how best to organize the various elements of a site can help to significantly reduce the PDP's potential impact on the environment and reduce the number and size of Structural LID BMPs that must be implemented. Integrate opportunities to accommodate the following LID Principles within the preliminary PDP site layout to maximize implementation of LID Principles.

Site Optimization

Complete checklist below to determine applicable Site Design BMPs for your site.

Project- Specific WQMP Site Design BMP Checklist

The following questions below are based upon Section 3.2 of the SMR WQMP will help you determine how to best optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

SITE DESIGN REQUIREMENTS

Answer the following questions below by indicating "Yes," "No," or "N/A" (Not Applicable). Justify all "No" and "N/A" answers by inserting a narrative at the end of the section. The narrative should include identification and justification of any constraints that would prevent the use of those categories of LID BMPs. Upon identifying Site Design BMP opportunities, include these on your WQMP Site plan in Appendix 1.

☒ Yes ☐ No ☐ N/A

Did you identify and preserve existing drainage patterns?

Integrating existing drainage patterns into the site plan helps to maintain the time of concentration and infiltration rates of runoff, decreasing peak flows, and may also help preserve the contribution of Critical Coarse Sediment (i.e., Bed Sediment Supply) from the PDP to the Receiving Water. Preserve existing drainage patterns by:

- Minimizing unnecessary site grading that would eliminate small depressions, where appropriate add additional "micro" storage throughout the site landscaping.
- Where possible conform the PDP site layout along natural landforms, avoid excessive grading and disturbance of vegetation and soils, preserve or replicate the sites natural drainage features and patterns.
- Set back PDP improvements from creeks, wetlands, riparian habitats and any other natural water bodies.
- Use existing and proposed site drainage patterns as a natural design element, rather than using expensive impervious conveyance systems. Use depressed landscaped areas, vegetated buffers, and bioretention areas as amenities and focal points within the site and landscape design.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.

The project is preserving the majority of the largest natural watercourse that flows through the site. The only impact will be at a single proposed roadway crossing. In addition, many of the smaller natural tributaries are being preserved. Where the smaller tributaries are being disturbed by the project, drainage facilities will be constructed to convey the flow from the tributaries through the site and back towards the pre-project flow direction. A dual drainage system has been incorporated into the design to avoid commingling, where possible.

☒ Yes ☐ No ☐ N/A

Did you identify and protect existing vegetation?

Identify any areas containing dense native vegetation or well-established trees, and try to avoid disturbing these areas. Soils with thick, undisturbed vegetation have a much higher capacity to store and infiltrate runoff than do disturbed soils. Reestablishment of a mature vegetative community may take decades. Sensitive areas, such as streams and floodplains should also be avoided.

- Define the development envelope and protected areas, identifying areas that are most suitable for development and areas that should be left undisturbed.
- Establish setbacks and buffer zones surrounding sensitive areas.
- Preserve significant trees and other natural vegetation where possible.

Project- Specific WQMP Site Design BMP Checklist	
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. The majority of the 957 acre site will be preserved as open space (663 acres). Therefore, over 69 percent of the existing vegetation and natural areas are being preserved.	
☒ Yes ☐ No ☐ N/A	**Did you identify and preserve natural infiltration capacity?** A key component of LID is taking advantage of a site's natural infiltration and storage capacity. A site survey and geotechnical investigation can help define areas with high potential for infiltration and surface storage. • Identify opportunities to locate LID Principles and Structural BMPs in highly pervious areas. Doing so will maximize infiltration and limit the amount of runoff generated. • Concentrate development on portions of the site with less permeable soils, and preserve areas that can promote infiltration.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. The natural infiltration capacity is being maintained in the large open space area. Furthermore, the development footprint will include a public park, HOA parks, and landscaping that will provide infiltration.	
☒ Yes ☐ No ☐ N/A	**Did you minimize impervious area?** Look for opportunities to limit impervious cover through identification of the smallest possible land area that can be practically impacted or disturbed during site development. • Limit overall coverage of paving and roofs. This can be accomplished by designing compact, taller structures, narrower and shorter streets and sidewalks, clustering buildings and sharing driveways, smaller parking lots (fewer stalls, smaller stalls, and more efficient lanes), and indoor or underground parking. • Inventory planned impervious areas on your preliminary site plan. Identify where permeable pavements, or other permeable materials, such as crushed aggregate, turf block, permeable modular blocks, pervious concrete or pervious asphalt could be substituted for impervious concrete or asphalt paving. This will help reduce the amount of Runoff that may need to be addressed through Structural BMPs. • Examine site layout and circulation patterns and identify areas where landscaping can be substituted for pavement, such as for overflow parking. • Consider green roofs. Green roofs are roofing systems that provide a layer of soil/vegetative cover over a waterproofing membrane. A green roof mimics pre-development conditions by filtering, absorbing, and evapotranspiring precipitation to help manage the effects of an otherwise impervious rooftop.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. The impervious area is being minimized by clustering the development footprint. As mentioned above, over 69 percent of the existing vegetation and natural areas will remain as open space. Parks and landscaping will be incorporated within the site. These measures will minimize the impervious area to a large extent.	

Project- Specific WQMP Site Design BMP Checklist	
☒ Yes ☐ No ☐ N/A	**Did you identify and disperse runoff to adjacent pervious areas or small collection areas?** Look for opportunities to direct runoff from impervious areas to adjacent landscaping, other pervious areas, or small collection areas where such runoff may be retained. This is sometimes referred to as reducing Directly Connected Impervious Areas. • Direct roof runoff into landscaped areas such as medians, parking islands, planter boxes, etc., and/or areas of pervious paving. Instead of having landscaped areas raised above the surrounding impervious areas, design them as depressed areas that can receive Runoff from adjacent impervious pavement. For example, a lawn or garden depressed 3"-4" below surrounding walkways or driveways provides a simple but quite functional landscape design element. • Detain and retain runoff throughout the site. On flatter sites, smaller Structural BMPs may be interspersed in landscaped areas among the buildings and paving. • On hillside sites, drainage from upper areas may be collected in conventional catch basins and piped to landscaped areas and LID BMPs and/or Hydrologic Control BMPs in lower areas. Low retaining walls may also be used to create terraces that can accommodate LID BMPs. Wherever possible, direct drainage from landscaped slopes offsite and not to impervious surfaces like parking lots. • Reduce curb maintenance and provide for allowances for curb cuts. • Design landscaped areas or other pervious areas to receive and infiltrate runoff from nearby impervious areas. • Use Tree Wells to intercept, infiltrate, and evapotranspire precipitation and runoff before it reaches structural BMPs. Tree wells can be used to limit the size of Drainage Management Areas that must be treated by structural BMPs. Guidelines for Tree Wells are included in the Tree Well Fact Sheet in the LID BMP Design Handbook.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. The project drainage design will reduce directly connected impervious areas (disconnect downspouts, draining paved surfaces to natural drainages, using natural drainage swales to convey runoff from impervious surfaces, and including landscape areas between sidewalk and curb along portions of McElwain Road) and preserve many of the natural watercourses within the site. The potential BMPs the single-family lots can incorporate are shown on the Typical On-Lot BMPs detail in Appendix 6. Conscientious landscape design using drought tolerant plants, integrated pest management and herbicide use guidelines, and effective irrigation minimizing overflow are site design concepts that will be implemented to reduce pollutant loading at the source. Walkways within parks or trails shall be constructed of pervious materials as compatible with the landscape design. Ten biofiltration basins (with no infiltration) and one bioretention basin will capture and treat the majority of the developed area runoff. Harvest and use to irrigate the proposed parks and frontage landscaping along McElwain Road will be assessed during final engineering.	
☒ Yes ☐ No ☐ N/A	**Did you utilize native or drought tolerant species in site landscaping?** Wherever possible, use native or drought tolerant species within site landscaping instead of alternatives. These plants are uniquely suited to local soils and climate and can reduce the overall demands for potable water use associated with irrigation.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. The landscape architect will select native and/or drought tolerant species in accordance with the City's landscape regulations.	

Project- Specific WQMP Site Design BMP Checklist

Did implement harvest and use of runoff?

Under the Regional MS4 Permit, Harvest and Use BMPs must be employed to reduce runoff on any site where they are applicable and feasible. However, Harvest and Use BMPs are effective for retention of stormwater runoff only when there is adequate demand for non-potable water during the wet season. If demand for non-potable water is not sufficiently large, the actual retention of stormwater runoff will be diminished during larger storms or during back-to-back storms.

For the purposes of planning level Harvest and Use BMP feasibility screening, Harvest and Use is only considered to be a feasible if the total average wet season demand for non-potable water is sufficiently large to use the entire DCV within 72 hours. If the average wet season demand for non-potable water is not sufficiently large to use the entire DCV within 72 hours, then Harvest and Use is not considered to be feasible and need not be considered further.

☒ Yes ☐ No ☐ N/A

The general feasibility and applicability of Harvest and Use BMPs should consider:

- Any downstream impacts related to water rights that could arise from capturing stormwater (not common).
- Conflicts with recycled water used – where the project is conditioned to use recycled water for irrigation, this should be given priority over stormwater capture as it is a year-round supply of water.
- Code Compliance - If a particular use of captured stormwater, and/or available methods for storage of captured stormwater would be contrary to building codes in effect at the time of approval of the preliminary Project-Specific WQMP, then an evaluation of harvesting and use for that use would not be required.
- Wet season demand – the applicant shall demonstrate, to the acceptance of the city of Murrieta, that there is adequate demand for harvested water during the wet season to drain the system in a reasonable amount of time.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.

The irrigation use feasibility assessment in the previously submitted WQMP shows that harvest and use is feasible. Therefore, H&U will be assessed in the proposed parks and street frontage during final engineering. The total DCV is 166,495 cf per Appendix 6. This will need to be used within 72 hours in the wet season. The assessment determined that toilet use and other non-potable use are not feasible.

Did you keep the runoff from sediment producing pervious area hydrologically separate from developed areas that require treatment?

☐ Yes ☐ No ☒ N/A

Pervious area that qualify as self-treating areas or off-site open space should be kept separate from drainage to structural BMPs whenever possible. This helps limit the required size of structural BMPs, helps avoid impacts to sediment supply, and helps reduce clogging risk to BMPs.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.

This is not required because the Mapleton project has created a hydrologic control for sediment. Murrieta Hills discharges to the Mapleton project, which has a debris basin and two detention basins. This mitigates for the potential for sediment transport.

Section C: Delineate Drainage Management Areas (DMAs)

This section provides streamlined guidance and documentation of the DMA delineation and categorization process, for additional information refer to the procedure in Section 3.3 of the SMR WQMP which discusses the methods of delineating and mapping your project site into individual DMAs. Complete Steps 1 to 4 to successfully delineate and categorize DMAs.

Step 1: Identify Surface Types and Drainage Pathways

Carefully delineate pervious areas and impervious areas (including roofs) throughout site and identify overland flow paths and above ground and below ground conveyances. Also identify common points (such as BMPs) that these areas drain to.

Step 2: DMA Delineation

Use the information in Step 1 to divide the entire PDP site into individual, discrete DMAs. Typically, lines delineating DMAs follow grade breaks and roof ridge lines. Where possible, establish separate DMAs for each surface type (e.g., landscaping, pervious paving, or roofs). Assign each DMA a unique code and determine its size in square feet. The total area of your site should total the sum of all of your DMAs (unless water from outside the project limits comingles with water from inside the project limits, i.e. run-on). Complete Table C-1

Table C-1 DMA Identification

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
Impervious Areas	Roofs, paving, etc.	Varies (see Appendix 1)	To be Determined in Step 3
Pervious Areas	Landscaping, open space, etc.	Varies (see Appendix 1)	

Add Columns as Needed

Step 3: DMA Classification

Determine how drainage from each DMA will be handled by using information from Steps 1 and 2 and by completing Steps 3.A to 3.C. Each DMA will be classified as one of the following four types:

- Type 'A': Self-Treating Areas:
- Type 'B': Self-Retaining Areas
- Type 'C': Areas Draining to Self-Retaining Areas
- Type 'D': Areas Draining to BMPs

Step 3.A – Identify Type 'A' Self-Treating Area

Indicate if the DMAs meet the following criteria by answering "Yes" or "No".

☒ Yes ☐ No — Area is undisturbed from their natural condition OR restored with Native and/or California Friendly vegetative covers.

☐ Yes ☒ No	Area is irrigated, if at all, with appropriate low water use irrigation systems to prevent irrigation runoff.
☒ Yes ☐ No	Runoff from the area will not comingle with runoff from the developed portion of the site, or across other landscaped areas that do not meet the above criteria.

If all answers indicate "Yes," complete Table C-2 to document the DMAs that are classified as Self-Treating Areas.

Table C-2 Type 'A', Self-Treating Areas

DMA Name or Identification	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
Open Space	663 acres (over 28 million sq. ft.)	Natural Vegetation	None

Step 3.B – Identify Type 'B' Self-Retaining Area and Type 'C' Areas Draining to Self-Retaining Areas

Type 'B' Self-Retaining Area: A Self-Retaining Area is shallowly depressed 'micro infiltration' areas designed to retain the Design Storm rainfall that reaches the area, without producing any Runoff.

Indicate if the DMAs meet the following criteria by answering "Yes," "No," or "N/A".

☐ Yes ☒ No ☐ N/A	Slopes will be graded toward the center of the pervious area.
☒ Yes ☐ No ☐ N/A	Soils will be freely draining to not create vector or nuisance conditions.
☐ Yes ☒ No ☐ N/A	Inlet elevations of area/overflow drains, if any, should be clearly specified to be three inches or more above the low point to promote ponding.
☐ Yes ☐ No ☒ N/A	Pervious pavements (e.g., crushed stone, porous asphalt, pervious concrete, or permeable pavers) can be self-retaining when constructed with a gravel base course four or more inches deep below any underdrain discharge elevation.

If all answers indicate "Yes," DMAs may be categorized as Type 'B', proceed to identify Type 'C' Areas Draining to Self-Retaining Areas.

Type 'C' Areas Draining to Self-Retaining Areas: Runoff from impervious or partially pervious areas can be managed by routing it to Self-Retaining Areas consistent with the LID Principle discussed in SMR WQMP Section 3.2.5 for 'Dispersing Runoff to Adjacent Pervious Areas'.
Indicate if the DMAs meet the following criteria by answering "Yes" or "No".

☐ Yes ☒ No	The drainage from the tributary area must be directed to and dispersed within the Self-Retaining Area.

☐ Yes ☒ No Area must be designed to retain the entire Design Storm runoff without flowing offsite.

If all answers indicate "Yes," DMAs may be categorized as Type 'C'.

Complete Table C-3 and Table C-4 to identify Type 'B' Self-Retaining Areas and Type 'C' Areas Draining to Self-Retaining Areas.

Table C-3 Type 'B', Self-Retaining Areas

Self-Retaining Area				Type 'C' DMAs that are draining to the Self-Retaining Area		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C-4= [C]	Required Retention Depth (inches) [D] = $[B] + \frac{[B]\cdot[C]}{[A]}$
N/A						

Table C-4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Runoff factor [B]	Product [C] = [A] x [B]	DMA name /ID	Area (square feet) [D]	Ratio [C]/[D]
N/A							

Note: (See Section 3.3 of SMR WQMP) Ensure that partially pervious areas draining to a Self-Retaining area do not exceed the following ratio:

$$\left(\frac{2}{Impervious\ Fraction}\right) : 1$$

(Tributary Area: Self-Retaining Area)

Step 3.C – Identify Type 'D' Areas Draining to BMPs

Areas draining to BMPs are those that could not be fully managed through LID Principles (DMA Types A through C) and will instead drain to an LID BMP and/or a Conventional Treatment BMP designed to manage water quality impacts from that area, and Hydromodification where necessary.

Complete Table C-5 to document which DMAs are classified as Areas Draining to BMPs

Table C-5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID Receiving Runoff from DMA
DMA 1 through 7 and 9 through 11	Biofiltration Basin with No Infiltration (see WQMP Site Plan in Appendix 1)
DMA 8	Bioretention Basin
DMA 12	Gravel Trenches along McElwain Road

Note: More than one DMA may drain to a single LID BMP; however, one DMA may not drain to more than one BMP.

Section D: Implement LID BMPs

The Regional MS4 Permit requires the use of LID BMPs to provide retention or treatment of the DCV and includes a BMP hierarchy which requires Full Retention BMPs (Priority 1) to be considered before Biofiltration BMPs (Priority 2) and Flow-Through Treatment BMPs and Alternative Compliance BMPs (Priority 3). LID BMP selection must be based on technical feasibility and should be considered early in the site planning and design process. Use this section to document the selection of LID BMPs for each DMA. Note that feasibility is based on the DMA scale and may vary between DMAs based on site conditions.

D.1 Full Infiltration Applicability

An assessment of the feasibility of utilizing full infiltration BMPs is required for all projects, *except where it can be shown that site design LID principals fully retain the DCV (i.e., all DMAs are Type A, B, or C), or where Harvest and Use BMPs fully retain the DCV. Check the following box if applicable:*

☐ Site design LID principals fully retain the DCV (i.e., all DMAs are Type A, B, or C), (Proceed to Section E).

If the above box remains unchecked, perform a site-specific evaluation of the feasibility of Infiltration BMPs using each of the applicable criteria identified in Chapter 2.3.3 of the SMR WQMP and complete the remainder of Section D.1.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Copermittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the SMR WQMP. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Infiltration Feasibility

Table D-1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the SMR WQMP in Chapter 2.3.3. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D-1 Infiltration Feasibility

Downstream Impacts (SMR WQMP Section 2.3.3.a)		
Does the project site…	**YES**	**NO**
…have any DMAs where infiltration would negatively impact downstream water rights or other Beneficial Uses[3]?		X
If Yes, list affected DMAs:		
Groundwater Protection (SMR WQMP Section 2.3.3.b)		
Does the project site…	**YES**	**NO**
…have any DMAs with industrial, and other land uses that pose a high threat to water quality, which cannot be treated by Bioretention BMPs? Or have DMAs with active industrial process areas?		X
If Yes, list affected DMAs:		
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet horizontally of a water supply well?		X
If Yes, list affected DMAs:		
…have any DMAs that would restrict BMP locations to within a 2:1 (horizontal: vertical) influence line extending from any septic leach line?		X
If Yes, list affected DMAs:		
…have any DMAs been evaluated by a licensed Geotechnical Engineer, Hydrogeologist, or Environmental Engineer, who has concluded that the soils do not have adequate physical and chemical characteristics for the protection of groundwater, and has treatment provided by amended media layers in Bioretention BMPs been considered in evaluating this factor?		X
If Yes, list affected DMAs:		
Public Safety and Offsite Improvements (SMR WQMP Section 2.3.3.c)		
Does the project site…	**YES**	**NO**
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
Infiltration Characteristics For LID BMPs (SMR WQMP Section 2.3.3.d)		
Does the project site…	**YES**	**NO**
…have factored infiltration rates of less than 0.8 inches / hour? (Note: on a case-by-case basis, the Local Jurisdiction may allow a factor of safety as low as 1.0 to support selection of full infiltration BMPs. Therefore, measured infiltration rates could be as low as 0.8 in/hr to support full infiltration. A higher factor of safety would be required for design in accordance with the LID BMP Deign Handbook).	X	
If Yes, list affected DMAs:	1 to 7 and 9 to 11	
Cut/Fill Conditions (SMR WQMP Section 2.3.3.e)		
Does the project site…	**YES**	**NO**
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?	X	
If Yes, list affected DMAs:	1 to 7 and 9 to 11	
Other Site-Specific Factors (SMR WQMP Section 2.3.3.f)		
Does the project site…	**YES**	**NO**
…have DMAs where the geotechnical investigation discovered other site-specific factors that would preclude effective and/or safe infiltration?	X	
Describe here: Majority of the site contains granitic bedrock with low infiltration potential.		

[3] Such a condition must be substantiated by sufficient modeling to demonstrate an impact and would be subject to City of Murrieta discretion. There is not a standardized method for assessing this criterion. Water rights evaluations should be site-specific.

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs that rely solely on infiltration should not be used for those DMAs and you should proceed to the assessment for Biofiltration BMPs below. Biofiltration BMPs that provide partial infiltration may still be feasible and should be assessed in Section D.2. Summarize concerns identified in the Geotechnical Report, if any, that resulted in a "YES" response above in the table below.

Table D-2 Geotechnical Concerns for On-site Infiltration

Type of Geotechnical Concern	DMAs Feasible (By Name or ID)	DMAs Infeasible (By Name or ID)
Collapsible Soil		
Expansive Soil		
Slopes		
Liquefaction		
Other: Project includes large cut/fill and is underlain with bedrock.		DMA 1 through 7 and 9 through 11

D.2 Biofiltration Applicability

This section should document the applicability of biofiltration BMPs for Type D DMAs that are not feasible for full infiltration BMPs. The key decisions to be documented in this section include:

1. Are biofiltration BMPs with partial infiltration feasible?
    a. Biofiltration BMPs must be designed to maximize incidental infiltration via a partial infiltration design unless it is demonstrated that this design is not feasible.
    b. These designs can be used at sites with low infiltration rates where other feasibility factors do not preclude incidental infiltration.

    Document summary in Table D-3.
2. If not, what are the factors that require the use of biofiltration with no infiltration? This may include:
    a. Geotechnical hazards
    b. Water rights issues
    c. Water balance issues
    d. Soil contamination or groundwater quality issues
    e. Very low infiltration rates (factored rates < 0.1 in/hr)
    f. Other factors, demonstrated to the acceptance of the local jurisdiction

    If this applies to any DMAs, then rationale must be documented in Table D-3.
3. Are biofiltration BMPs infeasible?
    a. If yes, then provide a site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee with jurisdiction over the Project site to discuss this option. Proceed to Section F to document your alternative compliance measures.

Table D-3 Evaluation of Biofiltration BMP Feasibility

DMA ID	Is Partial/ Incidental Infiltration Allowable? (Y/N)	Basis for Infeasibility of Partial Infiltration (provide summary and include supporting basis if partial infiltration not feasible)
1 through 7, 9 through 11	N	Infiltration study in Appendix 3

Proprietary Biofiltration BMP Approval Criteria

If the project will use proprietary BMPs as biofiltration BMPs, then this section is completed to document that the proprietary BMPs are selected in accordance with Section 2.3.7 of the SMR WQMP. Proprietary Biofiltration BMPs must meet both of the following approval criteria:

1. Approval Criteria for All Proprietary BMPs, and
2. Acceptance Criteria for Proprietary Biofiltration BMPs.

When the use of proprietary biofiltration BMPs is proposed to meet the Pollutant Control performance standards, use Table D-4 to document that appropriate approval criteria have been met for the proposed BMPs. Add additional rows to document approval criteria are met for each type of BMP proposed.

Table D-4 Proprietary BMP Approval Requirement Summary

Proposed Proprietary Biofiltration BMP	Approval Criteria	Notes/Comments
N/A	☐ Proposed BMP has an active TAPE GULD Certification for the project pollutants of concern[4] or equivalent 3rd party demonstrated performance.	
	☐ The BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification.	
	☐ The BMP includes biological features including vegetation supported by engineered or other growing media.	
	☐ The BMP is designed to maximize infiltration, or supplemental infiltration is provided to achieve retention equivalent to Biofiltration with Partial Infiltration BMPs if factored infiltration rate is between 0.1 and 0.8 inches/hour.	

[4] Use Table F-1 and F-2 to identify and document the pollutants of concern and include these tables in Appendix 5.

	☐ The BMP is sized using one of two Biofiltration LID sizing options in Section 2.3.2 of the SRM WQMP.	

D.3 Feasibility Assessment Summaries

From the Infiltration, Biofiltration with Partial Infiltration and Biofiltration with No Infiltration Sections above, complete Table D-5 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D-5 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy			No LID (Alternative Compliance)
	1. Infiltration	2. Biofiltration with Partial Infiltration	3. Biofiltration with No Infiltration	
DMA 1-7 and 9-11	☐	☐	☒	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐

For those DMAs where LID BMPs are not feasible, provide a narrative in Table D-6 below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section F below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

This is based on the clarification letter titled "San Diego Water Board's Expectations of Documentation to Support a Determination of Priority Development Project Infiltration Infeasibility" (April 28, 2017, Via email from San Diego Regional Water Quality Control Board to San Diego County Municipal Storm Water Copermittees[5]).

Table D-6 Summary of Infeasibility Documentation

Question	Narrative Summary (include reference to applicable appendix/attachment/report, as applicable)
a) When in the entitlement process did a geotechnical engineer analyze the site for infiltration feasibility?	See report in Appendix 3.
b) When in the entitlement process were other investigations conducted (e.g., groundwater	See report in Appendix 3.

[5] http://www.projectcleanwater.org/download/pdp-infiltration-infeasibility/

quality, water rights) to evaluate infiltration feasibility?	
c) What was the scope and results of testing, if conducted, or rationale for why testing was not needed to reach findings?	N/A
d) What public health and safety requirements affected infiltration locations?	N/A
e) What were the conclusions and recommendations of the geotechnical engineer and/or other professional responsible for other investigations?	No infiltration except at DMA 8.
f) What was the history of design discussions between the permittee and applicant for the proposed project, resulting in the final design determination related locations feasible for infiltration?	Discussions were based on report in Appendix 3.
g) What site design alternatives were considered to achieve infiltration or partial infiltration on site?	Design was based on BMP hierarchy and soil testing results.
h) What physical impairments (i.e., fire road egress, public safety considerations, utilities) and public safety concerns influenced site layout and infiltration feasibility?	The TM design (grading, streets, lotting, watercourse avoidance, etc.) influenced the site layout and infiltration feasibility.
i) What LID Principles (site design BMPs) were included in the project site design?	Preserve existing drainage patterns and primary watercourse that flows through the site, preserve existing vegetation and minimize impervious area by setting aside 663 acres in open space, preserve natural infiltration and disperse runoff within open space, and use native and drought tolerant landscaping.

D.4 LID BMP Sizing

Each LID BMP must be designed to ensure that the DCV will be captured by the selected BMPs with no discharge to the storm drain or surface waters during the DCV size storm. Infiltration BMPs must at minimum be sized to capture the DCV to achieve pollutant control requirements.

Biofiltration BMPs must at a minimum be sized to:

- Treat 1.5 times the DCV not reliably retained on site using a volume-base or flow-based sizing method, or
- Include static storage volume, including pore spaces and pre-filter detention volume, at least 0.75 times the portion of the DCV not reliably retained on site.

First**,** calculate the DCV for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using the methods included in Section 3 of the LID BMP Design Handbook. Utilize the worksheets found in the LID BMP Design Handbook or consult with the Copermittee to assist you in correctly sizing your LID BMPs. Use Table D-7 below to document the DCV each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D-7 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
See	Appendix	6				*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]

[B], [C] is obtained as described in Section 2.6.1.b of the SMR WQMP

[E] is obtained from Exhibit A in the SMR WQMP

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6.

Complete Table D-8 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. You can add rows to the table as needed. Alternatively, the Santa Margarita Hydrology Model (SMRHM) can be used to size LID BMPs to address the DCV and, if applicable, to size Hydrologic Control BMPs to meet the Hydrologic Performance Standard described in the SMR WQMP, as identified in Section E.

Table D-8 LID BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	Design Capture Volume (ft^3)	Proposed Volume (ft^3)
BMP 1-7, 9-11	DMA 1-7, 9-11	Biofiltration with no infiltration	See Appendix 6	Proposed volume based on SMRHM analysis in Appendix 7
BMP 8	DMA 8	Bioretention	See Appendix 6	See Appendix 7
BMP 12	DMA 12	Gravel Trench	See Appendix 6	See Appendix 7

If bioretention will include a capped underdrain, then include sizing calculations demonstrating that the BMP will meet infiltration sizing requirements with the underdrain capped and also meet biofiltration sizing requirements if the underdrain is uncapped.

Section E: Implement Hydrologic Control BMPs and Sediment Supply BMPs

If a completed Table 1.2 demonstrates that the project is exempt from Hydromodification Performance Standards, specify N/A and proceed to Section G.

☐ N/A Project is Exempt from Hydromodification Performance Standards.

If a PDP is not exempt from hydromodification requirements than the PDP must satisfy the requirements of the performance standards for hydrologic control BMPs and Sediment Supply BMPs. The PDP may choose to satisfy hydrologic control requirements using onsite or offsite BMPs (i.e. Alternative Compliance). Sediment supply requirements cannot be met via alternative compliance. If N/A is not selected above, select one of the two options below and complete the applicable sections.

☒ Project is Not Hydromodification Exempt and chooses to implement Hydrologic Control and Sediment Supply BMPs Onsite (complete Section E).

☐ Project is Not Hydromodification Exempt and chooses to implement Hydrologic Control Requirements using Alternative Compliance (complete Section F). Selection of this option must be approved by the Copermittee.

E.1 Hydrologic Control BMP Selection

Capture of the DCV and achievement of the Hydrologic Performance Standard may be met by combined and/or separate structural BMPs. The user should consider the full suite of Hydrologic Control BMPs to manage runoff from the post-development condition and meet the Hydrologic Performance Standard identified in this section.

The Hydrologic Performance Standard consists of matching or reducing the flow duration curve of post-development conditions to that of pre-existing, naturally occurring conditions, for the range of geomorphically significant flows (10% of the 2-year runoff event up to the 10-year runoff event). Select each of the hydrologic control BMP types that are applied to meet the above performance standard on the site.

☒ LID principles as defined in Section 3.2 of the SMR WQMP.

☒ Structural LID BMPs that may be modified or enlarged, if necessary, beyond the DCV.

☐ Structural Hydrologic Control BMPs that are distinct from the LID BMPs above. The LID BMP Design Handbook provides information not only on Hydrologic Control BMP design, but also on BMP design to meet the combined LID requirement and Hydrologic Performance Standard. The Handbook specifies the type of BMPs that can be used to meet the Hydrologic Performance Standard.

E.2 Hydrologic Control BMP Sizing

Hydrologic Control BMPs must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA for the range of geomorphically significant flows. Using SMRHM, (or another acceptable continuous simulation model if approved by the Copermittee) the applicant shall demonstrate that the performance of the Hydrologic Control BMPs complies with the Hydrologic Performance Standard. Complete Table E-1 below and identify, for each DMA, the type of Hydrologic Control BMP, if the SMRHM model confirmed the management (Identified as "passed" in SMRHM), the total volume capacity of the Hydrologic Control BMP, the Hydrologic Control BMP footprint at top floor elevation, and the drawdown time of the Hydrologic Control BMP. SMRHM summary reports should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table E-1 Hydrologic Control BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
BMP 1-7, 9-11	DMA 1-7, 9-11	Biofiltration with no infiltration	☒	See Appendix	7 for SMRHM	analyses.
BMP 8	DMA 8	Bioretention	☒	See Appendix	7 for SMRHM	analyses.
BMP 12	DMA 12	Gravel Trench	☒	See Appendix	7 for SMRHM	analyses.
			☐			

If a bioretention BMP with capped underdrain is used and hydromodification requirements apply, then sizing calculations must demonstrate that the BMP meets flow duration control criteria with the underdrain capped and uncapped. Both calculations must be included.

E.3 Implement Sediment Supply BMPs

The sediment supply performance standard applies to PDPs for which hydromodification applied that have the potential to impact Potential Critical Coarse Sediment Yield Areas. Refer to Exhibit G of the WQMP to determine if there are onsite Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas. Select one of the two options below and include the Potential Critical Coarse Sediment Yield Area Exhibit showing your project location in Appendix 7.

☒ There are no mapped Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas on the site. The Sediment Supply Performance Standard is met with no further action.

☐ There are mapped Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas on the site, the Sediment Supply Performance Standard will be met through Option 1 or Option 2 below.

The applicant may refer to Section 3.6.4 of the SMR WQMP for a description of the methodology to meet the Sediment Supply Performance Standard. Select the applicable compliance pathway and complete the appropriate sections to demonstrate compliance with the Sediment Supply Performance Standard if the second box is selected above:

☐ Avoid impacts related to any PDP activities to Potential Critical Coarse Sediment Yield Areas. Proceed to Section E.3.1.

☐ Complete a Site-Specific Critical Coarse Sediment Analysis. Proceed to Section E.3.2.

E.3.1 Option 1: Avoid Potential Critical Coarse Sediment Yield Areas and Potential Sediment Source Areas N/A

The simplest approach for complying with the Sediment Supply Performance Standard is to avoid impacts to areas identified as Potential Critical Coarse Sediment Yield Areas or Potential Sediment Supply Areas. If a portion of PDP is identified as a Potential Critical Coarse Sediment Yield Area or a Potential Sediment Source Area, that PDP may still achieve compliance with the Sediment Supply Performance Standards if Potential Critical Coarse Sediment Yield Areas and Potential Sediment Supply Areas are avoided, i.e. areas are not developed and thereby delivery of Critical Coarse Sediment to the receiving waters is not impeded by site developments.

Provide a narrative describing how the PDP has avoided impacts to Potential Critical Coarse Sediment Yield Areas and/or Potential Sediment Source Areas below.

N/A. There are no CCSYA's mapped at the site.

If it is not feasible to avoid these areas, proceed to Option 2 to complete a Site-Specific Critical Coarse Sediment Analysis.

E.3.2 Option 2: Site-Specific Critical Coarse Sediment Analysis N/A

Perform a stepwise assessment to ensure the maintenance of the pre-project source(s) of Critical Coarse Sediment (i.e., Bed Sediment Supply):

1. Determine whether the site or a portion of the site is a Significant Source of Bed Sediment Supply to the Receiving Channel (i.e., an actual verified Critical Coarse Sediment Yield Area);
2. Avoid areas identified as actual verified Critical Coarse Sediment Yield Areas in the PDP design and maintain pathways for discharge of Bed Sediment Supply from these areas to receiving waters.

Step 1: Identify if the site is an actual verified Critical Coarse Sediment Yield Area supplying Bed Sediment Supply to the receiving channel

☐ **Step 1.A** – Is the Bed Sediment of onsite streams similar to that of receiving streams?

Rate the similarity: ☐ High
☐ Medium
☐ Low

Results from the geotechnical and sieve analysis to be performed both onsite and in the receiving channel should be documented in Appendix 7. Of particular interest, the results of the sieve analysis, the soil erodibility factor, a description of the topographic relief of the project area, and the lithology of onsite soils should be reported in Appendix 7.

☐ **Step 1.B** – Are onsite streams capable of delivering Bed Sediment Supply from the site, if any, to the receiving channel?

Rate the potential: ☐ High
☐ Medium
☐ Low

Results from the analyses of the sediment delivery potential to the receiving channel should be documented in Appendix 7 and identify, at a minimum, the Sediment Source, the distance to the receiving channel, the onsite channel density, the project watershed area, the slope, length, land use, and rainfall intensity.

☐ **Step 1.C** – Will the receiving channel adversely respond to a change in Bed Sediment Load?

Rate the need for bed sediment supply:
☐ High
☐ Medium
☐ Low

Results from the in-stream analysis to be performed both onsite should be documented in Appendix 7. The analysis should, at a minimum, quantify the bank stability and the degree of incision, provide a gradation of the Bed Sediment within the receiving channel, and identify if the channel is sediment supply-limited.

☐ **Step 1.D** – Summary of Step 1

Summarize in Table E.3 the findings of Step 1 and associate a score (in parenthesis) to each step. The sum of the three individual scores determines if a stream is a significant contributor to the receiving stream.

- Sum is equal to or greater than eight - Site is a significant source of sediment bed material – all on-site streams must be preserved or by-passed within the site plan. The applicant shall proceed to Step 2 for all onsite streams.
- Sum is greater than five but lower than eight. Site is a source of sediment bed material – some of the on-site streams must be preserved (with identified streams noted). The applicant shall proceed to Step 2 for the identified streams only.
- Sum is equal to or lower than five. Site is not a significant source of sediment bed material. The applicant may advance to Section F.

Table E-2 Triad Assessment Summary

Step	Rating			Total Score
1.A	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.B	☐ High (3)	☐ Medium (2)	☐ Low (1)	

1.C	☐ High (3)	☐ Medium (2)	☒ Low (1)	
Significant Source Rating of Bed Sediment to the receiving channel(s)				

Step 2: Avoid Development of Critical Coarse Sediment Yield Areas, Potential Sediment Sources Areas, and Preserve Pathways for Transport of Bed Sediment Supply to Receiving Waters

Onsite streams identified as a actual verified Critical Coarse Sediment Yield Areas should be avoided in the site design and transport pathways for Critical Coarse Sediment should be preserved

Check those that apply:

☐ The site design does avoid all onsite channels identified as actual verified Critical Coarse Sediment Yield Areas

AND

☐ The drainage design bypasses flow and sediment from onsite upstream drainages identified as actual verified Critical Coarse Sediment Yield Areas to maintain Critical Coarse Sediment supply to receiving waters

(If both are yes, the applicant may disregard subsequent steps of Section E.3 and directly advance directly to Section G).

- Or -

☐ The site design **does NOT avoid** all onsite channels identified as actual verified Critical Coarse Sediment Yield Areas

OR

☐ The project impacts transport pathways of Critical Coarse Sediment from onsite upstream drainages.

(If either of these are the case, the applicant may proceed with the subsequent steps of Section E.3).

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment. The site map shall demonstrate, if feasible, that the site design avoids those onsite channels identified as a Significant Source of Bed Sediment. In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment. If the design plan cannot avoid the onsite channels, please provide a rationale for each channel individually.

The site map shall demonstrate that the drainage design bypasses those onsite channels that supply Critical Coarse Sediment to the receiving channel(s). In addition, the applicant shall describe the characteristics of each onsite channel identified as an actual verified Critical Coarse Sediment Yield Area.

E.3.3 Sediment Supply BMPs to Result in No Net Impact to Downstream Receiving Waters

If impacts to Critical Coarse Sediment Yield Areas cannot be avoided, sediment supply BMPs must be implemented such there is no net impact to receiving waters. Sediment supply BMPs may consist of approaches that permit flux of bed sediment supply from Critical Coarse Sediment Yield Areas within the project boundary. This approach is subject to acceptance by the City of Murrieta. It may require extensive documentation and analysis by qualified professionals to support this demonstration.

Appendix H of the San Diego Model BMP Design Manual provides additional information on site-specific investigation of Critical Coarse Sediment Supply areas.

http://www.projectcleanwater.org/download/2018-model-bmp-design-manual/

Documentation of sediment supply BMPs should be detailed in Appendix 7.

N/A. There are no CCSYA's mapped at the site.

Section F: Alternative Compliance

Alternative Compliance may be used to achieve compliance with pollutant control and/or hydromodification requirements for a given PDP. Alternative Compliance may be used under two scenarios, check the applicable box if the PDP is proposing to use Alternative Compliance to satisfy all or a portion of the Pollutant Control and/or Hydrologic Control requirements (but not sediment supply requirements)

☐ If it is not feasible to fully implement Infiltration or Biofiltration BMPs at a PDP site, Flow-Through Treatment Control BMPs may be used to treat pollutants contained in the portion of DCV not reliably retained on site and Alternative Compliance measures must also be implemented to mitigate for those pollutants in the DCV that are not retained or removed on site prior to discharging to a receiving water.

☐ Alternative Compliance is selected to comply with either pollutant control or hydromodification flow control requirements even if complying with these requirements is potentially feasible on-site. If such voluntary Alternative Compliance is implemented, Flow-Through Treatment Control BMPs must still be used to treat those pollutants in the portion of the DCV not reliably retained on site prior to discharging to a receiving water.

Refer to Section 2.7 of the SMR WQMP and consult the Local Jurisdiction for currently available Alternative Compliance pathways. Coordinate with the Copermittee if electing to participate in Alternative Compliance and complete the sections below to document implementation of the Flow-Through BMP component of the program.

F.1 Identify Pollutants of Concern

The purpose of this section is to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs and to document compliance and.

Utilize

Table A-1 from Section A, which noted your project's Receiving Waters, to identify impairments for Receiving Waters (including downstream receiving waters) by completing Table F-1. Table F-1 includes the watersheds identified as impaired in the Approved 2010 303(d) list; check box corresponding with the PDP's receiving water. The most recent 303(d) lists are available from the State Water Resources Control Board website:
https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml).https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml.

Table F-1 Summary of Approved 2010 303(d) listed waterbodies and associated pollutants of concern for the Riverside County SMR Region and downstream waterbodies.

	Water Body	Nutrients[1]	Metals[2]	Toxicity	Bacteria and Pathogens	Pesticides and Herbicides	Sulfate	Total Dissolved Solids
☐	De Luz Creek	X	X				X	
☐	Long Canyon Creek		X		X	X		
☒	Murrieta Creek	X	X	X		X		
☐	Redhawk Channel	X	X		X	X		X
☐	Santa Gertudis Creek	X	X		X	X		
☒	Santa Margarita Estuary	X						
☒	Santa Margarita River (Lower)	X			X			
☒	Santa Margarita River (Upper)	X		X				
☐	Temecula Creek	X	X	X		X		X
☒	Warm Springs Creek	X	X		X	X		

[1] Nutrients include nitrogen, phosphorus and eutrophic conditions caused by excess nutrients.

[2] Metals includes copper, iron, and manganese.

Use Table F-2 to identify the pollutants identified with the project site. Indicate the applicable PDP Categories and/or Project Features by checking the boxes that apply. If the identified General Pollutant Categories are the same as those listed for your Receiving Waters, then these will be your Pollutants of Concern; check the appropriate box or boxes in the last row.

Table F-2 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)		General Pollutant Categories									
		Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease	Total Dissolved Solids	Sulfate
☒	Detached Residential Development	P	N	P	P	N	P	P	P	N	N
☐	Attached Residential Development	P	N	P	P	N	P	P	P[(2)]	N	N
☐	Commercial/Industrial Development	P[(3)]	P[(7)]	P[(1)]	P[(1)]	P	P[(1)]	P	P	N	N
☐	Automotive Repair Shops	N	P	N	N	P[(4, 5)]	N	P	P	N	N
☐	Restaurants (>5,000 ft^2)	P	N	N	P[(1)]	N	N	P	P	N	N
☐	Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P	N	N
☐	Parking Lots (>5,000 ft^2)	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☒	Streets, Highways, and Freeways	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Retail Gasoline Outlets	N	P[(7)]	N	N	P[(4)]	N	P	P	N	N
Project Priority Pollutant(s) of Concern		☒	☒	☒	☒	☒	☒	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste products; otherwise not expected

(4) Including petroleum hydrocarbons

(5) Including solvents

(6) Bacterial indicators are routinely detected in pavement runoff

(7) A potential source of metals, primarily copper and zinc. Iron, magnesium, and aluminum are commonly found in the environment and are commonly associated with soils, but are not primarily of anthropogenic stormwater origin in the municipal environment.

F.2 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential Pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must be selected to address the Project Priority Pollutants of Concern (identified above) and meet the acceptance criteria described in Section 2.3.7 of the SMR WQMP. Documentation of acceptance criteria must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table F-3 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
N/A. No proprietary treatment	BMPs proposed.	

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Copermittee Approved Study and provided in Appendix 6.

F.3 Sizing Criteria

Utilize Table F-4 below to appropriately size flow-through BMPs to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.1 of the SMR WQMP for further information.

Table F-4 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*	
	[A]		[B]	[C]	[A] x [C]		
N/A						*Design Storm (in)*	*Design Flow Rate (cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$

[B], [C] is obtained as described in Section 2.6.1.b from the SMR WQMP
[E] either 0.2 inches or 2 times the 85th percentile hourly rainfall intensity
[G] = 43,560,.

F.4 Hydrologic Performance Standard – Alternative Compliance Approach

Alternative compliance options are only available if the governing Copermittee has acknowledged the infeasibility of onsite Hydrologic Control BMPs and approved an alternative compliance approach. See Section 3.5 and 3.6 of the SMR WQMP.

Select the pursued alternative and describe the specifics of the alternative:

☐ Offsite Hydrologic Control Management within the same channel system

N/A

☐ In-Stream Restoration Project

N/A

For Offsite Hydrologic Control BMP Option

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP is equivalent with the Hydrologic Performance Standard for onsite conditions. Complete Table F-5 below and identify, for each Hydrologic Control BMP, the equivalent DMA the Hydrologic Control BMP mitigates, that the SMRHM model passed, the total volume capacity of the BMP, the BMP footprint at top floor elevation, and the drawdown time of the BMP. SMRHM summary reports for the alternative approach should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table F-5 Offsite Hydrologic Control BMP Sizing

BMP Name / Type	Equivalent DMA (ac)	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
N/A		☐			
		☐			
		☐			
		☐			

For Instream Restoration Option

Attach to Appendix 7 the technical report detailing the condition of the receiving channel subject to the proposed hydrologic and sediment regimes. Provide the full design plans for the in-stream restoration project that have been approved by the Copermittee. Utilize the San Diego Regional Water Quality Equivalency Guidance Document.

Section G: Implement Trash Capture BMPs

The Local Jurisdiction may require full trash capture BMPs to be installed as part of the project. Consult with the Local Jurisdiction to determine applicability.

Trash Capture BMPs may be applicable to Type 'D' DMAs, as defined in Section 2.3.4 of the SMR WQMP. Trash Capture BMPs are designed to treat Q_{TRASH}, the runoff flow rate generated during the 1-year 1-hour precipitation depth. Utilize Table G-1 to size Trash Capture BMP. Refer to Table G-2 to determine the Trash Capture Design Storm Intensity (E).

Table G-1 Sizing Trash Capture BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*	
	[A]		[B]	[C]	[A] x [C]		
N/A						*Trash Capture Design Storm Intensity (in)*	*Trash Capture Design Flow Rate (cubic feet or cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$

[B], [C] is obtained as described in Section 2.6.1.b from the SMR WQMP
[G] = 43,560

Table G-2 Approximate precipitation depth/intensity values for calculation of the Trash Capture Design Storm

City	1-year 1-hour Precipitation Depth/Intensity (inches/hr)
Murrieta	0.47
Temecula	0.50
Wildomar	0.37

Use Table G-3 to summarize and document the selection and sizing of Trash Capture BMPs.

Table G-3 Trash Capture BMPs

BMP Name / ID	DMA No(s)	BMP Type / Description	Required Trash Capture Flowrate (cfs)	Provided Trash Capture Flowrate (cfs)
N/A				

Section H: Source Control BMPs

Source Control BMPs include permanent, structural features that may be required in your Project plans, such as roofs over and berms around trash and recycling areas, and Operational BMPs, such as regular sweeping and "housekeeping," that must be implemented by the site's occupant or user. The Maximum Extent Practicable (MEP) standard typically requires both types of BMPs. In general, Operational Source Control BMPs cannot be substituted for a feasible and effective Structural Source Control BMP. Complete checklist below to determine applicable Source Control BMPs for your site.

Project-Specific WQMP Source Control BMP Checklist

All development projects must implement Source Control BMPs. Source Control BMPs are used to minimize pollutants that may discharge to the MS4. Refer to Chapter 3 (Section 3.8) of the SMR WQMP for additional information. Complete Steps 1 and 2 below to identify Source Control BMPs for the project site.

STEP 1: IDENTIFY POLLUTANT SOURCES

Review project site plans and identify the applicable pollutant sources. "Yes" indicates that the pollutant source is applicable to project site. "No" indicates that the pollutant source is not applicable to project site.

☒ Yes ☐ No	Storm Drain Inlets		☐ Yes ☒ No	Outdoor storage areas	
☐ Yes ☒ No	Floor Drains		☐ Yes ☒ No	Material storage areas	
☐ Yes ☒ No	Sump Pumps		☐ Yes ☒ No	Fueling areas	
☒ Yes ☐ No	Pets Control/Herbicide Application		☐ Yes ☒ No	Loading Docks	
☐ Yes ☒ No	Food Service Areas		☒ Yes ☐ No	Fire Sprinkler Test/Maintenance water	
☒ Yes ☐ No	Trash Storage Areas		☒ Yes ☐ No	Plazas, Sidewalks and Parking Lots	
☐ Yes ☒ No	Industrial Processes		☒ Yes ☐ No	Pools, Spas, Fountains and other water features	
☐ Yes ☒ No	Vehicle and Equipment Cleaning and Maintenance/Repair Areas				

STEP 2: REQUIRED SOURCE CONTROL BMPS

List each Pollutant source identified above in column 1 and fill in the corresponding Structural Source Control BMPs and Operational Control BMPs by referring to the Stormwater Pollutant Sources/Source Control Checklist included in Appendix 8. The resulting list of structural and operational source control BMPs must be implemented as long as the associated sources are present on the project site. Add additional rows as needed.

Pollutant Source	Structural Source Control BMP	Operational Source Control BMP
On-site storm drain inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar where feasible. Catch basin markers may be available from the RCFCWCD. Call 951-955-1200 to verify.	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality

		Handbooks at www.cabmphandbooks.com
Need for future indoor & structural pest control	Building design shall exclude openings that allow pest and rodent entry. Buildings/homes will be slab on grade, which will avoid pests in crawl space.	Integrated Pest Management information shall be provided to owners, lessees, and operators.
Landscape / Outdoor Pesticide Use	Existing native trees, shrubs, and ground cover shall be preserved beyond the project footprint. Landscaping shall be selected to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. When landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Use pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. See applicable operational BMPs in "What you should know . . . for Landscape and Gardening" on rcwatershed.org. Provide Integrated Pest Management information to new owners, lessees and operators.
Refuse areas	Refuse containers (dumpsters) will be stored in gated and fenced enclosures. Dumpsters shall have covers to prevent rain intrusion. Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	An adequate number of receptacles (dumpsters and individual trash containers) will be provided for the facilities. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered or under a covered area. Prohibit/prevent dumping of

		liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in Appendix 10 or the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer or per architectural guidelines.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in Appendix 10 or the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Condensate drain lines	Condensate drain lines will be designed on the architectural plans and may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.	Condensate lines shall be maintained in accordance with manufacturers and local regulations.
Roofing, gutters, and trim	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Roof drain runoff will ultimately discharge to w water quality basin for treatment.	Roofing, gutters, and trim shall be kept clear of debris to ensure proper functioning.
Plazas, sidewalks, and parking lots.		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Wash water containing any cleaning agent or degreaser shall be collected and discharged to

		the sanitary sewer and not discharged to a storm drain.
Swimming pools, spas, fountains, and other water features.		The CC&R's shall include prohibitions on swimming pool discharge into the storm drain system.

Section I: Coordinate Submittal with Other Site Plans

Populate Table I-1 below to assist the plan checker in an expeditious review of your project. During construction and at completion, City of Murrieta inspectors will verify the installation of BMPs against the approved plans. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table I-1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
DMA 1 through 7 and 9 through 11	Biofiltration Basin with No Infiltration	Tentative Map sheets 2, 6, 7, 8, 10, and 11
DMA 8	Bioretention Basin	Tentative Map sheet 10
DMA 12	Gravel Trenches along McElwain Road	Tentative Map sheets 12 and 13

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. The Copermittee with jurisdiction over the Project site can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Use Table I-2 to identify other applicable permits that may impact design of the site. If yes is answered to any of the items below, the Copermittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Table I-2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☒ Y	☐ N
State Water Resources Control Board, Clean Water Act Section 401 Water Quality Certification	☒ Y	☐ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☒ Y	☐ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☒ Y	☐ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☒ Y	☐ N
Other *(please list in the space below as required)*	☐ Y	☒ N

Section J: Operation, Maintenance and Funding

The Copermittee with jurisdiction over the Project site will periodically verify that BMPs on your Project are maintained and continue to operate as designed. To make this possible, the Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement maintenance of BMPs in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized Operations and Maintenance or inspections but will require typical landscape maintenance as noted in Chapter 5, in the SMR WQMP. Include a brief description of typical landscape maintenance for these areas.

The Copermittee with jurisdiction over the Project site will also require that you prepare and submit a detailed BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a BMP Operation and Maintenance Plan are in Chapter 5 of the SMR WQMP.

Maintenance Mechanism: BMPs will be privately maintained initially by the developer and ultimately by the HOA.

Will the proposed BMPs be maintained by a Homeowners' Association (HOA) or Property Owners Association (POA)?

☒ Y ☐ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Section K: Acronyms, Abbreviations and Definitions

Regional MS4 Permit	Order No. R9-2013-0001 as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100 an NPDES Permit issued by the San Diego Regional Water Quality Control Board.
Applicant	Public or private entity seeking the discretionary approval of new or replaced improvements from the Copermittee with jurisdiction over the project site. The Applicant has overall responsibility for the implementation and the approval of a Priority Development Project. The WQMP uses consistently the term "user" to refer to the applicant such as developer or project proponent. The WQMP employs also the designation "user" to identify the Registered Professional Civil Engineer responsible for submitting the Project-Specific WQMP, and designing the required BMPs.
Best Management Practice (BMP)	Defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In the case of municipal storm water permits, BMPs are typically used in place of numeric effluent limits.
BMP Fact Sheets	BMP Fact Sheets are available in the LID BMP Design Handbook. Individual BMP Fact Sheets include sitting considerations, and design and sizing guidelines for seven types of structural BMPs (infiltration basin, infiltration trench, permeable pavement, harvest-and-use, bioretention, extended detention basin, and sand filter).
California Stormwater Quality Association (CASQA)	Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com.
Conventional Treatment Control BMP	A type of BMP that provides treatment of stormwater runoff. Conventional treatment control BMPs, while designed to treat particular Pollutants, typically do not provide the same level of volume reduction as LID BMPs, and commonly require more specialized maintenance than LID BMPs. As such, the Regional MS4 Permit and this WQMP require the use of LID BMPs wherever feasible, before Conventional Treatment BMPs can be considered or implemented.
Copermittees	The Regional MS4 Permit identifies the Cities of Murrieta, Temecula, and Wildomar, the County, and the District, as Copermittees for the SMR.
County	The abbreviation refers to the County of Riverside in this document.

CEQA	California Environmental Quality Act - a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.
CIMIS	California Irrigation Management Information System - an integrated network of 118 automated active weather stations all over California managed by the California Department of Water Resources.
CWA	Clean Water Act - is the primary federal law governing water pollution. Passed in 1972, the CWA established the goals of eliminating releases of high amounts of toxic substances into water, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983. CWA Section 402(p) is the federal statute requiring NPDES permits for discharges from MS4s.
CWA Section 303(d) Waterbody	Impaired water in which water quality does not meet applicable water quality standards and/or is not expected to meet water quality standards, even after the application of technology based pollution controls required by the CWA. The discharge of urban runoff to these water bodies by the Copermittees is significant because these discharges can cause or contribute to violations of applicable water quality standards.
Design Storm	The Regional MS4 Permit has established the 85th percentile, 24-hour storm event as the "Design Storm". The applicant may refer to Exhibit A to identify the applicable Design Storm Depth (D85) to the project.
DCV	Design Capture Volume (DCV) is the volume of runoff produced from the Design Storm to be mitigated through LID Retention BMPs, Other LID BMPs and Volume Based Conventional Treatment BMPs, as appropriate.
Design Flow Rate	The design flow rate represents the minimum flow rate capacity that flow-based conventional treatment control BMPs should treat to the MEP, when considered.
DCIA	Directly Connected Impervious Areas - those impervious areas that are hydraulically connected to the MS4 (i.e. street curbs, catch basins, storm drains, etc.) and thence to the structural BMP without flowing over pervious areas.
Discretionary Approval	A decision in which a Copermittee uses its judgment in deciding whether and how to carry out or approve a project.
District	Riverside County Flood Control and Water Conservation District.
DMA	A Drainage Management Area - a delineated portion of a project site that is hydraulically connected to a common structural BMP or conveyance point. The Applicant may refer to Section 3.3 for further guidelines on how to delineate DMAs.

Drawdown Time	Refers to the amount of time the design volume takes to pass through the BMP. The specified or incorporated drawdown times are to ensure that adequate contact or detention time has occurred for treatment, while not creating vector or other nuisance issues. It is important to abide by the drawdown time requirements stated in the fact sheet for each specific BMP.
Effective Area	Area which 1) is suitable for a BMP (for example, if infiltration is potentially feasible for the site based on infeasibility criteria, infiltration must be allowed over this area) and 2) receives runoff from impervious areas.
ESA	An Environmental Sensitive Area (ESA) designates an area "in which plants or animals life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments". (Reference: California Public Resources Code § 30107.5).
ET	Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is also an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity
FAR	The Floor Area Ratio (FAR) is the total square feet of a building divided by the total square feet of the lot the building is located on.
Flow-Based BMP	Flow-based BMPs are conventional treatment control BMPs that are sized to treat the design flow rate.
FPPP	Facility Pollution Prevention Plan
HCOC	Hydrologic Condition of Concern - Exists when the alteration of a site's hydrologic regime caused by development would cause significant impacts on downstream channels and aquatic habitats, alone or in conjunction with impacts of other projects.
HMP	Hydromodification Management Plan – Plan defining Performance Standards for PDPs to manage increases in runoff discharge rates and durations.
Hydrologic Control BMP	BMP to mitigate the increases in runoff discharge rates and durations and meet the Performance Standards set forth in the HMP.
HSG	Hydrologic Soil Groups – soil classification to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs are A (very low runoff potential/high infiltration rate), B, C, and D (high runoff potential/very low infiltration rate)

Hydromodification	The Regional MS4 Permit identifies that increased volume, velocity, frequency and discharge duration of storm water runoff from developed areas has the potential to greatly accelerate downstream erosion, impair stream habitat in natural drainages, and negatively impact beneficial uses.
JRMP	A separate Jurisdictional Runoff Management Plan (JRMP) has been developed by each Copermittee and identifies the local programs and activities that the Copermittee is implementing to meet the Regional MS4 Permit requirements.
LID	Low Impact Development (LID) is a site design strategy with a goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques. LID site design BMPs help preserve and restore the natural hydrologic cycle of the site, allowing for filtration and infiltration which can greatly reduce the volume, peak flow rate, velocity, and pollutant loads of storm water runoff.
LID BMP	A type of stormwater BMP that is based upon Low Impact Development concepts. LID BMPs not only provide highly effective treatment of stormwater runoff, but also yield potentially significant reductions in runoff volume – helping to mimic the pre-project hydrologic regime, and also require less ongoing maintenance than Treatment Control BMPs. The applicant may refer to Chapter 2.
LID BMP Design Handbook	The LID BMP Design Handbook was developed by the Copermittees to provide guidance for the planning, design and maintenance of LID BMPs which may be used to mitigate the water quality impacts of PDPs within the County.
LID Bioretention BMP	LID Bioretention BMPs are bioretention areas are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration, and provide for pollutant removal (e.g., filtration, adsorption, nutrient uptake) by filtering stormwater through the vegetation and soils. In bioretention areas, pore spaces and organic material in the soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants use soil moisture and promote the drying of the soil through transpiration. The Regional MS4 Permit defines "retain" as to keep or hold in a particular place, condition, or position without discharge to surface waters.
LID Biofiltration BMP	BMPs that reduce stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration, and other biological and chemical processes. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, and collected through an underdrain.

LID Harvest and Reuse BMP	BMPs used to facilitate capturing Stormwater Runoff for later use without negatively impacting downstream water rights or other Beneficial Uses.
LID Infiltration BMP	BMPs to reduce stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Typical LID Infiltration BMPs include infiltration basins, infiltration trenches and pervious pavements.
LID Retention BMP	BMPs to ensure full onsite retention without runoff of the DCV such as infiltration basins, bioretention, chambers, trenches, permeable pavement and pavers, harvest and reuse.
LID Principles	Site design concepts that prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
MEP	Maximum Extent Practicable - standard established by the 1987 amendments to the CWA for the reduction of Pollutant discharges from MS4s. Refer to Attachment C of the Regional MS4 Permit for a complete definition of MEP.
MF	Multi-family – zoning classification for parcels having 2 or more living residential units.
MS4	Municipal Separate Storm Sewer System (MS4) is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designated or used for collecting or conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.26.
New Development Project	Defined by the Regional MS4 Permit as 'Priority Development Projects' if the project, or a component of the project meets the categories and thresholds described in Section 1.1.1.
NPDES	National Pollution Discharge Elimination System - Federal program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 318, 402, and 405 of the CWA.
NRCS	Natural Resources Conservation Service

PDP	Priority Development Project - Includes New Development and Redevelopment project categories listed in Provision E.3.b of the Regional MS4 Permit.
Priority Pollutants of Concern	Pollutants expected to be present on the project site and for which a downstream water body is also listed as Impaired under the CWA Section 303(d) list or by a TMDL.
Project-Specific WQMP	A plan specifying and documenting permanent LID Principles and Stormwater BMPs to control post-construction Pollutants and stormwater runoff for the life of the PDP, and the plans for operation and maintenance of those BMPs for the life of the project.
Receiving Waters	Waters of the United States.
Redevelopment Project	The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing existing roadways; new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair. Project that meets the criteria described in Section 1.
Runoff Fund	Runoff Funds have not been established by the Copermittees and are not available to the Applicant. If established, a Runoff Fund will develop regional mitigation projects where PDPs will be able to buy mitigation credits if it is determined that implementing onsite controls is infeasible.
San Diego Regional Board	San Diego Regional Water Quality Control Board - The term "Regional Board", as defined in Water Code section 13050(b), is intended to refer to the California Regional Water Quality Control Board for the San Diego Region as specified in Water Code Section 13200. State agency responsible for managing and regulating water quality in the SMR.
SCCWRP	Southern California Coastal Water Research Project
Site Design BMP	Site design BMPs prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
SF	Parcels with a zoning classification for a single residential unit.
SMC	Southern California Stormwater Monitoring Coalition
SMR	The Santa Margarita Region (SMR) represents the portion of the Santa Margarita Watershed that is included within the County of Riverside.

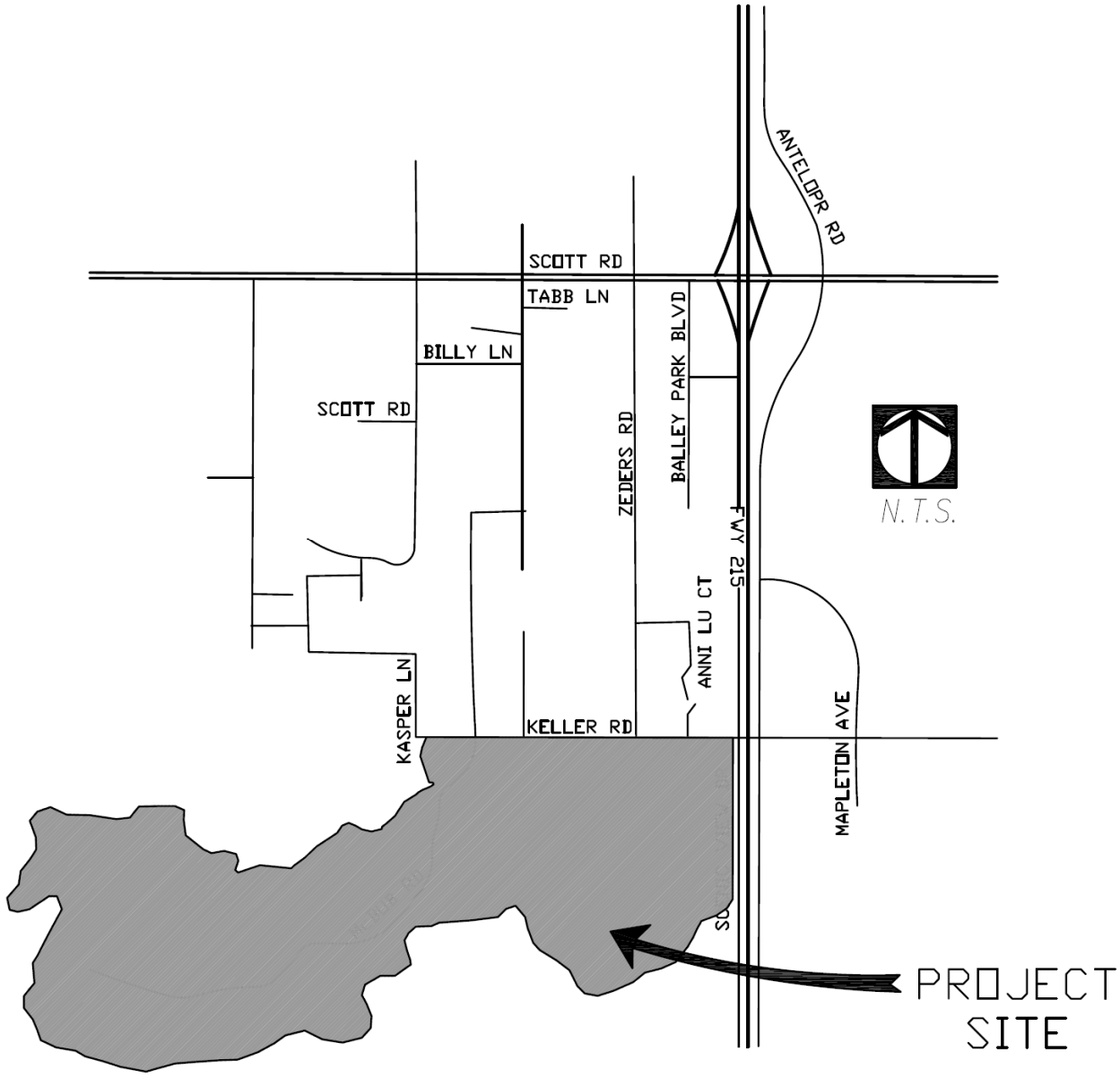
Source Control BMP	Source Control BMPs land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between Pollutants and runoff.
Structural BMP	Structures designed to remove pollutants from stormwater runoff and mitigate hydromodification impacts.
SWPPP	Storm Water Pollution Prevention Plan
Tentative Tract Map	Tentative Tract Maps are required for all subdivision creating five (5) or more parcels, five (5) or more condominiums as defined in Section 783 of the California Civil Code, a community apartment project containing five (5) or more parcels, or for the conversion of a dwelling to a stock cooperative containing five (5) or more dwelling units.
TMDL	Total Maximum Daily Load - the maximum amount of a Pollutant that can be discharged into a waterbody from all sources (point and non-point) and still maintain Water Quality Standards. Under CWA Section 303(d), TMDLs must be developed for all waterbodies that do not meet Water Quality Standards after application of technology-based controls.
USEPA	United States Environmental Protection Agency
Volume-Based BMP	Volume-Based BMPs applies to BMPs where the primary mode of pollutant removal depends upon the volumetric capacity such as detention, retention, and infiltration systems.
WQMP	Water Quality Management Plan
Wet Season	The Regional MS4 Permit defines the wet season from October 1 through April 30.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

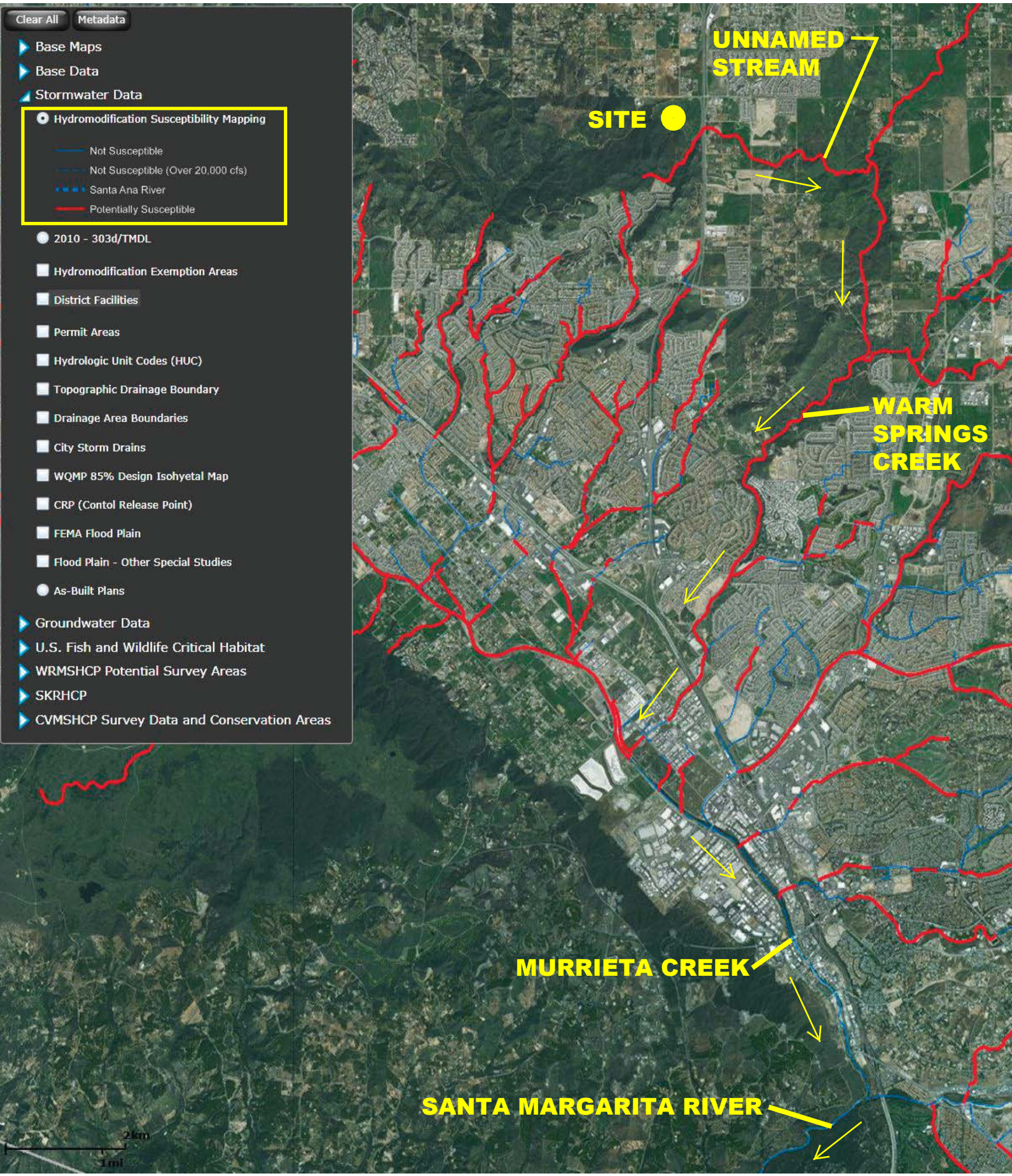
Complete the checklist below to verify all exhibits and components are included in the Project-Specific WQMP. Refer Section 4 of the SMR WQMP and Section D of this Template.

Map and Site Plan Checklist
Indicate all Maps and Site Plans are included in your Project-Specific WQMP by checking the boxes below.
☒ Vicinity and Location Map
☐ Existing Site Map (unless exiting conditions are included in WQMP Site Plan) – included on WQMP Site Plan.
☒ WQMP Site Plan
☒ Parcel Boundary and Project Footprint
☒ Existing and Proposed Topography
☒ Drainage Management Areas (DMAs)
☒ Proposed Structural Best Management Practices (BMPs)
☒ Drainage Paths
☒ Drainage infrastructure, inlets, overflows
☒ Source Control BMPs
☒ Site Design BMPs
☐ Buildings, Roof Lines, Downspouts – building plans will be developed at final engineering
☒ Impervious Surfaces
☒ Pervious Surfaces (i.e. Landscaping)
☒ Standard Labeling

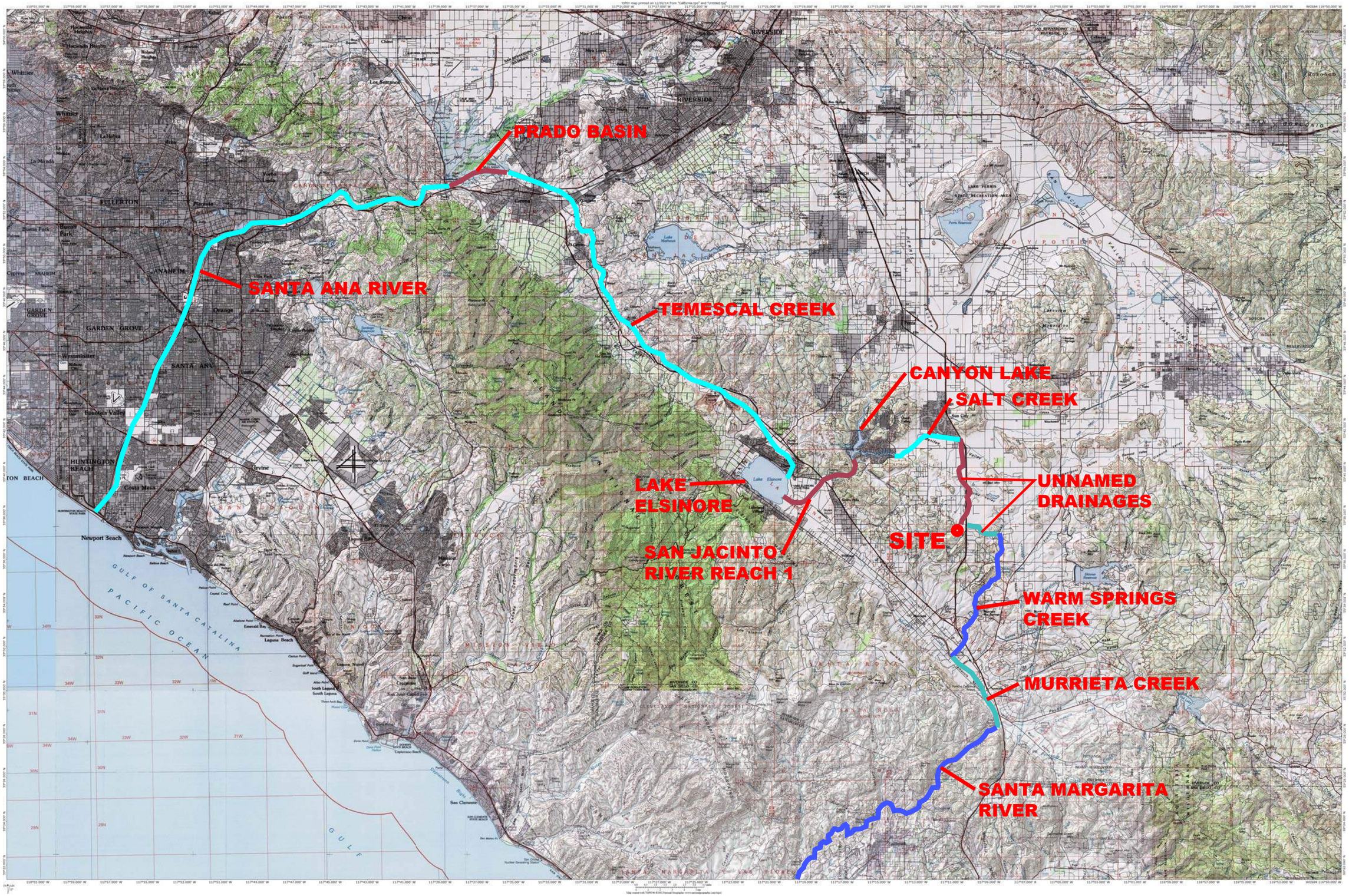


VICINITY AND LOCATION MAP

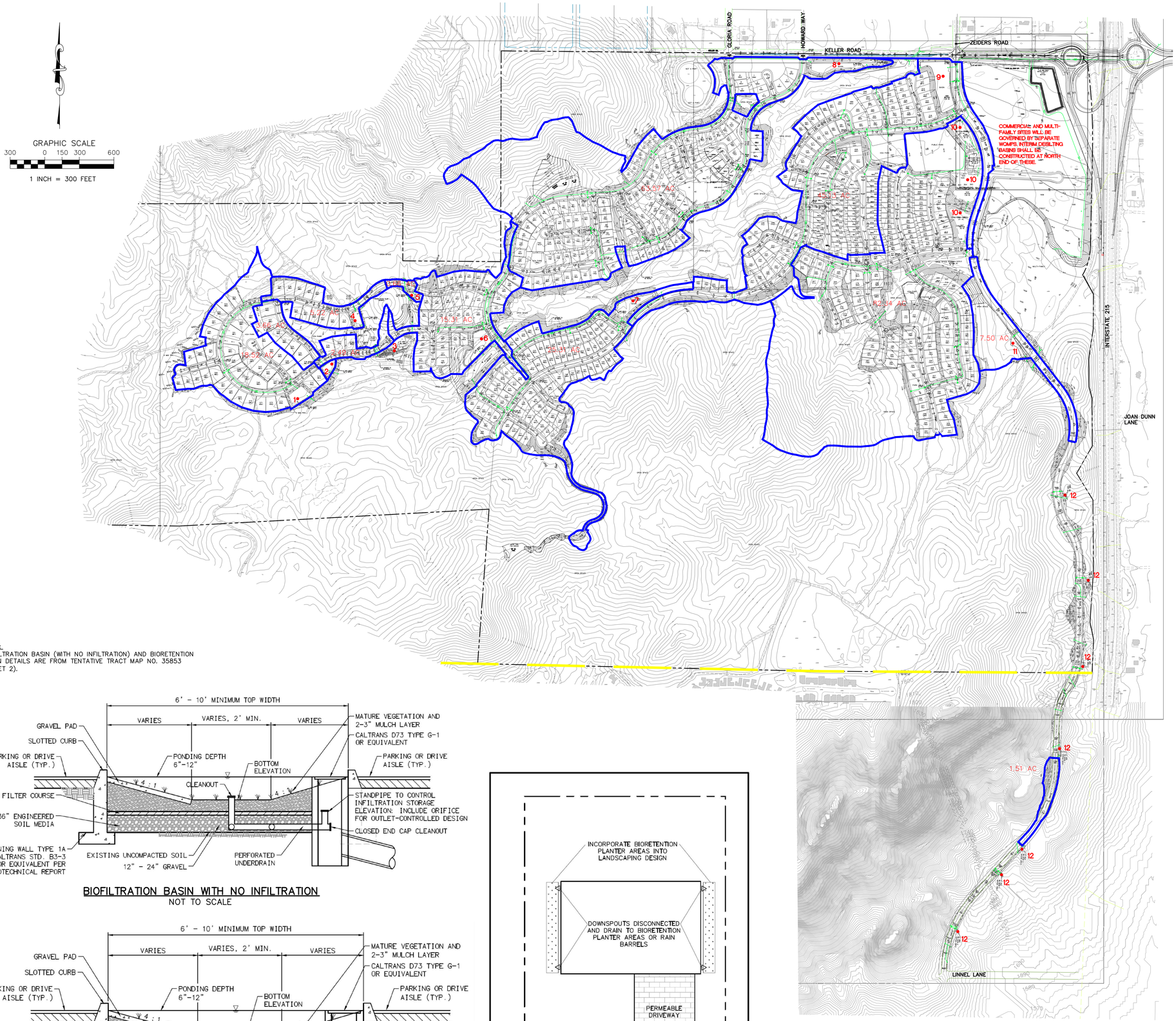
MAPPING FROM STORMWATER & WATER CONSERVATION TRACKING TOOL



HYDROMODIFICATION SUSCEPTIBILITY OF RECEIVING WATERS



RECEIVING WATERS MAP



LEGEND:

- DRAINAGE BASIN BOUNDARY TRIBUTARY TO BIOFILTRATION AND BIORETENTION BASINS
- PROPOSED PUBLIC DRAINAGE FACILITY
- ● 1 TO 11 — BIOFILTRATION BASIN WITH NO INFILTRATION, OR BIORETENTION BASIN (BMP 8)
- ● 12 — GRAVEL TRENCH
- 3.62 AC — DRAINAGE BASIN AREA
- PROPOSED CATCH BASIN WITH STENCILING AND FILTER
- EXISTING CALTRANS STORM DRAIN
- EXISTING CALTRANS DRAINAGE DITCH
- PROPERTY BOUNDARY
- CITY/COUNTY BOUNDARY (CITY OF MURRIETA IS SOUTH OF BOUNDARY)

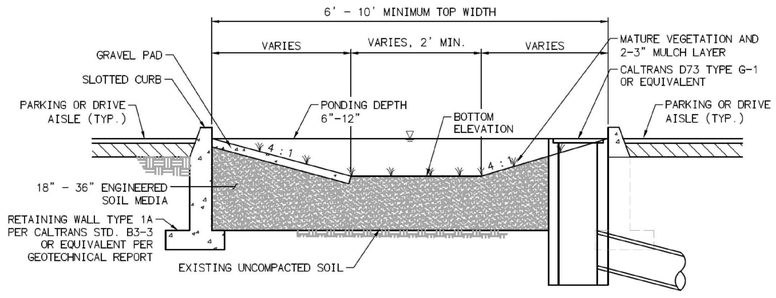
NOTES:
ALL PROPOSED CATCH BASINS TO BE STENCILED. THE PROJECT PROPOSES 547 SINGLE–FAMILY LOTS. GRAVEL TRENCHES OR BIORETENTION BASINS WILL BE USED ALONG KELLER ROAD AND THE NORTHERLY PORTION OF MCELWAIN ROAD FOR TREATMENT CONTROL OF THE HALF–STREET IMPROVMENTS.

A SERIES OF GRAVEL TRENCHES WILL BE INSTALLED ALONG THE SOUTHERLY EXTENSION OF MCELWAIN ROAD (LABELED WITH 12). THESE AREAS ARE BEING DESIGNED SO THE ADJACENT HILLSIDE RUNOFF IS CONVEYED BY CULVERTS THROUGH MCELWAIN ROAD TO AVOID COMMINGLING WITH THE STREEET RUNOFF. FOR THE PRELIMINARY WQMP, ONLY THE LARGEST DRAINAGE BASIN TRIBUTARY TO ONE OF THE GRAVEL TRENCHES IS BEING ANALYZED TO DEMONSTRATE FEASIBILITY.

Structural and Operational Source Control BMPs		
Pollutant Source	**Structural Source Control BMP**	**Operational Source Control BMP**
On-site storm drain inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar where feasible. Catch basin markers may be available from the RCFCWCD. Call 951-955-1200 to verify.	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Need for future indoor & structural pest control	Building design shall exclude openings that allow pest and rodent entry. Buildings/homes will be slab on grade, which will avoid pests in crawl space.	Integrated Pest Management information shall be provided to owners, lessees, and operators.
Landscape / Outdoor Pesticide Use	Existing native trees, shrubs, and ground cover shall be preserved beyond the project footprint. Landscaping shall be selected to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. When landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Use pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. See applicable operational BMPs in "What you should know . . . for Landscape and Gardening" on rcwatershed.org. Provide Integrated Pest Management information to new owners, lessees and operators.
Refuse areas	Refuse containers (dumpsters) will be stored in gated and fenced enclosures. Dumpsters shall have covers to prevent rain intrusion. Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	An adequate number of receptacles (dumpsters and individual trash containers) will be provided for the facilities. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered or under a covered area. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in Appendix 10 or the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer or per architectural guidelines.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in Appendix 10 or the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Condensate drain lines Roofing, gutters, and trim	Condensate drain lines will be designed on the architectural plans and may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Roof drain runoff will ultimately discharge to w water quality basin for treatment.	Condensate lines shall be maintained in accordance with manufacturers and local regulations. Roofing, gutters, and trim shall be kept clear of debris to ensure proper functioning.
Plazas, sidewalks, and parking lots.		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Wash water containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.
Swimming pools, spas, fountains, and other water features.		The CC&R's shall include prohibitions on swimming pool discharge into the storm drain system.

NOTE:
BIOFILTRATION BASIN (WITH NO INFILTRATION) AND BIORETENTION BASIN DETAILS ARE FROM TENTATIVE TRACT MAP NO. 35853 (SHEET 2).

BIOFILTRATION BASIN WITH NO INFILTRATION
NOT TO SCALE



BIORETENTION BASIN
NOT TO SCALE

NOTE:
THIS EXHIBIT SHOWS POTENTIAL BMPs THAT CAN BE CONSIDERED FOR SINGLE–FAMILY LOTS.

TYPICAL ON–LOT BMPS
NO SCALE

WQMP SITE PLAN
TRACT 35853

Appendix 2: Construction Plans

Grading and Drainage Plans

Examples of material to provide in Appendix 2 may include but are not limited to the following:

- Site grading plans from the Project's Civil Plan Set,
- Drainage plans showing the exiting condition and proposed drainage system from the project's drainage report,
- Other plan sheets containing elements that impact site grading and drainage.

Refer to Section 4 of the SMR WQMP and Section I of this Template.

Not applicable for Preliminary WQMP (see Tentative Tract Map No. 35853 submitted with WQMP)

Appendix 3: Soils Information

Geotechnical Study, Other Infiltration Testing Data, and/or Other Documentation

Examples of material to provide in Appendix 3 may include but are not limited to the following:

- Geotechnical Study/Report prepared for the project,
- Additional soils testing data (if not included in the Geotechnical Study),
- Exhibits/Maps/Other Documentation of the Hydrologic Soils Groups (HSG)s at the project site.

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections A and D of this Template.

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

December 4, 2018
J.N.: 2662.00

Mr. Sohail Bokhari
Pulte Group
27101 Puerta Real, Suite 300
Mission Viejo, California 92691

Subject: **Geotechnical Response to Comments Regarding the Preliminary Storm Water Quality Management Plan (WQMP), Tentative Tract Map No. 35853, Murrieta Hills, Southwest of Keller Road and Interstate 215, Murrieta, California.**

Reference: Preliminary Infiltration Study for Proposed Water Quality Improvements, Tentative Tract Map No. 35853, Murrieta Hills, Southwest of Keller Road and Interstate 215, Murrieta, California, prepared by Albus-Keefe & Associates, Inc., dated January 9, 2018 (J.N. 2662.00).

WQMP Site Plan, Tract 35853, undated.

Tentative Tract Map No. 35853, City of Murrieta, California, prepared by Michael Baker International, undated.

Dear Mr. Bokhari,

Pursuant to your request, ***Albus-Keefe & Associates, Inc***., is providing you our response to the engineering comments made by the city of Murrieta regarding the preliminary WQMP. These comments were contained in the city of Murrieta Attachment E Engineering Comments, dated October 16, 2018, that were provided to us by Mr. Wayne Chang of Chang Consultants. Based on our review of their comments there are two main items that need responses:

- Converting Percolation Test Results to an Infiltration Rate
- The use of partial infiltration for selected basins

Converting Percolation Test Results to an Infiltration Rate:

We concur that the field test results were not converted to an infiltration rate via the Porchet Method. As noted in the above-referenced report, we performed our field testing in general conformance with the constant-head test procedures outlined in the Well Permeameter Method USBR 7300-89. The Well Permeameter Method provides a calculation of permeability (infiltration rate) based on three different type of conditions between the groundwater and the the water level in the test well. We direct your attention to section 2.4 in Appendix A of the Riverside County LID BMP Design Handbook where there is a small discussion of this calculation.

It should be noted that the Porchet Method is applicable to the boring Percolation Test outlined by Riverside County. The Porchet Method, also known as the Inversed Augerhole Method, is specifically used to back calculate the permeability of soil from data obtained from a falling head borehole test method. The Porchet Method is not used for the constant-head test procedures outlined in the Well Permeameter Method (USBR 7300-89) which was used by our firm.

The use of partial infiltration for selected basins:

Percolation testing during our investigation was performed in represented areas of the site in the vicinity of many of the proposed WQMP basins that were potential candidates for onsite infiltration. Basins in proposed fill areas were not considered suitable for onsite infiltration and were generally excluded from testing. The results of our testing indicate that infiltration at the site is only feasible using shallow basins within the areas in proximity to borings B-5 through B-8 (Basin #8 of the WMP Site Plan). All other basins, either based on relatively low permeability test values, proposed grading or underlying geologic conditions, were considered not suitable for onsite infiltration. Partial infiltration was also not considered at the time. However, based on additional testing, partial infiltration may be considered during final engineering for some of the currently proposed bio-filtration basins where infiltration of storm water will not result in adverse geotechnical conditions at the site or surrounding areas. We also noted that the details for the bio-filtration basins do not include an impermeable membrane liner. As such, partial infiltration is expected for some of these bio-filtration basins.

We appreciate this opportunity to be of service to you. If you should have any questions regarding the contents of this report, please do not hesitate to call.

Sincerely,

Albus-Keefe & Associates, Inc.,





Paul Hyun Jin Kim
Associate Engineer
GE 3106

ALBUS-KEEFE & ASSOCIATES, INC
GEOTECHNICAL CONSULTANTS

January 9, 2018
J.N.: 2662.00

Mr. Sohail Bokhari
Pulte Group
27101 Puerta Real, Suite 300
Mission Viejo, California 92691

Subject: **Preliminary Infiltration Study for Proposed Water Quality Improvements, Tentative Tract Map No. 35853, Murrieta Hills, Southwest of Keller Road and Interstate 215, Murrieta, California**

Dear Mr. Bokhari,

Pursuant to your request, ***Albus-Keefe & Associates, Inc***. has completed a geotechnical investigation of the site for preliminary evaluation of the percolation characteristics of the site soils. The scope of this investigation consisted of the following:

- Exploratory drilling, soil sampling and test well installation
- Field percolation testing
- Laboratory testing of selected soil samples
- Engineering analysis of the data
- Preparation of this report

SUMMARY OF FIELD AND LABORATORY WORK

Subsurface Investigation

Subsurface exploration for this investigation was conducted on November 8, 2017 and December 13, 2017. Our exploration consisted of drilling eight (8) exploratory borings throughout the site utilizing a truck-mounted, hollow-stem-auger drill rig. Representatives of *Albus-Keefe & Associates, Inc*. logged the exploratory excavation. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented in the Exploration Logs in Appendix A. The approximate locations of the exploratory excavations completed by this firm are shown on the enclosed Geotechnical Map, Plate 1.

Bulk and Standard Penetration Test (SPT) samples were obtained at selected depths within the exploratory borings for subsequent laboratory testing. SPT samples were obtained from the boring using a standard, unlined SPT soil sampler. During each sampling interval, the sampler was driven 12 or 18 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses. Borings were backfilled with auger cuttings upon completion of sampling.

Upon completion of drilling, 3-inch-diameter casing was installed in the borings or in secondary drill holes adjacent the borings for subsequent percolation testing. Well screens were installed from near the bottom of the borings to ground surface. The annular space of the well screen sections were filled with sand for depths covering the extent of our testing. The remaining annular space was then backfilled with native soils.

Percolation Testing

Percolation testing was performed on November 8, 2017 and December 13, 2017, in general conformance with the constant-head test procedures outlined in the referenced Well Permeameter Method (USBR 7300-89). A water hose attached to a water tank on site was connected to an inline flow meter to measure the water flow. The flow meter is capable of measuring flow rates up to 10 gallons per minute and as low as 0.1 gallons per minute. A valve was connected in line with the flow meter to control the flow rate. A filling hose was used to connect the flow meter and the test wells. Water was introduced by the filling hose near the bottom of the test wells. A water level meter with 1/100-foot divisions was used to measure the depths to water surface from the top of well casings.

Flow to each well was terminated upon either completion of testing of all the pre-determined water levels or the flow rate reached the maximum capacity of the flow meter.

Laboratory Testing

Selected soil samples of representative earth materials were tested to assist in the formulation of conclusions and recommendations presented in this report. Tests consisted of grain-size analysis.

ANALYSIS OF DATA

Subsurface Conditions

The site is underlain by granitic bedrock with minor amounts of topsoil. Within the drainage courses and in the lower portion of the site, the bedrock is also overlain by minor amounts of alluvial soils. The granitic bedrock is generally granular in nature, dense, and has varying degrees of weathering. The topsoil and alluvial soils are generally comprised of sandy silt. No groundwater was encountered in any of our borings.

Percolation Data

Analyses were performed to evaluate permeability using the flow rate obtained at the end of the constant-head stage of field percolation testing. These analyses were performed in accordance with the procedures provided in the referenced USBR 7300-89. The procedure essentially uses a closed-form solution to the percolation out of a small-diameter well. Using the USBR method, we calculated a composite permeability value for various head conditions maintained in the wells. The results are summarized in Table 1 below. All tests were performed within the granitic rock unit.

TABLE 1
Summary of Back-Calculated Permeability Coefficient

Location	Total Depth of Well (ft)	Depth to Water in Well (ft)	Height of Water in Well (ft)	Static Flow Rate (gal./min.)	Estimated Permeability, k_s (in/hr.)
B-1	16.8	6.2	10.6	0.09	0.04
P-2	9.8	2.4	7.4	0.07	0.05
B-3	24.2	19.2	5.0	0.06	0.09
B-4	30.8	26.0	4.8	0.14	0.22
B-5	19.2	14.2	5.0	1.0	1.5
B-6	25.0	20.0	5.0	2.0	3.0
B-7	20.0	15.0	5.0	0.8	1.2
B-8	9.0	4.0	5.0	2.0	3.0

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our work, infiltration at the site is feasible using shallow basins within the areas in proximity to borings B-5 through B-8. The locations of these borings are indicated on the attached Exploration Location Map, Plate 1. Results at other locations indicate that infiltration is not feasible due to relatively low permeability values. From our work, we recommend a preliminary "measured" infiltration rate of 1.5 inches/hour in basins proposed in proximity to borings B-5 through B-8. An appropriate factor of safety should be applied to this "measured" value to obtain the "design" infiltration rate.

Infiltration of storm water is not anticipated to result in adverse geotechnical conditions at the site or surrounding sites. The site is not subject to effects of liquefaction and as such, infiltration is not anticipated to increase risks associated with liquefaction. Site soils exhibit Very Low expansion characteristics and as such, increases in moisture due to infiltration is not anticipated to cause adverse swelling. Although one of the basins in the area suitable for infiltration is located adjacent a descending slope, the slope gradients are generally 4:1 (H:V) or flatter and as such, are not anticipated to be adversely influenced by nearby infiltration. Therefore, infiltration is not anticipated to result in instability provided it is limited to the proximity of borings B-5 through B-8. The site is not underlain by soils with hydrocollapse potential and as such, infiltration is not anticipated to cause adverse effects due to soil collapse.

Infiltration should occur into the granitic bedrock. The easterly basin of the two proposed basins within the area suitable for infiltration will require up to about 4 feet of fill to achieve currently proposed grade. The bottom elevation of this basin will require lowering by about 5 feet to avoid the placement of fill in the bottom of the basin and expose granitic bedrock. The westerly basin as proposed is anticipated to expose granitic rock at the currently proposed grades.

Once final grading plans are developed, this office should review the plans to confirm if the preliminary design values remain applicable and provide any supplemental recommendations deemed appropriate.

LIMITATIONS

This report is based on the geotechnical data as described herein. The materials encountered in our boring excavations and utilized in our laboratory testing for this investigation are believed representative of the project area, and the conclusions and recommendations contained in this report are presented on that basis. However, soil and bedrock materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observations by a geotechnical consultant during the construction phase of the storm water infiltration systems are essential to confirming the basis of this report.

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty.

This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein.

This report has been prepared for the exclusive use of **Pulte Group** to assist the project consultants in the design of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This report is subject to review by the controlling governmental agency.

We appreciate this opportunity to be of service to you. If you should have any questions regarding the contents of this report, please do not hesitate to call.

Sincerely,

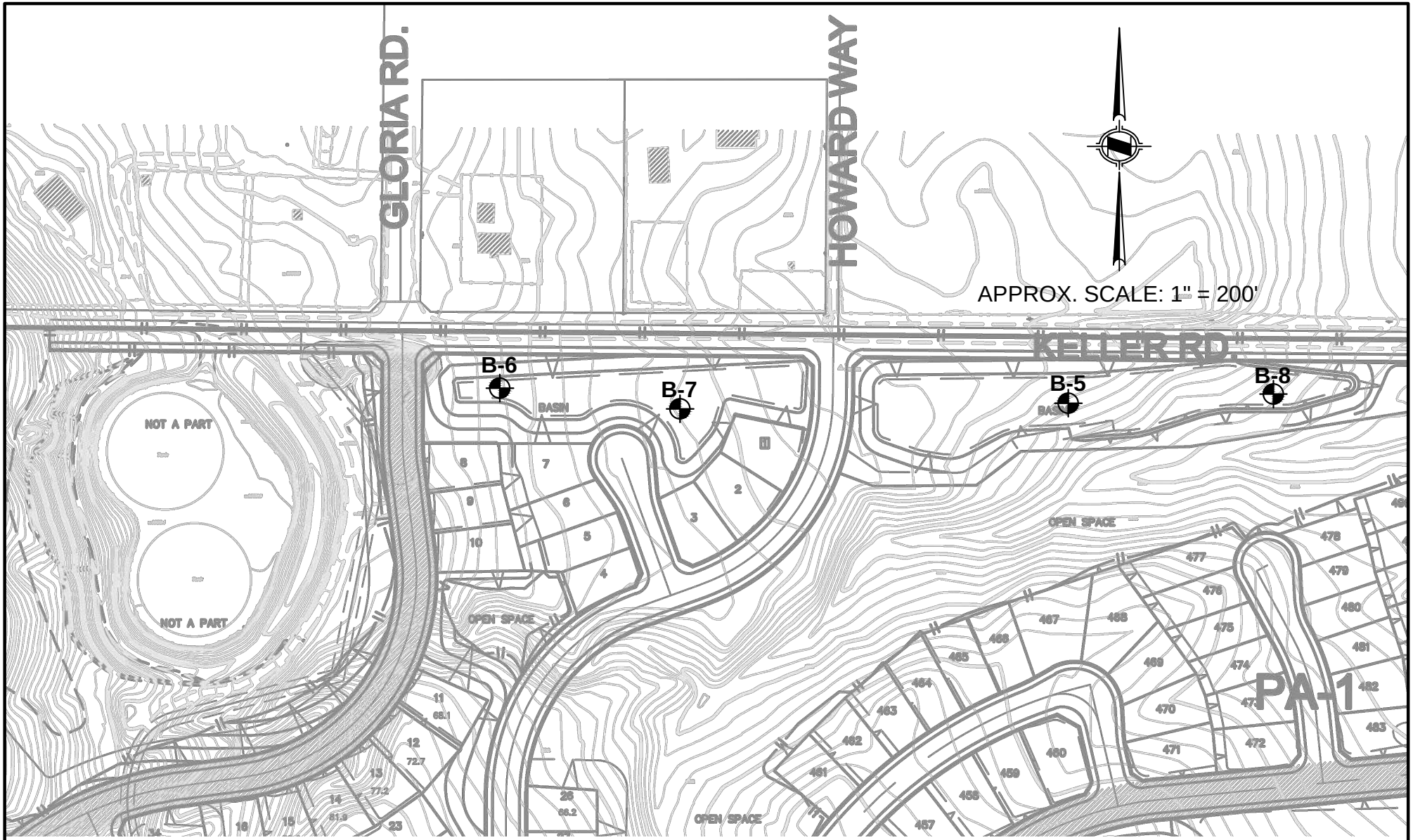
ALBUS-KEEFE & ASSOCIATES, INC.





David E. Albus
Principal Engineer
G.E. 2455

Enclosure:
Plate 1- Exploration Location Map



EXPLANATION

(Locations Approximate)

- Exploratory Boring and Percolation Test Well

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

EXPLORATION LOCATION MAP

Job No.: 2662.00	Date: 01/09/18	Plate: 1

UPDATE GEOTECHNICAL REPORT
TENTATIVE TRACT MAP NO. 35853
MURRIETA HILLS SPECIFIC PLAN
SOUTHWEST OF KELLER ROAD AND I-215
MURRIETA, CALIFORNIA

Prepared for

PULTE/BP MURRIETA HILLS, LLC

550 Laguna Drive, Suite B
Carlsbad, California 92008

Project No. 10642.001

March 21, 2014



Leighton and Associates, Inc.

A LEIGHTON GROUP COMPANY

EXCERPTS FROM SOILS REPORT

3.0 SUMMARY OF GEOTECHNICAL FINDINGS

3.1 Regional Geologic Setting

The subject property is located within a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. This province is characterized by steep, elongated ranges and valleys that generally trend northwestward. Tectonic activity along the numerous faults in the region has created the geomorphology present today.

Specifically, the property is situated in the southern portion of the Perris Block, a stable, eroded mass of Cretaceous and older crystalline and metamorphic rock. Thin sedimentary, metamorphic and volcanic units locally mantle the bedrock with alluvial deposits filling in the lower valley and drainage areas. The Perris Block is bounded by the San Jacinto fault zone to the northeast, the Elsinore fault zone to the southwest, the Cucamonga fault zone to the northwest and the poorly-defined northern boundary of the Temecula basin to the southeast. The Temecula segment of the active Elsinore Fault Zone is approximately 5 miles to the southwest of the site.

The subject site is located within the Paloma Valley ring complex, (Figure 2) which consists of a granodiorite ring dike and numerous younger pegmatitic ring dikes and stringers emplaced into the older gabbro (Morton, 2006).

3.2 Site Geologic Units

Our field observations and review of pertinent literature (see References) indicate that subsurface materials within the site are composed of undocumented artificial fill, surficial topsoil/colluvium, younger and older alluvium and granitic bedrock (see Plate 1) as further described below.

3.2.1 Undocumented Artificial Fill (Afu)

Undocumented artificial fill is observed in isolated areas, primarily in the central portion of the site. The fill is associated with dirt roadways and former building pads. The undocumented artificial fill generally consists of silty sand with scattered debris. All undocumented artificial fill is considered to be unsuitable for the support of additional fills or structural improvements.

3.2.2 Surficial Soils (not a mapped unit)

Deposits of topsoil and colluvium are present throughout the site. These deposits typically extend to 2 to 3 feet, but they can be locally thicker. As encountered in our test pits, colluvial soils in excess of 14 feet thick were locally encountered. These soils consist of relatively loose sand silt and silty sand and are considered to be unsuitable for the support of additional fills or structural improvements.

3.2.3 Young Alluvium (Qal)

Deposits of unconsolidated Holocene-age alluvium are present in the central drainage channel and in the relatively low-lying northeastern corner of the site. The alluvial deposits are typically less than 5 feet, but they may locally be up to approximately 15 feet in thickness. The young alluvium is considered to be unsuitable for the support of additional fills or structural improvements.

3.2.4 Older Alluvium (Qalo)

Local deposits of older (Late to Middle Pleistocene) alluvial deposits overlie the bedrock along the central drainage channel and in north-trending valley areas in the western portion of the site. The older alluvial deposits are typically thin and discontinuous, but may be locally up to approximately 15 feet in thickness. The older alluvium generally consists of medium dense to dense silty sand and contains some roots and gravels/cobbles. It is anticipated that most of the older alluvium will be unsuitable for support of additional fills or structural improvements in its current condition.

3.2.5 Granitic Bedrock (Kgr)

The Cretaceous-age granitic bedrock within the site includes gabbro, granodiorite, and granophyre (Morton, 2006). The granitic rock contains numerous planar dikes and sills of quartz and granite. All of the granitic units, described in the following paragraphs, are considered suitable for the support of compacted fills and structural improvements. When excavated, these units will generate silty sand with varying percentages and sizes of gravel, and boulders.

The bedrock in the majority of the site consists of gabbro varying from greenish-gray to dark gray in color and is typically fine-grained. Fracture and joint spacing are close in the gabbro, and weathering is moderate to deep. In general, the gabbro may be somewhat more rippable than the other onsite granitic rocks.

Granodiorite is exposed in the hills of the south-central portion of the site. The granodiorite is light gray in color, generally massive, fine- to medium-grained, and slightly to deeply weathered.

Granophyre, a fine-grained and porphyritic rock, is exposed in the north-central ridges of the site. The granophyre generally is light gray in color, but weathers to form reddish-brown outcrops. Numerous pegmatitic dikes and sills cut through the granophyre.

3.3 Soil Compressibility

Compressibility characteristics of the onsite soils were interpreted from measured blow counts, in-situ dry density and moisture, consolidation tests, and field observations during trenching. The surficial soils, young alluvium, and weathered older alluvium are considered relatively compressible and unsuitable for the support of additional fills or settlement-sensitive improvements. The mitigation for such geologic hazard is presented in Section 5 of this report.

3.4 Expansive Soils

Based on our previous explorations and on our experience with similar materials in the vicinity of the subject site, we anticipate the onsite soils will generally have a very low to low expansion index (Expansion Index ≤ 50 per ASTM D4829). Localized deposits of medium or higher expansive soils may be encountered during grading surficial soils and alluvium. Additional testing should be performed before or during grading to confirm the expansion potential of the soils. The mitigation for such geologic hazard is presented in Section 5.

3.5 Surface Water and Groundwater

Surface water is intermittently present in the central drainage channel. This flow should be expected to fluctuate seasonally and as a result of future irrigation run-off within the site. No other significant surface water features were observed during our investigation.

Groundwater was encountered in an abandoned water well located in the east central portion of the site at a depth of 7 feet, and in boring B-5 at a depth of 18 feet (Leighton, 1987b). Groundwater was also encountered at a depth of 6.5 feet in an exploratory fault trench located in the northwest portion of the site (Leighton, 1992). This shallow groundwater is attributed to a bedrock fault that acts as a groundwater barrier. The fractured and jointed bedrock serves as the aquifer within the property.

Based on our experience with similar sites in the vicinity of the subject site, we anticipate that perched groundwater will be encountered locally during site grading and underground utility construction, and in cut slope exposures, particularly during and after rainy seasons. Seepage from slope faces may occur after the establishment of routine irrigation. In hardrock areas, surface seepage may develop during periods of prolonged rainfall or irrigation.

3.6 Landslides/Debris Flow and Rockfalls

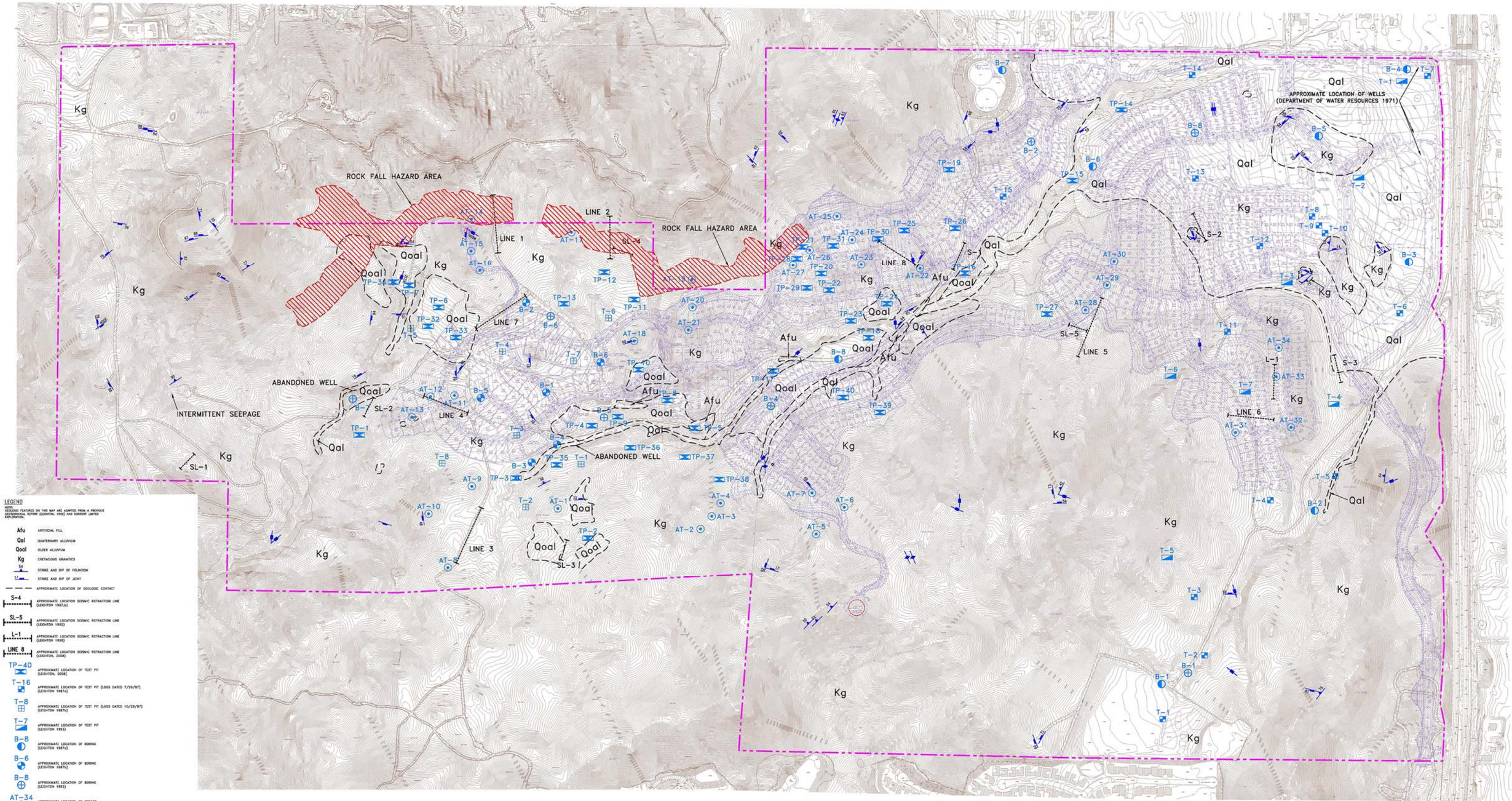
No evidence of on-site landslides/debris flow was observed during our field investigation or in review of California Geologic Survey landslide inventory maps (CGS, 2012). However, the potential for rockfall due to either erosion or seismic ground shaking is considered possible in limited areas along the elevated portions of the site where rock outcrops and exposed boulders are present. Based on our review of the tentative tract map (Pangaea, 2013), we anticipate that exposed boulders will remain on the northern and southern ridges after the completion of grading and will require mitigation. Based on the moderate steepness of the southern hillside and the low density of exposed boulders in that area, we do not anticipate a rockfall hazard along the southern boundary of the development area. The northern ridge has very steep topography and contains a large number of exposed boulders that may be subject to rockfall. The areas of anticipated rockfall hazard are depicted on the Geotechnical Map (Figure 1).

Remedial measures may include removal of boulders, securing boulders, debris catchment devices, and rock fences. If additional loose rocks are exposed during grading, removal, repositioning, embedment or stabilization may be needed to prevent rockfall. Methods to further mitigate the rockfall hazard should be based on further rock stability evaluation and review of rough grading plans.

4.0 CONCLUSIONS

It is our opinion that the proposed development is feasible from a geotechnical standpoint, provided that the recommendations presented herein are incorporated into the design and construction phases of development. The following is a summary of the major geotechnical constraints or opportunities associated with this site:

- The site contains undocumented artificial fills, surficial soils, young alluvium, and weathered older alluvium that are potentially compressible, Thus, these materials should be removed and compacted beneath structural improvements or prior to placing any additional fills.
- The onsite soils are geotechnically suitable for re-use as compacted fill during proposed grading, provided they are relatively free of organic matter, other deleterious material or oversize rock fragments.
- Onsite near surface soils are anticipated to generally be very low to low expansive. Medium or higher expansive soils may be encountered in localized deposits.
- The shallow soils and upper 5 to 20 feet of bedrock in most areas of the site can be excavated with heavy-duty conventional grading equipment in good working condition.
- Nonrippable rock may be encountered in cuts deeper than 5 to 20 feet. A significant amount of oversized rock will be generated from the bedrock cuts.
- Groundwater was encountered in localized areas. Perched groundwater may be encountered locally during grading and utility construction. Seepage may occur after grading.
- Evidence of active faulting was not identified within the subject site.
- The liquefaction potential is considered very low for this site.
- 2:1 cut and fill slopes are proposed to maximum heights of approximately 80 and 35 feet, respectively. Steeper cut slopes (up to 1.5:1) may be acceptable in the less weathered onsite rock provided further field verification and evaluation are performed.
- Cut slopes excavated in younger or older alluvium is considered unstable and should be constructed as a replacement fill as depicted in Appendix D.
- Localized rock fill hazards, exist onsite and mitigation methods should be further evaluated.
- The sites of the two domestic water tanks are generally suitable form a geotechnical point of view. Additional site specific studies of each tank site should be performed when design details are known.



LEGEND

NOTE: GEOLOGIC FEATURES ON THIS MAP ARE ADAPTED FROM A PREVIOUS GEOTECHNICAL REPORT (LEIGHTON, 1992) AND CURRENT LIMITED EXPLORATION.

- Afu — ARTIFICIAL FILL
- Qal — QUATERNARY ALLUVIUM
- Qaol — OLDER ALLUVIUM
- Kg — CRETACEOUS GRANITICS
- 54 — STRIKE AND DIP OF FOLIATION
- STRIKE AND DIP OF JOINT
- APPROXIMATE LOCATION OF GEOLOGIC CONTACT
- S-4 — APPROXIMATE LOCATION SEISMIC REFRACTION LINE (LEIGHTON 1987,a)
- SL-5 — APPROXIMATE LOCATION SEISMIC REFRACTION LINE (LEIGHTON 1992)
- L-1 — APPROXIMATE LOCATION SEISMIC REFRACTION LINE (LEIGHTON 1990)
- LINE 8 — APPROXIMATE LOCATION SEISMIC REFRACTION LINE (LEIGHTON, 2008)
- TP-40 — APPROXIMATE LOCATION OF TEST PIT (LEIGHTON, 2008)
- T-16 — APPROXIMATE LOCATION OF TEST PIT (LOGS DATED 7/20/87) (LEIGHTON 1987a)
- T-8 — APPROXIMATE LOCATION OF TEST PIT (LOGS DATED 10/29/87) (LEIGHTON 1987a)
- T-7 — APPROXIMATE LOCATION OF TEST PIT (LEIGHTON 1992)
- B-8 — APPROXIMATE LOCATION OF BORING (LEIGHTON 1987a)
- B-6 — APPROXIMATE LOCATION OF BORING (LEIGHTON 1987a)
- B-8 — APPROXIMATE LOCATION OF BORING (LEIGHTON 1992)
- AT-34 — APPROXIMATE LOCATION OF ROTARY PERCUSSION TEST HOLES (LEIGHTON, 2008)

PLATE 1

GEOTECHNICAL MAP
MURRIETA HILLS
MURRIETA, CALIFORNIA

Proj: 10642.001	Scale: 1"=200'	Date: 03/2014
Eng/Geol: SIS/RFR	Drafted By: BQT	CP By: BQT

Leighton

EXHIBIT SHOWING MAJORITY OF SITE IS Kg (GRANITIC BEDROCK)

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Examples of material to provide in Appendix 4 may include but are not limited to the following:

- Environmental Site Assessments conducted for the project,
- Other information on Past Site Use that impacts the feasibility of LID BMP implementation on the site.

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections D of this Template.

IWS Environmental, Inc.
Environmental Management & Engineering

March 17, 2014

Mr. Richard Robotta
Benchmark Pacific
550 Laguna Road, Suite B
Carlsbad, California 92008

Subject/Project: Environmental Site Inspection
973 Acres, Vacant Land
South of Keller Road, West of 215 Freeway
Murrieta, California

Dear Mr. Robotta:

In February 2006, our company conducted a Phase I Environmental Assessment (ESA), of the above referenced property. At that time the property consisted of thirty-seven contiguous parcels comprising approximately 1,300 acres. In February of 2008 our firm conducted an additional ESA for 8.8 acres which was situated within the 1,300 acres which was not part of the original assessment. Both ESA's concluded there was a "*low probability the subject site has been significantly impacted by the presence of hazardous materials or waste that would have a negative impact on both health and the environment".* Those assessments only noted a few small containers of paint and oil on the site located next to the rock house on the property which was occupied at that time.

Per your request, on February 14, 2014, our firm conducted a physical inspection of the property once again. The purpose of the inspection was to determine if any hazardous materials have been spilled or discarded on the property that may represent an environmental concern and alter the conclusions and recommendations presented in our two previous ESA's.

On February 26, 2014, we conducted a physical inspection of the subject site via accessible, unimproved roads and trails which intertwine the property. The purpose of this inspection was to identify any hazardous materials that may have been purposely spilled or discarded on the property subsequent to our last inspection of the site. It should be noted, that due to steep terrain and thick vegetation in many portions of the property, the visual inspection was limited to those areas accessible by vehicle or foot traffic. Those areas of the site inaccessible by vehicle or foot were viewed via binoculars for any unusual features or conditions.

Since our last inspection of the property in 2008, only a few minor changes have occurred on the site. The nursery which operated in the middle portion of the site is no longer present, and the rock house located east of the nursery is now vacant. It appears the level of use on the site by off-roaders, specifically motorcycles, has increased slightly. More small trails carved out by off-road motorcycles are now present on the property. IWS noticed a couple of isolated areas of the property that have been used for target practice as spent shell casing from fire arms discharge were observed on the ground.

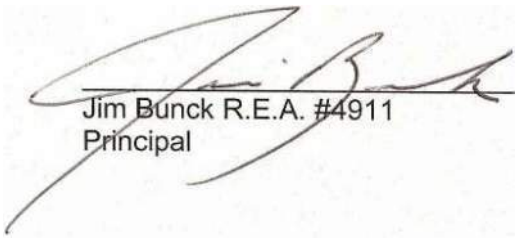
Litter and debris was present on the site, especially in those areas of the property accessible by vehicle. The litter and debris included the usual paper and plastics from food and drink items, along with discarded couches, beds, clothing, and other miscellaneous items. Each area where debris was observed was inspected to determine if the debris included any containers which may contain hazardous materials. Additionally, the inspection included any areas on the site where the soil appeared to be stained by hazardous material (oils, solvents, etc.).

None of areas where litter and debris was observed on the site contained any containers of hazardous materials. There were no areas observed on the property where hazardous materials have been discarded or spilled. Based upon our physical inspection, it appears the site is absent of any significant surface contamination which would represent an environmental concern. Furthermore, since the general land use characteristics of the subject property have not changed (buildings, development, etc.), subsequent to our last inspection of the site, the conclusions and recommendations presented in our previous Phase I's should remain valid at this time.

It should be noted this was a physical inspection of the property only. No database records or regulatory agency files were obtained or reviewed as part of this assessment. This letter report is not intended to be to an "Update" to our previous Phase I's conducted for this site.

If you have any questions concerning this report, please do not hesitate to contact me at 714-893-6140.

Sincerely,



Jim Bunck R.E.A. #4911
Principal

Appendix 5: LID Feasibility Supplemental Information

Information that supports or supplements the determination of LID technical feasibility documented in Section D

Examples of material to provide in Appendix 5 may include but are not limited to the following:

- Technical feasibility criteria for DMAs
- Site specific analysis of technical infeasibility of all LID BMPs (if Alternative Compliance is needed)
- Documentation of Approval criteria for Proprietary Biofiltration BMPs

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections D of this Template.

SUMMARY

Low impact design BMPs are feasible and preliminary sizing has been performed by determining the design capture volume (DCV) as outlined in the Riverside County Flood Control and Water Conservation District's (RCFCWCD) June 2018, *Low Impact Development BMP Design Handbook*. As determined in Section D of this WQMP as well as through infiltration testing, the appropriate BMPs for the majority of site are biofiltration basins with no infiltration. In addition, bioretention can be used for DMA 8 since there is infiltration at this location. Finally, gravel trenches will be used for the McElwain Road extension.

Appendix 6: LID BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation to supplement Section D

Examples of material to provide in Appendix 6 may include but are not limited to the following:

- DCV calculations,
- LID BMP sizing calculations from Exhibit C of the SMR WQMP
- Design details/drawings from manufacturers for proprietary BMPs

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 3.4 of the SMR WQMP and Sections D.4 of this Template.

The preliminary design capture volume (DCV) was determined for each of the proposed biofiltration (with no infiltration) and bioretention BMPs (BMP 1 through 11 as shown on the WQMP Site Plan in Appendix 1) using the Santa Margarita Watershed spreadsheet from the *BMP Design Handbook* (results attached). The procedure is summarized below.

The project site was divided into individual overall drainage areas tributary to each of the bioretention basins identified as 1 through 11 on the Site Plan in Appendix 1. Note that biofiltration basin 10 consists of multiple interconnected basins. In addition, BMP 12 reflects gravel trenches serving the McElwain Road extension. Gravel trenches are selected since they do not require irrigation. Since this is a Preliminary WQMP, the largest tributary area along McElwain Road was used to verify feasibility of gravel trenches for the roadway. During final engineering, an analysis shall be performed for each individual gravel trench along McElwain Road.

Each overall drainage area was separated into its pervious and impervious areas. The single-family development areas tributary to biofiltration basins 1 through 6 were assumed to be 45 percent impervious and 55 percent pervious. This is based on Plate E-6.3 Actual Impervious Cover from the Riverside County *Hydrology Manual.* The remaining single-family areas have higher density and were assumed to be 50 percent pervious and impervious. The total impervious area tributary to each biofiltration basin was multiplied by a runoff factor of 1.0 while the total pervious area was multiplied by a runoff factor of 0.1 in accordance with the Santa Margarita guidelines. From this, the weighted average runoff factor was determined and represents the Effective Pervious Fraction (see the attached spreadsheet).

BMP	Design Storage Volume, cf	Design Storage Volume, ac-ft
1	12,101	0.28
2	2,524	0.06
3	1,808	0.04
4	3,600	0.08
5	479	0.01
6	10,004	0.23
7	19,294	0.44
8	36,921	0.85
9	32,764	0.75
10	42,099	0.97
11	4,901	0.11

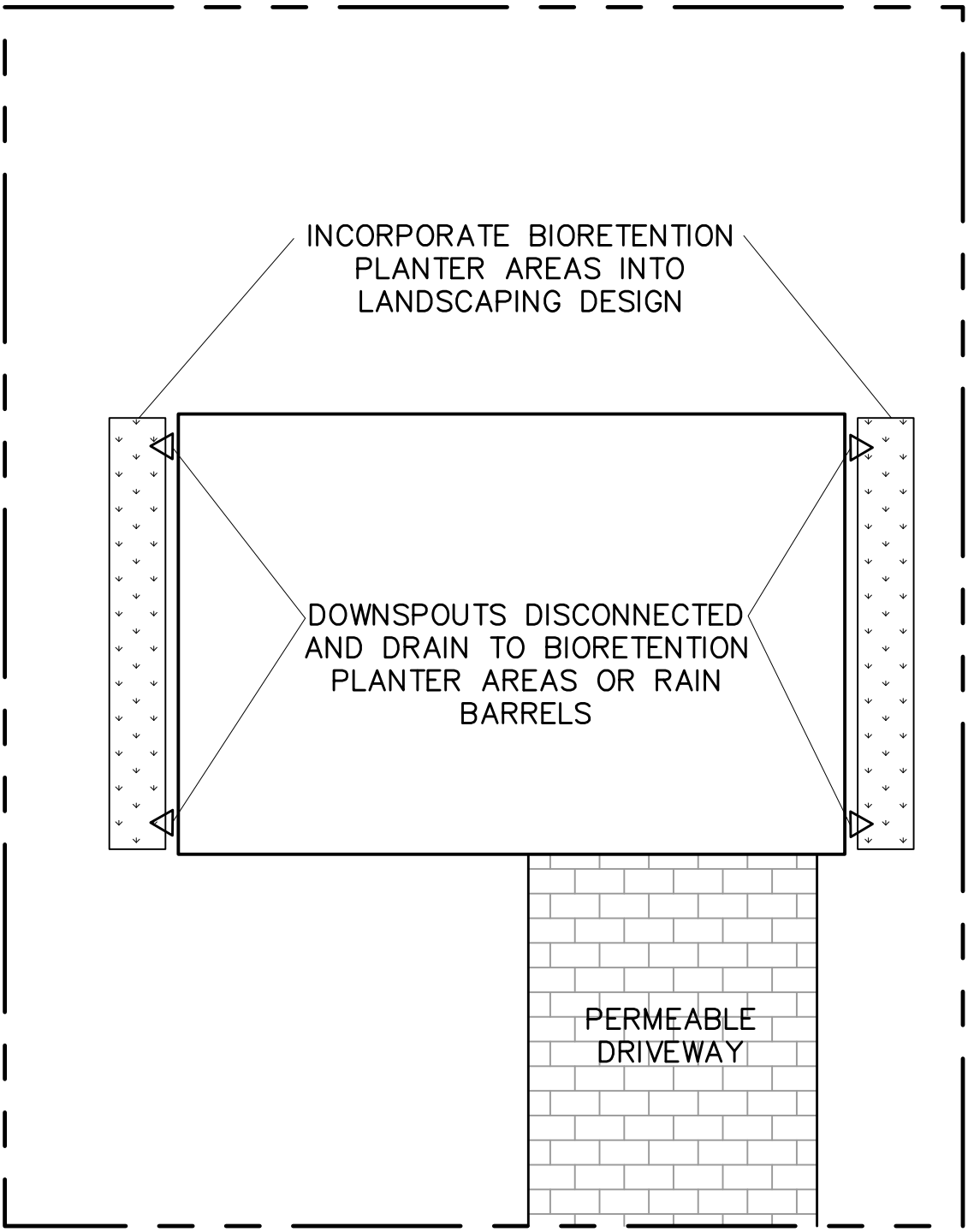
Table 1. Design Storage Volume for Bioretention Basins

For each biofiltration and bioretention basin, the overall tributary area, effective pervious fraction, and 85th percentile, 24-hour rainfall depth (0.59 inches) was entered into the Santa Margarita Watershed Spreadsheet to determine the minimum design storage volume for entitlement purposes. The results are attached and summarized in Table 1. The biofiltration and bioretention basins on the tentative map have been designed with greater capacity than the design storage volume.

The commercial area and the multi-family area will be covered by separate future WQMPs, so these are not part of this report.

Under the recently approved Santa Margarita Region *2018 Water Quality Management Plan*, the BMPs must also mitigate for hydromodification impacts. Hydromodification sizing is included in Appendix 7.

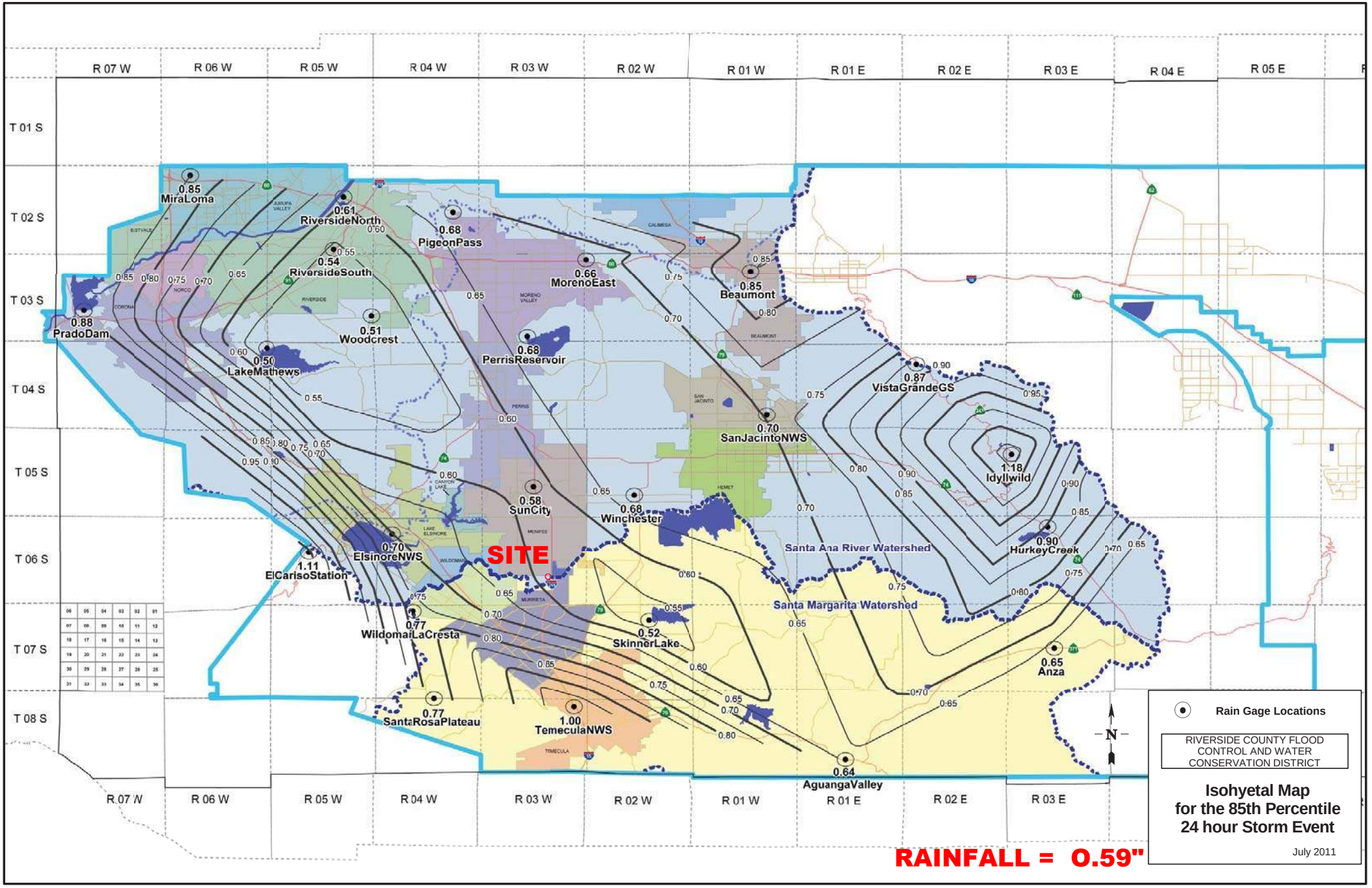
A detail showing potential on-lot BMPs is included. These shall be considered during final engineering.



NOTE:
THIS EXHIBIT SHOWS POTENTIAL BMPs THAT CAN BE CONSIDERED FOR SINGLE-FAMILY LOTS.

TYPICAL ON-LOT BMPS

NO SCALE


R 07 W
R 06 W
R 05 W
R 04 W
R 03 W
R 02 W
R 01 W
R 01 E
R 02 E
R 03 E
R 04 E
R 05 E
T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S
0.85 MiraLoma
0.61 RiversideNorth
0.68 PigeonPass
0.54 RiversideSouth
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.68 PerrisReservoir
0.50 LakeMathews
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.70 ElsinoreNWS
1.11 ElCarisoStation
SITE
Santa Ana River Watershed
0.90 HurkeyCreek
Santa Margarita Watershed
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley
N
Rain Gage Locations
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
Isohyetal Map for the 85th Percentile 24 hour Storm Event
July 2011
RAINFALL = 0.59"

ACTUAL IMPERVIOUS COVER

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

Notes:

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

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

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

RCFC & WCD
HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE E-6.3

MURRIETA HILLS - EFFECTIVE IMPERVIOUS FRACTION

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
1	18.52					
		Impervious	7.24	1.0	7.24	
		Pervious	11.28	0.1	1.13	
		Total	18.52		8.37	0.45

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
2	3.66					
		Impervious	1.50	1.0	1.50	
		Pervious	2.16	0.1	0.22	
		Total	3.66		1.72	0.47

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
3	2.49					
		Impervious	1.12	1.0	1.12	
		Pervious	1.37	0.1	0.14	
		Total	2.49		1.26	0.51

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
4	5.22					
		Impervious	2.18	1.0	2.18	
		Pervious	3.04	0.1	0.30	
		Total	5.22		2.49	0.48

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
5	0.66					
		Impervious	0.30	1.0	0.30	
		Pervious	0.36	0.1	0.04	
		Total	0.66		0.33	0.51

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
6	15.31					
		Impervious	5.89	1.0	5.89	
		Pervious	9.42	0.1	0.94	
		Total	15.31		6.83	0.45

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
7	25.31					
		Impervious	11.82	1.0	11.82	
		Pervious	13.50	0.1	1.35	
		Total	25.31		13.16	0.52

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
8	63.57					
		Impervious	20.05	1.0	20.05	
		Pervious	43.52	0.1	4.35	
		Total	63.57		24.40	0.38

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
9	45.13					
		Impervious	20.01	1.0	20.01	
		Pervious	25.12	0.1	2.51	
		Total	45.13		22.52	0.50

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
10	82.84					
		Impervious	19.66	1.0	19.66	
		Pervious	63.19	0.1	6.32	
		Total	82.84		25.97	0.31

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
11	7.50					
		Impervious	2.83	1.0	2.83	
		Pervious	4.67	0.1	0.47	
		Total	7.50		3.30	0.44

BMP	Drainage Area, ac	Cover	Area, ac	Runoff Factor	Area x RF, ac	Effective Impervious Fraction
12	1.51					
		Impervious	0.80	1.0	0.80	
		Pervious	0.71	0.1	0.07	
		Total	1.51		0.87	0.58

Santa Margarita Watershed

V_{BMP} and Q_{BMP} worksheets

These worksheets are to be used to determine the required

Design Capture Volume (V_{BMP})
or the
Design Flow Rate (Q_{BMP})

for BMPs in the Santa Margarita Watershed

To verify which watershed your project is located within, visit

www.rcflood.org/npdes

and use the 'Locate my Watershed' tool

If your project is not located in the Santa Margarita Watershed,

Do not use these worksheets! Instead visit

www.rcflood.org/npdes/developers.aspx

To access worksheets applicable to your watershed

Use the tabs across the bottom
to access the worksheets for the Santa Margarita Watershed

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 1		

Enter the Area Tributary to this Feature A_T = 18.52 acres

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

Site Location

Township: 6S

Range: 3W

Section: 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.45

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.31

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.18 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 12,101 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 1	Legend:	Required Entries / Calculated Cells
Company Name:	Chang Consultants	Date:	9/25/2018
Designed by:	WWC	County/City Case No.:	TM-013-3311

Design Volume

Enter the area tributary to this feature	A_T =	18.52	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	12,101	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	18,000	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft) — d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft) — $d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$ — $V_{biofiltered}$ = 43950.0 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$ — $V_{biofiltered\_static}$ = 25200.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 2		

Enter the Area Tributary to this Feature A_T = 3.66 acres

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

Site Location

Township 6S

Range 3W

Section 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.47

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.32

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.19 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 2,524 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 2	Legend:	Required Entries / Calculated Cells
Company Name:	Chang Consultants	Date:	9/25/2018
Designed by:	WWC	County/City Case No.:	TM-013-3311

Design Volume

Enter the area tributary to this feature	A_T =	3.66	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	2,524	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	7,900	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 19289.2 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 11060.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 3		

Enter the Area Tributary to this Feature A_T = 2.49 acres

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

Site Location

Township 6S

Range 3W

Section 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.51

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.35

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.20 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 1,808 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 3	Legend:	Required Entries / Calculated Cells
Company Name: Chang Consultants		Date: 9/25/2018	
Designed by: WWC		County/City Case No.: TM-013-3311	

Design Volume

Enter the area tributary to this feature	A_T =	2.49	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	1,808	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	3,000	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 7325.0 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 4200.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 4		

Enter the Area Tributary to this Feature A_T = 5.22 acres

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

Site Location

Township: 6S

Range: 3W

Section: 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.48

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.33

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.19 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 3,600 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 4	Legend:	Required Entries / Calculated Cells
Company Name: Chang Consultants		Date: 9/25/2018	
Designed by: WWC		County/City Case No.: TM-013-3311	

Design Volume

Enter the area tributary to this feature	A_T =	5.22	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	3,600	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	8,000	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 19533.3 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 11200.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 5		

Enter the Area Tributary to this Feature A_T = 0.66 acres

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

Site Location

Township 6S

Range 3W

Section 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.51

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.35

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.20 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 479 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 5	Legend:	Required Entries / Calculated Cells
Company Name: Chang Consultants		Date: 9/25/2018	
Designed by: WWC		County/City Case No.: TM-013-3311	

Design Volume

Enter the area tributary to this feature	A_T =	0.66	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	479	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	2,300	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 5615.8 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 3220.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 6		

Enter the Area Tributary to this Feature A_T = 15.31 acres

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

Site Location

Township 6S

Range 3W

Section 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.45

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.31

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.18 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 10,004 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 6	Legend:	Required Entries / Calculated Cells
Company Name:	Chang Consultants	Date:	9/25/2018
Designed by:	WWC	County/City Case No.:	TM-013-3311

Design Volume

Enter the area tributary to this feature	A_T =	15.31	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	10,004	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	30,000	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 73250.0 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 42000.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 7		

Enter the Area Tributary to this Feature A_T = 25.31 acres

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

Site Location	Township	6S
	Range	3W
	Section	27 and 28
Enter the 85th Percentile, 24-hour Rainfall Depth	D_{85} =	0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu)		Mixed Surface Types
Effective Impervious Fraction	I_f =	0.52

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C = 0.35

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.21 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 19,294 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 7	Legend:	Required Entries / Calculated Cells
Company Name: Chang Consultants		Date: 9/25/2018	
Designed by: WWC		County/City Case No.: TM-013-3311	

Design Volume

Enter the area tributary to this feature	A_T =	25.31	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	19,294	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	25,000	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 61041.7 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 35000.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 8		

Enter the Area Tributary to this Feature A_T = 63.57 acres

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

Site Location

Township: 6S

Range: 3W

Section: 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.38

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.27

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.16 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 36,921 ft^3

Notes:

Bioretention Facility - Design Procedure	BMP ID: BMP 8	Legend:	Required Entries / Calculated Cells
Company Name: Chang Consultants		Date: 9/25/2018	
Designed by: WWC		County/City Case No.: TM-013-3311	

Design Volume

Enter the area tributary to this feature	A_T=	63.6	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	36,921	ft^3
Enter the measured infiltration rate	I=	1.50	in/hr
Enter the Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" of this BMP Design Handbook)	FS =	3.00	
Enter factored infiltration rate (design)	$I_{factored}$=	0.50	in/hr

Bioretention Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" allowed if vertically consti	d_s =	36.0	inches
Depth of Gravel Storage Layer (Optional Layer; up to 30")	d_g =	12.0	inches

Note: Check that storage in gravel does not exceed the amount that can enter these systems during a typical storm event. The depth of effective stored water should be less than 12 inches (30 inch bulk depth) unless higher permeability media is used to allow faster filling of this layer.

Total Effective Depth, d_E

$$d_E(ft) = d_p(ft) + [(0.3) \times d_S(ft) + (0.4) \times d_g(ft)]$$

d_E = 1.80 feet

Required Effective Footprint Area, A_{BMP}

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

A_{BMP} = 20,512 ft^2

Proposed Surface Area (shall not be less than A_{BMP}) A= 32,000 ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water qualty ponding depth of the basin. The underlying gravel layer should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Message: Facility meets the Minimum Footprint

Drawdown Time (must be less than 72 hours) T_{Dd} = 43.2 hr

Message: Facility meets drawdown time limitations

Bioretention Facility Properties

Side Slopes in Bioretention Facility z = 4 :1

Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	25	feet
Describe Vegetation:	Natural Grasses	

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 9		

Enter the Area Tributary to this Feature A_T = 45.13 acres

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

Site Location

Township: 6S

Range: 3W

Section: 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.50

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.34

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.20 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 32,764 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 9	Legend:	Required Entries / Calculated Cells
Company Name:	Chang Consultants	Date:	9/25/2018
Designed by:	WWC	County/City Case No.:	TM-013-3311

Design Volume

Enter the area tributary to this feature	A_T =	45.13	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	32,764	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	57,000	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 139175.0 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 79800.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 10		

Enter the Area Tributary to this Feature A_T = 82.84 acres

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

Site Location

Township: 6S

Range: 3W

Section: 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.31

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.23

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.14 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 42,099 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 10	Legend:	Required Entries / Calculated Cells
Company Name: Chang Consultants		Date: 9/25/2018	
Designed by: WWC		County/City Case No.: TM-013-3311	

Design Volume

Enter the area tributary to this feature	A_T =	82.84	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	42,099	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	87,000	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 212425.0 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 121800.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 11		

Enter the Area Tributary to this Feature A_T = 7.5 acres

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

Site Location

Township: 6S

Range: 3W

Section: 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.44

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.30

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.18 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 4,901 ft^3

Notes:

Biofiltration with No Infiltration Facility - Design Procedure	BMP ID: BMP 11	Legend:	Required Entries / Calculated Cells
Company Name: Chang Consultants		Date: 9/25/2018	
Designed by: WWC		County/City Case No.: TM-013-3311	

Design Volume

Enter the area tributary to this feature	A_T =	7.5	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	4,901	ft^3
Estimated footprint of BMP, $Area_{BMP}$ (available space or 3% imp. area)	$Area_{BMP}$ =	6,300	ft^2

Note: This area shall be measured at the mid-ponding depth of the BMP. For systems with side-slopes, this should be the contour that is midway between the floor of the basin and the maximum water quality ponding elevation of the basin. The underlying gravel layer for drain pipes should extend to this contour. For systems with vertical walls, the effective area is the full footprint.

Biofiltration with No Infiltration Facility Surface Area

Depth of Surface Ponding Layer (6" minimum, 12" maximum)	d_P =	6.0	inches
Depth of Engineered Soil Media (24" to 36"; 18" if vertically constrained)	d_S =	36.0	inches
Design Media Filtration Rate (2.5 in/hr)	I_{design} =	2.5	in/hr
Allowable Routing Period, $T_{routing}$ (5 hrs)	$T_{routing}$ =	5.0	hr

Effective Biofiltration Depth, d_{E_bio}

d_{E_bio} (ft) = (d_P + (0.3 x d_S) + (I_{design} * $T_{routing}$)) (ft)

d_{E_bio} = 2.4 ft

Effective Static Depth, $d_{E\_bio\_static}$

$d_{E\_bio\_static}$ = (d_P + (0.3 * d_S)) (ft)

$d_{E\_bio\_static}$ = 1.4 ft

$V_{biofiltered}$ = d_{E_bio} * $Area_{BMP}$

$V_{biofiltered}$ = 15382.5 ft^3

$V_{biofiltered\_static}$ = $d_{E\_bio\_static}$ * $Area_{BMP}$

$V_{biofiltered\_static}$ = 8820.0 ft^3

Sizing Option 1 Result

Criteria 1: $V_{biofiltered\ (with\ routing)} \geq 150\%$ of V_{BMP} — Results: PASS

Sizing Option 2 Result

Criteria 2: $V_{biofiltered\_static} \geq 0.75$ x V_{BMP} — Results: PASS

Note

If neither of these criteria are met increase the footprint and rerun calculations. This calculation is inherently iterative.

Biofiltration with No Retention Facility Properties		
Side Slopes in Partial Retention with Biofiltration Facility	z = 4	:1
Diameter of Underdrain	6	inches
Longitudinal Slope of Site (3% maximum)	1	%
Check Dam Spacing	0	feet
Describe Vegetation:	Natural Grasses	
Notes:		

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Chang Consultants	Date	12/8/2017
Designed by	WWC	County/City Case No	TTM-013-3311
Company Project Number/Name	Murrieta Hills / TTM 35853		
Drainage Area Number/Name	Santa Margarita Watershed - BMP 12		

Enter the Area Tributary to this Feature A_T = 1.51 acres

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

Site Location

Township: 6S

Range: 3W

Section: 27 and 28

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.59

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.58

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.39

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.23 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 1,261 ft^3

Notes:

Infiltration Trench - Design Procedure	BMP ID: BMP 12	Legend:	Required Entries / Calculated Cells

Company Name:	Chang Consultants	Date:	9/25/2018
Designed by:	WWC	County/City Case No.:	TTM-013-3311

Design Volume

Enter the area tributary to this feature, Max = 10 acres	A_t=	2	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	1,261	ft^3

Calculate Maximum Depth of the Reservoir Layer

Enter measured infiltration rate	I =	1.5	in/hr
Enter Factor of Safety, FS (unitless)	FS =	3	
Obtain from Table 1, Appendix A: "Infiltration Testing" of this BMP Handbook			
	n =	40	%
Calculate D_1. $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times (n/100) \times FS}$	D_1 =	7.50	ft
Enter depth to historic high groundwater mark (measured from finished grade)		20	ft
Enter depth to top of bedrock or impermeable layer (measured from finished grade)		20	ft
D_2 is the smaller of: Depth to groundwater - 11 ft; & Depth to impermeable layer - 6 ft	D_2 =	9.0	ft
D_{MAX} is the smaller value of D_1 and D_2, must be less than or equal to 8 feet.	D_{MAX}=	7.5	ft

Trench Sizing

Enter proposed reservoir layer depth D_R, must be ≤ D_{MAX}	D_R =	5.00	ft
Calculate the design depth of water, d_W			
Design $d_W = (D_R) \times (n/100)$	Design d_W=	2.00	ft
Minimum Surface Area, A_S $A_S = \frac{V_{BMP}}{d_W}$	A_S =	631	ft^2
Proposed Design Surface Area	A_D =	1,000	ft^2
Minimum Width = D_R + 1 foot pea gravel		6.00	ft
Sediment Control Provided? (Use pulldown)		Yes	
Geotechnical report attached? (Use pulldown)		Yes	

If the trench has been designed correctly, there should be no error messages on the spreadsheet.

Effective Impervious Fraction

Developed Cover Types	Effective Impervious Fraction
Roofs	1.00
Concrete or Asphalt	1.00
Grouted or Gapless Paving Blocks	1.00
Compacted Soil (e.g. unpaved parking)	0.40
Decomposed Granite	0.40
Permeable Paving Blocks w/ Sand Filled Gap	0.25
Class 2 Base	0.30
Gravel or Class 2 Permeable Base	0.10
Pervious Concrete / Porous Asphalt	0.10
Open and Porous Pavers	0.10
Turf block	0.10
Ornamental Landscaping	0.10
Natural (A Soil)	0.03
Natural (B Soil)	0.15
Natural (C Soil)	0.30
Natural (D Soil)	0.40
Mixed Surface Types	

Use this table to determine the effective impervious fraction for the V_{BMP} and Q_{BMP} calculation sheets

Appendix 7: Hydromodification

Supporting Detail Relating to compliance with the Hydromodification Performance Standards

Examples of material to provide in Appendix 7 may include but are not limited to the following:

- Hydromodification Exemption Exhibit,
- Potential Critical Coarse Sediment Yield Area Mapping
- Hydromodification BMP sizing calculations,
- SMRHM report files,
- Site-Specific Critical Coarse Sediment Analysis,
- Design details/drawings from manufacturers for proprietary BMPs

This information should support the hydromodification exemption (if applicable) and hydrologic control BMP and Sediment Supply BMP sections of this Template. Refer to Section 2.4 and 3.6 of the SMR WQMP and Sections E of this Template.

SUMMARY

The Riverside County Santa Margarita Region Hydrology Model (SMRHM) has been developed by Clear Creek Solutions for designing hydrologic control BMPs. SMRHM was used for preliminary sizing of BMP 1 through 12. Section 2.4.2 of the *2018 Water Quality Management Plan* indicates that LID BMPs can be analyzed using SMRHM to demonstrate that hydrologic performance standards are met. This is consistent with feedback from Clear Creek Solutions and Mr. Joe Castaneda from JLC Engineering & Consulting, who have indicated that SMRHM results are applicable to hydromodification and LID.

Based on this, SMRHM was used to determine the storage volume for each biofiltration (with no infiltration) and bioretention basin for BMP 1 through 11. The basin elements were based on the fact sheet, while the impervious, pervious, and overall tributary areas from Appendix 6 were used. An infiltration rate was assigned to BMP 8 per the soils report. The gravel layer and underdrain were also removed from BMP 8 in accordance with the bioretention fact sheet. The results are summarized below and compared with the design storage volume results. The comparison shows that the SMRHM volumes are significantly larger than the associated LID volumes except at BMP 8, which has infiltration. Therefore, the preliminary sizing of the biofiltration and bioretention basins can be based on the SMRHM storage volumes except for BMP 8, which will be based on the LID volume. The basins on the tentative tract map have been designed based on this criteria.

BMP	SMRHM Storage Volume, ac-ft	Design Storage Volume, ac-ft
1	0.24	0.28
2	0.09	0.06
3	0.09	0.04
4	0.06	0.08
5	0.10	0.01
6	0.30	0.23
7	0.53	0.44
8	0.78	0.85
9	1.78	0.75
10	3.32	0.97
11	0.49	0.11

Table 2. SMRHM and Design Storage Volume for Bioretention Basins

As mentioned in Appendix 6, BMP 12 reflects all of the gravel trenches serving the McElwain Road extension. Since this is a Preliminary WQMP, the largest tributary area along McElwain Road was used to verify feasibility of gravel trenches for the roadway. During final engineering, an analysis shall be performed for each individual bioretention basin along McElwain Road.

Sediment Supply

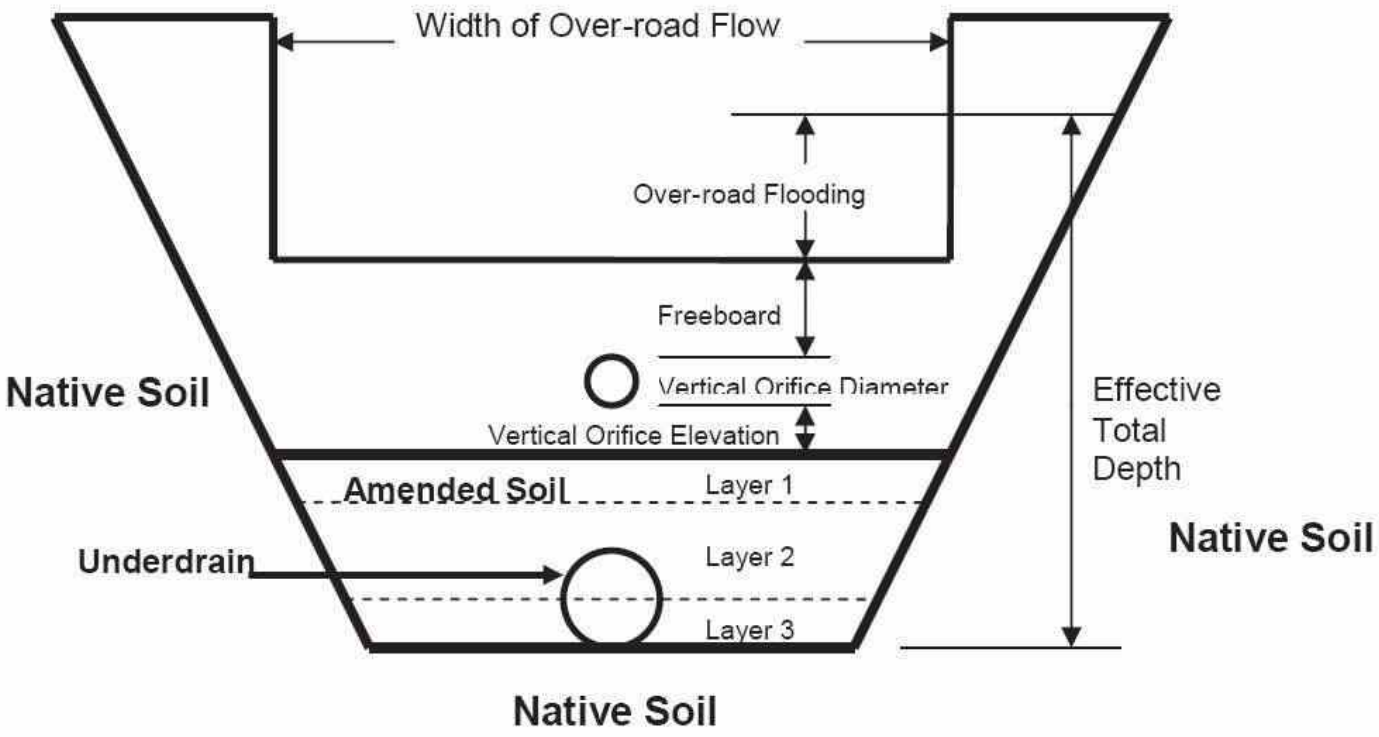
Sediment supply BMPs are not required because the Mapleton project has created a hydrologic control for sediment. Murrieta Hills discharges to the Mapleton project, which has a debris basin and two detention basins. This mitigates for the potential for sediment transport. Even though sediment supply BMPs are not required, the following provides additional information on the on-site soils.

The on-site soils have been investigated and mapped in Leighton and Associates, Inc.'s March 21, 2014, *Update Geotechnical Report Tentative Tract Map No. 35853, Murrieta Hills Specific Plan, Southwest of Keller Road and I-215, Murrieta, California.* Relevant excerpts from this report are included in Appendix 3. Plate 1 in Appendix 3 shows the site with moderately to steeply sloping hillside topography. The development footprint is mostly within the hillside area, and the majority of the hillside area is classified as granitic bedrock (Kgr) consisting primarily of gabbro as well as granodiorite and granophyre. Since the hillside is primarily composed of natural rock, its sediment supply is limited due to rock's low soil erodibility factor. Therefore, development within the granitic bedrock will not significantly alter sediment supply.

Besides granitic bedrock, the site contains alluvium (Qal and Qalo) along the primary watercourse that bisects the site. Alluvium has a higher soil erodibility factor. However, the majority of the watercourse is not being disturbed by the project, so the project will not cause significant sediment transport impacts on the watercourse.

Based on this information, the on-site streams will have bed sediment that is dissimilar from the receiving streams. The bedrock hillsides contribute minor sediment amounts to the on-site streams. The attached NRCS Web Soil Survey shows that the areas below the site do not contain large areas of bedrock, so the sediment source of the on- and off-site streams are classified with low similarity. Since the bedrock contributes minor sediment, the on-site streams have low potential to deliver sediment downstream. Similarly, the off-site receiving channels will have a low adverse response to changes in the bed sediment load since the upstream load is minor to begin with.

Diagram of bioretention swale with vertical orifice plus overflow:



Clear Creek Solutions
Bioretention Basin Detail

SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA1
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	18.52
Pervious Total	18.52
Impervious Land Use	acre
Impervious Total	0
Basin Total	18.52

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	11.28
Pervious Total	11.28

Impervious Land Use	acre
Roads,Flat(0-5%)	7.24
Impervious Total	7.24
Basin Total	18.52

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 1	Surface oretention 1	

Mitigated Routing

Bioretention 1

Bottom Length:	80.00 ft.
Bottom Width:	80.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Amended 1.5 in/hr
Material thickness of second layer:	3
Material type for second layer:	Amended 1.5 in/hr
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	46.963
Total Outflow (ac-ft.):	467.095
Percent Through Underdrain:	10.05
Discharge Structure	
Riser Height:	4 ft.
Riser Diameter:	36 in.
Orifice 1 Diameter:	1.5 in. Elevation:0.5 ft.
Orifice 2 Diameter:	1.5 in. Elevation:1.5 ft.
Orifice 3 Diameter:	1.5 in. Elevation:2.5 ft.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1469	0.0000	0.0000	0.0000
0.1016	0.1469	0.0055	0.0000	0.0000
0.2033	0.1469	0.0109	0.0000	0.0000
0.3049	0.1469	0.0164	0.0000	0.0000
0.4066	0.1469	0.0218	0.0000	0.0000
0.5082	0.1469	0.0273	0.0000	0.0000
0.6099	0.1469	0.0327	0.0000	0.0000
0.7115	0.1469	0.0382	0.0000	0.0000
0.8132	0.1469	0.0436	0.0000	0.0000
0.9148	0.1469	0.0491	0.0000	0.0000
1.0165	0.1469	0.0545	0.0000	0.0000
1.1181	0.1469	0.0600	0.0000	0.0000
1.2198	0.1469	0.0654	0.0000	0.0000
1.3214	0.1469	0.0709	0.0000	0.0000
1.4231	0.1469	0.0763	0.0000	0.0000
1.5247	0.1469	0.0818	0.0003	0.0000
1.6264	0.1469	0.0872	0.0005	0.0000
1.7280	0.1469	0.0927	0.0011	0.0000
1.8297	0.1469	0.0981	0.0014	0.0000
1.9313	0.1469	0.1036	0.0018	0.0000
2.0330	0.1469	0.1090	0.0021	0.0000
2.1346	0.1469	0.1145	0.0024	0.0000
2.2363	0.1469	0.1199	0.0026	0.0000
2.3379	0.1469	0.1254	0.0029	0.0000
2.4396	0.1469	0.1308	0.0030	0.0000
2.5412	0.1469	0.1363	0.0033	0.0000

2.6429	0.1469	0.1417	0.0034	0.0000
2.7445	0.1469	0.1472	0.0036	0.0000
2.8462	0.1469	0.1526	0.0037	0.0000
2.9478	0.1469	0.1581	0.0039	0.0000
3.0495	0.1469	0.1635	0.0040	0.0000
3.1511	0.1469	0.1690	0.0042	0.0000
3.2527	0.1469	0.1752	0.0043	0.0000
3.3544	0.1469	0.1814	0.0045	0.0000
3.4560	0.1469	0.1876	0.0046	0.0000
3.5577	0.1469	0.1938	0.0046	0.0000
3.6593	0.1469	0.2000	0.0047	0.0000
3.7610	0.1469	0.2062	0.0048	0.0000
3.8626	0.1469	0.2124	0.0049	0.0000
3.9643	0.1469	0.2186	0.0050	0.0000
4.0659	0.1469	0.2248	0.0051	0.0000
4.1676	0.1469	0.2310	0.0053	0.0000
4.2500	0.1469	0.2360	0.0136	0.0000

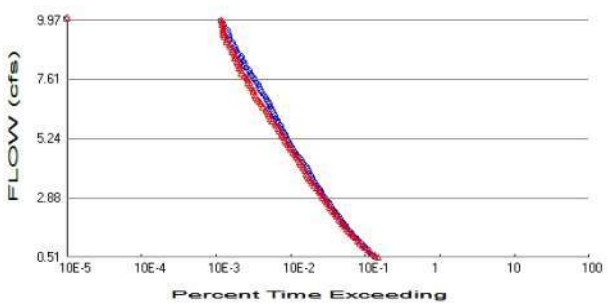
Landscape Swale Hydraulic Table

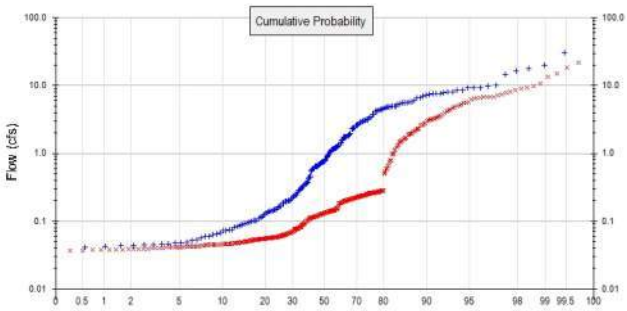
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.1469	0.2360	0.0000	0.0053	0.0000
4.3516	0.1492	0.2510	0.0000	0.0053	0.0000
4.4533	0.1514	0.2663	0.0000	0.0053	0.0000
4.5549	0.1537	0.2818	0.0000	0.0053	0.0000
4.6566	0.1560	0.2976	0.0000	0.0053	0.0000
4.7582	0.1583	0.3135	0.0055	0.0053	0.0000
4.8599	0.1606	0.3298	0.0202	0.0053	0.0000
4.9615	0.1630	0.3462	0.0281	0.0053	0.0000
5.0632	0.1653	0.3629	0.0342	0.0053	0.0000
5.1648	0.1677	0.3798	0.0393	0.0053	0.0000
5.2665	0.1701	0.3970	0.0439	0.0053	0.0000
5.3681	0.1725	0.4144	0.0480	0.0053	0.0000
5.4698	0.1749	0.4320	0.0518	0.0053	0.0000
5.5714	0.1773	0.4499	0.0553	0.0053	0.0000
5.6731	0.1798	0.4681	0.0587	0.0053	0.0000
5.7747	0.1822	0.4865	0.0714	0.0053	0.0000
5.8764	0.1847	0.5051	0.0865	0.0053	0.0000
5.9780	0.1872	0.5240	0.0968	0.0053	0.0000
6.0797	0.1897	0.5432	0.1055	0.0053	0.0000
6.1813	0.1922	0.5626	0.1131	0.0053	0.0000
6.2830	0.1948	0.5823	0.1202	0.0053	0.0000
6.3846	0.1973	0.6022	0.1267	0.0053	0.0000
6.4863	0.1999	0.6224	0.1328	0.0053	0.0000
6.5879	0.2025	0.6428	0.1387	0.0053	0.0000
6.6896	0.2051	0.6636	0.1442	0.0053	0.0000
6.7912	0.2077	0.6845	0.1619	0.0053	0.0000
6.8929	0.2103	0.7058	0.1777	0.0053	0.0000
6.9945	0.2129	0.7273	0.1898	0.0053	0.0000
7.0962	0.2156	0.7491	0.2003	0.0053	0.0000
7.1978	0.2183	0.7711	0.2099	0.0053	0.0000
7.2995	0.2210	0.7934	0.2188	0.0053	0.0000
7.4011	0.2237	0.8160	0.2271	0.0053	0.0000
7.5027	0.2264	0.8389	0.2351	0.0053	0.0000
7.6044	0.2291	0.8621	0.2427	0.0053	0.0000
7.7060	0.2319	0.8855	0.2501	0.0053	0.0000
7.8077	0.2346	0.9092	0.2571	0.0053	0.0000
7.9093	0.2374	0.9332	0.2640	0.0053	0.0000
8.0110	0.2402	0.9575	0.2706	0.0053	0.0000

8.1126	0.2430	0.9820	0.2771	0.0053	0.0000
8.2143	0.2458	1.0069	0.2834	0.0053	0.0000
8.3159	0.2487	1.0320	0.8284	0.0053	0.0000
8.4176	0.2515	1.0574	2.4759	0.0053	0.0000
8.5192	0.2544	1.0831	4.7280	0.0053	0.0000
8.6209	0.2573	1.1091	7.4191	0.0053	0.0000
8.7225	0.2602	1.1354	10.427	0.0053	0.0000
8.8242	0.2631	1.1620	13.636	0.0053	0.0000
8.9258	0.2660	1.1889	16.926	0.0053	0.0000
9.0275	0.2690	1.2161	20.175	0.0053	0.0000
9.1291	0.2719	1.2436	23.264	0.0053	0.0000
9.2308	0.2749	1.2714	26.087	0.0053	0.0000
9.2500	0.2755	1.2767	28.556	0.0053	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 18.52
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 11.28
Total Impervious Area: 7.24

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	5.14656
5 year	8.108358
10 year	9.972873
25 year	18.140383

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	4.244763
5 year	7.321925
10 year	9.429042
25 year	15.281707

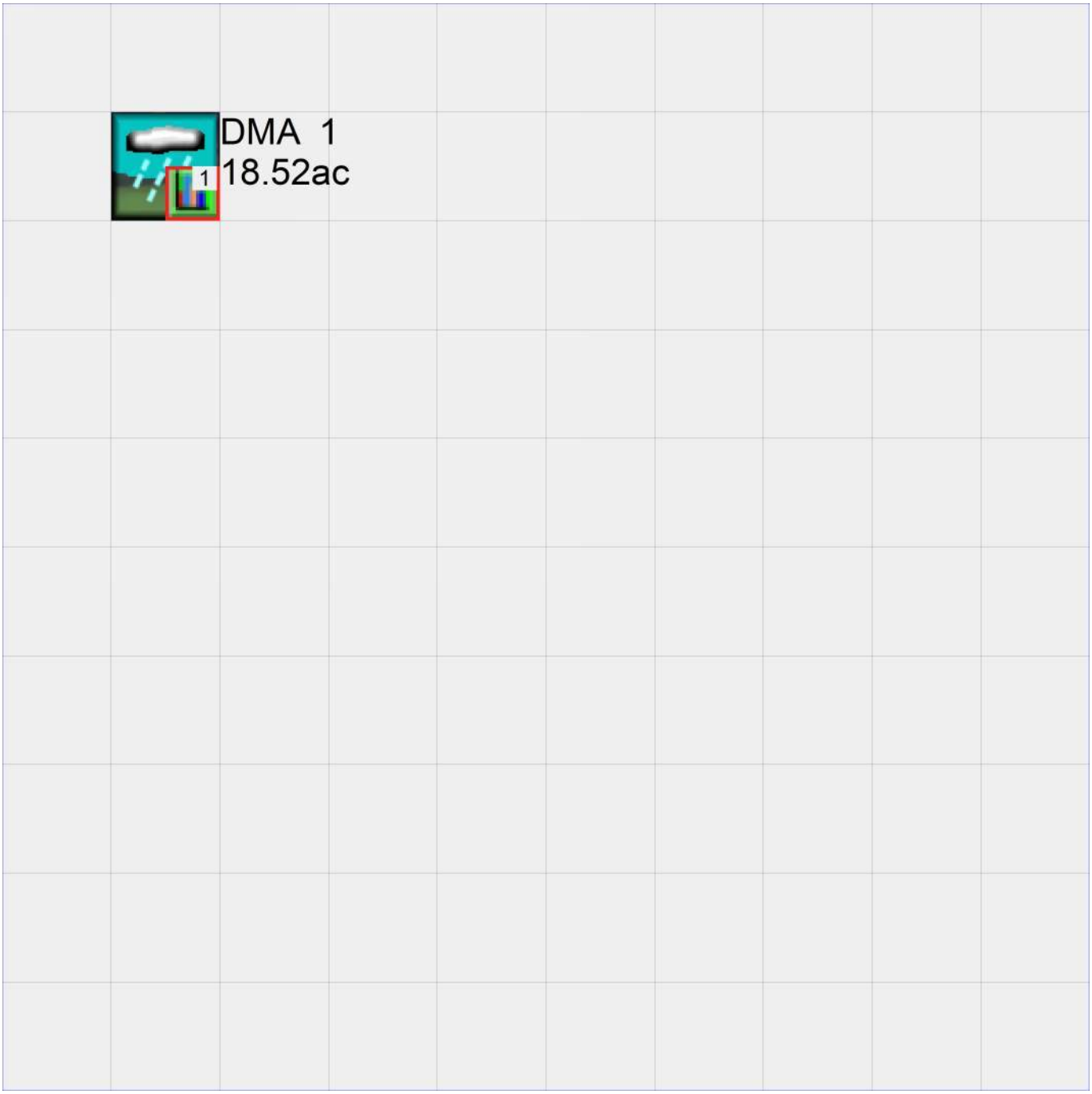
Duration Flows

The Facility PASSED

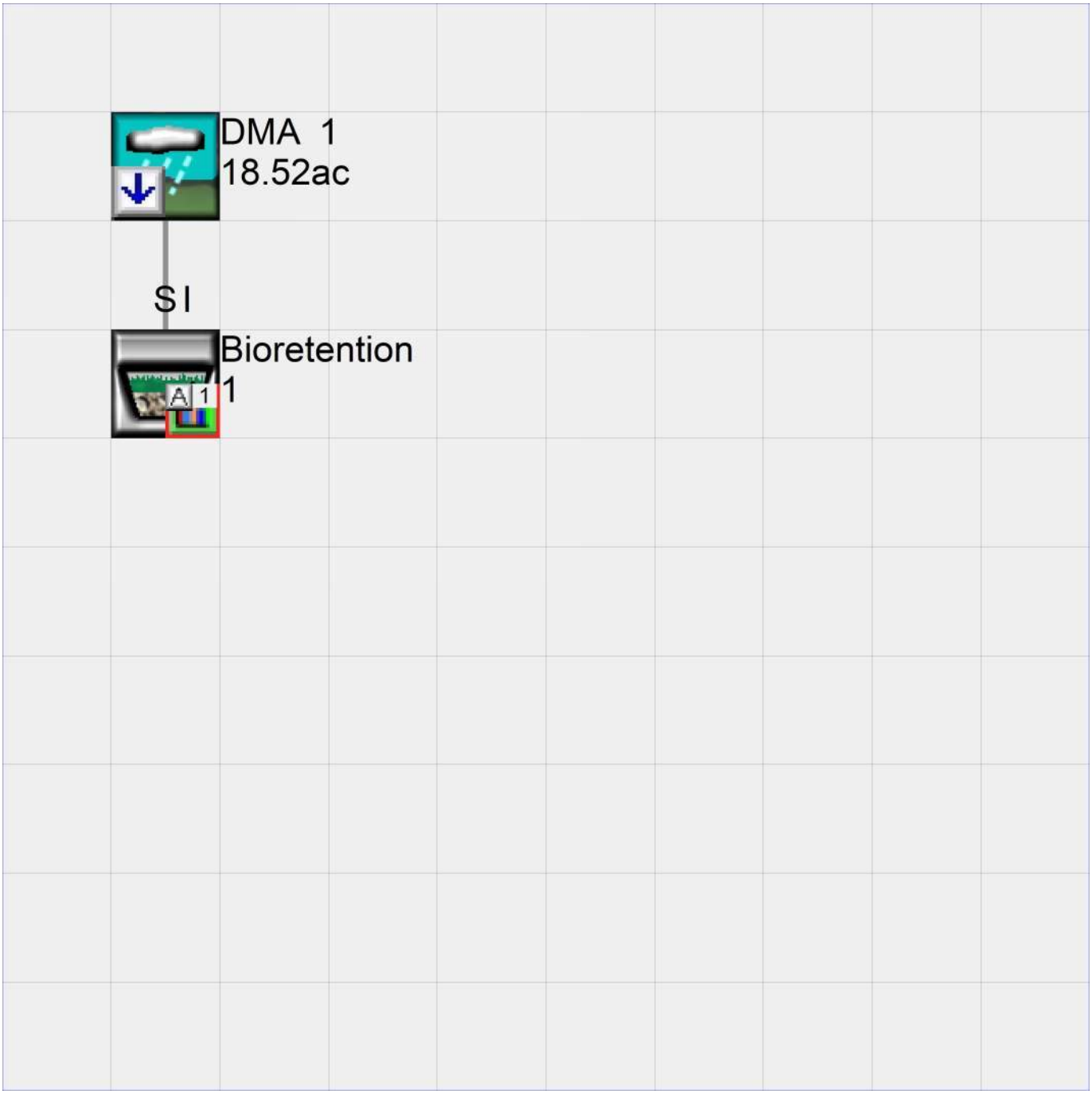
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.5147	2939	3230	109	Pass
0.6102	2724	2896	106	Pass
0.7057	2526	2580	102	Pass
0.8013	2354	2350	99	Pass
0.8968	2198	2160	98	Pass
0.9923	2017	1996	98	Pass
1.0879	1891	1832	96	Pass
1.1834	1747	1705	97	Pass
1.2790	1629	1592	97	Pass
1.3745	1511	1490	98	Pass
1.4700	1414	1385	97	Pass
1.5656	1346	1294	96	Pass
1.6611	1258	1220	96	Pass
1.7566	1190	1149	96	Pass
1.8522	1111	1082	97	Pass
1.9477	1054	1020	96	Pass
2.0433	1008	971	96	Pass
2.1388	952	911	95	Pass
2.2343	893	869	97	Pass
2.3299	848	814	95	Pass
2.4254	801	774	96	Pass
2.5209	759	732	96	Pass
2.6165	721	703	97	Pass
2.7120	692	662	95	Pass
2.8076	650	627	96	Pass
2.9031	618	595	96	Pass
2.9986	585	563	96	Pass
3.0942	561	538	95	Pass
3.1897	537	517	96	Pass
3.2852	510	486	95	Pass
3.3808	485	450	92	Pass
3.4763	453	422	93	Pass
3.5719	432	400	92	Pass
3.6674	422	382	90	Pass
3.7629	409	371	90	Pass
3.8585	393	352	89	Pass
3.9540	376	341	90	Pass
4.0495	364	327	89	Pass
4.1451	349	316	90	Pass
4.2406	325	296	91	Pass
4.3362	310	288	92	Pass
4.4317	297	275	92	Pass
4.5272	277	260	93	Pass
4.6228	258	246	95	Pass
4.7183	246	233	94	Pass
4.8138	234	220	94	Pass
4.9094	225	209	92	Pass
5.0049	213	200	93	Pass
5.1005	206	191	92	Pass
5.1960	198	182	91	Pass
5.2915	188	177	94	Pass
5.3871	184	167	90	Pass
5.4826	175	163	93	Pass

5.5781	169	155	91	Pass
5.6737	161	148	91	Pass
5.7692	157	140	89	Pass
5.8648	149	134	89	Pass
5.9603	146	122	83	Pass
6.0558	138	118	85	Pass
6.1514	133	111	83	Pass
6.2469	129	108	83	Pass
6.3424	123	104	84	Pass
6.4380	119	100	84	Pass
6.5335	116	93	80	Pass
6.6291	112	88	78	Pass
6.7246	109	84	77	Pass
6.8201	103	77	74	Pass
6.9157	99	75	75	Pass
7.0112	94	73	77	Pass
7.1067	88	69	78	Pass
7.2023	85	69	81	Pass
7.2978	83	65	78	Pass
7.3934	81	63	77	Pass
7.4889	75	58	77	Pass
7.5844	72	58	80	Pass
7.6800	69	56	81	Pass
7.7755	65	52	80	Pass
7.8710	63	48	76	Pass
7.9666	60	47	78	Pass
8.0621	55	45	81	Pass
8.1577	53	45	84	Pass
8.2532	52	43	82	Pass
8.3487	51	41	80	Pass
8.4443	47	39	82	Pass
8.5398	47	39	82	Pass
8.6353	43	38	88	Pass
8.7309	41	36	87	Pass
8.8264	40	36	90	Pass
8.9220	38	34	89	Pass
9.0175	36	33	91	Pass
9.1130	36	30	83	Pass
9.2086	33	30	90	Pass
9.3041	33	28	84	Pass
9.3996	31	27	87	Pass
9.4952	31	27	87	Pass
9.5907	31	27	87	Pass
9.6863	28	27	96	Pass
9.7818	27	26	96	Pass
9.8773	26	26	100	Pass
9.9729	25	26	104	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA2
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	3.66
Pervious Total	3.66
Impervious Land Use	acre
Impervious Total	0
Basin Total	3.66

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	2.16
Pervious Total	2.16

Impervious Land Use	acre
Roads,Flat(0-5%)	1.5
Impervious Total	1.5
Basin Total	3.66

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 2	Surface oretention 2	

Mitigated Routing

Bioretention 2

Bottom Length:	50.00 ft.	
Bottom Width:	50.00 ft.	
Material thickness of first layer:	0.25	
Material type for first layer:	Amended 1.5 in/hr	
Material thickness of second layer:	3	
Material type for second layer:	Amended 1.5 in/hr	
Material thickness of third layer:	1	
Material type for third layer:	GRAVEL	
Underdrain used		
Underdrain Diameter (feet):	0.5	
Orifice Diameter (in.):	0.5	
Offset (in.):	3	
Flow Through Underdrain (ac-ft.):	22.887	
Total Outflow (ac-ft.):	96.231	
Percent Through Underdrain:	23.78	
Discharge Structure		
Riser Height:	4 ft.	
Riser Diameter:	36 in.	
Orifice 1 Diameter:	0.5 in.	Elevation:-0.166666666666667 ft.
Orifice 2 Diameter:	0.5 in.	Elevation:1.5 ft.
Orifice 3 Diameter:	1 in.	Elevation:2.5 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0574	0.0000	0.0000	0.0000
0.1016	0.0574	0.0021	0.0000	0.0000
0.2033	0.0574	0.0043	0.0000	0.0000
0.3049	0.0574	0.0064	0.0000	0.0000
0.4066	0.0574	0.0085	0.0000	0.0000
0.5082	0.0574	0.0106	0.0000	0.0000
0.6099	0.0574	0.0128	0.0000	0.0000
0.7115	0.0574	0.0149	0.0000	0.0000
0.8132	0.0574	0.0170	0.0000	0.0000
0.9148	0.0574	0.0192	0.0000	0.0000
1.0165	0.0574	0.0213	0.0000	0.0000
1.1181	0.0574	0.0234	0.0000	0.0000
1.2198	0.0574	0.0256	0.0000	0.0000
1.3214	0.0574	0.0277	0.0000	0.0000
1.4231	0.0574	0.0298	0.0000	0.0000
1.5247	0.0574	0.0319	0.0003	0.0000
1.6264	0.0574	0.0341	0.0005	0.0000
1.7280	0.0574	0.0362	0.0011	0.0000
1.8297	0.0574	0.0383	0.0014	0.0000
1.9313	0.0574	0.0405	0.0018	0.0000
2.0330	0.0574	0.0426	0.0021	0.0000
2.1346	0.0574	0.0447	0.0024	0.0000
2.2363	0.0574	0.0468	0.0026	0.0000
2.3379	0.0574	0.0490	0.0029	0.0000
2.4396	0.0574	0.0511	0.0030	0.0000
2.5412	0.0574	0.0532	0.0033	0.0000

2.6429	0.0574	0.0554	0.0034	0.0000
2.7445	0.0574	0.0575	0.0036	0.0000
2.8462	0.0574	0.0596	0.0037	0.0000
2.9478	0.0574	0.0618	0.0039	0.0000
3.0495	0.0574	0.0639	0.0040	0.0000
3.1511	0.0574	0.0660	0.0042	0.0000
3.2527	0.0574	0.0684	0.0043	0.0000
3.3544	0.0574	0.0709	0.0045	0.0000
3.4560	0.0574	0.0733	0.0046	0.0000
3.5577	0.0574	0.0757	0.0046	0.0000
3.6593	0.0574	0.0781	0.0047	0.0000
3.7610	0.0574	0.0805	0.0048	0.0000
3.8626	0.0574	0.0830	0.0049	0.0000
3.9643	0.0574	0.0854	0.0050	0.0000
4.0659	0.0574	0.0878	0.0051	0.0000
4.1676	0.0574	0.0902	0.0053	0.0000
4.2500	0.0574	0.0922	0.0136	0.0000

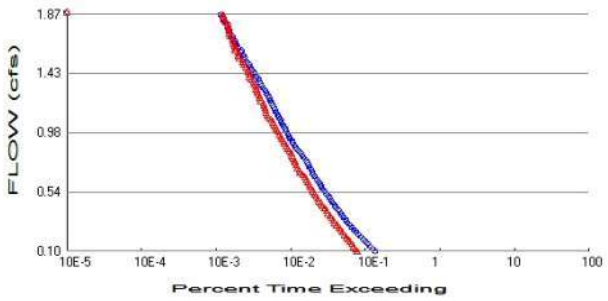
Landscape Swale Hydraulic Table

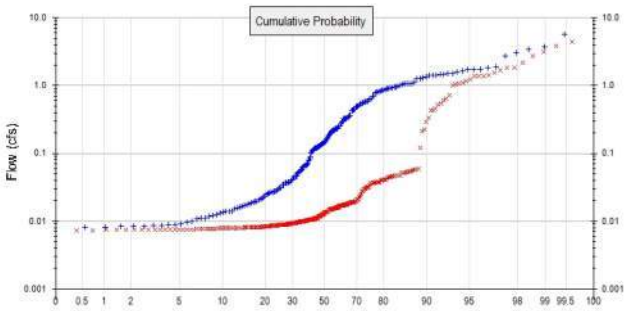
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.0574	0.0922	0.0028	0.0053	0.0000
4.3516	0.0588	0.0981	0.0035	0.0053	0.0000
4.4533	0.0602	0.1041	0.0041	0.0053	0.0000
4.5549	0.0617	0.1103	0.0047	0.0053	0.0000
4.6566	0.0631	0.1167	0.0051	0.0053	0.0000
4.7582	0.0646	0.1232	0.0056	0.0053	0.0000
4.8599	0.0661	0.1298	0.0060	0.0053	0.0000
4.9615	0.0676	0.1366	0.0064	0.0053	0.0000
5.0632	0.0691	0.1435	0.0067	0.0053	0.0000
5.1648	0.0706	0.1506	0.0071	0.0053	0.0000
5.2665	0.0722	0.1579	0.0074	0.0053	0.0000
5.3681	0.0737	0.1653	0.0077	0.0053	0.0000
5.4698	0.0753	0.1729	0.0080	0.0053	0.0000
5.5714	0.0769	0.1806	0.0083	0.0053	0.0000
5.6731	0.0785	0.1885	0.0086	0.0053	0.0000
5.7747	0.0801	0.1966	0.0099	0.0053	0.0000
5.8764	0.0817	0.2048	0.0115	0.0053	0.0000
5.9780	0.0834	0.2132	0.0126	0.0053	0.0000
6.0797	0.0851	0.2217	0.0135	0.0053	0.0000
6.1813	0.0867	0.2305	0.0143	0.0053	0.0000
6.2830	0.0884	0.2394	0.0150	0.0053	0.0000
6.3846	0.0901	0.2485	0.0157	0.0053	0.0000
6.4863	0.0919	0.2577	0.0163	0.0053	0.0000
6.5879	0.0936	0.2671	0.0169	0.0053	0.0000
6.6896	0.0954	0.2767	0.0175	0.0053	0.0000
6.7912	0.0971	0.2865	0.0236	0.0053	0.0000
6.8929	0.0989	0.2965	0.0289	0.0053	0.0000
6.9945	0.1007	0.3066	0.0326	0.0053	0.0000
7.0962	0.1025	0.3170	0.0356	0.0053	0.0000
7.1978	0.1044	0.3275	0.0383	0.0053	0.0000
7.2995	0.1062	0.3382	0.0407	0.0053	0.0000
7.4011	0.1081	0.3491	0.0430	0.0053	0.0000
7.5027	0.1100	0.3602	0.0451	0.0053	0.0000
7.6044	0.1119	0.3714	0.0471	0.0053	0.0000
7.7060	0.1138	0.3829	0.0489	0.0053	0.0000
7.8077	0.1157	0.3946	0.0507	0.0053	0.0000
7.9093	0.1176	0.4064	0.0525	0.0053	0.0000
8.0110	0.1196	0.4185	0.0541	0.0053	0.0000

8.1126	0.1216	0.4307	0.0557	0.0053	0.0000
8.2143	0.1235	0.4432	0.0573	0.0053	0.0000
8.3159	0.1255	0.4559	0.5977	0.0053	0.0000
8.4176	0.1276	0.4687	2.2406	0.0053	0.0000
8.5192	0.1296	0.4818	4.4883	0.0053	0.0000
8.6209	0.1316	0.4951	7.1751	0.0053	0.0000
8.7225	0.1337	0.5085	10.179	0.0053	0.0000
8.8242	0.1358	0.5222	13.384	0.0053	0.0000
8.9258	0.1379	0.5362	16.669	0.0053	0.0000
9.0275	0.1400	0.5503	19.914	0.0053	0.0000
9.1291	0.1421	0.5646	22.999	0.0053	0.0000
9.2308	0.1442	0.5792	25.818	0.0053	0.0000
9.2500	0.1446	0.5819	28.284	0.0053	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.66
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.16
Total Impervious Area: 1.5

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.96597
5 year	1.521876
10 year	1.871832
25 year	3.40481

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.165616
5 year	1.384374
10 year	1.812008
25 year	3.165538

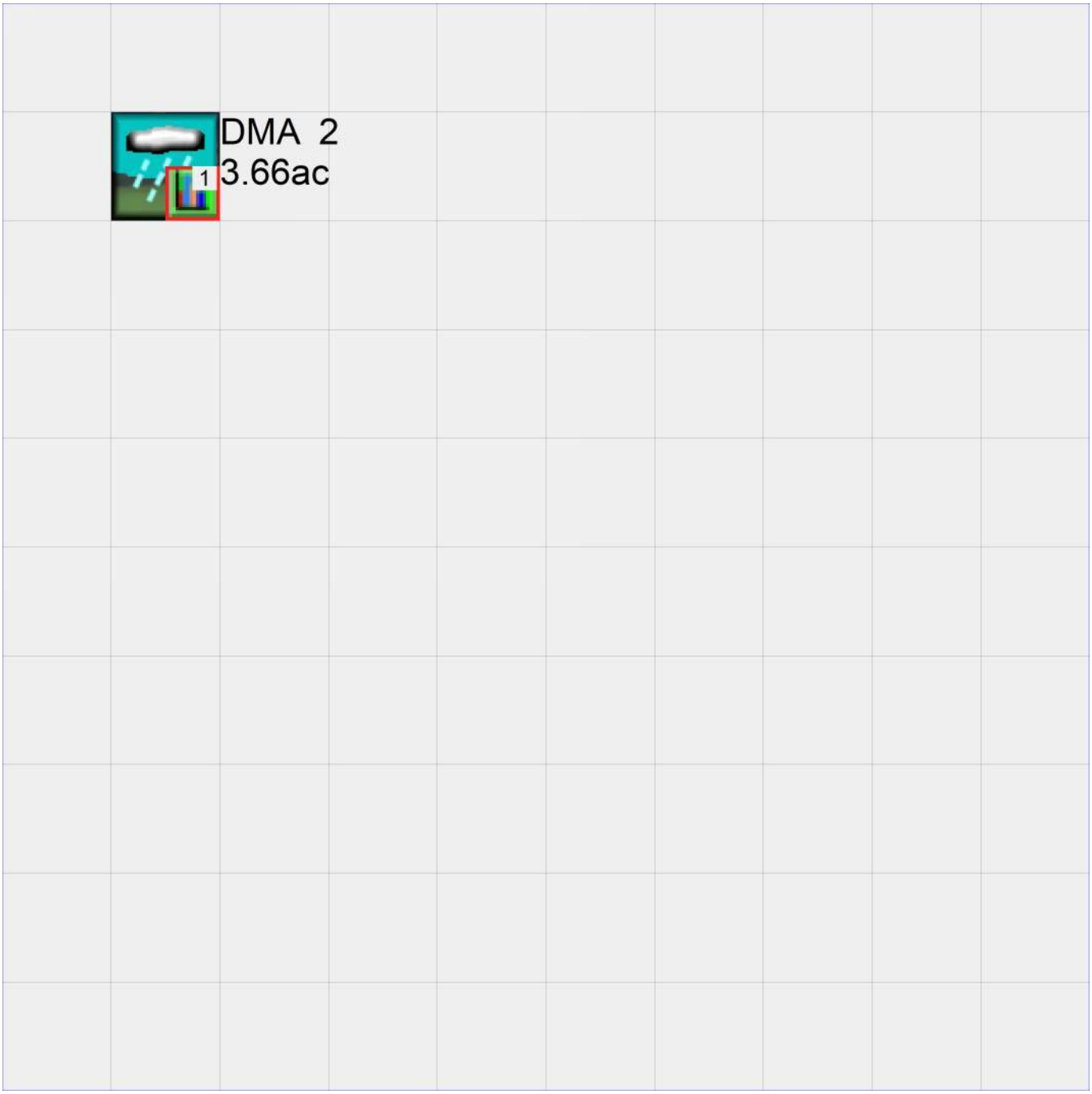
Duration Flows

The Facility PASSED

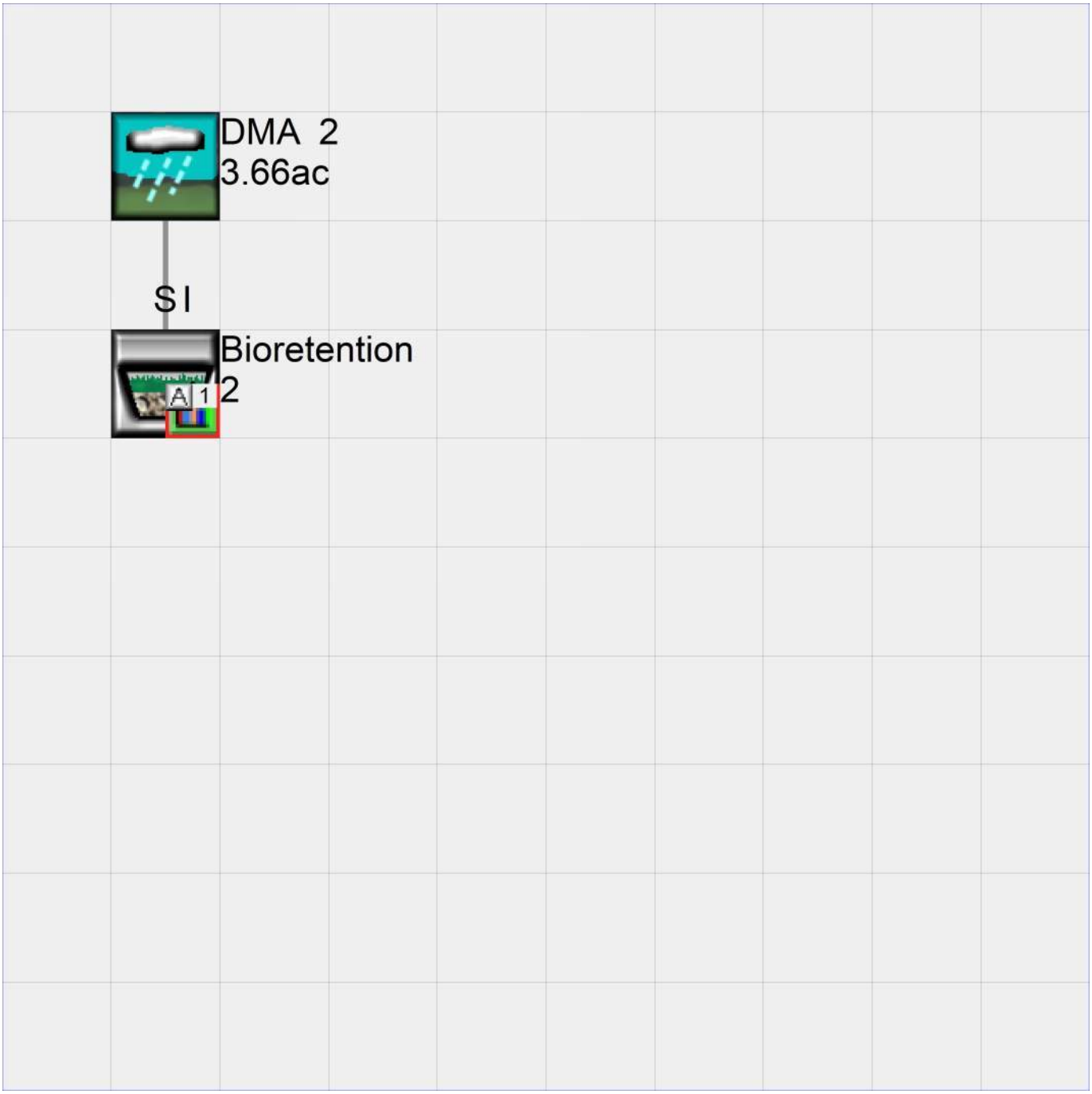
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0966	2941	1692	57	Pass
0.1145	2728	1601	58	Pass
0.1325	2528	1508	59	Pass
0.1504	2359	1437	60	Pass
0.1683	2198	1355	61	Pass
0.1863	2018	1279	63	Pass
0.2042	1891	1203	63	Pass
0.2221	1747	1126	64	Pass
0.2401	1628	1060	65	Pass
0.2580	1518	1014	66	Pass
0.2759	1422	972	68	Pass
0.2938	1347	900	66	Pass
0.3118	1266	848	66	Pass
0.3297	1193	810	67	Pass
0.3476	1113	771	69	Pass
0.3656	1055	726	68	Pass
0.3835	1011	691	68	Pass
0.4014	952	657	69	Pass
0.4194	894	621	69	Pass
0.4373	848	579	68	Pass
0.4552	801	550	68	Pass
0.4732	759	517	68	Pass
0.4911	721	499	69	Pass
0.5090	692	473	68	Pass
0.5270	651	455	69	Pass
0.5449	620	435	70	Pass
0.5628	587	416	70	Pass
0.5808	561	397	70	Pass
0.5987	538	387	71	Pass
0.6166	510	370	72	Pass
0.6345	486	353	72	Pass
0.6525	454	336	74	Pass
0.6704	432	316	73	Pass
0.6883	422	291	68	Pass
0.7063	409	283	69	Pass
0.7242	393	268	68	Pass
0.7421	376	258	68	Pass
0.7601	364	246	67	Pass
0.7780	349	243	69	Pass
0.7959	326	233	71	Pass
0.8139	311	228	73	Pass
0.8318	298	221	74	Pass
0.8497	277	208	75	Pass
0.8677	258	198	76	Pass
0.8856	246	189	76	Pass
0.9035	234	178	76	Pass
0.9215	227	174	76	Pass
0.9394	213	167	78	Pass
0.9573	206	160	77	Pass
0.9752	199	152	76	Pass
0.9932	188	147	78	Pass
1.0111	184	141	76	Pass
1.0290	175	135	77	Pass

1.0470	169	130	76	Pass
1.0649	162	125	77	Pass
1.0828	157	118	75	Pass
1.1008	150	109	72	Pass
1.1187	146	105	71	Pass
1.1366	139	102	73	Pass
1.1546	133	101	75	Pass
1.1725	129	98	75	Pass
1.1904	124	95	76	Pass
1.2084	119	94	78	Pass
1.2263	116	87	75	Pass
1.2442	112	84	75	Pass
1.2622	109	83	76	Pass
1.2801	103	79	76	Pass
1.2980	99	76	76	Pass
1.3160	94	75	79	Pass
1.3339	88	74	84	Pass
1.3518	85	70	82	Pass
1.3697	83	69	83	Pass
1.3877	81	65	80	Pass
1.4056	75	61	81	Pass
1.4235	72	61	84	Pass
1.4415	69	59	85	Pass
1.4594	65	58	89	Pass
1.4773	63	54	85	Pass
1.4953	60	51	85	Pass
1.5132	56	50	89	Pass
1.5311	53	49	92	Pass
1.5491	52	44	84	Pass
1.5670	51	43	84	Pass
1.5849	47	43	91	Pass
1.6029	47	39	82	Pass
1.6208	43	39	90	Pass
1.6387	41	39	95	Pass
1.6567	40	37	92	Pass
1.6746	38	36	94	Pass
1.6925	36	36	100	Pass
1.7104	36	34	94	Pass
1.7284	33	32	96	Pass
1.7463	33	32	96	Pass
1.7642	31	32	103	Pass
1.7822	31	32	103	Pass
1.8001	31	31	100	Pass
1.8180	28	29	103	Pass
1.8360	27	27	100	Pass
1.8539	26	27	103	Pass
1.8718	25	27	108	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA3
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

DMA 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	2.49
Pervious Total	2.49
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.49

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	1.37
Pervious Total	1.37

Impervious Land Use	acre
Roads,Flat(0-5%)	1.12
Impervious Total	1.12
Basin Total	2.49

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 3	Surface oretention 3	

Mitigated Routing

Bioretention 3

Bottom Length:	50.00 ft.
Bottom Width:	50.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Amended 1.5 in/hr
Material thickness of second layer:	3
Material type for second layer:	Amended 1.5 in/hr
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	29.495
Total Outflow (ac-ft.):	67.994
Percent Through Underdrain:	43.38
Discharge Structure	
Riser Height:	4 ft.
Riser Diameter:	36 in.
Orifice 1 Diameter:	0.5 in. Elevation:0.5 ft.
Orifice 2 Diameter:	0.5 in. Elevation:1.5 ft.
Orifice 3 Diameter:	0.5 in. Elevation:2.5 ft.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0574	0.0000	0.0000	0.0000
0.1016	0.0574	0.0021	0.0000	0.0000
0.2033	0.0574	0.0043	0.0000	0.0000
0.3049	0.0574	0.0064	0.0000	0.0000
0.4066	0.0574	0.0085	0.0000	0.0000
0.5082	0.0574	0.0106	0.0000	0.0000
0.6099	0.0574	0.0128	0.0000	0.0000
0.7115	0.0574	0.0149	0.0000	0.0000
0.8132	0.0574	0.0170	0.0000	0.0000
0.9148	0.0574	0.0192	0.0000	0.0000
1.0165	0.0574	0.0213	0.0000	0.0000
1.1181	0.0574	0.0234	0.0000	0.0000
1.2198	0.0574	0.0256	0.0000	0.0000
1.3214	0.0574	0.0277	0.0000	0.0000
1.4231	0.0574	0.0298	0.0000	0.0000
1.5247	0.0574	0.0319	0.0003	0.0000
1.6264	0.0574	0.0341	0.0005	0.0000
1.7280	0.0574	0.0362	0.0011	0.0000
1.8297	0.0574	0.0383	0.0014	0.0000
1.9313	0.0574	0.0405	0.0018	0.0000
2.0330	0.0574	0.0426	0.0021	0.0000
2.1346	0.0574	0.0447	0.0024	0.0000
2.2363	0.0574	0.0468	0.0026	0.0000
2.3379	0.0574	0.0490	0.0029	0.0000
2.4396	0.0574	0.0511	0.0030	0.0000
2.5412	0.0574	0.0532	0.0033	0.0000

2.6429	0.0574	0.0554	0.0034	0.0000
2.7445	0.0574	0.0575	0.0036	0.0000
2.8462	0.0574	0.0596	0.0037	0.0000
2.9478	0.0574	0.0618	0.0039	0.0000
3.0495	0.0574	0.0639	0.0040	0.0000
3.1511	0.0574	0.0660	0.0042	0.0000
3.2527	0.0574	0.0684	0.0043	0.0000
3.3544	0.0574	0.0709	0.0045	0.0000
3.4560	0.0574	0.0733	0.0046	0.0000
3.5577	0.0574	0.0757	0.0046	0.0000
3.6593	0.0574	0.0781	0.0047	0.0000
3.7610	0.0574	0.0805	0.0048	0.0000
3.8626	0.0574	0.0830	0.0049	0.0000
3.9643	0.0574	0.0854	0.0050	0.0000
4.0659	0.0574	0.0878	0.0051	0.0000
4.1676	0.0574	0.0902	0.0053	0.0000
4.2500	0.0574	0.0922	0.0136	0.0000

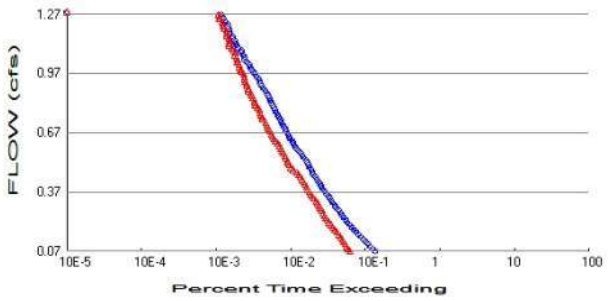
Landscape Swale Hydraulic Table

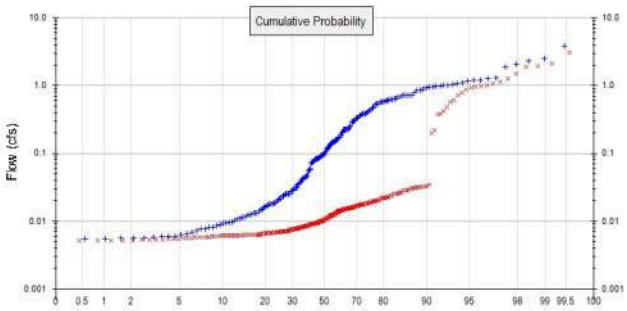
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.0574	0.0922	0.0000	0.0053	0.0000
4.3516	0.0588	0.0981	0.0000	0.0053	0.0000
4.4533	0.0602	0.1041	0.0000	0.0053	0.0000
4.5549	0.0617	0.1103	0.0000	0.0053	0.0000
4.6566	0.0631	0.1167	0.0000	0.0053	0.0000
4.7582	0.0646	0.1232	0.0006	0.0053	0.0000
4.8599	0.0661	0.1298	0.0022	0.0053	0.0000
4.9615	0.0676	0.1366	0.0031	0.0053	0.0000
5.0632	0.0691	0.1435	0.0038	0.0053	0.0000
5.1648	0.0706	0.1506	0.0044	0.0053	0.0000
5.2665	0.0722	0.1579	0.0049	0.0053	0.0000
5.3681	0.0737	0.1653	0.0053	0.0053	0.0000
5.4698	0.0753	0.1729	0.0058	0.0053	0.0000
5.5714	0.0769	0.1806	0.0061	0.0053	0.0000
5.6731	0.0785	0.1885	0.0065	0.0053	0.0000
5.7747	0.0801	0.1966	0.0079	0.0053	0.0000
5.8764	0.0817	0.2048	0.0096	0.0053	0.0000
5.9780	0.0834	0.2132	0.0108	0.0053	0.0000
6.0797	0.0851	0.2217	0.0117	0.0053	0.0000
6.1813	0.0867	0.2305	0.0126	0.0053	0.0000
6.2830	0.0884	0.2394	0.0134	0.0053	0.0000
6.3846	0.0901	0.2485	0.0141	0.0053	0.0000
6.4863	0.0919	0.2577	0.0148	0.0053	0.0000
6.5879	0.0936	0.2671	0.0154	0.0053	0.0000
6.6896	0.0954	0.2767	0.0160	0.0053	0.0000
6.7912	0.0971	0.2865	0.0180	0.0053	0.0000
6.8929	0.0989	0.2965	0.0197	0.0053	0.0000
6.9945	0.1007	0.3066	0.0211	0.0053	0.0000
7.0962	0.1025	0.3170	0.0223	0.0053	0.0000
7.1978	0.1044	0.3275	0.0233	0.0053	0.0000
7.2995	0.1062	0.3382	0.0243	0.0053	0.0000
7.4011	0.1081	0.3491	0.0252	0.0053	0.0000
7.5027	0.1100	0.3602	0.0261	0.0053	0.0000
7.6044	0.1119	0.3714	0.0270	0.0053	0.0000
7.7060	0.1138	0.3829	0.0278	0.0053	0.0000
7.8077	0.1157	0.3946	0.0286	0.0053	0.0000
7.9093	0.1176	0.4064	0.0293	0.0053	0.0000
8.0110	0.1196	0.4185	0.0301	0.0053	0.0000

8.1126	0.1216	0.4307	0.0308	0.0053	0.0000
8.2143	0.1235	0.4432	0.0315	0.0053	0.0000
8.3159	0.1255	0.4559	0.5710	0.0053	0.0000
8.4176	0.1276	0.4687	2.2132	0.0053	0.0000
8.5192	0.1296	0.4818	4.4602	0.0053	0.0000
8.6209	0.1316	0.4951	7.1461	0.0053	0.0000
8.7225	0.1337	0.5085	10.149	0.0053	0.0000
8.8242	0.1358	0.5222	13.353	0.0053	0.0000
8.9258	0.1379	0.5362	16.638	0.0053	0.0000
9.0275	0.1400	0.5503	19.882	0.0053	0.0000
9.1291	0.1421	0.5646	22.967	0.0053	0.0000
9.2308	0.1442	0.5792	25.785	0.0053	0.0000
9.2500	0.1446	0.5819	28.250	0.0053	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.49
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.37
Total Impervious Area: 1.12

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.657176
5 year	1.035375
10 year	1.273459
25 year	2.316387

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.030475
5 year	0.884362
10 year	1.183871
25 year	1.944228

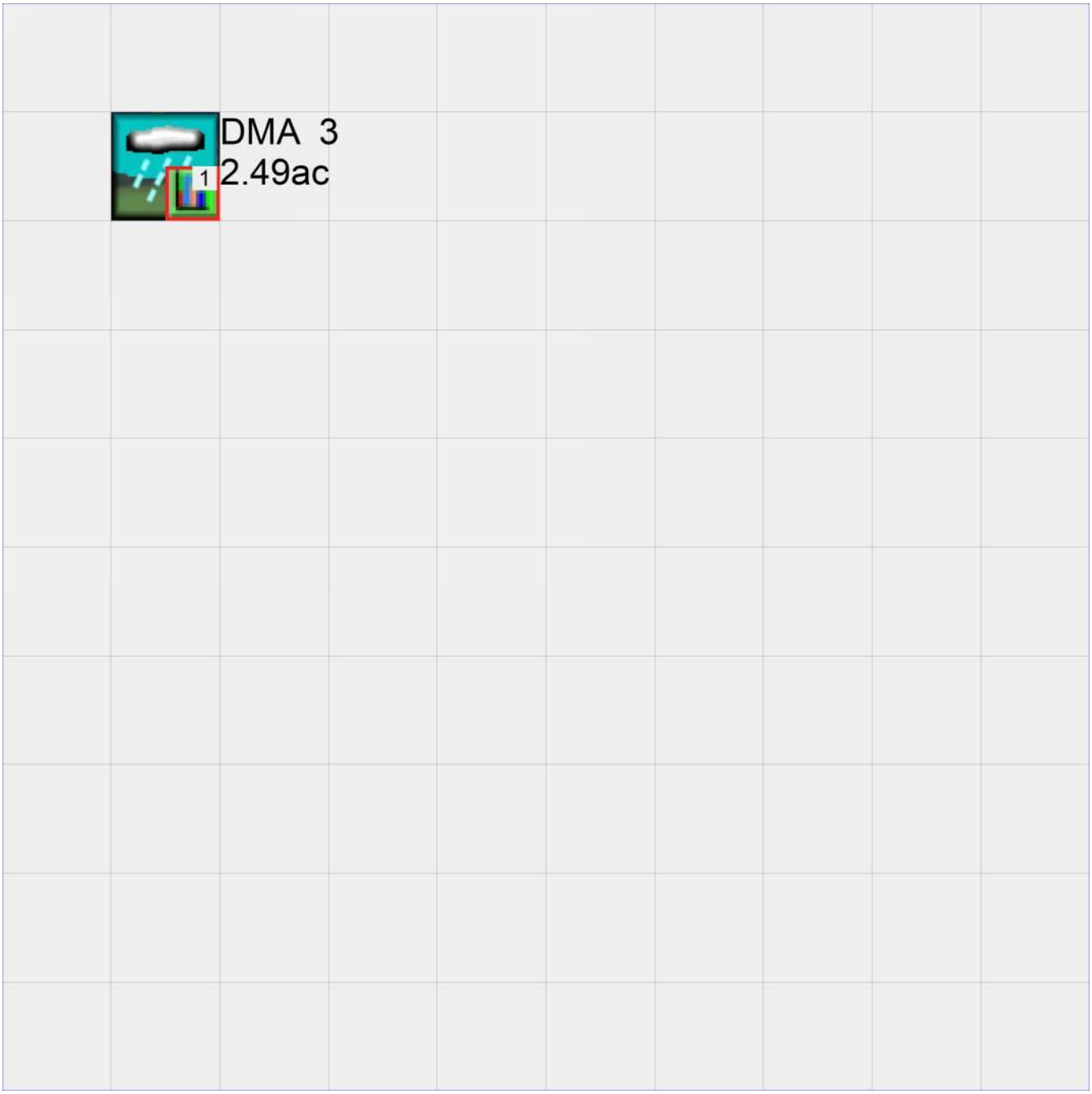
Duration Flows

The Facility PASSED

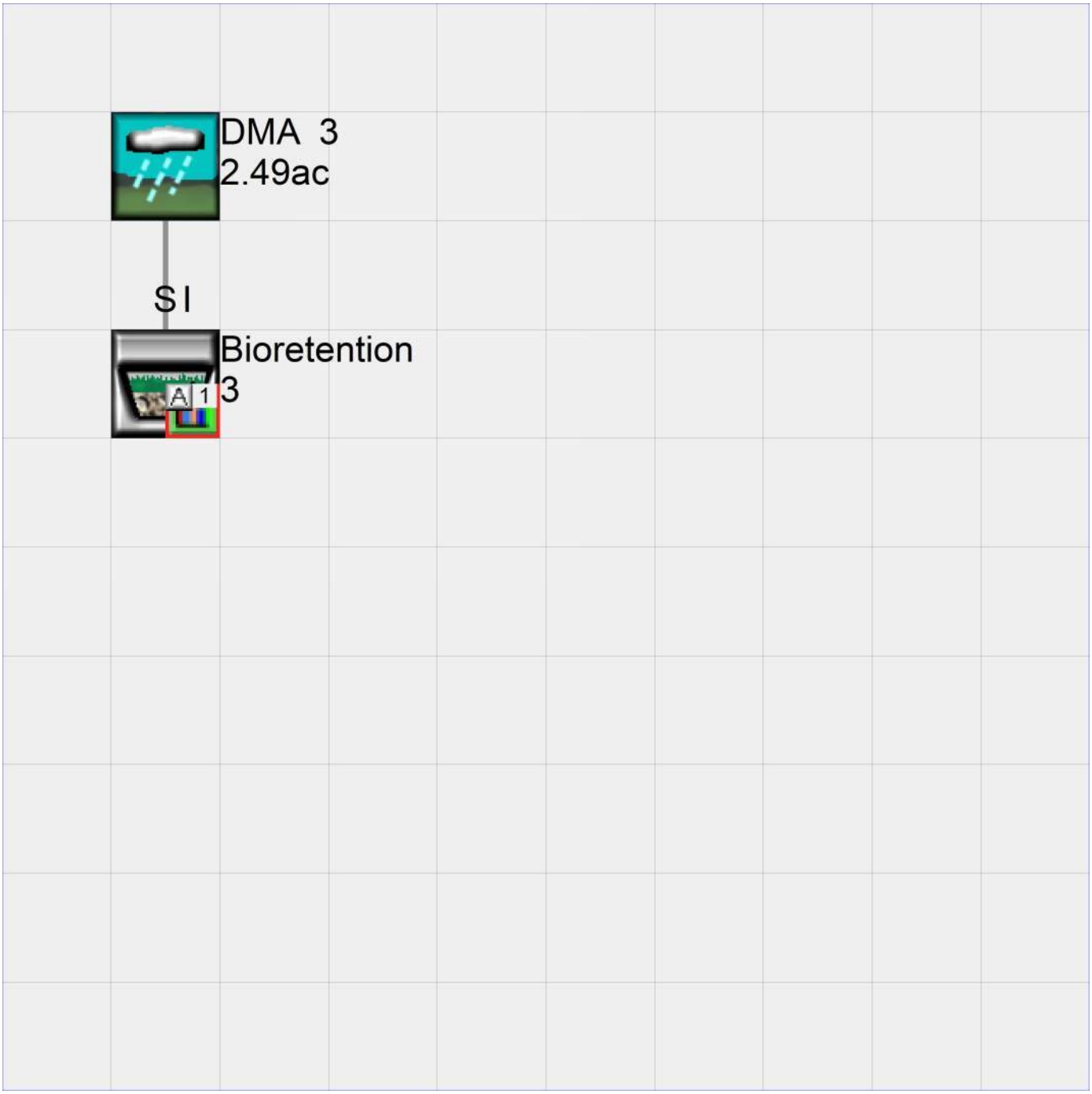
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0657	2946	1353	45	Pass
0.0779	2743	1285	46	Pass
0.0901	2526	1213	48	Pass
0.1023	2359	1161	49	Pass
0.1145	2200	1106	50	Pass
0.1267	2029	1060	52	Pass
0.1389	1897	1020	53	Pass
0.1511	1747	950	54	Pass
0.1633	1630	895	54	Pass
0.1755	1515	844	55	Pass
0.1877	1422	801	56	Pass
0.1999	1348	761	56	Pass
0.2121	1261	707	56	Pass
0.2243	1193	670	56	Pass
0.2365	1113	643	57	Pass
0.2487	1056	614	58	Pass
0.2609	1012	589	58	Pass
0.2731	952	562	59	Pass
0.2853	894	541	60	Pass
0.2975	848	520	61	Pass
0.3097	804	497	61	Pass
0.3219	763	477	62	Pass
0.3341	721	443	61	Pass
0.3463	692	420	60	Pass
0.3585	651	402	61	Pass
0.3707	620	385	62	Pass
0.3829	587	368	62	Pass
0.3951	561	353	62	Pass
0.4073	538	335	62	Pass
0.4195	510	326	63	Pass
0.4317	488	308	63	Pass
0.4439	457	294	64	Pass
0.4561	432	278	64	Pass
0.4683	422	260	61	Pass
0.4805	409	235	57	Pass
0.4927	393	219	55	Pass
0.5049	376	207	55	Pass
0.5171	364	199	54	Pass
0.5293	349	196	56	Pass
0.5415	325	188	57	Pass
0.5537	311	180	57	Pass
0.5659	298	172	57	Pass
0.5781	277	165	59	Pass
0.5903	258	160	62	Pass
0.6025	246	155	63	Pass
0.6147	235	145	61	Pass
0.6269	228	135	59	Pass
0.6391	213	129	60	Pass
0.6513	206	123	59	Pass
0.6635	199	119	59	Pass
0.6757	189	115	60	Pass
0.6879	184	110	59	Pass
0.7001	175	107	61	Pass

0.7123	169	104	61	Pass
0.7245	161	100	62	Pass
0.7367	157	91	57	Pass
0.7489	150	89	59	Pass
0.7611	146	87	59	Pass
0.7733	139	85	61	Pass
0.7855	133	83	62	Pass
0.7977	129	78	60	Pass
0.8099	124	73	58	Pass
0.8221	119	71	59	Pass
0.8343	116	71	61	Pass
0.8465	112	68	60	Pass
0.8587	109	66	60	Pass
0.8709	104	63	60	Pass
0.8831	99	59	59	Pass
0.8953	94	59	62	Pass
0.9075	88	56	63	Pass
0.9197	85	56	65	Pass
0.9319	84	53	63	Pass
0.9441	81	52	64	Pass
0.9563	75	52	69	Pass
0.9685	72	51	70	Pass
0.9807	69	47	68	Pass
0.9929	65	46	70	Pass
1.0051	63	45	71	Pass
1.0173	60	44	73	Pass
1.0295	56	42	75	Pass
1.0417	53	42	79	Pass
1.0539	52	41	78	Pass
1.0661	51	39	76	Pass
1.0783	47	39	82	Pass
1.0905	47	37	78	Pass
1.1027	43	35	81	Pass
1.1149	41	33	80	Pass
1.1271	40	33	82	Pass
1.1393	38	33	86	Pass
1.1515	36	32	88	Pass
1.1637	36	30	83	Pass
1.1759	33	30	90	Pass
1.1881	33	30	90	Pass
1.2003	31	28	90	Pass
1.2125	31	27	87	Pass
1.2247	31	27	87	Pass
1.2369	29	26	89	Pass
1.2491	27	24	88	Pass
1.2613	26	24	92	Pass
1.2735	25	23	92	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA4
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

DMA 4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	5.22
Pervious Total	5.22
Impervious Land Use	acre
Impervious Total	0
Basin Total	5.22

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 4

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	3.04
Pervious Total	3.04

Impervious Land Use	acre
Roads,Flat(0-5%)	2.18
Impervious Total	2.18
Basin Total	5.22

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 4	Surface oretention 4	

Mitigated Routing

Bioretention 4

Bottom Length:	40.00 ft.	
Bottom Width:	40.00 ft.	
Material thickness of first layer:	0.25	
Material type for first layer:	Amended 1.5 in/hr	
Material thickness of second layer:	3	
Material type for second layer:	Amended 1.5 in/hr	
Material thickness of third layer:	1	
Material type for third layer:	GRAVEL	
Underdrain used		
Underdrain Diameter (feet):	0.5	
Orifice Diameter (in.):	0.5	
Offset (in.):	3	
Flow Through Underdrain (ac-ft.):	25.332	
Total Outflow (ac-ft.):	138.039	
Percent Through Underdrain:	18.35	
Discharge Structure		
Riser Height:	4 ft.	
Riser Diameter:	36 in.	
Orifice 1 Diameter:	1 in.	Elevation:0.5 ft.
Orifice 2 Diameter:	1 in.	Elevation:1.5 ft.
Orifice 3 Diameter:	1 in.	Elevation:2.5 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0367	0.0000	0.0000	0.0000
0.1016	0.0367	0.0014	0.0000	0.0000
0.2033	0.0367	0.0027	0.0000	0.0000
0.3049	0.0367	0.0041	0.0000	0.0000
0.4066	0.0367	0.0055	0.0000	0.0000
0.5082	0.0367	0.0068	0.0000	0.0000
0.6099	0.0367	0.0082	0.0000	0.0000
0.7115	0.0367	0.0095	0.0000	0.0000
0.8132	0.0367	0.0109	0.0000	0.0000
0.9148	0.0367	0.0123	0.0000	0.0000
1.0165	0.0367	0.0136	0.0000	0.0000
1.1181	0.0367	0.0150	0.0000	0.0000
1.2198	0.0367	0.0164	0.0000	0.0000
1.3214	0.0367	0.0177	0.0000	0.0000
1.4231	0.0367	0.0191	0.0000	0.0000
1.5247	0.0367	0.0204	0.0003	0.0000
1.6264	0.0367	0.0218	0.0005	0.0000
1.7280	0.0367	0.0232	0.0011	0.0000
1.8297	0.0367	0.0245	0.0014	0.0000
1.9313	0.0367	0.0259	0.0018	0.0000
2.0330	0.0367	0.0273	0.0021	0.0000
2.1346	0.0367	0.0286	0.0024	0.0000
2.2363	0.0367	0.0300	0.0026	0.0000
2.3379	0.0367	0.0313	0.0029	0.0000
2.4396	0.0367	0.0327	0.0030	0.0000
2.5412	0.0367	0.0341	0.0033	0.0000

2.6429	0.0367	0.0354	0.0034	0.0000
2.7445	0.0367	0.0368	0.0036	0.0000
2.8462	0.0367	0.0382	0.0037	0.0000
2.9478	0.0367	0.0395	0.0039	0.0000
3.0495	0.0367	0.0409	0.0040	0.0000
3.1511	0.0367	0.0422	0.0042	0.0000
3.2527	0.0367	0.0438	0.0043	0.0000
3.3544	0.0367	0.0453	0.0045	0.0000
3.4560	0.0367	0.0469	0.0046	0.0000
3.5577	0.0367	0.0484	0.0046	0.0000
3.6593	0.0367	0.0500	0.0047	0.0000
3.7610	0.0367	0.0515	0.0048	0.0000
3.8626	0.0367	0.0531	0.0049	0.0000
3.9643	0.0367	0.0546	0.0050	0.0000
4.0659	0.0367	0.0562	0.0051	0.0000
4.1676	0.0367	0.0577	0.0053	0.0000
4.2500	0.0367	0.0590	0.0136	0.0000

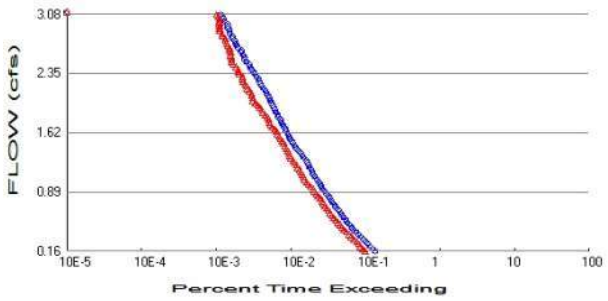
Landscape Swale Hydraulic Table

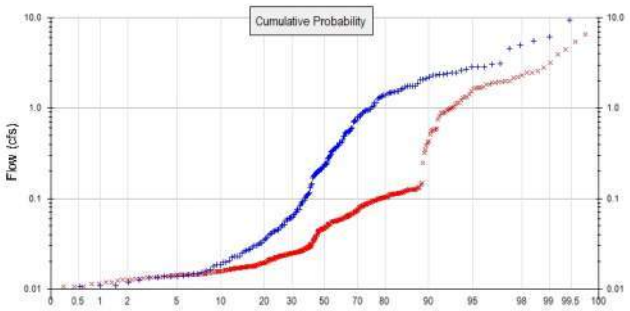
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.0367	0.0590	0.0000	0.0053	0.0000
4.3516	0.0379	0.0628	0.0000	0.0053	0.0000
4.4533	0.0390	0.0667	0.0000	0.0053	0.0000
4.5549	0.0402	0.0707	0.0000	0.0053	0.0000
4.6566	0.0413	0.0749	0.0000	0.0053	0.0000
4.7582	0.0425	0.0791	0.0025	0.0053	0.0000
4.8599	0.0437	0.0835	0.0090	0.0053	0.0000
4.9615	0.0449	0.0880	0.0125	0.0053	0.0000
5.0632	0.0462	0.0926	0.0152	0.0053	0.0000
5.1648	0.0474	0.0974	0.0175	0.0053	0.0000
5.2665	0.0487	0.1023	0.0195	0.0053	0.0000
5.3681	0.0500	0.1073	0.0213	0.0053	0.0000
5.4698	0.0513	0.1124	0.0230	0.0053	0.0000
5.5714	0.0526	0.1177	0.0246	0.0053	0.0000
5.6731	0.0539	0.1231	0.0261	0.0053	0.0000
5.7747	0.0552	0.1287	0.0317	0.0053	0.0000
5.8764	0.0566	0.1344	0.0384	0.0053	0.0000
5.9780	0.0580	0.1402	0.0430	0.0053	0.0000
6.0797	0.0594	0.1461	0.0469	0.0053	0.0000
6.1813	0.0608	0.1523	0.0503	0.0053	0.0000
6.2830	0.0622	0.1585	0.0534	0.0053	0.0000
6.3846	0.0636	0.1649	0.0563	0.0053	0.0000
6.4863	0.0650	0.1714	0.0590	0.0053	0.0000
6.5879	0.0665	0.1781	0.0616	0.0053	0.0000
6.6896	0.0680	0.1850	0.0641	0.0053	0.0000
6.7912	0.0695	0.1919	0.0720	0.0053	0.0000
6.8929	0.0710	0.1991	0.0790	0.0053	0.0000
6.9945	0.0725	0.2064	0.0843	0.0053	0.0000
7.0962	0.0740	0.2138	0.0890	0.0053	0.0000
7.1978	0.0756	0.2214	0.0933	0.0053	0.0000
7.2995	0.0772	0.2292	0.0972	0.0053	0.0000
7.4011	0.0787	0.2371	0.1010	0.0053	0.0000
7.5027	0.0803	0.2452	0.1045	0.0053	0.0000
7.6044	0.0820	0.2534	0.1079	0.0053	0.0000
7.7060	0.0836	0.2619	0.1111	0.0053	0.0000
7.8077	0.0852	0.2704	0.1143	0.0053	0.0000
7.9093	0.0869	0.2792	0.1173	0.0053	0.0000
8.0110	0.0886	0.2881	0.1203	0.0053	0.0000

8.1126	0.0903	0.2972	0.1232	0.0053	0.0000
8.2143	0.0920	0.3065	0.1259	0.0053	0.0000
8.3159	0.0937	0.3159	0.6676	0.0053	0.0000
8.4176	0.0954	0.3255	2.3117	0.0053	0.0000
8.5192	0.0972	0.3353	4.5606	0.0053	0.0000
8.6209	0.0989	0.3453	7.2485	0.0053	0.0000
8.7225	0.1007	0.3554	10.254	0.0053	0.0000
8.8242	0.1025	0.3657	13.459	0.0053	0.0000
8.9258	0.1043	0.3762	16.746	0.0053	0.0000
9.0275	0.1061	0.3869	19.992	0.0053	0.0000
9.1291	0.1080	0.3978	23.078	0.0053	0.0000
9.2308	0.1098	0.4089	25.898	0.0053	0.0000
9.2500	0.1102	0.4110	28.365	0.0053	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 5.22
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.04
Total Impervious Area: 2.18

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.591475
5 year	2.507354
10 year	3.083919
25 year	5.609565

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	1.194398
5 year	2.024664
10 year	2.638886
25 year	4.532696

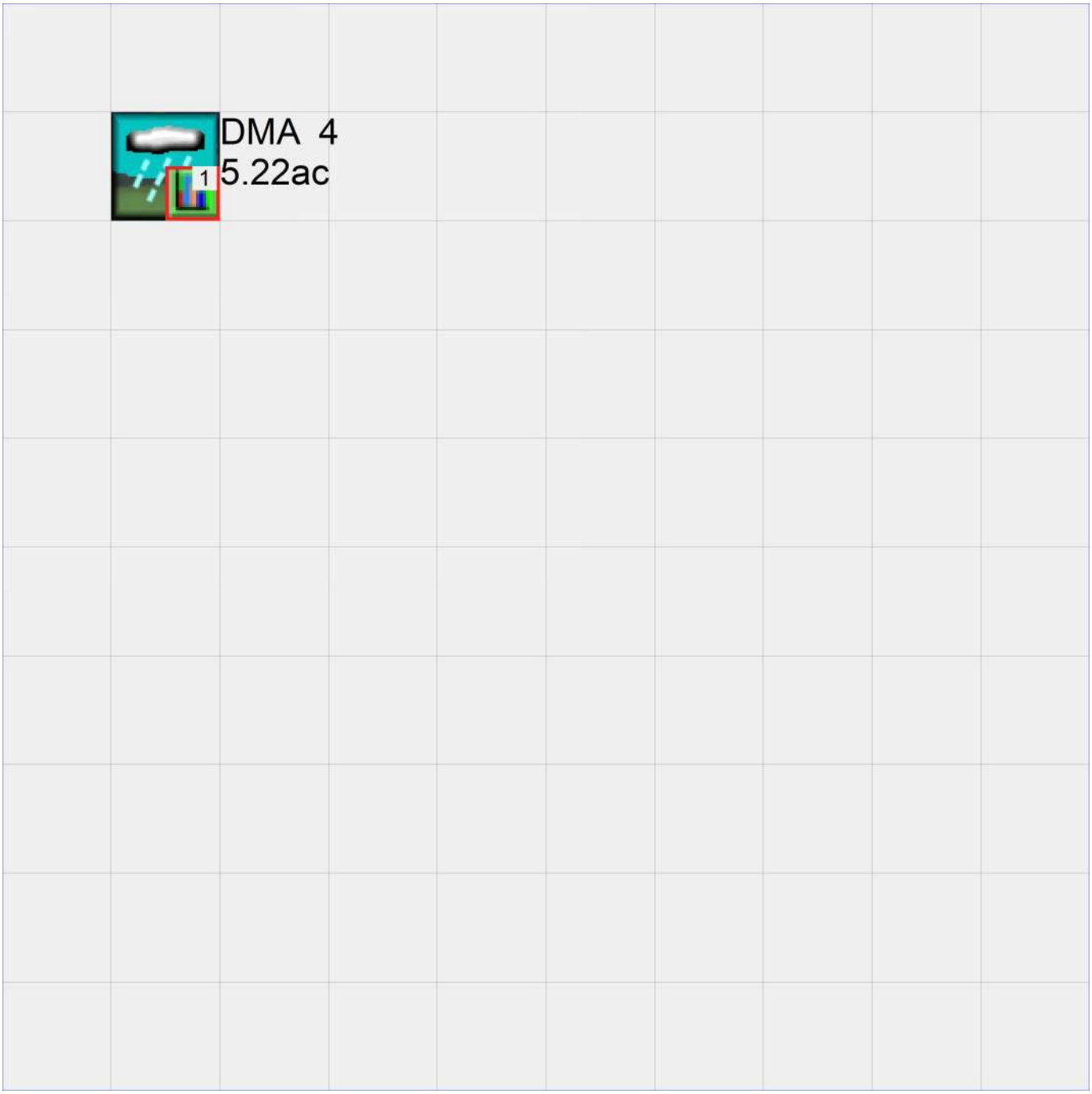
Duration Flows

The Facility PASSED

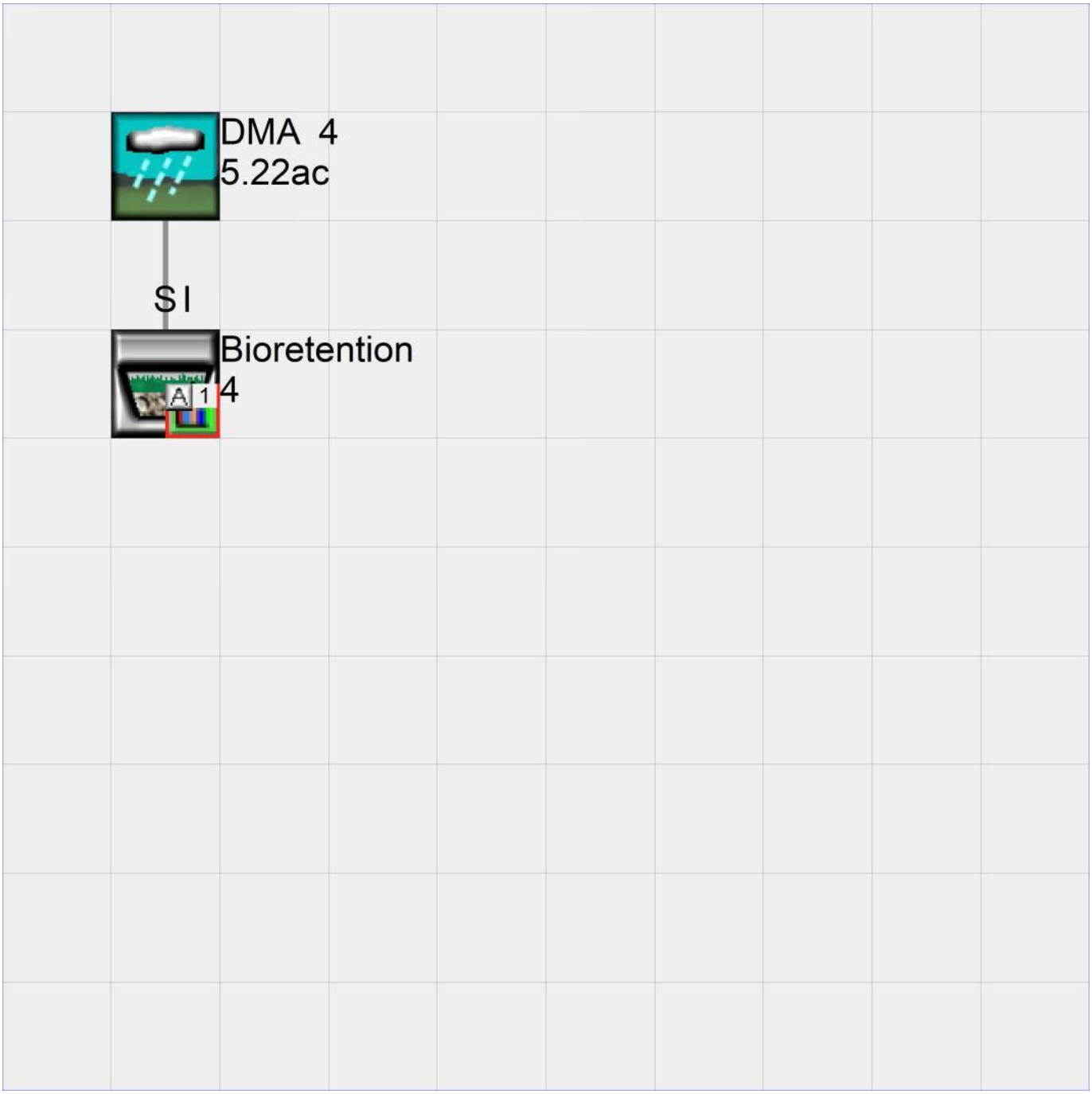
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1591	2939	2152	73	Pass
0.1887	2726	2008	73	Pass
0.2182	2526	1881	74	Pass
0.2478	2359	1769	74	Pass
0.2773	2198	1661	75	Pass
0.3069	2023	1520	75	Pass
0.3364	1891	1414	74	Pass
0.3659	1752	1320	75	Pass
0.3955	1629	1215	74	Pass
0.4250	1511	1112	73	Pass
0.4546	1418	1052	74	Pass
0.4841	1346	991	73	Pass
0.5137	1263	926	73	Pass
0.5432	1190	867	72	Pass
0.5728	1113	815	73	Pass
0.6023	1054	773	73	Pass
0.6318	1011	733	72	Pass
0.6614	952	696	73	Pass
0.6909	894	655	73	Pass
0.7205	848	623	73	Pass
0.7500	801	602	75	Pass
0.7796	759	571	75	Pass
0.8091	720	542	75	Pass
0.8386	692	502	72	Pass
0.8682	650	473	72	Pass
0.8977	619	455	73	Pass
0.9273	585	432	73	Pass
0.9568	561	400	71	Pass
0.9864	538	375	69	Pass
1.0159	510	351	68	Pass
1.0454	485	334	68	Pass
1.0750	455	320	70	Pass
1.1045	432	309	71	Pass
1.1341	422	298	70	Pass
1.1636	409	285	69	Pass
1.1932	393	272	69	Pass
1.2227	376	258	68	Pass
1.2522	364	242	66	Pass
1.2818	349	234	67	Pass
1.3113	325	220	67	Pass
1.3409	310	209	67	Pass
1.3704	297	203	68	Pass
1.4000	277	199	71	Pass
1.4295	258	189	73	Pass
1.4590	246	183	74	Pass
1.4886	234	172	73	Pass
1.5181	226	166	73	Pass
1.5477	213	158	74	Pass
1.5772	206	153	74	Pass
1.6068	199	145	72	Pass
1.6363	188	141	75	Pass
1.6658	184	132	71	Pass
1.6954	175	121	69	Pass

1.7249	169	115	68	Pass
1.7545	161	111	68	Pass
1.7840	157	110	70	Pass
1.8136	149	107	71	Pass
1.8431	146	98	67	Pass
1.8726	139	92	66	Pass
1.9022	133	89	66	Pass
1.9317	129	84	65	Pass
1.9613	123	79	64	Pass
1.9908	119	73	61	Pass
2.0204	116	68	58	Pass
2.0499	112	67	59	Pass
2.0795	109	65	59	Pass
2.1090	103	65	63	Pass
2.1385	99	61	61	Pass
2.1681	94	57	60	Pass
2.1976	88	55	62	Pass
2.2272	85	53	62	Pass
2.2567	83	50	60	Pass
2.2863	81	49	60	Pass
2.3158	75	49	65	Pass
2.3453	72	44	61	Pass
2.3749	69	43	62	Pass
2.4044	65	43	66	Pass
2.4340	63	40	63	Pass
2.4635	60	37	61	Pass
2.4931	55	35	63	Pass
2.5226	53	35	66	Pass
2.5521	52	35	67	Pass
2.5817	51	34	66	Pass
2.6112	47	34	72	Pass
2.6408	47	33	70	Pass
2.6703	43	33	76	Pass
2.6999	41	31	75	Pass
2.7294	40	30	75	Pass
2.7589	38	29	76	Pass
2.7885	36	29	80	Pass
2.8180	36	26	72	Pass
2.8476	33	26	78	Pass
2.8771	33	24	72	Pass
2.9067	31	24	77	Pass
2.9362	31	24	77	Pass
2.9657	31	24	77	Pass
2.9953	28	24	85	Pass
3.0248	27	24	88	Pass
3.0544	26	23	88	Pass
3.0839	25	22	88	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA5
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA 5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	0.66
Pervious Total	0.66
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.66

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 5

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.36
Pervious Total	0.36

Impervious Land Use	acre
Roads,Flat(0-5%)	0.3
Impervious Total	0.3
Basin Total	0.66

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 5	Surface oretention 5	

Mitigated Routing

Bioretention 5

Bottom Length:	52.00 ft.
Bottom Width:	52.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Amended 1.5 in/hr
Material thickness of second layer:	3
Material type for second layer:	Amended 1.5 in/hr
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	12.838
Total Outflow (ac-ft.):	17.401
Percent Through Underdrain:	73.78
Discharge Structure	
Riser Height:	4 ft.
Riser Diameter:	36 in.
Orifice 1 Diameter:	0.5 in. Elevation:0.5 ft.
Orifice 2 Diameter:	0.5 in. Elevation:1.5 ft.
Orifice 3 Diameter:	0.5 in. Elevation:2.5 ft.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0621	0.0000	0.0000	0.0000
0.1016	0.0621	0.0023	0.0000	0.0000
0.2033	0.0621	0.0046	0.0000	0.0000
0.3049	0.0621	0.0069	0.0000	0.0000
0.4066	0.0621	0.0092	0.0000	0.0000
0.5082	0.0621	0.0115	0.0000	0.0000
0.6099	0.0621	0.0138	0.0000	0.0000
0.7115	0.0621	0.0161	0.0000	0.0000
0.8132	0.0621	0.0184	0.0000	0.0000
0.9148	0.0621	0.0207	0.0000	0.0000
1.0165	0.0621	0.0230	0.0000	0.0000
1.1181	0.0621	0.0253	0.0000	0.0000
1.2198	0.0621	0.0276	0.0000	0.0000
1.3214	0.0621	0.0299	0.0000	0.0000
1.4231	0.0621	0.0322	0.0000	0.0000
1.5247	0.0621	0.0345	0.0003	0.0000
1.6264	0.0621	0.0368	0.0005	0.0000
1.7280	0.0621	0.0392	0.0011	0.0000
1.8297	0.0621	0.0415	0.0014	0.0000
1.9313	0.0621	0.0438	0.0018	0.0000
2.0330	0.0621	0.0461	0.0021	0.0000
2.1346	0.0621	0.0484	0.0024	0.0000
2.2363	0.0621	0.0507	0.0026	0.0000
2.3379	0.0621	0.0530	0.0029	0.0000
2.4396	0.0621	0.0553	0.0030	0.0000
2.5412	0.0621	0.0576	0.0033	0.0000

2.6429	0.0621	0.0599	0.0034	0.0000
2.7445	0.0621	0.0622	0.0036	0.0000
2.8462	0.0621	0.0645	0.0037	0.0000
2.9478	0.0621	0.0668	0.0039	0.0000
3.0495	0.0621	0.0691	0.0040	0.0000
3.1511	0.0621	0.0714	0.0042	0.0000
3.2527	0.0621	0.0740	0.0043	0.0000
3.3544	0.0621	0.0766	0.0045	0.0000
3.4560	0.0621	0.0793	0.0046	0.0000
3.5577	0.0621	0.0819	0.0046	0.0000
3.6593	0.0621	0.0845	0.0047	0.0000
3.7610	0.0621	0.0871	0.0048	0.0000
3.8626	0.0621	0.0897	0.0049	0.0000
3.9643	0.0621	0.0923	0.0050	0.0000
4.0659	0.0621	0.0950	0.0051	0.0000
4.1676	0.0621	0.0976	0.0053	0.0000
4.2500	0.0621	0.0997	0.0136	0.0000

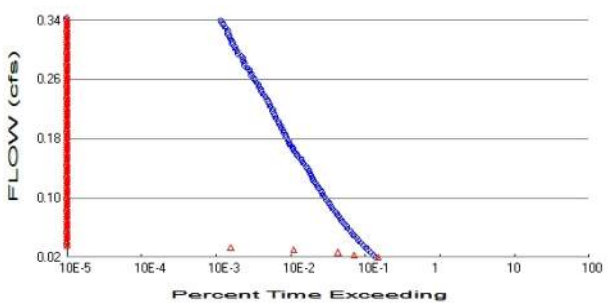
Landscape Swale Hydraulic Table

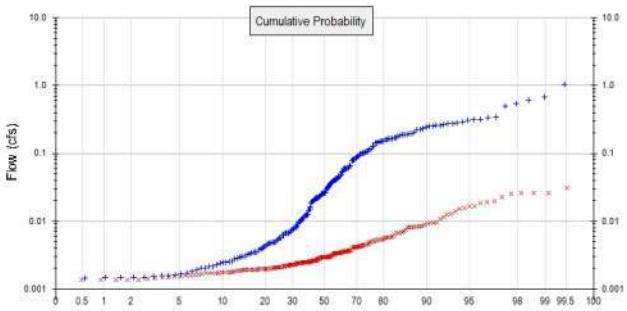
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.0621	0.0997	0.0000	0.0053	0.0000
4.3516	0.0635	0.1061	0.0000	0.0053	0.0000
4.4533	0.0650	0.1126	0.0000	0.0053	0.0000
4.5549	0.0665	0.1193	0.0000	0.0053	0.0000
4.6566	0.0680	0.1261	0.0000	0.0053	0.0000
4.7582	0.0695	0.1331	0.0006	0.0053	0.0000
4.8599	0.0711	0.1403	0.0022	0.0053	0.0000
4.9615	0.0726	0.1476	0.0031	0.0053	0.0000
5.0632	0.0742	0.1551	0.0038	0.0053	0.0000
5.1648	0.0758	0.1627	0.0044	0.0053	0.0000
5.2665	0.0774	0.1705	0.0049	0.0053	0.0000
5.3681	0.0790	0.1784	0.0053	0.0053	0.0000
5.4698	0.0806	0.1865	0.0058	0.0053	0.0000
5.5714	0.0823	0.1948	0.0061	0.0053	0.0000
5.6731	0.0839	0.2033	0.0065	0.0053	0.0000
5.7747	0.0856	0.2119	0.0079	0.0053	0.0000
5.8764	0.0873	0.2207	0.0096	0.0053	0.0000
5.9780	0.0890	0.2296	0.0108	0.0053	0.0000
6.0797	0.0907	0.2388	0.0117	0.0053	0.0000
6.1813	0.0925	0.2481	0.0126	0.0053	0.0000
6.2830	0.0942	0.2576	0.0134	0.0053	0.0000
6.3846	0.0960	0.2672	0.0141	0.0053	0.0000
6.4863	0.0978	0.2771	0.0148	0.0053	0.0000
6.5879	0.0996	0.2871	0.0154	0.0053	0.0000
6.6896	0.1014	0.2973	0.0160	0.0053	0.0000
6.7912	0.1032	0.3077	0.0180	0.0053	0.0000
6.8929	0.1051	0.3183	0.0197	0.0053	0.0000
6.9945	0.1069	0.3291	0.0211	0.0053	0.0000
7.0962	0.1088	0.3401	0.0223	0.0053	0.0000
7.1978	0.1107	0.3512	0.0233	0.0053	0.0000
7.2995	0.1126	0.3626	0.0243	0.0053	0.0000
7.4011	0.1145	0.3741	0.0252	0.0053	0.0000
7.5027	0.1164	0.3858	0.0261	0.0053	0.0000
7.6044	0.1184	0.3978	0.0270	0.0053	0.0000
7.7060	0.1204	0.4099	0.0278	0.0053	0.0000
7.8077	0.1223	0.4222	0.0286	0.0053	0.0000
7.9093	0.1243	0.4348	0.0293	0.0053	0.0000
8.0110	0.1263	0.4475	0.0301	0.0053	0.0000

8.1126	0.1284	0.4605	0.0308	0.0053	0.0000
8.2143	0.1304	0.4736	0.0315	0.0053	0.0000
8.3159	0.1325	0.4870	0.5710	0.0053	0.0000
8.4176	0.1345	0.5005	2.2132	0.0053	0.0000
8.5192	0.1366	0.5143	4.4602	0.0053	0.0000
8.6209	0.1387	0.5283	7.1461	0.0053	0.0000
8.7225	0.1408	0.5425	10.149	0.0053	0.0000
8.8242	0.1430	0.5570	13.353	0.0053	0.0000
8.9258	0.1451	0.5716	16.638	0.0053	0.0000
9.0275	0.1473	0.5865	19.882	0.0053	0.0000
9.1291	0.1495	0.6015	22.967	0.0053	0.0000
9.2308	0.1516	0.6168	25.785	0.0053	0.0000
9.2500	0.1521	0.6198	28.250	0.0053	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.66
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.36
Total Impervious Area: 0.3

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.174191
5 year	0.274437
10 year	0.337543
25 year	0.613982

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.007262
5 year	0.015344
10 year	0.02049
25 year	0.0258

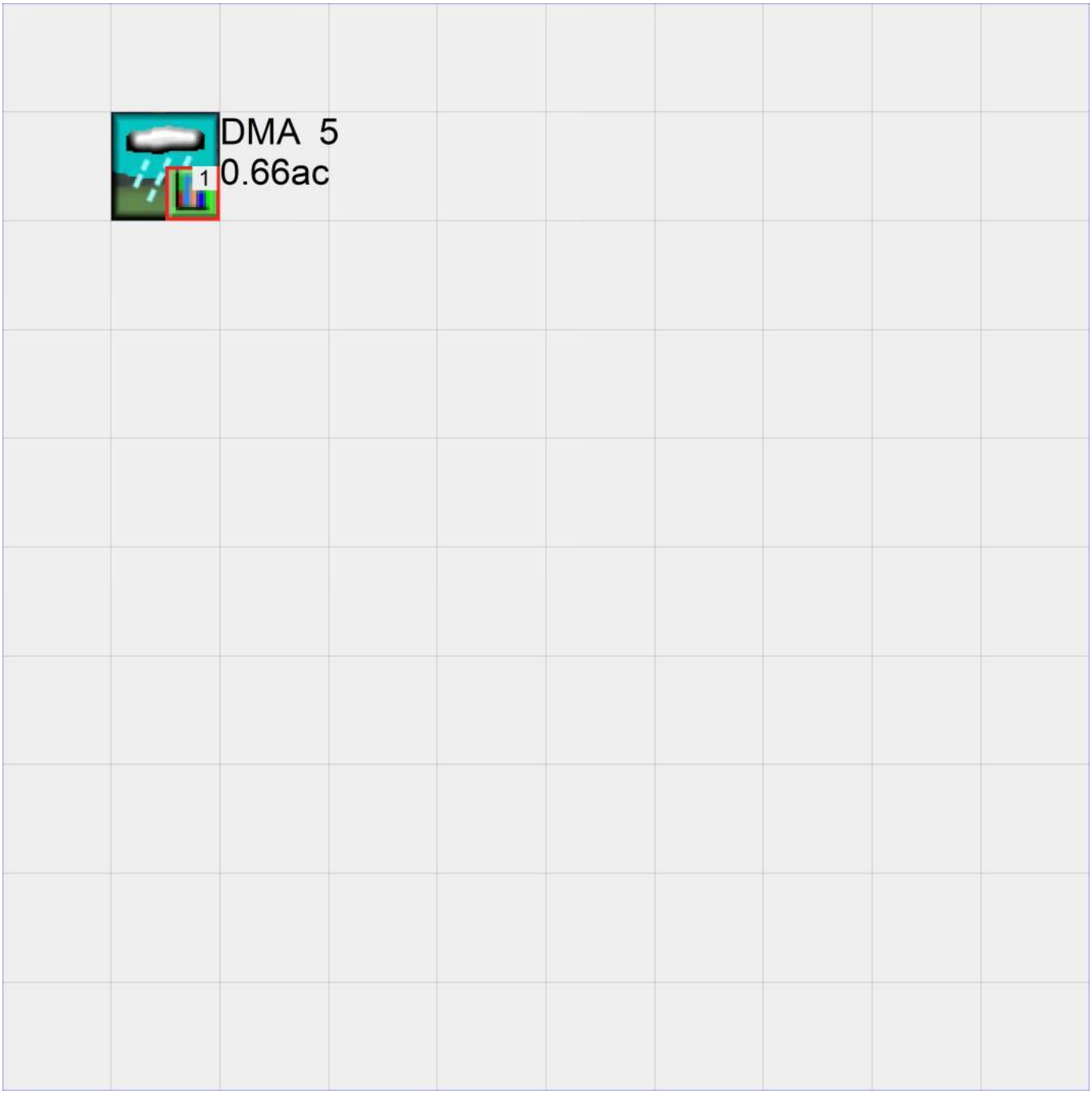
Duration Flows

The Facility PASSED

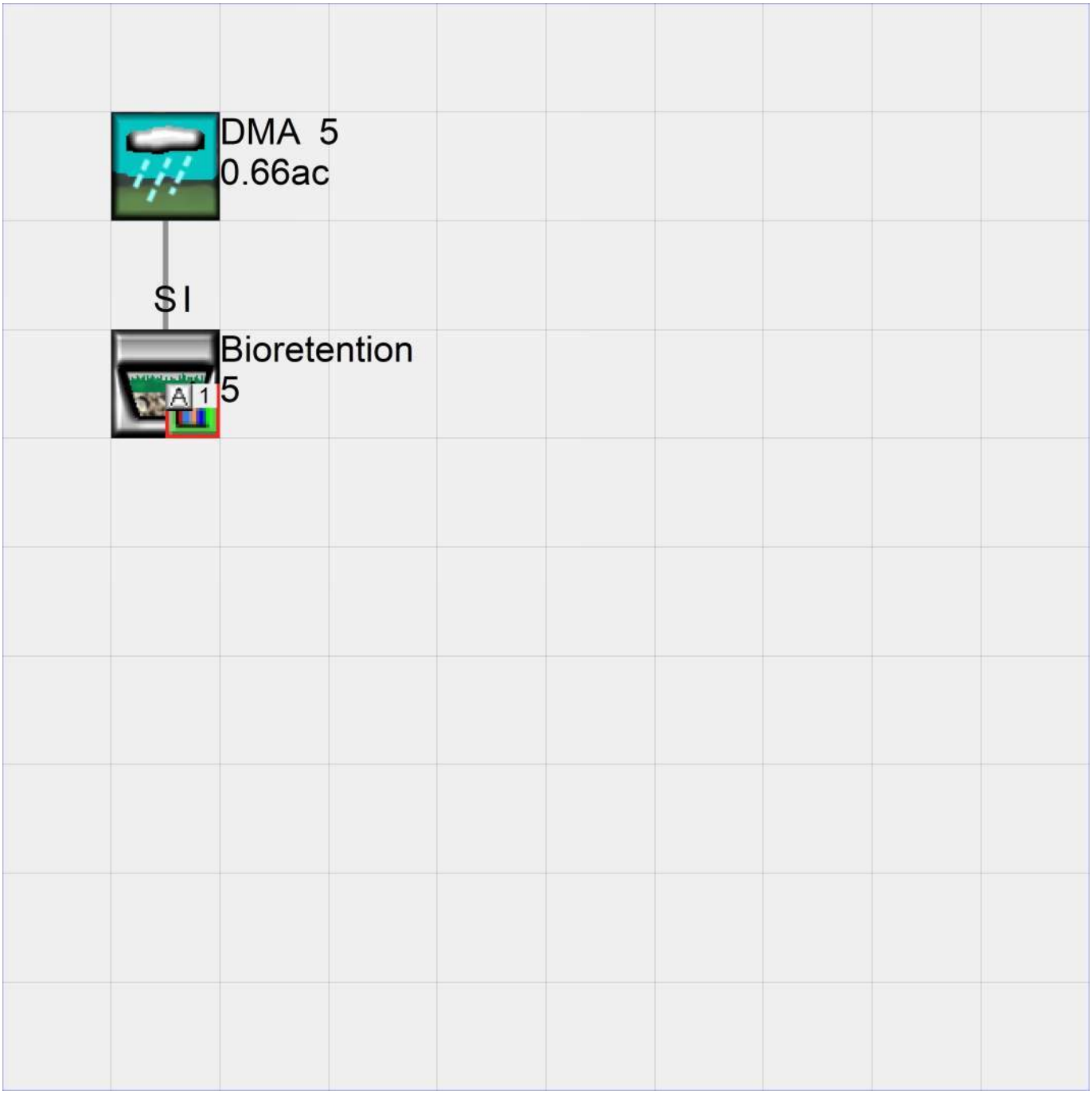
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0174	2963	3204	108	Pass
0.0207	2776	1546	55	Pass
0.0239	2580	941	36	Pass
0.0271	2363	238	10	Pass
0.0304	2217	34	1	Pass
0.0336	2048	0	0	Pass
0.0368	1921	0	0	Pass
0.0401	1748	0	0	Pass
0.0433	1641	0	0	Pass
0.0465	1528	0	0	Pass
0.0498	1436	0	0	Pass
0.0530	1366	0	0	Pass
0.0562	1267	0	0	Pass
0.0595	1205	0	0	Pass
0.0627	1123	0	0	Pass
0.0659	1068	0	0	Pass
0.0692	1011	0	0	Pass
0.0724	958	0	0	Pass
0.0756	906	0	0	Pass
0.0789	859	0	0	Pass
0.0821	801	0	0	Pass
0.0853	764	0	0	Pass
0.0886	728	0	0	Pass
0.0918	698	0	0	Pass
0.0950	650	0	0	Pass
0.0983	620	0	0	Pass
0.1015	588	0	0	Pass
0.1047	565	0	0	Pass
0.1080	545	0	0	Pass
0.1112	510	0	0	Pass
0.1144	491	0	0	Pass
0.1177	461	0	0	Pass
0.1209	440	0	0	Pass
0.1241	422	0	0	Pass
0.1274	410	0	0	Pass
0.1306	394	0	0	Pass
0.1338	381	0	0	Pass
0.1371	364	0	0	Pass
0.1403	350	0	0	Pass
0.1435	330	0	0	Pass
0.1468	312	0	0	Pass
0.1500	301	0	0	Pass
0.1532	278	0	0	Pass
0.1565	261	0	0	Pass
0.1597	246	0	0	Pass
0.1629	236	0	0	Pass
0.1662	228	0	0	Pass
0.1694	213	0	0	Pass
0.1726	206	0	0	Pass
0.1759	201	0	0	Pass
0.1791	189	0	0	Pass
0.1823	184	0	0	Pass
0.1856	175	0	0	Pass

0.1888	172	0	0	Pass
0.1920	161	0	0	Pass
0.1953	157	0	0	Pass
0.1985	151	0	0	Pass
0.2017	147	0	0	Pass
0.2050	139	0	0	Pass
0.2082	133	0	0	Pass
0.2114	129	0	0	Pass
0.2147	124	0	0	Pass
0.2179	123	0	0	Pass
0.2211	116	0	0	Pass
0.2244	112	0	0	Pass
0.2276	109	0	0	Pass
0.2308	105	0	0	Pass
0.2341	99	0	0	Pass
0.2373	94	0	0	Pass
0.2405	88	0	0	Pass
0.2438	87	0	0	Pass
0.2470	83	0	0	Pass
0.2502	81	0	0	Pass
0.2535	77	0	0	Pass
0.2567	72	0	0	Pass
0.2599	69	0	0	Pass
0.2632	65	0	0	Pass
0.2664	64	0	0	Pass
0.2696	61	0	0	Pass
0.2729	57	0	0	Pass
0.2761	53	0	0	Pass
0.2793	52	0	0	Pass
0.2826	51	0	0	Pass
0.2858	50	0	0	Pass
0.2890	47	0	0	Pass
0.2923	43	0	0	Pass
0.2955	42	0	0	Pass
0.2987	40	0	0	Pass
0.3020	38	0	0	Pass
0.3052	36	0	0	Pass
0.3084	36	0	0	Pass
0.3117	35	0	0	Pass
0.3149	33	0	0	Pass
0.3181	31	0	0	Pass
0.3214	31	0	0	Pass
0.3246	31	0	0	Pass
0.3278	29	0	0	Pass
0.3311	27	0	0	Pass
0.3343	26	0	0	Pass
0.3375	25	0	0	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA6
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

DMA 6

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	15.31
Pervious Total	15.31
Impervious Land Use	acre
Impervious Total	0
Basin Total	15.31

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 6

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	9.42
Pervious Total	9.42

Impervious Land Use	acre
Roads,Flat(0-5%)	5.89
Impervious Total	5.89
Basin Total	15.31

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 6	Surface oretention 6	

Mitigated Routing

Bioretention 6

Bottom Length:	90.00 ft.	
Bottom Width:	90.00 ft.	
Material thickness of first layer:	0.25	
Material type for first layer:	Amended 1.5 in/hr	
Material thickness of second layer:	3	
Material type for second layer:	Amended 1.5 in/hr	
Material thickness of third layer:	1	
Material type for third layer:	GRAVEL	
Underdrain used		
Underdrain Diameter (feet):	0.5	
Orifice Diameter (in.):	0.5	
Offset (in.):	3	
Flow Through Underdrain (ac-ft.):	53.577	
Total Outflow (ac-ft.):	379.55	
Percent Through Underdrain:	14.12	
Discharge Structure		
Riser Height:	4 ft.	
Riser Diameter:	36 in.	
Orifice 1 Diameter:	1 in.	Elevation:0.5 ft.
Orifice 2 Diameter:	1 in.	Elevation:1.5 ft.
Orifice 3 Diameter:	1 in.	Elevation:2.5 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1860	0.0000	0.0000	0.0000
0.1016	0.1860	0.0069	0.0000	0.0000
0.2033	0.1860	0.0138	0.0000	0.0000
0.3049	0.1860	0.0207	0.0000	0.0000
0.4066	0.1860	0.0276	0.0000	0.0000
0.5082	0.1860	0.0345	0.0000	0.0000
0.6099	0.1860	0.0414	0.0000	0.0000
0.7115	0.1860	0.0483	0.0000	0.0000
0.8132	0.1860	0.0552	0.0000	0.0000
0.9148	0.1860	0.0621	0.0000	0.0000
1.0165	0.1860	0.0690	0.0000	0.0000
1.1181	0.1860	0.0759	0.0000	0.0000
1.2198	0.1860	0.0828	0.0000	0.0000
1.3214	0.1860	0.0897	0.0000	0.0000
1.4231	0.1860	0.0966	0.0000	0.0000
1.5247	0.1860	0.1035	0.0003	0.0000
1.6264	0.1860	0.1104	0.0005	0.0000
1.7280	0.1860	0.1173	0.0011	0.0000
1.8297	0.1860	0.1242	0.0014	0.0000
1.9313	0.1860	0.1311	0.0018	0.0000
2.0330	0.1860	0.1380	0.0021	0.0000
2.1346	0.1860	0.1449	0.0024	0.0000
2.2363	0.1860	0.1518	0.0026	0.0000
2.3379	0.1860	0.1587	0.0029	0.0000
2.4396	0.1860	0.1656	0.0030	0.0000
2.5412	0.1860	0.1725	0.0033	0.0000

2.6429	0.1860	0.1794	0.0034	0.0000
2.7445	0.1860	0.1863	0.0036	0.0000
2.8462	0.1860	0.1932	0.0037	0.0000
2.9478	0.1860	0.2001	0.0039	0.0000
3.0495	0.1860	0.2070	0.0040	0.0000
3.1511	0.1860	0.2139	0.0042	0.0000
3.2527	0.1860	0.2217	0.0043	0.0000
3.3544	0.1860	0.2296	0.0045	0.0000
3.4560	0.1860	0.2374	0.0046	0.0000
3.5577	0.1860	0.2452	0.0046	0.0000
3.6593	0.1860	0.2531	0.0047	0.0000
3.7610	0.1860	0.2609	0.0048	0.0000
3.8626	0.1860	0.2688	0.0049	0.0000
3.9643	0.1860	0.2766	0.0050	0.0000
4.0659	0.1860	0.2845	0.0051	0.0000
4.1676	0.1860	0.2923	0.0053	0.0000
4.2500	0.1860	0.2987	0.0136	0.0000

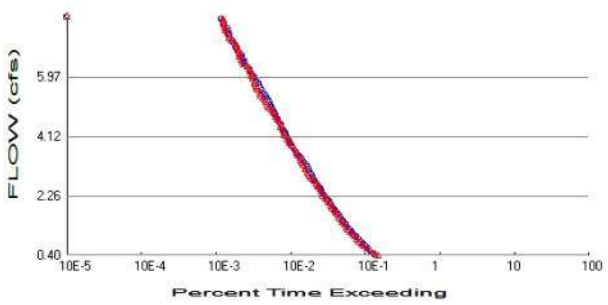
Landscape Swale Hydraulic Table

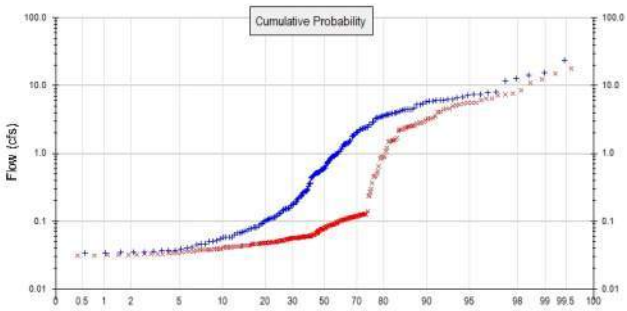
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.1860	0.2987	0.0000	0.0053	0.0000
4.3516	0.1885	0.3177	0.0000	0.0053	0.0000
4.4533	0.1910	0.3370	0.0000	0.0053	0.0000
4.5549	0.1936	0.3565	0.0000	0.0053	0.0000
4.6566	0.1962	0.3763	0.0000	0.0053	0.0000
4.7582	0.1987	0.3964	0.0025	0.0053	0.0000
4.8599	0.2013	0.4167	0.0090	0.0053	0.0000
4.9615	0.2040	0.4373	0.0125	0.0053	0.0000
5.0632	0.2066	0.4582	0.0152	0.0053	0.0000
5.1648	0.2092	0.4794	0.0175	0.0053	0.0000
5.2665	0.2119	0.5008	0.0195	0.0053	0.0000
5.3681	0.2146	0.5224	0.0213	0.0053	0.0000
5.4698	0.2173	0.5444	0.0230	0.0053	0.0000
5.5714	0.2200	0.5666	0.0246	0.0053	0.0000
5.6731	0.2227	0.5891	0.0261	0.0053	0.0000
5.7747	0.2255	0.6119	0.0317	0.0053	0.0000
5.8764	0.2282	0.6349	0.0384	0.0053	0.0000
5.9780	0.2310	0.6583	0.0430	0.0053	0.0000
6.0797	0.2338	0.6819	0.0469	0.0053	0.0000
6.1813	0.2366	0.7058	0.0503	0.0053	0.0000
6.2830	0.2394	0.7300	0.0534	0.0053	0.0000
6.3846	0.2422	0.7545	0.0563	0.0053	0.0000
6.4863	0.2451	0.7792	0.0590	0.0053	0.0000
6.5879	0.2479	0.8043	0.0616	0.0053	0.0000
6.6896	0.2508	0.8296	0.0641	0.0053	0.0000
6.7912	0.2537	0.8553	0.0720	0.0053	0.0000
6.8929	0.2566	0.8812	0.0790	0.0053	0.0000
6.9945	0.2595	0.9075	0.0843	0.0053	0.0000
7.0962	0.2625	0.9340	0.0890	0.0053	0.0000
7.1978	0.2654	0.9608	0.0933	0.0053	0.0000
7.2995	0.2684	0.9879	0.0972	0.0053	0.0000
7.4011	0.2714	1.0154	0.1010	0.0053	0.0000
7.5027	0.2744	1.0431	0.1045	0.0053	0.0000
7.6044	0.2774	1.0712	0.1079	0.0053	0.0000
7.7060	0.2804	1.0995	0.1111	0.0053	0.0000
7.8077	0.2835	1.1282	0.1143	0.0053	0.0000
7.9093	0.2865	1.1571	0.1173	0.0053	0.0000
8.0110	0.2896	1.1864	0.1203	0.0053	0.0000

8.1126	0.2927	1.2160	0.1232	0.0053	0.0000
8.2143	0.2958	1.2459	0.1259	0.0053	0.0000
8.3159	0.2989	1.2761	0.6676	0.0053	0.0000
8.4176	0.3020	1.3067	2.3117	0.0053	0.0000
8.5192	0.3052	1.3375	4.5606	0.0053	0.0000
8.6209	0.3084	1.3687	7.2485	0.0053	0.0000
8.7225	0.3115	1.4002	10.254	0.0053	0.0000
8.8242	0.3147	1.4321	13.459	0.0053	0.0000
8.9258	0.3179	1.4642	16.746	0.0053	0.0000
9.0275	0.3212	1.4967	19.992	0.0053	0.0000
9.1291	0.3244	1.5295	23.078	0.0053	0.0000
9.2308	0.3277	1.5627	25.898	0.0053	0.0000
9.2500	0.3283	1.5690	28.365	0.0053	0.0000

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 15.31
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 9.42
Total Impervious Area: 5.89

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	4.040709
5 year	6.366101
10 year	7.829983
25 year	14.242525

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	2.773822
5 year	5.570964
10 year	7.425566
25 year	12.495813

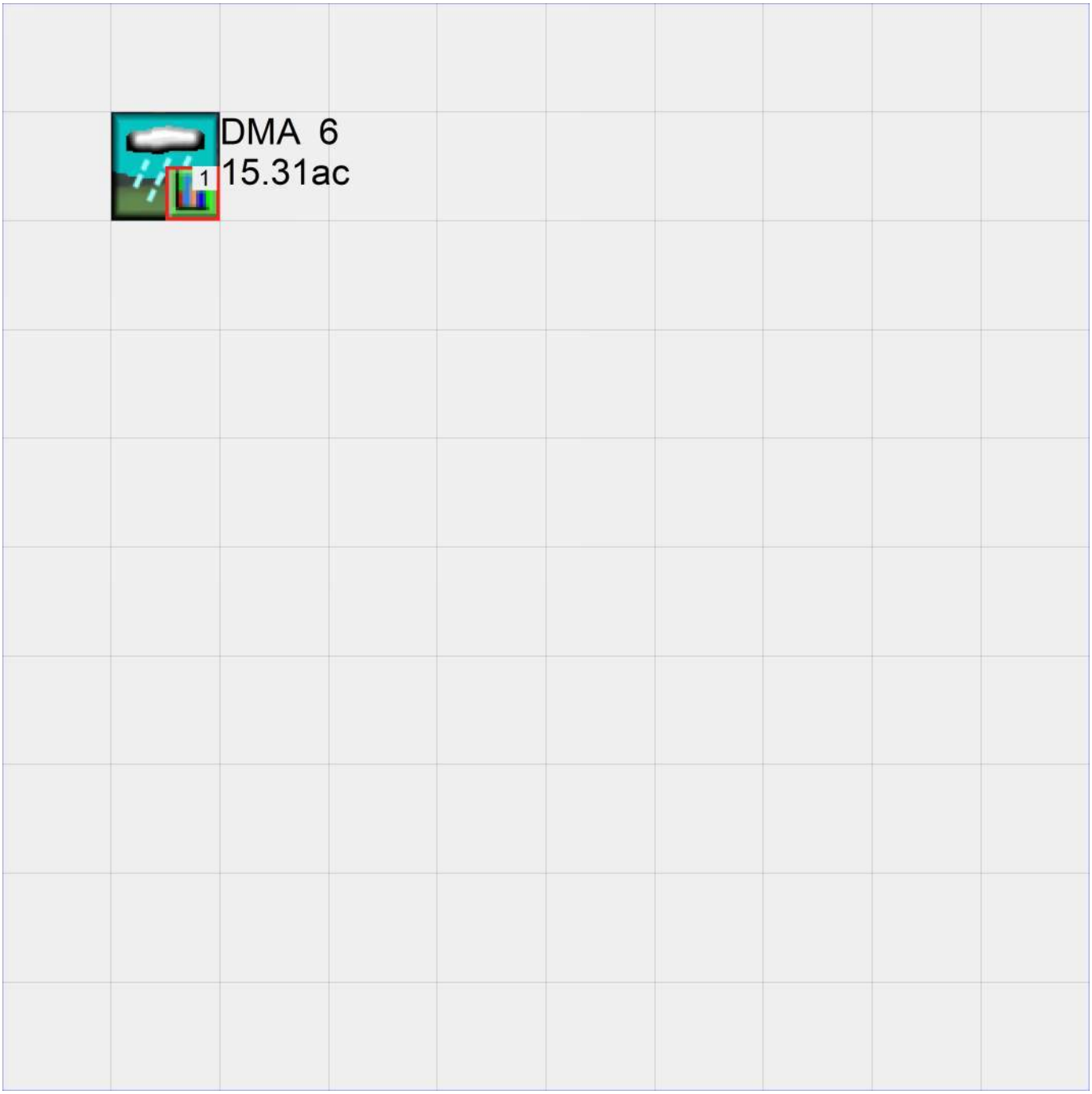
Duration Flows

The Facility PASSED

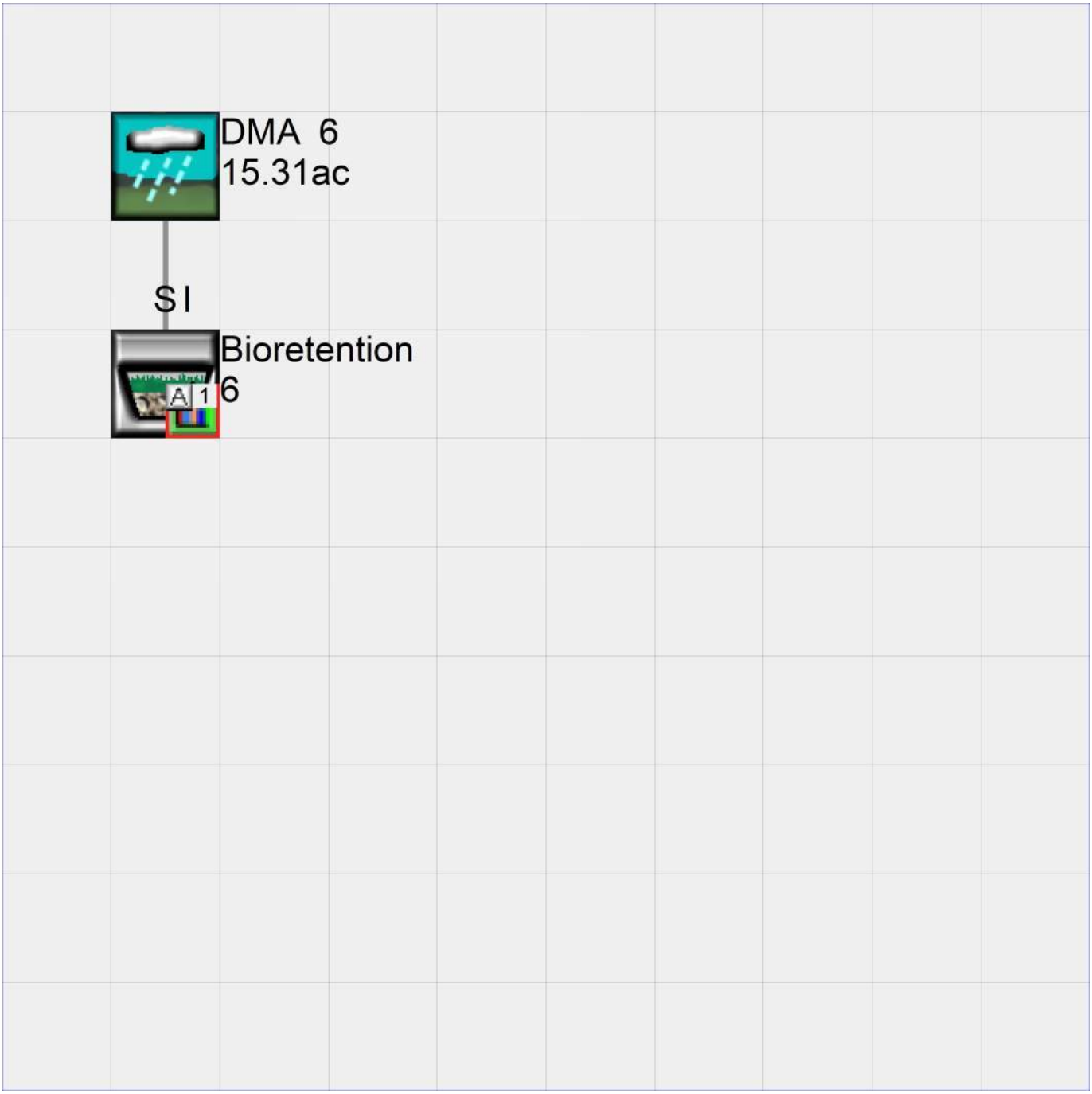
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.4041	2939	3228	109	Pass
0.4791	2724	2885	105	Pass
0.5541	2524	2578	102	Pass
0.6291	2354	2276	96	Pass
0.7041	2196	2074	94	Pass
0.7791	2017	1930	95	Pass
0.8541	1891	1768	93	Pass
0.9291	1747	1650	94	Pass
1.0041	1628	1550	95	Pass
1.0792	1511	1452	96	Pass
1.1542	1414	1364	96	Pass
1.2292	1346	1258	93	Pass
1.3042	1259	1204	95	Pass
1.3792	1190	1149	96	Pass
1.4542	1111	1081	97	Pass
1.5292	1054	1027	97	Pass
1.6042	1008	962	95	Pass
1.6792	952	916	96	Pass
1.7542	893	874	97	Pass
1.8292	848	825	97	Pass
1.9043	801	780	97	Pass
1.9793	759	746	98	Pass
2.0543	720	709	98	Pass
2.1293	692	674	97	Pass
2.2043	650	644	99	Pass
2.2793	618	602	97	Pass
2.3543	585	575	98	Pass
2.4293	561	551	98	Pass
2.5043	537	531	98	Pass
2.5793	510	500	98	Pass
2.6543	485	473	97	Pass
2.7294	453	444	98	Pass
2.8044	432	412	95	Pass
2.8794	422	390	92	Pass
2.9544	409	375	91	Pass
3.0294	393	360	91	Pass
3.1044	376	345	91	Pass
3.1794	364	339	93	Pass
3.2544	349	317	90	Pass
3.3294	325	307	94	Pass
3.4044	310	297	95	Pass
3.4794	297	285	95	Pass
3.5545	277	272	98	Pass
3.6295	258	262	101	Pass
3.7045	246	254	103	Pass
3.7795	234	240	102	Pass
3.8545	226	222	98	Pass
3.9295	213	212	99	Pass
4.0045	206	205	99	Pass
4.0795	198	194	97	Pass
4.1545	188	185	98	Pass
4.2295	184	179	97	Pass
4.3045	175	174	99	Pass

4.3796	169	168	99	Pass
4.4546	161	162	100	Pass
4.5296	157	159	101	Pass
4.6046	149	152	102	Pass
4.6796	146	145	99	Pass
4.7546	138	138	100	Pass
4.8296	133	133	100	Pass
4.9046	129	127	98	Pass
4.9796	123	120	97	Pass
5.0546	119	109	91	Pass
5.1297	116	104	89	Pass
5.2047	112	100	89	Pass
5.2797	109	97	88	Pass
5.3547	103	93	90	Pass
5.4297	99	87	87	Pass
5.5047	94	85	90	Pass
5.5797	88	79	89	Pass
5.6547	85	75	88	Pass
5.7297	83	74	89	Pass
5.8047	81	72	88	Pass
5.8797	75	71	94	Pass
5.9548	72	68	94	Pass
6.0298	69	66	95	Pass
6.1048	65	66	101	Pass
6.1798	63	62	98	Pass
6.2548	60	61	101	Pass
6.3298	56	57	101	Pass
6.4048	53	51	96	Pass
6.4798	52	50	96	Pass
6.5548	51	48	94	Pass
6.6298	47	45	95	Pass
6.7048	47	45	95	Pass
6.7799	43	44	102	Pass
6.8549	41	43	104	Pass
6.9299	40	42	104	Pass
7.0049	38	41	107	Pass
7.0799	36	38	105	Pass
7.1549	36	35	97	Pass
7.2299	33	33	100	Pass
7.3049	33	32	96	Pass
7.3799	31	31	100	Pass
7.4549	31	29	93	Pass
7.5299	31	29	93	Pass
7.6050	28	28	100	Pass
7.6800	27	27	100	Pass
7.7550	26	27	103	Pass
7.8300	25	27	108	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA7
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

DMA 7

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,Very(>20%)	25.31
Pervious Total	25.31
Impervious Land Use	acre
Impervious Total	0
Basin Total	25.31

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 7

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	13.5
Pervious Total	13.5

Impervious Land Use	acre
Roads,Flat(0-5%)	11.81
Impervious Total	11.81
Basin Total	25.31

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 7	Surface oretention 7	

Mitigated Routing

Bioretention 7

Bottom Length:	120.00 ft.	
Bottom Width:	120.00 ft.	
Material thickness of first layer:	0.25	
Material type for first layer:	Amended 1.5 in/hr	
Material thickness of second layer:	3	
Material type for second layer:	Amended 1.5 in/hr	
Material thickness of third layer:	1	
Material type for third layer:	GRAVEL	
Underdrain used		
Underdrain Diameter (feet):	0.5	
Orifice Diameter (in.):	0.5	
Offset (in.):	3	
Flow Through Underdrain (ac-ft.):	65.131	
Total Outflow (ac-ft.):	700.558	
Percent Through Underdrain:	9.3	
Discharge Structure		
Riser Height:	4 ft.	
Riser Diameter:	36 in.	
Orifice 1 Diameter:	1 in.	Elevation:0.5 ft.
Orifice 2 Diameter:	1 in.	Elevation:1.5 ft.
Orifice 3 Diameter:	1 in.	Elevation:2.5 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.3306	0.0000	0.0000	0.0000
0.1016	0.3306	0.0123	0.0000	0.0000
0.2033	0.3306	0.0245	0.0000	0.0000
0.3049	0.3306	0.0368	0.0000	0.0000
0.4066	0.3306	0.0491	0.0000	0.0000
0.5082	0.3306	0.0613	0.0000	0.0000
0.6099	0.3306	0.0736	0.0000	0.0000
0.7115	0.3306	0.0859	0.0000	0.0000
0.8132	0.3306	0.0981	0.0000	0.0000
0.9148	0.3306	0.1104	0.0000	0.0000
1.0165	0.3306	0.1227	0.0000	0.0000
1.1181	0.3306	0.1349	0.0000	0.0000
1.2198	0.3306	0.1472	0.0000	0.0000
1.3214	0.3306	0.1594	0.0000	0.0000
1.4231	0.3306	0.1717	0.0000	0.0000
1.5247	0.3306	0.1840	0.0003	0.0000
1.6264	0.3306	0.1962	0.0005	0.0000
1.7280	0.3306	0.2085	0.0011	0.0000
1.8297	0.3306	0.2208	0.0014	0.0000
1.9313	0.3306	0.2330	0.0018	0.0000
2.0330	0.3306	0.2453	0.0021	0.0000
2.1346	0.3306	0.2576	0.0024	0.0000
2.2363	0.3306	0.2698	0.0026	0.0000
2.3379	0.3306	0.2821	0.0029	0.0000
2.4396	0.3306	0.2944	0.0030	0.0000
2.5412	0.3306	0.3066	0.0033	0.0000

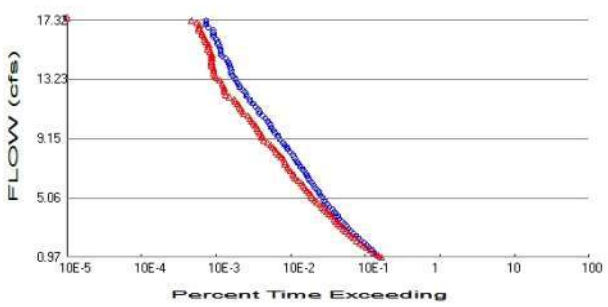
2.6429	0.3306	0.3189	0.0034	0.0000
2.7445	0.3306	0.3312	0.0036	0.0000
2.8462	0.3306	0.3434	0.0037	0.0000
2.9478	0.3306	0.3557	0.0039	0.0000
3.0495	0.3306	0.3680	0.0040	0.0000
3.1511	0.3306	0.3802	0.0042	0.0000
3.2527	0.3306	0.3942	0.0043	0.0000
3.3544	0.3306	0.4081	0.0045	0.0000
3.4560	0.3306	0.4221	0.0046	0.0000
3.5577	0.3306	0.4360	0.0046	0.0000
3.6593	0.3306	0.4499	0.0047	0.0000
3.7610	0.3306	0.4639	0.0048	0.0000
3.8626	0.3306	0.4778	0.0049	0.0000
3.9643	0.3306	0.4918	0.0050	0.0000
4.0659	0.3306	0.5057	0.0051	0.0000
4.1676	0.3306	0.5197	0.0053	0.0000
4.2500	0.3306	0.5310	0.0136	0.0000

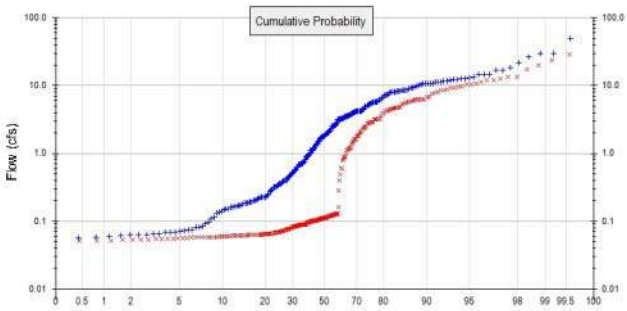
Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.3306	0.5310	0.0000	0.0053	0.0000
4.3516	0.3339	0.5647	0.0000	0.0053	0.0000
4.4533	0.3373	0.5989	0.0000	0.0053	0.0000
4.5549	0.3407	0.6333	0.0000	0.0053	0.0000
4.6566	0.3441	0.6681	0.0000	0.0053	0.0000
4.7582	0.3476	0.7033	0.0025	0.0053	0.0000
4.8599	0.3510	0.7388	0.0090	0.0053	0.0000
4.9615	0.3545	0.7747	0.0125	0.0053	0.0000
5.0632	0.3579	0.8109	0.0152	0.0053	0.0000
5.1648	0.3614	0.8474	0.0175	0.0053	0.0000
5.2665	0.3649	0.8843	0.0195	0.0053	0.0000
5.3681	0.3685	0.9216	0.0213	0.0053	0.0000
5.4698	0.3720	0.9592	0.0230	0.0053	0.0000
5.5714	0.3755	0.9972	0.0246	0.0053	0.0000
5.6731	0.3791	1.0356	0.0261	0.0053	0.0000
5.7747	0.3827	1.0743	0.0317	0.0053	0.0000
5.8764	0.3863	1.1134	0.0384	0.0053	0.0000
5.9780	0.3899	1.1528	0.0430	0.0053	0.0000
6.0797	0.3935	1.1927	0.0469	0.0053	0.0000
6.1813	0.3972	1.2328	0.0503	0.0053	0.0000
6.2830	0.4008	1.2734	0.0534	0.0053	0.0000
6.3846	0.4045	1.3143	0.0563	0.0053	0.0000
6.4863	0.4082	1.3556	0.0590	0.0053	0.0000
6.5879	0.4119	1.3973	0.0616	0.0053	0.0000
6.6896	0.4156	1.4394	0.0641	0.0053	0.0000
6.7912	0.4193	1.4818	0.0720	0.0053	0.0000
6.8929	0.4231	1.5246	0.0790	0.0053	0.0000
6.9945	0.4268	1.5678	0.0843	0.0053	0.0000
7.0962	0.4306	1.6114	0.0890	0.0053	0.0000
7.1978	0.4344	1.6554	0.0933	0.0053	0.0000
7.2995	0.4382	1.6997	0.0972	0.0053	0.0000
7.4011	0.4420	1.7444	0.1010	0.0053	0.0000
7.5027	0.4459	1.7896	0.1045	0.0053	0.0000
7.6044	0.4497	1.8351	0.1079	0.0053	0.0000
7.7060	0.4536	1.8810	0.1111	0.0053	0.0000
7.8077	0.4575	1.9273	0.1143	0.0053	0.0000
7.9093	0.4614	1.9740	0.1173	0.0053	0.0000
8.0110	0.4653	2.0211	0.1203	0.0053	0.0000

8.1126	0.4692	2.0686	0.1232	0.0053	0.0000
8.2143	0.4732	2.1165	0.1259	0.0053	0.0000
8.3159	0.4771	2.1648	0.6676	0.0053	0.0000
8.4176	0.4811	2.2135	2.3117	0.0053	0.0000
8.5192	0.4851	2.2626	4.5606	0.0053	0.0000
8.6209	0.4891	2.3121	7.2485	0.0053	0.0000
8.7225	0.4931	2.3620	10.254	0.0053	0.0000
8.8242	0.4972	2.4124	13.459	0.0053	0.0000
8.9258	0.5012	2.4631	16.746	0.0053	0.0000
9.0275	0.5053	2.5143	19.992	0.0053	0.0000
9.1291	0.5094	2.5658	23.078	0.0053	0.0000
9.2308	0.5135	2.6178	25.898	0.0053	0.0000
9.2500	0.5142	2.6277	28.365	0.0053	0.0000

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 25.31
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 13.5
Total Impervious Area: 11.81

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	9.655819
5 year	13.021045
10 year	17.324578
25 year	29.693523

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	5.991393
5 year	10.287938
10 year	12.955431
25 year	20.085768

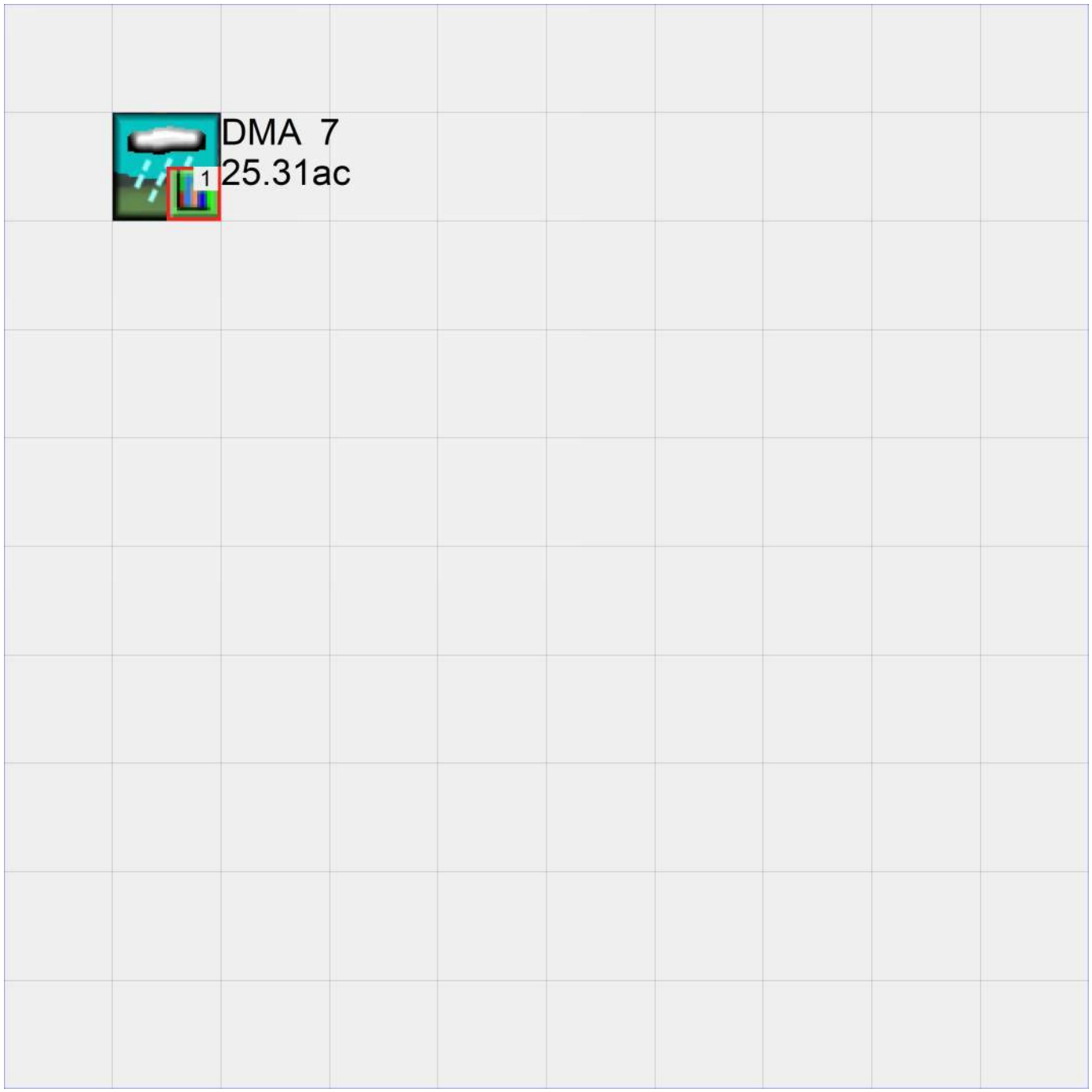
Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.9656	3276	3550	108	Pass
1.1308	3035	3204	105	Pass
1.2961	2835	2839	100	Pass
1.4613	2639	2552	96	Pass
1.6266	2443	2263	92	Pass
1.7918	2261	2037	90	Pass
1.9570	2071	1838	88	Pass
2.1223	1894	1661	87	Pass
2.2875	1752	1530	87	Pass
2.4528	1626	1403	86	Pass
2.6180	1505	1295	86	Pass
2.7832	1404	1196	85	Pass
2.9485	1303	1094	83	Pass
3.1137	1208	1010	83	Pass
3.2790	1128	940	83	Pass
3.4442	1058	879	83	Pass
3.6095	985	824	83	Pass
3.7747	933	767	82	Pass
3.9399	880	712	80	Pass
4.1052	826	666	80	Pass
4.2704	786	618	78	Pass
4.4357	723	572	79	Pass
4.6009	669	537	80	Pass
4.7662	629	484	76	Pass
4.9314	603	451	74	Pass
5.0966	576	426	73	Pass
5.2619	544	403	74	Pass
5.4271	522	376	72	Pass
5.5924	496	354	71	Pass
5.7576	467	337	72	Pass
5.9229	441	320	72	Pass
6.0881	416	296	71	Pass
6.2533	393	273	69	Pass
6.4186	375	251	66	Pass
6.5838	361	240	66	Pass
6.7491	351	230	65	Pass
6.9143	329	214	65	Pass
7.0796	312	203	65	Pass
7.2448	290	195	67	Pass
7.4100	277	186	67	Pass
7.5753	266	181	68	Pass
7.7405	251	174	69	Pass
7.9058	239	162	67	Pass
8.0710	229	150	65	Pass
8.2362	212	140	66	Pass
8.4015	199	132	66	Pass
8.5667	192	124	64	Pass
8.7320	178	117	65	Pass
8.8972	169	106	62	Pass
9.0625	158	95	60	Pass
9.2277	149	90	60	Pass
9.3929	145	89	61	Pass
9.5582	134	84	62	Pass

9.7234	129	81	62	Pass
9.8887	121	76	62	Pass
10.0539	116	73	62	Pass
10.2192	112	69	61	Pass
10.3844	107	65	60	Pass
10.5496	99	62	62	Pass
10.7149	91	58	63	Pass
10.8801	83	51	61	Pass
11.0454	82	49	59	Pass
11.2106	80	46	57	Pass
11.3759	73	45	61	Pass
11.5411	68	42	61	Pass
11.7063	63	39	61	Pass
11.8716	61	38	62	Pass
12.0368	56	33	58	Pass
12.2021	55	29	52	Pass
12.3673	53	28	52	Pass
12.5325	49	28	57	Pass
12.6978	45	28	62	Pass
12.8630	44	27	61	Pass
13.0283	42	26	61	Pass
13.1935	40	24	60	Pass
13.3588	38	22	57	Pass
13.5240	36	21	58	Pass
13.6892	35	20	57	Pass
13.8545	35	20	57	Pass
14.0197	34	20	58	Pass
14.1850	33	19	57	Pass
14.3502	32	19	59	Pass
14.5155	31	19	61	Pass
14.6807	29	19	65	Pass
14.8459	26	19	73	Pass
15.0112	25	19	76	Pass
15.1764	25	18	72	Pass
15.3417	25	17	68	Pass
15.5069	24	17	70	Pass
15.6722	23	17	73	Pass
15.8374	23	16	69	Pass
16.0026	22	15	68	Pass
16.1679	20	15	75	Pass
16.3331	20	14	70	Pass
16.4984	20	14	70	Pass
16.6636	20	13	65	Pass
16.8289	17	13	76	Pass
16.9941	16	13	81	Pass
17.1593	16	12	75	Pass
17.3246	16	10	62	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA8infiltration
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	9/27/2018
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA 8

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	63.57
Pervious Total	63.57
Impervious Land Use	acre
Impervious Total	0
Basin Total	63.57

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 8

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	43.52
Pervious Total	43.52

Impervious Land Use	acre
Roads,Mod(5-10%)	20.05
Impervious Total	20.05
Basin Total	63.57

Element Flows To:

Surface	Interflow	Groundwater
Surface oretention 8	Surface oretention 8	

Mitigated Routing

Bioretention 8

Bottom Length:	145.00 ft.
Bottom Width:	145.00 ft.
Material thickness of first layer:	3
Material type for first layer:	Amended 1.5 in/hr
Material thickness of second layer:	0
Material type for second layer:	Amended 1.5 in/hr
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	1.5
Infiltration safety factor:	0.3333
Total Volume Infiltrated (ac-ft.):	762.351
Total Volume Through Riser (ac-ft.):	687.855
Total Volume Through Facility (ac-ft.):	1450.206
Percent Infiltrated:	52.57
Total Precip Applied to Facility:	31
Total Evap From Facility:	47.995
Underdrain used	
Underdrain Diameter (feet):	0
Orifice Diameter (in.):	0
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	0
Total Outflow (ac-ft.):	1450.206
Percent Through Underdrain:	0
Discharge Structure	

Riser Height:	4 ft.	
Riser Diameter:	48 in.	
Orifice 1 Diameter:	1.5 in.	Elevation:0.5 ft.
Orifice 2 Diameter:	1.5 in.	Elevation:1.5 ft.
Orifice 3 Diameter:	1 in.	Elevation:2.5 ft.

Element Flows To:

Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.4827	0.0000	0.0000	0.0000
0.0879	0.4827	0.0155	0.0000	0.0000
0.1758	0.4827	0.0310	0.0000	0.0000
0.2637	0.4827	0.0465	0.0000	0.0000
0.3516	0.4827	0.0620	0.0000	0.0000
0.4396	0.4827	0.0774	0.0000	0.0000
0.5275	0.4827	0.0929	0.0000	0.0206
0.6154	0.4827	0.1084	0.0000	0.0252
0.7033	0.4827	0.1239	0.0000	0.0316
0.7912	0.4827	0.1394	0.0000	0.0396
0.8791	0.4827	0.1549	0.0000	0.0494
0.9670	0.4827	0.1704	0.0000	0.0609
1.0549	0.4827	0.1859	0.0000	0.0743
1.1429	0.4827	0.2013	0.0000	0.0895
1.2308	0.4827	0.2168	0.0000	0.1067
1.3187	0.4827	0.2323	0.0000	0.1259
1.4066	0.4827	0.2478	0.0000	0.1471

1.4945	0.4827	0.2633	0.0000	0.1705
1.5824	0.4827	0.2788	0.0000	0.1961
1.6703	0.4827	0.2943	0.0000	0.2239
1.7582	0.4827	0.3098	0.0000	0.2433
1.8462	0.4827	0.3252	0.0000	0.2433
1.9341	0.4827	0.3407	0.0000	0.2433
2.0220	0.4827	0.3562	0.0000	0.2433
2.1099	0.4827	0.3717	0.0000	0.2433
2.1978	0.4827	0.3872	0.0000	0.2433
2.2857	0.4827	0.4027	0.0000	0.2433
2.3736	0.4827	0.4182	0.0000	0.2433
2.4615	0.4827	0.4337	0.0000	0.2433
2.5495	0.4827	0.4491	0.0000	0.2433
2.6374	0.4827	0.4646	0.0000	0.2433
2.7253	0.4827	0.4801	0.0000	0.2433
2.8132	0.4827	0.4956	0.0000	0.2433
2.9011	0.4827	0.5111	0.0000	0.2433
2.9890	0.4827	0.5266	0.0000	0.2433
3.0000	0.4827	0.5285	0.0000	0.2433

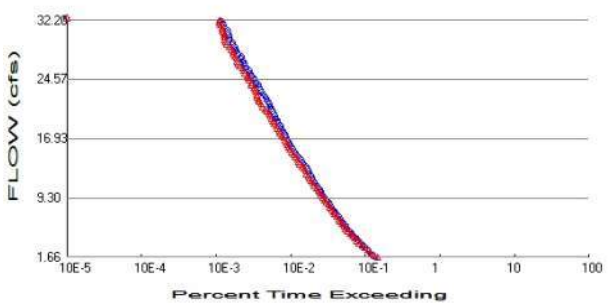
Landscape Swale Hydraulic Table

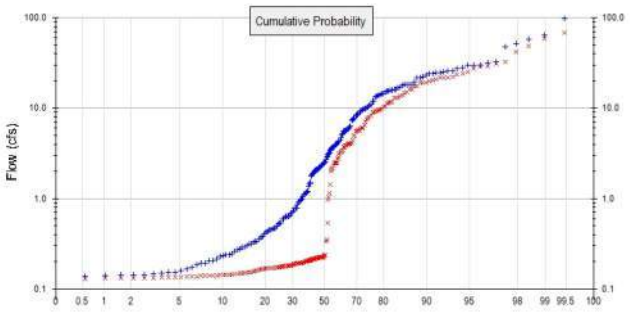
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.0000	0.4827	0.5285	0.0000	0.2433	0.0000
3.0879	0.4862	0.5711	0.0000	0.2433	0.0000
3.1758	0.4897	0.6140	0.0000	0.2433	0.0000
3.2637	0.4933	0.6572	0.0000	0.2433	0.0000
3.3516	0.4968	0.7007	0.0000	0.2433	0.0000
3.4396	0.5004	0.7446	0.0000	0.2433	0.0000
3.5275	0.5039	0.7887	0.0101	0.2433	0.0000
3.6154	0.5075	0.8332	0.0207	0.2433	0.0000
3.7033	0.5111	0.8779	0.0275	0.2433	0.0000
3.7912	0.5147	0.9230	0.0329	0.2433	0.0000
3.8791	0.5184	0.9684	0.0376	0.2433	0.0000
3.9670	0.5220	1.0142	0.0417	0.2433	0.0000
4.0549	0.5256	1.0602	0.0455	0.2433	0.0000
4.1429	0.5293	1.1066	0.0490	0.2433	0.0000
4.2308	0.5329	1.1533	0.0522	0.2433	0.0000
4.3187	0.5366	1.2003	0.0552	0.2433	0.0000
4.4066	0.5403	1.2476	0.0581	0.2433	0.0000
4.4945	0.5440	1.2953	0.0609	0.2433	0.0000
4.5824	0.5477	1.3433	0.0811	0.2433	0.0000
4.6703	0.5514	1.3916	0.0913	0.2433	0.0000
4.7582	0.5552	1.4402	0.0995	0.2433	0.0000
4.8462	0.5589	1.4892	0.1068	0.2433	0.0000
4.9341	0.5627	1.5385	0.1133	0.2433	0.0000
5.0220	0.5664	1.5881	0.1194	0.2433	0.0000
5.1099	0.5702	1.6381	0.1252	0.2433	0.0000
5.1978	0.5740	1.6884	0.1306	0.2433	0.0000
5.2857	0.5778	1.7390	0.1357	0.2433	0.0000
5.3736	0.5816	1.7900	0.1406	0.2433	0.0000
5.4615	0.5854	1.8413	0.1454	0.2433	0.0000
5.5495	0.5893	1.8929	0.1560	0.2433	0.0000
5.6374	0.5931	1.9449	0.1644	0.2433	0.0000
5.7253	0.5970	1.9972	0.1715	0.2433	0.0000
5.8132	0.6009	2.0499	0.1780	0.2433	0.0000
5.9011	0.6047	2.1029	0.1841	0.2433	0.0000
5.9890	0.6086	2.1562	0.1898	0.2433	0.0000
6.0769	0.6125	2.2099	0.1953	0.2433	0.0000

6.1648	0.6164	2.2639	0.2006	0.2433	0.0000
6.2527	0.6204	2.3183	0.2057	0.2433	0.0000
6.3407	0.6243	2.3730	0.2106	0.2433	0.0000
6.4286	0.6283	2.4280	0.2154	0.2433	0.0000
6.5165	0.6322	2.4834	0.2201	0.2433	0.0000
6.6044	0.6362	2.5392	0.2247	0.2433	0.0000
6.6923	0.6402	2.5953	0.2291	0.2433	0.0000
6.7802	0.6442	2.6517	0.2335	0.2433	0.0000
6.8681	0.6482	2.7086	0.2378	0.2433	0.0000
6.9560	0.6522	2.7657	0.2419	0.2433	0.0000
7.0440	0.6562	2.8232	0.6374	0.2433	0.0000
7.1319	0.6603	2.8811	2.2814	0.2433	0.0000
7.2198	0.6643	2.9393	4.6205	0.2433	0.0000
7.3077	0.6684	2.9979	7.4794	0.2433	0.0000
7.3956	0.6724	3.0568	10.761	0.2433	0.0000
7.4835	0.6765	3.1161	14.391	0.2433	0.0000
7.5714	0.6806	3.1758	18.302	0.2433	0.0000
7.6593	0.6847	3.2358	22.431	0.2433	0.0000
7.7473	0.6889	3.2962	26.711	0.2433	0.0000
7.8352	0.6930	3.3569	31.076	0.2433	0.0000
7.9231	0.6971	3.4180	35.456	0.2433	0.0000
8.0000	0.7008	3.4718	39.784	0.2433	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 63.57
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 43.52
Total Impervious Area: 20.05

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	16.61679
5 year	26.1796
10 year	32.199589
25 year	58.570173

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	13.150574
5 year	22.375903
10 year	29.746613
25 year	49.821427

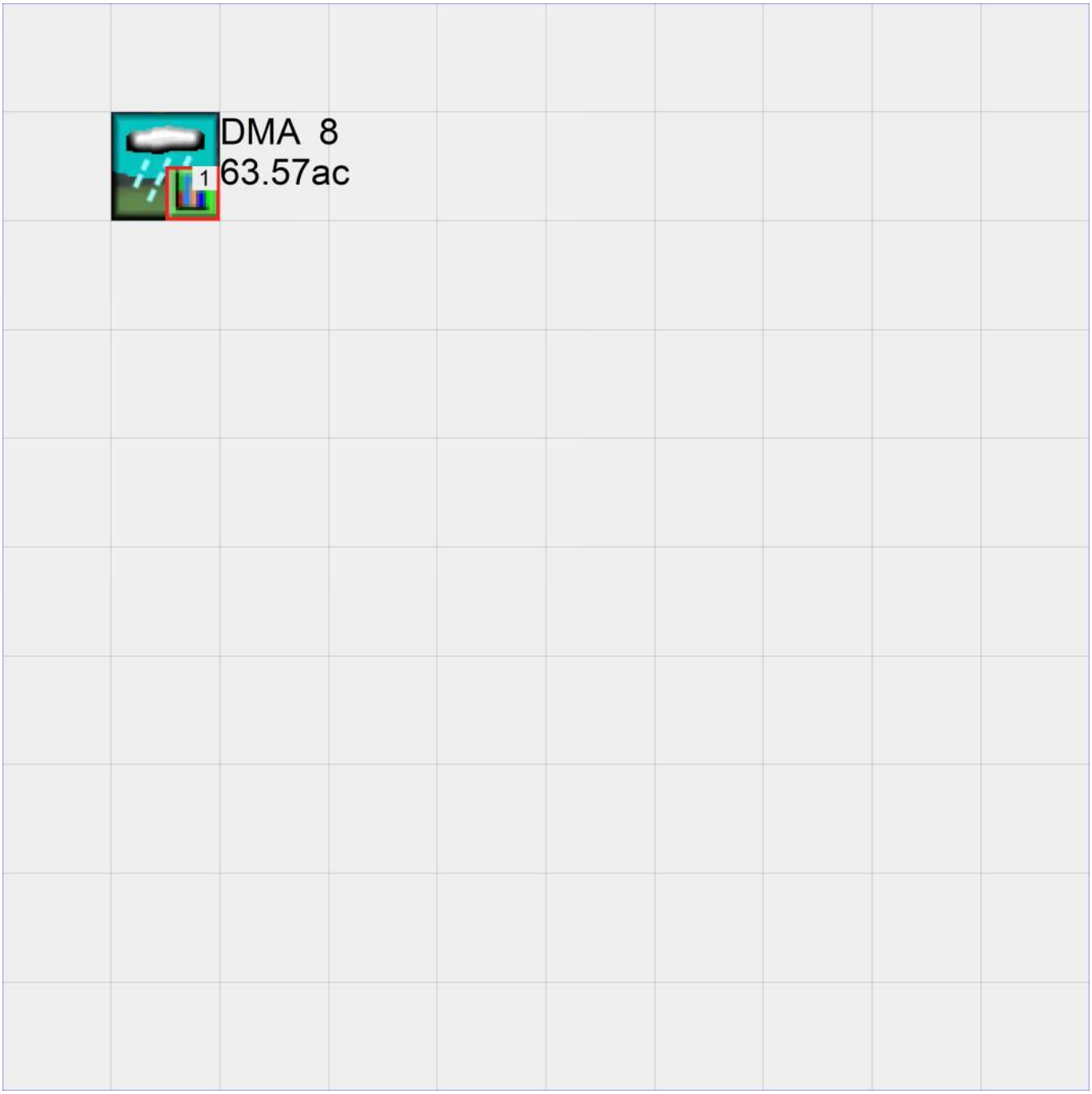
Duration Flows

The Facility PASSED

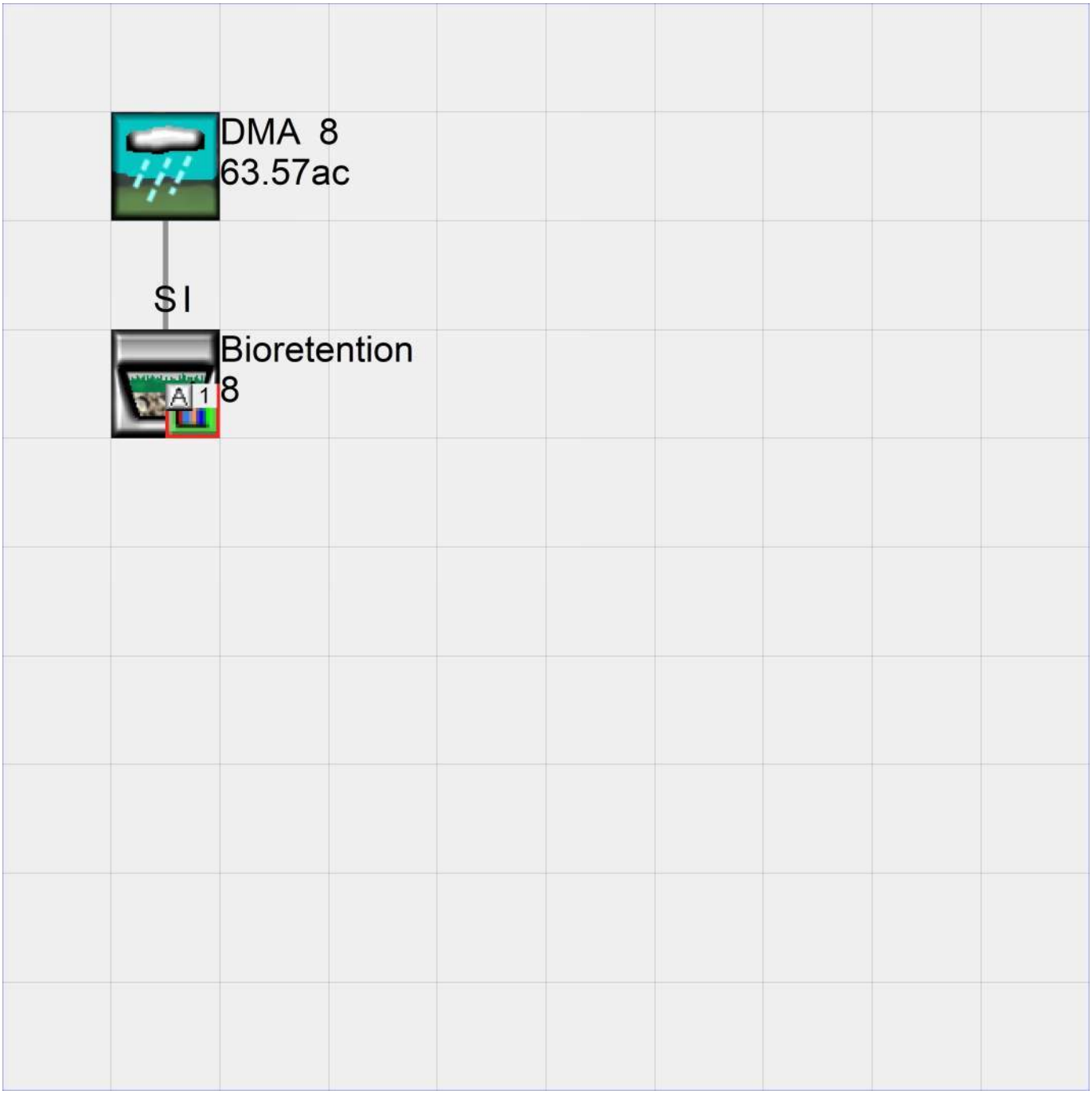
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
1.6617	2939	3187	108	Pass
1.9701	2724	2846	104	Pass
2.2786	2524	2572	101	Pass
2.5871	2354	2343	99	Pass
2.8955	2196	2131	97	Pass
3.2040	2017	1963	97	Pass
3.5125	1891	1806	95	Pass
3.8209	1747	1670	95	Pass
4.1294	1628	1557	95	Pass
4.4379	1511	1445	95	Pass
4.7463	1414	1353	95	Pass
5.0548	1346	1280	95	Pass
5.3632	1258	1193	94	Pass
5.6717	1190	1125	94	Pass
5.9802	1111	1074	96	Pass
6.2886	1054	1006	95	Pass
6.5971	1008	950	94	Pass
6.9056	952	894	93	Pass
7.2140	893	849	95	Pass
7.5225	848	809	95	Pass
7.8310	801	769	96	Pass
8.1394	759	730	96	Pass
8.4479	720	693	96	Pass
8.7563	692	650	93	Pass
9.0648	650	621	95	Pass
9.3733	618	589	95	Pass
9.6817	585	561	95	Pass
9.9902	561	530	94	Pass
10.2987	538	509	94	Pass
10.6071	510	480	94	Pass
10.9156	486	454	93	Pass
11.2241	453	427	94	Pass
11.5325	432	406	93	Pass
11.8410	422	387	91	Pass
12.1494	409	375	91	Pass
12.4579	393	358	91	Pass
12.7664	376	347	92	Pass
13.0748	364	329	90	Pass
13.3833	349	311	89	Pass
13.6918	325	289	88	Pass
14.0002	310	280	90	Pass
14.3087	298	267	89	Pass
14.6172	277	251	90	Pass
14.9256	258	239	92	Pass
15.2341	246	227	92	Pass
15.5425	234	213	91	Pass
15.8510	225	203	90	Pass
16.1595	213	196	92	Pass
16.4679	206	192	93	Pass
16.7764	199	180	90	Pass
17.0849	188	174	92	Pass
17.3933	184	167	90	Pass
17.7018	175	156	89	Pass

18.0103	169	153	90	Pass
18.3187	161	146	90	Pass
18.6272	157	139	88	Pass
18.9356	149	131	87	Pass
19.2441	146	125	85	Pass
19.5526	138	119	86	Pass
19.8610	133	115	86	Pass
20.1695	129	111	86	Pass
20.4780	124	104	83	Pass
20.7864	119	98	82	Pass
21.0949	116	91	78	Pass
21.4034	112	88	78	Pass
21.7118	109	82	75	Pass
22.0203	103	81	78	Pass
22.3287	99	78	78	Pass
22.6372	94	77	81	Pass
22.9457	88	75	85	Pass
23.2541	85	73	85	Pass
23.5626	83	70	84	Pass
23.8711	81	66	81	Pass
24.1795	75	65	86	Pass
24.4880	72	60	83	Pass
24.7965	69	59	85	Pass
25.1049	65	57	87	Pass
25.4134	63	53	84	Pass
25.7219	60	51	85	Pass
26.0303	55	49	89	Pass
26.3388	53	45	84	Pass
26.6472	52	43	82	Pass
26.9557	51	42	82	Pass
27.2642	47	41	87	Pass
27.5726	47	39	82	Pass
27.8811	43	37	86	Pass
28.1896	41	37	90	Pass
28.4980	40	35	87	Pass
28.8065	38	33	86	Pass
29.1150	36	30	83	Pass
29.4234	36	29	80	Pass
29.7319	33	28	84	Pass
30.0403	33	28	84	Pass
30.3488	31	28	90	Pass
30.6573	31	27	87	Pass
30.9657	31	26	83	Pass
31.2742	28	26	92	Pass
31.5827	27	25	92	Pass
31.8911	26	24	92	Pass
32.1996	25	24	96	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA9
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

DMA 9

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	45.13
Pervious Total	45.13
Impervious Land Use	acre
Impervious Total	0
Basin Total	45.13

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 9

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	25.12
Pervious Total	25.12

Impervious Land Use	acre
Roads,Mod(5-10%)	20.01
Impervious Total	20.01
Basin Total	45.13

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 1	Surface Bio Swale 1	

Mitigated Routing

Bio Swale 1

Bottom Length:	220.00 ft.
Bottom Width:	220.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Amended 1.5 in/hr
Material thickness of second layer:	3
Material type for second layer:	Amended 1.5 in/hr
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	25.402
Total Outflow (ac-ft.):	1174.469
Percent Through Underdrain:	2.16
Discharge Structure	
Riser Height:	4 ft.
Riser Diameter:	48 in.
Orifice 1 Diameter:	1.5 in. Elevation:0.5 ft.
Orifice 2 Diameter:	1.5 in. Elevation:1.5 ft.
Orifice 3 Diameter:	1 in. Elevation:2.5 ft.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	1.1111	0.0000	0.0000	0.0000
0.1016	1.1111	0.0412	0.0000	0.0000
0.2033	1.1111	0.0824	0.0000	0.0000
0.3049	1.1111	0.1237	0.0000	0.0000
0.4066	1.1111	0.1649	0.0000	0.0000
0.5082	1.1111	0.2061	0.0000	0.0000
0.6099	1.1111	0.2473	0.0000	0.0000
0.7115	1.1111	0.2886	0.0000	0.0000
0.8132	1.1111	0.3298	0.0000	0.0000
0.9148	1.1111	0.3710	0.0000	0.0000
1.0165	1.1111	0.4122	0.0000	0.0000
1.1181	1.1111	0.4535	0.0000	0.0000
1.2198	1.1111	0.4947	0.0000	0.0000
1.3214	1.1111	0.5359	0.0000	0.0000
1.4231	1.1111	0.5771	0.0000	0.0000
1.5247	1.1111	0.6184	0.0003	0.0000
1.6264	1.1111	0.6596	0.0005	0.0000
1.7280	1.1111	0.7008	0.0011	0.0000
1.8297	1.1111	0.7420	0.0014	0.0000
1.9313	1.1111	0.7833	0.0018	0.0000
2.0330	1.1111	0.8245	0.0021	0.0000
2.1346	1.1111	0.8657	0.0024	0.0000
2.2363	1.1111	0.9069	0.0026	0.0000
2.3379	1.1111	0.9482	0.0029	0.0000
2.4396	1.1111	0.9894	0.0030	0.0000
2.5412	1.1111	1.0306	0.0033	0.0000

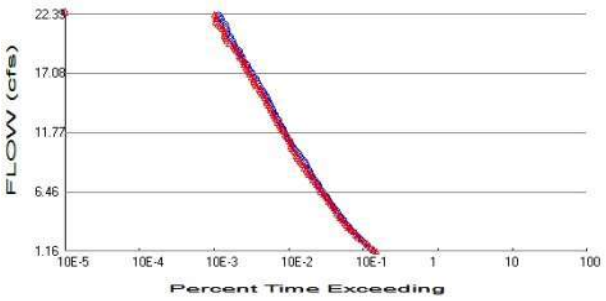
2.6429	1.1111	1.0718	0.0034	0.0000
2.7445	1.1111	1.1130	0.0036	0.0000
2.8462	1.1111	1.1543	0.0037	0.0000
2.9478	1.1111	1.1955	0.0039	0.0000
3.0495	1.1111	1.2367	0.0040	0.0000
3.1511	1.1111	1.2779	0.0042	0.0000
3.2527	1.1111	1.3248	0.0043	0.0000
3.3544	1.1111	1.3717	0.0045	0.0000
3.4560	1.1111	1.4186	0.0046	0.0000
3.5577	1.1111	1.4654	0.0046	0.0000
3.6593	1.1111	1.5123	0.0047	0.0000
3.7610	1.1111	1.5592	0.0048	0.0000
3.8626	1.1111	1.6060	0.0049	0.0000
3.9643	1.1111	1.6529	0.0050	0.0000
4.0659	1.1111	1.6998	0.0051	0.0000
4.1676	1.1111	1.7467	0.0053	0.0000
4.2500	1.1111	1.7847	0.0136	0.0000

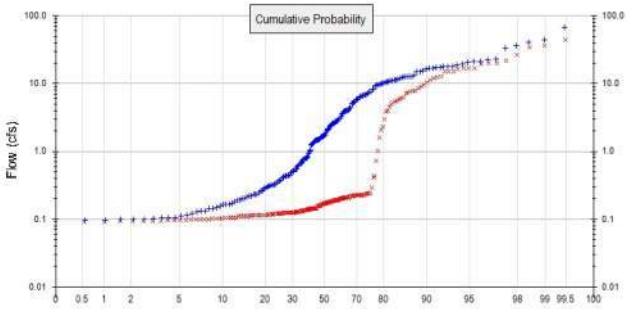
Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	1.1111	1.7847	0.0000	0.0053	0.0000
4.3516	1.1173	1.8979	0.0000	0.0053	0.0000
4.4533	1.1235	2.0118	0.0000	0.0053	0.0000
4.5549	1.1297	2.1263	0.0000	0.0053	0.0000
4.6566	1.1359	2.2415	0.0000	0.0053	0.0000
4.7582	1.1421	2.3572	0.0055	0.0053	0.0000
4.8599	1.1483	2.4736	0.0202	0.0053	0.0000
4.9615	1.1546	2.5907	0.0281	0.0053	0.0000
5.0632	1.1609	2.7084	0.0342	0.0053	0.0000
5.1648	1.1672	2.8267	0.0393	0.0053	0.0000
5.2665	1.1735	2.9457	0.0439	0.0053	0.0000
5.3681	1.1798	3.0653	0.0480	0.0053	0.0000
5.4698	1.1861	3.1855	0.0518	0.0053	0.0000
5.5714	1.1925	3.3064	0.0553	0.0053	0.0000
5.6731	1.1988	3.4279	0.0587	0.0053	0.0000
5.7747	1.2052	3.5501	0.0714	0.0053	0.0000
5.8764	1.2116	3.6730	0.0865	0.0053	0.0000
5.9780	1.2180	3.7964	0.0968	0.0053	0.0000
6.0797	1.2245	3.9206	0.1055	0.0053	0.0000
6.1813	1.2309	4.0454	0.1131	0.0053	0.0000
6.2830	1.2374	4.1708	0.1202	0.0053	0.0000
6.3846	1.2438	4.2969	0.1267	0.0053	0.0000
6.4863	1.2503	4.4237	0.1328	0.0053	0.0000
6.5879	1.2568	4.5511	0.1387	0.0053	0.0000
6.6896	1.2633	4.6792	0.1442	0.0053	0.0000
6.7912	1.2699	4.8079	0.1550	0.0053	0.0000
6.8929	1.2764	4.9374	0.1649	0.0053	0.0000
6.9945	1.2830	5.0674	0.1730	0.0053	0.0000
7.0962	1.2896	5.1982	0.1803	0.0053	0.0000
7.1978	1.2961	5.3296	0.1872	0.0053	0.0000
7.2995	1.3028	5.4617	0.1936	0.0053	0.0000
7.4011	1.3094	5.5944	0.1998	0.0053	0.0000
7.5027	1.3160	5.7279	0.2057	0.0053	0.0000
7.6044	1.3227	5.8620	0.2114	0.0053	0.0000
7.7060	1.3293	5.9968	0.2169	0.0053	0.0000
7.8077	1.3360	6.1322	0.2223	0.0053	0.0000
7.9093	1.3427	6.2684	0.2275	0.0053	0.0000
8.0110	1.3494	6.4052	0.2325	0.0053	0.0000

8.1126	1.3562	6.5427	0.2375	0.0053	0.0000
8.2143	1.3629	6.6809	0.2423	0.0053	0.0000
8.3159	1.3697	6.8198	0.9657	0.0053	0.0000
8.4176	1.3765	6.9594	3.1608	0.0053	0.0000
8.5192	1.3832	7.0996	6.1718	0.0053	0.0000
8.6209	1.3900	7.2406	9.7997	0.0053	0.0000
8.7225	1.3969	7.3822	13.920	0.0053	0.0000
8.8242	1.4037	7.5246	18.428	0.0053	0.0000
8.9258	1.4106	7.6676	23.224	0.0053	0.0000
9.0275	1.4174	7.8113	28.206	0.0053	0.0000
9.1291	1.4243	7.9557	33.268	0.0053	0.0000
9.2308	1.4312	8.1009	38.307	0.0053	0.0000
9.2500	1.4325	8.1284	43.216	0.0053	0.0000

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 45.13
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 25.12
Total Impervious Area: 20.01

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	11.552049
5 year	18.200146
10 year	22.385263
25 year	40.718179

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	5.711529
5 year	15.242632
10 year	19.866344
25 year	34.126717

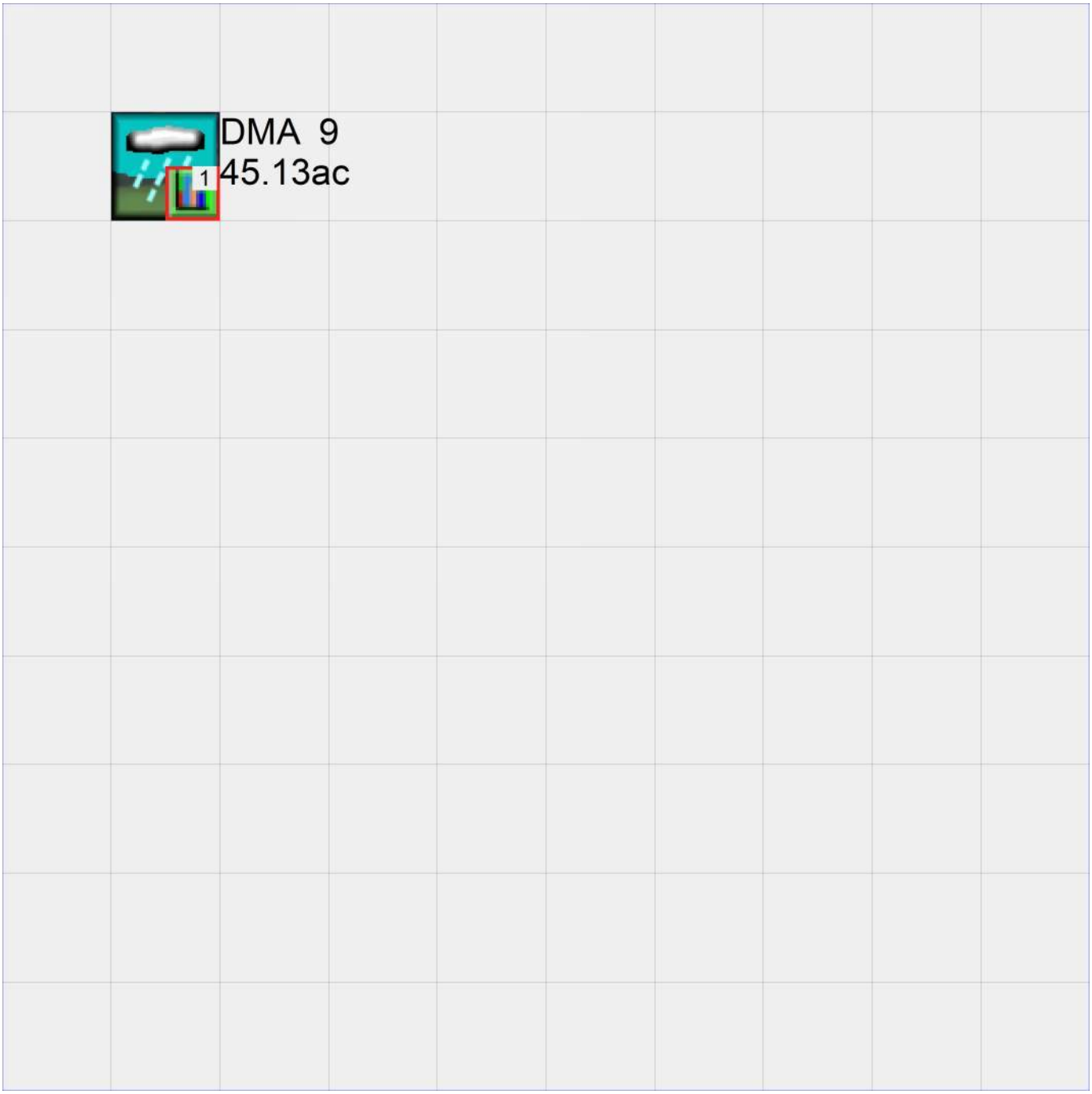
Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
1.1552	2939	3200	108	Pass
1.3696	2724	2920	107	Pass
1.5841	2524	2661	105	Pass
1.7985	2354	2448	103	Pass
2.0130	2198	2241	101	Pass
2.2274	2017	2042	101	Pass
2.4419	1891	1880	99	Pass
2.6563	1747	1727	98	Pass
2.8708	1628	1595	97	Pass
3.0852	1511	1479	97	Pass
3.2997	1414	1372	97	Pass
3.5141	1346	1289	95	Pass
3.7285	1259	1209	96	Pass
3.9430	1190	1140	95	Pass
4.1574	1111	1073	96	Pass
4.3719	1054	1026	97	Pass
4.5863	1008	967	95	Pass
4.8008	952	932	97	Pass
5.0152	893	885	99	Pass
5.2297	848	836	98	Pass
5.4441	801	798	99	Pass
5.6586	759	756	99	Pass
5.8730	720	722	100	Pass
6.0874	692	676	97	Pass
6.3019	650	637	98	Pass
6.5163	618	602	97	Pass
6.7308	585	577	98	Pass
6.9452	561	545	97	Pass
7.1597	537	514	95	Pass
7.3741	510	490	96	Pass
7.5886	484	470	97	Pass
7.8030	453	442	97	Pass
8.0174	432	409	94	Pass
8.2319	422	394	93	Pass
8.4463	409	376	91	Pass
8.6608	393	355	90	Pass
8.8752	376	337	89	Pass
9.0897	364	315	86	Pass
9.3041	349	302	86	Pass
9.5186	325	286	88	Pass
9.7330	310	276	89	Pass
9.9475	297	268	90	Pass
10.1619	277	256	92	Pass
10.3763	258	244	94	Pass
10.5908	246	236	95	Pass
10.8052	234	233	99	Pass
11.0197	228	225	98	Pass
11.2341	213	218	102	Pass
11.4486	206	203	98	Pass
11.6630	199	196	98	Pass
11.8775	189	188	99	Pass
12.0919	184	179	97	Pass
12.3063	175	172	98	Pass

12.5208	169	165	97	Pass
12.7352	161	156	96	Pass
12.9497	157	149	94	Pass
13.1641	149	142	95	Pass
13.3786	146	137	93	Pass
13.5930	139	133	95	Pass
13.8075	133	127	95	Pass
14.0219	129	124	96	Pass
14.2364	124	117	94	Pass
14.4508	119	112	94	Pass
14.6652	116	109	93	Pass
14.8797	112	104	92	Pass
15.0941	109	100	91	Pass
15.3086	103	95	92	Pass
15.5230	99	91	91	Pass
15.7375	94	90	95	Pass
15.9519	88	81	92	Pass
16.1664	85	76	89	Pass
16.3808	83	74	89	Pass
16.5952	81	74	91	Pass
16.8097	75	69	92	Pass
17.0241	72	66	91	Pass
17.2386	69	64	92	Pass
17.4530	65	61	93	Pass
17.6675	63	58	92	Pass
17.8819	60	55	91	Pass
18.0964	56	55	98	Pass
18.3108	53	53	100	Pass
18.5253	52	50	96	Pass
18.7397	51	48	94	Pass
18.9541	47	46	97	Pass
19.1686	47	43	91	Pass
19.3830	43	41	95	Pass
19.5975	41	40	97	Pass
19.8119	40	35	87	Pass
20.0264	38	32	84	Pass
20.2408	36	31	86	Pass
20.4553	36	30	83	Pass
20.6697	33	30	90	Pass
20.8841	33	30	90	Pass
21.0986	31	28	90	Pass
21.3130	31	26	83	Pass
21.5275	31	25	80	Pass
21.7419	28	23	82	Pass
21.9564	27	23	85	Pass
22.1708	26	23	88	Pass
22.3853	25	22	88	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA10
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA 10

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	82.84
Pervious Total	82.84
Impervious Land Use	acre
Impervious Total	0
Basin Total	82.84

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Bioretention 10

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	63.19
Pervious Total	63.19

Impervious Land Use	acre
Roads,Flat(0-5%)	19.65
Impervious Total	19.65
Basin Total	82.84

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 10	Surface retention 10	

Mitigated Routing

Bioretention 10

Bottom Length:	300.00 ft.	
Bottom Width:	300.00 ft.	
Material thickness of first layer:	0.25	
Material type for first layer:	Amended 1.5 in/hr	
Material thickness of second layer:	3	
Material type for second layer:	Amended 1.5 in/hr	
Material thickness of third layer:	1	
Material type for third layer:	GRAVEL	
Underdrain used		
Underdrain Diameter (feet):	0.5	
Orifice Diameter (in.):	0.5	
Offset (in.):	3	
Flow Through Underdrain (ac-ft.):	0	
Total Outflow (ac-ft.):	1487.691	
Percent Through Underdrain:	0	
Discharge Structure		
Riser Height:	4 ft.	
Riser Diameter:	48 in.	
Orifice 1 Diameter:	1 in.	Elevation:0.5 ft.
Orifice 2 Diameter:	1 in.	Elevation:1.5 ft.
Orifice 3 Diameter:	1 in.	Elevation:2.5 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	2.0661	0.0000	0.0000	0.0000
0.1016	2.0661	0.0767	0.0000	0.0000
0.2033	2.0661	0.1533	0.0000	0.0000
0.3049	2.0661	0.2300	0.0000	0.0000
0.4066	2.0661	0.3066	0.0000	0.0000
0.5082	2.0661	0.3833	0.0000	0.0000
0.6099	2.0661	0.4599	0.0000	0.0000
0.7115	2.0661	0.5366	0.0000	0.0000
0.8132	2.0661	0.6133	0.0000	0.0000
0.9148	2.0661	0.6899	0.0000	0.0000
1.0165	2.0661	0.7666	0.0000	0.0000
1.1181	2.0661	0.8432	0.0000	0.0000
1.2198	2.0661	0.9199	0.0000	0.0000
1.3214	2.0661	0.9965	0.0000	0.0000
1.4231	2.0661	1.0732	0.0000	0.0000
1.5247	2.0661	1.1498	0.0003	0.0000
1.6264	2.0661	1.2265	0.0005	0.0000
1.7280	2.0661	1.3032	0.0011	0.0000
1.8297	2.0661	1.3798	0.0014	0.0000
1.9313	2.0661	1.4565	0.0018	0.0000
2.0330	2.0661	1.5331	0.0021	0.0000
2.1346	2.0661	1.6098	0.0024	0.0000
2.2363	2.0661	1.6864	0.0026	0.0000
2.3379	2.0661	1.7631	0.0029	0.0000
2.4396	2.0661	1.8398	0.0030	0.0000
2.5412	2.0661	1.9164	0.0033	0.0000

2.6429	2.0661	1.9931	0.0034	0.0000
2.7445	2.0661	2.0697	0.0036	0.0000
2.8462	2.0661	2.1464	0.0037	0.0000
2.9478	2.0661	2.2230	0.0039	0.0000
3.0495	2.0661	2.2997	0.0040	0.0000
3.1511	2.0661	2.3763	0.0042	0.0000
3.2527	2.0661	2.4635	0.0043	0.0000
3.3544	2.0661	2.5507	0.0045	0.0000
3.4560	2.0661	2.6378	0.0046	0.0000
3.5577	2.0661	2.7250	0.0046	0.0000
3.6593	2.0661	2.8121	0.0047	0.0000
3.7610	2.0661	2.8993	0.0048	0.0000
3.8626	2.0661	2.9864	0.0049	0.0000
3.9643	2.0661	3.0736	0.0050	0.0000
4.0659	2.0661	3.1608	0.0051	0.0000
4.1676	2.0661	3.2479	0.0053	0.0000
4.2500	2.0661	3.3186	0.0136	0.0000

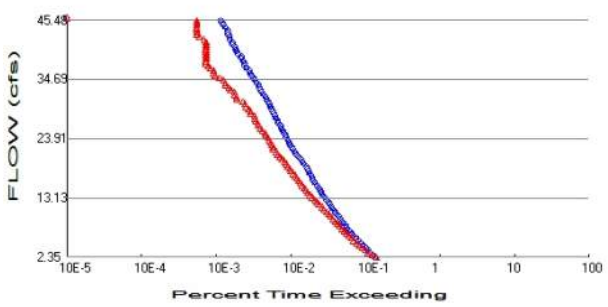
Landscape Swale Hydraulic Table

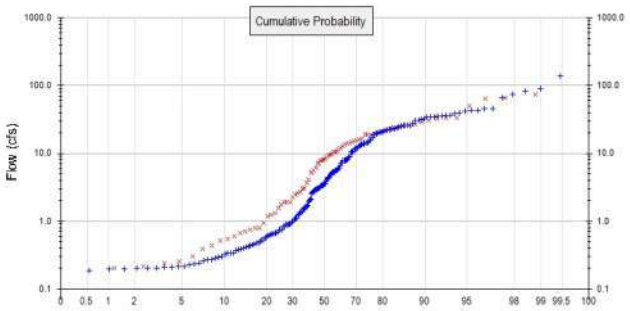
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	2.0661	3.3186	0.0000	0.0053	0.0000
4.3516	2.0745	3.5290	0.0000	0.0053	0.0000
4.4533	2.0829	3.7403	0.0000	0.0053	0.0000
4.5549	2.0914	3.9525	0.0000	0.0053	0.0000
4.6566	2.0998	4.1655	0.0000	0.0053	0.0000
4.7582	2.1083	4.3794	0.0025	0.0053	0.0000
4.8599	2.1168	4.5941	0.0090	0.0053	0.0000
4.9615	2.1253	4.8097	0.0125	0.0053	0.0000
5.0632	2.1338	5.0262	0.0152	0.0053	0.0000
5.1648	2.1423	5.2435	0.0175	0.0053	0.0000
5.2665	2.1509	5.4617	0.0195	0.0053	0.0000
5.3681	2.1594	5.6808	0.0213	0.0053	0.0000
5.4698	2.1680	5.9007	0.0230	0.0053	0.0000
5.5714	2.1766	6.1215	0.0246	0.0053	0.0000
5.6731	2.1852	6.3432	0.0261	0.0053	0.0000
5.7747	2.1938	6.5658	0.0317	0.0053	0.0000
5.8764	2.2025	6.7892	0.0384	0.0053	0.0000
5.9780	2.2111	7.0135	0.0430	0.0053	0.0000
6.0797	2.2198	7.2387	0.0469	0.0053	0.0000
6.1813	2.2285	7.4648	0.0503	0.0053	0.0000
6.2830	2.2372	7.6918	0.0534	0.0053	0.0000
6.3846	2.2459	7.9196	0.0563	0.0053	0.0000
6.4863	2.2546	8.1484	0.0590	0.0053	0.0000
6.5879	2.2633	8.3780	0.0616	0.0053	0.0000
6.6896	2.2721	8.6085	0.0641	0.0053	0.0000
6.7912	2.2809	8.8399	0.0720	0.0053	0.0000
6.8929	2.2897	9.0722	0.0790	0.0053	0.0000
6.9945	2.2985	9.3054	0.0843	0.0053	0.0000
7.0962	2.3073	9.5395	0.0890	0.0053	0.0000
7.1978	2.3161	9.7744	0.0933	0.0053	0.0000
7.2995	2.3250	10.010	0.0972	0.0053	0.0000
7.4011	2.3338	10.247	0.1010	0.0053	0.0000
7.5027	2.3427	10.485	0.1045	0.0053	0.0000
7.6044	2.3516	10.723	0.1079	0.0053	0.0000
7.7060	2.3605	10.963	0.1111	0.0053	0.0000
7.8077	2.3694	11.203	0.1143	0.0053	0.0000
7.9093	2.3784	11.445	0.1173	0.0053	0.0000
8.0110	2.3873	11.687	0.1203	0.0053	0.0000

8.1126	2.3963	11.930	0.1232	0.0053	0.0000
8.2143	2.4053	12.174	0.1259	0.0053	0.0000
8.3159	2.4143	12.419	0.8473	0.0053	0.0000
8.4176	2.4233	12.665	3.0405	0.0053	0.0000
8.5192	2.4323	12.912	6.0495	0.0053	0.0000
8.6209	2.4414	13.159	9.6755	0.0053	0.0000
8.7225	2.4504	13.408	13.794	0.0053	0.0000
8.8242	2.4595	13.657	18.301	0.0053	0.0000
8.9258	2.4686	13.908	23.094	0.0053	0.0000
9.0275	2.4777	14.159	28.074	0.0053	0.0000
9.1291	2.4868	14.412	33.135	0.0053	0.0000
9.2308	2.4960	14.665	38.172	0.0053	0.0000
9.2500	2.4977	14.713	43.079	0.0053	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 82.84
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 63.19
Total Impervious Area: 19.65

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	23.468314
5 year	36.974113
10 year	45.4763
25 year	82.720139

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	12.414664
5 year	24.327903
10 year	32.678313
25 year	63.578504

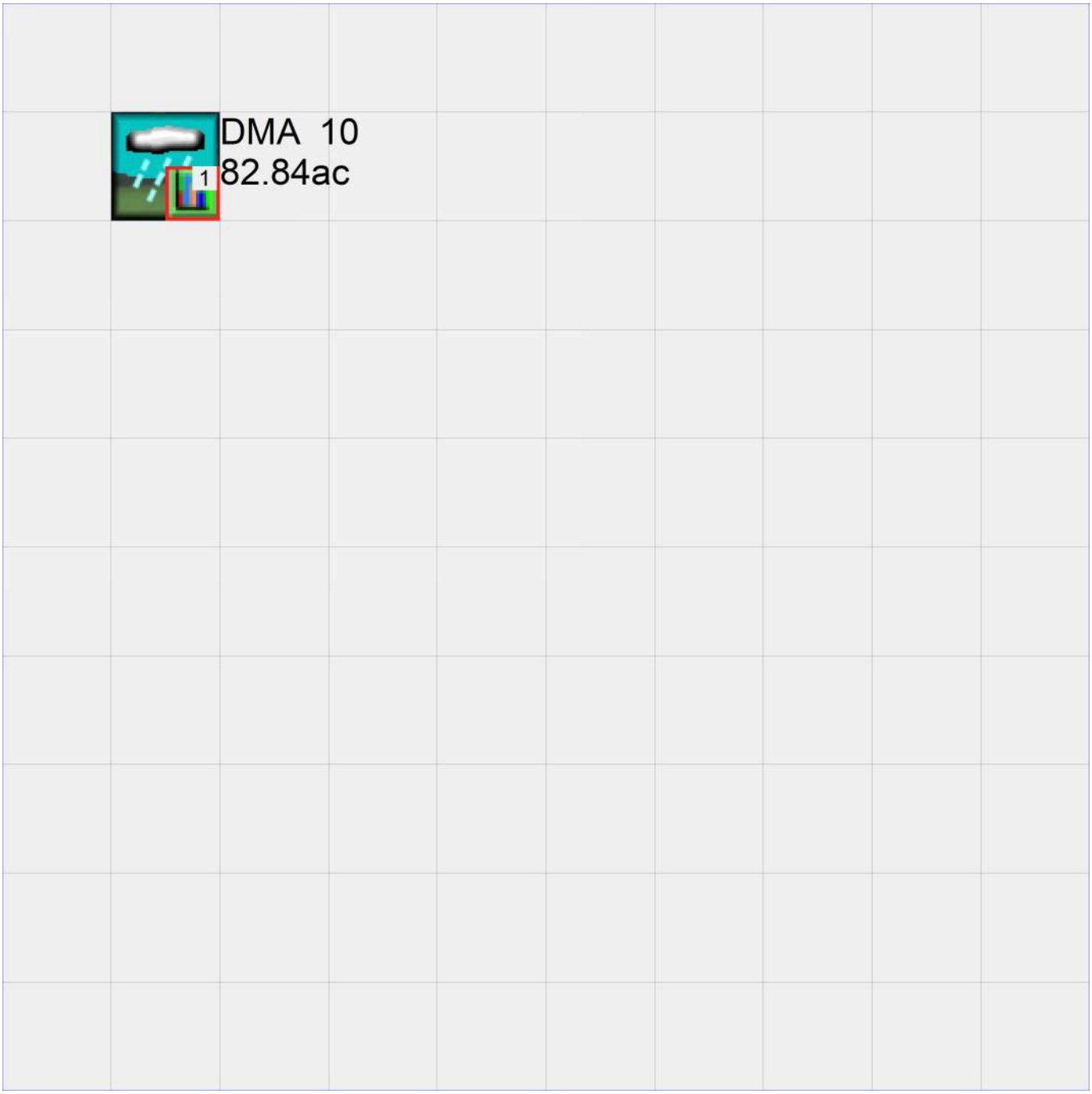
Duration Flows

The Facility PASSED

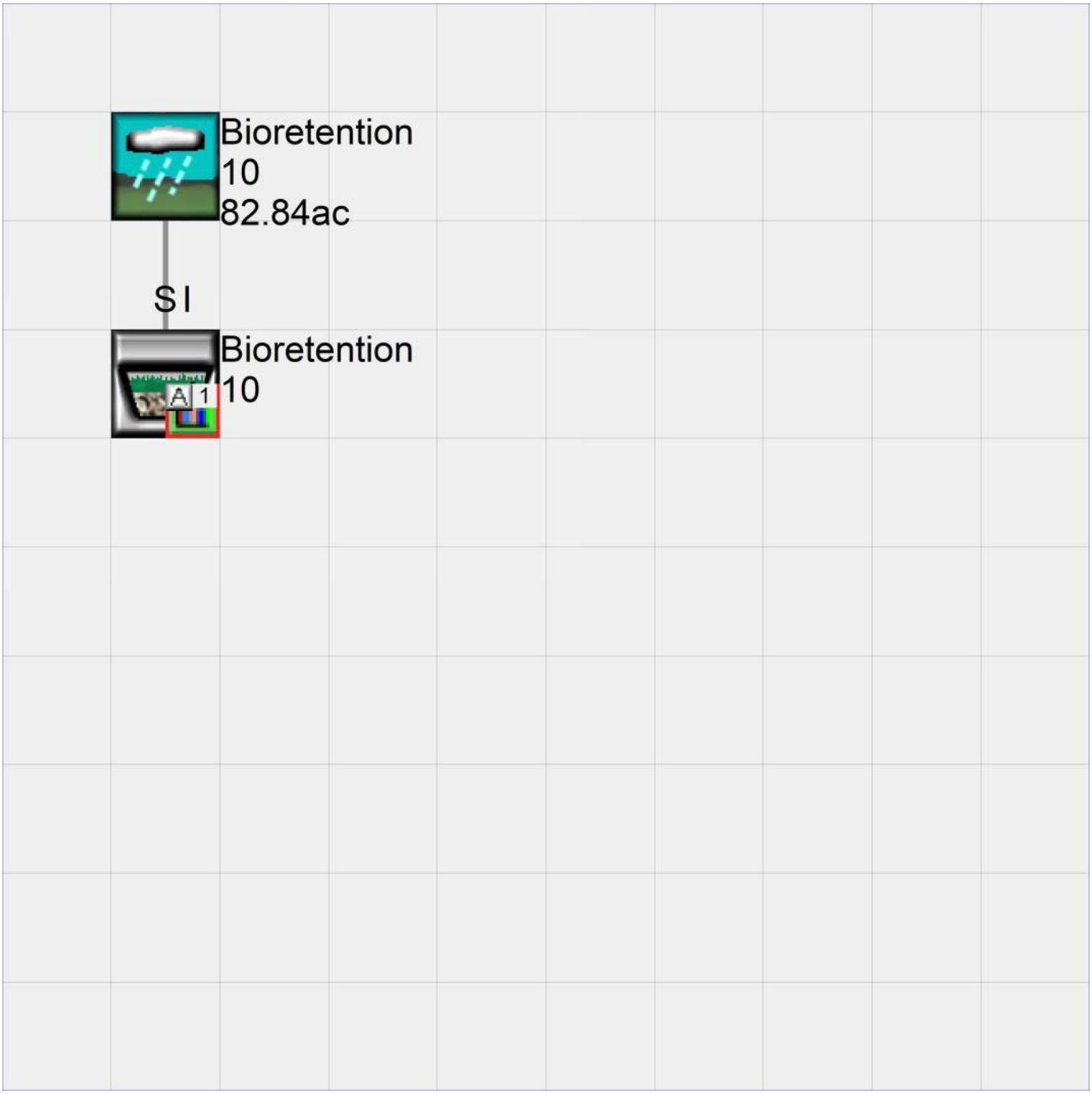
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
2.3468	2939	3083	104	Pass
2.7825	2724	2680	98	Pass
3.2181	2524	2391	94	Pass
3.6538	2354	2164	91	Pass
4.0894	2196	1958	89	Pass
4.5251	2017	1802	89	Pass
4.9607	1891	1650	87	Pass
5.3964	1747	1517	86	Pass
5.8320	1626	1399	86	Pass
6.2677	1511	1297	85	Pass
6.7033	1414	1208	85	Pass
7.1390	1346	1127	83	Pass
7.5746	1258	1055	83	Pass
8.0103	1190	981	82	Pass
8.4459	1111	913	82	Pass
8.8816	1054	855	81	Pass
9.3173	1008	802	79	Pass
9.7529	952	746	78	Pass
10.1886	894	703	78	Pass
10.6242	848	653	77	Pass
11.0599	801	606	75	Pass
11.4955	759	569	74	Pass
11.9312	720	521	72	Pass
12.3668	692	489	70	Pass
12.8025	650	459	70	Pass
13.2381	618	421	68	Pass
13.6738	585	395	67	Pass
14.1094	561	366	65	Pass
14.5451	538	349	64	Pass
14.9807	510	332	65	Pass
15.4164	485	309	63	Pass
15.8520	453	293	64	Pass
16.2877	432	277	64	Pass
16.7233	422	264	62	Pass
17.1590	409	252	61	Pass
17.5946	393	235	59	Pass
18.0303	376	221	58	Pass
18.4659	364	211	57	Pass
18.9016	349	197	56	Pass
19.3372	325	192	59	Pass
19.7729	310	180	58	Pass
20.2085	297	167	56	Pass
20.6442	277	155	55	Pass
21.0798	258	146	56	Pass
21.5155	246	139	56	Pass
21.9511	233	127	54	Pass
22.3868	226	126	55	Pass
22.8224	213	122	57	Pass
23.2581	206	117	56	Pass
23.6937	198	111	56	Pass
24.1294	188	108	57	Pass
24.5650	184	101	54	Pass
25.0007	175	98	56	Pass

25.4363	169	91	53	Pass
25.8720	161	85	52	Pass
26.3076	157	81	51	Pass
26.7433	149	79	53	Pass
27.1789	146	74	50	Pass
27.6146	138	72	52	Pass
28.0503	133	71	53	Pass
28.4859	129	63	48	Pass
28.9216	123	63	51	Pass
29.3572	119	59	49	Pass
29.7929	116	55	47	Pass
30.2285	112	53	47	Pass
30.6642	109	50	45	Pass
31.0998	103	41	39	Pass
31.5355	99	41	41	Pass
31.9711	94	39	41	Pass
32.4068	88	38	43	Pass
32.8424	85	34	40	Pass
33.2781	83	32	38	Pass
33.7137	81	29	35	Pass
34.1494	75	29	38	Pass
34.5850	72	27	37	Pass
35.0207	69	24	34	Pass
35.4563	65	21	32	Pass
35.8920	63	20	31	Pass
36.3276	60	20	33	Pass
36.7633	55	18	32	Pass
37.1989	53	17	32	Pass
37.6346	52	16	30	Pass
38.0702	51	16	31	Pass
38.5059	47	16	34	Pass
38.9415	47	16	34	Pass
39.3772	43	16	37	Pass
39.8128	41	16	39	Pass
40.2485	40	16	40	Pass
40.6841	38	16	42	Pass
41.1198	36	16	44	Pass
41.5554	36	16	44	Pass
41.9911	33	15	45	Pass
42.4267	33	13	39	Pass
42.8624	31	12	38	Pass
43.2980	31	12	38	Pass
43.7337	31	12	38	Pass
44.1693	29	12	41	Pass
44.6050	27	12	44	Pass
45.0406	26	12	46	Pass
45.4763	25	12	48	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA11
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	12/20/2017
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA 11

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,St(10-20%)	7.5
Pervious Total	7.5
Impervious Land Use	acre
Impervious Total	0
Basin Total	7.5

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 11

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,St(10-20%)	2.67
C D,Urban,St(10-20%)	2
Pervious Total	4.67

Impervious Land Use	acre
Roads,Flat(0-5%)	2.83
Impervious Total	2.83
Basin Total	7.5

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 11	Surface retention 11	

Mitigated Routing

Bioretention 11

Bottom Length:	115.00 ft.	
Bottom Width:	115.00 ft.	
Material thickness of first layer:	0.25	
Material type for first layer:	Amended 1.5 in/hr	
Material thickness of second layer:	3	
Material type for second layer:	Amended 1.5 in/hr	
Material thickness of third layer:	1	
Material type for third layer:	GRAVEL	
Underdrain used		
Underdrain Diameter (feet):	0.5	
Orifice Diameter (in.):	0.5	
Offset (in.):	3	
Flow Through Underdrain (ac-ft.):	41.256	
Total Outflow (ac-ft.):	183.452	
Percent Through Underdrain:	22.49	
Discharge Structure		
Riser Height:	4 ft.	
Riser Diameter:	36 in.	
Orifice 1 Diameter:	1 in.	Elevation:0.5 ft.
Orifice 2 Diameter:	1 in.	Elevation:1.5 ft.
Orifice 3 Diameter:	1 in.	Elevation:2.5 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.3036	0.0000	0.0000	0.0000
0.1016	0.3036	0.0113	0.0000	0.0000
0.2033	0.3036	0.0225	0.0000	0.0000
0.3049	0.3036	0.0338	0.0000	0.0000
0.4066	0.3036	0.0451	0.0000	0.0000
0.5082	0.3036	0.0563	0.0000	0.0000
0.6099	0.3036	0.0676	0.0000	0.0000
0.7115	0.3036	0.0788	0.0000	0.0000
0.8132	0.3036	0.0901	0.0000	0.0000
0.9148	0.3036	0.1014	0.0000	0.0000
1.0165	0.3036	0.1126	0.0000	0.0000
1.1181	0.3036	0.1239	0.0000	0.0000
1.2198	0.3036	0.1352	0.0000	0.0000
1.3214	0.3036	0.1464	0.0000	0.0000
1.4231	0.3036	0.1577	0.0000	0.0000
1.5247	0.3036	0.1690	0.0003	0.0000
1.6264	0.3036	0.1802	0.0005	0.0000
1.7280	0.3036	0.1915	0.0011	0.0000
1.8297	0.3036	0.2028	0.0014	0.0000
1.9313	0.3036	0.2140	0.0018	0.0000
2.0330	0.3036	0.2253	0.0021	0.0000
2.1346	0.3036	0.2365	0.0024	0.0000
2.2363	0.3036	0.2478	0.0026	0.0000
2.3379	0.3036	0.2591	0.0029	0.0000
2.4396	0.3036	0.2703	0.0030	0.0000
2.5412	0.3036	0.2816	0.0033	0.0000

2.6429	0.3036	0.2929	0.0034	0.0000
2.7445	0.3036	0.3041	0.0036	0.0000
2.8462	0.3036	0.3154	0.0037	0.0000
2.9478	0.3036	0.3267	0.0039	0.0000
3.0495	0.3036	0.3379	0.0040	0.0000
3.1511	0.3036	0.3492	0.0042	0.0000
3.2527	0.3036	0.3620	0.0043	0.0000
3.3544	0.3036	0.3748	0.0045	0.0000
3.4560	0.3036	0.3876	0.0046	0.0000
3.5577	0.3036	0.4004	0.0046	0.0000
3.6593	0.3036	0.4132	0.0047	0.0000
3.7610	0.3036	0.4260	0.0048	0.0000
3.8626	0.3036	0.4388	0.0049	0.0000
3.9643	0.3036	0.4516	0.0050	0.0000
4.0659	0.3036	0.4645	0.0051	0.0000
4.1676	0.3036	0.4773	0.0053	0.0000
4.2500	0.3036	0.4876	0.0136	0.0000

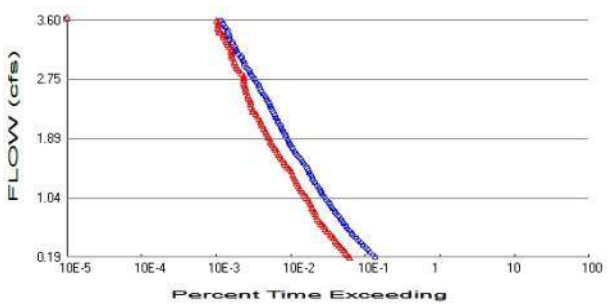
Landscape Swale Hydraulic Table

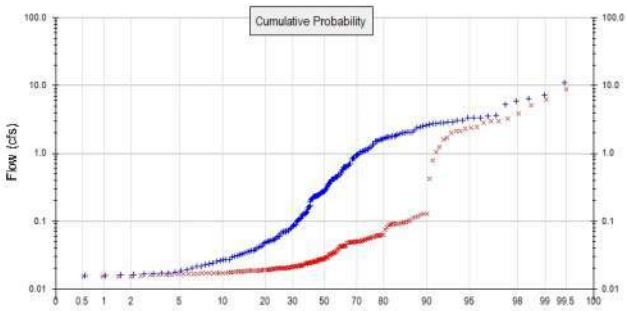
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.3036	0.4876	0.0000	0.0053	0.0000
4.3516	0.3068	0.5187	0.0000	0.0053	0.0000
4.4533	0.3101	0.5500	0.0000	0.0053	0.0000
4.5549	0.3133	0.5817	0.0000	0.0053	0.0000
4.6566	0.3166	0.6137	0.0000	0.0053	0.0000
4.7582	0.3199	0.6461	0.0025	0.0053	0.0000
4.8599	0.3232	0.6788	0.0090	0.0053	0.0000
4.9615	0.3265	0.7118	0.0125	0.0053	0.0000
5.0632	0.3299	0.7451	0.0152	0.0053	0.0000
5.1648	0.3332	0.7788	0.0175	0.0053	0.0000
5.2665	0.3366	0.8129	0.0195	0.0053	0.0000
5.3681	0.3399	0.8473	0.0213	0.0053	0.0000
5.4698	0.3433	0.8820	0.0230	0.0053	0.0000
5.5714	0.3468	0.9171	0.0246	0.0053	0.0000
5.6731	0.3502	0.9525	0.0261	0.0053	0.0000
5.7747	0.3536	0.9883	0.0317	0.0053	0.0000
5.8764	0.3571	1.0244	0.0384	0.0053	0.0000
5.9780	0.3605	1.0608	0.0430	0.0053	0.0000
6.0797	0.3640	1.0977	0.0469	0.0053	0.0000
6.1813	0.3675	1.1349	0.0503	0.0053	0.0000
6.2830	0.3710	1.1724	0.0534	0.0053	0.0000
6.3846	0.3746	1.2103	0.0563	0.0053	0.0000
6.4863	0.3781	1.2485	0.0590	0.0053	0.0000
6.5879	0.3817	1.2872	0.0616	0.0053	0.0000
6.6896	0.3853	1.3261	0.0641	0.0053	0.0000
6.7912	0.3889	1.3655	0.0720	0.0053	0.0000
6.8929	0.3925	1.4052	0.0790	0.0053	0.0000
6.9945	0.3961	1.4453	0.0843	0.0053	0.0000
7.0962	0.3997	1.4857	0.0890	0.0053	0.0000
7.1978	0.4034	1.5265	0.0933	0.0053	0.0000
7.2995	0.4070	1.5677	0.0972	0.0053	0.0000
7.4011	0.4107	1.6093	0.1010	0.0053	0.0000
7.5027	0.4144	1.6512	0.1045	0.0053	0.0000
7.6044	0.4181	1.6935	0.1079	0.0053	0.0000
7.7060	0.4219	1.7362	0.1111	0.0053	0.0000
7.8077	0.4256	1.7793	0.1143	0.0053	0.0000
7.9093	0.4294	1.8228	0.1173	0.0053	0.0000
8.0110	0.4331	1.8666	0.1203	0.0053	0.0000

8.1126	0.4369	1.9108	0.1232	0.0053	0.0000
8.2143	0.4407	1.9554	0.1259	0.0053	0.0000
8.3159	0.4446	2.0004	0.6676	0.0053	0.0000
8.4176	0.4484	2.0458	2.3117	0.0053	0.0000
8.5192	0.4522	2.0916	4.5606	0.0053	0.0000
8.6209	0.4561	2.1377	7.2485	0.0053	0.0000
8.7225	0.4600	2.1843	10.254	0.0053	0.0000
8.8242	0.4639	2.2313	13.459	0.0053	0.0000
8.9258	0.4678	2.2786	16.746	0.0053	0.0000
9.0275	0.4717	2.3264	19.992	0.0053	0.0000
9.1291	0.4757	2.3745	23.078	0.0053	0.0000
9.2308	0.4796	2.4231	25.898	0.0053	0.0000
9.2500	0.4804	2.4323	28.365	0.0053	0.0000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 7.5
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 4.67
Total Impervious Area: 2.83

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.85804
5 year	2.927325
10 year	3.600463
25 year	6.549143

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.093515
5 year	2.130281
10 year	2.978186
25 year	5.162725

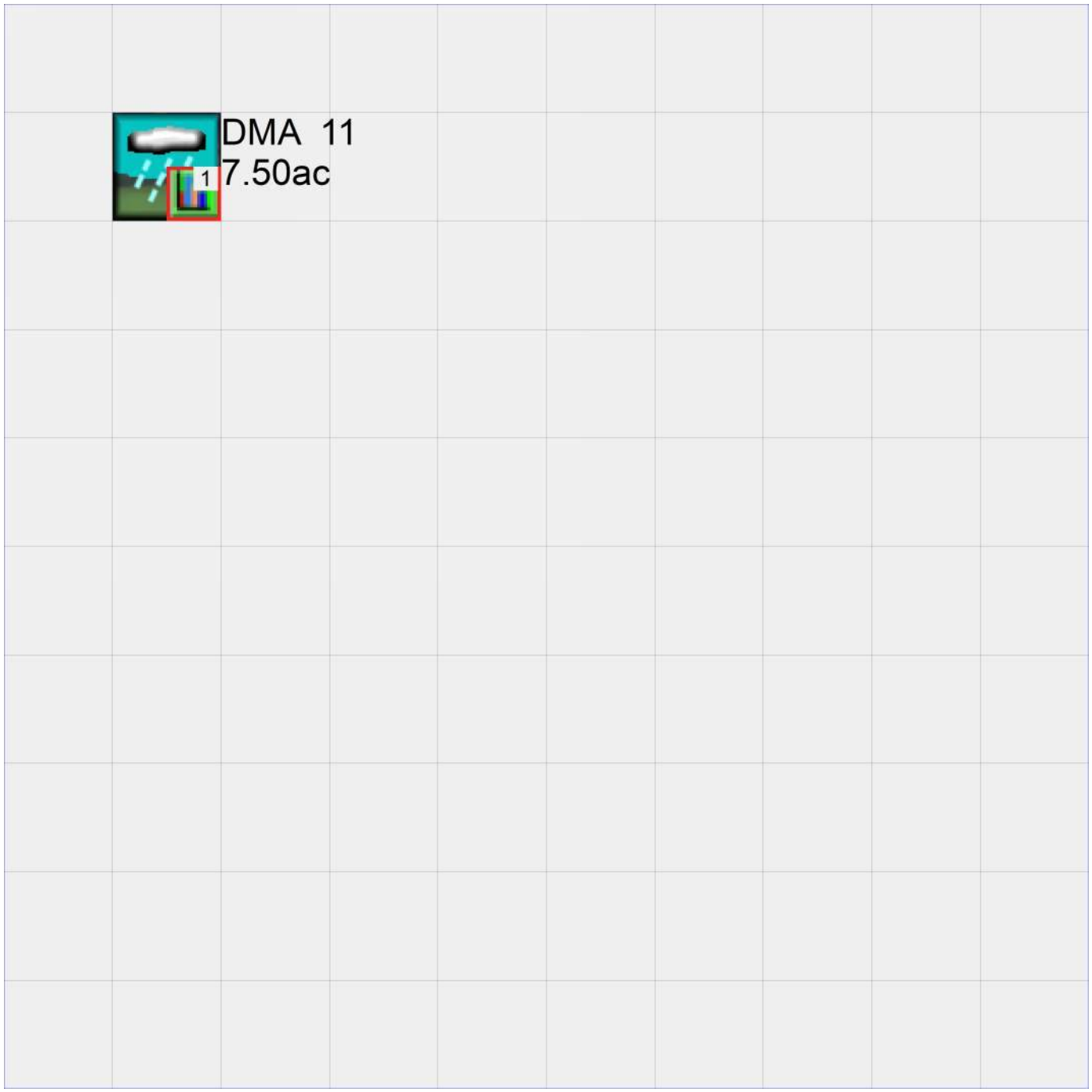
Duration Flows

The Facility PASSED

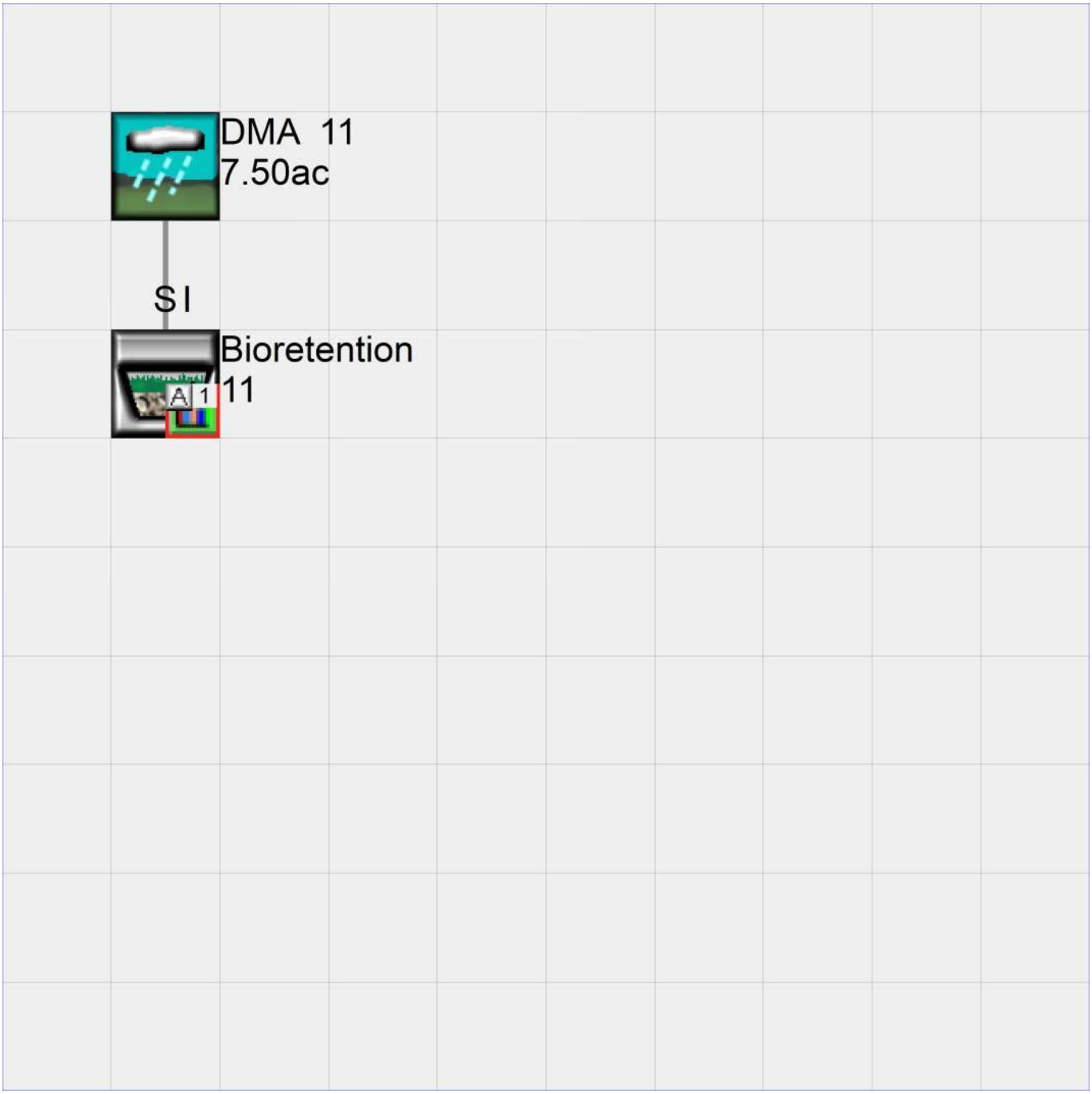
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1858	2939	1347	45	Pass
0.2203	2726	1253	45	Pass
0.2548	2528	1181	46	Pass
0.2893	2354	1105	46	Pass
0.3238	2198	1030	46	Pass
0.3583	2017	967	47	Pass
0.3928	1892	909	48	Pass
0.4272	1747	859	49	Pass
0.4617	1629	816	50	Pass
0.4962	1511	759	50	Pass
0.5307	1418	727	51	Pass
0.5652	1346	675	50	Pass
0.5997	1262	628	49	Pass
0.6342	1190	601	50	Pass
0.6687	1111	561	50	Pass
0.7032	1054	527	50	Pass
0.7377	1011	505	49	Pass
0.7722	952	483	50	Pass
0.8067	894	466	52	Pass
0.8411	848	453	53	Pass
0.8756	801	428	53	Pass
0.9101	759	417	54	Pass
0.9446	721	405	56	Pass
0.9791	692	390	56	Pass
1.0136	650	372	57	Pass
1.0481	618	353	57	Pass
1.0826	586	333	56	Pass
1.1171	561	315	56	Pass
1.1516	538	298	55	Pass
1.1861	510	285	55	Pass
1.2205	486	274	56	Pass
1.2550	453	261	57	Pass
1.2895	432	256	59	Pass
1.3240	422	247	58	Pass
1.3585	409	237	57	Pass
1.3930	393	231	58	Pass
1.4275	376	222	59	Pass
1.4620	364	207	56	Pass
1.4965	349	193	55	Pass
1.5310	325	185	56	Pass
1.5655	310	174	56	Pass
1.6000	298	164	55	Pass
1.6344	277	157	56	Pass
1.6689	258	151	58	Pass
1.7034	246	145	58	Pass
1.7379	234	136	58	Pass
1.7724	226	129	57	Pass
1.8069	213	123	57	Pass
1.8414	206	117	56	Pass
1.8759	199	115	57	Pass
1.9104	188	110	58	Pass
1.9449	184	108	58	Pass
1.9794	175	102	58	Pass

2.0139	169	101	59	Pass
2.0483	161	94	58	Pass
2.0828	157	90	57	Pass
2.1173	149	88	59	Pass
2.1518	146	86	58	Pass
2.1863	138	82	59	Pass
2.2208	133	77	57	Pass
2.2553	129	74	57	Pass
2.2898	124	67	54	Pass
2.3243	119	67	56	Pass
2.3588	116	65	56	Pass
2.3933	112	63	56	Pass
2.4278	109	63	57	Pass
2.4622	103	61	59	Pass
2.4967	99	59	59	Pass
2.5312	94	58	61	Pass
2.5657	88	55	62	Pass
2.6002	85	54	63	Pass
2.6347	83	54	65	Pass
2.6692	81	53	65	Pass
2.7037	75	51	68	Pass
2.7382	72	51	70	Pass
2.7727	69	51	73	Pass
2.8072	65	51	78	Pass
2.8416	63	47	74	Pass
2.8761	60	44	73	Pass
2.9106	56	42	75	Pass
2.9451	53	40	75	Pass
2.9796	52	39	75	Pass
3.0141	51	38	74	Pass
3.0486	47	37	78	Pass
3.0831	47	35	74	Pass
3.1176	43	35	81	Pass
3.1521	41	35	85	Pass
3.1866	40	35	87	Pass
3.2211	38	33	86	Pass
3.2555	36	31	86	Pass
3.2900	36	30	83	Pass
3.3245	33	29	87	Pass
3.3590	33	27	81	Pass
3.3935	31	27	87	Pass
3.4280	31	24	77	Pass
3.4625	31	24	77	Pass
3.4970	29	23	79	Pass
3.5315	27	23	85	Pass
3.5660	26	23	88	Pass
3.6005	25	22	88	Pass

Appendix
Predeveloped Schematic



Mitigated Schematic



SMRHM

PROJECT REPORT

General Model Information

Project Name:	DMA12 trench
Site Name:	Murrieta Hills
Site Address:	Keller Road
City:	Murrieta
Report Date:	6/6/2018
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2017/10/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA 12

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,Very(>20%)	1.51
Pervious Total	1.51
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.51

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 12

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Urban,Flat(0-5%)	0.71
Pervious Total	0.71

Impervious Land Use	acre
Roads,Flat(0-5%)	0.8
Impervious Total	0.8
Basin Total	1.51

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	Gravel Trench Bed 1

Routing Elements
Predeveloped Routing

Mitigated Routing

Gravel Trench Bed 1

Bottom Length: 100.00 ft.
Bottom Width: 10.00 ft.
Trench bottom slope 1: 0.01 To 1
Trench Left side slope 0: 2 To 1
Trench right side slope 2: 2 To 1
Material thickness of first layer: 1
Pour Space of material for first layer: 0.33
Material thickness of second layer: 1
Pour Space of material for second layer: 0.33
Material thickness of third layer: 1
Pour Space of material for third layer: 0.33
Discharge Structure
Riser Height: 4 ft.
Riser Diameter: 10 in.
Notch Type: Rectangular
Notch Width: 0.833 ft.
Notch Height: 1.000 ft.
Orifice 1 Diameter: 1 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

Gravel Trench Bed Hydraulic Table

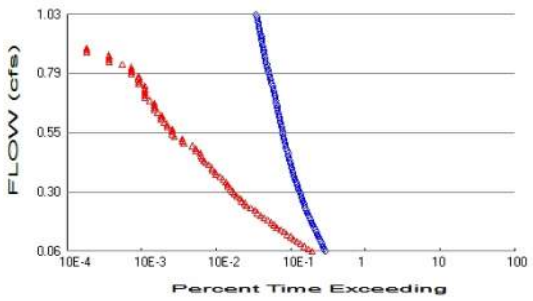
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.023	0.000	0.000	0.000
0.0444	0.023	0.000	0.005	0.000
0.0889	0.023	0.000	0.008	0.000
0.1333	0.024	0.001	0.009	0.000
0.1778	0.024	0.001	0.011	0.000
0.2222	0.025	0.001	0.012	0.000
0.2667	0.025	0.002	0.014	0.000
0.3111	0.025	0.002	0.015	0.000
0.3556	0.026	0.002	0.016	0.000
0.4000	0.026	0.003	0.017	0.000
0.4444	0.027	0.003	0.018	0.000
0.4889	0.027	0.004	0.019	0.000
0.5333	0.027	0.004	0.019	0.000
0.5778	0.028	0.004	0.020	0.000
0.6222	0.028	0.005	0.021	0.000
0.6667	0.029	0.005	0.022	0.000
0.7111	0.029	0.006	0.022	0.000
0.7556	0.029	0.006	0.023	0.000
0.8000	0.030	0.007	0.024	0.000
0.8444	0.030	0.007	0.024	0.000
0.8889	0.031	0.007	0.025	0.000
0.9333	0.031	0.008	0.026	0.000
0.9778	0.031	0.008	0.026	0.000
1.0222	0.032	0.009	0.027	0.000
1.0667	0.032	0.009	0.028	0.000
1.1111	0.033	0.010	0.028	0.000
1.1556	0.033	0.010	0.029	0.000
1.2000	0.034	0.011	0.029	0.000
1.2444	0.034	0.011	0.030	0.000

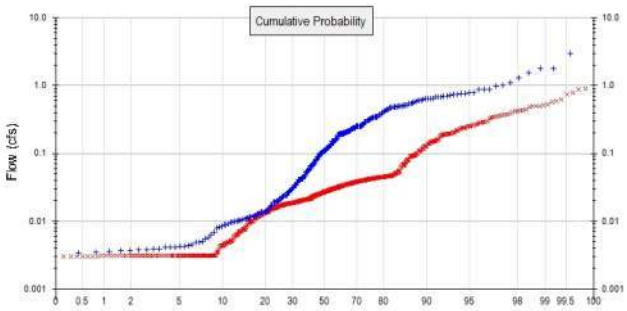
1.2889	0.034	0.012	0.030	0.000
1.3333	0.035	0.012	0.031	0.000
1.3778	0.035	0.013	0.031	0.000
1.4222	0.036	0.013	0.032	0.000
1.4667	0.036	0.014	0.032	0.000
1.5111	0.036	0.014	0.033	0.000
1.5556	0.037	0.015	0.033	0.000
1.6000	0.037	0.016	0.034	0.000
1.6444	0.038	0.016	0.034	0.000
1.6889	0.038	0.017	0.035	0.000
1.7333	0.038	0.017	0.035	0.000
1.7778	0.039	0.018	0.036	0.000
1.8222	0.039	0.018	0.036	0.000
1.8667	0.040	0.019	0.037	0.000
1.9111	0.040	0.020	0.037	0.000
1.9556	0.040	0.020	0.037	0.000
2.0000	0.041	0.021	0.038	0.000
2.0444	0.041	0.021	0.038	0.000
2.0889	0.042	0.022	0.039	0.000
2.1333	0.042	0.023	0.039	0.000
2.1778	0.043	0.023	0.040	0.000
2.2222	0.043	0.024	0.040	0.000
2.2667	0.043	0.025	0.040	0.000
2.3111	0.044	0.025	0.041	0.000
2.3556	0.044	0.026	0.041	0.000
2.4000	0.045	0.026	0.042	0.000
2.4444	0.045	0.027	0.042	0.000
2.4889	0.045	0.028	0.042	0.000
2.5333	0.046	0.028	0.043	0.000
2.5778	0.046	0.029	0.043	0.000
2.6222	0.047	0.030	0.043	0.000
2.6667	0.047	0.031	0.044	0.000
2.7111	0.047	0.031	0.044	0.000
2.7556	0.048	0.032	0.045	0.000
2.8000	0.048	0.033	0.045	0.000
2.8444	0.049	0.033	0.045	0.000
2.8889	0.049	0.034	0.046	0.000
2.9333	0.049	0.035	0.046	0.000
2.9778	0.050	0.036	0.046	0.000
3.0222	0.050	0.038	0.056	0.000
3.0667	0.051	0.040	0.095	0.000
3.1111	0.051	0.042	0.150	0.000
3.1556	0.052	0.045	0.218	0.000
3.2000	0.052	0.047	0.296	0.000
3.2444	0.052	0.049	0.384	0.000
3.2889	0.053	0.052	0.480	0.000
3.3333	0.053	0.054	0.583	0.000
3.3778	0.054	0.056	0.694	0.000
3.4222	0.054	0.059	0.811	0.000
3.4667	0.054	0.061	0.935	0.000
3.5111	0.055	0.064	1.064	0.000
3.5556	0.055	0.066	1.200	0.000
3.6000	0.056	0.069	1.341	0.000
3.6444	0.056	0.071	1.487	0.000
3.6889	0.056	0.074	1.638	0.000
3.7333	0.057	0.076	1.795	0.000
3.7778	0.057	0.079	1.956	0.000
3.8222	0.058	0.081	2.122	0.000

3.8667	0.058	0.084	2.292	0.000
3.9111	0.058	0.087	2.467	0.000
3.9556	0.059	0.089	2.646	0.000
4.0000	0.059	0.092	2.829	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.51
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.71
Total Impervious Area: 0.8

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.576296
5 year	0.777145
10 year	1.033997
25 year	1.772222

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.295174
5 year	0.487055
10 year	0.576077
25 year	0.783701

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0576	1574	1053	66	Pass
0.0675	1515	937	61	Pass
0.0774	1459	818	56	Pass
0.0872	1411	732	51	Pass
0.0971	1367	659	48	Pass
0.1069	1326	599	45	Pass
0.1168	1293	543	41	Pass
0.1267	1245	486	39	Pass
0.1365	1207	440	36	Pass
0.1464	1166	398	34	Pass
0.1563	1113	351	31	Pass
0.1661	1079	326	30	Pass
0.1760	1042	298	28	Pass
0.1858	1001	265	26	Pass
0.1957	973	236	24	Pass
0.2056	945	213	22	Pass
0.2154	914	194	21	Pass
0.2253	877	179	20	Pass
0.2352	855	158	18	Pass
0.2450	831	138	16	Pass
0.2549	809	132	16	Pass
0.2647	790	119	15	Pass
0.2746	769	114	14	Pass
0.2845	750	102	13	Pass
0.2943	732	96	13	Pass
0.3042	715	91	12	Pass
0.3140	695	85	12	Pass
0.3239	677	78	11	Pass
0.3338	657	78	11	Pass
0.3436	641	73	11	Pass
0.3535	621	68	10	Pass
0.3634	604	61	10	Pass
0.3732	591	54	9	Pass
0.3831	580	53	9	Pass
0.3929	569	49	8	Pass
0.4028	559	48	8	Pass
0.4127	548	43	7	Pass
0.4225	533	39	7	Pass
0.4324	525	37	7	Pass
0.4423	513	35	6	Pass
0.4521	508	34	6	Pass
0.4620	500	33	6	Pass
0.4718	489	29	5	Pass
0.4817	475	29	6	Pass
0.4916	462	26	5	Pass
0.5014	450	20	4	Pass
0.5113	446	19	4	Pass
0.5212	436	19	4	Pass
0.5310	431	15	3	Pass
0.5409	427	14	3	Pass
0.5507	420	14	3	Pass
0.5606	415	14	3	Pass
0.5705	409	12	2	Pass

0.5803	403	12	2	Pass
0.5902	395	11	2	Pass
0.6001	390	10	2	Pass
0.6099	385	10	2	Pass
0.6198	377	10	2	Pass
0.6296	371	9	2	Pass
0.6395	364	8	2	Pass
0.6494	361	8	2	Pass
0.6592	353	8	2	Pass
0.6691	346	8	2	Pass
0.6790	342	7	2	Pass
0.6888	339	6	1	Pass
0.6987	334	6	1	Pass
0.7085	327	6	1	Pass
0.7184	325	6	1	Pass
0.7283	316	6	1	Pass
0.7381	310	6	1	Pass
0.7480	301	5	1	Pass
0.7579	295	5	1	Pass
0.7677	290	5	1	Pass
0.7776	286	5	1	Pass
0.7874	281	4	1	Pass
0.7973	271	4	1	Pass
0.8072	269	4	1	Pass
0.8170	264	4	1	Pass
0.8269	259	3	1	Pass
0.8368	249	2	0	Pass
0.8466	247	2	0	Pass
0.8565	245	2	0	Pass
0.8663	242	2	0	Pass
0.8762	238	1	0	Pass
0.8861	236	1	0	Pass
0.8959	233	1	0	Pass
0.9058	229	0	0	Pass
0.9156	225	0	0	Pass
0.9255	222	0	0	Pass
0.9354	222	0	0	Pass
0.9452	219	0	0	Pass
0.9551	211	0	0	Pass
0.9650	209	0	0	Pass
0.9748	204	0	0	Pass
0.9847	203	0	0	Pass
0.9945	202	0	0	Pass
1.0044	198	0	0	Pass
1.0143	194	0	0	Pass
1.0241	191	0	0	Pass
1.0340	185	0	0	Pass

Water Quality

Rational Method

Company Name
Designed by
Company Project Number/Name
Drainage Area Number/Name
Date
County/City Case No.

	Township
	Range
	Section
.59	85th Percentile
acre	Cover Type
	Roofs
	Concrete or Asphalt
	Grouted or Gapless Paving Blocks
	Compacted Soil (e.g. unpaved parking)
	Decomposed Granite
	Permeable Paving Blocks w/ Sand Filled Gap
	Class 2 Base
	Gravel or Class 2 Permeable Base
	Pervious Concrete / Porous Asphalt
	Open and Porous Pavers
	Turf block
	Ornamental Landscaping
	Natural (A Soil)
	Natural (B Soil)
	Natural (C Soil)
	Natural (D Soil)
19.5	Mixed Surface Types Fraction = 0.37

Calculated Values

C	= 0.26
Vu	= 0.15 (in * ac)/ac
Vbmp	= 10,618 ft3
Qbmp	= 1.0 ft3/s

Model Default Modifications

Total of 0 changes have been made.

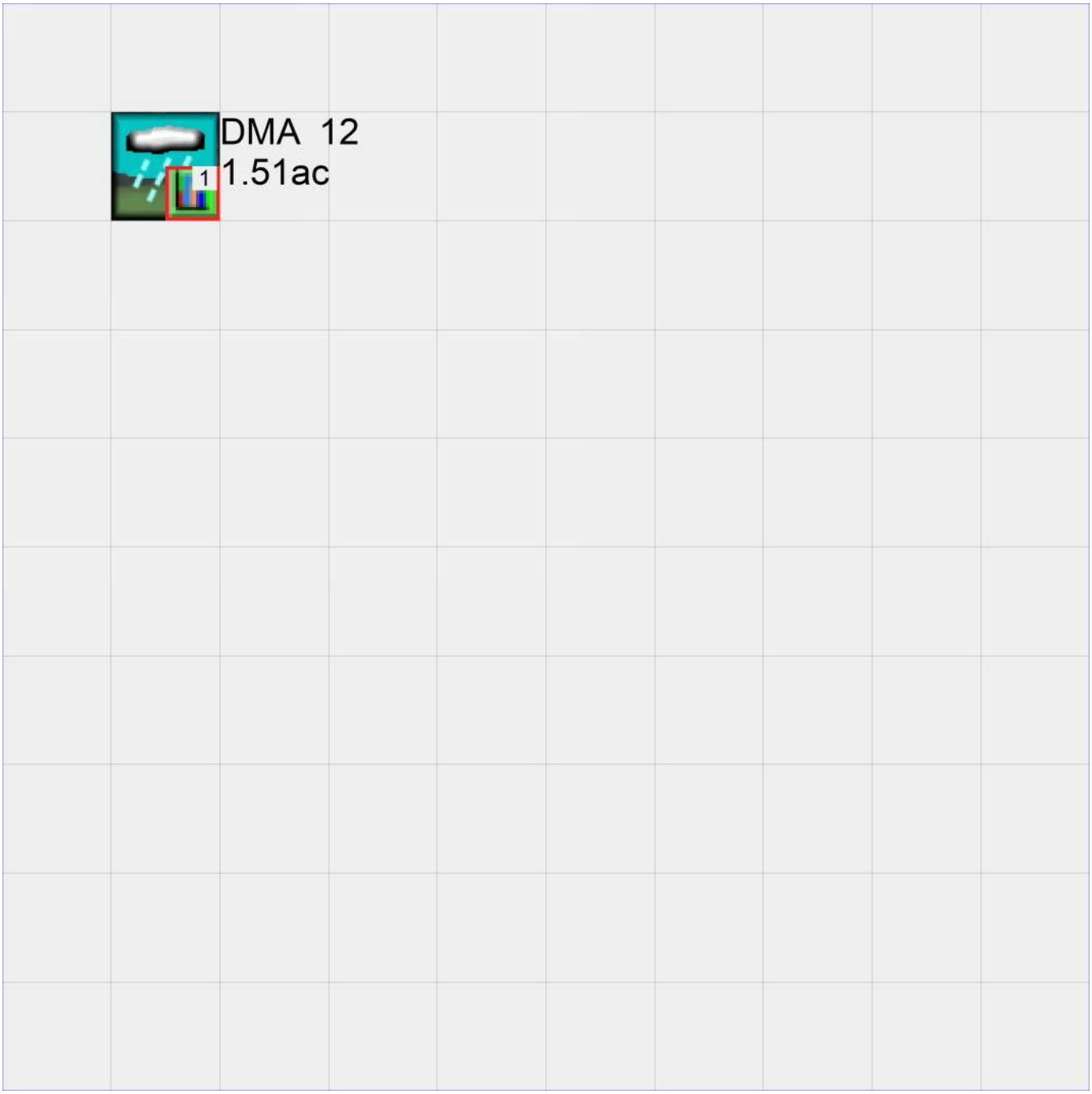
PERLND Changes

No PERLND changes have been made.

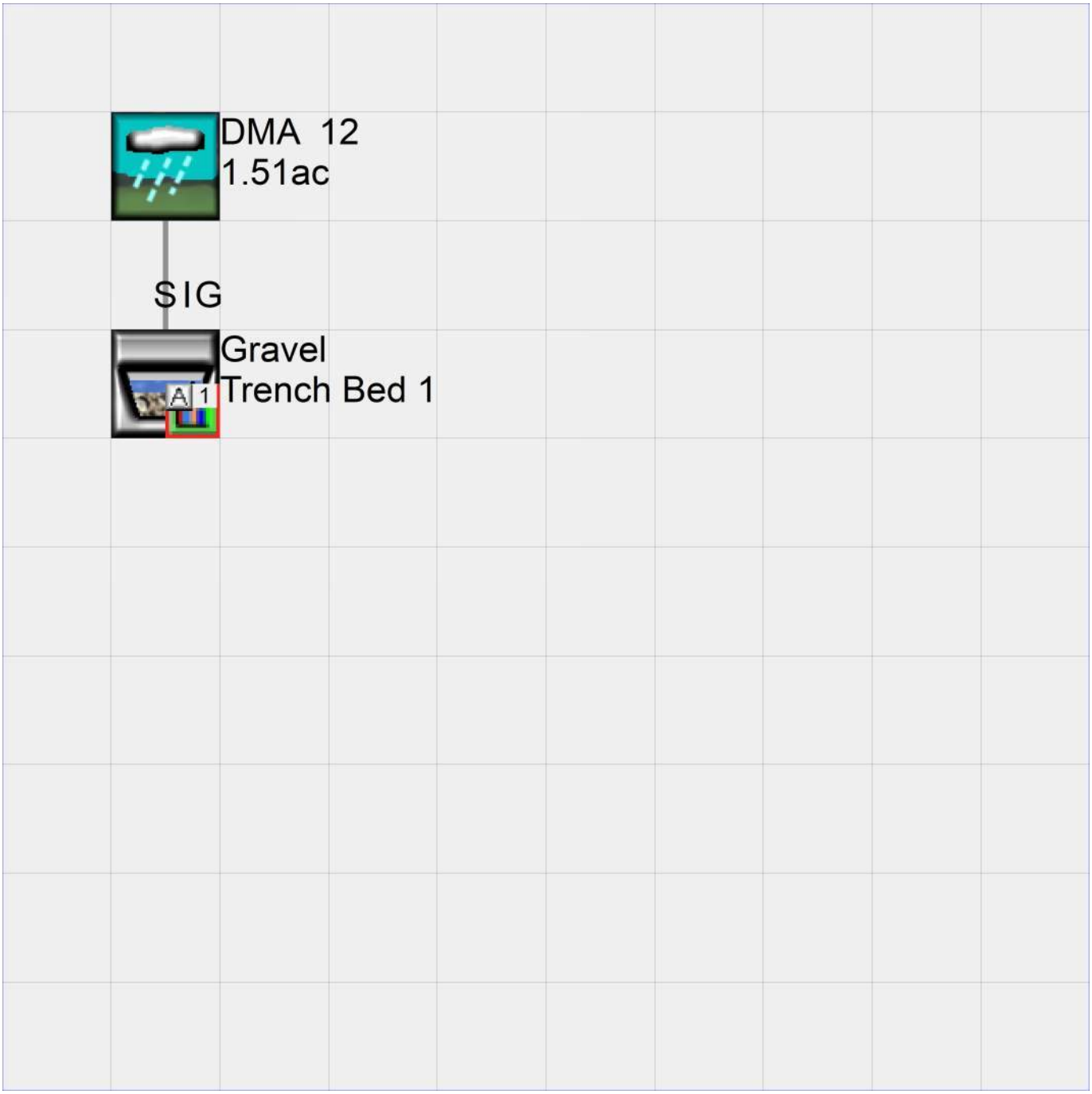
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   DMA12 trench.wdm
MESSU       25   PreDMA12 trench.MES
            27   PreDMA12 trench.L61
            28   PreDMA12 trench.L62
            30   POCDMA12 trench1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      40
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        DMA  12                    MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
   40     C/D,Shrub,Very(>20%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   40         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   40         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   40         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   40             0         4     0.025       200      0.25         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   40            40        35         3         2      0.15      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   40             0       0.4       0.3       0.4      0.35         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   40       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   40      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   40             0         0      0.01         0       0.5       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA  12***
PERLND  40                        1.51     COPY   501     12
PERLND  40                        1.51     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                         in  out                             ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES
```

```
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   DMA12 trench.wdm
MESSU       25   MitDMA12 trench.MES
            27   MitDMA12 trench.L61
            28   MitDMA12 trench.L62
            30   POCDMA12 trench1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      45
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Gravel Trench Bed 1         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                      in  out           ***
   45     C/D,Urban,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   45         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   45         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   45             0       4.6      0.04       400      0.05         3     0.995
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   45            40        35         3         2      0.45      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   45             0       0.7      0.25         1       0.4         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   45      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   45             0         0      0.01         0       3.5       1.7       0.1
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1     Roads,Flat(0-5%)        1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
```

```
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >       IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >       IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA  12***
PERLND  45                        0.71     RCHRES   1      2
PERLND  45                        0.71     RCHRES   1      3
PERLND  45                        0.71     RCHRES   1      4
IMPLND   1                         0.8     RCHRES   1      5

******Routing******
PERLND  45                        0.71     COPY     1     12
IMPLND   1                         0.8     COPY     1     15
PERLND  45                        0.71     COPY     1     13
PERLND  45                        0.71     COPY     1     14
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Gravel Trench Be-008    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1             0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.022957  0.000000  0.000000
  0.044444  0.023365  0.000340  0.005721
  0.088889  0.023774  0.000685  0.008091
  0.133333  0.024182  0.001037  0.009909
  0.177778  0.024590  0.001395  0.011442
  0.222222  0.024999  0.001758  0.012792
  0.266667  0.025407  0.002128  0.014013
  0.311111  0.025815  0.002504  0.015136
  0.355556  0.026224  0.002885  0.016181
  0.400000  0.026632  0.003273  0.017163
  0.444444  0.027040  0.003666  0.018091
  0.488889  0.027449  0.004066  0.018974
  0.533333  0.027857  0.004472  0.019818
  0.577778  0.028266  0.004883  0.020627
  0.622222  0.028674  0.005301  0.021406
  0.666667  0.029083  0.005724  0.022157
  0.711111  0.029491  0.006154  0.022884
  0.755556  0.029899  0.006589  0.023588
  0.800000  0.030308  0.007031  0.024272
  0.844444  0.030716  0.007478  0.024937
  0.888889  0.031125  0.007932  0.025585
  0.933333  0.031533  0.008391  0.026217
  0.977778  0.031942  0.008857  0.026834
  1.022222  0.032350  0.009328  0.027437
  1.066667  0.032759  0.009806  0.028027
  1.111111  0.033167  0.010289  0.028605
  1.155556  0.033576  0.010779  0.029171
  1.200000  0.033984  0.011274  0.029727
  1.244444  0.034393  0.011776  0.030272
  1.288889  0.034801  0.012283  0.030808
  1.333333  0.035210  0.012796  0.031335
  1.377778  0.035618  0.013316  0.031853
  1.422222  0.036027  0.013841  0.032363
  1.466667  0.036436  0.014373  0.032864
  1.511111  0.036844  0.014910  0.033359
  1.555556  0.037253  0.015453  0.033846
  1.600000  0.037661  0.016003  0.034326
  1.644444  0.038070  0.016558  0.034799
  1.688889  0.038478  0.017119  0.035266
  1.733333  0.038887  0.017687  0.035727
```

```
  1.777778  0.039296  0.018260  0.036182
  1.822222  0.039704  0.018840  0.036632
  1.866667  0.040113  0.019425  0.037076
  1.911111  0.040522  0.020016  0.037515
  1.955556  0.040930  0.020613  0.037948
  2.000000  0.041339  0.021217  0.038377
  2.044444  0.041747  0.021826  0.038801
  2.088889  0.042156  0.022441  0.039221
  2.133333  0.042565  0.023063  0.039636
  2.177778  0.042974  0.023690  0.040047
  2.222222  0.043382  0.024323  0.040453
  2.266667  0.043791  0.024962  0.040856
  2.311111  0.044200  0.025608  0.041254
  2.355556  0.044608  0.026259  0.041649
  2.400000  0.045017  0.026916  0.042040
  2.444444  0.045426  0.027579  0.042428
  2.488889  0.045834  0.028249  0.042812
  2.533333  0.046243  0.028924  0.043192
  2.577778  0.046652  0.029605  0.043569
  2.622222  0.047061  0.030292  0.043943
  2.666667  0.047469  0.030986  0.044314
  2.711111  0.047878  0.031685  0.044682
  2.755556  0.048287  0.032390  0.045047
  2.800000  0.048696  0.033101  0.045409
  2.844444  0.049105  0.033818  0.045768
  2.888889  0.049513  0.034542  0.046124
  2.933333  0.049922  0.035271  0.046477
  2.977778  0.050331  0.036006  0.046828
  3.022222  0.050740  0.038252  0.056369
  3.066667  0.051149  0.040516  0.095288
  3.111111  0.051557  0.042799  0.150643
  3.155556  0.051966  0.045099  0.218457
  3.200000  0.052375  0.047418  0.296747
  3.244444  0.052784  0.049755  0.384257
  3.288889  0.053193  0.052110  0.480096
  3.333333  0.053602  0.054483  0.583594
  3.377778  0.054011  0.056874  0.694218
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  3.466667  0.054828  0.061712  0.935179
  3.511111  0.055237  0.064158  1.064844
  3.555556  0.055646  0.066622  1.200260
  3.600000  0.056055  0.069104  1.341192
  3.644444  0.056464  0.071604  1.487431
  3.688889  0.056873  0.074123  1.638791
  3.733333  0.057282  0.076660  1.795103
  3.777778  0.057691  0.079215  1.956216
  3.822222  0.058100  0.081788  2.121989
  3.866667  0.058509  0.084379  2.292295
  3.911111  0.058918  0.086988  2.467015
  3.955556  0.059327  0.089616  2.646042
  4.000000  0.059736  0.092262  2.829274
  4.044444  0.060145  0.094926  2.912306
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1         SUM  PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1         SUM  IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  45     EXTNL  SURLI
WDM      2 PREC     ENGL    1         SUM  RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    1              RCHRES   1     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
```

```
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1008 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1009 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        4
PERLND     PWATER AGWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    4

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       14
PERLND     PWATER AGWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   14

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

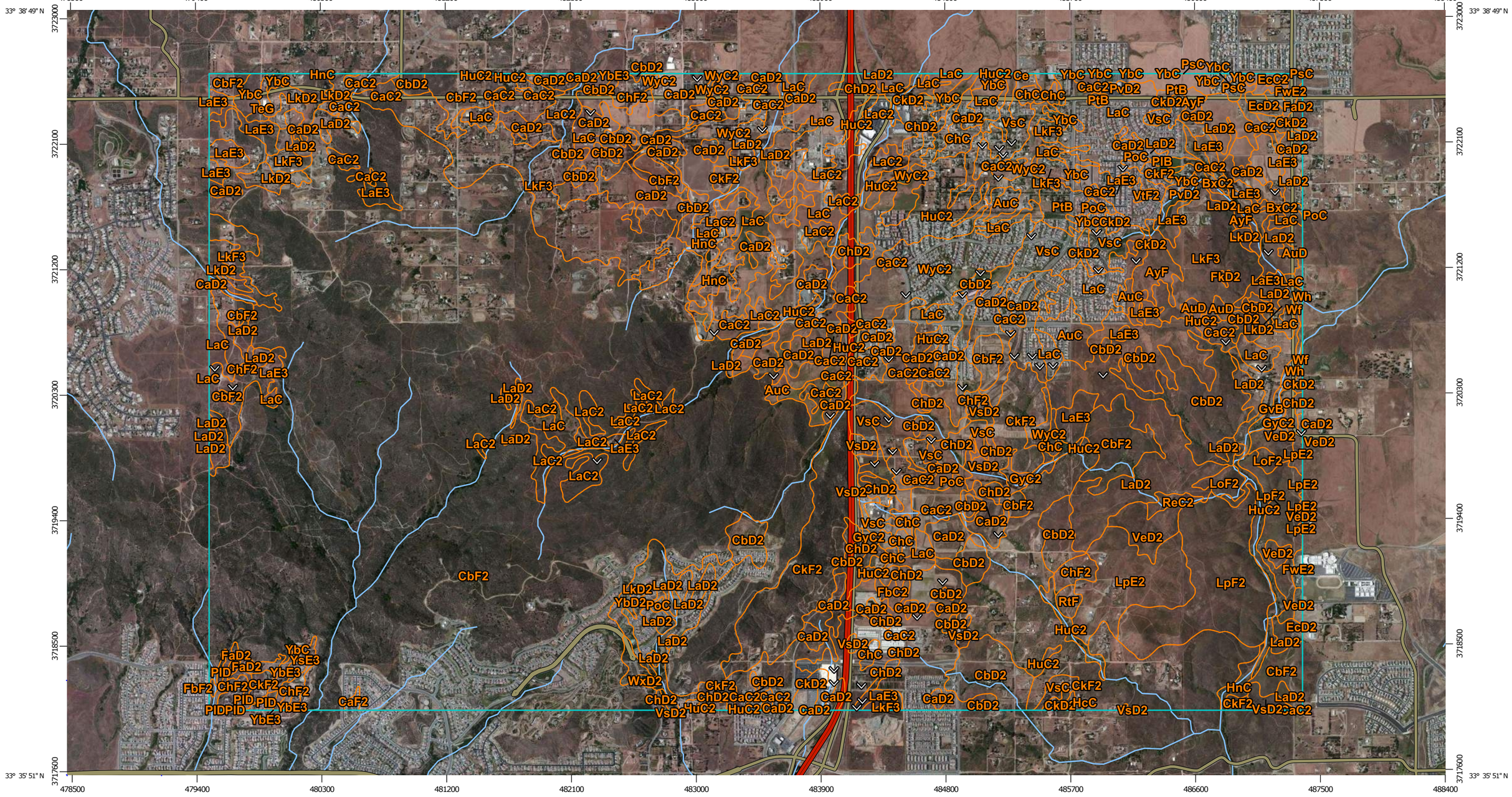
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Soil Map—Western Riverside Area, California



Map Scale: 1:26,800 if printed on B landscape (17" x 11") sheet.

N

0 350 700 1400 2100 Meters

0 1000 2000 4000 6000 Feet

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 7, Sep 17, 2014

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

Date(s) aerial images were photographed: May 3, 2010—Jun 19, 2010

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

Map Unit Legend

Western Riverside Area, California (CA679)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AuC	Auld clay, 2 to 8 percent slopes	43.8	0.5%
AuD	Auld clay, 8 to 15 percent slopes	12.2	0.1%
AyF	Auld cobbly clay, 8 to 50 percent slopes	28.6	0.3%
BxC2	Buren loam, deep, 2 to 8 percent slopes, eroded	5.0	0.1%
CaC2	Cajalco fine sandy loam, 2 to 8 percent slopes, eroded	557.6	6.3%
CaD2	Cajalco fine sandy loam, 8 to 15 percent slopes, eroded	458.4	5.1%
CaF2	Cajalco fine sandy loam, 15 to 35 percent slopes, erode d	2.8	0.0%
CbD2	Cajalco rocky fine sandy loam, 5 to 15 percent slopes, eroded	330.7	3.7%
CbF2	Cajalco rocky fine sandy loam, 15 to 50 percent slopes, eroded	3,378.3	37.9%
Ce	Chino silt loam, drained	16.5	0.2%
ChC	Cieneba sandy loam, 5 to 8 percent slopes	37.1	0.4%
ChD2	Cieneba sandy loam, 8 to 15 percent slopes, eroded	103.1	1.2%
ChF2	Cieneba sandy loam, 15 to 50 percent slopes, eroded	48.0	0.5%
CkD2	Cieneba rocky sandy loam, 8 to 15 percent slopes, eroded	35.8	0.4%
CkF2	Cieneba rocky sandy loam, 15 to 50 percent slopes, erod ed	548.9	6.2%
EcC2	Escondido fine sandy loam, 2 to 8 percent slopes, erode d	3.1	0.0%
EcD2	Escondido fine sandy loam, 8 to 15 percent slopes, erod ed	7.7	0.1%
FaD2	Fallbrook sandy loam, 8 to 15 percent slopes, eroded	17.9	0.2%
FbC2	Fallbrook sandy loam, shallow, 5 to 8 percent slopes, e roded	8.0	0.1%
FbF2	Fallbrook sandy loam, shallow, 15 to 35 percent slopes, eroded	1.1	0.0%
FkD2	Fallbrook fine sandy loam, shallow, 8 to 15 percent slo pes, eroded	1.8	0.0%

Western Riverside Area, California (CA679)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
FwE2	Friant fine sandy loam, 5 to 25 percent slopes, eroded	10.7	0.1%
GvB	Grangeville fine sandy loam, saline-alkali, 0 to 5 perc ent slopes	6.9	0.1%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	25.1	0.3%
HcC	Hanford coarse sandy loam, 2 to 8 percent slopes	15.7	0.2%
HnC	Honcut sandy loam, 2 to 8 percent slopes	29.4	0.3%
HuC2	Honcut loam, 2 to 8 percent slopes, eroded	254.6	2.9%
LaC	Las Posas loam, 2 to 8 percent slopes	539.7	6.0%
LaC2	Las Posas loam, 5 to 8 percent slopes, eroded	174.9	2.0%
LaD2	Las Posas loam, 8 to 15 percent slopes, eroded	410.7	4.6%
LaE3	Las Posas loam, 8 to 25 percent slopes, severely eroded	213.1	2.4%
LkD2	Las Posas rocky loam, 8 to 15 percent slopes, eroded	50.5	0.6%
LkF3	Las Posas rocky loam, 15 to 50 percent slopes, severely eroded	436.0	4.9%
LoF2	Lodo gravelly loam, 15 to 50 percent slopes, eroded	18.3	0.2%
LpE2	Lodo rocky loam, 8 to 25 percent slopes, eroded	111.4	1.2%
LpF2	Lodo rocky loam, 25 to 50 percent slopes, eroded	224.6	2.5%
PlB	Placentia fine sandy loam, 0 to 5 percent slopes	3.7	0.0%
PlD	Placentia fine sandy loam, 5 to 15 percent slopes	3.9	0.0%
PoC	Porterville clay, 0 to 8 percent slopes	9.7	0.1%
PsC	Porterville clay, moderately deep, 2 to 8 percent slope s	0.0	0.0%
PtB	Porterville clay, moderately deep, slightly saline-alka li, 0 to 5 percent slopes	47.8	0.5%
PvD2	Porterville gravelly clay, moderately deep, 2 to 15 per cent slopes, eroded	19.0	0.2%
ReC2	Ramona very fine sandy loam, 0 to 8 percent slopes, ero ded	8.3	0.1%

Western Riverside Area, California (CA679)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
RtF	Rockland	7.7	0.1%
TeG	Terrace escarpments	6.3	0.1%
VeC2	Vallecitos loam, thick solum variant, 2 to 8 percent slopes, eroded	4.1	0.0%
VeD2	Vallecitos loam, thick solum variant, 8 to 15 percent slopes, eroded	62.6	0.7%
VsC	Vista coarse sandy loam, 2 to 8 percent slopes	142.2	1.6%
VsD2	Vista coarse sandy loam, 8 to 15 percent slopes, eroded	58.0	0.7%
VsF2	Vista coarse sandy loam, 15 to 35 percent slopes, erode d	1.8	0.0%
VtF2	Vista rocky coarse sandy loam, 2 to 35 percent slopes, eroded	2.9	0.0%
Wf	Willows silty clay	4.6	0.1%
Wh	Willows silty clay, strongly saline-alkali	8.5	0.1%
WxD2	Wyman fine sandy loam, 8 to 15 percent slopes, eroded	2.8	0.0%
WyC2	Wyman loam, 2 to 8 percent slopes, eroded	281.7	3.2%
YbC	Yokohl loam, 2 to 8 percent slopes	54.2	0.6%
YbD2	Yokohl loam, 8 to 15 percent slopes, eroded	11.7	0.1%
YbE3	Yokohl loam, 8 to 25 percent slopes, severely eroded	6.2	0.1%
YsE3	Ysidora gravelly very fine sandy loam, 8 to 25 percent slopes, severely eroded	6.6	0.1%
Totals for Area of Interest		**8,922.1**	**100.0%**

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Include a copy of the completed Pollutant Sources/Source Control Checklist used to document Source Control BMPs in Section H of this Template.

REQUIRED SOURCE CONTROL BMPS		
Pollutant Source	**Structural Source Control BMP**	**Operational Source Control BMP**
On-site storm drain inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar where feasible. Catch basin markers may be available from the RCFCWCD. Call 951-955-1200 to verify.	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Need for future indoor & structural pest control	Building design shall exclude openings that allow pest and rodent entry. Buildings/homes will be slab on grade, which will avoid pests in crawl space.	Integrated Pest Management information shall be provided to owners, lessees, and operators.
Landscape / Outdoor Pesticide Use	Existing native trees, shrubs, and ground cover shall be preserved beyond the project footprint. Landscaping shall be selected to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. When landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Use pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological	Maintain landscaping using minimum or no pesticides. See applicable operational BMPs in "What you should know . . . for Landscape and Gardening" on rcwatershed.org. Provide Integrated Pest Management information to new owners, lessees and operators.

	consistency, and plant interactions.	
Refuse areas	Refuse containers (dumpsters) will be stored in gated and fenced enclosures. Dumpsters shall have covers to prevent rain intrusion. Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	An adequate number of receptacles (dumpsters and individual trash containers) will be provided for the facilities. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered or under a covered area. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in Appendix 10 or the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer or per architectural guidelines.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in Appendix 10 or the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Condensate drain lines	Condensate drain lines will be designed on the architectural plans and may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.	Condensate lines shall be maintained in accordance with manufacturers and local regulations.
Roofing, gutters, and trim	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	Roofing, gutters, and trim shall be kept clear of debris to ensure proper functioning.

	Roof drain runoff will ultimately discharge to w water quality basin for treatment.	
Plazas, sidewalks, and parking lots.		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Wash water containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.
Swimming pools, spas, fountains, and other water features.		The CC&R's shall include prohibitions on swimming pool discharge into the storm drain system.

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Include the completed Operation and Maintenance Plan in this Appendix along with additional documentation of Finance and Maintenance Recording Mechanisms for the site. Refer to Sections 3.10 and 5 of the SMR WQMP and Section J of this Template.

SUMMARY

All of the proposed improvements (see the WQMP Site Plan in Appendix 1) constructed for the Tentative Tract Map No. 35853 project will be privately built, owned, and operated. Consequently, the funding, installation, operations, and maintenance of the proposed best management practices will be the responsibility of the developer, HOA, or future operator.

A detailed BMP operations and maintenance plan will be prepared for the project during final engineering.

The primary LID BMP will be bioretention basins. Maintenance involves observations to ensure adequate drain time. The drain time shall be set to prevent vector issues. Trash, debris, and accumulated sediment should be removed on a routine basis and at least every week. Erosion in the basin shall be repaired and stabilized. Vegetation shall be maintained to ensure adequate growth.

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Examples of material to provide in Appendix 10 may include but are not limited to the following:

- BMP Fact Sheets for proposed BMPs form Exhibit C: LID BMP Design Handbook of the SMR WQMP,
- Source control information and training material for site owners and operators,
- O&M training material,
- Other educational/training material related to site drainage and BMPs.

After the Storm

For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

EPA United States Environmental Protection Agency
EPA 833-B-03-002
January 2003

A Citizen's Guide to Understanding Stormwater

What is stormwater runoff?



Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?



Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution



Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.



- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.



Stormwater Pollution Solutions



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential





Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Auto care



Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Lawn care



Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Septic systems



Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Pet waste



Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.



Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.



Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

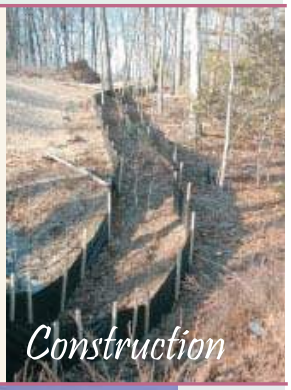
Commercial



Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Construction



Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.

Agriculture

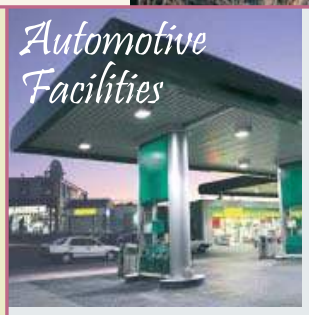


Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.



- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

Automotive Facilities



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

Forestry



Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.

Helpful Hints To Keep Our Water Clean

There are a number of things you can do to prevent stormwater pollution. Whether you're in your home, in your yard, in the garage or in your community. . . be aware of how your actions affect the environment. Pollution prevention is much easier, and less costly, than cleaning up "after the fact," so we're counting on YOU to do your share to help protect our environment.

www.floodcontrol.co.riverside.ca.us/stormwater/
1-800-506-2555 (report stormwater pollution)
Anti-freeze, batteries, oil, and paint drop-off location at County Road Yard, 25315 Jefferson Av., Murrieta, CA 92562



- Home
- Yard
- Garage
- Community

In Your Home

Hazardous Waste: It's as close as your kitchen cupboard.

Did you know that many products used around our homes can be hazardous to our health and our environment? While products such as household cleaners, bleach, oven cleaners, spot solvents and toilet bowl cleaners serve useful purposes, you must remember to handle them as household hazardous waste (HHW) when you throw them away. Never throw HHW in the trash, on the ground or into a storm drain.

Take unwanted products to an HHW collection event. Check the HHW Collection Event Schedule for an event in your area. Bringing these items to a collection event is the proper thing to do and it's FREE!

Try environmentally friendly alternatives to household hazardous waste. Order the Easy Recipes for A Healthy House brochure to learn how to make your own environmentally friendly cleaning products.

Painting Activities: Use the proper cleanup methods.

Even though latex paint is a water based paint, you must clean paint brushes and containers in the sink. Never clean brushes or rinse paint containers into the street, gutter or storm drain. If you use oil-based paints and stains, filter, settle, and reuse the thinners and solvent.

Dispose of unusable paints, thinners, thinner residue, and paint strippers at a Household Hazardous Waste Collection Event. Empty, dry paint cans may go in household garbage, or they may be recyclable in your area - check with your local waste hauler.

Housecleaning: Use the proper disposal methods for washwater.

When washing your windows or mopping the floors, send dirty cleaning water down a sink or toilet. Don't throw washwater into the street, gutter, or storm drain. Also, if you clean your carpets, dispose of dirty washwater down a sink or toilet. If you have your carpets professionally cleaned, make sure the cleaning service either disposes of washwater in the sink or toilet or takes the dirty washwater back to his/her facility for proper discharge into a sewer system.

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In Your Yard

What's the Scoop on Pet Waste?

Never hose pet waste into to the street or gutter. Pick-up waste and dispose of it in trash can. And, remember to take something to pick-up after your dog when you take it for a walk. You'll be helping the environment and keeping peace with your neighbors.

Overdose the Environment!

Achieving a healthy garden doesn't require the use of toxic pesticide and herbicides.

Try non-toxic alternatives for the garden. Try planting plants that deter bad pests and plant other plants that help attract beneficial insects. Chemicals should always be your last choice in the garden. Review the Home Garden Care Guide for various non-toxic alternatives in the garden, or come to a Home Garden Workshop for a live demonstration of how to achieve a healthy chemical-free garden.

Composting - a natural way of recycling organic material

Composting can provide a healthy soil amendment for your yard or garden. Compost provides natural essential nutrients for healthier plants, increases moisture retention and is less expensive then commercial fertilizers and mulches. Learn how to compost from the expert *Master Composters*. Master Composters show residents just how easy it is to compost. Join the Master Composters at a FREE Composting Workshop. Check the workshop schedule for a workshop in your community.

Properly drain your pool to help protect local waterways

If you need to drain your pool, contact your local sewering agency for drainage requirements. If you have a septic tank system or if your sewering agency has no special requirements for draining the pool, let the pool water dechlorinate (this may take up to two weeks) and then discharge the water into landscaped areas. Avoid allowing any water to flow into the street, gutter or storm drain. You may have to drain the pool over a number of days to allow dirt and landscaped areas to absorb the water.

Septic Systems: Properly maintain them to keep our environment clean.

Septic systems should never be piped into a road ditch, stream, concrete flood channel or storm drains. Avoid washing or flushing grease, alcohol, or strong chemicals into your septic system as these substances kill the bacteria needed to break down wastes.

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In the Garage

Do you know where the nearest Certified Collection Center is?

It's probably not too far from you. Many auto service/supply stores accept used motor oil and oil filters. Certified collection centers will even give you some spare change for every gallon your bring in. Remember to bring your used motor oil in a clean container. Do not mix with antifreeze or water. Call 1-800-CLEANUP to find the nearest collection center in your area or visit www.1800CLEANUP.org.

Come to the ABOPs!

ABOPs are recycling centers for **A**ntifreeze, **B**atteries (car and household), motor **O**il and oil filters, and latex/water-based **P**aints. Bringing these items to the ABOP is the proper ways to dispose of these items and it's FREE! ABOPs are open each Saturday from 9 a.m. to 2 p.m. and are closed on holiday weekends. Check for an ABOP in your area.

Use Proper Car Wash Methods

Did you know that water runoff from carwashing activities contains various pollutants? Most detergents contain phosphates that harm aquatic life and dirty soap water usually contains oil, grease and dirt that gets washed off the car and tires. All of these pollutants can harm our environment if the washwater is allowed to flow into the street and gutter. Here's what you can do: wash cars on the lawn or in an area that will absorb the water runoff. Use biodegradable and phosphate-free detergents. If you must use wheel cleaners, use them sparingly and avoid any runoff. Or, give yourself a break and take the car to a carwash facility. Carwash facilities are constructed to capture water runoff to help protect our environment.

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In Your Community

Illegal Dumping Harms Our Environment!

Report illegal dumping by calling 1.800.506.2555.

Stencil A Drain Campaign

Help remind neighbors and communities to never pour anything down a storm drain. Call 951.683.7691 to volunteer to stencil storm drains with the message - NO DUMPING, ONLY RAIN IN THE DRAIN. Students and boy/girl scouts seeking community hours can participate in this effort.

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Pesticide Safety Tips

Resources

- Questions On Pesticides? National Pesticide Information Center (NPIC) 1-800-858-7378 EXIT Disclaimer

Although pesticides can be useful, they also can be dangerous if used carelessly or not are stored properly. Here are some tips for safer pest control:

- The most effective way to reduce risks posed by pesticides is to use non-chemical control methods to reduce or eliminate pest problems. Around the home, such measures include removing sources of food and water (such as leaky pipes) and destroying pest shelters and breeding sites (such as litter and plant debris).
- If you decide you must use pesticides, always read the label first and follow the directions to the letter, including all precautions and restrictions.
- Don't use products for pests that are not indicated on the label and don't use more pesticide than directed by the label. Don't think that twice the amount will do twice the job.
- Use protective measures when handling pesticides as directed by the label, such as wearing impermeable gloves, long pants, and long-sleeve shirts. Change clothes and wash your hands immediately after applying pesticides.
- Before applying a pesticide (indoors or outdoors), remove children, their toys, and pets from the area and keep them away until the pesticide has dried or as recommended by the label.
- Don't spray outdoors on windy or rainy days. Take precautions to keep the pesticide from drifting or running off into the vegetable garden, pool, or neighbor's yard.
- Remove or cover food during indoor applications.
- If using a commercial applicator or lawn care service, ask for information about potential risks and safety precautions to take.
- Don't buy more pesticides than you will need. If you have leftover pesticides, check with your local government to determine whether your community has a household hazardous waste collection program or other program for disposing of pesticides. If no community program exists, follow label directions and any state or local regulations regarding disposal.
- Keep the telephone number of your area Poison Control Center near your telephone: 1-800-222-1222.

Here are some tips to follow if you have children or if children visit your house or yard:

- Always store pesticides away from children's reach, in a locked cabinet or garden shed. Child-proof safety latches also may be installed on cabinets and can be purchased at local hardware stores and other retail outlets.
- Never transfer pesticides to other containers that children may associate with food or drink.
- Never place rodent or insect baits where small children can get to them.
- Teach children that "pesticides are poisons" - something they should not touch.
- Alert others to the potential hazard of pesticides, especially care givers and grandparents.

IN CASE OF AN EMERGENCY, try to determine what the person was exposed to and what part of the body was affected **before** you take action, since taking the right action is as important as taking immediate action. If the person is unconscious having trouble breathing, or having convulsions, give needed first aid immediately. Call 911.or your local emergency service. If the

person does not have these symptoms, contact your local Poison Control Center at 1-800-222-1222. Have the product container with you when you call for assistance - remember to act fast!

General First -Aid Guidelines:

- **Swallowed poison.** Induce vomiting. **ONLY if the emergency personnel on the phone tell you to do so.** This will depend on what the child has swallowed; some petroleum products or caustic poisons will cause more damage if the victim is made to vomit.

- **Poison in eye.** Eye damage can occur, within minutes with some types of pesticide. If poison splashes into an eye, hold the eyelid open and wash quickly and gently with clean, running water from the tap or a gentle stream from a hose for at least 15 minutes. Do not use eye drops or place chemicals or drugs in the wash water.

- **Poison on skin.** If pesticide splashes on the skin, drench area with water and remove contaminated clothing. Wash skin and hair thoroughly with soap and water. Later, discard contaminated clothing or thoroughly wash it separately from other laundry.

- **Inhaled poison.** Carry or drag victim to fresh air immediately. If you are able to get to the victim because of fumes, immediately contact the Fire Department. Loosen victim's tight clothing. If the victim is blue or has stopped breathing, give artificial respiration (if you know how) and call rescue service for help. Open doors and windows so no one else will be poisoned by fumes.



Landscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call
1-800-506-2555
"Only Rain Down the Storm Drain"

Important Links:

Riverside County Household Hazardous Waste Collection Information
1-800-304-2226 or www.rivcowm.org

Riverside County Backyard Composting Program
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions
www.ipm.ucdavis.edu

California Master Gardener Programs
www.mastergardeners.org
www.camastergardeners.ucdavis.edu

California Native Plant Society
www.cnps.org

The Riverside County "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges Orange County's Storm Water Program for their contribution to this brochure.

...Only Rain Down ...the Storm Drain

What you should know for... Landscape and Gardening

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators



Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.



- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.
- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:
  - **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
  - **Biological Controls** - Use predatory insects to control harmful pests.
  - **Chemical Controls** - Check out www.ipm.ucdavis.edu before using chemicals. Remember, all chemicals should be used cautiously and in moderation.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

www.bewaterwise.com Great water conservation tips and drought tolerant garden designs.

www.ourwaterourworld.com Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure.

Saltwater Pools

- Salt water pools, although different from regular pools, are in fact, sanitized using chlorine. A salt-chlorine generator separates the chlorine and sodium molecules in salt and reintroduces them into the pool water. The same harmful effects of chlorine still apply.
- A salt water pool is still maintained with chemicals such as Muriatic acid, soda ash and sodium carbonate to help keep a proper pH, total Alkalinity, Calcium Hardness and Stabilizer levels.



- It may be illegal to discharge salt water to land. The salt may kill plants and the build-up of salt in soil puts animals, plants, and groundwater at risk. Consult your city representatives to determine local requirements regarding salt water drainage.

NEVER put unused chemicals into the trash, onto the ground or down a storm drain.

IMPORTANT: The discharge of pollutants into the street, gutter, storm drain system or waterways - without a permit or waiver - is strictly prohibited by local ordinances, state and federal law. Violations may result in monetary fines and enforcement actions.

Helpful telephone numbers and links

Riverside County Water Agencies:

City of Banning	(951) 922-3130
City of Beaumont/Cherry Valley	(951) 845-9581
City of Blythe	(760) 922-6161
City of Coachella	(760) 398-3502
City of Corona	(951) 736-2263
City of Hemet	(951) 765-3710
City of Norco	(951) 270 5607
City of Riverside Public Works	(951) 351-6140
City of San Jacinto	(951) 654-4041
Coachella Valley Water District	(760) 398-2651
Desert Water Agency (Palm Springs)	(760) 323-4971
Eastern Municipal Water District	(951) 928-3777
Elsinore Valley Municipal Water District	(951) 674 3146
Elsinore Water District	(951) 674-2168
Farm Mutual Water Company	(951) 244-4198
Idyllwild Water District	(951) 659-2143
Indio Water Authority	(760) 391-4129
Jurupa Community Services District	(951) 685-7434
Lee Lake Water	(951) 658-3241
Mission Springs Water	(760) 329-6448
Rancho California Water District	(951) 296-6900
Ripley, CSA #62	(760) 922-4951
Riverside Co. Service Area #51	(760) 227-3203
Rubidoux Community Services District	(951) 684-7580
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(951) 789-5000
Yucaipa Valley Water District	(909) 797-5117

CALL 1-800-506-2555 to:

- Report clogged storm drains or illegal storm drain disposal from residential, industrial, construction and commercial sites into public streets, storm drains and/or water bodies.
- Find out about our various storm drain pollution prevention materials.
- Locate the dates and times of Household Hazardous Waste (HHW) Collection Events.
- Request adult, neighborhood, or classroom presentations.
- Locate other County environmental services.
- Receive grasscycling information and composting workshop information.

Or visit our
Riverside County Flood Control and Water Conservation District
website at: www.rcflood.org

Other links to additional storm drain pollution information:

- County of Riverside Environmental Health: www.rivcoeh.org
- State Water Resources Control Board: www.waterboards.ca.gov
- California Stormwater Quality Association: www.casqa.org
- United States Environmental Protection Agency (EPA): www.epa.gov/compliance/assistance (compliance assistance information)

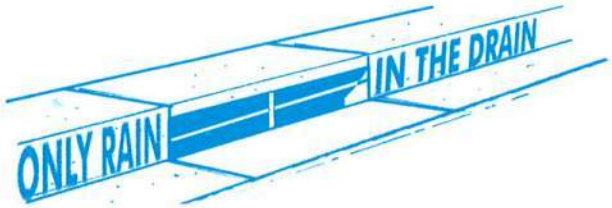
Riverside County's, "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure.

Guidelines for Maintaining your...



Swimming Pool, Jacuzzi and Garden Fountain

Where does the water go?



Pool, Jacuzzi and Fountain wastewater and rain water runoff (also called stormwater) that reach streets can enter the storm drain and be conveyed directly into local streams, rivers and lakes.



A storm drain's purpose is to prevent flooding by carrying rain water away from developed areas. Storm drains are not connected to sanitary sewers systems and treatment plants!

Wastewater, from residential swimming pools, Jacuzzis, fishponds and fountains, often contains chemicals used for sanitizing or cleansing purposes. Toxic chemicals (such as chlorine or copper-based algaecides) may pollute the environment when discharged into a storm drain system.

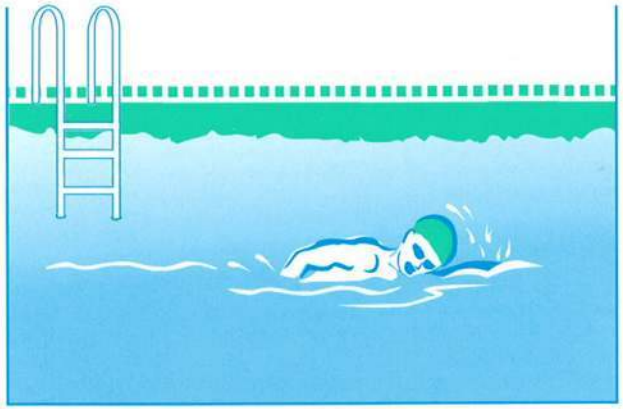
The Cities and County of Riverside have adopted ordinances that prohibit the discharge of wastewater to the street and storm drain system.



Discharge Regulations

Regulatory requirements for discharging wastewater from your pool may differ from city to city. Chlorinated water should not be discharged into the street, storm drain or surface waters. Check with your water agency to see if disposal to the sanitary sewer line is allowed for pool discharges (see reverse for Riverside County sewer agencies).

If allowed, a hose can be run from the pool Jacuzzi, or fountain to the private sewer cleanout, washing machine drain or a sink or bathtub.



If you cannot discharge to the sewer, you may drain your fountain, pool, or jacuzzi to your landscaping by following these guidelines:

First, reduce or eliminate solids (e.g. debris, leaves or dirt) in the pool water and allow the chemicals in the pool water to dissipate before draining the pool (this could take up to 7 days, verify using a home pool test kit).

Second, slowly drain to a landscaped area away from buildings or structures. Control the flow to prevent soil erosion; it may take more than one day to empty. Do not allow sediment to enter the street, gutter or storm drain.

Maintenance & Chemicals



Cleaning Filters

Filter rinse water and backwash must be discharged to the sanitary sewer, on-site septic tank and drain field system (if properly designed and adequately sized), or a seepage pit. Alternatively, rinse water or backwash may be diverted to landscaped or dirt areas. Filter media and other non-hazardous solids should be picked up and disposed of in the trash.

Algaecides

Avoid using copper-based algaecides unless absolutely necessary. Control algae with chlorine, organic polymers or other alternatives to copper-based pool chemicals. Copper is a heavy metal that can be toxic to aquatic life when you drain your pool.

Chemical Storage and Handling

- Use only the amount indicated on product labels
- Store chlorine and other chemicals in a covered area to prevent runoff. Keep out of reach of children and pets.
- Chlorine kits, available at retail swimming pool equipment and supply stores, should be used to monitor the chlorine and pH levels before draining your pool.
- Chlorine and other pool chemicals should never be allowed to flow into the gutter or storm drain system.

Take unwanted chemicals to a Household Hazardous Waste (HHW) Collection Event. There's no cost for taking HHW items to collection events – it's FREE! Call **1-800-506-2555** for a schedule of HHW events in your community.



For Information:

Local Sewering Agencies in Riverside County:

City of Beaumont	(909) 769-8520
Belair Homeowners Association	(909) 277-1414
City of Banning	(909) 922-3130
City of Blythe	(760) 922-6161
City of Coachella	(760) 391-5008
Coachella Valley Water District	(760) 398-2651
City of Corona	(909) 736-2259
Desert Center, CSA #51	(760) 227-3203
Eastern Municipal Water District	(909) 928-3777
Elsinore Valley MWD	(909) 674-3146
Farm Mutual Water Company	(909) 244-4198
Idyllwild Water District	(909) 659-2143
Jurupa Community Services Dist.	(909) 685-7434
Lake Hemet MWD	(909) 658-3241
Lee Lake Water District	(909) 277-1414
March Air Force Base	(909) 656-7000
Mission Springs Water District	(760) 329-6448
City of Palm Springs	(760) 323-8242
Rancho Caballero	(909) 780-9272
Rancho California Water Dist.	(909) 676-4101
Ripley, CSA #62	(760) 922-4909
Rubidoux Community Services Dist.	(909) 684-7580
City of Riverside	(909) 782-5341
Silent Valley Club, Inc	(909) 849-4501
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(909) 780-4170

Spill Response Agency:
Haz-Mat: (909) 358-5055
Hazardous Waste Disposal: (909) 358-5055
To Report Illegal Dumping or a Clogged Storm Drain: 1-800-506-2555

StormWater CleanWater
PROTECTION PROGRAM

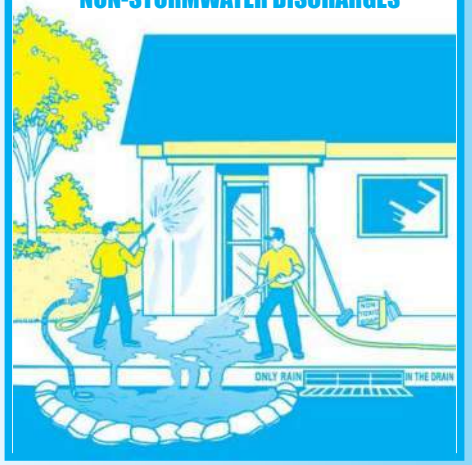
Riverside County gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure.

StormWater Pollution

What you should know for...

OUTDOOR CLEANING ACTIVITIES

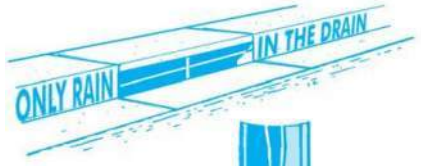
NON-STORMWATER DISCHARGES



GUIDELINES for disposal of washwater from:

- Sidewalk, plaza or parking lot cleaning
- Vehicle washing or detailing
- Building exterior cleaning
- Waterproofing
- Equipment cleaning or degreasing

Do you know . . . where the water should go?



Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to prevent flooding by carrying excess rainwater away from streets. . . it's not designed to be a waste disposal system. Since the storm drain system does not provide for water treatment, it often serves the unintended function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

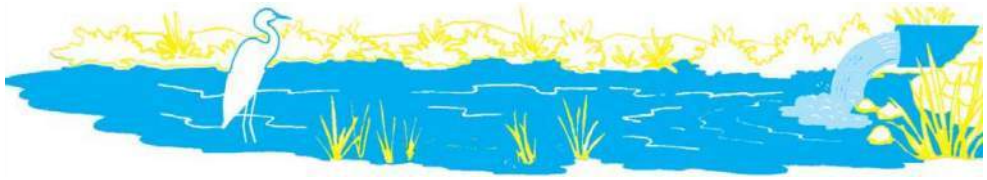
Non-stormwater discharges such as washwater generated from outdoor cleaning projects often transport harmful pollutants into storm drains and our local waterways. Polluted runoff contaminates local waterways and poses a threat to groundwater resources.

Soaps, degreasers, automotive fluids, litter, and a host of other materials washed off buildings, sidewalks, plazas, parking areas, vehicles, and equipment can all pollute our waterways.

The Cities and County of Riverside StormWater/CleanWater Protection Program

Since preventing pollution is much easier, and less costly than cleaning up "after the fact," the Cities and County of Riverside StormWater/CleanWater Protection Program informs residents and businesses of pollution prevention activities such as those described in this pamphlet.

The Cities and County of Riverside have adopted ordinances for stormwater management and discharge control. In accordance with state and federal law, these local stormwater ordinances **prohibit** the discharge of wastes into the storm drain system or local surface waters. This includes non-stormwater discharges containing oil, grease, detergents, degreasers, trash, or other waste materials.



PLEASE NOTE: The discharge of pollutants into the street, gutters, storm drain system, or waterways - without a Regional Water Quality Control Board permit or waiver - is ***strictly prohibited*** by local ordinances and state and federal law.

Help Protect Our Waterways!

Use These Guidelines For Outdoor Cleaning Activities and Washwater Disposal

DO . . . Dispose of **small amounts** of **washwater from cleaning building exteriors, sidewalks, or plazas** onto landscaped or unpaved surfaces provided you have the owner's permission and the discharge will not cause flooding or nuisance problems, or flow into a storm drain.

DO NOT . . . Discharge **large amounts** of these types of washwater onto landscaped areas or soil where water may run to a street or storm drain. Wastewater from exterior cleaning may be pumped to a sewer line with specific permission from the local sewering agency.

DO . . . Check with your local sewering agency's policies and requirements concerning waste water disposal. **Water from many outdoor cleaning activities** may be acceptable for disposal to the sewer system. See the list on the back of this flyer for phone numbers of the sewering agencies in your area.

DO NOT . . . Pour **hazardous wastes** or toxic materials into the storm drain or sewer system . . . properly dispose of it instead. When in doubt, contact the local sewering agency! The agency will tell you what types of liquid wastes can be accepted.

DO . . . Understand that **water (without soap) used to remove dust from clean vehicles** may be discharged to a street or storm drain. **Washwater from sidewalk, plaza, and building surface cleaning** may go into a street or storm drain if ALL of the following conditions are met:

1) The surface being washed is free of residual oil stains, debris and similar pollutants by using dry cleanup methods (sweeping, and cleaning any oil or chemical spills with rags or other absorbent materials before using water).
2) Washing is done with water only - no soap or other cleaning materials.
3) You have not used the water to remove paint from surfaces during cleaning.

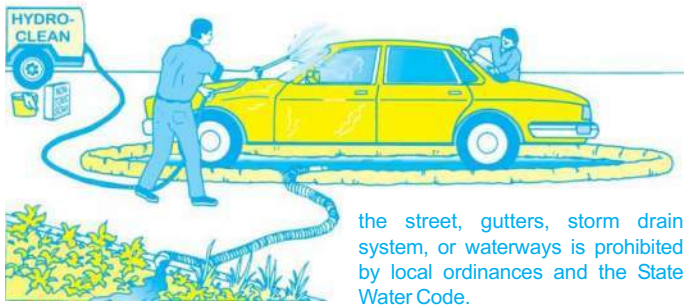
DO NOT . . . Dispose of water containing **soap or any other type of cleaning agent** into a storm drain or water body. This is a direct violation of state and/or local regulations. Because **wastewater from cleaning parking areas or roadways** normally contains metallic brake pad dust, oil and other automotive fluids, it should never be discharged to a street, gutter, or storm drain.

DO . . . Understand that **mobile auto detailers** should divert washwater to landscaped or dirt areas. Note: Be aware that soapy washwater may adversely affect landscaping; consult with the property owner. Residual washwater may remain on paved surfaces to evaporate; sweep up any remaining residue. If there is sufficient water volume to reach the storm drain, collect the runoff and obtain permission to pump it into the sanitary sewer. Follow local sewering agency's requirements for disposal.

DO NOT . . . Dispose of left over cleaning agents into the gutter, storm drain or sanitary sewer.

Regarding Cleaning Agents:

If you must use soap, use biodegradable/phosphate free cleaners. Avoid use of petroleum based cleaning products. Although the use of nontoxic cleaning products is strongly encouraged, ***do*** understand that these products can still degrade water quality and, therefore, the discharge of these products into



the street, gutters, storm drain system, or waterways is prohibited by local ordinances and the State Water Code.

Note: When cleaning surfaces with a high pressure washer or steam cleaning methods, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning, as compared to the use of a low pressure hose, can remove additional materials that can contaminate local waterways.

Other Tips to Help Protect Our Water . . .

Screening Wash Water

A thorough dry cleanup before washing (without soap) surfaces such as building exteriors and decks without loose paint, sidewalks, or plaza areas, *should be sufficient to protect storm drains.* **However**, if any debris (solids) could enter storm drains or remain in the gutter or street after cleaning, washwater should first pass through a "20 mesh" or finer screen to catch the solid material, which should then be disposed of in the trash.

Drain Inlet Protection/ Containing & Collecting Wash Water

- Sand bags can be used to create a barrier around storm drain inlets.
- Plugs or rubber mats can be used to temporarily seal storm drain openings.
- You can also use vacuum booms, containment pads, or temporary berms to keep wash water away from the street, gutter, or storm drain.

Equipment and Supplies

Special materials such as absorbents, storm drain plugs and seals, small sump pumps, and vacuum booms are available from many vendors. For more information check catalogs such as New Pig (800-468-4647), Lab Safety Supply (800-356-0783), C&H (800-558-9966), and W.W. Grainger (800-994-9174); or call the Cleaning Equipment Trade Association (800-441-0111) or the Power Washers of North America (800-393-PWNA).



RIVERSIDE COUNTY
ANIMAL SERVICES LOCATIONS:

www.rcdas.org

BLYTHE
16450 West Hobson Way
Blythe, CA 92225
760-921-7857

COACHELLA VALLEY ANIMAL CAMPUS
72-050 Petland Place
Thousand Palms, CA 92276
760-343-3644

RIVERSIDE COUNTY ANIMAL SERVICES
6851 Van Buren Blvd.
Riverside, CA 92509
951-688-4340

OTHER ANIMAL SHELTERS:

ANIMAL CARE CENTER OF INDIO
45-355 Van Buren
Indio, CA 92201
760-391-4138

ANIMAL FRIENDS OF THE VALLEYS
29001 Bastron Avenue
Lake Elsinore, CA 92530
951-674-0618
(Serving incorporated Temecula, Wildomar, Lake Elsinore, Murrieta and Canyon Lake)

MARY S. ROBERTS PET ADOPTION CENTER
6185 Industrial Avenue
Riverside, CA 92504
951-688-4340

RAMONA HUMANE SOCIETY
690 Humane Way
San Jacinto 92586
951-654-8002
(Serving Sun City, Menifee, Romoland and Homeland)

Looking to adopt a pet?
This website is linked to many animal shelters.
www.petfinder.com

To report illegal storm drain disposal, call
1-800-506-2555

Or visit our website at www.rcflood.org

E-mail fcnpdes@rcflood.org

What's the Scoop?



Tips for a Healthy Pet and a Healthier Environment

CREATE A HEALTHY ENVIRONMENT in and around your home by following these simple pet practices. Your pet, family and neighbors will appreciate their clean comfortable surroundings.

HOUSEHOLD PETS

We all love our pets, but pet waste is a subject everyone likes to avoid. Pet waste left on trails, sidewalks, streets and grassy areas can be washed into the nearest waterway when it rains. Even if you can't see streams or lakes near you, rainfall (stormwater) or sprinkler runoff can wash pet waste into the storm drains that carry runoff to the nearest streams or lakes untreated. The risk of stormwater contamination increases if pet waste is allowed to accumulate in outdoor animal pen areas or left on sidewalks, streets or driveways.



Pet waste contains nutrients and bacteria. Nutrients can promote the growth of algae in streams and lakes. Algae can cause fish kills and other environmental damage if it is fed too many nutrients. Pet Waste also contains e. Coli and fecal bacteria, which can cause disease in other animals and humans that come in contact with it when swimming or splashing in streams and lakes. Dogs also carry salmonella and giardia, which can make people sick.

Pet waste that is not picked up and properly disposed can also increase vector problems. Flies and other insects are not only attracted to and feed on pet waste, but can also be infected with diseases and spread those diseases to humans and other animals.

WHAT CAN YOU DO?

- SCOOP up pet waste and flush it down the toilet or place in trash can.
- NEVER DUMP pet waste into a storm drain or catch basin.
- USE the complimentary bags or mutt mitts offered in dispensers at local parks.
- CARRY EXTRA BAGS when walking your dog and make them available to other pet owners who are without.
- TEACH CHILDREN how to properly clean up after a pet.
- TELL FRIENDS AND NEIGHBORS about the ill effects of animal waste on the environment. Encourage them to clean up after pets.

Call 1-800-506-2555 TOLL FREE to report illegal dumping to the storm drain, find the dates and times of local Household Hazardous Waste Collection Events, obtain additional information on stormwater problems and solutions, request presentations about stormwater pollution in your child's classroom, or learn about free grasscycling and composting workshops.

SCOOP THE POOP



Many communities have "Scoop the Poop" laws that govern pet waste cleanup. Some of these laws specifically require anyone who walks an animal off their property to carry a bag, shovel, or scooper. Any waste left by the animal must be cleaned up immediately. CALL YOUR LOCAL CODE ENFORCEMENT OFFICE to find out more about pet waste regulations.

OTHER WAYS TO PROTECT YOUR PETS AND THE ENVIRONMENT

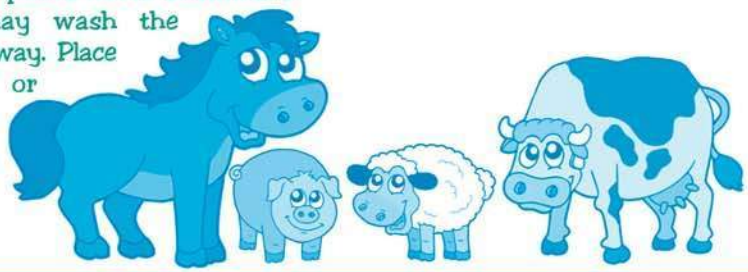
Pets are only one of many sources that contribute to water pollution. However, these other sources of water pollution cannot only harm the environment but also harm your pet. Improperly used or stored lawn fertilizers, pesticides, soaps, grease and vehicle fluids cannot only be washed into local streams and lakes, these chemicals can also harm your pet if they ingest or touch these chemicals. Call 1-800-506-2555 for information regarding how to properly dispose of household hazardous wastes such as these. You can also keep your pets and our environment healthy by properly maintaining your vehicles, and limiting use of pesticides and fertilizers to only the amount that is absolutely needed.

Make sure to not only protect your pets, but to also protect your neighbors pets. NEVER HOSE VEHICLE FLUIDS into the street or gutter. USE ABSORBENT MATERIALS such as cat litter to clean-up spills. SWEEP UP used absorbent materials and place it in the trash.

HORSES AND LIVESTOCK

Fortunate enough to own a horse or livestock? You, too, can play a part in protecting and cleaning up our water resources. The following are a few simple Best Management Practices (BMPs) specifically designed for horses and livestock.

- STORE your manure properly. Do not store unprotected piles of manure in places where stormwater runoff may wash the manure away. Place a cover or tarp over the pile to keep rainwater out.



- BUILD a manure storage facility to protect your pets, property and the environment. These structures usually consist of a concrete pad to protect groundwater and a short wall on one or two sides to make manure handling easier.
- READ the Only Rain Down the Storm Drain brochure titled "Tips for Horse Care" for additional guidance and recommendations. This brochure should be available from your local city office or for download at www.rcflood.org/stormwater.
- KEEP animals out of streams - Horses and livestock can deficate in streams causing stormwater pollution. Livestock and horses in streams can also disturb sensitive habitat and vegetation, causing additional environmental damage. Keep livestock and horses away from streams and use designated stream crossings whenever possible.
- MATERIAL STORAGE SAFETY TIPS Many of the chemicals found in barns require careful handling and proper disposal. When using these chemicals, be certain to follow these common sense guidelines:
  - Buy only what you need.
  - Treat spills of hoof oils like a fuel spill. Use kitty litter to soak up the oil and dispose of it in a tightly sealed plastic bag.
  - Store pesticides in a locked, dry, well-ventilated area.
  - Protect stored fertilizer and pesticides from rain and surface water.

RESOURCE CONSERVATION DISTRICTS CAN HELP

Call 1-800-506-2555 for assistance with locating a local conservation district that can help you properly manage your manure, re-establish healthy pastures, control weeds, or identify appropriate grasses for your soils.



Thank you for doing your part to protect your watershed, the environment, your pets and your community!

SANTA ANA WATERSHED NPDES PERMITTEES

City of Beaumont
City of Calimesa
City of Canyon Lakes
City of Corona
City of Hemet
City of Lake Elsinore
City of Moreno Valley
City of Norco
City of Perris
City of Riverside
County of Riverside
City of San Jacinto
Riverside County Flood Control and Water Conservation District*

SANTA MARGARITA WATERSHED NPDES PERMITTEES

City of Murrieta
City of Temecula
County of Riverside
Riverside County Flood Control and Water Conservation District*

WHITEWATER WATERSHED NPDES PERMITTEES

City of Banning
Cathedral City
City of Coachella
City of Desert Hot Springs
City of Indian Wells
City of Indio
City of La Quinta
City of Palm Desert
City of Palm Springs
City of Rancho Mirage
Coachella Valley Water District*
County of Riverside*
Riverside County Flood Control and Water Conservation District*

* Principal Permittee

The Santa Ana/Santa Margarita
NPDES Advisory Committee

StormWater CleanWater
PROTECTION PROGRAM

To obtain copies, contact:

Riverside County Flood Control and Water Conservation District
1995 Market Street, Riverside, California 92501

Tel: 909/955-1200 flood.fcnpdes@co.riverside.ca.us FAX: 909/788-9965