

CEQA-Level Drainage Report for Ocean Kamp

T19-00004, D19-00016, CUP 19-00021, P19-00009

Oceanside, CA

Prepared for:

Zephyr Oceanside, LLC
700 Second Street
Encinitas, CA 92101

Prepared by:

Tory R. Walker Engineering
122 Civic Center Drive, Ste. 206
Vista, CA 92084

Prepared on:

December 19, 2019

Revised: March 5, 2020

Tory R. Walker, PE
R.C.E. 45005



TORY R. WALKER ENGINEERING

RELIABLE SOLUTIONS IN WATER RESOURCES

122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 • 760-414-9212



TABLE OF CONTENTS

1. Introduction & Purpose	1
2. Project Description.....	1
3. Hydrologic Methodology and Discussion.....	3
4. Detention Basin Routing.....	4
5. Retention Analysis and Hydraulics	4
6. Middle Pond & Park Pond.....	4
7. Conclusions	5
8. References	5

Appendices

- A. San Diego County Charts and Nomographs
- B. Rational Method Calculations/AES Output
- C. Detention Basin Routing
- D. Retention Analysis and Hydraulics
- E. Project Maps
 - Existing Condition Hydrology Map
 - Developed Condition Hydrology Map



1. Introduction and Purpose

The proposed Ocean Kamp project is a combined mixed-use/community resort project located near the Oceanside airport along the 76 Expressway in Oceanside, CA. This CEQA-level drainage report provides a basis for preliminary detention basin sizes and trunk storm drain design. Estimated flows from the project storm drain outfalls are quantified and assessed in relation to the adjacent San Luis River and regional flood control basins along the U.S. Army Corps of Engineers (USACOE) levee at the river. Supporting calculations, exhibits, and narrative for the project drainage designs are included in the Appendices of this report. A Storm Water Quality Management Plan (SWQMP) is provided separately with the project submittal.

2. Project Description

Location

The project is located at the former Oceanside Drive-in location at Foussat Road and Mission Road, and adjacent to the 76 Expressway in Oceanside, CA.

Proposed Project

The developers of the Ocean Kamp project are proposing a resort with wave pool on the southerly one-third of the site. Extensive planting, landscaping, and decorative hardscape features will accent the large wave pool/beach with smaller pools, lawn areas, cabanas, and bungalows proposed along the entire perimeter of the wave pool. Retail shops, hotel buildings, and a parking lot are proposed further out along the project loop road, north of the wave pool. Future residential areas are proposed north and east of the loop road, with densities ranging from 11 to 25 dwelling units per acre. Those areas are currently mass-graded and development plans are pending. All calculations in this report account for the future developed conditions of these areas.

Existing (Pre-Developed) Conditions Drainage Patterns

The Existing (pre-developed) Condition Hydrology Map is the same as was used in the 2007 report that Tory R. Walker Engineering (TRWE) prepared for the Pavilion Project. That map is provided in Appendix E of this report. The 90-acre site is bounded by the San Luis Rey River channel and levee to the northwest, Park Pond and Fireside Channel and Master Drainage Facility AD box culvert to the northeast and east, the State Route 76 Expressway to the south, and Foussat Road and Middle Pond to the west. The middle third of the site was formerly paved for the old drive-in theater and swap meet. Park Pond and Middle Pond were both constructed with the San Luis Rey Levee and Channel Project in the late 1980s and are designed for local flood attenuation when the San Luis Rey River is at flood stage. A utility/powerline corridor bisects the easterly third of the property; the northerly portion of the corridor drains west, with an outfall at the 48-inch RCP storm drain crossing the levee (Node 29 on the existing conditions map). The southerly portion drains south to the 76 Expressway. From there, runoff flows westerly in an existing



concrete trapezoidal channel along the north edge of the expressway, and then into a headwall/60-inch RCP storm drain (Node 15). The storm drain continues west along the expressway, with an outfall into Middle Pond just west of Foussat Road. The westerly quarter of the site (between Foussat and Old Foussat) currently drains southwesterly to a low point in Foussat, where a 24-inch RCP storm drain conveys runoff south to the 60-inch RCP storm drain (Node 18). The remaining middle portion of the property drains west and north to the existing headwall and 48-inch RCP storm drain just east of the Foussat Road bridge (Node 29). The 48-inch storm drain conveys runoff through the levee into the San Luis Rey River. In summary, the two project discharge points are Node 19 (southwest corner 60-inch RCP outfall just west of Foussat), and Node 29 (48-inch outfall into the San Luis Rey River).

Developed Conditions Drainage Patterns and Designs

The proposed project drainage design is intended to generally match existing drainage patterns. Approximately 60% of the resort and retail areas drain southwest to the outfall at the existing 60-inch storm drain near Foussat Road. Runoff from the southerly portion of the SDGE easement and the proposed residential area to the east also contribute to the existing 60-inch storm drain. Within the resort area, approximately 25 acres drain to the large (30k square feet) combined stormwater treatment - detention basin (Basin 1A) at the southwest corner of the site. Flow attenuation is provided within this basin, and outflows are piped to join the existing 60-inch storm drain along the 76 Expressway. The combined total outflow at the 60-inch outlet into Middle Pond is summarized in the conclusions section of this report and compared with existing condition flows.

Portions of the areas north and east of the wave pool drain north into the project loop road and large treatment-detention basin (Basin 2) just north of the loop road. Runoff from the northerly future residential area is also treated and attenuated in this basin. From there, flows join the loop road trunk storm drain and continue to the San Luis Rey River through the aforementioned 48-inch storm drain outfall near the Foussat Bridge. Portions of the SDGE easement and easterly residential areas (treated at small basins within those areas) drain to the loop road trunk storm drain and also to the outfall at the existing 48-inch pipe. There are two separate trunk storm drains proposed in the loop road; one for untreated flows (leading to Basin 2), and one for treated flows (treated upstream).

Drainage at Easterly Edge of Project

The approximately 4-acre area at the easterly boundary will remain as open space; the northerly half of this area will drain north toward the Fireside Channel, and the southerly half will drain to the existing box culvert (Oceanside Master Facility AD). No runoff will flow to the adjacent residential tract along Fireside Drive.



Residential Areas North and East of Loop Road and SDGE Easement – Infrastructure

The residential area north of the loop road, and west of the SDGE easement, will be approximately 40% single family detached (11 DU/AC), and 60% multi-family attached, with a cul-de-sac street feeding several private driveways throughout. A large detention/treatment basin and a neighborhood park are planned on either side of the cul-de-sac. Drainage infrastructure for both residential areas will include roof downspouts to landscaped areas, private drainage pipes, catch basins at sumps, trunk private storm drains, and grass swales where there is available space. The cul-de-sac street will include a trunk public storm drain that will outlet into the detention basin and curb inlets.

Resort Area Infrastructure

The northerly parking lot area will drain to the loop road, with sheet flow, V-gutters where needed, and catch basins/private storm drains to be located and sized at the final engineering stage of the project. Buildings and parking areas east of the main parking lot will have downspouts, areas of sheet flow, V-gutters, catch basins and private storm drains again leading to the loop road.

The resort area includes grass areas, pools, hardscape walkways, and perimeter buildings/commercial areas. Roof downspouts will outlet onto grass and planter areas wherever feasible. A network of private catch basins and storm drains will convey runoff westerly to the large treatment/detention basin. Runoff in the parking areas west of the resort area will be captured in catch basins and trunk storm drains, discharging into the basin. Areas south of the wave pool area will drain to the southerly loop road, which slopes west toward the large basin.

3. Hydrologic Methodology and Discussion

Rational Method hydrologic calculations are provided for the developed conditions using San Diego County Hydrology Manual (SDCHM) methodology. Flows for three storm events, the 2, 10, and 100-year design storms were calculated using AES (Advanced Engineering Software) which routes and confluences flows in a nodal system. AES calculates runoff using the Rational Method based on estimated runoff coefficients and times-of-concentration (see Appendix B for output). The project runoff totals for existing and developed conditions are summarized in Table 1. The basis for the hydrology calculations is provided with the hydrology maps in Appendix E, with corresponding drainage boundaries, initial subareas, and discharge points illustrated. The project site consists of Soil Type D, with the proposed imported fill. The land cover consists of pavement, landscaped areas, buildings, pools, hardscape, seating lawns, etc. Runoff coefficients were assigned based on the combinations of land cover/imperviousness and proposed use. Peak flow rates from the Rational Method calculations were input into the detention basin routing calculations. Detained peak flow values were also reentered into the rational method calculations for post-detention basin flows.



4. Detention Basin Routing

Detention basin routing calculations for the 100-year, 6-hour storm event are provided for the project's several combined treatment-detention basins. We used a Modified-Puls routing of the BMP facilities in SWMM with the Rational Method Hydrograph procedure per the San Diego County Hydrology Manual (SDCHM). Peak flows were obtained using the Rational Method per the SDCHM. The design storm and runoff hydrographs (generated per the SDCHM) were routed through the BMPs in order to satisfy the drainage study Q_{100} criteria. Backup calculations are provided in Appendix C.

5. Retention Analysis and Hydraulics

As noted previously, the northern portion of the proposed project drains to the existing 48-inch storm drain under the levee, which incorporates a flap gate to prevent backwater flow from the San Luis Rey River. In order to satisfy City of Oceanside criteria, we determined the onsite storage volume required for full retention of the runoff volume from a 10-year, 24-hour storm event for the area tributary to the 48-inch pipe (assuming 100-year water surface elevation in the San Luis Rey River and the 48-inch flap gate is closed). We performed a HEC-HMS model hydrologic analysis of the subbasin and used the NRCS Unit Hydrograph method to calculate the 10-year, 24-hour runoff volume. We then prepared preliminary calculations demonstrating that the runoff volume can be temporarily retained within the onsite storm drain system, BMP-2 (basin), and the SDGE easement area. The ponded elevation within the SDGE easement area is 37.1 feet, just over one foot of ponding.

We performed a preliminary hydraulic analysis of the existing 48-inch storm drain and the loop road trunk storm drain and confirmed that the system has sufficient capacity to convey the onsite 100-year peak flow. The analysis assumes a 10-year water surface elevation in the San Luis Rey River per City of Oceanside criteria. The analysis continues upstream in the loop road to the SDGE easement (Node 604 on the Developed Conditions Hydrology Map).

6. Middle Pond & Park Pond

Park Pond

The project design currently routes no runoff north to Park Pond. Runoff for the northerly half of the site flows to the 48-inch storm drain outlet at the San Luis Rey River and is detained in Basin 2 as noted above in Sections 4 and 5.

Middle Pond

Project runoff from the resort area/southwest portion of the site, will be significantly attenuated in Basin 1A, the large basin west of the wave pool. After attenuation, flows combine with runoff from Route 76 and Foussat Road, and outlet into Middle Pond. The combined area is 51.5 acres, which is a slight increase from the existing condition contribution of 49 acres. Using the USACOE



General Design Memorandum (GDM) for the San Luis Rey River Levee Project as a reference, the total tributary area for Middle Pond is 3.3 square miles. The small increase in contributing area from the proposed Ocean Kamp project is therefore inconsequential in terms of flood risk, runoff rate, or storage volume. On-site attenuation and increased pervious cover and infiltration throughout the resort landscaping provides a net decrease from the site to Middle Pond for each of those measurables. As noted in the summary and the hydrology map, the developed condition 100-year flow is reduced with the project, due to extensive detention.

7. Conclusions

As proposed, the Ocean Kamp project will not substantially alter existing drainage patterns. At Discharge Point 2, the 100-year flows and tributary area that run into the 48-inch outfall at the Foussat bridge are both less than with existing conditions. In addition, retention storage volume will be available within project pipes and the adjacent SDGE easement, such that 10-year storm volumes will be retained in the 100-year flow condition in the adjacent San Luis Rey River. At Discharge Point 1, the project will result in reductions as noted in Section 6 above.

A summary of existing and developed conditions runoff is provided in Table 1 below.

Table 1: Project Outfall Flows and Tributary Areas

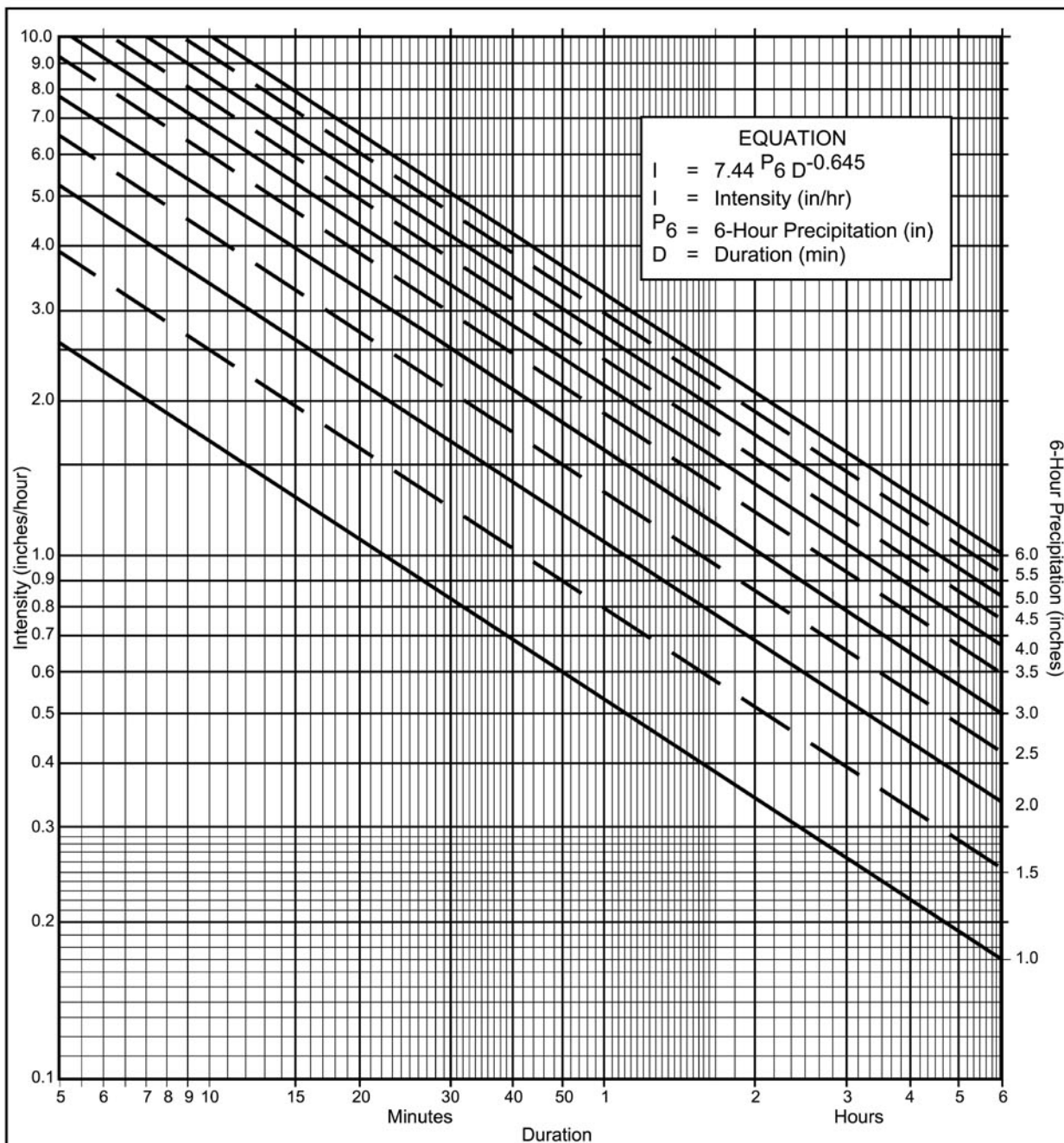
Location	Existing Conditions		Developed Conditions	
	Drainage Area (ac)	Q ₁₀₀ (cfs)	Drainage Area (ac)	Q ₁₀₀ (cfs)
Discharge Point 1 (60-inch RCP)	49.0	50.0	51.6	40.0
Discharge Point 2 (48-inch RCP)	64.1	68	48.1	24.8

REFERENCES

1. San Diego County, *Hydrology Manual*, June 2013.
2. Hydrology Report for The Pavilion at Oceanside, by TRWE, December 14, 2007
(on file with the City of Oceanside Engineering Dept)

APPENDIX A

San Diego County Charts and Nomographs



Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

- (a) Selected frequency 10- year
- (b) $P_6 = 1.8$ in., $P_{24} = 3.3$, $\frac{P_6}{P_{24}} = 55\%$ ⁽²⁾
- (c) Adjusted P_6 ⁽²⁾ = N/A in.
- (d) $t_x =$ _____ min.
- (e) $I =$ _____ in./hr.

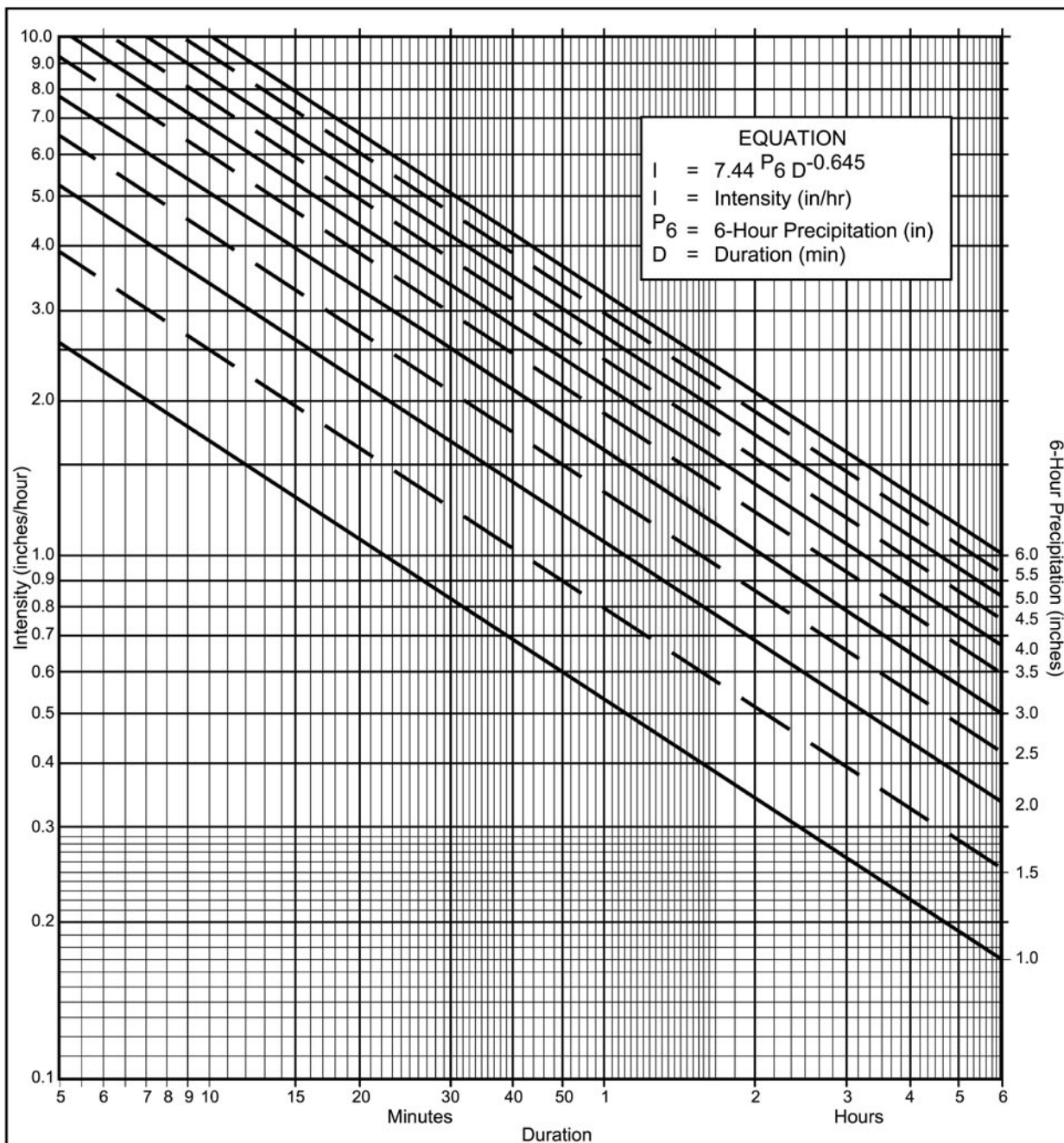
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1



Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

- (a) Selected frequency 100- year
- (b) $P_6 = \underline{2.7}$ in., $P_{24} = \underline{5.0}$, $\frac{P_6}{P_{24}} = \underline{54} \%^{(2)}$
- (c) Adjusted $P_6^{(2)} = \underline{N/A}$ in.
- (d) $t_x = \underline{\hspace{2cm}}$ min.
- (e) $I = \underline{\hspace{2cm}}$ in./hr.

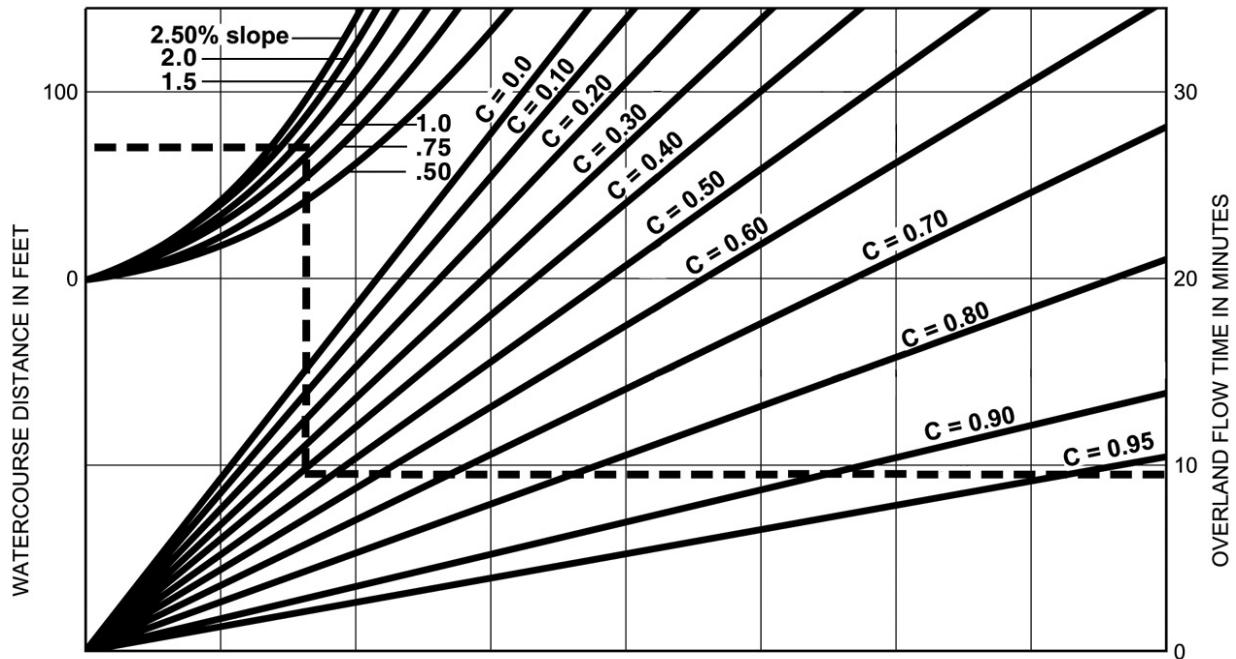
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
 Slope (s) = 1.3%
 Runoff Coefficient (C) = 0.41
 Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8 (1.1-C) \sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

F I G U R E

Rational Formula - Overland Time of Flow Nomograph

3-3

**Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS**

Land Use		Runoff Coefficient "C"				
		% IMPER.	Soil Type			
NRCS Elements	County Elements		A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, C_p , for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

County of San Diego Hydrology Manual



Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

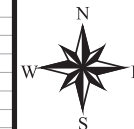
----- Isopluvial (inches)



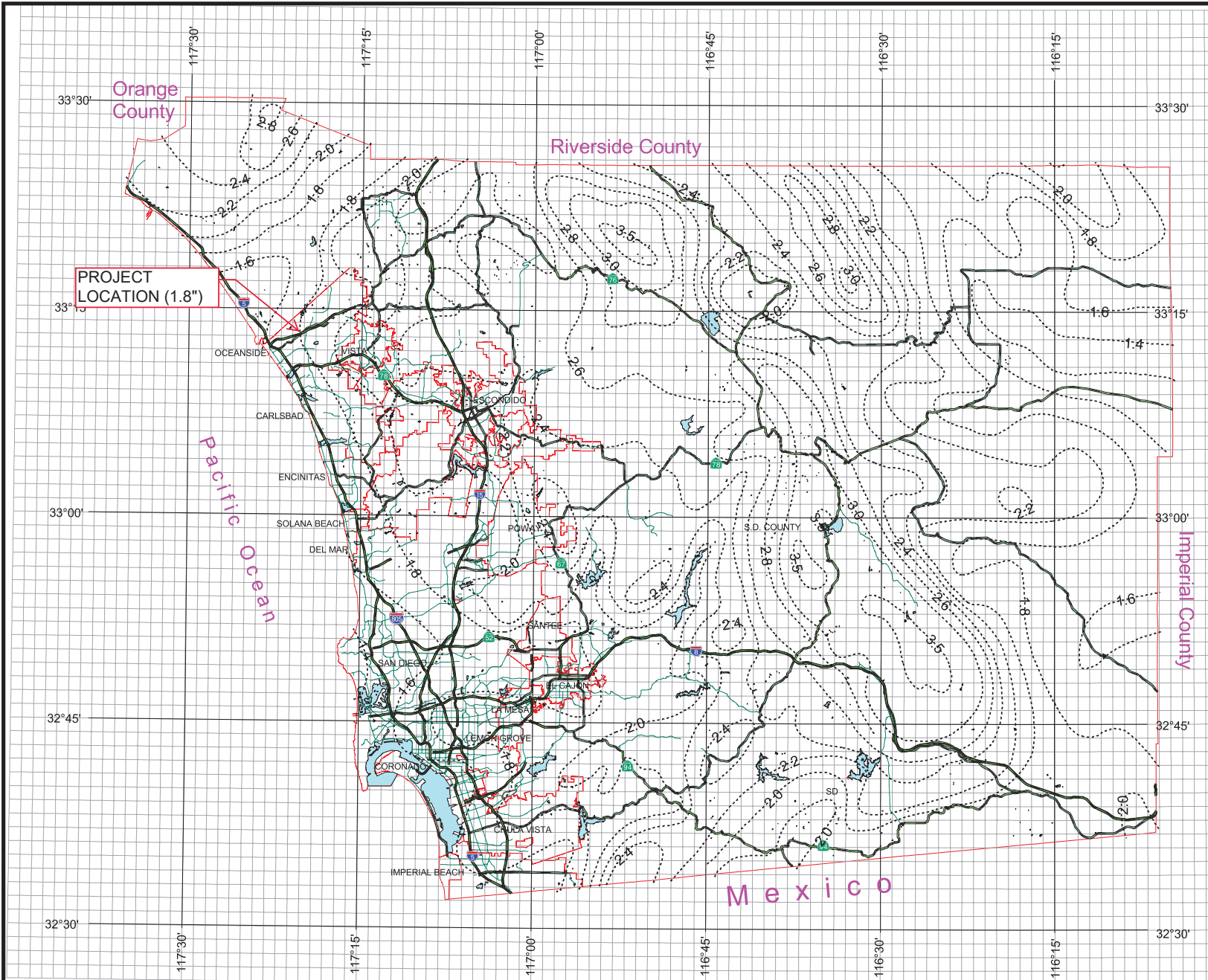
THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.



3 0 3 Miles



County of San Diego Hydrology Manual



Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

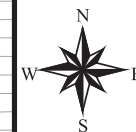
..... Isopluvial (inches)



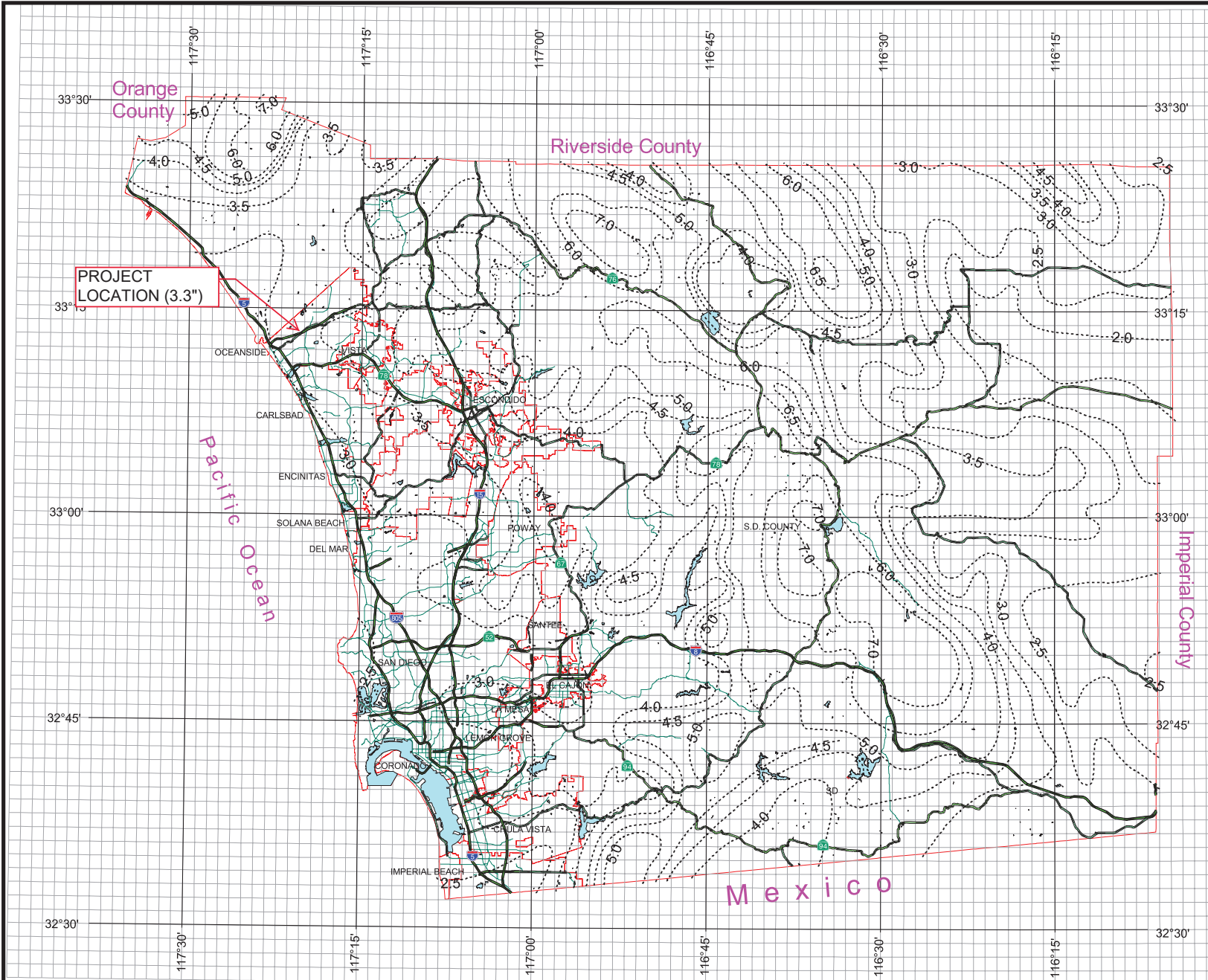
THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.



3 0 3 Miles



County of San Diego Hydrology Manual



Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

----- Isopluvial (inches)

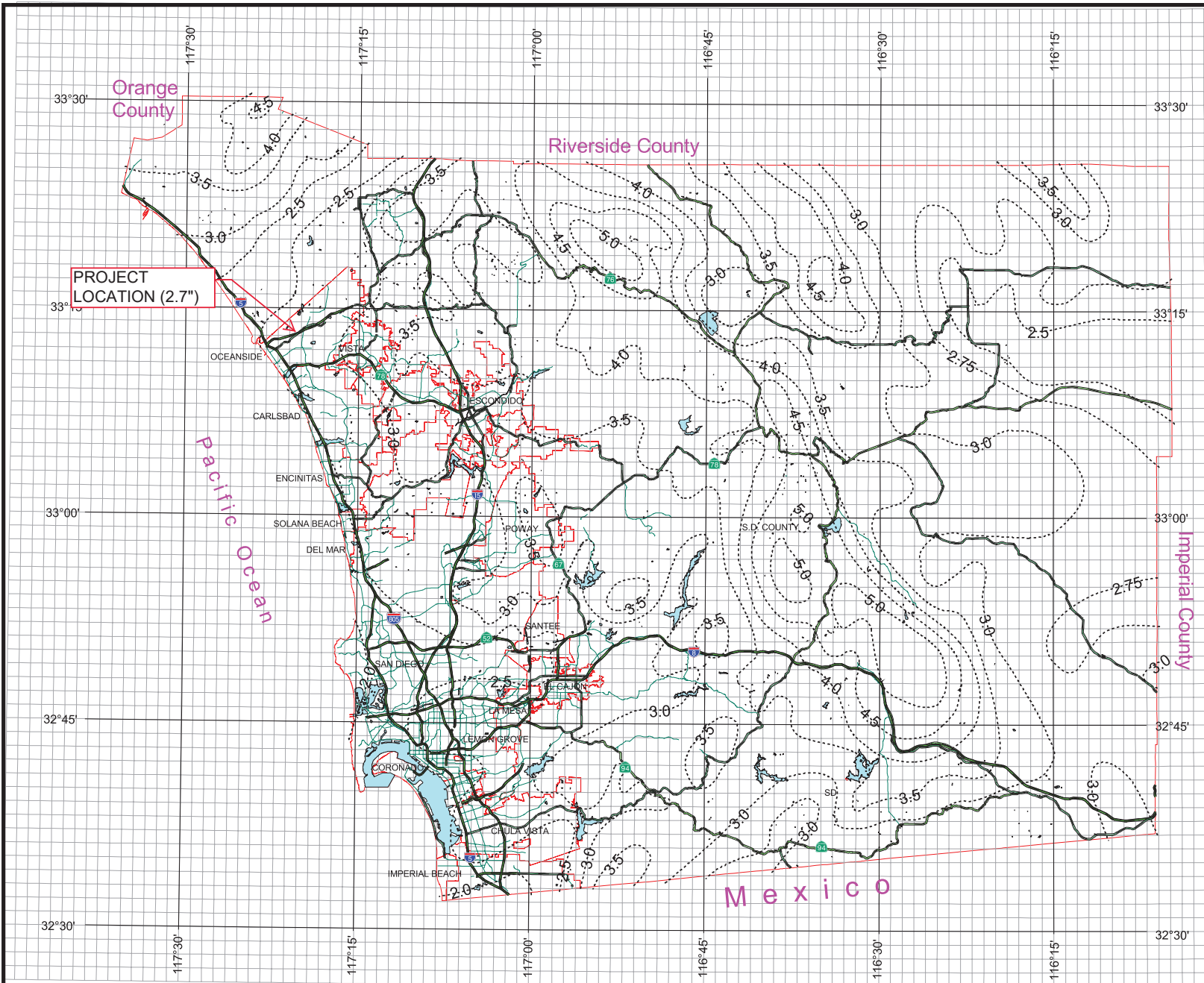


3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This product may contain information which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.



County of San Diego Hydrology Manual



Rainfall Isoplethals

100 Year Rainfall Event - 24 Hours

----- Isopleth (inches)



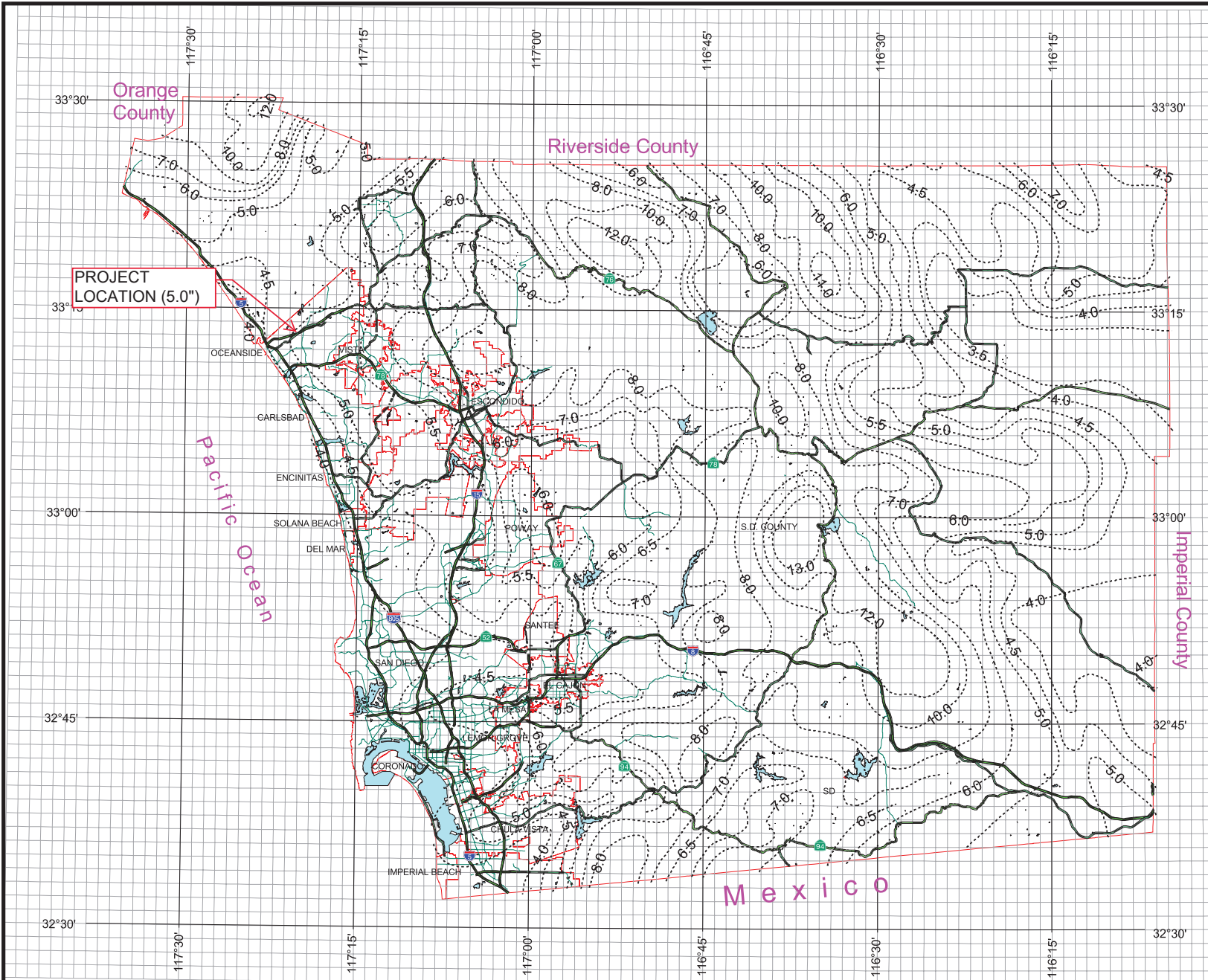
THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.



3 0 3 Miles



APPENDIX B

Rational Method Calculations/AES Output

B. 100-Year Rational Method

1a-zsw100

1b-zne100

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1532

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* Ocean Kamp - Rational Method - SW Area *
* December 16, 2019 *
* 100-year analysis *

FILE NAME: ZSW100.DAT
TIME/DATE OF STUDY: 07:25 12/19/2019

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP (FT) (FT)	MANNING HIKE FACTOR (n)
NO.						
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313	0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED (SUBAREA) :

USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 48.00
DOWNSTREAM ELEVATION(FEET) = 47.50
ELEVATION DIFFERENCE(FEET) = 0.50
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 7.216

WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

```

      THE MAXIMUM OVERLAND FLOW LENGTH =      50.00
      (Reference: Table 3-1B of Hydrology Manual)
      THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.615
      SUBAREA RUNOFF(CFS) =      1.09
      TOTAL AREA(ACRES) =      0.30      TOTAL RUNOFF(CFS) =      1.09

*****
FLOW PROCESS FROM NODE      101.00 TO NODE      102.00 IS CODE =  51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      47.50  DOWNSTREAM(FEET) =      46.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    270.00  CHANNEL SLOPE =    0.0056
CHANNEL BASE(FEET) =    10.00  "Z" FACTOR =    10.000
MANNING'S FACTOR = 0.020  MAXIMUM DEPTH(FEET) =    2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    4.480
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.71
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    1.49
AVERAGE FLOW DEPTH(FEET) =    0.16  TRAVEL TIME(MIN.) =    3.02
Tc(MIN.) =    10.24
SUBAREA AREA(ACRES) =    1.10      SUBAREA RUNOFF(CFS) =    3.20
AREA-AVERAGE RUNOFF COEFFICIENT =    0.650
TOTAL AREA(ACRES) =    1.4      PEAK FLOW RATE(CFS) =      4.08

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =    0.20  FLOW VELOCITY(FEET/SEC.) =    1.69
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    390.00 FEET.

*****
FLOW PROCESS FROM NODE      102.00 TO NODE      103.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      42.00  DOWNSTREAM(FEET) =      38.00
FLOW LENGTH(FEET) =    420.00  MANNING'S N =    0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS    8.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    5.26
ESTIMATED PIPE DIAMETER(INCH) =    18.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =      4.08
PIPE TRAVEL TIME(MIN.) =    1.33  Tc(MIN.) =    11.57
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    810.00 FEET.

*****
FLOW PROCESS FROM NODE      103.10 TO NODE      103.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    4.140
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6167
SUBAREA AREA(ACRES) =    2.80  SUBAREA RUNOFF(CFS) =    6.96
TOTAL AREA(ACRES) =    4.2  TOTAL RUNOFF(CFS) =    10.72
TC(MIN.) =    11.57

```

```

*****
FLOW PROCESS FROM NODE      103.20 TO NODE      103.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.140
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6097
SUBAREA AREA(ACRES) = 3.00 SUBAREA RUNOFF(CFS) = 7.45
TOTAL AREA(ACRES) = 7.2 TOTAL RUNOFF(CFS) = 18.18
TC(MIN.) = 11.57

*****
FLOW PROCESS FROM NODE      103.00 TO NODE      107.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 32.60
FLOW LENGTH(FEET) = 350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.85
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 18.18
PIPE TRAVEL TIME(MIN.) = 0.66 Tc(MIN.) = 12.23
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 1160.00 FEET.

*****
FLOW PROCESS FROM NODE      107.10 TO NODE      107.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.995
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5888
SUBAREA AREA(ACRES) = 1.70 SUBAREA RUNOFF(CFS) = 3.40
TOTAL AREA(ACRES) = 8.9 TOTAL RUNOFF(CFS) = 20.93
TC(MIN.) = 12.23

*****
FLOW PROCESS FROM NODE      107.20 TO NODE      107.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.995
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6064
SUBAREA AREA(ACRES) = 3.60 SUBAREA RUNOFF(CFS) = 9.35
TOTAL AREA(ACRES) = 12.5 TOTAL RUNOFF(CFS) = 30.28
TC(MIN.) = 12.23

*****
FLOW PROCESS FROM NODE      107.00 TO NODE      107.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2

```

```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 12.23
RAINFALL INTENSITY(INCH/HR) = 4.00
TOTAL STREAM AREA(ACRES) = 12.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 30.28

*****
FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 46.50
DOWNSTREAM ELEVATION(FEET) = 45.50
ELEVATION DIFFERENCE(FEET) = 1.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.320
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH = 56.67
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.114
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 1.71
TOTAL AREA(ACRES) = 0.30 TOTAL RUNOFF(CFS) = 1.71

*****
FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 45.50 DOWNSTREAM(FEET) = 42.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 370.00 CHANNEL SLOPE = 0.0081
CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 5.000
MANNING'S FACTOR = 0.013 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.548
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 9.32
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.51
AVERAGE FLOW DEPTH(FEET) = 0.41 TRAVEL TIME(MIN.) = 1.37
Tc(MIN.) = 5.69
SUBAREA AREA(ACRES) = 2.90 SUBAREA RUNOFF(CFS) = 15.19
AREA-AVERAGE RUNOFF COEFFICIENT = 0.800
TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 16.76

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.55 FLOW VELOCITY(FEET/SEC.) = 5.27
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 110.00 = 490.00 FEET.

*****
FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 36.00
FLOW LENGTH(FEET) = 360.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 27.0 INCH PIPE IS 17.7 INCHES

```

```

PIPE-FLOW VELOCITY(FEET/SEC.) = 6.07
ESTIMATED PIPE DIAMETER(INCH) = 27.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 16.76
PIPE TRAVEL TIME(MIN.) = 0.99    Tc(MIN.) = 6.67
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 111.00 = 850.00 FEET.

*****
FLOW PROCESS FROM NODE 111.10 TO NODE 111.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.905
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7508
SUBAREA AREA(ACRES) = 3.10    SUBAREA RUNOFF(CFS) = 12.81
TOTAL AREA(ACRES) = 6.3    TOTAL RUNOFF(CFS) = 27.93
TC(MIN.) = 6.67

*****
FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.00    DOWNSTREAM(FEET) = 34.20
FLOW LENGTH(FEET) = 265.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.36
ESTIMATED PIPE DIAMETER(INCH) = 30.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 27.93
PIPE TRAVEL TIME(MIN.) = 0.60    Tc(MIN.) = 7.27
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 112.00 = 1115.00 FEET.

*****
FLOW PROCESS FROM NODE 112.10 TO NODE 112.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.586
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7405
SUBAREA AREA(ACRES) = 1.60    SUBAREA RUNOFF(CFS) = 6.26
TOTAL AREA(ACRES) = 7.9    TOTAL RUNOFF(CFS) = 32.68
TC(MIN.) = 7.27

*****
FLOW PROCESS FROM NODE 112.00 TO NODE 107.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.20    DOWNSTREAM(FEET) = 32.60
FLOW LENGTH(FEET) = 130.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.67
ESTIMATED PIPE DIAMETER(INCH) = 30.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 32.68
PIPE TRAVEL TIME(MIN.) = 0.22    Tc(MIN.) = 7.50
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 107.00 = 1245.00 FEET.

```

 FLOW PROCESS FROM NODE 112.00 TO NODE 107.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.50
 RAINFALL INTENSITY(INCH/HR) = 5.48
 TOTAL STREAM AREA(ACRES) = 7.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 32.68

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	T _c (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	30.28	12.23	3.995	12.50
2	32.68	7.50	5.478	7.90

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	T _c (MIN.)	INTENSITY (INCH/HOUR)
1	51.24	7.50	5.478
2	54.12	12.23	3.995

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 54.12 T_c(MIN.) = 12.23
 TOTAL AREA(ACRES) = 20.4
 LONGEST FLOWPATH FROM NODE 108.00 TO NODE 107.00 = 1245.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 123.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 32.80 DOWNSTREAM(FEET) = 32.30
 CHANNEL LENGTH THRU SUBAREA(FEET) = 50.00 CHANNEL SLOPE = 0.0100
 CHANNEL BASE(FEET) = 30.00 "Z" FACTOR = 20.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.931
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) = 0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 54.87
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.70
 AVERAGE FLOW DEPTH(FEET) = 0.51 TRAVEL TIME(MIN.) = 0.31
 T_c(MIN.) = 12.54
 SUBAREA AREA(ACRES) = 1.10 SUBAREA RUNOFF(CFS) = 1.51
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.643
 TOTAL AREA(ACRES) = 21.5 PEAK FLOW RATE(CFS) = 54.31

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.50 FLOW VELOCITY(FEET/SEC.) = 2.71
 LONGEST FLOWPATH FROM NODE 108.00 TO NODE 123.00 = 1295.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 123.00 IS CODE = 1

```

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 12.54
RAINFALL INTENSITY(INCH/HR) = 3.93
TOTAL STREAM AREA(ACRES) = 21.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 54.31

*****
FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 150.00
UPSTREAM ELEVATION(FEET) = 48.90
DOWNSTREAM ELEVATION(FEET) = 47.80
ELEVATION DIFFERENCE(FEET) = 1.10
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.641
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH = 54.67
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.924
SUBAREA RUNOFF(CFS) = 1.93
TOTAL AREA(ACRES) = 0.50 TOTAL RUNOFF(CFS) = 1.93

*****
FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 47.80 DOWNSTREAM ELEVATION(FEET) = 41.60
STREET LENGTH(FEET) = 570.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 12.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.51
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.33
HALFSTREET FLOOD WIDTH(FEET) = 10.24
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.36
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.78
STREET FLOW TRAVEL TIME(MIN.) = 4.02 Tc(MIN.) = 10.67
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.364
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.608
SUBAREA AREA(ACRES) = 2.70 SUBAREA RUNOFF(CFS) = 7.07
TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 8.49

```

```

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.37    HALFSTREET FLOOD WIDTH(FEET) = 12.00
FLOW VELOCITY(FEET/SEC.) = 2.64    DEPTH*VELOCITY(FT*FT/SEC.) = 0.98
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 122.00 = 720.00 FEET.

*****
FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.70    DOWNSTREAM(FEET) = 32.60
FLOW LENGTH(FEET) = 140.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 11.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.46
ESTIMATED PIPE DIAMETER(INCH) = 18.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.49
PIPE TRAVEL TIME(MIN.) = 0.31    Tc(MIN.) = 10.98
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 123.00 = 860.00 FEET.

*****
FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 10.98
RAINFALL INTENSITY(INCH/HR) = 4.28
TOTAL STREAM AREA(ACRES) = 3.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.49

** CONFLUENCE DATA **
STREAM    RUNOFF    Tc    INTENSITY    AREA
NUMBER    (CFS)    (MIN.)    (INCH/HR)    (ACRE)
1          54.31    12.54    3.931    21.50
2          8.49    10.98    4.284    3.20

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM    RUNOFF    Tc    INTENSITY
NUMBER    (CFS)    (MIN.)    (INCH/HR)
1          58.34    10.98    4.284
2          62.10    12.54    3.931

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 62.10    Tc(MIN.) = 12.54
TOTAL AREA(ACRES) = 24.7
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 123.00 = 1295.00 FEET.

*****
FLOW PROCESS FROM NODE 123.00 TO NODE 123.00 IS CODE = 7
-----
>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 45.00    RAIN INTENSITY(INCH/HR) = 1.72
TOTAL AREA(ACRES) = 24.70    TOTAL RUNOFF(CFS) = 6.20

```

```

*****
FLOW PROCESS FROM NODE      123.00 TO NODE      306.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      28.60  DOWNSTREAM(FEET) =      25.60
FLOW LENGTH(FEET) =     145.00  MANNING'S N =  0.013
DEPTH OF FLOW IN  36.0 INCH PIPE IS    6.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    7.35
GIVEN PIPE DIAMETER(INCH) =    36.00    NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =          6.20
PIPE TRAVEL TIME(MIN.) =    0.33    Tc(MIN.) =    45.33
LONGEST FLOWPATH FROM NODE    108.00 TO NODE    306.00 =    1440.00 FEET.

*****
FLOW PROCESS FROM NODE      123.00 TO NODE      306.00 IS CODE =  10
-----
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
=====

*****
FLOW PROCESS FROM NODE      500.00 TO NODE      501.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =    0
INITIAL SUBAREA FLOW-LENGTH(FEET) =    120.00
UPSTREAM ELEVATION(FEET) =      51.00
DOWNSTREAM ELEVATION(FEET) =      49.80
ELEVATION DIFFERENCE(FEET) =      1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.256
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
         THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
         (Reference: Table 3-1B of Hydrology Manual)
         THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.595
SUBAREA RUNOFF(CFS) =          1.01
TOTAL AREA(ACRES) =          0.30  TOTAL RUNOFF(CFS) =          1.01

*****
FLOW PROCESS FROM NODE      501.00 TO NODE      502.00 IS CODE =  61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) =      49.30  DOWNSTREAM ELEVATION(FEET) =      46.30
STREET LENGTH(FEET) =     300.00  CURB HEIGHT(INCHES) =    6.0
STREET HALFWIDTH(FEET) =    18.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =    13.00
INSIDE STREET CROSSFALL(DECIMAL) =    0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =    0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =    1
STREET PARKWAY CROSSFALL(DECIMAL) =    0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =    0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =    0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =          3.49
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

```

```

STREET FLOW DEPTH(FEET) = 0.36
HALFSTREET FLOOD WIDTH(FEET) = 11.47
AVERAGE FLOW VELOCITY(FT/SEC.) = 2.43
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.86
STREET FLOW TRAVEL TIME(MIN.) = 2.06 Tc(MIN.) = 9.31
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.763
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.642
SUBAREA AREA(ACRES) = 1.60 SUBAREA RUNOFF(CFS) = 4.95
TOTAL AREA(ACRES) = 1.9 PEAK FLOW RATE(CFS) = 5.81

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.41 HALFSTREET FLOOD WIDTH(FEET) = 14.17
FLOW VELOCITY(FT/SEC.) = 2.73 DEPTH*VELOCITY(FT*FT/SEC.) = 1.12
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 420.00 FEET.

*****
FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 41.00 DOWNSTREAM(FEET) = 38.00
FLOW LENGTH(FEET) = 300.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.9 INCHES
PIPE-FLOW VELOCITY(FT/SEC.) = 5.85
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.81
PIPE TRAVEL TIME(MIN.) = 0.85 Tc(MIN.) = 10.17
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 720.00 FEET.

*****
FLOW PROCESS FROM NODE 503.10 TO NODE 503.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.501
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6474
SUBAREA AREA(ACRES) = 3.80 SUBAREA RUNOFF(CFS) = 11.12
TOTAL AREA(ACRES) = 5.7 TOTAL RUNOFF(CFS) = 16.61
TC(MIN.) = 10.17

*****
FLOW PROCESS FROM NODE 503.20 TO NODE 503.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.501
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6234
SUBAREA AREA(ACRES) = 0.50 SUBAREA RUNOFF(CFS) = 0.79
TOTAL AREA(ACRES) = 6.2 TOTAL RUNOFF(CFS) = 17.39
TC(MIN.) = 10.17

*****

```

```

FLOW PROCESS FROM NODE      503.00 TO NODE      503.00 IS CODE =   7
-----
>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 21.00    RAIN INTENSITY(INCH/HOUR) = 2.82
TOTAL AREA(ACRES) = 6.20    TOTAL RUNOFF(CFS) = 4.00

*****
FLOW PROCESS FROM NODE      503.00 TO NODE      504.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.50 DOWNSTREAM(FEET) = 38.00
FLOW LENGTH(FEET) = 60.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 8.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.98
ESTIMATED PIPE DIAMETER(INCH) = 18.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 4.00
PIPE TRAVEL TIME(MIN.) = 0.20    Tc(MIN.) = 21.20
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 504.00 = 780.00 FEET.

*****
FLOW PROCESS FROM NODE      504.00 TO NODE      505.00 IS CODE =  51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 36.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 280.00 CHANNEL SLOPE = 0.0054
CHANNEL BASE(FEET) = 2.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.689
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.05
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.35
AVERAGE FLOW DEPTH(FEET) = 0.42 TRAVEL TIME(MIN.) = 1.39
Tc(MIN.) = 22.59
SUBAREA AREA(ACRES) = 0.10 SUBAREA RUNOFF(CFS) = 0.09
AREA-AVERAGE RUNOFF COEFFICIENT = 0.231
TOTAL AREA(ACRES) = 6.3 PEAK FLOW RATE(CFS) = 4.00

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.42 FLOW VELOCITY(FEET/SEC.) = 3.31
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 505.00 = 1060.00 FEET.

*****
FLOW PROCESS FROM NODE      505.10 TO NODE      505.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.689
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2841
SUBAREA AREA(ACRES) = 5.10 SUBAREA RUNOFF(CFS) = 4.80
TOTAL AREA(ACRES) = 11.4 TOTAL RUNOFF(CFS) = 8.71
TC(MIN.) = 22.59

```

FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 36.50 DOWNSTREAM(FEET) = 36.35
FLOW LENGTH(FEET) = 80.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.36
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.71
PIPE TRAVEL TIME(MIN.) = 0.40 Tc(MIN.) = 22.99
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 506.00 = 1140.00 FEET.

FLOW PROCESS FROM NODE 506.00 TO NODE 506.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 22.99
RAINFALL INTENSITY(INCH/HR) = 2.66
TOTAL STREAM AREA(ACRES) = 11.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.71

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====

*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 49.00
DOWNSTREAM ELEVATION(FEET) = 4.00
ELEVATION DIFFERENCE(FEET) = 45.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 3.342
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 100.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.114
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 5.48
TOTAL AREA(ACRES) = 1.10 TOTAL RUNOFF(CFS) = 5.48

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====

ELEVATION DATA: UPSTREAM(FEET) = 44.00 DOWNSTREAM(FEET) = 42.60
FLOW LENGTH(FEET) = 180.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.24
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.48
PIPE TRAVEL TIME(MIN.) = 0.57 Tc(MIN.) = 3.91

```

LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    300.00 FEET.

*****
FLOW PROCESS FROM NODE    302.10 TO NODE    302.00 IS CODE =    81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HR) =    7.114
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT =    .4500
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT =    0.5646
SUBAREA AREA(ACRES) =    1.30    SUBAREA RUNOFF(CFS) =    4.16
TOTAL AREA(ACRES) =    2.4    TOTAL RUNOFF(CFS) =    9.64
TC(MIN.) =    3.91

*****
FLOW PROCESS FROM NODE    506.00 TO NODE    506.00 IS CODE =    1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS =    2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM    2 ARE:
TIME OF CONCENTRATION(MIN.) =    3.91
RAINFALL INTENSITY(INCH/HR) =    7.11
TOTAL STREAM AREA(ACRES) =    2.40
PEAK FLOW RATE(CFS) AT CONFLUENCE =    9.64

** CONFLUENCE DATA **
STREAM    RUNOFF    Tc    INTENSITY    AREA
NUMBER    (CFS)    (MIN.)    (INCH/HR)    (ACRE)
1        8.71    22.99    2.659    11.40
2        9.64    3.91    7.114    2.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR    2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM    RUNOFF    Tc    INTENSITY
NUMBER    (CFS)    (MIN.)    (INCH/HR)
1        11.12    3.91    7.114
2        12.31    22.99    2.659

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    12.31    Tc(MIN.) =    22.99
TOTAL AREA(ACRES) =    13.8
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    506.00 =    1140.00 FEET.

*****
FLOW PROCESS FROM NODE    506.00 TO NODE    304.00 IS CODE =    31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    36.35    DOWNSTREAM(FEET) =    36.00
FLOW LENGTH(FEET) =    160.00    MANNING'S N =    0.013
DEPTH OF FLOW IN    27.0 INCH PIPE IS    19.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    3.91
ESTIMATED PIPE DIAMETER(INCH) =    27.00    NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    12.31
PIPE TRAVEL TIME(MIN.) =    0.68    Tc(MIN.) =    23.67

```



```

LONGEST FLOWPATH FROM NODE    500.00 TO NODE    304.00 =    1300.00 FEET.

*****
FLOW PROCESS FROM NODE    304.10 TO NODE    304.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.609
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3399
SUBAREA AREA(ACRES) = 0.60 SUBAREA RUNOFF(CFS) = 0.78
TOTAL AREA(ACRES) = 14.4 TOTAL RUNOFF(CFS) = 12.77
TC(MIN.) = 23.67

*****
FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE = 51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.00 DOWNSTREAM(FEET) = 33.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 720.00 CHANNEL SLOPE = 0.0042
CHANNEL BASE(FEET) = 7.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.402
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 15.00
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.70
AVERAGE FLOW DEPTH(FEET) = 0.51 TRAVEL TIME(MIN.) = 3.25
Tc(MIN.) = 26.92
SUBAREA AREA(ACRES) = 3.10 SUBAREA RUNOFF(CFS) = 4.47
AREA-AVERAGE RUNOFF COEFFICIENT = 0.386
TOTAL AREA(ACRES) = 17.5 PEAK FLOW RATE(CFS) = 16.22

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.53 FLOW VELOCITY(FEET/SEC.) = 3.79
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    305.00 =    2020.00 FEET.

*****
FLOW PROCESS FROM NODE    305.00 TO NODE    306.00 IS CODE = 41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 29.30 DOWNSTREAM(FEET) = 27.80
FLOW LENGTH(FEET) = 364.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 13.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.20
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 16.22
PIPE TRAVEL TIME(MIN.) = 1.17 Tc(MIN.) = 28.09
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    306.00 =    2384.00 FEET.

*****
FLOW PROCESS FROM NODE    306.10 TO NODE    306.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.337

```

```

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4387
SUBAREA AREA (ACRES) = 2.00 SUBAREA RUNOFF (CFS) = 4.21
TOTAL AREA (ACRES) = 19.5 TOTAL RUNOFF (CFS) = 19.99
TC (MIN.) = 28.09

*****
FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 11
-----
>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<
=====

** MAIN STREAM CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 19.99 28.09 2.337 19.50
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 306.00 = 2384.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 6.20 45.33 1.716 24.70
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 306.00 = 1440.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM RUNOFF Tc INTENSITY
NUMBER (CFS) (MIN.) (INCH/HOUR)
1 23.83 28.09 2.337
2 20.88 45.33 1.716

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 23.83 Tc (MIN.) = 28.09
TOTAL AREA (ACRES) = 44.2

*****
FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM (FEET) = 27.80 DOWNSTREAM (FEET) = 26.60
FLOW LENGTH (FEET) = 198.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 14.3 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 6.67
GIVEN PIPE DIAMETER (INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 23.83
PIPE TRAVEL TIME (MIN.) = 0.50 Tc (MIN.) = 28.58
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 307.00 = 2582.00 FEET.

*****
FLOW PROCESS FROM NODE 307.10 TO NODE 307.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.311
*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2927
SUBAREA AREA (ACRES) = 1.30 SUBAREA RUNOFF (CFS) = 2.70
TOTAL AREA (ACRES) = 45.5 TOTAL RUNOFF (CFS) = 30.78

```

```

TC(MIN.) = 28.58

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 127.00 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 26.60 DOWNSTREAM(FEET) = 25.50
FLOW LENGTH(FEET) = 198.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 16.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.96
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 30.78
PIPE TRAVEL TIME(MIN.) = 0.47 Tc(MIN.) = 29.06
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 127.00 = 2780.00 FEET.

*****
FLOW PROCESS FROM NODE 125.00 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.286
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2954
SUBAREA AREA(ACRES) = 2.20 SUBAREA RUNOFF(CFS) = 1.76
TOTAL AREA(ACRES) = 47.7 TOTAL RUNOFF(CFS) = 32.21
TC(MIN.) = 29.06

*****
FLOW PROCESS FROM NODE 125.10 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.286
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3300
SUBAREA AREA(ACRES) = 2.90 SUBAREA RUNOFF(CFS) = 5.97
TOTAL AREA(ACRES) = 50.6 TOTAL RUNOFF(CFS) = 38.18
TC(MIN.) = 29.06

*****
FLOW PROCESS FROM NODE 126.00 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.286
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3400
SUBAREA AREA(ACRES) = 0.90 SUBAREA RUNOFF(CFS) = 1.85
TOTAL AREA(ACRES) = 51.5 TOTAL RUNOFF(CFS) = 40.03
TC(MIN.) = 29.06

*****
FLOW PROCESS FROM NODE 127.00 TO NODE 128.00 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

```

>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

```
=====
ELEVATION DATA: UPSTREAM(FEET) =    25.50  DOWNSTREAM(FEET) =    25.32
FLOW LENGTH(FEET) =    80.00  MANNING'S N =  0.013
DEPTH OF FLOW IN  60.0 INCH PIPE IS  24.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    5.40
GIVEN PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    40.03
PIPE TRAVEL TIME(MIN.) =    0.25    Tc(MIN.) =    29.30
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    128.00 =    2860.00 FEET.
=====
```

END OF STUDY SUMMARY:

```
=====
TOTAL AREA(ACRES)      =    51.5  TC(MIN.) =    29.30
PEAK FLOW RATE(CFS)   =    40.03
=====
```

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1532

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* Ocean Kamp - Rational Method Northerly area nodes 600-700 *
* December 13, 2019 *
* 100-year analysis *

FILE NAME: ZNE100.DAT
TIME/DATE OF STUDY: 07:13 12/19/2019

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP (FT) (FT)	MANNING HIKE FACTOR (n)
NO.						
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313	0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 600.00 TO NODE 601.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6300
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 51.00
DOWNSTREAM ELEVATION(FEET) = 49.80
ELEVATION DIFFERENCE(FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.821
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

```

      THE MAXIMUM OVERLAND FLOW LENGTH =      65.00
      (Reference: Table 3-1B of Hydrology Manual)
      THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.823
      SUBAREA RUNOFF(CFS) =      1.10
      TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.10

*****
      FLOW PROCESS FROM NODE      601.00 TO NODE      602.00 IS CODE =  61
-----
      >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
      >>>>>(STANDARD CURB SECTION USED)<<<<<
=====
      UPSTREAM ELEVATION(FEET) =   49.80   DOWNSTREAM ELEVATION(FEET) =   44.80
      STREET LENGTH(FEET) =   600.00   CURB HEIGHT(INCHES) =   6.0
      STREET HALFWIDTH(FEET) =  16.00

      DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
      INSIDE STREET CROSSFALL(DECIMAL) =  0.020
      OUTSIDE STREET CROSSFALL(DECIMAL) =  0.020

      SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
      STREET PARKWAY CROSSFALL(DECIMAL) =  0.020
      Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =  0.0150
      Manning's FRICTION FACTOR for Back-of-Walk Flow Section =  0.0200

      **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      9.90
      STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
      STREET FLOW DEPTH(FEET) =  0.40
      HALFSTREET FLOOD WIDTH(FEET) =  13.77
      AVERAGE FLOW VELOCITY(FEET/SEC.) =  2.46
      PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =  0.99
      STREET FLOW TRAVEL TIME(MIN.) =  4.07   Tc(MIN.) =  10.89
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.305
      *USER SPECIFIED(SUBAREA) :
      USER-SPECIFIED RUNOFF COEFFICIENT = .6000
      S.C.S. CURVE NUMBER (AMC II) =  0
      AREA-AVERAGE RUNOFF COEFFICIENT =  0.601
      SUBAREA AREA(ACRES) =   6.70   SUBAREA RUNOFF(CFS) =  17.31
      TOTAL AREA(ACRES) =   7.0   PEAK FLOW RATE(CFS) =  18.12

      END OF SUBAREA STREET FLOW HYDRAULICS:
      DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  16.00
      FLOW VELOCITY(FEET/SEC.) =  2.94   DEPTH*VELOCITY(FT*FT/SEC.) =  1.39
      LONGEST FLOWPATH FROM NODE  600.00 TO NODE  602.00 =  720.00 FEET.

*****
      FLOW PROCESS FROM NODE      602.00 TO NODE      603.00 IS CODE =  81
-----
      >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.305
      *USER SPECIFIED(SUBAREA) :
      USER-SPECIFIED RUNOFF COEFFICIENT = .3500
      S.C.S. CURVE NUMBER (AMC II) =  0
      AREA-AVERAGE RUNOFF COEFFICIENT = 0.5845
      SUBAREA AREA(ACRES) =   0.50   SUBAREA RUNOFF(CFS) =   0.75
      TOTAL AREA(ACRES) =   7.5   TOTAL RUNOFF(CFS) =  18.87
      TC(MIN.) =  10.89

*****
      FLOW PROCESS FROM NODE      602.00 TO NODE      603.00 IS CODE =  7
-----

```

```

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 51.00    RAIN INTENSITY(INCH/HOUR) = 1.59
TOTAL AREA(ACRES) = 7.50    TOTAL RUNOFF(CFS) = 2.50

*****
FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 81
-----

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.591
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2798
SUBAREA AREA(ACRES) = 7.50    SUBAREA RUNOFF(CFS) = 4.18
TOTAL AREA(ACRES) = 15.0    TOTAL RUNOFF(CFS) = 6.68
TC(MIN.) = 51.00

*****
FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 7
-----

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 30.00    RAIN INTENSITY(INCH/HOUR) = 2.24
TOTAL AREA(ACRES) = 15.00    TOTAL RUNOFF(CFS) = 13.00

*****
FLOW PROCESS FROM NODE 604.00 TO NODE 605.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.10    DOWNSTREAM(FEET) = 34.90
FLOW LENGTH(FEET) = 210.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 14.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.81
GIVEN PIPE DIAMETER(INCH) = 30.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 13.00
PIPE TRAVEL TIME(MIN.) = 0.60    Tc(MIN.) = 30.60
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 605.00 = 930.00 FEET.

*****
FLOW PROCESS FROM NODE 605.00 TO NODE 606.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.90    DOWNSTREAM(FEET) = 30.80
FLOW LENGTH(FEET) = 840.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 14.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.48
GIVEN PIPE DIAMETER(INCH) = 30.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 13.00
PIPE TRAVEL TIME(MIN.) = 2.56    Tc(MIN.) = 33.16
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 606.00 = 1770.00 FEET.

*****
FLOW PROCESS FROM NODE 605.00 TO NODE 606.00 IS CODE = 10
-----

>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

```

FLOW PROCESS FROM NODE 730.00 TO NODE 731.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 120.00
UPSTREAM ELEVATION (FEET) = 50.60
DOWNSTREAM ELEVATION (FEET) = 49.40
ELEVATION DIFFERENCE (FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 7.256
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 65.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN T_c CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.595
SUBAREA RUNOFF (CFS) = 0.67
TOTAL AREA (ACRES) = 0.20 TOTAL RUNOFF (CFS) = 0.67

FLOW PROCESS FROM NODE 731.00 TO NODE 732.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION (FEET) = 49.40 DOWNSTREAM ELEVATION (FEET) = 46.00
STREET LENGTH (FEET) = 380.00 CURB HEIGHT (INCHES) = 6.0
STREET HALFWIDTH (FEET) = 16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 10.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL (DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section (curb-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 6.59
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.43
HALFSTREET FLOOD WIDTH (FEET) = 15.18
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.72
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 1.17
STREET FLOW TRAVEL TIME (MIN.) = 2.33 T_c (MIN.) = 9.59
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.675
*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.600
SUBAREA AREA (ACRES) = 4.20 SUBAREA RUNOFF (CFS) = 11.78
TOTAL AREA (ACRES) = 4.4 PEAK FLOW RATE (CFS) = 12.34

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.45 HALFSTREET FLOOD WIDTH (FEET) = 16.00
FLOW VELOCITY (FEET/SEC.) = 2.79 DEPTH*VELOCITY (FT*FT/SEC.) = 1.24
LONGEST FLOWPATH FROM NODE 730.00 TO NODE 732.00 = 500.00 FEET.

```

FLOW PROCESS FROM NODE      732.00 TO NODE      732.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.675
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6185
SUBAREA AREA(ACRES) = 7.10 SUBAREA RUNOFF(CFS) = 20.91
TOTAL AREA(ACRES) = 11.5 TOTAL RUNOFF(CFS) = 33.25
TC(MIN.) = 9.59

*****
FLOW PROCESS FROM NODE      732.00 TO NODE      733.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 41.00 DOWNSTREAM(FEET) = 36.00
FLOW LENGTH(FEET) = 480.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.06
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 33.25
PIPE TRAVEL TIME(MIN.) = 0.88 Tc(MIN.) = 10.47
LONGEST FLOWPATH FROM NODE 730.00 TO NODE 733.00 = 980.00 FEET.

*****
FLOW PROCESS FROM NODE      733.10 TO NODE      733.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.417
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6226
SUBAREA AREA(ACRES) = 6.40 SUBAREA RUNOFF(CFS) = 17.81
TOTAL AREA(ACRES) = 17.9 TOTAL RUNOFF(CFS) = 49.23
TC(MIN.) = 10.47

*****
FLOW PROCESS FROM NODE      733.20 TO NODE      733.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.417
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6096
SUBAREA AREA(ACRES) = 0.90 SUBAREA RUNOFF(CFS) = 1.39
TOTAL AREA(ACRES) = 18.8 TOTAL RUNOFF(CFS) = 50.62
TC(MIN.) = 10.47

*****
FLOW PROCESS FROM NODE      733.00 TO NODE      715.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.417
*USER SPECIFIED(SUBAREA):

```

```

USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5916
SUBAREA AREA(ACRES) = 1.40 SUBAREA RUNOFF(CFS) = 2.16
TOTAL AREA(ACRES) = 20.2 TOTAL RUNOFF(CFS) = 52.78
TC(MIN.) = 10.47

*****
FLOW PROCESS FROM NODE 733.00 TO NODE 715.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 10.47
RAINFALL INTENSITY(INCH/HR) = 4.42
TOTAL STREAM AREA(ACRES) = 20.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 52.78

*****
FLOW PROCESS FROM NODE 710.00 TO NODE 711.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 49.00
DOWNSTREAM ELEVATION(FEET) = 47.80
ELEVATION DIFFERENCE(FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.577
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 60.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.630
SUBAREA RUNOFF(CFS) = 3.71
TOTAL AREA(ACRES) = 0.80 TOTAL RUNOFF(CFS) = 3.71

*****
FLOW PROCESS FROM NODE 711.00 TO NODE 712.00 IS CODE = 61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 47.80 DOWNSTREAM ELEVATION(FEET) = 46.10
STREET LENGTH(FEET) = 300.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.82
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.40
HALFSTREET FLOOD WIDTH(FEET) = 13.54

```

```

    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.80
    STREET FLOW TRAVEL TIME(MIN.) =    2.49    Tc(MIN.) =    8.07
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    5.223
    *USER SPECIFIED(SUBAREA) :
    USER-SPECIFIED RUNOFF COEFFICIENT = .6500
    S.C.S. CURVE NUMBER (AMC II) =    0
    AREA-AVERAGE RUNOFF COEFFICIENT =    0.663
    SUBAREA AREA(ACRES) =    2.40    SUBAREA RUNOFF(CFS) =    8.15
    TOTAL AREA(ACRES) =    3.2    PEAK FLOW RATE(CFS) =    11.07

    END OF SUBAREA STREET FLOW HYDRAULICS:
    DEPTH(FEET) = 0.44    HALFSTREET FLOOD WIDTH(FEET) =    15.57
    FLOW VELOCITY(FEET/SEC.) =    2.18    DEPTH*VELOCITY(FT*FT/SEC.) =    0.95
    LONGEST FLOWPATH FROM NODE    710.00 TO NODE    712.00 =    420.00 FEET.

*****
    FLOW PROCESS FROM NODE    712.00 TO NODE    713.00 IS CODE =    41
-----
    >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
    >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
    ELEVATION DATA: UPSTREAM(FEET) =    41.40    DOWNSTREAM(FEET) =    40.40
    FLOW LENGTH(FEET) =    250.00    MANNING'S N =    0.013
    DEPTH OF FLOW IN    24.0 INCH PIPE IS    16.5 INCHES
    PIPE-FLOW VELOCITY(FEET/SEC.) =    4.82
    GIVEN PIPE DIAMETER(INCH) =    24.00    NUMBER OF PIPES =    1
    PIPE-FLOW(CFS) =    11.07
    PIPE TRAVEL TIME(MIN.) =    0.86    Tc(MIN.) =    8.94
    LONGEST FLOWPATH FROM NODE    710.00 TO NODE    713.00 =    670.00 FEET.

*****
    FLOW PROCESS FROM NODE    713.10 TO NODE    713.00 IS CODE =    81
-----
    >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    4.892
    *USER SPECIFIED(SUBAREA) :
    USER-SPECIFIED RUNOFF COEFFICIENT = .6500
    S.C.S. CURVE NUMBER (AMC II) =    0
    AREA-AVERAGE RUNOFF COEFFICIENT =    0.6571
    SUBAREA AREA(ACRES) =    2.40    SUBAREA RUNOFF(CFS) =    7.63
    TOTAL AREA(ACRES) =    5.6    TOTAL RUNOFF(CFS) =    18.00
    TC(MIN.) =    8.94

*****
    FLOW PROCESS FROM NODE    713.00 TO NODE    714.00 IS CODE =    41
-----
    >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
    >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
    ELEVATION DATA: UPSTREAM(FEET) =    40.40    DOWNSTREAM(FEET) =    36.10
    FLOW LENGTH(FEET) =    620.00    MANNING'S N =    0.013
    DEPTH OF FLOW IN    30.0 INCH PIPE IS    16.0 INCHES
    PIPE-FLOW VELOCITY(FEET/SEC.) =    6.77
    GIVEN PIPE DIAMETER(INCH) =    30.00    NUMBER OF PIPES =    1
    PIPE-FLOW(CFS) =    18.00
    PIPE TRAVEL TIME(MIN.) =    1.53    Tc(MIN.) =    10.46
    LONGEST FLOWPATH FROM NODE    710.00 TO NODE    714.00 =    1290.00 FEET.

*****
    FLOW PROCESS FROM NODE    714.10 TO NODE    714.00 IS CODE =    81
-----

```

```

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.419
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6531
SUBAREA AREA(ACRES) = 7.30 SUBAREA RUNOFF(CFS) = 20.97
TOTAL AREA(ACRES) = 12.9 TOTAL RUNOFF(CFS) = 37.23
TC(MIN.) = 10.46

*****
FLOW PROCESS FROM NODE 714.00 TO NODE 715.00 IS CODE = 1
-----

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 10.46
RAINFALL INTENSITY(INCH/HR) = 4.42
TOTAL STREAM AREA(ACRES) = 12.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 37.23

** CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 52.78 10.47 4.417 20.20
2 37.23 10.46 4.419 12.90

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM RUNOFF Tc INTENSITY
NUMBER (CFS) (MIN.) (INCH/HOUR)
1 89.97 10.46 4.419
2 89.99 10.47 4.417

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 89.99 Tc(MIN.) = 10.47
TOTAL AREA(ACRES) = 33.1
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 715.00 = 1290.00 FEET.

*****
FLOW PROCESS FROM NODE 715.00 TO NODE 716.00 IS CODE = 7
-----

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 36.00 RAIN INTENSITY(INCH/HOUR) = 1.99
TOTAL AREA(ACRES) = 33.10 TOTAL RUNOFF(CFS) = 12.50

*****
FLOW PROCESS FROM NODE 716.00 TO NODE 606.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 31.50 DOWNSTREAM(FEET) = 30.80
FLOW LENGTH(FEET) = 65.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 10.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.15

```

```

GIVEN PIPE DIAMETER(INCH) = 36.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.50
PIPE TRAVEL TIME(MIN.) = 0.15    Tc(MIN.) = 36.15
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 606.00 = 1355.00 FEET.

*****
FLOW PROCESS FROM NODE 716.00 TO NODE 606.00 IS CODE = 11
-----
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
=====

** MAIN STREAM CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)  (ACRE)
1           12.50      36.15      1.986        33.10
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 606.00 = 1355.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)  (ACRE)
1           13.00      33.16      2.100        15.00
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 606.00 = 1770.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)
1           24.47      33.16      2.100
2           24.80      36.15      1.986

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 24.80    Tc(MIN.) = 36.15
TOTAL AREA(ACRES) = 48.1

*****
FLOW PROCESS FROM NODE 606.00 TO NODE 607.00 IS CODE = 41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 30.70    DOWNSTREAM(FEET) = 29.40
FLOW LENGTH(FEET) = 220.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 15.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.82
GIVEN PIPE DIAMETER(INCH) = 48.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 24.80
PIPE TRAVEL TIME(MIN.) = 0.54    Tc(MIN.) = 36.69
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 607.00 = 1990.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 48.1    TC(MIN.) = 36.69
PEAK FLOW RATE(CFS) = 24.80
=====
END OF RATIONAL METHOD ANALYSIS

```

B. 10-Year Rational Method

2a-zsw10

2b-zne10

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1532

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* Ocean Kamp - Rational Method - SW Area *
* December 16, 2019 *
* 10-year analysis *

FILE NAME: ZSW10.DAT
TIME/DATE OF STUDY: 09:45 12/19/2019

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 10.00
6-HOUR DURATION PRECIPITATION (INCHES) = 1.800
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP (FT) (FT)	MANNING HIKE FACTOR (n)
NO.						
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313	0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 48.00
DOWNSTREAM ELEVATION(FEET) = 47.50
ELEVATION DIFFERENCE(FEET) = 0.50
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 7.216
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

```

      THE MAXIMUM OVERLAND FLOW LENGTH =      50.00
      (Reference: Table 3-1B of Hydrology Manual)
      THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
      10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.743
      SUBAREA RUNOFF(CFS) =      0.73
      TOTAL AREA(ACRES) =      0.30      TOTAL RUNOFF(CFS) =      0.73

*****
FLOW PROCESS FROM NODE      101.00 TO NODE      102.00 IS CODE =  51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      47.50  DOWNSTREAM(FEET) =      46.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    270.00  CHANNEL SLOPE =    0.0056
CHANNEL BASE(FEET) =    10.00  "Z" FACTOR =    10.000
MANNING'S FACTOR = 0.020  MAXIMUM DEPTH(FEET) =    2.00
      10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.891
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.78
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    1.27
AVERAGE FLOW DEPTH(FEET) =    0.12  TRAVEL TIME(MIN.) =    3.56
Tc(MIN.) =    10.77
SUBAREA AREA(ACRES) =    1.10      SUBAREA RUNOFF(CFS) =    2.07
AREA-AVERAGE RUNOFF COEFFICIENT =  0.650
TOTAL AREA(ACRES) =    1.4      PEAK FLOW RATE(CFS) =    2.63

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.16  FLOW VELOCITY(FEET/SEC.) =    1.46
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    390.00 FEET.

*****
FLOW PROCESS FROM NODE      102.00 TO NODE      103.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      42.00  DOWNSTREAM(FEET) =      38.00
FLOW LENGTH(FEET) =    420.00  MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS  6.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    4.68
ESTIMATED PIPE DIAMETER(INCH) =    18.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    2.63
PIPE TRAVEL TIME(MIN.) =    1.50  Tc(MIN.) =    12.27
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    810.00 FEET.

*****
FLOW PROCESS FROM NODE      103.10 TO NODE      103.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.658
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6167
SUBAREA AREA(ACRES) =    2.80  SUBAREA RUNOFF(CFS) =    4.47
TOTAL AREA(ACRES) =    4.2  TOTAL RUNOFF(CFS) =    6.88
TC(MIN.) =    12.27

```



```

*****
FLOW PROCESS FROM NODE      103.20 TO NODE      103.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.658
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =  0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6097
SUBAREA AREA(ACRES) =      3.00  SUBAREA RUNOFF(CFS) =      4.78
TOTAL AREA(ACRES) =      7.2   TOTAL RUNOFF(CFS) =     11.67
TC(MIN.) =     12.27

*****
FLOW PROCESS FROM NODE      103.00 TO NODE      107.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =     38.00  DOWNSTREAM(FEET) =     32.60
FLOW LENGTH(FEET) =     350.00  MANNING'S N =  0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 13.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =     7.97
ESTIMATED PIPE DIAMETER(INCH) =    18.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =     11.67
PIPE TRAVEL TIME(MIN.) =     0.73  Tc(MIN.) =    13.00
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1160.00 FEET.

*****
FLOW PROCESS FROM NODE      107.10 TO NODE      107.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.560
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) =  0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5888
SUBAREA AREA(ACRES) =     1.70  SUBAREA RUNOFF(CFS) =     2.18
TOTAL AREA(ACRES) =     8.9   TOTAL RUNOFF(CFS) =    13.42
TC(MIN.) =     13.00

*****
FLOW PROCESS FROM NODE      107.20 TO NODE      107.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.560
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) =  0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6064
SUBAREA AREA(ACRES) =     3.60  SUBAREA RUNOFF(CFS) =     5.99
TOTAL AREA(ACRES) =    12.5   TOTAL RUNOFF(CFS) =    19.41
TC(MIN.) =     13.00

*****
FLOW PROCESS FROM NODE      107.00 TO NODE      107.00 IS CODE =   1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS =  2

```

```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.00
RAINFALL INTENSITY(INCH/HR) = 2.56
TOTAL STREAM AREA(ACRES) = 12.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 19.41

*****
FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 46.50
DOWNSTREAM ELEVATION(FEET) = 45.50
ELEVATION DIFFERENCE(FEET) = 1.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.320
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 56.67
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.743
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 1.14
TOTAL AREA(ACRES) = 0.30 TOTAL RUNOFF(CFS) = 1.14

*****
FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 45.50 DOWNSTREAM(FEET) = 42.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 370.00 CHANNEL SLOPE = 0.0081
CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 5.000
MANNING'S FACTOR = 0.013 MAXIMUM DEPTH(FEET) = 2.00
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.275
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.11
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.97
AVERAGE FLOW DEPTH(FEET) = 0.33 TRAVEL TIME(MIN.) = 1.55
Tc(MIN.) = 5.87
SUBAREA AREA(ACRES) = 2.90 SUBAREA RUNOFF(CFS) = 9.92
AREA-AVERAGE RUNOFF COEFFICIENT = 0.800
TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 10.94

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.45 FLOW VELOCITY(FEET/SEC.) = 4.70
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 110.00 = 490.00 FEET.

*****
FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 36.00
FLOW LENGTH(FEET) = 360.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.8 INCHES

```

```

PIPE-FLOW VELOCITY(FEET/SEC.) = 5.31
ESTIMATED PIPE DIAMETER(INCH) = 21.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 10.94
PIPE TRAVEL TIME(MIN.) = 1.13    Tc(MIN.) = 7.00
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 111.00 = 850.00 FEET.

*****
FLOW PROCESS FROM NODE 111.10 TO NODE 111.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.816
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7508
SUBAREA AREA(ACRES) = 3.10    SUBAREA RUNOFF(CFS) = 8.28
TOTAL AREA(ACRES) = 6.3    TOTAL RUNOFF(CFS) = 18.05
TC(MIN.) = 7.00

*****
FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.00    DOWNSTREAM(FEET) = 34.20
FLOW LENGTH(FEET) = 265.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 27.0 INCH PIPE IS 17.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.67
ESTIMATED PIPE DIAMETER(INCH) = 27.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 18.05
PIPE TRAVEL TIME(MIN.) = 0.66    Tc(MIN.) = 7.67
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 112.00 = 1115.00 FEET.

*****
FLOW PROCESS FROM NODE 112.10 TO NODE 112.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.600
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7405
SUBAREA AREA(ACRES) = 1.60    SUBAREA RUNOFF(CFS) = 4.03
TOTAL AREA(ACRES) = 7.9    TOTAL RUNOFF(CFS) = 21.06
TC(MIN.) = 7.67

*****
FLOW PROCESS FROM NODE 112.00 TO NODE 107.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.20    DOWNSTREAM(FEET) = 32.60
FLOW LENGTH(FEET) = 130.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.56
ESTIMATED PIPE DIAMETER(INCH) = 24.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 21.06
PIPE TRAVEL TIME(MIN.) = 0.25    Tc(MIN.) = 7.92
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 107.00 = 1245.00 FEET.

```

 FLOW PROCESS FROM NODE 112.00 TO NODE 107.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.92
 RAINFALL INTENSITY(INCH/HR) = 3.53
 TOTAL STREAM AREA(ACRES) = 7.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 21.06

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	T _c (MIN.)	INTENSITY (INCH/HR)	AREA (ACRE)
1	19.41	13.00	2.560	12.50
2	21.06	7.92	3.525	7.90

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	T _c (MIN.)	INTENSITY (INCH/HR)
1	32.88	7.92	3.525
2	34.70	13.00	2.560

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 34.70 T_c(MIN.) = 13.00
 TOTAL AREA(ACRES) = 20.4
 LONGEST FLOWPATH FROM NODE 108.00 TO NODE 107.00 = 1245.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 123.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 32.80 DOWNSTREAM(FEET) = 32.30
 CHANNEL LENGTH THRU SUBAREA(FEET) = 50.00 CHANNEL SLOPE = 0.0100
 CHANNEL BASE(FEET) = 30.00 "Z" FACTOR = 20.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.517
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) = 0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 35.19
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.36
 AVERAGE FLOW DEPTH(FEET) = 0.39 TRAVEL TIME(MIN.) = 0.35
 T_c(MIN.) = 13.35
 SUBAREA AREA(ACRES) = 1.10 SUBAREA RUNOFF(CFS) = 0.97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.643
 TOTAL AREA(ACRES) = 21.5 PEAK FLOW RATE(CFS) = 34.77

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.39 FLOW VELOCITY(FEET/SEC.) = 2.34
 LONGEST FLOWPATH FROM NODE 108.00 TO NODE 123.00 = 1295.00 FEET.

 FLOW PROCESS FROM NODE 107.00 TO NODE 123.00 IS CODE = 1

```

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.35
RAINFALL INTENSITY(INCH/HR) = 2.52
TOTAL STREAM AREA(ACRES) = 21.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 34.77

*****
FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 150.00
UPSTREAM ELEVATION(FEET) = 48.90
DOWNSTREAM ELEVATION(FEET) = 47.80
ELEVATION DIFFERENCE(FEET) = 1.10
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.641
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH = 54.67
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.949
SUBAREA RUNOFF(CFS) = 1.28
TOTAL AREA(ACRES) = 0.50 TOTAL RUNOFF(CFS) = 1.28

*****
FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 47.80 DOWNSTREAM ELEVATION(FEET) = 41.60
STREET LENGTH(FEET) = 570.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 12.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.62
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.30
HALFSTREET FLOOD WIDTH(FEET) = 8.52
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.14
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.64
STREET FLOW TRAVEL TIME(MIN.) = 4.43 Tc(MIN.) = 11.08
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.839
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.608
SUBAREA AREA(ACRES) = 2.70 SUBAREA RUNOFF(CFS) = 4.60
TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 5.52

```

```

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(Feet) = 0.33    HALFSTREET FLOOD WIDTH(Feet) = 10.24
FLOW VELOCITY(Feet/Sec.) = 2.37    DEPTH*VELOCITY(Ft*Ft/Sec.) = 0.78
LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =    720.00 FEET.

*****
FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(Feet) =    34.70    DOWNSTREAM(Feet) =    32.60
FLOW LENGTH(Feet) =    140.00    MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS    8.5 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) =    6.73
ESTIMATED PIPE DIAMETER(INCH) = 18.00    NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    5.52
PIPE TRAVEL TIME(Min.) =    0.35    Tc(Min.) =    11.42
LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =    860.00 FEET.

*****
FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(Min.) =    11.42
RAINFALL INTENSITY(INCH/HR) =    2.78
TOTAL STREAM AREA(ACRES) =    3.20
PEAK FLOW RATE(CFS) AT CONFLUENCE =    5.52

** CONFLUENCE DATA **
STREAM    RUNOFF    Tc    INTENSITY    AREA
NUMBER    (CFS)    (Min.)    (INCH/HR)    (ACRE)
1        34.77    13.35    2.517    21.50
2         5.52    11.42    2.784     3.20

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM    RUNOFF    Tc    INTENSITY
NUMBER    (CFS)    (Min.)    (INCH/HR)
1        36.95    11.42    2.784
2        39.76    13.35    2.517

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    39.76    Tc(Min.) =    13.35
TOTAL AREA(ACRES) =    24.7
LONGEST FLOWPATH FROM NODE    108.00 TO NODE    123.00 =    1295.00 FEET.

*****
FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE = 7
-----
>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(Min) = 55.00    RAIN INTENSITY(INCH/HR) = 1.01
TOTAL AREA(ACRES) =    24.70    TOTAL RUNOFF(CFS) =    4.50

```

```

*****
FLOW PROCESS FROM NODE      123.00 TO NODE      306.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    28.60  DOWNSTREAM(FEET) =    25.60
FLOW LENGTH(FEET) =   145.00  MANNING'S N =  0.013
DEPTH OF FLOW IN  36.0 INCH PIPE IS   5.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    6.69
GIVEN PIPE DIAMETER(INCH) =   36.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =         4.50
PIPE TRAVEL TIME(MIN.) =    0.36  Tc(MIN.) =   55.36
LONGEST FLOWPATH FROM NODE    108.00 TO NODE    306.00 =   1440.00 FEET.

*****
FLOW PROCESS FROM NODE      123.00 TO NODE      306.00 IS CODE =  10
-----
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
=====

*****
FLOW PROCESS FROM NODE      500.00 TO NODE      501.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =  0
INITIAL SUBAREA FLOW-LENGTH(FEET) =  120.00
UPSTREAM ELEVATION(FEET) =    51.00
DOWNSTREAM ELEVATION(FEET) =    49.80
ELEVATION DIFFERENCE(FEET) =    1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.256
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
          10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.730
SUBAREA RUNOFF(CFS) =         0.67
TOTAL AREA(ACRES) =         0.30  TOTAL RUNOFF(CFS) =         0.67

*****
FLOW PROCESS FROM NODE      501.00 TO NODE      502.00 IS CODE =  61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) =   49.30  DOWNSTREAM ELEVATION(FEET) =   46.30
STREET LENGTH(FEET) =   300.00  CURB HEIGHT(INCHES) =    6.0
STREET HALFWIDTH(FEET) =   18.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   13.00
INSIDE STREET CROSSFALL(DECIMAL) =    0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =    0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
STREET PARKWAY CROSSFALL(DECIMAL) =    0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =   0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =         2.30

```

```

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.32
HALFSTREET FLOOD WIDTH(FEET) = 9.65
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.20
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.70
STREET FLOW TRAVEL TIME(MIN.) = 2.28   Tc(MIN.) = 9.53
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.128
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.642
SUBAREA AREA(ACRES) = 1.60   SUBAREA RUNOFF(CFS) = 3.25
TOTAL AREA(ACRES) = 1.9   PEAK FLOW RATE(CFS) = 3.82

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) = 11.93
FLOW VELOCITY(FEET/SEC.) = 2.48   DEPTH*VELOCITY(FT*FT/SEC.) = 0.90
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 420.00 FEET.

*****
FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 41.00   DOWNSTREAM(FEET) = 38.00
FLOW LENGTH(FEET) = 300.00   MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.27
ESTIMATED PIPE DIAMETER(INCH) = 18.00   NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.82
PIPE TRAVEL TIME(MIN.) = 0.95   Tc(MIN.) = 10.48
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 720.00 FEET.

*****
FLOW PROCESS FROM NODE 503.10 TO NODE 503.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.942
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6474
SUBAREA AREA(ACRES) = 3.80   SUBAREA RUNOFF(CFS) = 7.27
TOTAL AREA(ACRES) = 5.7   TOTAL RUNOFF(CFS) = 10.86
TC(MIN.) = 10.48

*****
FLOW PROCESS FROM NODE 503.20 TO NODE 503.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.942
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6234
SUBAREA AREA(ACRES) = 0.50   SUBAREA RUNOFF(CFS) = 0.51
TOTAL AREA(ACRES) = 6.2   TOTAL RUNOFF(CFS) = 11.37
TC(MIN.) = 10.48

```



```

*****
FLOW PROCESS FROM NODE      503.00 TO NODE      503.00 IS CODE =   7
-----
>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 28.00    RAIN INTENSITY(INCH/HOUR) = 1.56
TOTAL AREA(ACRES) = 6.20    TOTAL RUNOFF(CFS) = 2.80
*****
FLOW PROCESS FROM NODE      503.00 TO NODE      504.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.50 DOWNSTREAM(FEET) = 38.00
FLOW LENGTH(FEET) = 60.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.53
ESTIMATED PIPE DIAMETER(INCH) = 18.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.80
PIPE TRAVEL TIME(MIN.) = 0.22    Tc(MIN.) = 28.22
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 504.00 = 780.00 FEET.
*****
FLOW PROCESS FROM NODE      504.00 TO NODE      505.00 IS CODE =  51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 36.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 280.00 CHANNEL SLOPE = 0.0054
CHANNEL BASE(FEET) = 2.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.501
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.83
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.01
AVERAGE FLOW DEPTH(FEET) = 0.35 TRAVEL TIME(MIN.) = 1.55
Tc(MIN.) = 29.77
SUBAREA AREA(ACRES) = 0.10 SUBAREA RUNOFF(CFS) = 0.05
AREA-AVERAGE RUNOFF COEFFICIENT = 0.290
TOTAL AREA(ACRES) = 6.3 PEAK FLOW RATE(CFS) = 2.80

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.35 FLOW VELOCITY(FEET/SEC.) = 2.98
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 505.00 = 1060.00 FEET.
*****
FLOW PROCESS FROM NODE      505.10 TO NODE      505.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.501
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3170
SUBAREA AREA(ACRES) = 5.10 SUBAREA RUNOFF(CFS) = 2.68
TOTAL AREA(ACRES) = 11.4 TOTAL RUNOFF(CFS) = 5.42

```

TC(MIN.) = 29.77

FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 36.50 DOWNSTREAM(FEET) = 36.35
FLOW LENGTH(FEET) = 80.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 14.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.03
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.42
PIPE TRAVEL TIME(MIN.) = 0.44 Tc(MIN.) = 30.21
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 506.00 = 1140.00 FEET.

FLOW PROCESS FROM NODE 506.00 TO NODE 506.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 30.21
RAINFALL INTENSITY(INCH/HR) = 1.49
TOTAL STREAM AREA(ACRES) = 11.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.42

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 49.00
DOWNSTREAM ELEVATION(FEET) = 4.00
ELEVATION DIFFERENCE(FEET) = 45.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 3.342
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 100.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.743
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 3.65
TOTAL AREA(ACRES) = 1.10 TOTAL RUNOFF(CFS) = 3.65

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 44.00 DOWNSTREAM(FEET) = 42.60
FLOW LENGTH(FEET) = 180.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 8.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.74
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

```

PIPE-FLOW(CFS) =          3.65
PIPE TRAVEL TIME(MIN.) =  0.63      Tc(MIN.) =    3.97
LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    300.00 FEET.

*****
FLOW PROCESS FROM NODE    302.10 TO NODE    302.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5646
SUBAREA AREA(ACRES) =    1.30      SUBAREA RUNOFF(CFS) =    2.77
TOTAL AREA(ACRES) =    2.4      TOTAL RUNOFF(CFS) =    6.43
TC(MIN.) =    3.97

*****
FLOW PROCESS FROM NODE    506.00 TO NODE    506.00 IS CODE =  1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    3.97
RAINFALL INTENSITY(INCH/HR) =    4.74
TOTAL STREAM AREA(ACRES) =    2.40
PEAK FLOW RATE(CFS) AT CONFLUENCE =    6.43

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/HOUR)  (ACRE)
    1         5.42      30.21      1.486       11.40
    2         6.43      3.97       4.743        2.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)  (INCH/HOUR)
    1         7.14      3.97       4.743
    2         7.44      30.21      1.486

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    7.44      Tc(MIN.) =    30.21
TOTAL AREA(ACRES) =    13.8
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    506.00 =    1140.00 FEET.

*****
FLOW PROCESS FROM NODE    506.00 TO NODE    304.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    36.35  DOWNSTREAM(FEET) =    36.00
FLOW LENGTH(FEET) =    160.00  MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    3.50
ESTIMATED PIPE DIAMETER(INCH) =  24.00      NUMBER OF PIPES =    1

```

```

PIPE-FLOW(CFS) =          7.44
PIPE TRAVEL TIME(MIN.) =    0.76      Tc(MIN.) =    30.97
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    304.00 =    1300.00 FEET.

*****
FLOW PROCESS FROM NODE    304.10 TO NODE    304.00 IS CODE =    81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =    1.463
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3659
SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    0.44
TOTAL AREA(ACRES) =    14.4      TOTAL RUNOFF(CFS) =    7.71
TC(MIN.) =    30.97

*****
FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =    51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    36.00 DOWNSTREAM(FEET) =    33.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    720.00 CHANNEL SLOPE =    0.0042
CHANNEL BASE(FEET) =    7.00 "Z" FACTOR =    2.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) =    2.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =    1.355
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    8.97
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    3.07
AVERAGE FLOW DEPTH(FEET) =    0.38 TRAVEL TIME(MIN.) =    3.91
Tc(MIN.) =    34.88
SUBAREA AREA(ACRES) =    3.10      SUBAREA RUNOFF(CFS) =    2.52
AREA-AVERAGE RUNOFF COEFFICIENT = 0.407
TOTAL AREA(ACRES) =    17.5      PEAK FLOW RATE(CFS) =    9.66

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.39 FLOW VELOCITY(FEET/SEC.) =    3.17
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    305.00 =    2020.00 FEET.

*****
FLOW PROCESS FROM NODE    305.00 TO NODE    306.00 IS CODE =    41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    29.30 DOWNSTREAM(FEET) =    27.80
FLOW LENGTH(FEET) =    364.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 10.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    4.46
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    9.66
PIPE TRAVEL TIME(MIN.) =    1.36      Tc(MIN.) =    36.24
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    306.00 =    2384.00 FEET.

*****
FLOW PROCESS FROM NODE    306.10 TO NODE    306.00 IS CODE =    81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

```

```
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.322
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4579
SUBAREA AREA(ACRES) = 2.00 SUBAREA RUNOFF(CFS) = 2.38
TOTAL AREA(ACRES) = 19.5 TOTAL RUNOFF(CFS) = 11.80
TC(MIN.) = 36.24
=====
```

```
*****
FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 11
=====
```

```
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
=====
```

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	11.80	36.24	1.322	19.50

LONGEST FLOWPATH FROM NODE 500.00 TO NODE 306.00 = 2384.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	4.50	55.36	1.006	24.70

LONGEST FLOWPATH FROM NODE 108.00 TO NODE 306.00 = 1440.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	14.75	36.24	1.322
2	13.48	55.36	1.006

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 14.75 Tc(MIN.) = 36.24
TOTAL AREA(ACRES) = 44.2

```
*****
FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 41
=====
```

```
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
```

ELEVATION DATA: UPSTREAM(FEET) = 27.80 DOWNSTREAM(FEET) = 26.60
FLOW LENGTH(FEET) = 198.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 11.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.79
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 14.75
PIPE TRAVEL TIME(MIN.) = 0.57 Tc(MIN.) = 36.81
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 307.00 = 2582.00 FEET.

```
*****
FLOW PROCESS FROM NODE 307.10 TO NODE 307.00 IS CODE = 81
=====
```

```
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
```

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.309
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3199

```

SUBAREA AREA(ACRES) = 1.30 SUBAREA RUNOFF(CFS) = 1.53
TOTAL AREA(ACRES) = 45.5 TOTAL RUNOFF(CFS) = 19.04
TC(MIN.) = 36.81

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 127.00 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 26.60 DOWNSTREAM(FEET) = 25.50
FLOW LENGTH(FEET) = 198.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 13.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.06
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 19.04
PIPE TRAVEL TIME(MIN.) = 0.54 Tc(MIN.) = 37.36
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 127.00 = 2780.00 FEET.

*****
FLOW PROCESS FROM NODE 125.00 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.296
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3213
SUBAREA AREA(ACRES) = 2.20 SUBAREA RUNOFF(CFS) = 1.00
TOTAL AREA(ACRES) = 47.7 TOTAL RUNOFF(CFS) = 19.86
TC(MIN.) = 37.36

*****
FLOW PROCESS FROM NODE 125.10 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.296
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3544
SUBAREA AREA(ACRES) = 2.90 SUBAREA RUNOFF(CFS) = 3.38
TOTAL AREA(ACRES) = 50.6 TOTAL RUNOFF(CFS) = 23.25
TC(MIN.) = 37.36

*****
FLOW PROCESS FROM NODE 126.00 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.296
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3640
SUBAREA AREA(ACRES) = 0.90 SUBAREA RUNOFF(CFS) = 1.05
TOTAL AREA(ACRES) = 51.5 TOTAL RUNOFF(CFS) = 24.30
TC(MIN.) = 37.36

*****
FLOW PROCESS FROM NODE 127.00 TO NODE 128.00 IS CODE = 41

```

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	25.50	DOWNSTREAM(FEET) =	25.32
FLOW LENGTH(FEET) =	80.00	MANNING'S N =	0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS	18.5 INCHES		
PIPE-FLOW VELOCITY(FEET/SEC.) =	4.71		
GIVEN PIPE DIAMETER(INCH) =	60.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	24.30		
PIPE TRAVEL TIME(MIN.) =	0.28	Tc(MIN.) =	37.64
LONGEST FLOWPATH FROM NODE	500.00	TO NODE	128.00 = 2860.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	51.5	TC(MIN.) =	37.64
PEAK FLOW RATE(CFS)	=	24.30		

=====

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1532

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* Ocean Kamp - Rational Method Northerly area nodes 600-700 *
* December 13, 2019 *
* 10-year analysis *

FILE NAME: ZNE10.DAT
TIME/DATE OF STUDY: 09:47 12/19/2019

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 10.00
6-HOUR DURATION PRECIPITATION (INCHES) = 1.800
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL
 HALF- CROWN TO STREET-CROSSFALL: CURB GUTTER-GEOMETRIES: MANNING
 WIDTH CROSSFALL IN- / OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR
NO. (FT) (FT) SIDE / SIDE/ WAY (FT) (FT) (FT) (FT) (n)
=== =====
1 30.0 20.0 0.018/0.018/0.020 0.67 2.00 0.0313 0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 600.00 TO NODE 601.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6300
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 51.00
DOWNSTREAM ELEVATION(FEET) = 49.80
ELEVATION DIFFERENCE(FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.821
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN


```

      THE MAXIMUM OVERLAND FLOW LENGTH =      65.00
      (Reference: Table 3-1B of Hydrology Manual)
      THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
      10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.882
      SUBAREA RUNOFF(CFS) =      0.73
      TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.73

*****
FLOW PROCESS FROM NODE      601.00 TO NODE      602.00 IS CODE =  61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) =   49.80  DOWNSTREAM ELEVATION(FEET) =   44.80
STREET LENGTH(FEET) =   600.00   CURB HEIGHT(INCHES) =    6.0
STREET HALFWIDTH(FEET) =  16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
INSIDE STREET CROSSFALL(DECIMAL) =   0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =   0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
STREET PARKWAY CROSSFALL(DECIMAL) =   0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =   0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      6.46
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FT) =   0.36
HALFSTREET FLOOD WIDTH(FT) =  11.59
AVERAGE FLOW VELOCITY(FT/SEC.) =   2.21
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =   0.79
STREET FLOW TRAVEL TIME(MIN.) =   4.52   Tc(MIN.) =  11.34
10 YEAR RAINFALL INTENSITY(INCH/HOUR) =   2.797
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT =   0.601
SUBAREA AREA(ACRES) =   6.70   SUBAREA RUNOFF(CFS) =  11.24
TOTAL AREA(ACRES) =   7.0   PEAK FLOW RATE(CFS) =  11.77

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FT) = 0.42   HALFSTREET FLOOD WIDTH(FT) =  14.79
FLOW VELOCITY(FT/SEC.) =  2.55   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
LONGEST FLOWPATH FROM NODE      600.00 TO NODE      602.00 =  720.00 FEET.

*****
FLOW PROCESS FROM NODE      602.00 TO NODE      603.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) =   2.797
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5845
SUBAREA AREA(ACRES) =   0.50   SUBAREA RUNOFF(CFS) =   0.49
TOTAL AREA(ACRES) =   7.5   TOTAL RUNOFF(CFS) =  12.26
TC(MIN.) =  11.34

*****
FLOW PROCESS FROM NODE      602.00 TO NODE      603.00 IS CODE =   7
-----

```

```

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 60.00    RAIN INTENSITY(INCH/HOUR) = 0.95
TOTAL AREA(ACRES) = 7.50    TOTAL RUNOFF(CFS) = 1.80

*****
FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 81
-----

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 0.955
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3007
SUBAREA AREA(ACRES) = 7.50    SUBAREA RUNOFF(CFS) = 2.51
TOTAL AREA(ACRES) = 15.0    TOTAL RUNOFF(CFS) = 4.31
TC(MIN.) = 60.00

*****
FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 7
-----

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 40.00    RAIN INTENSITY(INCH/HOUR) = 1.24
TOTAL AREA(ACRES) = 15.00    TOTAL RUNOFF(CFS) = 10.00

*****
FLOW PROCESS FROM NODE 604.00 TO NODE 605.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.10    DOWNSTREAM(FEET) = 34.90
FLOW LENGTH(FEET) = 210.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 12.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.42
GIVEN PIPE DIAMETER(INCH) = 30.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 10.00
PIPE TRAVEL TIME(MIN.) = 0.65    Tc(MIN.) = 40.65
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 605.00 = 930.00 FEET.

*****
FLOW PROCESS FROM NODE 605.00 TO NODE 606.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.90    DOWNSTREAM(FEET) = 30.80
FLOW LENGTH(FEET) = 840.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 12.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.11
GIVEN PIPE DIAMETER(INCH) = 30.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 10.00
PIPE TRAVEL TIME(MIN.) = 2.74    Tc(MIN.) = 43.38
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 606.00 = 1770.00 FEET.

*****
FLOW PROCESS FROM NODE 605.00 TO NODE 606.00 IS CODE = 10
-----

>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

```

FLOW PROCESS FROM NODE 730.00 TO NODE 731.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 120.00
UPSTREAM ELEVATION (FEET) = 50.60
DOWNSTREAM ELEVATION (FEET) = 49.40
ELEVATION DIFFERENCE (FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 7.256
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 65.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN T_c CALCULATION!
10 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.730
SUBAREA RUNOFF (CFS) = 0.45
TOTAL AREA (ACRES) = 0.20 TOTAL RUNOFF (CFS) = 0.45

FLOW PROCESS FROM NODE 731.00 TO NODE 732.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION (FEET) = 49.40 DOWNSTREAM ELEVATION (FEET) = 46.00
STREET LENGTH (FEET) = 380.00 CURB HEIGHT (INCHES) = 6.0
STREET HALFWIDTH (FEET) = 16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 10.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL (DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section (curb-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 4.34
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.38
HALFSTREET FLOOD WIDTH (FEET) = 12.84
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.46
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 0.94
STREET FLOW TRAVEL TIME (MIN.) = 2.58 T_c (MIN.) = 9.84
10 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.065
*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.600
SUBAREA AREA (ACRES) = 4.20 SUBAREA RUNOFF (CFS) = 7.72
TOTAL AREA (ACRES) = 4.4 PEAK FLOW RATE (CFS) = 8.09

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.45 HALFSTREET FLOOD WIDTH (FEET) = 16.00
FLOW VELOCITY (FEET/SEC.) = 2.79 DEPTH*VELOCITY (FT*FT/SEC.) = 1.24
LONGEST FLOWPATH FROM NODE 730.00 TO NODE 732.00 = 500.00 FEET.

```

FLOW PROCESS FROM NODE      732.00 TO NODE      732.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.065
    *USER SPECIFIED(SUBAREA):
    USER-SPECIFIED RUNOFF COEFFICIENT = .6300
    S.C.S. CURVE NUMBER (AMC II) = 0
    AREA-AVERAGE RUNOFF COEFFICIENT = 0.6185
    SUBAREA AREA(ACRES) = 7.10 SUBAREA RUNOFF(CFS) = 13.71
    TOTAL AREA(ACRES) = 11.5 TOTAL RUNOFF(CFS) = 21.80
    TC(MIN.) = 9.84

*****
FLOW PROCESS FROM NODE      732.00 TO NODE      733.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
    ELEVATION DATA: UPSTREAM(FEET) = 41.00 DOWNSTREAM(FEET) = 36.00
    FLOW LENGTH(FEET) = 480.00 MANNING'S N = 0.013
    DEPTH OF FLOW IN 24.0 INCH PIPE IS 19.6 INCHES
    PIPE-FLOW VELOCITY(FEET/SEC.) = 7.95
    ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
    PIPE-FLOW(CFS) = 21.80
    PIPE TRAVEL TIME(MIN.) = 1.01 Tc(MIN.) = 10.84
    LONGEST FLOWPATH FROM NODE 730.00 TO NODE 733.00 = 980.00 FEET.

*****
FLOW PROCESS FROM NODE      733.10 TO NODE      733.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.879
    *USER SPECIFIED(SUBAREA):
    USER-SPECIFIED RUNOFF COEFFICIENT = .6300
    S.C.S. CURVE NUMBER (AMC II) = 0
    AREA-AVERAGE RUNOFF COEFFICIENT = 0.6226
    SUBAREA AREA(ACRES) = 6.40 SUBAREA RUNOFF(CFS) = 11.61
    TOTAL AREA(ACRES) = 17.9 TOTAL RUNOFF(CFS) = 32.08
    TC(MIN.) = 10.84

*****
FLOW PROCESS FROM NODE      733.20 TO NODE      733.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.879
    *USER SPECIFIED(SUBAREA):
    USER-SPECIFIED RUNOFF COEFFICIENT = .3500
    S.C.S. CURVE NUMBER (AMC II) = 0
    AREA-AVERAGE RUNOFF COEFFICIENT = 0.6096
    SUBAREA AREA(ACRES) = 0.90 SUBAREA RUNOFF(CFS) = 0.91
    TOTAL AREA(ACRES) = 18.8 TOTAL RUNOFF(CFS) = 32.99
    TC(MIN.) = 10.84

*****
FLOW PROCESS FROM NODE      733.00 TO NODE      715.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.879
    *USER SPECIFIED(SUBAREA):

```

```

USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5916
SUBAREA AREA(ACRES) = 1.40 SUBAREA RUNOFF(CFS) = 1.41
TOTAL AREA(ACRES) = 20.2 TOTAL RUNOFF(CFS) = 34.40
TC(MIN.) = 10.84

*****
FLOW PROCESS FROM NODE 733.00 TO NODE 715.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 10.84
RAINFALL INTENSITY(INCH/HR) = 2.88
TOTAL STREAM AREA(ACRES) = 20.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 34.40

*****
FLOW PROCESS FROM NODE 710.00 TO NODE 711.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 49.00
DOWNSTREAM ELEVATION(FEET) = 47.80
ELEVATION DIFFERENCE(FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.577
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 60.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.420
SUBAREA RUNOFF(CFS) = 2.48
TOTAL AREA(ACRES) = 0.80 TOTAL RUNOFF(CFS) = 2.48

*****
FLOW PROCESS FROM NODE 711.00 TO NODE 712.00 IS CODE = 61
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 47.80 DOWNSTREAM ELEVATION(FEET) = 46.10
STREET LENGTH(FEET) = 300.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.16
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.35
HALFSTREET FLOOD WIDTH(FEET) = 11.43

```

```

    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.81
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.64
    STREET FLOW TRAVEL TIME(MIN.) =    2.76    Tc(MIN.) =    8.34
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =    3.410
    *USER SPECIFIED(SUBAREA):
    USER-SPECIFIED RUNOFF COEFFICIENT = .6500
    S.C.S. CURVE NUMBER (AMC II) =    0
    AREA-AVERAGE RUNOFF COEFFICIENT =    0.663
    SUBAREA AREA(ACRES) =    2.40    SUBAREA RUNOFF(CFS) =    5.32
    TOTAL AREA(ACRES) =    3.2    PEAK FLOW RATE(CFS) =    7.23

    END OF SUBAREA STREET FLOW HYDRAULICS:
    DEPTH(FEET) = 0.39    HALFSTREET FLOOD WIDTH(FEET) =    13.07
    FLOW VELOCITY(FEET/SEC.) =    1.98    DEPTH*VELOCITY(FT*FT/SEC.) =    0.77
    LONGEST FLOWPATH FROM NODE    710.00 TO NODE    712.00 =    420.00 FEET.

*****
    FLOW PROCESS FROM NODE    712.00 TO NODE    713.00 IS CODE =    41
-----
    >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
    >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
    ELEVATION DATA: UPSTREAM(FEET) =    41.40    DOWNSTREAM(FEET) =    40.40
    FLOW LENGTH(FEET) =    250.00    MANNING'S N =    0.013
    DEPTH OF FLOW IN 24.0 INCH PIPE IS 12.5 INCHES
    PIPE-FLOW VELOCITY(FEET/SEC.) =    4.39
    GIVEN PIPE DIAMETER(INCH) =    24.00    NUMBER OF PIPES =    1
    PIPE-FLOW(CFS) =    7.23
    PIPE TRAVEL TIME(MIN.) =    0.95    Tc(MIN.) =    9.29
    LONGEST FLOWPATH FROM NODE    710.00 TO NODE    713.00 =    670.00 FEET.

*****
    FLOW PROCESS FROM NODE    713.10 TO NODE    713.00 IS CODE =    81
-----
    >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =    3.181
    *USER SPECIFIED(SUBAREA):
    USER-SPECIFIED RUNOFF COEFFICIENT = .6500
    S.C.S. CURVE NUMBER (AMC II) =    0
    AREA-AVERAGE RUNOFF COEFFICIENT =    0.6571
    SUBAREA AREA(ACRES) =    2.40    SUBAREA RUNOFF(CFS) =    4.96
    TOTAL AREA(ACRES) =    5.6    TOTAL RUNOFF(CFS) =    11.71
    TC(MIN.) =    9.29

*****
    FLOW PROCESS FROM NODE    713.00 TO NODE    714.00 IS CODE =    41
-----
    >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
    >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
    ELEVATION DATA: UPSTREAM(FEET) =    40.40    DOWNSTREAM(FEET) =    36.10
    FLOW LENGTH(FEET) =    620.00    MANNING'S N =    0.013
    DEPTH OF FLOW IN 30.0 INCH PIPE IS 12.5 INCHES
    PIPE-FLOW VELOCITY(FEET/SEC.) =    6.07
    GIVEN PIPE DIAMETER(INCH) =    30.00    NUMBER OF PIPES =    1
    PIPE-FLOW(CFS) =    11.71
    PIPE TRAVEL TIME(MIN.) =    1.70    Tc(MIN.) =    10.99
    LONGEST FLOWPATH FROM NODE    710.00 TO NODE    714.00 =    1290.00 FEET.

*****
    FLOW PROCESS FROM NODE    714.10 TO NODE    714.00 IS CODE =    81
-----

```

```

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.854
    *USER SPECIFIED(SUBAREA) :
    USER-SPECIFIED RUNOFF COEFFICIENT = .6500
    S.C.S. CURVE NUMBER (AMC II) = 0
    AREA-AVERAGE RUNOFF COEFFICIENT = 0.6531
    SUBAREA AREA(ACRES) = 7.30 SUBAREA RUNOFF(CFS) = 13.54
    TOTAL AREA(ACRES) = 12.9 TOTAL RUNOFF(CFS) = 24.04
    TC(MIN.) = 10.99

*****
    FLOW PROCESS FROM NODE 714.00 TO NODE 715.00 IS CODE = 1
-----

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
    TOTAL NUMBER OF STREAMS = 2
    CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
    TIME OF CONCENTRATION(MIN.) = 10.99
    RAINFALL INTENSITY(INCH/HR) = 2.85
    TOTAL STREAM AREA(ACRES) = 12.90
    PEAK FLOW RATE(CFS) AT CONFLUENCE = 24.04

    ** CONFLUENCE DATA **
    STREAM RUNOFF Tc INTENSITY AREA
    NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
        1 34.40 10.84 2.879 20.20
        2 24.04 10.99 2.854 12.90

    RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
    CONFLUENCE FORMULA USED FOR 2 STREAMS.

    ** PEAK FLOW RATE TABLE **
    STREAM RUNOFF Tc INTENSITY
    NUMBER (CFS) (MIN.) (INCH/HOUR)
        1 58.12 10.84 2.879
        2 58.15 10.99 2.854

    COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
    PEAK FLOW RATE(CFS) = 58.15 Tc(MIN.) = 10.99
    TOTAL AREA(ACRES) = 33.1
    LONGEST FLOWPATH FROM NODE 710.00 TO NODE 715.00 = 1290.00 FEET.

*****
    FLOW PROCESS FROM NODE 715.00 TO NODE 716.00 IS CODE = 7
-----

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
    USER-SPECIFIED VALUES ARE AS FOLLOWS:
    TC(MIN) = 45.00 RAIN INTENSITY(INCH/HOUR) = 1.15
    TOTAL AREA(ACRES) = 33.10 TOTAL RUNOFF(CFS) = 19.00

*****
    FLOW PROCESS FROM NODE 716.00 TO NODE 606.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
    ELEVATION DATA: UPSTREAM(FEET) = 31.50 DOWNSTREAM(FEET) = 30.80
    FLOW LENGTH(FEET) = 65.00 MANNING'S N = 0.013
    DEPTH OF FLOW IN 36.0 INCH PIPE IS 13.3 INCHES
    PIPE-FLOW VELOCITY(FEET/SEC.) = 8.04

```

```

GIVEN PIPE DIAMETER(INCH) = 36.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 19.00
PIPE TRAVEL TIME(MIN.) = 0.13    Tc(MIN.) = 45.13
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 606.00 = 1355.00 FEET.

*****
FLOW PROCESS FROM NODE 716.00 TO NODE 606.00 IS CODE = 11
-----
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
=====

** MAIN STREAM CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)  (ACRE)
1           19.00      45.13    1.147        33.10
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 606.00 = 1355.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)  (ACRE)
1           10.00      43.38    1.177        15.00
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 606.00 = 1770.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)
1           28.26      43.38    1.177
2           28.75      45.13    1.147

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 28.75    Tc(MIN.) = 45.13
TOTAL AREA(ACRES) = 48.1

*****
FLOW PROCESS FROM NODE 606.00 TO NODE 607.00 IS CODE = 41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 30.70    DOWNSTREAM(FEET) = 29.40
FLOW LENGTH(FEET) = 220.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 17.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.11
GIVEN PIPE DIAMETER(INCH) = 48.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 28.75
PIPE TRAVEL TIME(MIN.) = 0.52    Tc(MIN.) = 45.65
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 607.00 = 1990.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 48.1    TC(MIN.) = 45.65
PEAK FLOW RATE(CFS) = 28.75
=====
END OF RATIONAL METHOD ANALYSIS

```


B. 2-Year Rational Method

3a-zsw2

3b-zne2

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1532

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* Ocean Kamp - Rational Method - SW Area *
* December 16, 2019 *
* 2-year analysis *

FILE NAME: ZSW2.DAT
TIME/DATE OF STUDY: 09:46 12/19/2019

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 2.00
6-HOUR DURATION PRECIPITATION (INCHES) = 1.250
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

	HALF- WIDTH	CROWN TO CROSSFALL	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT	GUTTER-GEOMETRIES: WIDTH	MANNING LIP	HIKE	FACTOR
NO.	(FT)	(FT)		(FT)	(FT)	(FT)	(FT)	(n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED (SUBAREA) :

USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 48.00
DOWNSTREAM ELEVATION(FEET) = 47.50
ELEVATION DIFFERENCE(FEET) = 0.50
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 7.216
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

```

      THE MAXIMUM OVERLAND FLOW LENGTH =      50.00
      (Reference: Table 3-1B of Hydrology Manual)
      THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.599
      SUBAREA RUNOFF(CFS) =      0.51
      TOTAL AREA(ACRES) =      0.30      TOTAL RUNOFF(CFS) =      0.51

*****
FLOW PROCESS FROM NODE      101.00 TO NODE      102.00 IS CODE =  51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      47.50  DOWNSTREAM(FEET) =      46.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    270.00  CHANNEL SLOPE =    0.0056
CHANNEL BASE(FEET) =    10.00  "Z" FACTOR =    10.000
MANNING'S FACTOR = 0.020  MAXIMUM DEPTH(FEET) =    2.00
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.965
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.21
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    1.15
AVERAGE FLOW DEPTH(FEET) =    0.10  TRAVEL TIME(MIN.) =    3.92
Tc(MIN.) =    11.13
SUBAREA AREA(ACRES) =    1.10      SUBAREA RUNOFF(CFS) =    1.41
AREA-AVERAGE RUNOFF COEFFICIENT =  0.650
TOTAL AREA(ACRES) =    1.4      PEAK FLOW RATE(CFS) =      1.79

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.12  FLOW VELOCITY(FEET/SEC.) =    1.27
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    390.00 FEET.

*****
FLOW PROCESS FROM NODE      102.00 TO NODE      103.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      42.00  DOWNSTREAM(FEET) =      38.00
FLOW LENGTH(FEET) =    420.00  MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    4.19
ESTIMATED PIPE DIAMETER(INCH) =    18.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =      1.79
PIPE TRAVEL TIME(MIN.) =    1.67  Tc(MIN.) =    12.80
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    810.00 FEET.

*****
FLOW PROCESS FROM NODE      103.10 TO NODE      103.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.796
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6167
SUBAREA AREA(ACRES) =    2.80  SUBAREA RUNOFF(CFS) =    3.02
TOTAL AREA(ACRES) =    4.2  TOTAL RUNOFF(CFS) =    4.65
TC(MIN.) =    12.80

```

```

*****
FLOW PROCESS FROM NODE      103.20 TO NODE      103.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.796
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6097
SUBAREA AREA(ACRES) = 3.00 SUBAREA RUNOFF(CFS) = 3.23
TOTAL AREA(ACRES) = 7.2 TOTAL RUNOFF(CFS) = 7.88
TC(MIN.) = 12.80

*****
FLOW PROCESS FROM NODE      103.00 TO NODE      107.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(Feet) = 38.00 DOWNSTREAM(Feet) = 32.60
FLOW LENGTH(Feet) = 350.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.4 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) = 7.42
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.88
PIPE TRAVEL TIME(MIN.) = 0.79 Tc(MIN.) = 13.59
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 1160.00 FEET.

*****
FLOW PROCESS FROM NODE      107.10 TO NODE      107.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.728
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5888
SUBAREA AREA(ACRES) = 1.70 SUBAREA RUNOFF(CFS) = 1.47
TOTAL AREA(ACRES) = 8.9 TOTAL RUNOFF(CFS) = 9.06
TC(MIN.) = 13.59

*****
FLOW PROCESS FROM NODE      107.20 TO NODE      107.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.728
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6064
SUBAREA AREA(ACRES) = 3.60 SUBAREA RUNOFF(CFS) = 4.04
TOTAL AREA(ACRES) = 12.5 TOTAL RUNOFF(CFS) = 13.10
TC(MIN.) = 13.59

*****
FLOW PROCESS FROM NODE      107.00 TO NODE      107.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2

```

```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.59
RAINFALL INTENSITY(INCH/HR) = 1.73
TOTAL STREAM AREA(ACRES) = 12.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 13.10

*****
FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 46.50
DOWNSTREAM ELEVATION(FEET) = 45.50
ELEVATION DIFFERENCE(FEET) = 1.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.320
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH = 56.67
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.293
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 0.79
TOTAL AREA(ACRES) = 0.30 TOTAL RUNOFF(CFS) = 0.79

*****
FLOW PROCESS FROM NODE 109.00 TO NODE 110.00 IS CODE = 51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 45.50 DOWNSTREAM(FEET) = 42.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 370.00 CHANNEL SLOPE = 0.0081
CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 5.000
MANNING'S FACTOR = 0.013 MAXIMUM DEPTH(FEET) = 2.00
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.912
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.18
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.56
AVERAGE FLOW DEPTH(FEET) = 0.27 TRAVEL TIME(MIN.) = 1.73
Tc(MIN.) = 6.05
SUBAREA AREA(ACRES) = 2.90 SUBAREA RUNOFF(CFS) = 6.76
AREA-AVERAGE RUNOFF COEFFICIENT = 0.800
TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 7.46

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.36 FLOW VELOCITY(FEET/SEC.) = 4.26
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 110.00 = 490.00 FEET.

*****
FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 36.00
FLOW LENGTH(FEET) = 360.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 12.5 INCHES

```

```

PIPE-FLOW VELOCITY(FEET/SEC.) = 4.98
ESTIMATED PIPE DIAMETER(INCH) = 21.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.46
PIPE TRAVEL TIME(MIN.) = 1.20    Tc(MIN.) = 7.25
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 111.00 = 850.00 FEET.

*****
FLOW PROCESS FROM NODE 111.10 TO NODE 111.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.591
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7508
SUBAREA AREA(ACRES) = 3.10    SUBAREA RUNOFF(CFS) = 5.62
TOTAL AREA(ACRES) = 6.3    TOTAL RUNOFF(CFS) = 12.25
TC(MIN.) = 7.25

*****
FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.00    DOWNSTREAM(FEET) = 34.20
FLOW LENGTH(FEET) = 265.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 17.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.87
ESTIMATED PIPE DIAMETER(INCH) = 21.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.25
PIPE TRAVEL TIME(MIN.) = 0.75    Tc(MIN.) = 8.01
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 112.00 = 1115.00 FEET.

*****
FLOW PROCESS FROM NODE 112.10 TO NODE 112.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.431
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7405
SUBAREA AREA(ACRES) = 1.60    SUBAREA RUNOFF(CFS) = 2.72
TOTAL AREA(ACRES) = 7.9    TOTAL RUNOFF(CFS) = 14.22
TC(MIN.) = 8.01

*****
FLOW PROCESS FROM NODE 112.00 TO NODE 107.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.20    DOWNSTREAM(FEET) = 32.60
FLOW LENGTH(FEET) = 130.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 14.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.79
ESTIMATED PIPE DIAMETER(INCH) = 21.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 14.22
PIPE TRAVEL TIME(MIN.) = 0.28    Tc(MIN.) = 8.28
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 107.00 = 1245.00 FEET.

```

```
*****
FLOW PROCESS FROM NODE      112.00 TO NODE      107.00 IS CODE =   1
-----
```

```
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
```

```
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 8.28
RAINFALL INTENSITY(INCH/HR) = 2.38
TOTAL STREAM AREA(ACRES) = 7.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 14.22
```

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	13.10	13.59	1.728	12.50
2	14.22	8.28	2.378	7.90

```
RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.
```

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	22.21	8.28	2.378
2	23.44	13.59	1.728

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

```
PEAK FLOW RATE(CFS) = 23.44 Tc(MIN.) = 13.59
TOTAL AREA(ACRES) = 20.4
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 107.00 = 1245.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      107.00 TO NODE      123.00 IS CODE =  51
-----
```

```
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
```

```
ELEVATION DATA: UPSTREAM(FEET) = 32.80 DOWNSTREAM(FEET) = 32.30
CHANNEL LENGTH THRU SUBAREA(FEET) = 50.00 CHANNEL SLOPE = 0.0100
CHANNEL BASE(FEET) = 30.00 "Z" FACTOR = 20.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.696
```

*USER SPECIFIED(SUBAREA):

```
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 23.76
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.07
AVERAGE FLOW DEPTH(FEET) = 0.32 TRAVEL TIME(MIN.) = 0.40
Tc(MIN.) = 13.99
SUBAREA AREA(ACRES) = 1.10 SUBAREA RUNOFF(CFS) = 0.65
AREA-AVERAGE RUNOFF COEFFICIENT = 0.643
TOTAL AREA(ACRES) = 21.5 PEAK FLOW RATE(CFS) = 23.44
```

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

```
DEPTH(FEET) = 0.32 FLOW VELOCITY(FEET/SEC.) = 2.04
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 123.00 = 1295.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      107.00 TO NODE      123.00 IS CODE =   1
-----
```

```

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.99
RAINFALL INTENSITY(INCH/HR) = 1.70
TOTAL STREAM AREA(ACRES) = 21.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 23.44

*****
FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 150.00
UPSTREAM ELEVATION(FEET) = 48.90
DOWNSTREAM ELEVATION(FEET) = 47.80
ELEVATION DIFFERENCE(FEET) = 1.10
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.641
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH = 54.67
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
          2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.742
SUBAREA RUNOFF(CFS) = 0.89
TOTAL AREA(ACRES) = 0.50 TOTAL RUNOFF(CFS) = 0.89

*****
FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 47.80 DOWNSTREAM ELEVATION(FEET) = 41.60
STREET LENGTH(FEET) = 570.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 12.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.48
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.27
HALFSTREET FLOOD WIDTH(FEET) = 7.12
AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.99
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.53
STREET FLOW TRAVEL TIME(MIN.) = 4.78 Tc(MIN.) = 11.42
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.933
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.608
SUBAREA AREA(ACRES) = 2.70 SUBAREA RUNOFF(CFS) = 3.13
TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 3.76

```



```

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.30    HALFSTREET FLOOD WIDTH(FEET) = 8.68
FLOW VELOCITY(FEET/SEC.) = 2.16    DEPTH*VELOCITY(FT*FT/SEC.) = 0.65
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 122.00 = 720.00 FEET.

*****
FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.70 DOWNSTREAM(FEET) = 32.60
FLOW LENGTH(FEET) = 140.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.08
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.76
PIPE TRAVEL TIME(MIN.) = 0.38 Tc(MIN.) = 11.80
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 123.00 = 860.00 FEET.

*****
FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 11.80
RAINFALL INTENSITY(INCH/HR) = 1.89
TOTAL STREAM AREA(ACRES) = 3.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.76

** CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 23.44 13.99 1.696 21.50
2 3.76 11.80 1.892 3.20

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM RUNOFF Tc INTENSITY
NUMBER (CFS) (MIN.) (INCH/HOUR)
1 24.76 11.80 1.892
2 26.81 13.99 1.696

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 26.81 Tc(MIN.) = 13.99
TOTAL AREA(ACRES) = 24.7
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 123.00 = 1295.00 FEET.

*****
FLOW PROCESS FROM NODE 123.00 TO NODE 123.00 IS CODE = 7
-----
>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 60.00 RAIN INTENSITY(INCH/HOUR) = 0.66
TOTAL AREA(ACRES) = 24.70 TOTAL RUNOFF(CFS) = 3.00

```

```

*****
FLOW PROCESS FROM NODE      123.00 TO NODE      306.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    28.60  DOWNSTREAM(FEET) =    25.60
FLOW LENGTH(FEET) =   145.00  MANNING'S N =  0.013
DEPTH OF FLOW IN  36.0 INCH PIPE IS  4.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    5.92
GIVEN PIPE DIAMETER(INCH) =   36.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =          3.00
PIPE TRAVEL TIME(MIN.) =    0.41  Tc(MIN.) =   60.41
LONGEST FLOWPATH FROM NODE    108.00 TO NODE    306.00 =   1440.00 FEET.

*****
FLOW PROCESS FROM NODE      123.00 TO NODE      306.00 IS CODE =  10
-----
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
=====

*****
FLOW PROCESS FROM NODE      500.00 TO NODE      501.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =  0
INITIAL SUBAREA FLOW-LENGTH(FEET) =  120.00
UPSTREAM ELEVATION(FEET) =    51.00
DOWNSTREAM ELEVATION(FEET) =    49.80
ELEVATION DIFFERENCE(FEET) =    1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.256
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
         THE MAXIMUM OVERLAND FLOW LENGTH =   65.00
         (Reference: Table 3-1B of Hydrology Manual)
         THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
         2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.590
SUBAREA RUNOFF(CFS) =          0.47
TOTAL AREA(ACRES) =    0.30  TOTAL RUNOFF(CFS) =    0.47

*****
FLOW PROCESS FROM NODE      501.00 TO NODE      502.00 IS CODE =  61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) =   49.30  DOWNSTREAM ELEVATION(FEET) =   46.30
STREET LENGTH(FEET) =   300.00  CURB HEIGHT(INCHES) =    6.0
STREET HALFWIDTH(FEET) =   18.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   13.00
INSIDE STREET CROSSFALL(DECIMAL) =   0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =   0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
STREET PARKWAY CROSSFALL(DECIMAL) =   0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =   0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    1.58

```

```

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.29
HALFSTREET FLOOD WIDTH(FEET) = 8.17
AVERAGE FLOW VELOCITY(FT/SEC.) = 2.02
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.58
STREET FLOW TRAVEL TIME(MIN.) = 2.48   Tc(MIN.) = 9.74
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.143
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.642
SUBAREA AREA(ACRES) = 1.60   SUBAREA RUNOFF(CFS) = 2.23
TOTAL AREA(ACRES) = 1.9   PEAK FLOW RATE(CFS) = 2.61

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) = 10.15
FLOW VELOCITY(FT/SEC.) = 2.27   DEPTH*VELOCITY(FT*FT/SEC.) = 0.75
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 502.00 = 420.00 FEET.

*****
FLOW PROCESS FROM NODE 502.00 TO NODE 503.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 41.00   DOWNSTREAM(FEET) = 38.00
FLOW LENGTH(FEET) = 300.00   MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.3 INCHES
PIPE-FLOW VELOCITY(FT/SEC.) = 4.75
ESTIMATED PIPE DIAMETER(INCH) = 18.00   NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.61
PIPE TRAVEL TIME(MIN.) = 1.05   Tc(MIN.) = 10.79
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 503.00 = 720.00 FEET.

*****
FLOW PROCESS FROM NODE 503.10 TO NODE 503.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.005
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6474
SUBAREA AREA(ACRES) = 3.80   SUBAREA RUNOFF(CFS) = 4.95
TOTAL AREA(ACRES) = 5.7   TOTAL RUNOFF(CFS) = 7.40
TC(MIN.) = 10.79

*****
FLOW PROCESS FROM NODE 503.20 TO NODE 503.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.005
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6234
SUBAREA AREA(ACRES) = 0.50   SUBAREA RUNOFF(CFS) = 0.35
TOTAL AREA(ACRES) = 6.2   TOTAL RUNOFF(CFS) = 7.75
TC(MIN.) = 10.79

```

```

*****
FLOW PROCESS FROM NODE      503.00 TO NODE      503.00 IS CODE =   7
-----
>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 45.00    RAIN INTENSITY(INCH/HOUR) = 0.80
TOTAL AREA(ACRES) = 6.20    TOTAL RUNOFF(CFS) = 1.50

*****
FLOW PROCESS FROM NODE      503.00 TO NODE      504.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.50 DOWNSTREAM(FEET) = 38.00
FLOW LENGTH(FEET) = 60.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.80
ESTIMATED PIPE DIAMETER(INCH) = 18.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.50
PIPE TRAVEL TIME(MIN.) = 0.26    Tc(MIN.) = 45.26
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 504.00 = 780.00 FEET.

*****
FLOW PROCESS FROM NODE      504.00 TO NODE      505.00 IS CODE =  51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 36.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 280.00 CHANNEL SLOPE = 0.0054
CHANNEL BASE(FEET) = 2.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 0.774
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.51
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.46
AVERAGE FLOW DEPTH(FEET) = 0.25 TRAVEL TIME(MIN.) = 1.90
Tc(MIN.) = 47.16
SUBAREA AREA(ACRES) = 0.10 SUBAREA RUNOFF(CFS) = 0.03
AREA-AVERAGE RUNOFF COEFFICIENT = 0.304
TOTAL AREA(ACRES) = 6.3 PEAK FLOW RATE(CFS) = 1.50

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.25 FLOW VELOCITY(FEET/SEC.) = 2.43
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 505.00 = 1060.00 FEET.

*****
FLOW PROCESS FROM NODE      505.10 TO NODE      505.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 0.774
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3245
SUBAREA AREA(ACRES) = 5.10 SUBAREA RUNOFF(CFS) = 1.38
TOTAL AREA(ACRES) = 11.4 TOTAL RUNOFF(CFS) = 2.86

```

TC(MIN.) = 47.16

FLOW PROCESS FROM NODE 505.00 TO NODE 506.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 36.50 DOWNSTREAM(FEET) = 36.35
FLOW LENGTH(FEET) = 80.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.61
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.86
PIPE TRAVEL TIME(MIN.) = 0.51 Tc(MIN.) = 47.67
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 506.00 = 1140.00 FEET.

FLOW PROCESS FROM NODE 506.00 TO NODE 506.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 47.67
RAINFALL INTENSITY(INCH/HR) = 0.77
TOTAL STREAM AREA(ACRES) = 11.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.86

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 49.00
DOWNSTREAM ELEVATION(FEET) = 4.00
ELEVATION DIFFERENCE(FEET) = 45.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 3.342
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 100.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.293
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 2.54
TOTAL AREA(ACRES) = 1.10 TOTAL RUNOFF(CFS) = 2.54

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 44.00 DOWNSTREAM(FEET) = 42.60
FLOW LENGTH(FEET) = 180.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.31
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

```

PIPE-FLOW(CFS) =          2.54
PIPE TRAVEL TIME(MIN.) =  0.70    Tc(MIN.) =    4.04
LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    300.00 FEET.

*****
FLOW PROCESS FROM NODE    302.10 TO NODE    302.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.293
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5646
SUBAREA AREA(ACRES) =    1.30    SUBAREA RUNOFF(CFS) =    1.93
TOTAL AREA(ACRES) =    2.4    TOTAL RUNOFF(CFS) =    4.46
TC(MIN.) =    4.04

*****
FLOW PROCESS FROM NODE    506.00 TO NODE    506.00 IS CODE =  1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    4.04
RAINFALL INTENSITY(INCH/HR) =    3.29
TOTAL STREAM AREA(ACRES) =    2.40
PEAK FLOW RATE(CFS) AT CONFLUENCE =    4.46

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)    (INCH/HOUR)    (ACRE)
    1         2.86      47.67         0.769         11.40
    2         4.46      4.04         3.293          2.40

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)    (INCH/HOUR)
    1         4.71      4.04         3.293
    2         3.91      47.67         0.769

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    4.71    Tc(MIN.) =    4.04
TOTAL AREA(ACRES) =    13.8
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    506.00 =    1140.00 FEET.

*****
FLOW PROCESS FROM NODE    506.00 TO NODE    304.00 IS CODE =  31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    36.35    DOWNSTREAM(FEET) =    36.00
FLOW LENGTH(FEET) =    160.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 12.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    3.13
ESTIMATED PIPE DIAMETER(INCH) = 21.00    NUMBER OF PIPES =  1

```

```

PIPE-FLOW(CFS) =          4.71
PIPE TRAVEL TIME(MIN.) =    0.85    Tc(MIN.) =    4.89
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    304.00 =    1300.00 FEET.

*****
FLOW PROCESS FROM NODE    304.10 TO NODE    304.00 IS CODE =    81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    3.293
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3718
SUBAREA AREA(ACRES) =    0.60    SUBAREA RUNOFF(CFS) =    0.99
TOTAL AREA(ACRES) =    14.4    TOTAL RUNOFF(CFS) =    17.63
TC(MIN.) =    4.89

*****
FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =    51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    36.00    DOWNSTREAM(FEET) =    33.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    720.00    CHANNEL SLOPE =    0.0042
CHANNEL BASE(FEET) =    7.00    "Z" FACTOR =    2.000
MANNING'S FACTOR = 0.015    MAXIMUM DEPTH(FEET) =    2.50
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.464
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    19.92
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    4.06
AVERAGE FLOW DEPTH(FEET) =    0.60    TRAVEL TIME(MIN.) =    2.95
Tc(MIN.) =    7.84
SUBAREA AREA(ACRES) =    3.10    SUBAREA RUNOFF(CFS) =    4.58
AREA-AVERAGE RUNOFF COEFFICIENT =    0.412
TOTAL AREA(ACRES) =    17.5    PEAK FLOW RATE(CFS) =    17.77

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =    0.56    FLOW VELOCITY(FEET/SEC.) =    3.91
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    305.00 =    2020.00 FEET.

*****
FLOW PROCESS FROM NODE    305.00 TO NODE    306.00 IS CODE =    41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    29.30    DOWNSTREAM(FEET) =    27.80
FLOW LENGTH(FEET) =    364.00    MANNING'S N =    0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 13.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    5.34
GIVEN PIPE DIAMETER(INCH) =    60.00    NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    17.77
PIPE TRAVEL TIME(MIN.) =    1.14    Tc(MIN.) =    8.98
LONGEST FLOWPATH FROM NODE    500.00 TO NODE    306.00 =    2384.00 FEET.

*****
FLOW PROCESS FROM NODE    306.10 TO NODE    306.00 IS CODE =    81
-----

```

```

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.258
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4623
SUBAREA AREA(ACRES) = 2.00 SUBAREA RUNOFF(CFS) = 4.06
TOTAL AREA(ACRES) = 19.5 TOTAL RUNOFF(CFS) = 20.35
TC(MIN.) = 8.98

*****
FLOW PROCESS FROM NODE 306.00 TO NODE 306.00 IS CODE = 11
-----

>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
=====

** MAIN STREAM CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 20.35 8.98 2.258 19.50
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 306.00 = 2384.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 3.00 60.41 0.660 24.70
LONGEST FLOWPATH FROM NODE 108.00 TO NODE 306.00 = 1440.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM RUNOFF Tc INTENSITY
NUMBER (CFS) (MIN.) (INCH/HOUR)
1 20.80 8.98 2.258
2 8.95 60.41 0.660

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 20.80 Tc(MIN.) = 8.98
TOTAL AREA(ACRES) = 44.2

*****
FLOW PROCESS FROM NODE 306.00 TO NODE 307.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 27.80 DOWNSTREAM(FEET) = 26.60
FLOW LENGTH(FEET) = 198.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 13.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.41
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 20.80
PIPE TRAVEL TIME(MIN.) = 0.51 Tc(MIN.) = 9.49
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 307.00 = 2582.00 FEET.

*****
FLOW PROCESS FROM NODE 307.10 TO NODE 307.00 IS CODE = 81
-----

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.178
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0

```



```

AREA-AVERAGE RUNOFF COEFFICIENT = 0.3233
SUBAREA AREA(ACRES) = 1.30 SUBAREA RUNOFF(CFS) = 2.55
TOTAL AREA(ACRES) = 45.5 TOTAL RUNOFF(CFS) = 32.03
TC(MIN.) = 9.49

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 127.00 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 26.60 DOWNSTREAM(FEET) = 25.50
FLOW LENGTH(FEET) = 198.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS 16.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.04
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 32.03
PIPE TRAVEL TIME(MIN.) = 0.47 Tc(MIN.) = 9.96
LONGEST FLOWPATH FROM NODE 500.00 TO NODE 127.00 = 2780.00 FEET.

*****
FLOW PROCESS FROM NODE 125.00 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.111
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3245
SUBAREA AREA(ACRES) = 2.20 SUBAREA RUNOFF(CFS) = 1.63
TOTAL AREA(ACRES) = 47.7 TOTAL RUNOFF(CFS) = 32.68
TC(MIN.) = 9.96

*****
FLOW PROCESS FROM NODE 125.10 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.111
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3575
SUBAREA AREA(ACRES) = 2.90 SUBAREA RUNOFF(CFS) = 5.51
TOTAL AREA(ACRES) = 50.6 TOTAL RUNOFF(CFS) = 38.19
TC(MIN.) = 9.96

*****
FLOW PROCESS FROM NODE 126.00 TO NODE 127.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.111
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .9000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3670
SUBAREA AREA(ACRES) = 0.90 SUBAREA RUNOFF(CFS) = 1.71
TOTAL AREA(ACRES) = 51.5 TOTAL RUNOFF(CFS) = 39.90
TC(MIN.) = 9.96

*****

```

FLOW PROCESS FROM NODE 127.00 TO NODE 128.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	25.50	DOWNSTREAM(FEET) =	25.32
FLOW LENGTH(FEET) =	80.00	MANNING'S N =	0.013
DEPTH OF FLOW IN 60.0 INCH PIPE IS	24.1 INCHES		
PIPE-FLOW VELOCITY(FEET/SEC.) =	5.40		
GIVEN PIPE DIAMETER(INCH) =	60.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	39.90		
PIPE TRAVEL TIME(MIN.) =	0.25	Tc(MIN.) =	10.21
LONGEST FLOWPATH FROM NODE	500.00 TO NODE	128.00 =	2860.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	51.5	TC(MIN.) =	10.21
PEAK FLOW RATE(CFS)	=	39.90		

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1532

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* Ocean Kamp - Rational Method Northerly area nodes 600-700 *
* December 13, 2019 *
* 2-year analysis *

FILE NAME: ZNE2.DAT
TIME/DATE OF STUDY: 09:49 12/19/2019

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 2.00
6-HOUR DURATION PRECIPITATION (INCHES) = 1.250
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL
 HALF- CROWN TO STREET-CROSSFALL: CURB GUTTER-GEOMETRIES: MANNING
 WIDTH CROSSFALL IN- / OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR
NO. (FT) (FT) SIDE / SIDE/ WAY (FT) (FT) (FT) (FT) (n)
=== =====
1 30.0 20.0 0.018/0.018/0.020 0.67 2.00 0.0313 0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 600.00 TO NODE 601.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6300
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 51.00
DOWNSTREAM ELEVATION(FEET) = 49.80
ELEVATION DIFFERENCE(FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.821
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

```

      THE MAXIMUM OVERLAND FLOW LENGTH =      65.00
      (Reference: Table 3-1B of Hydrology Manual)
      THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.696
      SUBAREA RUNOFF(CFS) =      0.51
      TOTAL AREA(ACRES) =      0.30    TOTAL RUNOFF(CFS) =      0.51

*****
FLOW PROCESS FROM NODE      601.00 TO NODE      602.00 IS CODE =  61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) =   49.80  DOWNSTREAM ELEVATION(FEET) =   44.80
STREET LENGTH(FEET) =   600.00    CURB HEIGHT(INCHES) =    6.0
STREET HALFWIDTH(FEET) =  16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =  0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
STREET PARKWAY CROSSFALL(DECIMAL) =  0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =  0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =  0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.41
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) =  0.32
HALFSTREET FLOOD WIDTH(FEET) =   9.87
AVERAGE FLOW VELOCITY(FEET/SEC.) =   2.02
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =   0.65
STREET FLOW TRAVEL TIME(MIN.) =  4.95    Tc(MIN.) =  11.77
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.896
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) =  0
AREA-AVERAGE RUNOFF COEFFICIENT =  0.601
SUBAREA AREA(ACRES) =   6.70    SUBAREA RUNOFF(CFS) =   7.62
TOTAL AREA(ACRES) =   7.0    PEAK FLOW RATE(CFS) =   7.98

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.38    HALFSTREET FLOOD WIDTH(FEET) =  12.60
FLOW VELOCITY(FEET/SEC.) =  2.34    DEPTH*VELOCITY(FT*FT/SEC.) =   0.88
LONGEST FLOWPATH FROM NODE      600.00 TO NODE      602.00 =   720.00 FEET.

*****
FLOW PROCESS FROM NODE      602.00 TO NODE      603.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.896
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) =  0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5845
SUBAREA AREA(ACRES) =   0.50    SUBAREA RUNOFF(CFS) =   0.33
TOTAL AREA(ACRES) =   7.5    TOTAL RUNOFF(CFS) =   8.31
TC(MIN.) =  11.77

*****
FLOW PROCESS FROM NODE      602.00 TO NODE      603.00 IS CODE =  7
-----

```

```

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 70.00    RAIN INTENSITY(INCH/HOUR) = 0.60
TOTAL AREA(ACRES) = 7.50    TOTAL RUNOFF(CFS) = 1.00

*****
FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 81
-----

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 0.600
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2860
SUBAREA AREA(ACRES) = 7.50    SUBAREA RUNOFF(CFS) = 1.58
TOTAL AREA(ACRES) = 15.0    TOTAL RUNOFF(CFS) = 2.58
TC(MIN.) = 70.00

*****
FLOW PROCESS FROM NODE 603.00 TO NODE 604.00 IS CODE = 7
-----

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 60.00    RAIN INTENSITY(INCH/HOUR) = 0.66
TOTAL AREA(ACRES) = 15.00    TOTAL RUNOFF(CFS) = 7.00

*****
FLOW PROCESS FROM NODE 604.00 TO NODE 605.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.10    DOWNSTREAM(FEET) = 34.90
FLOW LENGTH(FEET) = 210.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 10.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.91
GIVEN PIPE DIAMETER(INCH) = 30.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.00
PIPE TRAVEL TIME(MIN.) = 0.71    Tc(MIN.) = 60.71
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 605.00 = 930.00 FEET.

*****
FLOW PROCESS FROM NODE 605.00 TO NODE 606.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.90    DOWNSTREAM(FEET) = 30.80
FLOW LENGTH(FEET) = 840.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 10.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.64
GIVEN PIPE DIAMETER(INCH) = 30.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.00
PIPE TRAVEL TIME(MIN.) = 3.02    Tc(MIN.) = 63.73
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 606.00 = 1770.00 FEET.

*****
FLOW PROCESS FROM NODE 605.00 TO NODE 606.00 IS CODE = 10
-----

>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<

```

FLOW PROCESS FROM NODE 730.00 TO NODE 731.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 120.00
UPSTREAM ELEVATION (FEET) = 50.60
DOWNSTREAM ELEVATION (FEET) = 49.40
ELEVATION DIFFERENCE (FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 7.256
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 65.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN T_c CALCULATION!
2 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.590
SUBAREA RUNOFF (CFS) = 0.31
TOTAL AREA (ACRES) = 0.20 TOTAL RUNOFF (CFS) = 0.31

FLOW PROCESS FROM NODE 731.00 TO NODE 732.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION (FEET) = 49.40 DOWNSTREAM ELEVATION (FEET) = 46.00
STREET LENGTH (FEET) = 380.00 CURB HEIGHT (INCHES) = 6.0
STREET HALFWIDTH (FEET) = 16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 10.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL (DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section (curb-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 2.97
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.35
HALFSTREET FLOOD WIDTH (FEET) = 10.96
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.25
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 0.78
STREET FLOW TRAVEL TIME (MIN.) = 2.81 T_c (MIN.) = 10.07
2 YEAR RAINFALL INTENSITY (INCH/HOUR) = 2.097

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.600
SUBAREA AREA (ACRES) = 4.20 SUBAREA RUNOFF (CFS) = 5.28
TOTAL AREA (ACRES) = 4.4 PEAK FLOW RATE (CFS) = 5.53

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.41 HALFSTREET FLOOD WIDTH (FEET) = 14.16
FLOW VELOCITY (FEET/SEC.) = 2.61 DEPTH*VELOCITY (FT*FT/SEC.) = 1.07
LONGEST FLOWPATH FROM NODE 730.00 TO NODE 732.00 = 500.00 FEET.

```

FLOW PROCESS FROM NODE      732.00 TO NODE      732.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.097
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6185
SUBAREA AREA(ACRES) = 7.10 SUBAREA RUNOFF(CFS) = 9.38
TOTAL AREA(ACRES) = 11.5 TOTAL RUNOFF(CFS) = 14.91
TC(MIN.) = 10.07

*****
FLOW PROCESS FROM NODE      732.00 TO NODE      733.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 41.00 DOWNSTREAM(FEET) = 36.00
FLOW LENGTH(FEET) = 480.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 16.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.27
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 14.91
PIPE TRAVEL TIME(MIN.) = 1.10 Tc(MIN.) = 11.17
LONGEST FLOWPATH FROM NODE 730.00 TO NODE 733.00 = 980.00 FEET.

*****
FLOW PROCESS FROM NODE      733.10 TO NODE      733.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.961
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6226
SUBAREA AREA(ACRES) = 6.40 SUBAREA RUNOFF(CFS) = 7.91
TOTAL AREA(ACRES) = 17.9 TOTAL RUNOFF(CFS) = 21.85
TC(MIN.) = 11.17

*****
FLOW PROCESS FROM NODE      733.20 TO NODE      733.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.961
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6096
SUBAREA AREA(ACRES) = 0.90 SUBAREA RUNOFF(CFS) = 0.62
TOTAL AREA(ACRES) = 18.8 TOTAL RUNOFF(CFS) = 22.47
TC(MIN.) = 11.17

*****
FLOW PROCESS FROM NODE      733.00 TO NODE      715.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.961
*USER SPECIFIED(SUBAREA):

```

```

USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5916
SUBAREA AREA(ACRES) = 1.40 SUBAREA RUNOFF(CFS) = 0.96
TOTAL AREA(ACRES) = 20.2 TOTAL RUNOFF(CFS) = 23.43
TC(MIN.) = 11.17

*****
FLOW PROCESS FROM NODE 733.00 TO NODE 715.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 11.17
RAINFALL INTENSITY(INCH/HR) = 1.96
TOTAL STREAM AREA(ACRES) = 20.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 23.43

*****
FLOW PROCESS FROM NODE 710.00 TO NODE 711.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .7000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 120.00
UPSTREAM ELEVATION(FEET) = 49.00
DOWNSTREAM ELEVATION(FEET) = 47.80
ELEVATION DIFFERENCE(FEET) = 1.20
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.577
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 60.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.069
SUBAREA RUNOFF(CFS) = 1.72
TOTAL AREA(ACRES) = 0.80 TOTAL RUNOFF(CFS) = 1.72

*****
FLOW PROCESS FROM NODE 711.00 TO NODE 712.00 IS CODE = 61
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 47.80 DOWNSTREAM ELEVATION(FEET) = 46.10
STREET LENGTH(FEET) = 300.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.55
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.32
HALFSTREET FLOOD WIDTH(FEET) = 9.70

```



```

    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.54
    STREET FLOW TRAVEL TIME(MIN.) =    2.99    Tc(MIN.) =    8.56
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.328
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT =    0.663
SUBAREA AREA(ACRES) =    2.40    SUBAREA RUNOFF(CFS) =    3.63
TOTAL AREA(ACRES) =    3.2    PEAK FLOW RATE(CFS) =    4.94

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.35    HALFSTREET FLOOD WIDTH(FEET) =    11.20
FLOW VELOCITY(FEET/SEC.) =    1.80    DEPTH*VELOCITY(FT*FT/SEC.) =    0.63
LONGEST FLOWPATH FROM NODE    710.00 TO NODE    712.00 =    420.00 FEET.

*****
FLOW PROCESS FROM NODE    712.00 TO NODE    713.00 IS CODE =    41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    41.40    DOWNSTREAM(FEET) =    40.40
FLOW LENGTH(FEET) =    250.00    MANNING'S N =    0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 10.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    3.98
GIVEN PIPE DIAMETER(INCH) =    24.00    NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    4.94
PIPE TRAVEL TIME(MIN.) =    1.05    Tc(MIN.) =    9.61
LONGEST FLOWPATH FROM NODE    710.00 TO NODE    713.00 =    670.00 FEET.

*****
FLOW PROCESS FROM NODE    713.10 TO NODE    713.00 IS CODE =    81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =    2.161
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6571
SUBAREA AREA(ACRES) =    2.40    SUBAREA RUNOFF(CFS) =    3.37
TOTAL AREA(ACRES) =    5.6    TOTAL RUNOFF(CFS) =    7.95
TC(MIN.) =    9.61

*****
FLOW PROCESS FROM NODE    713.00 TO NODE    714.00 IS CODE =    41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    40.40    DOWNSTREAM(FEET) =    36.10
FLOW LENGTH(FEET) =    620.00    MANNING'S N =    0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 10.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    5.46
GIVEN PIPE DIAMETER(INCH) =    30.00    NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    7.95
PIPE TRAVEL TIME(MIN.) =    1.89    Tc(MIN.) =    11.50
LONGEST FLOWPATH FROM NODE    710.00 TO NODE    714.00 =    1290.00 FEET.

*****
FLOW PROCESS FROM NODE    714.10 TO NODE    714.00 IS CODE =    81
-----

```

```

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
      2 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.924
*USER SPECIFIED(SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .6500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.6531
SUBAREA AREA(ACRES) = 7.30 SUBAREA RUNOFF(CFS) = 9.13
TOTAL AREA(ACRES) = 12.9 TOTAL RUNOFF(CFS) = 16.21
TC(MIN.) = 11.50

*****
FLOW PROCESS FROM NODE 714.00 TO NODE 715.00 IS CODE = 1
-----

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 11.50
RAINFALL INTENSITY(INCH/HR) = 1.92
TOTAL STREAM AREA(ACRES) = 12.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.21

** CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 23.43 11.17 1.961 20.20
2 16.21 11.50 1.924 12.90

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM RUNOFF Tc INTENSITY
NUMBER (CFS) (MIN.) (INCH/HOUR)
1 39.18 11.17 1.961
2 39.21 11.50 1.924

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 39.21 Tc(MIN.) = 11.50
TOTAL AREA(ACRES) = 33.1
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 715.00 = 1290.00 FEET.

*****
FLOW PROCESS FROM NODE 715.00 TO NODE 716.00 IS CODE = 7
-----

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 60.00 RAIN INTENSITY(INCH/HOUR) = 0.66
TOTAL AREA(ACRES) = 33.10 TOTAL RUNOFF(CFS) = 6.00

*****
FLOW PROCESS FROM NODE 716.00 TO NODE 606.00 IS CODE = 41
-----

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 31.50 DOWNSTREAM(FEET) = 30.80
FLOW LENGTH(FEET) = 65.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 7.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.79

```

```

GIVEN PIPE DIAMETER(INCH) = 36.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 6.00
PIPE TRAVEL TIME(MIN.) = 0.19    Tc(MIN.) = 60.19
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 606.00 = 1355.00 FEET.

*****
FLOW PROCESS FROM NODE 716.00 TO NODE 606.00 IS CODE = 11
-----
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
=====

** MAIN STREAM CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)  (ACRE)
1           6.00      60.19    0.662        33.10
LONGEST FLOWPATH FROM NODE 710.00 TO NODE 606.00 = 1355.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)  (ACRE)
1           7.00      63.73    0.638        15.00
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 606.00 = 1770.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)  (INCH/ HOUR)
1           12.61     60.19    0.662
2           12.78     63.73    0.638

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 12.78    Tc(MIN.) = 63.73
TOTAL AREA(ACRES) = 48.1

*****
FLOW PROCESS FROM NODE 606.00 TO NODE 607.00 IS CODE = 41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 30.70    DOWNSTREAM(FEET) = 29.40
FLOW LENGTH(FEET) = 220.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 48.0 INCH PIPE IS 11.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.65
GIVEN PIPE DIAMETER(INCH) = 48.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.78
PIPE TRAVEL TIME(MIN.) = 0.65    Tc(MIN.) = 64.38
LONGEST FLOWPATH FROM NODE 600.00 TO NODE 607.00 = 1990.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 48.1    TC(MIN.) = 64.38
PEAK FLOW RATE(CFS) = 12.78
=====
END OF RATIONAL METHOD ANALYSIS

```

APPENDIX C

Detention Basin Routing

**Rational Method Hydrograph Calculations
for Post Developed Conditions
Node 123 (DMA-1A)**

		$Q_{100} =$		62.1	cfs			
		$T_c =$		12	min			
		$P_{100,6} =$		2.7	in			
#=	30			$C =$		0.67		
				$A =$		24.7	acres	
		$(7.44 * P_6 * D^{-.645})$		$(I * D / 60)$	$(V1 - V0)$	$(\Delta V / \Delta T)$	$(Q = ciA)$	$(Re-ordered)$
#	D (MIN)	I (IN/HR)	VOL (IN)	Δ VOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=
0	0	0.00	0.00	0.81	4.04	62.10	44712	0.00
1	12	4.04	0.81	0.23	1.13	18.67	13445	2.68
2	24	2.59	1.03	0.16	0.80	13.25	9542	2.74
3	36	1.99	1.19	0.13	0.64	10.63	7653	2.87
4	48	1.65	1.32	0.11	0.55	9.03	6499	2.94
5	60	1.43	1.43	0.10	0.48	7.92	5706	3.10
6	72	1.27	1.53	0.09	0.43	7.11	5121	3.19
7	84	1.15	1.61	0.08	0.39	6.48	4668	3.39
8	96	1.06	1.69	0.07	0.36	5.98	4305	3.50
9	108	0.98	1.76	0.07	0.34	5.56	4007	3.75
10	120	0.92	1.83	0.06	0.32	5.22	3756	3.90
11	132	0.86	1.89	0.06	0.30	4.92	3542	4.24
12	144	0.81	1.95	0.06	0.28	4.66	3356	4.44
13	156	0.77	2.01	0.05	0.27	4.44	3193	4.92
14	168	0.74	2.06	0.05	0.26	4.24	3049	5.22
15	180	0.71	2.12	0.05	0.25	4.06	2921	5.98
16	192	0.68	2.16	0.05	0.24	3.90	2805	6.48
17	204	0.65	2.21	0.05	0.23	3.75	2701	7.92
18	216	0.63	2.26	0.04	0.22	3.62	2606	9.03
19	228	0.61	2.30	0.04	0.21	3.50	2519	13.25
20	240	0.59	2.34	0.04	0.20	3.39	2439	18.67
21	252	0.57	2.38	0.04	0.20	3.28	2365	62.10
22	264	0.55	2.42	0.04	0.19	3.19	2297	10.63
23	276	0.54	2.46	0.04	0.19	3.10	2233	7.11
24	288	0.52	2.50	0.04	0.18	3.02	2174	5.56
25	300	0.51	2.54	0.04	0.18	2.94	2118	4.66
26	312	0.49	2.57	0.03	0.17	2.87	2066	4.06
27	324	0.48	2.61	0.03	0.17	2.80	2018	3.62
28	336	0.47	2.64	0.03	0.17	2.74	1972	3.28
29	348	0.46	2.67	0.03	0.16	2.68	1928	3.02
30	360	0.45	2.71	0.00	0.00	0.00	0	2.80
						SUM=	157714	cubic feet
							3.62	acre-feet

Check: $V = C * A * P_6$

V= 3.72 acre-feet

OK

**Rational Method Hydrograph Calculations
for Post Developed Conditions
Node 716 (DMA 2)**

		Q ₁₀₀ =	90.0	cfs				
		T _c =	10	min	C=	0.62		
#= 36		P _{100,6} =	2.7	in	A=	33.1	acres	
	(7.44*P6*D^-.645)	(I*D/60)	(V1-V0)	(ΔV/ΔT)	(Q=ciA)			(Re-ordered)
#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=
0	0	0.00	0.00	0.76	4.55	90.00	54000	0.00
1	10	4.55	0.76	0.21	1.27	26.05	15627	3.32
2	20	2.91	0.97	0.15	0.90	18.49	11091	3.38
3	30	2.24	1.12	0.12	0.72	14.83	8896	3.51
4	40	1.86	1.24	0.10	0.61	12.59	7554	3.58
5	50	1.61	1.34	0.09	0.54	11.05	6632	3.74
6	60	1.43	1.43	0.08	0.48	9.92	5952	3.82
7	70	1.30	1.51	0.07	0.44	9.04	5426	4.00
8	80	1.19	1.59	0.07	0.41	8.34	5004	4.10
9	90	1.10	1.65	0.06	0.38	7.76	4657	4.33
10	100	1.03	1.72	0.06	0.35	7.28	4366	4.45
11	110	0.97	1.78	0.06	0.33	6.86	4117	4.72
12	120	0.92	1.83	0.05	0.32	6.50	3901	4.88
13	130	0.87	1.88	0.05	0.30	6.19	3712	5.23
14	140	0.83	1.93	0.05	0.29	5.91	3544	5.43
15	150	0.79	1.98	0.05	0.28	5.66	3395	5.91
16	160	0.76	2.03	0.04	0.26	5.43	3261	6.19
17	170	0.73	2.07	0.04	0.25	5.23	3139	6.86
18	180	0.71	2.12	0.04	0.25	5.05	3029	7.28
19	190	0.68	2.16	0.04	0.24	4.88	2928	8.34
20	200	0.66	2.20	0.04	0.23	4.72	2835	9.04
21	210	0.64	2.23	0.04	0.22	4.58	2749	11.05
22	220	0.62	2.27	0.04	0.22	4.45	2669	12.59
23	230	0.60	2.31	0.04	0.21	4.33	2596	18.49
24	240	0.59	2.34	0.03	0.21	4.21	2527	26.05
25	250	0.57	2.38	0.03	0.20	4.10	2462	90.00
26	260	0.56	2.41	0.03	0.20	4.00	2402	14.83
27	270	0.54	2.44	0.03	0.19	3.91	2345	9.92
28	280	0.53	2.47	0.03	0.19	3.82	2292	7.76
29	290	0.52	2.51	0.03	0.18	3.74	2241	6.50
30	300	0.51	2.54	0.03	0.18	3.66	2194	5.66
31	310	0.50	2.57	0.03	0.17	3.58	2149	5.05
32	320	0.49	2.59	0.03	0.17	3.51	2106	4.58
33	330	0.48	2.62	0.03	0.17	3.44	2065	4.21
34	340	0.47	2.65	0.03	0.16	3.38	2026	3.91
35	350	0.46	2.68	0.03	0.16	3.32	1989	3.66
36	360	0.45	2.71	0.00	0.00	0.00	0	3.44
						SUM=	197876	cubic feet
							4.54	acre-feet

Check: V = C*A*P₆

V= 4.62 acre-feet

**Rational Method Hydrograph Calculations
for Post Developed Conditions
Node 716 (DMA 2)**

#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=
							OK	

**Rational Method Hydrograph Calculations
for Post Developed Conditions
Node 602 (DMA-3)**

		Q ₁₀₀ =	18.9	cfs			C=	0.6		
		T _c =	10	min			A=	7.5	acres	
#= 36		P _{100,6} =	2.7	in						
		(7.44*P ₆ *D ^{^-0.645})	(I*D/60)	(V1-V0)	(ΔV/ΔT)	(Q=ciA)	(Re-ordered)			
#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=		
0	0	0.00	0.00	0.76	4.55	18.90	11340	0.00		
1	10	4.55	0.76	0.21	1.27	5.71	3427	0.73		
2	20	2.91	0.97	0.15	0.90	4.05	2432	0.74		
3	30	2.24	1.12	0.12	0.72	3.25	1951	0.77		
4	40	1.86	1.24	0.10	0.61	2.76	1656	0.79		
5	50	1.61	1.34	0.09	0.54	2.42	1454	0.82		
6	60	1.43	1.43	0.08	0.48	2.18	1305	0.84		
7	70	1.30	1.51	0.07	0.44	1.98	1190	0.88		
8	80	1.19	1.59	0.07	0.41	1.83	1097	0.90		
9	90	1.10	1.65	0.06	0.38	1.70	1021	0.95		
10	100	1.03	1.72	0.06	0.35	1.60	957	0.98		
11	110	0.97	1.78	0.06	0.33	1.50	903	1.04		
12	120	0.92	1.83	0.05	0.32	1.43	855	1.07		
13	130	0.87	1.88	0.05	0.30	1.36	814	1.15		
14	140	0.83	1.93	0.05	0.29	1.30	777	1.19		
15	150	0.79	1.98	0.05	0.28	1.24	744	1.30		
16	160	0.76	2.03	0.04	0.26	1.19	715	1.36		
17	170	0.73	2.07	0.04	0.25	1.15	688	1.50		
18	180	0.71	2.12	0.04	0.25	1.11	664	1.60		
19	190	0.68	2.16	0.04	0.24	1.07	642	1.83		
20	200	0.66	2.20	0.04	0.23	1.04	622	1.98		
21	210	0.64	2.23	0.04	0.22	1.00	603	2.42		
22	220	0.62	2.27	0.04	0.22	0.98	585	2.76		
23	230	0.60	2.31	0.04	0.21	0.95	569	4.05		
24	240	0.59	2.34	0.03	0.21	0.92	554	5.71		
25	250	0.57	2.38	0.03	0.20	0.90	540	18.90		
26	260	0.56	2.41	0.03	0.20	0.88	527	3.25		
27	270	0.54	2.44	0.03	0.19	0.86	514	2.18		
28	280	0.53	2.47	0.03	0.19	0.84	503	1.70		
29	290	0.52	2.51	0.03	0.18	0.82	491	1.43		
30	300	0.51	2.54	0.03	0.18	0.80	481	1.24		
31	310	0.50	2.57	0.03	0.17	0.79	471	1.11		
32	320	0.49	2.59	0.03	0.17	0.77	462	1.00		
33	330	0.48	2.62	0.03	0.17	0.75	453	0.92		
34	340	0.47	2.65	0.03	0.16	0.74	444	0.86		
35	350	0.46	2.68	0.03	0.16	0.73	436	0.80		
36	360	0.45	2.71	0.00	0.00	0.00	0	0.75		
						SUM=	42889	cubic feet		
							0.98	acre-feet		
Check: V = C*A*P ₆										
						V=	1.01	acre-feet		

**Rational Method Hydrograph Calculations
for Post Developed Conditions
Node 602 (DMA-3)**

#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=
							OK	

**Rational Method Hydrograph Calculations
for Post Developed Conditions
Node 503 (DMA-4)**

#= 36		Q ₁₀₀ = 17.4 cfs	Tc= 10 min		C= 0.62	A= 6.2 acres		
(7.44*P ₆ *D ^{0.645})		(I*D/60)	(V1-V0)	(ΔV/ΔT)	(Q=ciA)	(Re-ordered)		
#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=
0	0	0.00	0.00	0.76	4.55	17.40	10440	0.00
1	10	4.55	0.76	0.21	1.27	4.88	2927	0.62
2	20	2.91	0.97	0.15	0.90	3.46	2078	0.63
3	30	2.24	1.12	0.12	0.72	2.78	1666	0.66
4	40	1.86	1.24	0.10	0.61	2.36	1415	0.67
5	50	1.61	1.34	0.09	0.54	2.07	1242	0.70
6	60	1.43	1.43	0.08	0.48	1.86	1115	0.72
7	70	1.30	1.51	0.07	0.44	1.69	1016	0.75
8	80	1.19	1.59	0.07	0.41	1.56	937	0.77
9	90	1.10	1.65	0.06	0.38	1.45	872	0.81
10	100	1.03	1.72	0.06	0.35	1.36	818	0.83
11	110	0.97	1.78	0.06	0.33	1.29	771	0.88
12	120	0.92	1.83	0.05	0.32	1.22	731	0.91
13	130	0.87	1.88	0.05	0.30	1.16	695	0.98
14	140	0.83	1.93	0.05	0.29	1.11	664	1.02
15	150	0.79	1.98	0.05	0.28	1.06	636	1.11
16	160	0.76	2.03	0.04	0.26	1.02	611	1.16
17	170	0.73	2.07	0.04	0.25	0.98	588	1.29
18	180	0.71	2.12	0.04	0.25	0.95	567	1.36
19	190	0.68	2.16	0.04	0.24	0.91	548	1.56
20	200	0.66	2.20	0.04	0.23	0.88	531	1.69
21	210	0.64	2.23	0.04	0.22	0.86	515	2.07
22	220	0.62	2.27	0.04	0.22	0.83	500	2.36
23	230	0.60	2.31	0.04	0.21	0.81	486	3.46
24	240	0.59	2.34	0.03	0.21	0.79	473	4.88
25	250	0.57	2.38	0.03	0.20	0.77	461	17.40
26	260	0.56	2.41	0.03	0.20	0.75	450	2.78
27	270	0.54	2.44	0.03	0.19	0.73	439	1.86
28	280	0.53	2.47	0.03	0.19	0.72	429	1.45
29	290	0.52	2.51	0.03	0.18	0.70	420	1.22
30	300	0.51	2.54	0.03	0.18	0.68	411	1.06
31	310	0.50	2.57	0.03	0.17	0.67	402	0.95
32	320	0.49	2.59	0.03	0.17	0.66	394	0.86
33	330	0.48	2.62	0.03	0.17	0.64	387	0.79
34	340	0.47	2.65	0.03	0.16	0.63	380	0.73
35	350	0.46	2.68	0.03	0.16	0.62	373	0.68
36	360	0.45	2.71	0.00	0.00	0.00	0	0.64
SUM=						37390	cubic feet	
						0.86	acre-feet	

Check: V = C*A*P₆

V= 0.86 acre-feet

**Rational Method Hydrograph Calculations
for Post Developed Conditions
Node 503 (DMA-4)**

#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=
							OK	

Stage-Area for BMP-1A

Depth (ft)	Area (ft ²)	Volume (ft ³)	
0.00	29800	0	BIOFILTRATION (1)
0.50	31000	15199	SURFACE OUTLET (2)
4.00	35471	131435	
9.00	45594	333569	

SUB SURFACE STORAGE

Elevation (ft)	Area (ft ²)	Volume (ft ³)	
-1.75	29800	10430	Amended Soil Base (0.2 voids)
-2.75	29800	11920	Gravel Base (0.4 voids)
Gravel & Amended Soil TOTAL = 22350 (ft³)			
Surface Total TOTAL = 333569 (ft³)			
BMP TOTAL = 355919 (ft³)			

- (1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)
 (2): Volume at this elevation corresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	6.12 in
------------------	---------

Stage-Area for BMP-2

Depth (ft)	Area (ft ²)	Volume (ft ³)	
0.00	42600	0	BIOFILTRATION (1)
0.50	43856	21613	SURFACE OUTLET (2)
3.00	50357	139286	
6.00	58625	302602	

SUB SURFACE STORAGE

Elevation (ft)	Area (ft ²)	Volume (ft ³)	
-1.75	42600	14910	Amended Soil Base (0.2 voids)
-2.75	42600	17040	Gravel Base (0.4 voids)
Gravel & Amended Soil TOTAL = 31950 (ft³)			
Surface Total TOTAL = 302602 (ft³)			
BMP TOTAL = 334552 (ft³)			

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)

(2): Volume at this elevation corresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	6.09 in
------------------	---------

Stage-Area for BMP-3

Depth (ft)	Area (ft ²)	Volume (ft ³)	
0.00	10800	0	BIOFILTRATION (1)
0.50	11422	5555	SURFACE OUTLET (2)
3.00	14698	38119	
5.00	17573	70347	

SUB SURFACE STORAGE

Elevation (ft)	Area (ft ²)	Volume (ft ³)	
-1.75	10800	3780	Amended Soil Base (0.2 voids)
-2.75	10800	4320	Gravel Base (0.4 voids)
Gravel & Amended Soil		TOTAL =	8100 (ft ³)
Surface Total		TOTAL =	70347 (ft ³)
BMP		TOTAL =	78447 (ft ³)

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)

(2): Volume at this elevation corresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	6.17 in
------------------	---------

Stage-Area for BMP-4

Depth (ft)	Area (ft ²)	Volume (ft ³)	
0.00	8800	0	BIOFILTRATION (1)
0.50	9357	4539	SURFACE OUTLET (2)
2.00	11082	19850	
3.00	12553	31659	

SUB SURFACE STORAGE

Elevation (ft)	Area (ft ²)	Volume (ft ³)	
-1.75	8800	3080	Amended Soil Base (0.2 voids)
-2.75	8800	3520	Gravel Base (0.4 voids)
Gravel & Amended Soil		TOTAL =	6600 (ft ³)
Surface Total		TOTAL =	31659 (ft ³)
BMP		TOTAL =	38259 (ft ³)

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)

(2): Volume at this elevation corresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	6.19 in
------------------	---------

Stage-Discharge for BMP-1A

Lowest Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot
Quantity: 1
Invert Elevation: 0.00 ft
Width: 0.33 ft
Height: 84.00 in
7.000 ft

Lower Weir
Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot
Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir
Invert Elevation: 7.50 ft
Length: 20.00 ft
H_w: 8.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
0.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.000	N/A	N/A	0.000	0.000
0.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.033	N/A	N/A	0.000	0.033
0.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.092	N/A	N/A	0.000	0.092
0.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.170	N/A	N/A	0.000	0.170
0.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.261	N/A	N/A	0.000	0.261
0.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.365	N/A	N/A	0.000	0.365
0.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.480	N/A	N/A	0.000	0.480
0.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.605	N/A	N/A	0.000	0.605
0.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.739	N/A	N/A	0.000	0.739
0.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.882	N/A	N/A	0.000	0.882
1.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.033	N/A	N/A	0.000	1.033
1.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.192	N/A	N/A	0.000	1.192
1.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.358	N/A	N/A	0.000	1.358
1.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.532	N/A	N/A	0.000	1.532
1.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.712	N/A	N/A	0.000	1.712
1.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.898	N/A	N/A	0.000	1.898
1.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.091	N/A	N/A	0.000	2.091
1.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.290	N/A	N/A	0.000	2.290
1.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.495	N/A	N/A	0.000	2.495
1.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.706	N/A	N/A	0.000	2.706
2.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.923	N/A	N/A	0.000	2.923
2.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.145	N/A	N/A	0.000	3.145
2.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.372	N/A	N/A	0.000	3.372
2.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.604	N/A	N/A	0.000	3.604
2.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.842	N/A	N/A	0.000	3.842
2.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.085	N/A	N/A	0.000	4.085
2.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.332	N/A	N/A	0.000	4.332

Stage-Discharge for BMP-1A

Lowest Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot
Quantity: 1
Invert Elevation: 0.00 ft
Width: 0.33 ft
Height: 84.00 in
7.000 ft

Lower Weir
Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot
Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir
Invert Elevation: 7.50 ft
Length: 20.00 ft
H_w: 8.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
2.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.584	N/A	N/A	0.000	4.584
2.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.841	N/A	N/A	0.000	4.841
2.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.103	N/A	N/A	0.000	5.103
3.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.369	N/A	N/A	0.000	5.369
3.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.640	N/A	N/A	0.000	5.640
3.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.915	N/A	N/A	0.000	5.915
3.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.195	N/A	N/A	0.000	6.195
3.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.478	N/A	N/A	0.000	6.478
3.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.766	N/A	N/A	0.000	6.766
3.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	7.058	N/A	N/A	0.000	7.058
3.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	7.354	N/A	N/A	0.000	7.354
3.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	7.654	N/A	N/A	0.000	7.654
3.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	7.959	N/A	N/A	0.000	7.959
4.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.267	N/A	N/A	0.000	8.267
4.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.579	N/A	N/A	0.000	8.579
4.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.894	N/A	N/A	0.000	8.894
4.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.214	N/A	N/A	0.000	9.214
4.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.537	N/A	N/A	0.000	9.537
4.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.864	N/A	N/A	0.000	9.864
4.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	10.195	N/A	N/A	0.000	10.195
4.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	10.529	N/A	N/A	0.000	10.529
4.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	10.867	N/A	N/A	0.000	10.867
4.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	11.208	N/A	N/A	0.000	11.208
5.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	11.553	N/A	N/A	0.000	11.553
5.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	11.901	N/A	N/A	0.000	11.901
5.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	12.253	N/A	N/A	0.000	12.253
5.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	12.608	N/A	N/A	0.000	12.608

Stage-Discharge for BMP-1A

Lowest Orifice

Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot

Quantity: 1
Invert Elevation: 0.00 ft
Width: 0.33 ft
Height: 84.00 in
7.000 ft

Lower Weir

Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice

Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot

Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir

Invert Elevation: 7.50 ft
Length: 20.00 ft
H_w: 8.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
5.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	12.967	N/A	N/A	0.000	12.967
5.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	13.329	N/A	N/A	0.000	13.329
5.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	13.694	N/A	N/A	0.000	13.694
5.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	14.062	N/A	N/A	0.000	14.062
5.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	14.434	N/A	N/A	0.000	14.434
5.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	14.809	N/A	N/A	0.000	14.809
6.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	15.187	N/A	N/A	0.000	15.187
6.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	15.568	N/A	N/A	0.000	15.568
6.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	15.952	N/A	N/A	0.000	15.952
6.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	16.340	N/A	N/A	0.000	16.340
6.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	16.731	N/A	N/A	0.000	16.731
6.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	17.124	N/A	N/A	0.000	17.124
6.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	17.521	N/A	N/A	0.000	17.521
6.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	17.921	N/A	N/A	0.000	17.921
6.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	18.323	N/A	N/A	0.000	18.323
6.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	18.729	N/A	N/A	0.000	18.729
7.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	19.138	N/A	N/A	0.000	19.138
7.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	19.549	N/A	N/A	0.000	19.549
7.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	19.964	N/A	N/A	0.000	19.964
7.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	20.381	N/A	N/A	0.000	20.381
7.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	20.801	N/A	N/A	0.000	20.801
7.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	21.224	N/A	N/A	0.000	21.224
7.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	21.650	N/A	N/A	2.071	23.721
7.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	22.079	N/A	N/A	5.867	27.946
7.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	22.510	N/A	N/A	10.796	33.306
7.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	22.945	N/A	N/A	16.646	39.591
8.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	23.382	N/A	N/A	23.299	46.681

Stage-Discharge for BMP-1A

Lowest Orifice

Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot

Quantity: 1
Invert Elevation: 0.00 ft
Width: 0.33 ft
Height: 84.00 in
7.000 ft

Lower Weir

Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice

Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot

Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir

Invert Elevation: 7.50 ft
Length: 20.00 ft
H_w: 8.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
8.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	23.821	N/A	N/A	30.674	54.495
8.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	24.264	N/A	N/A	38.712	62.976
8.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	24.709	N/A	N/A	47.369	72.078
8.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	25.157	N/A	N/A	56.608	81.765
8.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	25.608	N/A	N/A	66.400	92.008

Stage-Discharge for BMP-2

Lowest Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot
Quantity: 1
Invert Elevation: 0.00 ft
Width: 1.50 ft
Height: 48.00 in
4.000 ft

Lower Weir
Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot
Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir
Invert Elevation: 4.50 ft
Length: 28.00 ft
H_w: 5.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
0.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.000	N/A	N/A	0.000	0.000
0.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.147	N/A	N/A	0.000	0.147
0.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.416	N/A	N/A	0.000	0.416
0.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.764	N/A	N/A	0.000	0.764
0.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.176	N/A	N/A	0.000	1.176
0.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.644	N/A	N/A	0.000	1.644
0.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.161	N/A	N/A	0.000	2.161
0.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.723	N/A	N/A	0.000	2.723
0.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.327	N/A	N/A	0.000	3.327
0.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.970	N/A	N/A	0.000	3.970
1.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.650	N/A	N/A	0.000	4.650
1.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.365	N/A	N/A	0.000	5.365
1.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.113	N/A	N/A	0.000	6.113
1.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.892	N/A	N/A	0.000	6.892
1.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	7.703	N/A	N/A	0.000	7.703
1.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.543	N/A	N/A	0.000	8.543
1.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.411	N/A	N/A	0.000	9.411
1.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	10.307	N/A	N/A	0.000	10.307
1.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	11.230	N/A	N/A	0.000	11.230
1.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	12.178	N/A	N/A	0.000	12.178
2.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	13.152	N/A	N/A	0.000	13.152
2.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	14.151	N/A	N/A	0.000	14.151
2.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	15.174	N/A	N/A	0.000	15.174
2.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	16.220	N/A	N/A	0.000	16.220
2.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	17.289	N/A	N/A	0.000	17.289
2.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	18.381	N/A	N/A	0.000	18.381
2.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	19.495	N/A	N/A	0.000	19.495

Stage-Discharge for BMP-2

Lowest Orifice

Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot

Quantity: 1
Invert Elevation: 0.00 ft
Width: 1.50 ft
Height: 48.00 in
4.000 ft

Lower Weir

Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice

Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot

Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir

Invert Elevation: 4.50 ft
Length: 28.00 ft
H_w: 5.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
2.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	20.630	N/A	N/A	0.000	20.630
2.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	21.787	N/A	N/A	0.000	21.787
2.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	22.964	N/A	N/A	0.000	22.964
3.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	24.162	N/A	N/A	0.000	24.162
3.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	25.380	N/A	N/A	0.000	25.380
3.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	26.618	N/A	N/A	0.000	26.618
3.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	27.876	N/A	N/A	0.000	27.876
3.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	29.152	N/A	N/A	0.000	29.152
3.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	30.448	N/A	N/A	0.000	30.448
3.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	31.762	N/A	N/A	0.000	31.762
3.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	33.094	N/A	N/A	0.000	33.094
3.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	34.445	N/A	N/A	0.000	34.445
3.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	35.814	N/A	N/A	0.000	35.814
4.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	37.200	N/A	N/A	0.000	37.200
4.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	38.604	N/A	N/A	0.000	38.604
4.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	40.025	N/A	N/A	0.000	40.025
4.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	41.463	N/A	N/A	0.000	41.463
4.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	42.917	N/A	N/A	0.000	42.917
4.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	44.389	N/A	N/A	0.000	44.389
4.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	45.876	N/A	N/A	2.902	48.779
4.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	47.381	N/A	N/A	8.229	55.610
4.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	48.901	N/A	N/A	15.155	64.056
4.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	50.437	N/A	N/A	23.390	73.826
5.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	51.989	N/A	N/A	32.767	84.756
5.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	53.556	N/A	N/A	43.178	96.734
5.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	55.139	N/A	N/A	54.542	109.680
5.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	56.737	N/A	N/A	66.797	123.534

Stage-Discharge for BMP-2

Lowest Orifice

Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot

Quantity: 1
Invert Elevation: 0.00 ft
Width: 1.50 ft
Height: 48.00 in
4.000 ft

Lower Weir

Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice

Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot

Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir

Invert Elevation: 4.50 ft
Length: 28.00 ft
H_w: 5.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	<i>h/D</i>	<i>h/D</i>	<i>Q</i> LOWEST ORIFICE (cfs)				<i>Q</i> UPPER ORIFICE (cfs)				<i>Q</i> LOWER SLOT (cfs)	<i>Q</i> UPPER SLOT (cfs)	<i>Q</i> LOWER WEIR (cfs)	<i>Q</i> EMERGENCY (cfs)	<i>Q</i> TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	<i>Q</i> control	Discharge Coefficient	Orifice Flow	Weir Flow	<i>Q</i> control					
5.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	57.709	N/A	N/A	79.897	137.606
5.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	58.552	N/A	N/A	93.800	152.352

Stage-Discharge for BMP-3

Lowest Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot
Quantity: 1
Invert Elevation: 0.00 ft
Width: 0.50 ft
Height: 36.00 in
3.000 ft

Lower Weir
Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot
Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir
Invert Elevation: 3.50 ft
Length: 12.00 ft
H_w: 4.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
0.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.000	N/A	N/A	0.000	0.000
0.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.049	N/A	N/A	0.000	0.049
0.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.139	N/A	N/A	0.000	0.139
0.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.255	N/A	N/A	0.000	0.255
0.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.392	N/A	N/A	0.000	0.392
0.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.548	N/A	N/A	0.000	0.548
0.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.720	N/A	N/A	0.000	0.720
0.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.908	N/A	N/A	0.000	0.908
0.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.109	N/A	N/A	0.000	1.109
0.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.323	N/A	N/A	0.000	1.323
1.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.550	N/A	N/A	0.000	1.550
1.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.788	N/A	N/A	0.000	1.788
1.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.038	N/A	N/A	0.000	2.038
1.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.297	N/A	N/A	0.000	2.297
1.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.568	N/A	N/A	0.000	2.568
1.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.848	N/A	N/A	0.000	2.848
1.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.137	N/A	N/A	0.000	3.137
1.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.436	N/A	N/A	0.000	3.436
1.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.743	N/A	N/A	0.000	3.743
1.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.059	N/A	N/A	0.000	4.059
2.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.384	N/A	N/A	0.000	4.384
2.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.717	N/A	N/A	0.000	4.717
2.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.058	N/A	N/A	0.000	5.058
2.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.407	N/A	N/A	0.000	5.407
2.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.763	N/A	N/A	0.000	5.763
2.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.127	N/A	N/A	0.000	6.127
2.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.498	N/A	N/A	0.000	6.498

Stage-Discharge for BMP-3

Lowest Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot
Quantity: 1
Invert Elevation: 0.00 ft
Width: 0.50 ft
Height: 36.00 in
3.000 ft

Lower Weir
Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot
Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir
Invert Elevation: 3.50 ft
Length: 12.00 ft
H_w: 4.00 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
2.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.877	N/A	N/A	0.000	6.877
2.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	7.262	N/A	N/A	0.000	7.262
2.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	7.655	N/A	N/A	0.000	7.655
3.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.054	N/A	N/A	0.000	8.054
3.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.460	N/A	N/A	0.000	8.460
3.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.873	N/A	N/A	0.000	8.873
3.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.292	N/A	N/A	0.000	9.292
3.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.717	N/A	N/A	0.000	9.717
3.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	10.149	N/A	N/A	0.000	10.149
3.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	10.587	N/A	N/A	1.245	11.832
3.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	11.031	N/A	N/A	3.531	14.563
3.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	11.482	N/A	N/A	6.507	17.989
3.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	11.938	N/A	N/A	10.048	21.986
4.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	12.371	N/A	N/A	14.086	26.457
4.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	12.616	N/A	N/A	18.572	31.188
4.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	12.857	N/A	N/A	23.473	36.330
4.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	13.093	N/A	N/A	28.765	41.857
4.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	13.324	N/A	N/A	34.426	47.750
4.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	13.552	N/A	N/A	40.440	53.992

Stage-Discharge for BMP-4

Lowest Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot
Quantity: 1
Invert Elevation: 0.00 ft
Width: 1.00 ft
Height: 18.00 in
1.500 ft

Lower Weir
Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.50 ft

Upper Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot
Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft
H_w: 0.50 ft

Emergency Weir
Invert Elevation: 2.00 ft
Length: 12.00 ft
H_w: 2.50 ft

(H_w = height of slot/weir invert above basin bottom)

Absolute Invert Elevation of Lowest Discharge Opening

Invert Elevation: 0.50 ft

*Head taken as total depth above the invert of the lowest discharge opening.

h* (ft)	h/D	h/D	Q LOWEST ORIFICE (cfs)				Q UPPER ORIFICE (cfs)				Q LOWER SLOT (cfs)	Q UPPER SLOT (cfs)	Q LOWER WEIR (cfs)	Q EMERGENCY (cfs)	Q TOTAL (cfs)
	Lowest Orifice	Upper Orifice	Discharge Coefficient	Orifice Flow	Weir Flow	Q control	Discharge Coefficient	Orifice Flow	Weir Flow	Q control					
0.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.000	N/A	N/A	0.000	0.000
0.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.098	N/A	N/A	0.000	0.098
0.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.277	N/A	N/A	0.000	0.277
0.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.509	N/A	N/A	0.000	0.509
0.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	0.784	N/A	N/A	0.000	0.784
0.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.096	N/A	N/A	0.000	1.096
0.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.441	N/A	N/A	0.000	1.441
0.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	1.816	N/A	N/A	0.000	1.816
0.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.218	N/A	N/A	0.000	2.218
0.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	2.647	N/A	N/A	0.000	2.647
1.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.100	N/A	N/A	0.000	3.100
1.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	3.576	N/A	N/A	0.000	3.576
1.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.075	N/A	N/A	0.000	4.075
1.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	4.595	N/A	N/A	0.000	4.595
1.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.135	N/A	N/A	0.000	5.135
1.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	5.695	N/A	N/A	0.000	5.695
1.600	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.274	N/A	N/A	0.000	6.274
1.700	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	6.871	N/A	N/A	0.000	6.871
1.800	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	7.486	N/A	N/A	0.000	7.486
1.900	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.119	N/A	N/A	0.000	8.119
2.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	8.748	N/A	N/A	0.000	8.748
2.100	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.091	N/A	N/A	1.247	10.338
2.200	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.422	N/A	N/A	3.544	12.966
2.300	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	9.741	N/A	N/A	6.542	16.284
2.400	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	10.051	N/A	N/A	10.121	20.172
2.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	10.351	N/A	N/A	14.213	24.563

[TITLE]
 ;;Project Title/Notes
 537-03

[OPTIONS]
 ;;Option Value
 FLOW_UNITS CFS
 INFILTRATION GREEN_AMPT
 FLOW_ROUTING KINWAVE
 LINK_OFFSETS DEPTH
 MIN_SLOPE 0
 ALLOW_PONDING NO
 SKIP_STEADY_STATE NO

START_DATE 01/01/2000
 START_TIME 00:00:00
 REPORT_START_DATE 01/01/2000
 REPORT_START_TIME 00:00:00
 END_DATE 01/01/2000
 END_TIME 12:00:00
 SWEEP_START 01/01
 SWEEP_END 12/31
 DRY_DAYS 0
 REPORT_STEP 00:01:00
 WET_STEP 00:01:00
 DRY_STEP 00:01:00
 ROUTING_STEP 0:00:10
 RULE_STEP 00:00:00

INERTIAL_DAMPING PARTIAL
 NORMAL_FLOW_LIMITED BOTH
 FORCE_MAIN_EQUATION H-W
 VARIABLE_STEP 0.75
 LENGTHENING_STEP 0
 MIN_SURFAREA 12.566
 MAX_TRIALS 8
 HEAD_TOLERANCE 0.005
 SYS_FLOW_TOL 5
 LAT_FLOW_TOL 5
 MINIMUM_STEP 0.5
 THREADS 1

[EVAPORATION]
 ;;Data Source Parameters
 ;;-----
 CONSTANT 0.0
 DRY_ONLY NO

[RAINGAGES]
 ;;Name Format Interval SCF Source
 ;;-----
 Zero-Rain INTENSITY 6:00 1.0 TIMESERIES Zero-Rain

SWMM INPUT POC-1

[SUBCATCHMENTS]

;;Name	Rain Gage	Outlet	Area	%Imperv	Width	%Slope	CurbLen	SnowPack
;;-----	-----	-----	-----	-----	-----	-----	-----	-----
BMP-1A	Zero-Rain	SURF-1A	0.684113866	0	10	0.5	0	
BMP-2	Zero-Rain	SURF-2	0.977961433	0	10	0.5	0	
BMP-3	Zero-Rain	SURF-3	0.247933884	0	10	0.5	0	
BMP-4	Zero-Rain	SURF-4	0.202020202	0	10	0.5	0	

[SUBAREAS]

;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
;;-----	-----	-----	-----	-----	-----	-----	-----
BMP-1A	0.012	0.05	0.05	0.10	25	OUTLET	
BMP-2	0.012	0.05	0.05	0.10	25	OUTLET	
BMP-3	0.012	0.05	0.05	0.10	25	OUTLET	
BMP-4	0.012	0.05	0.05	0.10	25	OUTLET	

[INFILTRATION]

;;Subcatchment	Suction	Ksat	IMD
;;-----	-----	-----	-----
BMP-1A	9	0.01875	0.3
BMP-2	9	0.01875	0.3
BMP-3	9	0.01875	0.3
BMP-4	9	0.01875	0.3

[LID_CONTROLS]

;;Name	Type/Layer	Parameters						
;;-----	-----	-----	-----	-----	-----	-----	-----	-----
BMP-1A	BC							
BMP-1A	SURFACE	6.12	0.0	0	0	5		
BMP-1A	SOIL	21	0.4	0.2	0.1	5	5	1.5
BMP-1A	STORAGE	15	0.67	0	0			
BMP-1A	DRAIN	1.1173	0.5	3	6	0	0	
BMP-2	BC							
BMP-2	SURFACE	6.09	0.0	0	0	5		
BMP-2	SOIL	21	0.4	0.2	0.1	5	5	1.5
BMP-2	STORAGE	15	0.67	0	0			
BMP-2	DRAIN	1.1255	0.5	3	6	0	0	
BMP-3	BC							
BMP-3	SURFACE	6.17	0.0	0	0	5		
BMP-3	SOIL	21	0.4	0.2	0.1	5	5	1.5
BMP-3	STORAGE	15	0.67	0	0			
BMP-3	DRAIN	1.1099	0.5	3	6	0	0	
BMP-4	BC							
BMP-4	SURFACE	6.19	0.0	0	0	5		
BMP-4	SOIL	21	0.4	0.2	0.1	5	5	1.5
BMP-4	STORAGE	15	0.67	0	0			
BMP-4	DRAIN	1.3621	0.5	3	6	0	0	

SWMM INPUT POC-1

[LID_USAGE]										
;;Subcatchment	LID Process	Number	Area	Width	InitSat	FromImp	ToPerv	RptFile	DrainTo	FromPerv
;;-----										
BMP-1A	BMP-1A	1	29800.00	0	0	100	0	*	Node_306	0
BMP-2	BMP-2	1	42600.00	0	0	100	0	*	Node_606	0
BMP-3	BMP-3	1	10800.00	0	0	100	0	*	Node_603	0
BMP-4	BMP-4	1	8800.00	0	0	100	0	*	Node_504	0

[OUTFALLS]					
;;Name	Elevation	Type	Stage Data	Gated	Route To
;;-----					
Node_123	0	FREE		NO	BMP-1A
Node_716	0	FREE		NO	BMP-2
Node_602	0	FREE		NO	BMP-3
Node_306	0	FREE		NO	
Node_603	0	FREE		NO	
Node_503	0	FREE		NO	BMP-4
Node_606	0	FREE		NO	
Node_504	0	FREE		NO	

[STORAGE]										
;;Name	Elev.	MaxDepth	InitDepth	Shape	Curve Name/Params	N/A	Fevap	Psi	Ksat	IMD
;;-----										
SURF-1A	0	8.50	0	TABULAR	BMP-1A	0	0			
SURF-2	0	5.5	0	TABULAR	BMP-2	0	0			
SURF-3	0	4.5	0	TABULAR	BMP-3	0	0			
SURF-4	0	2.5	0	TABULAR	BMP-4	0	0			

[OUTLETS]							
;;Name	From Node	To Node	Offset	Type	QTable/Qcoeff	Qexpon	Gated
;;-----							
1A	SURF-1A	Node_306	0	TABULAR/HEAD	BMP_1A		NO
2	SURF-2	Node_606	0	TABULAR/HEAD	BMP_2		NO
3	SURF-3	Node_603	0	TABULAR/HEAD	BMP_3		NO
4	SURF-4	Node_504	0	TABULAR/HEAD	BMP_4		NO

[INFLOWS]						
;;Node	Constituent	Time Series	Type	Mfactor	Sfactor	Baseline Pattern
;;-----						
Node_123	FLOW	Node_123	FLOW	1.0	1.0	
Node_716	FLOW	Node_716	FLOW	1.0	1.0	
Node_602	FLOW	Node_602	FLOW	1.0	1.0	
Node_503	FLOW	Node_503	FLOW	1.0	1.0	

[CURVES]			
;;Name	Type	X-Value	Y-Value
;;-----			
BMP_1A	Rating	0.000	0.000

SWMM INPUT POC-1

BMP_1A	0.100	0.033
BMP_1A	0.200	0.092
BMP_1A	0.300	0.170
BMP_1A	0.400	0.261
BMP_1A	0.500	0.365
BMP_1A	0.600	0.480
BMP_1A	0.700	0.605
BMP_1A	0.800	0.739
BMP_1A	0.900	0.882
BMP_1A	1.000	1.033
BMP_1A	1.100	1.192
BMP_1A	1.200	1.358
BMP_1A	1.300	1.532
BMP_1A	1.400	1.712
BMP_1A	1.500	1.898
BMP_1A	1.600	2.091
BMP_1A	1.700	2.290
BMP_1A	1.800	2.495
BMP_1A	1.900	2.706
BMP_1A	2.000	2.923
BMP_1A	2.100	3.145
BMP_1A	2.200	3.372
BMP_1A	2.300	3.604
BMP_1A	2.400	3.842
BMP_1A	2.500	4.085
BMP_1A	2.600	4.332
BMP_1A	2.700	4.584
BMP_1A	2.800	4.841
BMP_1A	2.900	5.103
BMP_1A	3.000	5.369
BMP_1A	3.100	5.640
BMP_1A	3.200	5.915
BMP_1A	3.300	6.195
BMP_1A	3.400	6.478
BMP_1A	3.500	6.766
BMP_1A	3.600	7.058
BMP_1A	3.700	7.354
BMP_1A	3.800	7.654
BMP_1A	3.900	7.959
BMP_1A	4.000	8.267
BMP_1A	4.100	8.579
BMP_1A	4.200	8.894
BMP_1A	4.300	9.214
BMP_1A	4.400	9.537
BMP_1A	4.500	9.864
BMP_1A	4.600	10.195
BMP_1A	4.700	10.529
BMP_1A	4.800	10.867
BMP_1A	4.900	11.208
BMP_1A	5.000	11.553
BMP_1A	5.100	11.901
BMP_1A	5.200	12.253

SWMM INPUT POC-1

BMP_1A		5.300	12.608
BMP_1A		5.400	12.967
BMP_1A		5.500	13.329
BMP_1A		5.600	13.694
BMP_1A		5.700	14.062
BMP_1A		5.800	14.434
BMP_1A		5.900	14.809
BMP_1A		6.000	15.187
BMP_1A		6.100	15.568
BMP_1A		6.200	15.952
BMP_1A		6.300	16.340
BMP_1A		6.400	16.731
BMP_1A		6.500	17.124
BMP_1A		6.600	17.521
BMP_1A		6.700	17.921
BMP_1A		6.800	18.323
BMP_1A		6.900	18.729
BMP_1A		7.000	19.138
BMP_1A		7.100	19.549
BMP_1A		7.200	19.964
BMP_1A		7.300	20.381
BMP_1A		7.400	20.801
BMP_1A		7.500	21.224
BMP_1A		7.600	23.721
BMP_1A		7.700	27.946
BMP_1A		7.800	33.306
BMP_1A		7.900	39.591
BMP_1A		8.000	46.681
BMP_1A		8.100	54.495
BMP_1A		8.200	62.976
BMP_1A		8.300	72.078
BMP_1A		8.400	81.765
BMP_1A		8.500	92.008
;			
BMP_2	Rating	0.000	0.000
BMP_2		0.100	0.147
BMP_2		0.200	0.416
BMP_2		0.300	0.764
BMP_2		0.400	1.176
BMP_2		0.500	1.644
BMP_2		0.600	2.161
BMP_2		0.700	2.723
BMP_2		0.800	3.327
BMP_2		0.900	3.970
BMP_2		1.000	4.650
BMP_2		1.100	5.365
BMP_2		1.200	6.113
BMP_2		1.300	6.892
BMP_2		1.400	7.703
BMP_2		1.500	8.543
BMP_2		1.600	9.411
BMP_2		1.700	10.307

SWMM INPUT POC-1

BMP_2		1.800	11.230
BMP_2		1.900	12.178
BMP_2		2.000	13.152
BMP_2		2.100	14.151
BMP_2		2.200	15.174
BMP_2		2.300	16.220
BMP_2		2.400	17.289
BMP_2		2.500	18.381
BMP_2		2.600	19.495
BMP_2		2.700	20.630
BMP_2		2.800	21.787
BMP_2		2.900	22.964
BMP_2		3.000	24.162
BMP_2		3.100	25.380
BMP_2		3.200	26.618
BMP_2		3.300	27.876
BMP_2		3.400	29.152
BMP_2		3.500	30.448
BMP_2		3.600	31.762
BMP_2		3.700	33.094
BMP_2		3.800	34.445
BMP_2		3.900	35.814
BMP_2		4.000	37.200
BMP_2		4.100	38.604
BMP_2		4.200	40.025
BMP_2		4.300	41.463
BMP_2		4.400	42.917
BMP_2		4.500	44.389
BMP_2		4.600	48.779
BMP_2		4.700	55.610
BMP_2		4.800	64.056
BMP_2		4.900	73.826
BMP_2		5.000	84.756
BMP_2		5.100	96.734
BMP_2		5.200	109.680
BMP_2		5.300	123.534
BMP_2		5.400	137.606
BMP_2		5.500	152.352
;			
BMP_3	Rating	0.000	0.000
BMP_3		0.100	0.049
BMP_3		0.200	0.139
BMP_3		0.300	0.255
BMP_3		0.400	0.392
BMP_3		0.500	0.548
BMP_3		0.600	0.720
BMP_3		0.700	0.908
BMP_3		0.800	1.109
BMP_3		0.900	1.323
BMP_3		1.000	1.550
BMP_3		1.100	1.788
BMP_3		1.200	2.038

SWMM INPUT POC-1

BMP_3		1.300	2.297
BMP_3		1.400	2.568
BMP_3		1.500	2.848
BMP_3		1.600	3.137
BMP_3		1.700	3.436
BMP_3		1.800	3.743
BMP_3		1.900	4.059
BMP_3		2.000	4.384
BMP_3		2.100	4.717
BMP_3		2.200	5.058
BMP_3		2.300	5.407
BMP_3		2.400	5.763
BMP_3		2.500	6.127
BMP_3		2.600	6.498
BMP_3		2.700	6.877
BMP_3		2.800	7.262
BMP_3		2.900	7.655
BMP_3		3.000	8.054
BMP_3		3.100	8.460
BMP_3		3.200	8.873
BMP_3		3.300	9.292
BMP_3		3.400	9.717
BMP_3		3.500	10.149
BMP_3		3.600	11.832
BMP_3		3.700	14.563
BMP_3		3.800	17.989
BMP_3		3.900	21.986
BMP_3		4.000	26.457
BMP_3		4.100	31.188
BMP_3		4.200	36.330
BMP_3		4.300	41.857
BMP_3		4.400	47.750
BMP_3		4.500	53.992
;			
BMP_4	Rating	0.000	0.000
BMP_4		0.100	0.098
BMP_4		0.200	0.277
BMP_4		0.300	0.509
BMP_4		0.400	0.784
BMP_4		0.500	1.096
BMP_4		0.600	1.441
BMP_4		0.700	1.816
BMP_4		0.800	2.218
BMP_4		0.900	2.647
BMP_4		1.000	3.100
BMP_4		1.100	3.576
BMP_4		1.200	4.075
BMP_4		1.300	4.595
BMP_4		1.400	5.135
BMP_4		1.500	5.695
BMP_4		1.600	6.274
BMP_4		1.700	6.871

SWMM INPUT POC-1

BMP_4		1.800	7.486
BMP_4		1.900	8.119
BMP_4		2.000	8.748
BMP_4		2.100	10.338
BMP_4		2.200	12.966
BMP_4		2.300	16.284
BMP_4		2.400	20.172
BMP_4		2.500	24.563
;			
BMP-1A	Storage	0.00	31000
BMP-1A		3.50	35471
BMP-1A		8.50	45594
;			
BMP-2	Storage	0.00	43856
BMP-2		2.50	50357
BMP-2		5.50	58625
;			
BMP-3	Storage	0.00	11422
BMP-3		2.50	14698
BMP-3		4.50	17573
;			
BMP-4	Storage	0.00	9357
BMP-4		1.50	11082
BMP-4		2.50	12553

[TIMESERIES]

;;Name	Date	Time	Value
;;-----			
Zero-Rain		0:00	0
Zero-Rain		6:00	0
;			
;DMA-1A			
Node_123		0:00	0.00
Node_123		0:12	2.68
Node_123		0:24	2.74
Node_123		0:36	2.87
Node_123		0:48	2.94
Node_123		1:00	3.10
Node_123		1:12	3.19
Node_123		1:24	3.39
Node_123		1:36	3.50
Node_123		1:48	3.75
Node_123		2:00	3.90
Node_123		2:12	4.24
Node_123		2:24	4.44
Node_123		2:36	4.92
Node_123		2:48	5.22
Node_123		3:00	5.98
Node_123		3:12	6.48
Node_123		3:24	7.92
Node_123		3:36	9.03
Node_123		3:48	13.25

SWMM INPUT POC-1

Node_123	4:00	18.67
Node_123	4:12	62.10
Node_123	4:24	10.63
Node_123	4:36	7.11
Node_123	4:48	5.56
Node_123	5:00	4.66
Node_123	5:12	4.06
Node_123	5:24	3.62
Node_123	5:36	3.28
Node_123	5:48	3.02
Node_123	6:00	2.80
;		
;DMA-2		
Node_716	0:00	0.00
Node_716	0:10	3.32
Node_716	0:20	3.38
Node_716	0:30	3.51
Node_716	0:40	3.58
Node_716	0:50	3.74
Node_716	1:00	3.82
Node_716	1:10	4.00
Node_716	1:20	4.10
Node_716	1:30	4.33
Node_716	1:40	4.45
Node_716	1:50	4.72
Node_716	2:00	4.88
Node_716	2:10	5.23
Node_716	2:20	5.43
Node_716	2:30	5.91
Node_716	2:40	6.19
Node_716	2:50	6.86
Node_716	3:00	7.28
Node_716	3:10	8.34
Node_716	3:20	9.04
Node_716	3:30	11.05
Node_716	3:40	12.59
Node_716	3:50	18.49
Node_716	4:00	26.05
Node_716	4:10	90.00
Node_716	4:20	14.83
Node_716	4:30	9.92
Node_716	4:40	7.76
Node_716	4:50	6.50
Node_716	5:00	5.66
Node_716	5:10	5.05
Node_716	5:20	4.58
Node_716	5:30	4.21
Node_716	5:40	3.91
Node_716	5:50	3.66
Node_716	6:00	3.44
;		
;DMA-3		

SWMM INPUT POC-1

Node_602	0:00	0.00
Node_602	0:10	0.73
Node_602	0:20	0.74
Node_602	0:30	0.77
Node_602	0:40	0.79
Node_602	0:50	0.82
Node_602	1:00	0.84
Node_602	1:10	0.88
Node_602	1:20	0.90
Node_602	1:30	0.95
Node_602	1:40	0.98
Node_602	1:50	1.04
Node_602	2:00	1.07
Node_602	2:10	1.15
Node_602	2:20	1.19
Node_602	2:30	1.30
Node_602	2:40	1.36
Node_602	2:50	1.50
Node_602	3:00	1.60
Node_602	3:10	1.83
Node_602	3:20	1.98
Node_602	3:30	2.42
Node_602	3:40	2.76
Node_602	3:50	4.05
Node_602	4:00	5.71
Node_602	4:10	18.90
Node_602	4:20	3.25
Node_602	4:30	2.18
Node_602	4:40	1.70
Node_602	4:50	1.43
Node_602	5:00	1.24
Node_602	5:10	1.11
Node_602	5:20	1.00
Node_602	5:30	0.92
Node_602	5:40	0.86
Node_602	5:50	0.80
Node_602	6:00	0.75
;		
;DMA-4		
Node_503	0:00	0.00
Node_503	0:10	0.62
Node_503	0:20	0.63
Node_503	0:30	0.66
Node_503	0:40	0.67
Node_503	0:50	0.70
Node_503	1:00	0.72
Node_503	1:10	0.75
Node_503	1:20	0.77
Node_503	1:30	0.81
Node_503	1:40	0.83
Node_503	1:50	0.88
Node_503	2:00	0.91

SWMM INPUT POC-1

Node_503	2:10	0.98
Node_503	2:20	1.02
Node_503	2:30	1.11
Node_503	2:40	1.16
Node_503	2:50	1.29
Node_503	3:00	1.36
Node_503	3:10	1.56
Node_503	3:20	1.69
Node_503	3:30	2.07
Node_503	3:40	2.36
Node_503	3:50	3.46
Node_503	4:00	4.88
Node_503	4:10	17.40
Node_503	4:20	2.78
Node_503	4:30	1.86
Node_503	4:40	1.45
Node_503	4:50	1.22
Node_503	5:00	1.06
Node_503	5:10	0.95
Node_503	5:20	0.86
Node_503	5:30	0.79
Node_503	5:40	0.73
Node_503	5:50	0.68
Node_503	6:00	0.64

[REPORT]
 ;;Reporting Options
 SUBCATCHMENTS ALL
 NODES ALL
 LINKS ALL

[TAGS]

[MAP]
 DIMENSIONS 0.000 0.000 10000.000 10000.000
 Units None

[COORDINATES]
 ;;Node X-Coord Y-Coord
 ;;-----
 Node_123 983.359 7700.454
 Node_716 3000.000 7791.225
 Node_602 4500.000 7791.225
 Node_306 1089.259 3978.820
 Node_603 4500.000 4039.334
 Node_503 6500.000 7791.225
 Node_606 3000.000 4084.720
 Node_504 6422.088 4099.849
 SURF-1A 1059.002 5340.393
 SURF-2 3000.000 5506.808
 SURF-3 4500.000 5431.165
 SURF-4 6452.345 5446.293

SWMM INPUT POC-1

```
[VERTICES]
;;Link      X-Coord      Y-Coord
;;-----

```

```
[Polygons]
;;Subcatchment  X-Coord      Y-Coord
;;-----
BMP-1A          1043.873      6475.038
BMP-2           3000.000      6580.938
BMP-3           4500.000      6596.067
BMP-4           6422.088      6717.095

```

```
[SYMBOLS]
;;Gage      X-Coord      Y-Coord
;;-----
Zero-Rain   9878.971      7942.511

```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

537-03

 NOTE: The summary statistics displayed in this report are
 based on results found at every computational time step,
 not just on results from each reporting time step.

Analysis Options

Flow Units CFS

Process Models:

Rainfall/Runoff YES

RDII NO

Snowmelt NO

Groundwater NO

Flow Routing YES

Ponding Allowed NO

Water Quality NO

Infiltration Method GREEN_AMPT

Flow Routing Method KINWAVE

Starting Date 01/01/2000 00:00:00

Ending Date 01/01/2000 12:00:00

Antecedent Dry Days 0.0

Report Time Step 00:01:00

Wet Time Step 00:01:00

Dry Time Step 00:01:00

Routing Time Step 10.00 sec

*****	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
*****	-----	-----
Initial LID Storage	0.370	2.100
Total Precipitation	0.000	0.000
Outfall Runon	9.949	56.527
Evaporation Loss	0.000	0.000
Infiltration Loss	0.000	0.000
Surface Runoff	4.011	22.791
LID Drainage	5.356	30.431
Final Storage	0.951	5.403
Continuity Error (%)	0.004	

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal

SWMM OUTPUT POC-1

```

*****
Dry Weather Inflow ..... 0.000 0.000
Wet Weather Inflow ..... 9.367 3.052
Groundwater Inflow ..... 0.000 0.000
RDII Inflow ..... 0.000 0.000
External Inflow ..... 9.949 3.242
External Outflow ..... 18.490 6.025
Flooding Loss ..... 0.000 0.000
Evaporation Loss ..... 0.000 0.000
Exfiltration Loss ..... 0.000 0.000
Initial Stored Volume .... 0.000 0.000
Final Stored Volume ..... 0.825 0.269
Continuity Error (%) ..... 0.005

```

```

*****
Highest Flow Instability Indexes
*****
All links are stable.

```

```

*****
Routing Time Step Summary
*****
Minimum Time Step      : 10.00 sec
Average Time Step      : 10.00 sec
Maximum Time Step      : 10.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging  : 0.00

```

```

*****
Subcatchment Runoff Summary
*****

```

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
BMP-1A	0.00	63.10	0.00	0.00	0.00	0.00	59.79	1.11	59.52	0.948
BMP-2	0.00	55.44	0.00	0.00	0.00	0.00	52.14	1.38	85.59	0.940
BMP-3	0.00	47.41	0.00	0.00	0.00	0.00	44.11	0.30	17.87	0.930
BMP-4	0.00	50.71	0.00	0.00	0.00	0.00	47.41	0.26	16.57	0.935

```

*****
LID Performance Summary
*****

```

SWMM OUTPUT POC-1									
Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BMP-1A	BMP-1A	63.10	0.00	0.00	28.12	31.68	2.10	5.40	0.00
BMP-2	BMP-2	55.44	0.00	0.00	21.88	30.26	2.10	5.40	0.00
BMP-3	BMP-3	47.41	0.00	0.00	15.46	28.65	2.10	5.40	0.00
BMP-4	BMP-4	50.71	0.00	0.00	18.18	29.23	2.10	5.40	-0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
Node_123	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node_716	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node_602	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node_306	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node_603	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node_503	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node_606	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Node_504	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SURF-1A	STORAGE	0.86	1.92	1.92	0 04:45	1.92
SURF-2	STORAGE	0.39	1.40	1.40	0 04:26	1.40
SURF-3	STORAGE	0.26	0.97	0.97	0 04:26	0.97
SURF-4	STORAGE	0.15	1.01	1.01	0 04:21	1.01

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
Node_123	OUTFALL	62.10	62.10	0 04:12	1.17	1.17	0.000
Node_716	OUTFALL	90.00	90.00	0 04:10	1.47	1.47	0.000
Node_602	OUTFALL	18.90	18.90	0 04:10	0.319	0.319	0.000
Node_306	OUTFALL	4.41	6.19	0 04:45	0.588	0.923	0.000
Node_603	OUTFALL	1.59	2.53	0 04:51	0.193	0.286	0.000
Node_503	OUTFALL	17.40	17.40	0 04:10	0.278	0.278	0.000
Node_606	OUTFALL	6.37	12.46	0 04:36	0.804	1.32	0.000
Node_504	OUTFALL	1.59	3.96	0 04:21	0.16	0.258	0.000
SURF-1A	STORAGE	56.86	56.86	0 04:14	0.522	0.522	0.006
SURF-2	STORAGE	81.93	81.93	0 04:12	0.581	0.581	0.028

SWMM OUTPUT POC-1

SURF-3	STORAGE	17.00	17.00	0	04:12	0.104	0.104	0.028
SURF-4	STORAGE	15.77	15.77	0	04:12	0.0997	0.0997	0.069

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
SURF-1A	27.377	9	0	0	61.799	19	0 04:44	2.74
SURF-2	17.649	6	0	0	64.079	23	0 04:26	7.73
SURF-3	3.047	5	0	0	11.648	18	0 04:26	1.47
SURF-4	1.399	5	0	0	10.026	37	0 04:20	3.14

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Node_123	49.98	7.26	62.10	1.172
Node_716	49.98	9.12	90.00	1.472
Node_602	49.98	1.98	18.90	0.319
Node_306	89.84	3.18	6.19	0.923
Node_603	88.31	1.00	2.53	0.286
Node_503	49.98	1.72	17.40	0.278
Node_606	89.14	4.57	12.46	1.316
Node_504	88.59	0.90	3.96	0.258
System	69.47	29.73	3.96	6.025

Link Flow Summary

SWMM OUTPUT POC-1						
Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
1A	DUMMY	2.74	0 04:45			
2	DUMMY	7.73	0 04:26			
3	DUMMY	1.47	0 04:26			
4	DUMMY	3.14	0 04:21			

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Wed Dec 18 23:55:02 2019
Analysis ended on: Wed Dec 18 23:55:02 2019
Total elapsed time: < 1 sec

APPENDIX D

Retention Analysis and Hydraulics



NOAA Atlas 14, Volume 6, Version 2
Location name: Oceanside, California, USA*
Latitude: 33.2221°, Longitude: -117.3412°
Elevation: 40.7 ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.143 (0.121-0.172)	0.183 (0.154-0.220)	0.241 (0.202-0.290)	0.292 (0.243-0.355)	0.369 (0.296-0.465)	0.435 (0.341-0.560)	0.507 (0.387-0.671)	0.589 (0.436-0.803)	0.711 (0.503-1.01)	0.815 (0.557-1.21)
10-min	0.205 (0.173-0.247)	0.262 (0.221-0.315)	0.345 (0.289-0.416)	0.419 (0.348-0.509)	0.529 (0.424-0.667)	0.623 (0.488-0.803)	0.727 (0.555-0.962)	0.844 (0.625-1.15)	1.02 (0.722-1.45)	1.17 (0.798-1.73)
15-min	0.248 (0.209-0.298)	0.317 (0.267-0.381)	0.417 (0.350-0.503)	0.506 (0.421-0.615)	0.640 (0.513-0.806)	0.754 (0.591-0.971)	0.879 (0.671-1.16)	1.02 (0.756-1.39)	1.23 (0.873-1.76)	1.41 (0.965-2.09)
30-min	0.351 (0.296-0.421)	0.448 (0.377-0.539)	0.589 (0.494-0.710)	0.715 (0.594-0.869)	0.904 (0.725-1.14)	1.06 (0.834-1.37)	1.24 (0.948-1.64)	1.44 (1.07-1.97)	1.74 (1.23-2.48)	2.00 (1.36-2.95)
60-min	0.469 (0.395-0.563)	0.599 (0.504-0.720)	0.788 (0.660-0.949)	0.956 (0.794-1.16)	1.21 (0.968-1.52)	1.42 (1.12-1.83)	1.66 (1.27-2.20)	1.93 (1.43-2.63)	2.33 (1.65-3.32)	2.67 (1.82-3.95)
2-hr	0.640 (0.539-0.768)	0.793 (0.666-0.952)	1.01 (0.849-1.22)	1.21 (1.00-1.47)	1.51 (1.21-1.90)	1.76 (1.38-2.27)	2.04 (1.55-2.69)	2.35 (1.74-3.20)	2.82 (2.00-4.02)	3.23 (2.20-4.77)
3-hr	0.755 (0.636-0.906)	0.930 (0.782-1.12)	1.18 (0.989-1.42)	1.40 (1.16-1.70)	1.73 (1.39-2.18)	2.01 (1.57-2.59)	2.31 (1.76-3.06)	2.65 (1.96-3.61)	3.15 (2.24-4.50)	3.58 (2.45-5.30)
6-hr	0.977 (0.822-1.17)	1.21 (1.02-1.45)	1.53 (1.29-1.85)	1.81 (1.50-2.20)	2.21 (1.77-2.78)	2.53 (1.99-3.27)	2.88 (2.20-3.81)	3.26 (2.41-4.44)	3.80 (2.69-5.42)	4.25 (2.90-6.28)
12-hr	1.21 (1.02-1.46)	1.56 (1.31-1.88)	2.02 (1.69-2.43)	2.39 (1.98-2.90)	2.89 (2.31-3.64)	3.27 (2.56-4.22)	3.66 (2.79-4.84)	4.06 (3.01-5.54)	4.60 (3.26-6.56)	5.02 (3.43-7.43)
24-hr	1.46 (1.29-1.69)	1.97 (1.73-2.28)	2.59 (2.28-3.01)	3.08 (2.69-3.60)	3.72 (3.14-4.49)	4.18 (3.47-5.15)	4.64 (3.76-5.85)	5.10 (4.02-6.59)	5.69 (4.31-7.65)	6.13 (4.50-8.52)
2-day	1.78 (1.57-2.06)	2.40 (2.11-2.77)	3.17 (2.79-3.68)	3.78 (3.30-4.42)	4.58 (3.87-5.52)	5.17 (4.29-6.36)	5.76 (4.66-7.25)	6.34 (5.00-8.21)	7.11 (5.39-9.57)	7.69 (5.65-10.7)
3-day	1.99 (1.76-2.30)	2.66 (2.35-3.08)	3.52 (3.10-4.08)	4.21 (3.67-4.92)	5.13 (4.34-6.19)	5.83 (4.83-7.18)	6.53 (5.29-8.22)	7.24 (5.71-9.36)	8.18 (6.21-11.0)	8.90 (6.54-12.4)
4-day	2.15 (1.90-2.49)	2.88 (2.54-3.34)	3.82 (3.36-4.43)	4.59 (4.00-5.36)	5.61 (4.75-6.77)	6.40 (5.31-7.88)	7.19 (5.83-9.06)	8.01 (6.32-10.4)	9.10 (6.90-12.2)	9.95 (7.30-13.8)
7-day	2.50 (2.20-2.89)	3.36 (2.96-3.88)	4.48 (3.94-5.20)	5.41 (4.72-6.32)	6.68 (5.65-8.06)	7.66 (6.35-9.43)	8.66 (7.02-10.9)	9.71 (7.66-12.6)	11.1 (8.45-15.0)	12.3 (9.00-17.1)
10-day	2.76 (2.44-3.19)	3.72 (3.28-4.31)	5.00 (4.40-5.81)	6.06 (5.29-7.09)	7.52 (6.36-9.08)	8.67 (7.19-10.7)	9.85 (7.98-12.4)	11.1 (8.75-14.3)	12.8 (9.71-17.2)	14.2 (10.4-19.7)
20-day	3.41 (3.01-3.94)	4.62 (4.08-5.35)	6.27 (5.51-7.27)	7.65 (6.68-8.95)	9.60 (8.12-11.6)	11.2 (9.25-13.7)	12.8 (10.4-16.1)	14.5 (11.5-18.8)	17.0 (12.9-22.8)	18.9 (13.9-26.3)
30-day	4.02 (3.55-4.64)	5.45 (4.81-6.31)	7.41 (6.52-8.60)	9.08 (7.92-10.6)	11.5 (9.68-13.8)	13.4 (11.1-16.4)	15.4 (12.5-19.4)	17.6 (13.9-22.7)	20.7 (15.7-27.8)	23.2 (17.0-32.3)
45-day	4.80 (4.24-5.55)	6.47 (5.71-7.49)	8.79 (7.73-10.2)	10.8 (9.41-12.6)	13.6 (11.5-16.5)	16.0 (13.2-19.7)	18.5 (15.0-23.3)	21.2 (16.7-27.4)	25.1 (19.0-33.8)	28.3 (20.8-39.4)
60-day	5.57 (4.91-6.44)	7.45 (6.57-8.62)	10.1 (8.85-11.7)	12.3 (10.8-14.4)	15.6 (13.2-18.8)	18.3 (15.2-22.6)	21.2 (17.2-26.8)	24.4 (19.3-31.6)	29.1 (22.1-39.1)	33.0 (24.2-45.9)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

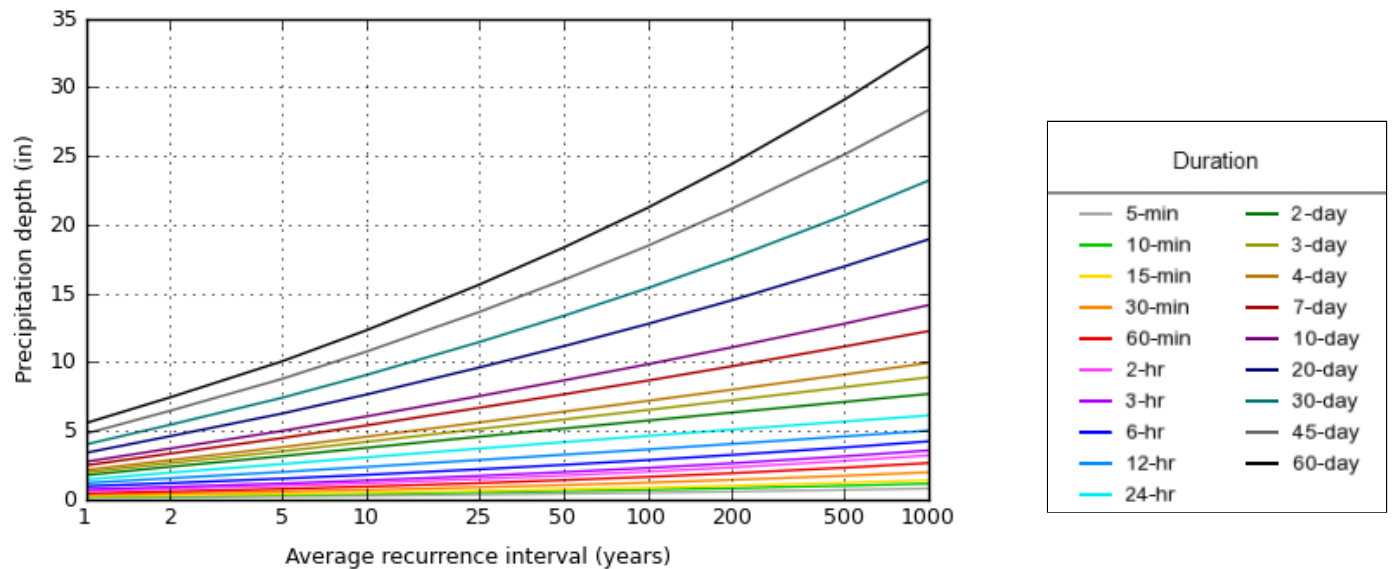
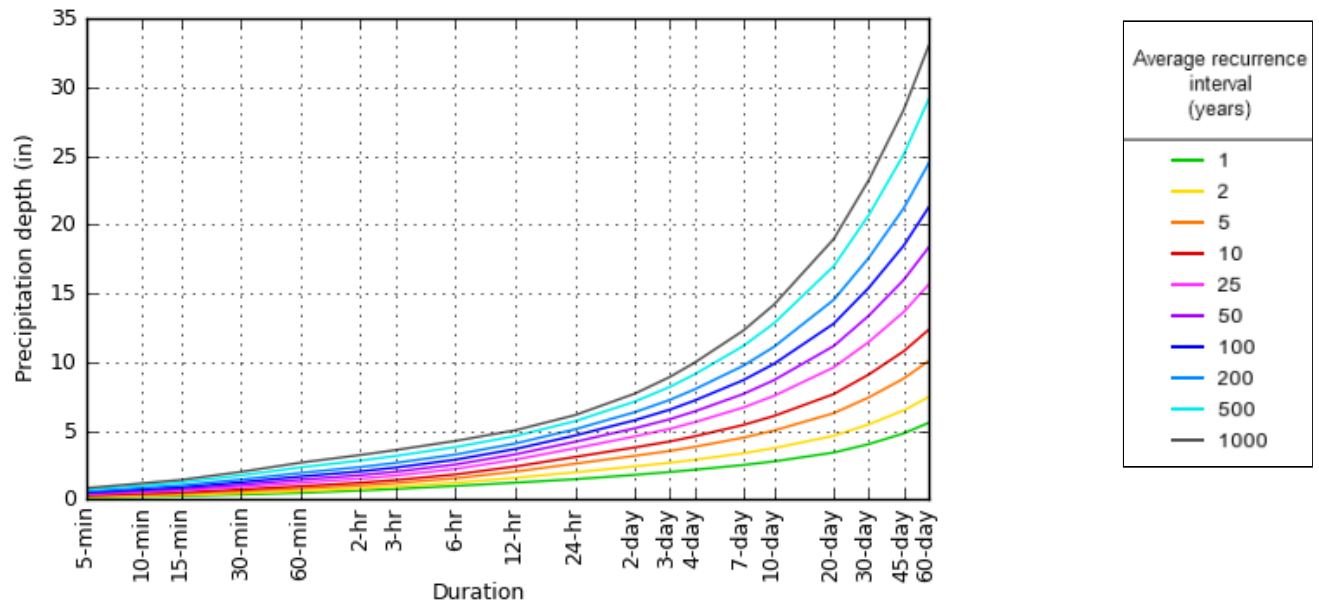
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

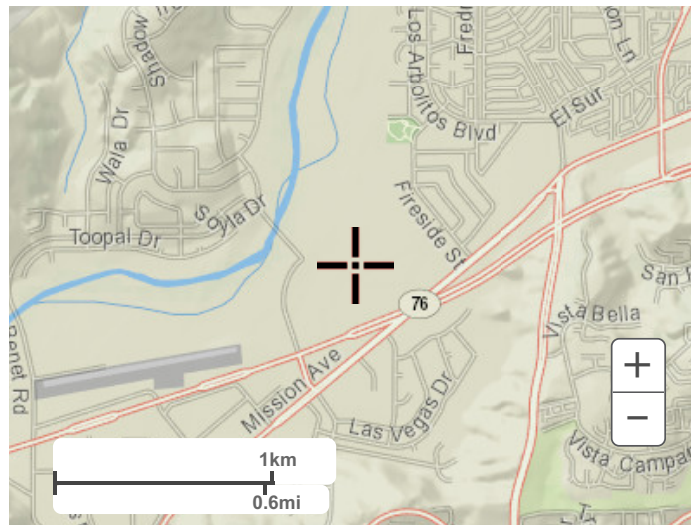
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.2221°, Longitude: -117.3412°



Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

[US Department of Commerce](#)
[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)

10yr-24hr Rainfall (NOAA Atlas 14)											
Time Interval (min):	5	0:05				Final 24 hour 5-min interval Storm Sorted per SDCHM (6 hr Storm is denoted by green range below)					
Time (hr:min)	Time (min)	Cumulative Rain NOAA-14 Values* (in)	Incremental Rain (in)	Position		Time (hr:min)	Incremental Rain (in)	Position	Cumulative Rain (in)	Intensity (in/hr)	
0:00	0	0.000	0.2920	193		0:00	0.0039	1	0.0039	0.0470	
0:05	5	0.292	0.1270	192		0:05	0.0039	2	0.0078	0.0471	
0:10	10	0.419	0.0870	191		0:10	0.0039	3	0.0118	0.0473	
0:15	15	0.506	0.0781	194		0:15	0.0040	4	0.0157	0.0474	
0:20	20	0.584	0.0688	190		0:20	0.0040	5	0.0197	0.0476	
0:25	25	0.653	0.0622	189		0:25	0.0040	6	0.0237	0.0478	
0:30	30	0.715	0.0477	195		0:30	0.0040	7	0.0277	0.0480	
0:35	35	0.763	0.0439	188		0:35	0.0040	8	0.0317	0.0481	
0:40	40	0.807	0.0408	187		0:40	0.0040	9	0.0357	0.0483	
0:45	45	0.847	0.0383	196		0:45	0.0040	10	0.0398	0.0484	
0:50	50	0.886	0.0361	186		0:50	0.0041	11	0.0438	0.0486	
0:55	55	0.922	0.0342	185		0:55	0.0041	12	0.0479	0.0487	
1:00	60	0.956	0.0264	197		1:00	0.0041	13	0.0520	0.0490	
1:05	65	0.982	0.0251	184		1:05	0.0041	14	0.0560	0.0491	
1:10	70	1.007	0.0239	183		1:10	0.0041	15	0.0602	0.0493	
1:15	75	1.031	0.0229	198		1:15	0.0041	16	0.0643	0.0494	
1:20	80	1.054	0.0220	182		1:20	0.0041	17	0.0684	0.0497	
1:25	85	1.076	0.0211	181		1:25	0.0042	18	0.0726	0.0498	
1:30	90	1.097	0.0204	199		1:30	0.0042	19	0.0767	0.0500	
1:35	95	1.118	0.0197	180		1:35	0.0042	20	0.0809	0.0502	
1:40	100	1.137	0.0190	179		1:40	0.0042	21	0.0851	0.0504	
1:45	105	1.156	0.0184	200		1:45	0.0042	22	0.0893	0.0505	
1:50	110	1.175	0.0179	178		1:50	0.0042	23	0.0936	0.0508	
1:55	115	1.193	0.0174	177		1:55	0.0042	24	0.0978	0.0509	
2:00	120	1.210	0.0179	201		2:00	0.0043	25	0.1021	0.0512	
2:05	125	1.228	0.0174	176		2:05	0.0043	26	0.1063	0.0513	
2:10	130	1.245	0.0170	175		2:10	0.0043	27	0.1106	0.0516	
2:15	135	1.262	0.0166	202		2:15	0.0043	28	0.1149	0.0517	
2:20	140	1.279	0.0162	174		2:20	0.0043	29	0.1193	0.0520	
2:25	145	1.295	0.0159	173		2:25	0.0043	30	0.1236	0.0521	

2:30	150	1.311	0.0156	203		2:30	0.0044	31	0.1280	0.0524	
2:35	155	1.327	0.0152	172		2:35	0.0044	32	0.1324	0.0525	
2:40	160	1.342	0.0149	171		2:40	0.0044	33	0.1368	0.0528	
2:45	165	1.357	0.0146	204		2:45	0.0044	34	0.1412	0.0529	
2:50	170	1.372	0.0144	170		2:50	0.0044	35	0.1456	0.0532	
2:55	175	1.386	0.0141	169		2:55	0.0044	36	0.1500	0.0534	
3:00	180	1.400	0.0143	205		3:00	0.0045	37	0.1545	0.0536	
3:05	185	1.414	0.0140	168		3:05	0.0045	38	0.1590	0.0538	
3:10	190	1.428	0.0138	167		3:10	0.0045	39	0.1635	0.0541	
3:15	195	1.442	0.0136	206		3:15	0.0045	40	0.1680	0.0542	
3:20	200	1.456	0.0134	166		3:20	0.0045	41	0.1726	0.0545	
3:25	205	1.469	0.0132	165		3:25	0.0046	42	0.1771	0.0547	
3:30	210	1.482	0.0130	207		3:30	0.0046	43	0.1817	0.0550	
3:35	215	1.495	0.0128	164		3:35	0.0046	44	0.1863	0.0552	
3:40	220	1.508	0.0126	163		3:40	0.0046	45	0.1909	0.0555	
3:45	225	1.521	0.0124	208		3:45	0.0046	46	0.1956	0.0556	
3:50	230	1.533	0.0123	162		3:50	0.0047	47	0.2002	0.0559	
3:55	235	1.545	0.0121	161		3:55	0.0047	48	0.2049	0.0561	
4:00	240	1.557	0.0119	209		4:00	0.0047	49	0.2096	0.0564	
4:05	245	1.569	0.0118	160		4:05	0.0047	50	0.2143	0.0566	
4:10	250	1.581	0.0116	159		4:10	0.0047	51	0.2191	0.0569	
4:15	255	1.593	0.0115	210		4:15	0.0048	52	0.2238	0.0571	
4:20	260	1.604	0.0114	158		4:20	0.0048	53	0.2286	0.0575	
4:25	265	1.616	0.0112	157		4:25	0.0048	54	0.2334	0.0576	
4:30	270	1.627	0.0111	211		4:30	0.0048	55	0.2383	0.0580	
4:35	275	1.638	0.0110	156		4:35	0.0048	56	0.2431	0.0582	
4:40	280	1.649	0.0109	155		4:40	0.0049	57	0.2480	0.0585	
4:45	285	1.660	0.0107	212		4:45	0.0049	58	0.2529	0.0587	
4:50	290	1.671	0.0106	154		4:50	0.0049	59	0.2578	0.0591	
4:55	295	1.681	0.0105	153		4:55	0.0049	60	0.2627	0.0593	
5:00	300	1.692	0.0104	213		5:00	0.0050	61	0.2677	0.0596	
5:05	305	1.702	0.0103	152		5:05	0.0050	62	0.2727	0.0598	
5:10	310	1.712	0.0102	151		5:10	0.0050	63	0.2777	0.0602	
5:15	315	1.723	0.0101	214		5:15	0.0050	64	0.2827	0.0604	
5:20	320	1.733	0.0100	150		5:20	0.0051	65	0.2878	0.0608	
5:25	325	1.743	0.0099	149		5:25	0.0051	66	0.2929	0.0610	
5:30	330	1.753	0.0098	215		5:30	0.0051	67	0.2980	0.0614	

5:35	335	1.762	0.0097	148		5:35	0.0051	68	0.3032	0.0616	
5:40	340	1.772	0.0096	147		5:40	0.0052	69	0.3083	0.0621	
5:45	345	1.782	0.0095	216		5:45	0.0052	70	0.3135	0.0623	
5:50	350	1.791	0.0094	146		5:50	0.0052	71	0.3187	0.0627	
5:55	355	1.801	0.0094	145		5:55	0.0052	72	0.3240	0.0629	
6:00	360	1.810	0.0100	217		6:00	0.0053	73	0.3293	0.0634	
6:05	365	1.820	0.0100	144		6:05	0.0053	74	0.3346	0.0636	
6:10	370	1.830	0.0099	143		6:10	0.0053	75	0.3399	0.0641	
6:15	375	1.840	0.0098	218		6:15	0.0054	76	0.3453	0.0643	
6:20	380	1.850	0.0097	142		6:20	0.0054	77	0.3507	0.0648	
6:25	385	1.859	0.0096	141		6:25	0.0054	78	0.3561	0.0650	
6:30	390	1.869	0.0096	219		6:30	0.0055	79	0.3615	0.0655	
6:35	395	1.879	0.0095	140		6:35	0.0055	80	0.3670	0.0657	
6:40	400	1.888	0.0094	139		6:40	0.0055	81	0.3725	0.0662	
6:45	405	1.898	0.0094	220		6:45	0.0055	82	0.3781	0.0665	
6:50	410	1.907	0.0093	138		6:50	0.0056	83	0.3836	0.0670	
6:55	415	1.916	0.0092	137		6:55	0.0056	84	0.3893	0.0672	
7:00	420	1.925	0.0092	221		7:00	0.0056	85	0.3949	0.0678	
7:05	425	1.935	0.0091	136		7:05	0.0057	86	0.4006	0.0680	
7:10	430	1.944	0.0090	135		7:10	0.0057	87	0.4063	0.0686	
7:15	435	1.953	0.0090	222		7:15	0.0057	88	0.4120	0.0689	
7:20	440	1.962	0.0089	134		7:20	0.0058	89	0.4178	0.0694	
7:25	445	1.971	0.0088	133		7:25	0.0058	90	0.4236	0.0697	
7:30	450	1.979	0.0088	223		7:30	0.0059	91	0.4295	0.0703	
7:35	455	1.988	0.0087	132		7:35	0.0059	92	0.4354	0.0706	
7:40	460	1.997	0.0087	131		7:40	0.0059	93	0.4413	0.0712	
7:45	465	2.006	0.0086	224		7:45	0.0060	94	0.4472	0.0715	
7:50	470	2.014	0.0086	130		7:50	0.0060	95	0.4532	0.0721	
7:55	475	2.023	0.0085	129		7:55	0.0060	96	0.4593	0.0724	
8:00	480	2.031	0.0085	225		8:00	0.0067	97	0.4659	0.0800	
8:05	485	2.040	0.0084	128		8:05	0.0067	98	0.4726	0.0804	
8:10	490	2.048	0.0084	127		8:10	0.0068	99	0.4794	0.0811	
8:15	495	2.057	0.0083	226		8:15	0.0068	100	0.4862	0.0814	
8:20	500	2.065	0.0083	126		8:20	0.0068	101	0.4930	0.0821	
8:25	505	2.073	0.0082	125		8:25	0.0069	102	0.4999	0.0825	
8:30	510	2.081	0.0082	227		8:30	0.0069	103	0.5068	0.0832	
8:35	515	2.089	0.0081	124		8:35	0.0070	104	0.5138	0.0836	

8:40	520	2.098	0.0081	123		8:40	0.0070	105	0.5208	0.0843	
8:45	525	2.106	0.0080	228		8:45	0.0071	106	0.5279	0.0847	
8:50	530	2.114	0.0080	122		8:50	0.0071	107	0.5350	0.0855	
8:55	535	2.122	0.0079	121		8:55	0.0072	108	0.5422	0.0859	
9:00	540	2.130	0.0079	229		9:00	0.0072	109	0.5494	0.0867	
9:05	545	2.137	0.0078	120		9:05	0.0073	110	0.5567	0.0871	
9:10	550	2.145	0.0078	119		9:10	0.0073	111	0.5640	0.0880	
9:15	555	2.153	0.0078	230		9:15	0.0074	112	0.5714	0.0884	
9:20	560	2.161	0.0077	118		9:20	0.0074	113	0.5788	0.0893	
9:25	565	2.169	0.0077	117		9:25	0.0075	114	0.5863	0.0898	
9:30	570	2.176	0.0076	231		9:30	0.0076	115	0.5938	0.0907	
9:35	575	2.184	0.0076	116		9:35	0.0076	116	0.6014	0.0911	
9:40	580	2.191	0.0076	115		9:40	0.0077	117	0.6091	0.0921	
9:45	585	2.199	0.0075	232		9:45	0.0077	118	0.6168	0.0926	
9:50	590	2.207	0.0075	114		9:50	0.0078	119	0.6246	0.0936	
9:55	595	2.214	0.0074	113		9:55	0.0078	120	0.6325	0.0941	
10:00	600	2.221	0.0074	233		10:00	0.0079	121	0.6404	0.0952	
10:05	605	2.229	0.0074	112		10:05	0.0080	122	0.6484	0.0957	
10:10	610	2.236	0.0073	111		10:10	0.0081	123	0.6564	0.0968	
10:15	615	2.244	0.0073	234		10:15	0.0081	124	0.6646	0.0973	
10:20	620	2.251	0.0073	110		10:20	0.0082	125	0.6728	0.0985	
10:25	625	2.258	0.0072	109		10:25	0.0083	126	0.6810	0.0991	
10:30	630	2.265	0.0072	235		10:30	0.0084	127	0.6894	0.1003	
10:35	635	2.273	0.0072	108		10:35	0.0084	128	0.6978	0.1009	
10:40	640	2.280	0.0071	107		10:40	0.0085	129	0.7063	0.1021	
10:45	645	2.287	0.0071	236		10:45	0.0086	130	0.7149	0.1028	
10:50	650	2.294	0.0071	106		10:50	0.0087	131	0.7235	0.1041	
10:55	655	2.301	0.0070	105		10:55	0.0087	132	0.7323	0.1048	
11:00	660	2.308	0.0070	237		11:00	0.0088	133	0.7411	0.1062	
11:05	665	2.315	0.0070	104		11:05	0.0089	134	0.7500	0.1069	
11:10	670	2.322	0.0069	103		11:10	0.0090	135	0.7591	0.1084	
11:15	675	2.329	0.0069	238		11:15	0.0091	136	0.7682	0.1091	
11:20	680	2.336	0.0069	102		11:20	0.0092	137	0.7774	0.1107	
11:25	685	2.343	0.0068	101		11:25	0.0093	138	0.7867	0.1115	
11:30	690	2.350	0.0068	239		11:30	0.0094	139	0.7961	0.1132	
11:35	695	2.356	0.0068	100		11:35	0.0095	140	0.8056	0.1140	
11:40	700	2.363	0.0068	99		11:40	0.0096	141	0.8152	0.1158	

11:45	705	2.370	0.0067	240		11:45	0.0097	142	0.8250	0.1167	
11:50	710	2.377	0.0067	98		11:50	0.0099	143	0.8348	0.1185	
11:55	715	2.383	0.0067	97		11:55	0.0100	144	0.8448	0.1195	
12:00	720	2.390	0.0061	241		12:00	0.0094	145	0.8542	0.1123	
12:05	725	2.396	0.0060	96		12:05	0.0094	146	0.8636	0.1133	
12:10	730	2.402	0.0060	95		12:10	0.0096	147	0.8732	0.1153	
12:15	735	2.408	0.0060	242		12:15	0.0097	148	0.8829	0.1164	
12:20	740	2.414	0.0060	94		12:20	0.0099	149	0.8928	0.1186	
12:25	745	2.420	0.0059	93		12:25	0.0100	150	0.9028	0.1198	
12:30	750	2.426	0.0059	243		12:30	0.0102	151	0.9130	0.1222	
12:35	755	2.432	0.0059	92		12:35	0.0103	152	0.9233	0.1234	
12:40	760	2.438	0.0059	91		12:40	0.0105	153	0.9338	0.1260	
12:45	765	2.444	0.0058	244		12:45	0.0106	154	0.9444	0.1274	
12:50	770	2.449	0.0058	90		12:50	0.0109	155	0.9552	0.1302	
12:55	775	2.455	0.0058	89		12:55	0.0110	156	0.9662	0.1317	
13:00	780	2.461	0.0058	245		13:00	0.0112	157	0.9774	0.1348	
13:05	785	2.467	0.0057	88		13:05	0.0114	158	0.9888	0.1364	
13:10	790	2.473	0.0057	87		13:10	0.0116	159	1.0004	0.1398	
13:15	795	2.478	0.0057	246		13:15	0.0118	160	1.0122	0.1415	
13:20	800	2.484	0.0057	86		13:20	0.0121	161	1.0243	0.1452	
13:25	805	2.490	0.0056	85		13:25	0.0123	162	1.0366	0.1472	
13:30	810	2.495	0.0056	247		13:30	0.0126	163	1.0492	0.1513	
13:35	815	2.501	0.0056	84		13:35	0.0128	164	1.0620	0.1535	
13:40	820	2.506	0.0056	83		13:40	0.0132	165	1.0752	0.1581	
13:45	825	2.512	0.0056	248		13:45	0.0134	166	1.0886	0.1606	
13:50	830	2.518	0.0055	82		13:50	0.0138	167	1.1024	0.1658	
13:55	835	2.523	0.0055	81		13:55	0.0140	168	1.1164	0.1685	
14:00	840	2.529	0.0055	249		14:00	0.0141	169	1.1305	0.1694	
14:05	845	2.534	0.0055	80		14:05	0.0144	170	1.1449	0.1725	
14:10	850	2.540	0.0055	79		14:10	0.0149	171	1.1599	0.1792	
14:15	855	2.545	0.0054	250		14:15	0.0152	172	1.1751	0.1829	
14:20	860	2.551	0.0054	78		14:20	0.0159	173	1.1910	0.1907	
14:25	865	2.556	0.0054	77		14:25	0.0162	174	1.2072	0.1950	
14:30	870	2.561	0.0054	251		14:30	0.0170	175	1.2243	0.2043	
14:35	875	2.567	0.0054	76		14:35	0.0174	176	1.2417	0.2094	
14:40	880	2.572	0.0053	75		14:40	0.0174	177	1.2591	0.2085	
14:45	885	2.577	0.0053	252		14:45	0.0179	178	1.2770	0.2146	

14:50	890	2.583	0.0053	74		14:50	0.0190	179	1.2960	0.2282
14:55	895	2.588	0.0053	73		14:55	0.0197	180	1.3156	0.2359
15:00	900	2.593	0.0053	253		15:00	0.0211	181	1.3368	0.2534
15:05	905	2.599	0.0052	72		15:05	0.0220	182	1.3587	0.2634
15:10	910	2.604	0.0052	71		15:10	0.0239	183	1.3826	0.2869
15:15	915	2.609	0.0052	254		15:15	0.0251	184	1.4077	0.3007
15:20	920	2.614	0.0052	70		15:20	0.0342	185	1.4419	0.4108
15:25	925	2.619	0.0052	69		15:25	0.0361	186	1.4780	0.4331
15:30	930	2.625	0.0052	255		15:30	0.0408	187	1.5188	0.4897
15:35	935	2.630	0.0051	68		15:35	0.0439	188	1.5627	0.5268
15:40	940	2.635	0.0051	67		15:40	0.0622	189	1.6249	0.7459
15:45	945	2.640	0.0051	256		15:45	0.0688	190	1.6936	0.8252
15:50	950	2.645	0.0051	66		15:50	0.0870	191	1.7806	1.0440
15:55	955	2.650	0.0051	65		15:55	0.1270	192	1.9076	1.5240
16:00	960	2.655	0.0051	257		16:00	0.2920	193	2.1996	3.5040
16:05	965	2.660	0.0050	64		16:05	0.0781	194	2.2777	0.9369
16:10	970	2.665	0.0050	63		16:10	0.0477	195	2.3254	0.5726
16:15	975	2.670	0.0050	258		16:15	0.0383	196	2.3637	0.4591
16:20	980	2.675	0.0050	62		16:20	0.0264	197	2.3900	0.3164
16:25	985	2.680	0.0050	61		16:25	0.0229	198	2.4129	0.2745
16:30	990	2.685	0.0050	259		16:30	0.0204	199	2.4333	0.2442
16:35	995	2.690	0.0049	60		16:35	0.0184	200	2.4517	0.2212
16:40	1000	2.695	0.0049	59		16:40	0.0179	201	2.4696	0.2148
16:45	1005	2.700	0.0049	260		16:45	0.0166	202	2.4862	0.1995
16:50	1010	2.705	0.0049	58		16:50	0.0156	203	2.5018	0.1867
16:55	1015	2.710	0.0049	57		16:55	0.0146	204	2.5164	0.1758
17:00	1020	2.715	0.0049	261		17:00	0.0143	205	2.5307	0.1714
17:05	1025	2.720	0.0048	56		17:05	0.0136	206	2.5443	0.1631
17:10	1030	2.725	0.0048	55		17:10	0.0130	207	2.5573	0.1558
17:15	1035	2.729	0.0048	262		17:15	0.0124	208	2.5697	0.1492
17:20	1040	2.734	0.0048	54		17:20	0.0119	209	2.5817	0.1434
17:25	1045	2.739	0.0048	53		17:25	0.0115	210	2.5932	0.1380
17:30	1050	2.744	0.0048	263		17:30	0.0111	211	2.6043	0.1332
17:35	1055	2.749	0.0048	52		17:35	0.0107	212	2.6150	0.1288
17:40	1060	2.753	0.0047	51		17:40	0.0104	213	2.6254	0.1247
17:45	1065	2.758	0.0047	264		17:45	0.0101	214	2.6355	0.1210
17:50	1070	2.763	0.0047	50		17:50	0.0098	215	2.6453	0.1175

17:55	1075	2.768	0.0047	49		17:55	0.0095	216	2.6548	0.1143	
18:00	1080	2.772	0.0047	265		18:00	0.0100	217	2.6648	0.1205	
18:05	1085	2.777	0.0047	48		18:05	0.0098	218	2.6746	0.1176	
18:10	1090	2.782	0.0047	47		18:10	0.0096	219	2.6842	0.1149	
18:15	1095	2.786	0.0046	266		18:15	0.0094	220	2.6936	0.1123	
18:20	1100	2.791	0.0046	46		18:20	0.0092	221	2.7027	0.1099	
18:25	1105	2.796	0.0046	45		18:25	0.0090	222	2.7117	0.1076	
18:30	1110	2.800	0.0046	267		18:30	0.0088	223	2.7205	0.1055	
18:35	1115	2.805	0.0046	44		18:35	0.0086	224	2.7291	0.1034	
18:40	1120	2.809	0.0046	43		18:40	0.0085	225	2.7376	0.1015	
18:45	1125	2.814	0.0046	268		18:45	0.0083	226	2.7459	0.0997	
18:50	1130	2.819	0.0046	42		18:50	0.0082	227	2.7540	0.0979	
18:55	1135	2.823	0.0045	41		18:55	0.0080	228	2.7621	0.0962	
19:00	1140	2.828	0.0045	269		19:00	0.0079	229	2.7699	0.0946	
19:05	1145	2.832	0.0045	40		19:05	0.0078	230	2.7777	0.0931	
19:10	1150	2.837	0.0045	39		19:10	0.0076	231	2.7853	0.0916	
19:15	1155	2.841	0.0045	270		19:15	0.0075	232	2.7929	0.0902	
19:20	1160	2.846	0.0045	38		19:20	0.0074	233	2.8003	0.0889	
19:25	1165	2.850	0.0045	37		19:25	0.0073	234	2.8076	0.0876	
19:30	1170	2.855	0.0045	271		19:30	0.0072	235	2.8147	0.0863	
19:35	1175	2.859	0.0044	36		19:35	0.0071	236	2.8218	0.0851	
19:40	1180	2.864	0.0044	35		19:40	0.0070	237	2.8288	0.0840	
19:45	1185	2.868	0.0044	272		19:45	0.0069	238	2.8357	0.0828	
19:50	1190	2.872	0.0044	34		19:50	0.0068	239	2.8426	0.0818	
19:55	1195	2.877	0.0044	33		19:55	0.0067	240	2.8493	0.0807	
20:00	1200	2.881	0.0044	273		20:00	0.0061	241	2.8553	0.0727	
20:05	1205	2.886	0.0044	32		20:05	0.0060	242	2.8613	0.0718	
20:10	1210	2.890	0.0044	31		20:10	0.0059	243	2.8672	0.0709	
20:15	1215	2.894	0.0044	274		20:15	0.0058	244	2.8731	0.0700	
20:20	1220	2.899	0.0043	30		20:20	0.0058	245	2.8788	0.0691	
20:25	1225	2.903	0.0043	29		20:25	0.0057	246	2.8845	0.0683	
20:30	1230	2.907	0.0043	275		20:30	0.0056	247	2.8901	0.0675	
20:35	1235	2.912	0.0043	28		20:35	0.0056	248	2.8957	0.0667	
20:40	1240	2.916	0.0043	27		20:40	0.0055	249	2.9012	0.0660	
20:45	1245	2.920	0.0043	276		20:45	0.0054	250	2.9066	0.0652	
20:50	1250	2.925	0.0043	26		20:50	0.0054	251	2.9120	0.0645	
20:55	1255	2.929	0.0043	25		20:55	0.0053	252	2.9173	0.0638	

21:00	1260	2.933	0.0043	277		21:00	0.0053	253	2.9226	0.0632	
21:05	1265	2.937	0.0042	24		21:05	0.0052	254	2.9278	0.0625	
21:10	1270	2.942	0.0042	23		21:10	0.0052	255	2.9330	0.0619	
21:15	1275	2.946	0.0042	278		21:15	0.0051	256	2.9381	0.0612	
21:20	1280	2.950	0.0042	22		21:20	0.0051	257	2.9431	0.0606	
21:25	1285	2.954	0.0042	21		21:25	0.0050	258	2.9481	0.0600	
21:30	1290	2.958	0.0042	279		21:30	0.0050	259	2.9531	0.0595	
21:35	1295	2.963	0.0042	20		21:35	0.0049	260	2.9580	0.0589	
21:40	1300	2.967	0.0042	19		21:40	0.0049	261	2.9628	0.0583	
21:45	1305	2.971	0.0042	280		21:45	0.0048	262	2.9677	0.0578	
21:50	1310	2.975	0.0042	18		21:50	0.0048	263	2.9724	0.0573	
21:55	1315	2.979	0.0041	17		21:55	0.0047	264	2.9772	0.0568	
22:00	1320	2.983	0.0041	281		22:00	0.0047	265	2.9818	0.0563	
22:05	1325	2.988	0.0041	16		22:05	0.0046	266	2.9865	0.0558	
22:10	1330	2.992	0.0041	15		22:10	0.0046	267	2.9911	0.0553	
22:15	1335	2.996	0.0041	282		22:15	0.0046	268	2.9957	0.0548	
22:20	1340	3.000	0.0041	14		22:20	0.0045	269	3.0002	0.0544	
22:25	1345	3.004	0.0041	13		22:25	0.0045	270	3.0047	0.0539	
22:30	1350	3.008	0.0041	283		22:30	0.0045	271	3.0092	0.0535	
22:35	1355	3.012	0.0041	12		22:35	0.0044	272	3.0136	0.0531	
22:40	1360	3.016	0.0041	11		22:40	0.0044	273	3.0180	0.0526	
22:45	1365	3.020	0.0040	284		22:45	0.0044	274	3.0223	0.0522	
22:50	1370	3.024	0.0040	10		22:50	0.0043	275	3.0266	0.0518	
22:55	1375	3.028	0.0040	9		22:55	0.0043	276	3.0309	0.0514	
23:00	1380	3.032	0.0040	285		23:00	0.0043	277	3.0352	0.0510	
23:05	1385	3.036	0.0040	8		23:05	0.0042	278	3.0394	0.0507	
23:10	1390	3.040	0.0040	7		23:10	0.0042	279	3.0436	0.0503	
23:15	1395	3.044	0.0040	286		23:15	0.0042	280	3.0478	0.0499	
23:20	1400	3.048	0.0040	6		23:20	0.0041	281	3.0519	0.0496	
23:25	1405	3.052	0.0040	5		23:25	0.0041	282	3.0560	0.0492	
23:30	1410	3.056	0.0040	287		23:30	0.0041	283	3.0601	0.0489	
23:35	1415	3.060	0.0040	4		23:35	0.0040	284	3.0641	0.0485	
23:40	1420	3.064	0.0039	3		23:40	0.0040	285	3.0681	0.0482	
23:45	1425	3.068	0.0039	288		23:45	0.0040	286	3.0721	0.0479	
23:50	1430	3.072	0.0039	2		23:50	0.0040	287	3.0761	0.0475	
23:55	1435	3.076	0.0039	1		23:55	0.0039	288	3.0800	0.0472	
0:00	1440	3.080				0:00					

*Note: Shaded values are taken directly from NOAA Atlas 14 data. Non-shaded values are obtained by log-log interpolation.											



TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

Project: Zephyr Oceanside
Project #: 537-03
Date:

HEC-HMS Inputs

Basin	Condition	Area (ac)	Area (mi ²)	¹ CN	Impervious (%)	² T _c (min)	³ Lag (min)
BYPASS ⁴	Proposed	15.0	0.023438	81	25.5%	15.0	12.00
DMA-2	Proposed	33.1	0.051719	81	61.0%	10.0	8.00

Notes:

- ¹ Pervious area Curve Number per 2003 SDCHM Table 4-2. Pervious areas assumed to be landscaped with native vegetation corresponding to "Open brush" cover description.
- ² Time of concentration taken from AES Q₁₀ calculations
- ³ Lag is equal to 80% of the time of concentration.
- ⁴ Drainage area that bypasses BMP-2 (BASIN 2)

Table 4-2 (Continued)
RUNOFF CURVE NUMBERS¹ FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice ²	Hydrologic Condition ³	Average Percent Impervious Area ⁴	Curve Numbers for Hydrologic Soil Groups:			
				A	B	C	D
Turf ⁸		Poor.....		58	74	83	87
		Fair.....		44	65	77	82
		Good.....		33	58	72	79
Water surfaces (during floods)				97	98	99	99
Broadleaf chaparral		Poor.....		53	70	80	85
		Fair.....		40	63	75	81
		Good.....		31	57	71	78
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.....		Poor.....		63	77	85	88
		Fair.....		55	72	81	86
		Good.....		49	68	79	84
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.....		Poor.....		⁹	80	87	93
		Fair.....		⁹	71	81	89
		Good.....		⁹	62	74	85
Narrowleaf chaparral.....		Poor.....		71	82	88	91
		Fair.....		55	72	81	86
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush		Poor.....		⁹	66	74	79
		Fair.....		⁹	48	57	63
		Good.....		⁹	30	41	48
Open brush		Poor.....		62	76	84	88
		Fair.....		46	66	77	83
		Good.....		41	63	75	81

 BYPASS

 Summary Results for Subbasin "BYPASS"

Project: 537-03 Simulation Run: 10yr-24hr
Subbasin: BYPASS

Start of Run:	01Jan2000, 00:00	Basin Model:	Basin 200
End of Run:	02Jan2000, 12:00	Meteorologic Model:	10yr-24hr
Compute Time:	19Dec2019, 03:47:46	Control Specifications:	24-hr

Volume Units: ☐ IN ☒ AC-FT

Computed Results

Peak Discharge:	18.34 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 16:15
Precipitation Volume:	3.85 (AC-FT)	Direct Runoff Volume:	2.26 (AC-FT)
Loss Volume:	1.59 (AC-FT)	Baseflow Volume:	0.00 (AC-FT)
Excess Volume:	2.26 (AC-FT)	Discharge Volume:	2.26 (AC-FT)

Basin Model [Basin 200] Current Run [10yr-24hr]

DMA-2

Summary Results for Subbasin "DMA-2"

Project: 537-03 Simulation Run: 10yr-24hr
Subbasin: DMA-2

Start of Run: 01Jan2000, 00:00	Basin Model: Basin 200
End of Run: 02Jan2000, 12:00	Meteorologic Model: 10yr-24hr
Compute Time: 19Dec2019, 03:47:46	Control Specifications: 24-hr

Volume Units: ☐ IN ☒ AC-FT

Computed Results

Peak Discharge: 57.37 (CFS)	Date/Time of Peak Discharge: 01Jan2000, 16:10
Precipitation Volume: 8.50 (AC-FT)	Direct Runoff Volume: 6.66 (AC-FT)
Loss Volume: 1.83 (AC-FT)	Baseflow Volume: 0.00 (AC-FT)
Excess Volume: 6.66 (AC-FT)	Discharge Volume: 6.66 (AC-FT)

10-yr-24hr ONSITE RETENTION VOLUME AND PONDING DEPTH							
Basin ID	Runoff Volume from HEC-HMS (AC-FT)	Runoff Volume (CF)			SDGE Easement Area Stage-Storage		
BYPASS	2.26	98446			Elevation (ft)	Depth (ft)	Area (sf)
DMA-2 only	6.66	290110			36.0	0.0	6532
	TOTAL	388555			37.0	1.0	101060
					38.0	2.0	205061
	BMP-2 (BASIN 2) VOLUME						
	Basin Area (SF)	42600			Ponded Depth	1.1 ft (interpolated)	
	Basin Depth (FT)	6			Ponded Elev	37.1 ft (interpolated)	-----> OK
	Basin Surface Volume (CF)	302602					
	Soil Volume	14910					
	Gravel Volume	17040					
	Total Basin Volume	334552					
	Volume Leftover to Pond in SDGE Easement	54003					

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Tuesday, Oct 22 2019

Circular Culvert

Invert Elev Dn (ft) = 27.10
Pipe Length (ft) = 104.00
Slope (%) = 2.22
Invert Elev Up (ft) = 29.41
Rise (in) = 48.0
Shape = Circular
Span (in) = 48.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Square edge w/headwall (C)
Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

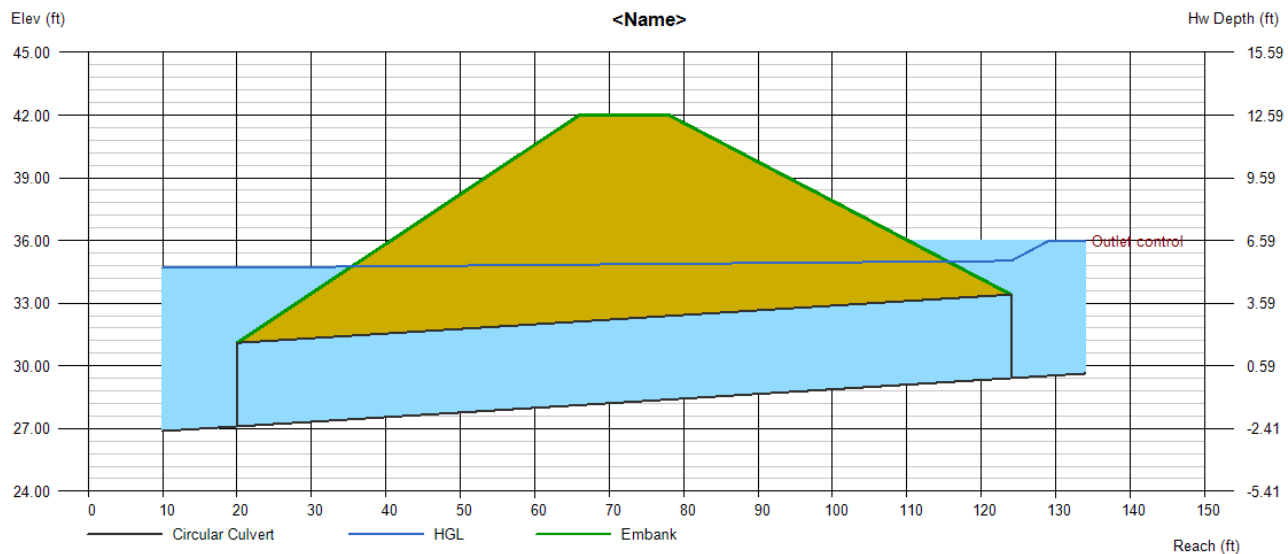
Top Elevation (ft) = 42.00
Top Width (ft) = 12.00
Crest Width (ft) = 300.00

Calculations

Qmin (cfs) = 10.00
Qmax (cfs) = 200.00
Tailwater Elev (ft) = 34.7

Highlighted

Qtotal (cfs) = 80.00
Qpipe (cfs) = 80.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 6.37
Veloc Up (ft/s) = 6.37
HGL Dn (ft) = 34.70
HGL Up (ft) = 35.02
Hw Elev (ft) = 35.97
Hw/D (ft) = 1.64
Flow Regime = Outlet Control



APPENDIX E

Project Maps

- Existing Condition Hydrology Map
- Developed Condition Hydrology Map

Exhibit A
Hydrology Map
Existing Condition
Scale 1"=300'

