Appendix I-1 Drainage Study



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PRELIMINARY DRAINAGE STUDY

As part of the: WARNER AVENUE FROM MAIN STREET TO GRAND AVENUE WIDENING PROJECT Located in: THE CITY OF SANTA ANA, CALIFORNIA

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1. PROJECT BACKGROUND

The project area is located in the City of Santa Ana in Orange County, CA. The study area consists of approximately 1 mile of proposed street widening along Warner Avenue between Main Street and Grand Avenue. The existing road right of way varies in width from 70' to 120'. Proposed improvements will widen the street to a 110' right of way from Main Street to Standard Avenue. Between Standard Avenue and Grand Avenue, the right of way width will vary from 106' to 110'.

The properties lining the project corridor include a mixture of residential, commercial, and industrial, with longitudinal grades along the street typically running between 0.2% to 0.5% draining towards the south and west. Storm drain piping conveys runoff to the existing Orange County Flood Control District (OCFCD) Facility F01 (See Appendix A for Drainage Maps of Existing Conditions along Warner Avenue). Soils on the site are Group C, being silty-loamy soils with fine texture and slow infiltration rates (see Appendix D for Soils Map). Based on the FEMA Flood Maps (See Appendix F), this area is not located in any recorded flood plain.

Data on existing drainage conditions have been gathered from a previous drainage study performed by Boyle Engineering in 1993 (See Appendix I). Using this data to make assumptions for offsite flows to Warner Avenue, effects of the proposed onsite improvements were studied using Orange County Flood control Districts' recommended software Advanced Engineering Software's (AES) hydrology-hydraulic modeling program. Improvements to this project area will have a negligible impact to the amount of impervious areas of the adjacent drainage basins (the 136.8 acres of onsite drainage per Boyle's 1993 study), and will increase the street's volume capacity to carry storm runoff. The proposed street widening also offers an opportunity to evaluate the existing storm drain system and upgrade the system to provide adequate capacity.

The existing storm drain infrastructure beginning at the east end of the project consists of a 7x6 concrete box that runs from Grand Avenue to the railroad tracks and then continues north paralleling the tracks. To the west a new line begins at Standard Avenue with a 27" RCP which continues to Rouselle Street where a large diameter pipe connects to the Warner Avenue system. Here the pipe size changes to 60" and continues west to Main Street.



2. HYDROLOGY

The method for evaluating the site hydrology follows the format set forth in the Orange County Local Drainage Manual (January 1996). For tributary areas of less than 640 acres, the 10-year storm is used to evaluate storm drains at continuous grade below the top of curb. In sump conditions, the 25-year storm would be used for determining the capacity of catch basins and connecting storm drains. As no sump conditions exist along Warner Avenue between Main Street and Grand Avenue, there was no need to perform the analysis for the 25-year storm event.

Design criteria, as described in the Local Drainage Manual, requires that one 12-foot travel lane in an arterial street remains clear in each direction for traffic ability, using the 10-year storm for streets at continuous grade. As this stretch of Warner Avenue is at continuous grade, only the 10-year storm event was used. In order to calculate street flow capacity, three typical cross-sections were used (see Appendix G for Cross-Section Details of the 106- and 110- foot Right of Way Street Widths). A 132 foot cross section analysis, applicable only at the intersections of Warner and Grand and Warner and Main, will follow in a subsequent phase of the street widening.

Additionally, during the 100-year storm event, 1 foot of freeboard is required between the recorded flood elevation and the lowest finished floor elevation of adjacent building structures.

AES was used for hydrologic modeling, following the Orange County standard for the Rational Method. While Land Use Maps (See Appendix C) were available for the City of Santa Ana, Boyle's study offered a more detailed breakdown of the specific development types within each sub-area. Comparing the impervious values from these two sources, it was determined that Boyle's 1993 report resulted in more conservative calculations; therefore, the acreages and development types were modeled after Boyle's report. Street improvements for the proposed condition were modeled along with the existing pipes, to determine which pipes had deficient capacity. Based on the program output (See Appendix J), recommendations for increased pipe sizes were made. These largely reflect the suggestions made by Boyle in 1993 with some minor adjustments due to updated rainfall intensities embedded within the 2008 version AES Software. (See Appendix I for Boyle's Hydrology Report and Recommendation; Summary of Recommendations are also included on the Existing Conditions Drainage Maps in Appendix A).

This hydrology analysis follows the drainage calculations completed by Boyle, using rainfall intensity graph data built into the 2008 AES' Rational Method program for Orange County. As this study is a conceptual-level exercise and focuses only on the runoff from drainage sub-areas that flow directly into Warner Avenue within the project limits, all existing offsite data is taken directly from Boyle's study. Apart from Boyle's report, no additional information was provided to re-calculate upstream runoff to the site. These offsite areas were modeled in the AES program as user-defined flows; using variables pulled from Boyle's report (see Appendix H for tables summarizing the sub-basin areas contributing to these flows). In cases where only the total runoff flow was provided, minus sufficient data available to input the required parameters for user-defined flow, an effective area was calculated that corresponds to the given flow.

For the purposes of this model, the upstream drainage area was assumed to be an "Initial Area" or starting point for the model. Due to insufficient topographic information, IBI was unable to determine a precise value for elevations at the high-end of the drainage basin. Therefore, the USGS quad map (see Appendix E) was used to determine the approximate slope and length of overland flow route to determine the initial Time of Concentration.

Antecedent Moisture Condition (AMC) II was used for this model as recommended in the Orange County Hydrology Manual for the 10- year design.

3. HYDRAULICS

This preliminary drainage study follows the requirements of the Orange County Local Drainage Manual (January 1996). Per Orange County requirements, the Hydraulic Grade Line (HGL) within catch basins must be at least 0.5 feet below the street gutter. As this study is conceptual and some lateral/catch basin invert elevation information was not available, inlet hydraulics were not considered; therefore, the design criteria for Hydraulic Grade Line (HGL) of the conveyance is assumed to be at least two feet below the street gutter grade. Additional constraints, per the Local Drainage Manual, dictate that depth of water at the curb (feet) x velocity (fps) cannot exceed 6 fps for storms up to a 25-year frequency. Based on the HGL calculations completed, both of these criteria have been exceeded.

AES (v. 2008) was used for hydraulic modeling of mainlines, and the Pipeflow component of the Hydrosoft Package was used to determine the HGL.

Since no previous hydraulic calculations were provided with the drainage study done by Boyle, the hydraulics were modeled for the existing pipe systems flows from the revised hydrology completed as part of this study to depict the current systems' deficient capacity. Output data for both models are included in Appendix K and the table below.

Dine Reach	Capacity	Existing Capacity	Recommended	Upgrade
Pipe Reach	Needed (cfs)	(cfs)	Upgrade	Capacity (cfs)
4705 - 4706	355.41	591.70	No Upgrade	
4706 - 4707	396.89	295.20	11'x6.5' RCB	481.00
3826 - 3834	128.72	13.90	66" Pipe	164.35
3834 - 3845	145.85	13.90	66" Pipe	160.89
3845 - 3805	189.36	13.90	72" Pipe	227.91
3805 - 3733	1110.73	116.70	11' x 8' RCB	1141.97
3733 - 3739	1123.07	169.50	11' x 8' RCB	1208.03
3739 - 3745	1150.36	169.50	11' x 9' RCB	1327.15
3745 - 3746	1167.79	169.50	13' x 9' RCB	1310.51
3746 - 3746	1167.79	169.50	13' x 9' RCB	1310.51

No survey information was available to indicate invert elevations and slopes, therefore all storm drain data came from as-builts and existing reports. Flow line elevations were not provided for the laterals at catch basins and the mainline; therefore, assumptions were made in order to calculate inlet hydraulics at catch basins and laterals in order to finally calculate RCB sizes. Additional assumptions were made to determine junction losses where these laterals connected to the main line. AES software does not model Reinforced Concrete Boxes, so these were modeled using an alternative, but approved software method. Detailed invert and as-built information at intersections with more than one catch basin was limited. Therefore, IBI was unable to determine which portion of a drainage sub-basin was discharged into a specific inlet.

4. PRELIMINARY CONSTRUCTION COST ESTIMATE

Planning level cost estimates for drainage modifications were prepared to address both the recommendations within this report regarding the necessary upsizing of existing facilities to accommodate projected design year flows as well as those physically required to accommodate the proposed widening.

Table 4.1 provides a breakdown of the estimated costs for the recommended upgrades to the existing storm drain facilities along Warner within the project limits needed to accommodate projected design year flows. The estimate in Table 4.1 does not include any upstream or downstream improvements outside the project limits that may also be needed but are not part of this study. These items and costs are subject to change pending more detailed studies and analysis during future project phases.

Table 4.2 provides a breakdown of the estimated costs for all modifications and relocations to existing storm drain laterals and catch basins needed to accommodate the proposed widening as shown in the Preliminary Engineering Plans completed as part of this current phase of study. These items and costs are subject to change also as the project is in its preliminary stage. These improvements will not meet the current storm drain deficiency in this area and continued ponding/flooding will occur in most areas if this is the only modification made to the system.

* Cost Estimates are based on the 2008 Contract Cost Data book published by the California Department of Transportation.

Table 4.1

Quantity	Unit	Item	Unit Cost	Amount	
11675	CY	Excavation & Backfill	\$10.00	\$116,750.00	
485	LF	Install 13' x 9' R.C. Box Culvert	\$745.00	\$361,325.00	
372	LF	Install 11' x 9' R.C. Box Culvert	\$625.00	\$232,500.00	
510	LF	Install 11' x 8' R.C. Box Culvert	\$595.00	\$303,450.00	
158	LF	Install 11' x 6.5' R.C. Box Culvert	\$550.00	\$86,900.00	
1150	LF	Install 72" R.C.P.	\$200.00	\$230,000.00	
1000	LF	Install 66" R.C.P.	\$175.00	\$175,000.00	
3550	LF	Removal of Existing Pipe	\$25.00	\$88,750.00	
1	1 EA Remove Junction Box		\$1,245.00	\$1,245.00	
			Sub-Total: **15% Cont: Total:	\$1,595,920.00 \$239,388.00 \$1,835,308.00	
**(15% Contingency Covers any Junction and Catch Basin amenities.)					

Storm Drain System Upgrade Costs

Table 4.2

Storm Drain Costs- Widening Only

Quantity	Unit	Item	Unit Cost	Amount
378	LF	Install 18" R.C.P.	\$200.00	\$75,600.00
56	LF	Install 30" R.C.P	\$150.00	\$8,400.00
37	LF	Install 60" R.C.P	\$200.00	\$7,400.00
1	EA	Install 7' Catch Basin	\$5,500.00	\$5,500.00
5	EA	Install 14' Catch Basin	\$8,000.00	\$40,000.00
2	EA	Install 21' Catch Basin	\$10,000.00	\$20,000.00
8	EA	Remove Catch Basin	\$1,000.00	\$8,000.00
378	LF	Remove Existing RCP Pipe	\$25.00	\$9,450.00
			*Total	\$174,350.00

5.

SUMMARY AND CONCLUSIONS

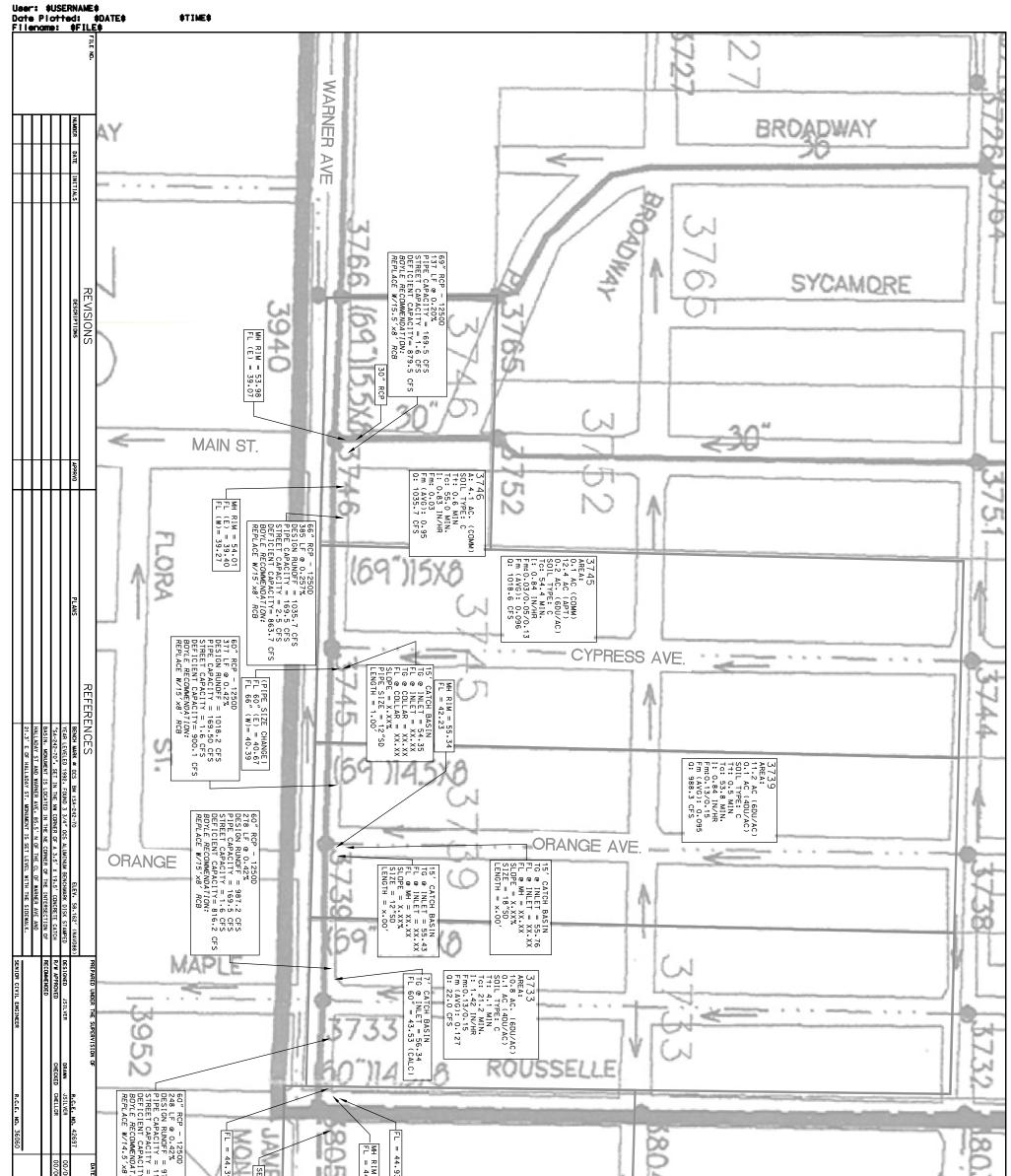
The results from Boyle's drainage study demonstrate that, at the time of the report in 1993, most piping along Warner Avenue lacked sufficient capacity to handle the runoff based on the rainfall intensity graphs of 1993. Asbuilts provided by the City of Santa Ana show that, in a few cases, the existing pipes are even smaller than what was assumed in study, resulting in greater deficiencies in their capacity. Boyle made recommendations for replacement of the undersized pipes and/or provided a second option with the addition of a parallel line. Based upon review of the as-built plans for the latest major roadway improvement project through the study limits completed in 2001, the majority of these suggestions were not implemented. As a result, the existing condition is one in which there is insufficient drainage capacity to accommodate the design rainfall. Actual storm events over the last several years have generated significant flooding in the study area, justifying the conclusions of this study and the Boyle report.

Additionally, based on the Hydraulic analysis, the existing condition is one in which most pipes are currently flowing under pressure conditions.

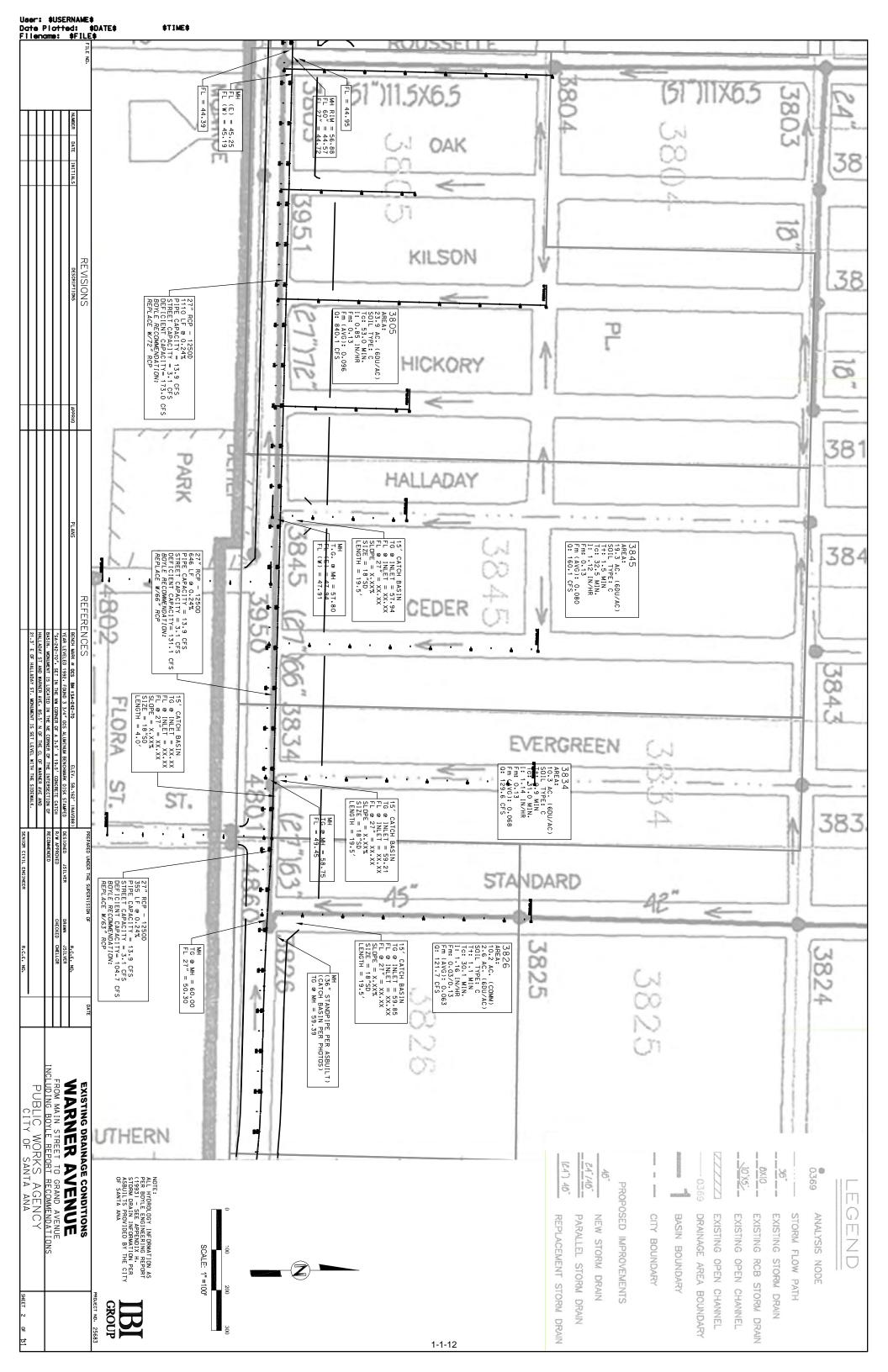
By widening Warner Avenue, the capacity of the street to carry additional runoff increases; however, this difference in most areas is negligible and not sufficient to make up for the lack of adequate storm drain conveyance. Therefore, it is imperative that the existing storm drain system be upgraded to provide the necessary additional capacity for storm runoff as part of this widening project. Recommended upgrades to the pipe system are shown in Appendix B. Hydraulic calculations show that, with these suggested improvements, the HGL will meet the City's requirement. Recommended upgrades to the system will be extensive in order to meet flow capacity and mitigate the current flood conditions currently taking place.

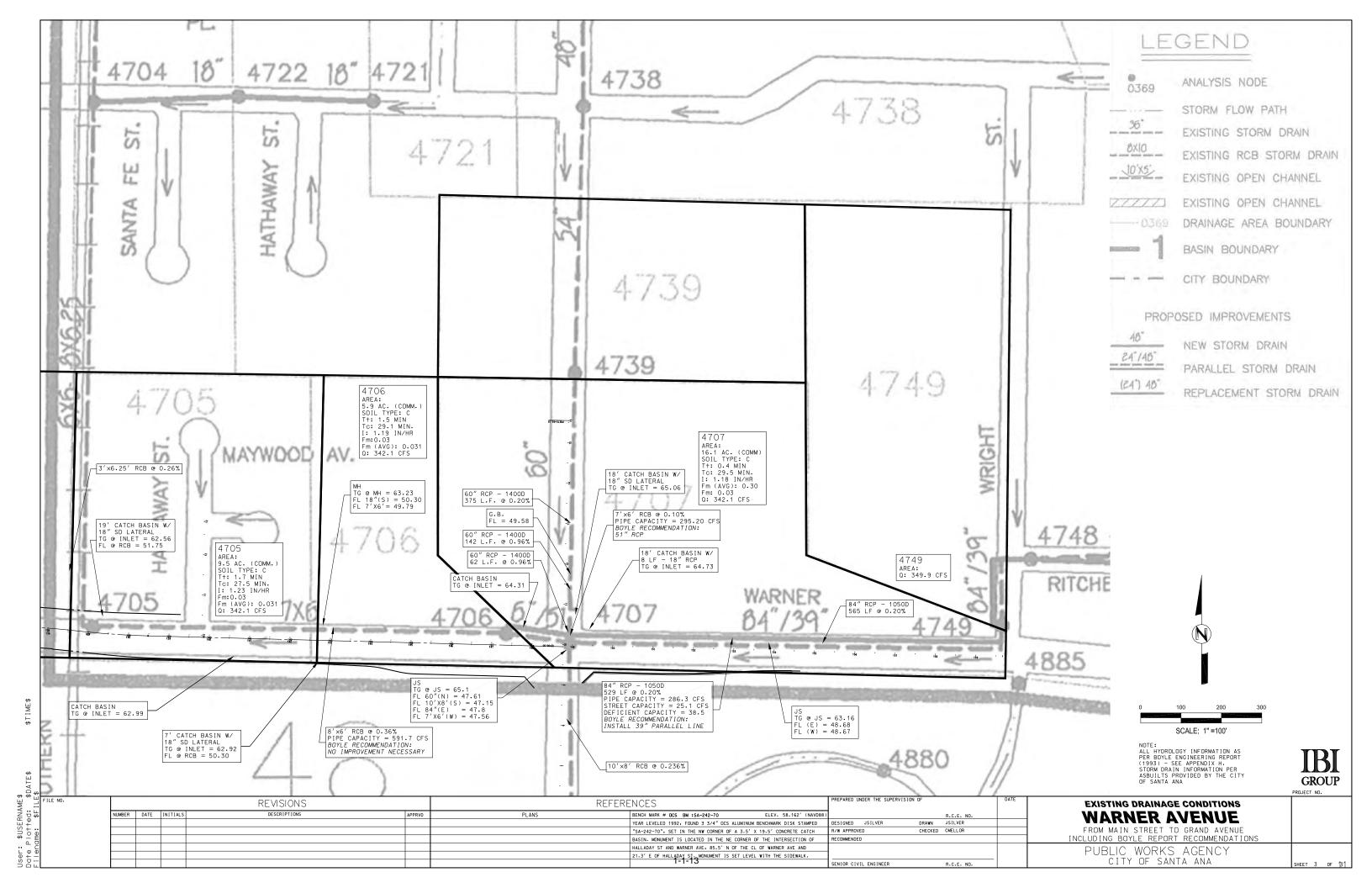
The basic drainage pattern for the area begins in the northeast and flows towards the southwest. The purpose of this preliminary study was to assess the impacts to the existing storm drain system associated with the proposed widening along Warner Avenue between Main Street and Grand Avenue. As such, this drainage report was not intended to determine whether or not there is a need to upsize additional upstream or downstream pipes outside of the project limits. The upstream and downstream areas will need to be completed in order to adequately size the needed drainage system.

APPENDIX A: HYDROLOGY/SITE MAPS – EXISTING CONDITIONS



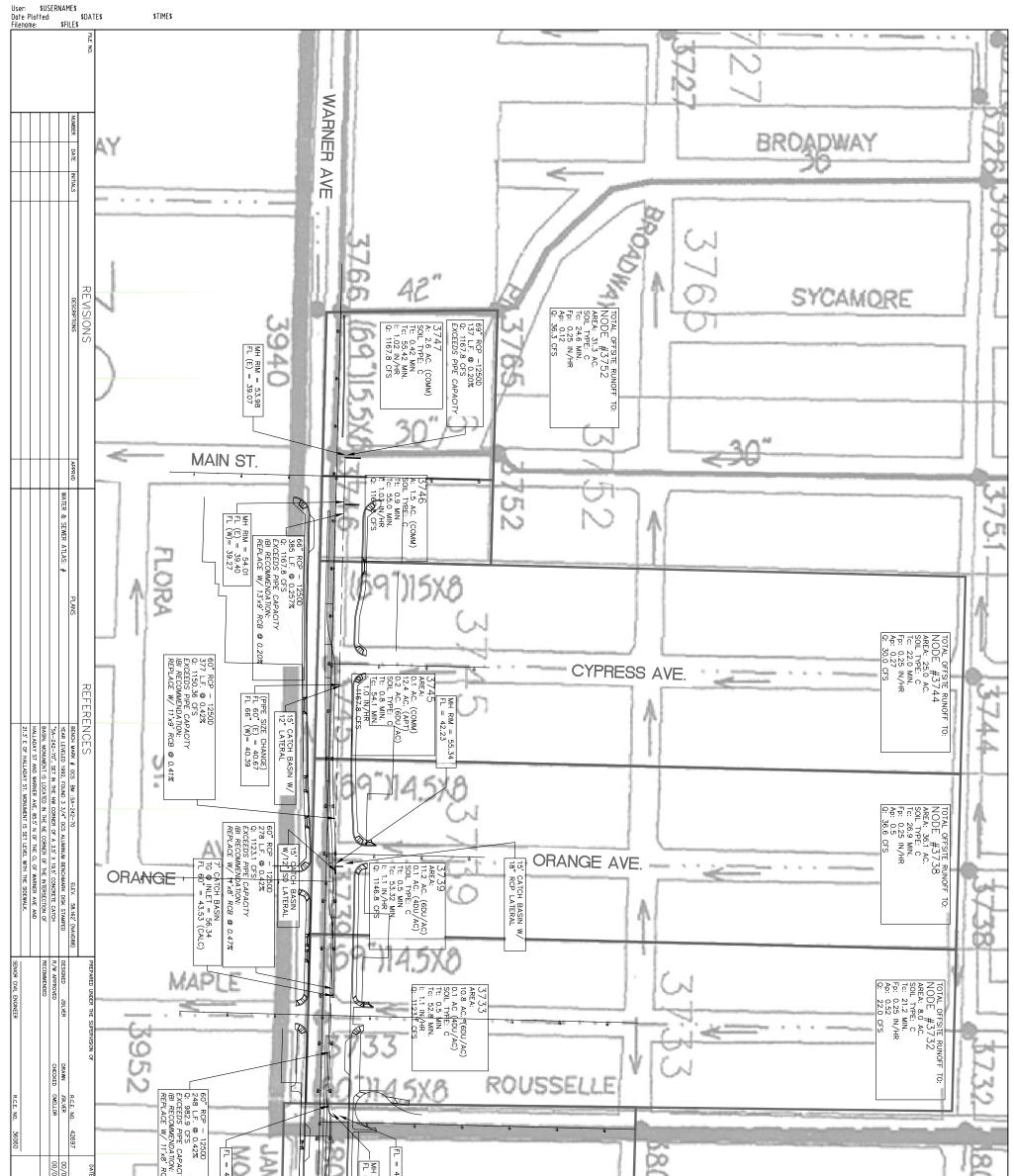
INCL F	978.9 CFS 116.7 CFS 116.6 CFS 1179 860.6 CFS 1179 860.6 CFS 477DN: 46 / RCB	93 93 44.57 8EE SHEET 2	OAK	4		1.23
WARNER AVENUE FROM MAIN STREET TO GRAND AVENUE LUDING BOYLE REPORT RECOMMENDATIONS PUBLIC WORKS AGENCY CITY OF SANTA ANA	NOTE: ALL HYDROLOGY INFORMATION AS PER BOYLE ENGINEERING REPORT 11933 - SEE APPENDIX H. SEE APPENDIX H. SAULL'S PROVIDED BY THE CITY OF SANTA ANA OF SANTA ANA		1-1-11	PROPOSED IMPROVEMENTS 40° NEW STORM DRAIN 24'/40° PARALLEL STORM DRAIN (24') 40° REPLACEMENT STORM DRAIN	ZZZZZ EXISTING OPEN CHANNEL 0369 DRAINAGE AREA BOUNDARY BASIN BOUNDARY CITY BOUNDARY	 ANALYSIS NODE



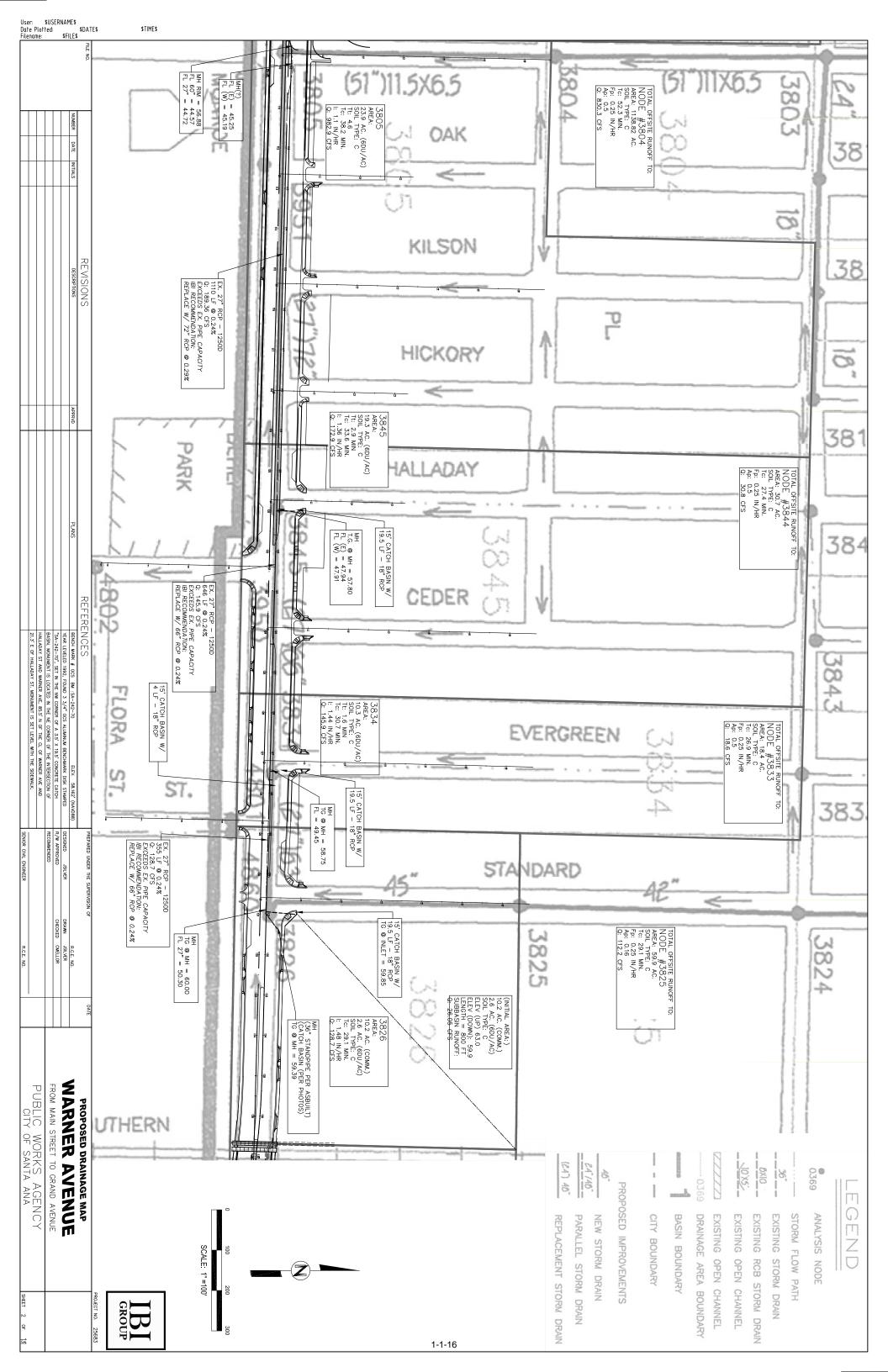


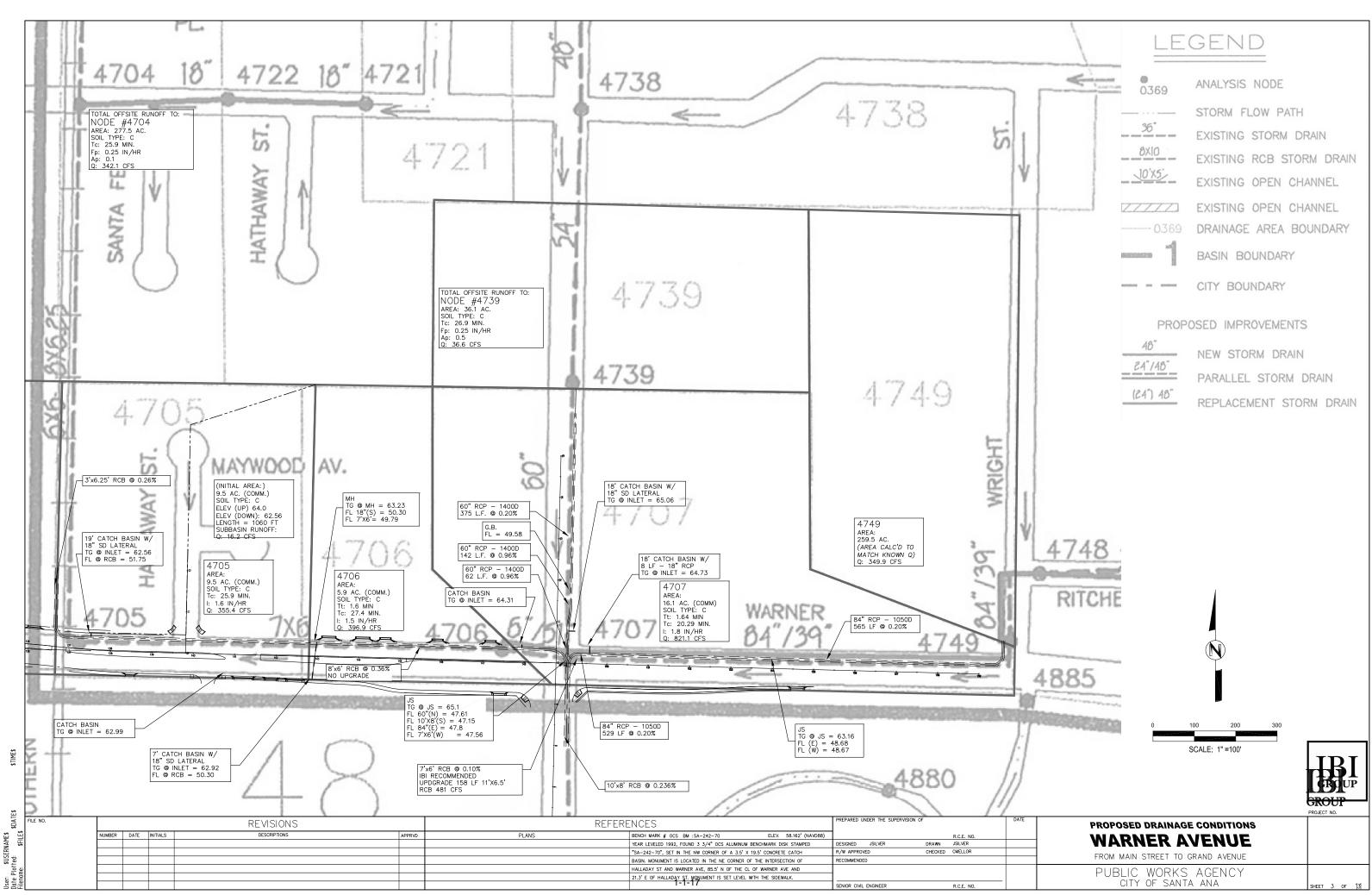
APPENDIX B: HYDROLOGY/SITE MAPS – PROPOSED CONDITIONS

Note: Appendix B Exhibits show an in progress version of the improvements proposed which reflects the current calculations of this report. Progression of improvements have not impacted this analysis.



	- 44.93 L = 44.57 L = 44.57 - 44.39 - 44.39 - 44.39 - 44.39 - 44.39 - 44.39 - 44.39 	OAK	04		103
PROPOSED DRAINAGE CONDITIONS WARNER AVENUE FROM MAIN STREET TO GRAND AVENUE PUBLIC WORKS AGENCY CITY OF SANTA ANA SHEET 1 OF 13	O SCALE: 1"=100 BBE	1-1-15	PROPOSED IMPROVEMENTS <u>46</u> <u>24'/46</u> (24') 46 (24') 46 REPLACEMENT STORM DRAIN	EXISTING OPEN CHANNEL 0369 DRAINAGE AREA BOUNDARY BASIN BOUNDARY CITY BOUNDARY	NODE NODE





APPENDIX C: CURRENT LAND USE PLAN

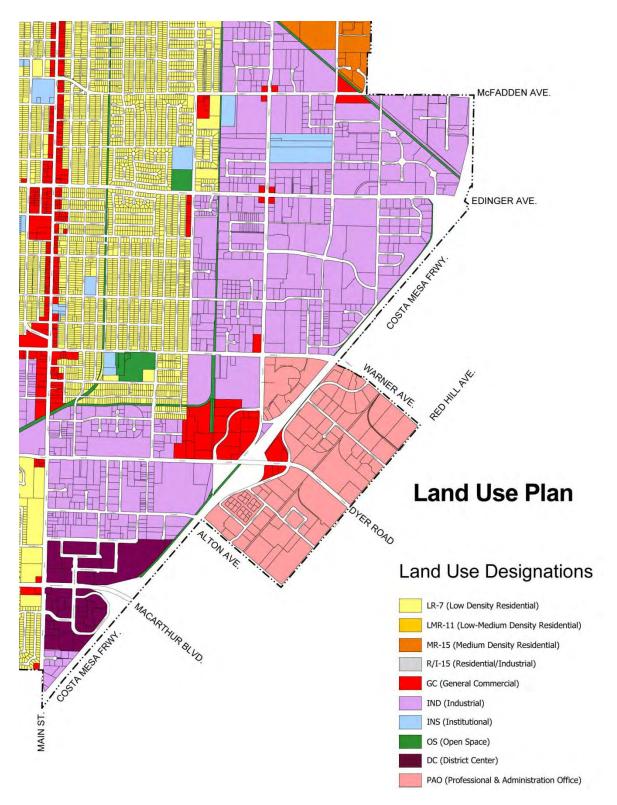


Figure 1: City of Santa Ana Plan, 2008

APPENDIX D: SOILS MAP

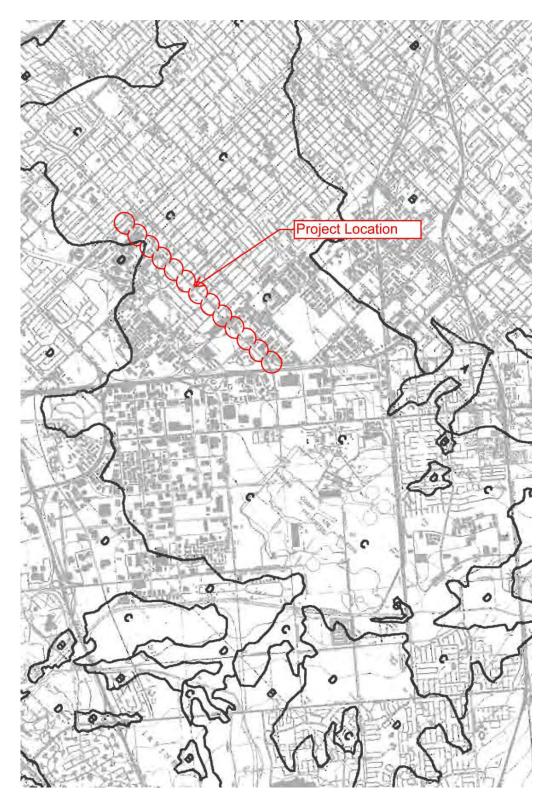


Figure 2: Hydrologic Classification of Soils (Orange County Hydrology Manual) - Plate B

APPENDIX E: USGS QUAD MAP

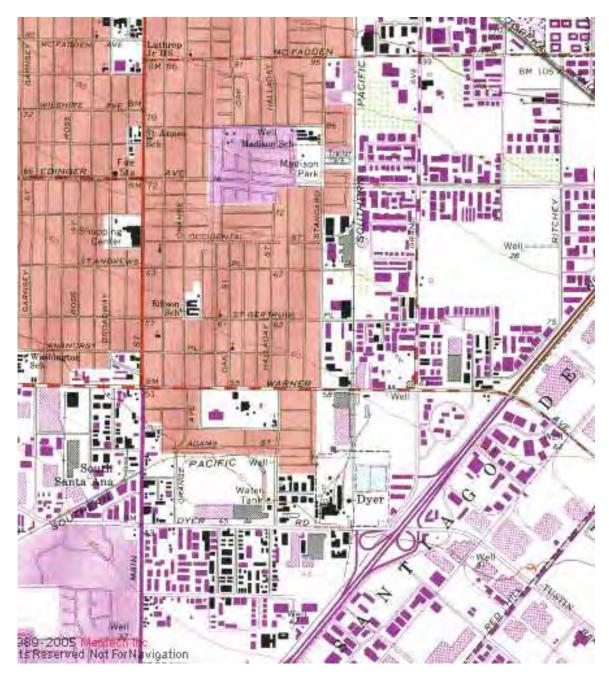
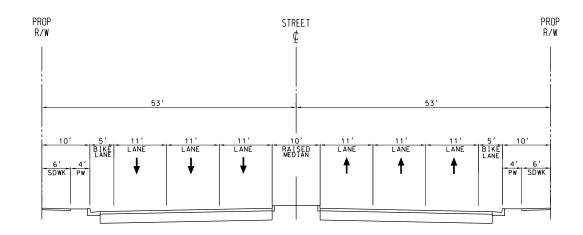


Figure 3: USGS Topo (from TerraServer)

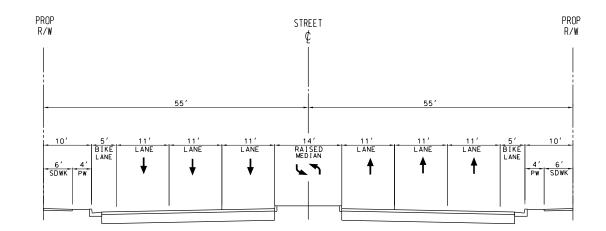
APPENDIX F: FEMA FLOOD MAP



APPENDIX G: STREET CROSS SECTION DETAILS



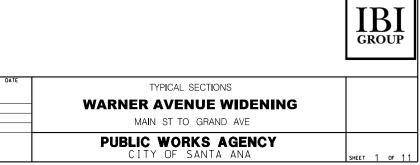
TYPICAL SECTION (106' ROW) FROM STANDARD AVENUE TO HATHAWAY STREET



TYPICAL SECTION (110' ROW) FROM MAIN STREET TO STANDARD AVENUE FROM HATHAWAY STREET TO GRAND AVENUE

REVISIONS			REVISIONS		REFERENCES		PREPARED UNDER THE SUPERVIS	ION OF		
NUMBER	DATE	INITIALS	DESCRIPTIONS	APPRVD	PLANS	BENCH MARK #	ELEV.		R.C.E. NO.	
								DESIGNED	DRAWN	
								R/W APPROVED	CHECKED	
								RECOMMENDED		
						1 1 07				
						1-1-27		SENIOR CIVIL ENGINEER	R.C.E. NO.	-

User Date Filen FILE NO.



APPENDIX H: EXISTING OFF-SITE HYDROLOGY

MAIN STREET TO STANDARD AVE:

Criteria for modeling "User Specified Hydrology Data at a Node" for AES:

Total Off-Site Flow to 3825-3826:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):				
Node	Area (Acres)	Pervious Area Fraction*		
3821	8.8 (Commercial)	0.1		
	0.2 (6 DU/Ac)	0.5		
3822	10.7 (Commercial)	0.1		
	0.3 (6 DU/Ac)	0.5		
3823	7.5 (Commercial)	0.1		
	2.0 (6 DU/Ac)	0.5		
3824	14.1 (Commercial)	0.1		
	3.9 (6 DU/Ac)	0.5		
3825	9.8 (Commercial)	0.1		
	2.6 (6 DU/Ac)	0.5		

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program: *Time of Concentration: 29.1 min. Total Area: 59.9 Ac Effective Area: 59.9 Ac (assume it is the same as "Total Area") Total Runoff: 12.2 cfs* Fp = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.16*

Total Off-Site Flow to 3833-3834:

ervious Area Fraction*
5
5
5
5

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program: *Time of Concentration: 26.9 min. Total Area: 18.4 Ac Effective Area: 18.4 Ac (assume it is the same as "Total Area") Total Runoff: 18.6 cfs Fp* = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.5*

Total Off-Site Flow to 3844-3845:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):				
Node	Area (Acres)	Pervious Area Fraction*		
3841	5.4 (6 DU/Ac)	0.5		
3842	10.8 (6 DU/Ac)	0.5		
3843	7.8 (6 DU/Ac)	0.5		
3844	6.7 (6 DU/Ac)	0.5		

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program: *Time of Concentration: 27.4 min. Total Area: 30.7 Ac Effective Area: 30.7 Ac (assume it is the same as "Total Area") Total Runoff: 30.8 cfs Fp* = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.5*

Total Off-Site Flow to 3804-3805:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):				
Node	Area (Acres)	Pervious Area Fraction*		
3504 (From Memory Bank)	1061.12			
3811	5.9 (6 DU/Ac)	0.5		
3812	4.4 (6 DU/Ac)	0.5		
3813	5.7 (6 DU/Ac)	0.5		
3801	19.3 (6 DU/Ac)	0.5		
3816	6.4 (6 DU/Ac)	0.5		
3817	5.8 (6 DU/Ac)	0.5		
3818	6.8 (6 DU/Ac)	0.5		
3802	12.1 (6 DU/Ac)	0.5		
3803	4.1 (6 DU/Ac)	0.5		
3804	7.2 (6 DU/Ac)	0.5		

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program: *Time of Concentration: 52.3 min. Total Area: 1138.82 Ac Effective Area: 1138.82 Ac (assume it is the same as "Total Area") Total Runoff: 830.3 cfs* Fp = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.5*

Total Off-Site Flow to 3732-3733:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3731	3.1 (6 DU/Ac)	0.5
3732	3.5 (6 DU/AC)	0.5
	1.4 (4 DU/Ac)	0.6

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program: *Time of Concentration: 21.2 min. Total Area: 8.0 Ac Effective Area: 8.0 Ac (assume it is the same as "Total Area") Total Runoff: 22.0 cfs Fp* = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.52*

Total Off-Site Flow to 3738-3739:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):			
Node	Area (Acres)	Pervious Area Fraction*	
3735	7.3 (6 DU/Ac)	0.5	
3736	9.8 (6 DU/Ac)	0.5	
3737	10.6 (6 DU/Ac)	0.5	
3738	7.0 (6 DU/Ac)	0.5	
	1.4 (4 DU/Ac)	0.6	

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program: *Time of Concentration: 26.9 min. Total Area: 36.1 Ac Effective Area: 36.1 Ac (assume it is the same as "Total Area") Total Runoff: 36.6 cfs* Fp = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.5*

Total Off-Site Flow to 3744-3745:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):			
Node	Area (Acres)	Pervious Area Fraction*	
3741	0.1 (Commercial)	0.1	
	1.9 (Apartment)	0.2	
	2.1 (6 DU/Ac)	0.5	
3742	1.4 (Commercial)	0.1	
	1.3 (Apartment)	0.2	
	2.9 (6 DU/Ac)	0.5	
3743	0.7 (Commercial)	0.1	
	3.7 (Apartment)	0.2	
	1.6 (6 DU/Ac)	0.5	
3744	9.2 (Apartment)	0.2	
	0.1 (6 DU/Ac)	0.5	

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program: *Time of Concentration: 22.0 min. Total Area: 25.0 Ac Effective Area: 25.0 Ac (assume it is the same as "Total Area") Total Runoff: 30.0 fs Fp* = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.27*

Total Off-Site Flow to 3752-3747:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):			
Node	Area (Acres)	Pervious Area Fraction*	
3748	3.7 (Commercial)	0.1	
	0.4 (Apartment)	0.2	
3749	5.2 (Commercial)	0.1	
	0.2 (Apartment)	0.2	
3750	5.3 (Commercial)	0.1	
	0.2 (Apartment)	0.2	
3751	8.1 (Commercial)	0.1	
	0.2 (Apartment)	0.2	
3752	6.7 (Commercial)	0.1	
	1.3 (4DU/Ac)	0.6	

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:

Time of Concentration: 24.6 min.

Total Area: 31.3 Ac

Effective Area: 31.3 Ac (assume it is the same as "Total Area")

Total Runoff: 36.3 cfs

Fp = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.12*

<u>Note:</u> As two parallel storm drain lines were placed in Main Street subsequent to the Boyle study in 1993, the original sub-basin area (#3746) has been split into two separate drainage basins (shown on the Drainage Map as #3746 and #37460). It is assumed that the flow to the east of Main will reach the catch basin in the 30" line, while flow to the west of Main Street will be carried in the 1'x3' RCB.

STANDARD AVE TO GRAND AVENUE:

Total Off-Site Flow to 4704-4705:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):			
Node	Area (Acres)	Pervious Area Fraction*	
4602 (From Memory Bank)	231.63		
4711	5.2 (Commercial)	0.1	
4701	6.8 (Commercial)	0.1	
4716	7.9 (Commercial)	0.1	
4717	18.0 (Commercial)	0.1	
4703	7.1 (Commercial)	0.1	
4721	7.7 (Commercial)	0.1	
4722	12.4 (Commercial)	0.1	
4704	12.1 (Commercial)	0.1	

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:

Time of Concentration: 25.9 min.

Total Area: 277.5 Ac

Effective Area: 277.5 Ac (assume it is the same as "Total Area")

Total Runoff: 342.1cfs

Fp = 0.25 *in/hr* (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates") *Pervious Area Fraction Ap: 0.1*

APPENDIX I: EXISTING HYDROLOGY (BOYLE ENGINEERING)



02/23/94

HYDRAULIC ANALYSIS SUMMARY

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	Pop	dway	-					-							Page No.
ID	Name	Slope	ĸ	Diam/Depth	Existing Drain Base Width Si		ĸ	Design Runoff	Roadway	ction Capaci Conduit	Total	Deficient Capacity	-Improvement	Alternatives-	Recommended
<u></u>		(ft/ft)	Č	(in)/ (ft)	(ft) Slo			(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	Replacement	New/Parallel	Improvemen
Map Area	:37														
605-3701	FLOWER	0.0050	566	66.0		0.00357	3365	1007 5	40.0	201.1	241.1	766.4	208 Euf E DOD	12 5 4 5 202	
3711-3712	PARTON	0.0050	566					12.9	40.0	0.0	40.0	0.0	208.5x6.5 RCB	12.5x6.5 RCB	208.5x6.5 R
3712-3713	ST. ANDREWS	0.0020	382					12.9	17.1	0.0	17.1	0.0			
3713-3714	ST. ANDREWS	0.0020	382					19.3	17.1	0.0	17.1	2.2		18" RCP	18" RCP
3714-3701	ST. ANDREWS	0.0020	283					24.5	12.7	0.0	12.7	11.9		27" RCP	27" RCP
3701-3702 3716-3717	FLOWER ST. GERTRUDE	0.0050	566 283	66.0		0.00357	3365		40.0	201.1	241.1	778.1	208.5x6.5 RCB	12.5x6.5 RCB	228.5x6.5 R
3717-3723	ST. GERTRUDE	0.0020	283					16.6	12.7	0.0	12.7	3.9		18" RCP	18" RCP
3719-3720	BIRCH	0.0050	566					16.6	12.7	0.0	12.7	3.9		18" RCP	18" RCP
3720-3721	ST. ANDREWS	0.0020	283					13.2	40.0	0.0	40.0	0.0		100 000	
3721-3722	ST. ANDREWS	0.0020	283		10			20.0	12.7	0.0	12.7	0.6		18" RCP	18" RCP
3722-3723	VAN NESS	0.0050	566					36.4	40.0	0.0	40.0	0.0		24" RCP	24" RCP
3723-3724	ST. GERTRUDE	0.0020	283					56.8	12.7	0.0	12.7	44.2		42" RCP	24" RCP 42" RCP
3724-3725	ST. GERTRUDE		283					61.6	12.7	0.0	12.7	48.9		45" RCP	45" RCP
3725-3702	ST. GERTRUDE		283					67.8	12.7	0.0	12.7	55.1		48" RCP	48" RCP
3702-3703	FLOWER	0.0050	566	66.0		0.00357	3365	1069.1	40.0	201.1	241.1	828.0	2@9x6.5 RCB	13x6.5 RCB	209x6.5 RCB
3727-3728	ANAHURST	0.0020	283					16.2	12.7	0.0	12.7	3.5	ALL CALLS ALLS	18" RCP	18" RCP
3728-3729	ANAHURST	0.0020	283					16.2	12.7	0.0	12.7	3.5		18" RCP	18" RCP
3729-3703	ANAHURST	0.0020	566					28.3	25.3	0.0	25.3	3.0		18" RCP	18" RCP
3703-3704	FLOWER	0.0050	566	10.0		0.00357			40.0	1615.6	1655.6	0.0			
3805-3733 3731-3732	WARNER	0.0020	35	60.0		0.00200	2610		1.6	116.7	118.3	860.6	15x8 RCB	2010x6.5 RCB	14.5x8 RCB
3732-3733	MAPLE	0.0050	566					10.9	40.0	0.0	40.0	0.0			
3733-3739	WARNER	0.0020	566 35	69.0		0 00200	3789	10.9	40.0	0.0	40.0	0.0	15.0 000		10.4.4.1.1.
3735-3736	ORANGE	0.0050	566	09.0		0.00200	3/09	19.4	1.6	169.5	171.0 40.0	816.2	15x8 RCB	2@9.5x6.5 RCB	14.5x8 RCB
3736-3737	ORANGE	0.0050	566					19.4	40.0	0.0	40.0	0.0			
3737-3738	ORANGE	0.0050	566					30.0	40.0	0.0	40.0	0.0			
3738-3739	ORANGE	0.0050	566					36.6	40.0	0.0	40.0	0.0			
3739-3745	WARNER	0.0020	35	69.0		0.00200	3789	1018.2	1.6	169.5	171.0	847.2	2011x6.5 RCB	209.5x6.5 RCB	15y8 PCB
3741-3742	CYPRESS	0.0050	566					13.7	40.0	0.0	40.0	0.0	Lutinois Rus	Luriskois Keb	1340 100
3742-3743	CYPRESS	0.0050	566					13.7	40.0	0.0	40.0	0.0			
3743-3744	CYPRESS	0.0050	566					20.3	40.0	0.0	40.0	0.0			
3744-3745	CYPRESS	0.0050	566					30.0	40.0	0.0	40.0	0.0			
3745-3746	WARNER	0.0050	35	69.0		0.00200	3789		2.5	169.5	171.9	863.7	15.5x8 RCB	2010x6.5 RCB	15x8 RCB
3748-3749	MAIN	0.0050	70					13.7	5.0	0.0	5.0	8.8		21" RCP	21" RCP
3749-3750	MAIN	0.0050	70					13.7	5.0	0.0	5.0	8.8		21" RCP	21" RCP
3750-3751	MAIN	0.0050	70					19.9	5.0	0.0	5.0	14.9		24" RCP	24" RCP
3751-3752 3752-3746	MAIN	0.0050	70 561					28.7	5.0 39.7	0.0	5.0	23.7		30" RCP	30" RCP
3746-3766	WARNER	0.0020	35	69.0		0.00200	3780		1.6	169.5	171.0	0.0 879.6	15.5x8 RCB	2010x6.5 RCB	30" RCP
3761-3762	POMONA	0.0020	566	07.0		0.00200	5107	15.5	25.3	0.0	25.3	0.0	IJ.JAO KUB	ZOTUXO.J KLB	15.5x8 RCB
3762-3763	BROADWAY	0.0050	500					15.5	0.0	0.0	0.0	15.5		24" RCP	24" RCP
3763-3764	BROADWAY	0.0050						32.3	0.0	0.0	0.0	32.3		33" RCP	33" RCP
3764-3765	BROADWAY	0.0050						46.4	0.0	0.0	0.0	46.4		36" RCP	36" RCP
3765-3766	BROADWAY	0.0050						59.8	0.0	0.0	0.0	59.8		42" RCP	42" RCP
3766-3767	WARNER	0.0020	30	69.0		0.00200	3789		1.3	169.5	170.8	906.4	2011.5x6.5 RC		
3767-3704	WARNER	0.0020	30	69.0		0.00200	3789		1.3	169.5	170.8	906.4	2011.5x6.5 RC		
3771-3772	BRISTOL	0.0050	70	24.24			1000	14.2	5.0	0.0	5.0	9.2		21" RCP	21" RCP
3772-3773	BRISTOL	0.0050	70					14.2	5.0	0.0	5.0	9.2		21" RCP	21" RCP
3773-3774	BRISTOL	0.0050	70					23.1	5.0	0.0	5.0	18.1		27" RCP	27" RCP
3774-3775	BRISTOL	0.0050	70				-22.00	36.1	5.0	0.0	5.0	31.2	100 C	33" RCP	33" RCP
3775-3776	WARNER	0.0010	70	42.0		0.00100	1008		2.2	31.9	34.1	24.1	54" RCP	39" RCP	54" RCP
3776-3790	WARNER	0.0010	70	42.0		0.00100	1008	62.4	2.2	31.9	34.1	28.3	54" RCP	42" RCP	54" RCP

Boyle Engineering Corporation

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HYDRAULIC ANALYSIS SUMMARY

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KER KER KER WELL	(ft/ft) 0.0050 0.0050 0.0050	К 566 566	Diam/Depth H (in)/ (ft)	Base Width (ft)	Side Slope	Slope (ft/ft)		Runoff (cfs)	Roadway (cfs)	Conduit (cfs)	Total (cfs)	Capacity (cfs)		Alternatives-	Recommended Improvement
KER	0.0050	566		TTERFORMULL							10101	(015)	Replacement	New/Parallel	
KER	0.0050							13.4	40.0	0.0	40.0	0.0			
								13.4	40.0	0.0	40.0	0.0			
WELL		566						21.9	40.0	0.0	40.0	0.0			
	0.0050	566						17.1	40.0	0.0	40.0	0.0			
RKELEY															
CIDENTAL		566												191 000	18" RCP
CIDENTAL		566													27" RCP
KER		566													
KER	0.0050	566													33" RCP 36" RCP
KER	0.0050	566													39" RCP
SEMOOD	0.0050	566													
RNER (ADV)	0.0010		42.0			0.00100	1008						011 000		42" RCP
IVE	0.0050	566					1000						OF KUP	()" KLP	81" RCP
. GERTRUDE	0.0020	566													
RK		566													
RNER (ADV)			42.0			0.00100	1008						7 5-4 5 000	044 000	7.5.4.5.000
RNER (ADV)															7.5x6.5 RCB 7.5x6.5 RCB
CCKKKKSRI .RR	IDENTAL IDENTAL ER ER EWOOD NER (ADV) VE GERTRUDE K NER (ADV)	IDENTAL 0.0020 IDENTAL 0.0020 ER 0.0050 ER 0.0050 ER 0.0050 ER 0.0050 EWOOD 0.0050 NER (ADV) 0.0010 VE 0.0050 GERTRUDE 0.0020 K 0.0050 NER (ADV) 0.0010	IDENTAL 0.0020 566 IDENTAL 0.0020 566 ER 0.0050 566 ER 0.0050 566 ER 0.0050 566 EW 0.0050 566 EW 0.0050 566 EW 0.0050 566 EW 0.0050 566 ER 0.0050 566 ER 0.0050 566 GERTRUDE 0.0020 566 K 0.0050 566 NER (ADV) 0.0010 566	IDENTAL 0.0020 566 IDENTAL 0.0020 566 ER 0.0050 566 ER 0.0050 566 ER 0.0050 566 EVODD 0.0050 566 EVODD 0.0050 566 NER (ADV) 0.0010 42.0 VE 0.0050 566 GERTRUDE 0.0020 566 K 0.0050 566 NER (ADV) 0.0010 42.0	IDENTAL 0.0020 566 IDENTAL 0.0020 566 ER 0.0050 566 ER 0.0050 566 ER 0.0050 566 EVOOD 0.0050 566 NER (ADV) 0.0010 42.0 VE 0.0050 566 GERTRUDE 0.0020 566 K 0.0050 566 NER (ADV) 0.0010 42.0	IDENTAL 0.0020 566 IDENTAL 0.0020 566 ER 0.0050 566 ER 0.0050 566 ER 0.0050 566 EVOOD 0.0050 566 NER (ADV) 0.0010 42.0 VE 0.0050 566 GERTRUDE 0.0020 566 K 0.0050 566 NER (ADV) 0.0010 42.0	IDENTAL 0.0020 566 IDENTAL 0.0020 566 ER 0.0050 566 ER 0.0050 566 ER 0.0050 566 EVOOD 0.0050 566 EVOOD 0.0050 566 EVOOD 0.0050 566 GERTRUDE 0.0020 566 K 0.0050 566 NER (ADV) 0.0010 42.0 0.00100	IDENTAL 0.0020 566 IDENTAL 0.0020 566 ER 0.0050 566 ER 0.0050 566 EWOOD 0.0050 566 EWOOD 0.0050 566 NER (ADV) 0.0010 42.0 0.00100 1008 VE 0.0050 566 GERTRUDE 0.0020 566 K 0.0050 566 NER (ADV) 0.0010 42.0 0.00100 1008	KELEY 0.0050 566 17.1 IDENTAL 0.0020 566 28.2 IDENTAL 0.0020 566 38.8 ER 0.0050 566 74.3 ER 0.0050 566 81.3 ER 0.0050 566 93.7 EWOOD 0.0050 566 102.0 NER (ADV) 0.0010 42.0 0.00100 1008 175.8 VE 0.0050 566 14.7 14.7 GERTRUDE 0.0020 566 34.6 NER (ADV) 0.0010 42.0 0.00100 1008 215.3	KELEY 0.0050 566 17.1 40.0 IDENTAL 0.0020 566 28.2 25.3 IDENTAL 0.0020 566 38.8 25.3 IDENTAL 0.0050 566 74.3 40.0 ER 0.0050 566 74.3 40.0 ER 0.0050 566 93.7 40.0 EWCOD 0.0050 566 102.0 40.0 EWCOD 0.0050 566 102.0 40.0 VE 0.0050 566 14.7 40.0 GERTRUDE 0.0020 566 14.7 25.3 K 0.0050 566 34.6 40.0 NER (ADV) 0.0010 42.0 0.00100 1008 215.3 0.0	KELEY 0.0050 566 17.1 40.0 0.0 IDENTAL 0.0020 566 28.2 25.3 0.0 IDENTAL 0.0020 566 38.8 25.3 0.0 ER 0.0050 566 74.3 40.0 0.0 ER 0.0050 566 81.3 40.0 0.0 ER 0.0050 566 93.7 40.0 0.0 EWOOD 0.0050 566 102.0 40.0 0.0 EWOOD 0.0050 566 102.0 40.0 0.0 VE 0.0050 566 102.0 40.0 0.0 VE 0.0050 566 14.7 25.3 0.0 K 0.0050 566 14.7 25.3 0.0 K 0.0050 566 34.6 40.0 0.0 NER (ADV) 0.0010 42.0 0.00100 1008 215.3 0.0 31.9	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	KELEY 0.0050 566 17.1 40.0 0.0 40.0 0.0 IDENTAL 0.0020 566 28.2 25.3 0.0 25.3 2.8 IDENTAL 0.0020 566 38.8 25.3 0.0 25.3 13.5 ER 0.0050 566 74.3 40.0 0.0 40.0 34.3 ER 0.0050 566 74.3 40.0 0.0 40.0 41.3 ER 0.0050 566 93.7 40.0 0.0 40.0 53.7 EWOOD 0.0050 566 102.0 40.0 0.0 40.0 53.7 EWOOD 0.0050 566 102.0 40.0 0.0 40.0 53.7 EWOOD 0.0050 566 102.0 40.0 0.0 40.0 62.0 VE 0.0050 566 14.7 40.0 0.0 40.0 0.0 GERTRUDE 0.0050 566 14.7 25.3 0.0 0.0 0.0 K 0.0050 566	KELEY 0.0050 566 17.1 40.0 0.0 40.0 0.0 IDENTAL 0.0020 566 28.2 25.3 0.0 25.3 2.8 IDENTAL 0.0020 566 38.8 25.3 0.0 25.3 2.8 ER 0.0050 566 74.3 40.0 0.0 40.0 34.3 ER 0.0050 566 74.3 40.0 0.0 40.0 41.3 ER 0.0050 566 93.7 40.0 0.0 40.0 62.0 NER (ADV) 0.0010 42.0 0.00100 1008 175.8 0.0 31.9 31.9 $81"$ RCP VE 0.0050 566 14.7 25.3 0.0 0.0 GERTRUDE 0.0020 566 14.7 25.3 0.0 0.0 K 0.0050 566 14.7 25.3 0.0 0.0 0.0 K 0.0050 566 14.7	KELEY 0.0050 566 17.1 40.0 0.0 40.0 0.0 IDENTAL 0.0020 566 28.2 25.3 0.0 25.3 2.8 18" RCP IDENTAL 0.0020 566 38.8 25.3 0.0 25.3 2.8 18" RCP ER 0.0050 566 74.3 40.0 0.0 40.0 34.3 33" RCP ER 0.0050 566 74.3 40.0 0.0 40.0 34.3 33" RCP ER 0.0050 566 93.7 40.0 0.0 40.0 53.7 39" RCP ENCOOD 0.0050 566 93.7 40.0 0.0 40.0 62.0 42" RCP VE 0.0050 566 102.0 40.0 0.0 40.0 62.0 42" RCP VE 0.0050 566 14.7 40.0 0.0 0.0 40.0 62.0 K 0.0050 566 14.7 25.3 0.0 0.0 62.0 K 0.0050 566

n=.0130 D= 1.8 27.0"-PIPE ADD SUBAREA	19.3	.123	- 13	25.911.28	*	1 1 3	60/AC	<u> </u>	18.5	6.6	3713.00 3713.00
D= .4 ,) FLOODWII 	12.8 303	.125	<u>-13</u>	51.32	24.6	7.9	60/AC	0	11.9	6.9	48.ft-STREET FLOW TO PT.# 3712.00
	7.1 863	.125	.13	3 1.69	16.8	1:	60/AC	0	5.0	5.0	3711.00
- FOR CONFLUENCE	1007.4	10	<u> </u>	.93	44.5				1286.3		3701.00
= 5.0 Fm(IN/HR) = .103; Ybar = .426 COURSE = 3280.0 WITH LENGTH = 18240.3 FEET 1.31; 6HR = 1.81; 24HR= 3.03 .99; 6HR = 1.00; 24HR= 1.00 .0%; VALLEY(UNDEV)/DESERT = .0% LUME(AF)= 212.27 	5.0 Fm(IN/HR) = 5.0 Fm(IN/HR) = 31; 6HR = 1.81; 39; 6HR = 1.00; 2 99; 6HR = 1.00; 2 ; VALLEY(UNDEV)/D E(AF)= 212.27 -[[[]	HR) = .59 TIME INTERVAL(MIN.) = 5.0 Fm(UPSTREAM NODE OF LONGEST WATERCOURSE = 328 IOM = .59; THR = .78; 3HR = 1.31; 6HR = .30M = .94; THR = .94; 3HR = .99; 6HR = .0THILL = .0%; MOUNTAIN = .0%; VALLEY(1) 45 TIME OF PEAK(HR) = 16.7 VOLUME(AF)=	1 7 4 2	= .59 TIME INTERVAL(MIN.) = STREAM NODE OF LONGEST WATERCO = .59; THR = .78; 3HR = 1 OM = .94; THR = .94; 3HR = . ILL = .0%; MOUNTAIN = .00 TIME OF PEAK(HR) = 16.7 VOLU	59 TIME IN 959 TIME IN 59; 1HR = .94; 1HR = .0%; MO 0F PEAK(HR) 	.59 T .59; 1 .59; 1 .59	LAG TIME(HR) = 1286.3 UPSTREA = .26; 30M = 5M = .94; 30M = 100.0%; FOOTHILL = 1007.45 TIME 	TIME(HR) = 26; 30M = 26; 30M = 	LAG TIME(HR) = 1286.3 UPSTF = .26; 30M = 5M = .94; 30M 100.0%; FOOTHILL = 1007.45 TI = -[[]	44.48 L CRES)= 4):5M = ACTORS:5 ACTORS:5 TE(CFS)= TE(CFS)=	TC(MIN.) = 44.48 TOTAL AREA(ACRES)= RAINFALL(INCH): 5M = DEPTH-AREA FACTORS: S-GRAPH : VALLEY = 1 PEAK FLOW RATE(CFS)=
1716 .0036 14.4 opipe=1007.4cfs		.103 1007.4		.93	44.5	2.0			22.2 1286.3	22.2	3701.00 3701.00
		EAM AREA(acres) 1264.00		Ybar ARE	 ED ONTO MAI Fm(in/hr) .102	Find of				10 M	3605.00
		AREA(acres) 1264.00	AREA	- LOWS: Ybar A .43		FINED		-		100	3605.00
PATH SLOPE V HYDRAULICS	Q PAI	Fm (Avg)	: 3	1 in/h	M T	MIN	SOIL DEV. Tt Tc TYPE TYPE MIN. MIN.	a complete the state of	ACRES)	AREA (J SUBAREA	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUM
CALCULATED BY: CHECKED BY: PAGE NUMBER 1 OF		3/1994 CANC II LOSSES) POFTWARED - 1983-1991 ADVANCED ENGINEERING SOFTWARED -	SU	II LOSSES)	IC II	- 1001	2/23/1994 HOD STUDY	2/2 METHOD	10:46 IONAL	SA37.DAT OF STUDY: 10:46 STORM RATIONAL 1	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC
			- EALNG	LEVEL	SE LEVEL	IDENC	OF DRA	PLAN AT 50	ASTER	A ANA M	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 110-YEAR RETURN FREQUENCY AT 50% CONFIDENCE MAP # 37

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3702.00	S-GRAPH : VALLEY = 10 PEAK FLOW RATE(CFS)=	RAINFALL(INCH): 5M = DEPTH-AREA FACTORS: 5M	TC(MIN.) = 45.61 TOTAL AREA(ACRES)=	3702.00		S-GRAPH : VALLEY = 100.0%; FOOTHILL = PEAK FLOW RATE(CFS)= 1019.19 TIME	TC(MIN.) = 44.48 LAG T TOTAL AREA(ACRES)= 13: RAINFALL(INCH): 5M = .2 DEPTH-AREA FACTORS: 5M =	CONFLUENCE ANALYSIS FOR POINT# 3701.00	3701.00	3714.00	CONCENTRATION AREA (ACRES)	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE MAP # 37
MAIN	CFS)=	ORS: 5M	5	12.4		EY = 100 (CFS)=	44.48 L CRES)= H): 5M = ACTORS: 5H	MEA		5.7	AREA (A	SA37.DAT OF STUDY: STORM RATI	TA ANA MAS JRN FREQUE
N-STREAM	1020.	" N	LAG TIME(HR) = 1322.9 UPSTR	 12.4 1322.9		1019.	LAG TIME(HR) = 1310.5 UPSTR = .26; 30M = 5M = .94; 30M	TIME O		24.3		10:46 IONAL ME	ASTER PI
MAIN-STREAM COPIED ONTO MEMORY BANK #	100.0%; FOOTHILL = .0%; MOUNTAIN = = 1020.02 TIME OF PEAK(HR) = 16.7	- de	IG TIME(HR) = .61 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .103; Ybar = 1322.9 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 19217.	UNIT HYDROGRAPH INFORMATION		00.0%; FOOTHILL = .0%; MOUNTAIN = 16.7 1019.19 TIME OF PEAK(HR) = 16.7	11ME(HR) = 10.5 UPSTRE/ 16; 30M = . .94; 30M =	<pre>PEAK FLOW RATE(CFS) = 101 TIME OF CONCENTRATION(MIN.) = 44.5 MEAN VALUES: Fm(IN/HR) = .103; Ybar = TOTAL AREA(ACRES) =</pre>		c 60/AC	SOIL DEV. Tt	- F(c) 1983-1991 ADVANCED ENGINEEDING SOFTWARE1	LAN OF D
	E OF PE	.59; 1HR = = .94; 1HR =	.61 TI	1.1 			.9. N	PEAK FLOW RATE(CFS) = NCENTRATION(MIN.) = 4 m(IN/HR) = .103; Yba TOTAL AREA(ACRES) = HYDROGRAPH INFORMATIO			YPE MIN.	994 UDY (AMC	DRA I NAGE
MEMORY B	.0%; MOUNTAIN = PEAK(HR) = 16.7	11	OF LON	45.6		.0%; MOUNTAIN = PEAK(HR) = 16.7 	ME INTE	ATE(CFS A(MIN.) .103) EA(ACRE		27.1	HIN.	- LORANG	111
BANX # 2	TAIN = = 16.7	.78; 3HR =	TIME INTERVAL(MIN.) = DOE OF LONGEST WATERCO	.92 .1	$-\frac{1}{1}$	JNTAIN =) = 16.7	59 TIME INTERVAL(MIN.) M NODE OF LONGEST WATER(59; 1HR = .78; 3HR = .94; 1HR = .94; 3HR =	= - 4/ 4/ 4/ 7/bar 710		1.25 .13	1 Fm	LORANCE COUNTYJ- II LOSSES)	
	VOLL		N.) = !	.13 .103 1020.0			TIME INTERVAL(MIN.) = 5.0 ODE OF LONGEST WATERCOURSE = THR = .78; 3HR = 1.31; 0 4; THR = .94; 3HR = .99; 0	A		within the second second statistics -	n Fm (Avg)	Y]	
	.0%; VALLEY(UNDEV)/DESERT = DLUME(AF)= 217.41	1.31; 6HR = 1.81; 24HR= 3.	5.0 Fm URSE = 321	1020.0		.0%; VALLEY(UNDEV)/DESERT DLUME(AF)= 215.45	= 5.0 fm(IN/HR) = .103; WRSE = 3280.0 WITH LENGTH = .31; 6HR = 1.81; 24HR= 3. .99; 6HR = 1.00; 24HR= 1.00	9.2 LAG TIME(HR) .430 .310.52		24.5	SUM O	SOFTUAL	
	CUNDEV3/00 217.41	= 1.81 = 1.00;	Fm(IN/HR) = 3280.0 WITH		977	215.45	fm(IN/HR) = 3280.0 WITH HR = 1.81; HR = 1.00; 2	± .59	186	301 .0020	PATH SLOPE (ft) ft/ft 		
	DESERT	1.81; 24HR= 1.00; 24HR=	= .1 TH LENG		0036 14	/DESERT 45 	N/HR) = .1 .0 WITH LENG 1.81; 24HR= 1.00; 24HR=	· · ·	.0020 4	0020	PATH SLOPE V (ft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER	
$\frac{1}{1} - \frac{1}{1}$		3.03	.103; Ybar NGTH = 1921		.4 api	1 n	.103; Ybar NGTH = 182 R= 3.03 (= 1.00		<u>à</u>	4.3 Opipe= 4.3 Opipe= 12.0130 33. 300 S	<u> //</u>	BY: BY: R 2 OF	
	.0%		ar = .430 9217.7 FEET	126.0"-PIPE ADD SUBAREA	977 .0036 14.4 apipe=1019.2cfs	.0%	oar = .430 8240.3 FEET		Qpipe= 24.5cfs n=.0130 D= 2.1 36.0"-PIPE	Qpipe= 19.3cfs n=.0130 D= 1.9 33.0"-PIPE ADD SUBAREA	HYDRAULICS AND NOTES		

4

AT 50%	AT 50%	AT 50%	AT 50%	AT 50% CONFIDENCE LEVEL CRANGE COUNTY) CAL 2/23/1994 CAL HETHOD STUDY (AMC 11 LOSSES) PAG ISOIL [DEV.] Tt Tt Fm GAL SOIL [DEV.] Tt Tt I Fm GAL ISOIL [DEV.] Tt Tt I Fm GAL ISOIL [DEV.] Tt Tt I Fm GAL ISOIL [DEV.] Tt Tt I Fm GA PATH ISOIL [DEV.] Tt Tt I Fm GA PATH ISOIL [DEV.] Tt Tt I.13 .125 9.7 I.C 60/AC 20.6 1.44 .13 .125 9.7 I.C 60/AC 21.8 1.40 .13 .125 23.9 I.C 60/AC 14.6 .13 .125 7.3 23.9 23.9 23.9 23.9	AT 50% CONFIDENCE LEVEL CRANGE COUNTY) CAL 2/23/1994 CAL HETHOD STUDY (AMC 11 LOSSES) PAG ISOIL [DEV.] Tt Tt Fm GAL SOIL [DEV.] Tt Tt I Fm GAL ISOIL [DEV.] Tt Tt I Fm GAL ISOIL [DEV.] Tt Tt I Fm GAL ISOIL [DEV.] Tt Tt I Fm GA PATH ISOIL [DEV.] Tt Tt I Fm GA PATH ISOIL [DEV.] Tt Tt I.13 .125 9.7 I.C 60/AC 20.6 1.44 .13 .125 9.7 I.C 60/AC 21.8 1.40 .13 .125 23.9 I.C 60/AC 14.6 .13 .125 7.3 23.9 23.9 23.9 23.9	AT 50% CONFIDENCE LEVEL 2/23/1994 ETHOD STUDY (AMC II LOSSES) ISOIL JDEV. ITT TTYPE ITYPE MIN. MIN. ITYPE ITYPE MIN. MIN. ITYPE ITYPE MIN. MIN. ITT IT ITT	3723.00	4 4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3722.00 3722.00 16.6 35.7	3721.00 6.9 19.1	3721.00	48.ft-STREET 5.6 5.6 5.6 5.6 5.6 5.2	3719.00 5.1 5.1		3723.00 20.8	3723.00 3723.00 6.8 20.8	3717.00 6.9 14.0	48.ft-STREET	3716.00 7.1 7	CONCENTRATION AREA (ACRES)	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/2: 5.0-YEAR STORM RATIONAL METHOD	10-YEAR RETURN FREQUENCY AT 50% CONFIDENC MAP # 37
23/1994 23/1994 5 STUDY (AMC 11 LOSSES) 6 STUDY (AMC 11 LOSSES) 1983-1991 ADVANCED EN 1983-1991 ADVANCED EN 1983-1991 ADVANCED EN 1983-1991 ADVANCED EN 1983-1991 ADVANCED EN 100/AC 1 17.5 1.64 1.2 60/AC 1 17.5 1.64 1.2 60/AC 1 21.8 1.40 21.8 1.40 21.8 1.40 21.8 1.40 21.8 1.40 26.8 1.20 60/AC 1 25.7 1.29 60/AC 1 26.8 1.20 26.8 1.20 2.3 2.3	23/1994 EIRANGE COUNTY]	23/1994 II LOSSES 0 STUDY (AMC II LOSSES) 1983-1991 ADVANCED ENGINEERING S 1983-1991 ADVANCED ENGINEERING S 100/0000000000000000000000000000000000	23/1994 II LOSSES) > STUDY (AMC II LOSSES) > 1983-1991 ADVANCED ENGINEERING SOFTWAR IPEV. Tt Tc I Fm q ITYPE MIN. MIN. In/h (Avg) SUH 60/AC 20.6 1.44 .13 .125 9.7 60/AC 21.8 1.40 .13 .125 23.9 60/AC 21.8 1.40 .13 .125 7.3 21.8 1.40 .13 .125 7.3 21.8 1.40 .13 .125 7.3 21.8 1.40 .13 .126 7.3 21.8 1.40 .13 .127 20.0	CONFIDENCE LEVEL CANGE COUNTY) CAL \$/1994 I LOSSES) PAG 1983-1991 ADVANCED ENGINEERING SOFTWARE] PAG 1982-1991 ADVANCED ENGINEERING SOFTWARE] PAG 10040 17.5 1.64 .13 .125 9.7 10040 17.5 1.64 .13 .125 9.7 1.2 20.6 1.44 .13 .125 9.7 1.2 21.8 1.40 .13 .125 9.7 21.8 1.40 .13 .125 16.6	CONFIDENCE LEVEL CANGE COUNTY) CAL \$/1994 I LOSSES) PAG 1983-1991 ADVANCED ENGINEERING SOFTWARE] PAG 1982-1991 ADVANCED ENGINEERING SOFTWARE] PAG 10040 17.5 1.64 .13 .125 9.7 10040 17.5 1.64 .13 .125 9.7 1.2 20.6 1.44 .13 .125 9.7 1.2 21.8 1.40 .13 .125 9.7 21.8 1.40 .13 .125 16.6	CONFIDENCE LEVEL CALCULATED BY: CALCULATED BY: STUDY (ANC II LOSSES) PAGE NUMBER ING SOFTWARE] PAGE NUMBER ING 1983-1991 ADVANCED ENGINEERING SOFTWARE] PAGE NUMBER ING 10EV. Tt Tc I Fm G PATH SLOPE[V] 11.2 1.2 1.64 .13 .125 9.7 12.2 20.6 1.44 .13 .125 9.7 12.2 20.6 1.44 .13 .125 9.7 12.2 20.6 1.44 .13 .125 9.7 12.2 21.8 1.40 .13 .125 1.6.6 12.2 21.8 1.40 .13 .125 7.3 13.125 7.3 836 0050 13.127 20.0 973 0050 2.2 14.1 1.26 .13 .127 <t< td=""><td></td><td></td><td>0</td><td>0</td><td></td><td>00</td><td>; 0</td><td>2 </td><td></td><td>0</td><td>10</td><td></td><td>0</td><td></td><td>6 2/2 METHO</td><td>AT 50</td></t<>			0	0		00	; 0	2 		0	10		0		6 2/2 METHO	AT 50
IDENCE LEVEL IDENCE LEVEL IDENCE LEVEL CAMC II LOSSES: Y (AMC II LOSSES: Y (AMC II LOSSES: T C I I TT Tc I I TT Tc I I TT Tc I I TT Tc I I T.5 1.64 21.8 1.40 21.8 1.40 21.8 1.40 25.7 1.29 25.8 1.26 25.8 1.26	IDENCE LEVEL IDENCE LEVEL IDENCE LEVEL IDENCE LORANGE COUNTY) ISON ADVANCED ENGINEER ITT Tc I Fm ITT Tc I Fm IN.N. MIN. in/h ITT Tc I Fm IN.N. MIN. in/h ITT Tc I Fm ITT Tc I Fm IN.N. in/h ITT Tc I Fm ITT Tc I Fm II.1 I.2 I.3 I.4 I.3 I.4 I.3 I.5 I.4 I.3 I.4 I.5 I.4 I.5 I.4 I.5 I.4 I.5 I.5 I.4 I.5 I	IDENCE LEVEL IDENCE LEVEL IT I LOSSES) 1991 ADVANCED ENGINEERING S IT Tc I Fm Fm MIN. MIN. In/h I (Avg) MIN. MIN. In/h I (Avg) 20.6 1.44 .13 .125 21.8 1.40 .13 .125 21.8 1.40 .13 .125 21.8 1.40 .13 .125 21.8 1.40 .13 .125 25.7 1.29 .13 .125 25.7 1.29 .13 .125 26.8 1.26 .13 .127 1.3 1.26 .13 .127 <td>IDENCE LEVEL IDENCE LEVEL IDENCE LEVEL CAMC II LOSSES) 1997 ADVANCED ENGINEERING SOFTWAR TTC I Fm Fm Q MIN. MIN. IN/h (Avg) SUM 20.6 1.44 .13 .125 1.64 21.8 1.40 .13 .125 1.64 2.1.8 1.40 .13 .125 1.64 2.1.8 1.40 .13 .125 2.3.9 2.4.4 1.33 .15 .128 1.25 .128 1.25 .128 1.26 .13 .125 .128 1.27 .128 1.27 .128 1.26 .13 .126 .14 .15 .126 .14 .15 .126 .14 .15 .126 .14 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 </td> <td>LEVEL II LOSSES) II LOSSES) TC I Fm Fm Q PAG TC I Fm I Fm I Fm I Q PAG TC I FM I Fm I Fm I Q PAG TC I FM I Fm I Fm I Fm I Fm I Q PAG TC I FM I F</td> <td>LEVEL II LOSSES) II LOSSES) TC I Fm Fm Q PAG TC I Fm I Fm I Fm I Q PAG TC I FM I Fm I Fm I Q PAG TC I FM I Fm I Fm I Fm I Fm I Q PAG TC I FM I F</td> <td>LEVEL.</td> <td></td> <td></td> <td>60/AC</td> <td>6D/AC</td> <td><u> </u></td> <td>6D/AC</td> <td>6D/AC</td> <td>3 3 1 1</td> <td></td> <td>6D/AC</td> <td>6D/AC</td> <td></td> <td>60/AC</td> <td>DEV.</td> <td>23/1990 23/1990 23/1990</td> <td>* CONF</td>	IDENCE LEVEL IDENCE LEVEL IDENCE LEVEL CAMC II LOSSES) 1997 ADVANCED ENGINEERING SOFTWAR TTC I Fm Fm Q MIN. MIN. IN/h (Avg) SUM 20.6 1.44 .13 .125 1.64 21.8 1.40 .13 .125 1.64 2.1.8 1.40 .13 .125 1.64 2.1.8 1.40 .13 .125 2.3.9 2.4.4 1.33 .15 .128 1.25 .128 1.25 .128 1.26 .13 .125 .128 1.27 .128 1.27 .128 1.26 .13 .126 .14 .15 .126 .14 .15 .126 .14 .15 .126 .14 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15	LEVEL II LOSSES) II LOSSES) TC I Fm Fm Q PAG TC I Fm I Fm I Fm I Q PAG TC I FM I Fm I Fm I Q PAG TC I FM I Fm I Fm I Fm I Fm I Q PAG TC I FM I F	LEVEL II LOSSES) II LOSSES) TC I Fm Fm Q PAG TC I Fm I Fm I Fm I Q PAG TC I FM I Fm I Fm I Q PAG TC I FM I Fm I Fm I Fm I Fm I Q PAG TC I FM I F	LEVEL.			60/AC	6D/AC	<u> </u>	6D/AC	6D/AC	3 3 1 1		6D/AC	6D/AC		60/AC	DEV.	23/1990 23/1990 23/1990	* CONF
LEVEL 11 LOSSES: ADVANCED EN TC I I MIN. in/h 20.6 1.44 20.6 1.44 21.8 1.40 21.8 1.40 25.7 1.29 26.8 1.26 26.8 1.26	LEVEL II LOSSES) ADVANCED ENGINEER Tc I Fm MIN. in/h Fm 17.5 1.64 .13 20.6 1.44 .13 21.8 1.40 .13 21.8 1.40 .13 21.8 1.40 .13 24.4 1.33 .15 24.4 1.33 .15 25.7 1.29 .13 24.4 1.33 .15 24.4 1.33 .15 25.7 1.29 .13 26.8 1.26 .13	LEVEL 11 LOSSES) 11 LOSSES) ADVANCED ENGINEERING S TC Fm Fm (Avg) 17.5 1.64 .13 .125 20.6 1.44 .13 .125 21.8 1.40 .13 .125 21.8 1.40 .13 .125 21.8 1.40 .13 .125 24.4 1.33 .15 .125 24.4 1.33 .15 .125 24.4 1.33 .15 .128 24.4 1.33 .15 .128 24.4 1.33 .15 .128 24.4 1.33 .15 .128 24.4 1.33 .125 .128 24.4 1.33 .125 .128 24.4 1.33 .126 .13 .126 25.7 1.29 .13 .126 26.8 1.26 .13 .126	LEVEL II LOSSES) ADVANCED ENGINEERING SOFTWAR Tc I Fm Fm Q MIN. in/h KM KAYS 20.6 164 .13 .125 9.7 17.5 164 .13 .125 9.7 17.5 164 .13 .125 16.6 20.6 144 .13 .125 16.6 20.6 144 .13 .125 23.9 21.8 140 .13 .125 23.9 21.8 140 .13 .125 23.9 21.8 140 .13 .125 7.3 16.6 170 .13 .125 7.3 16.6 170 .13 .125 7.3 16.8 126 .13 .127 20.0 25.7 129 .13 .126 36.4 26.8 126 .13 .126 36.4	LEVEL II LOSSES) II LOSSES) TC I Fm Fm Q PAG TC I Fm I Fm I Fm I Q PAG TC I FM I Fm I Fm I Q PAG TC I FM I Fm I Fm I Fm I Fm I Q PAG TC I FM I F	LEVEL 11 LOSSES) 11 LOSSES) 11 LOSSES) 11 LOSSES) 11 LOSSES) 12 LOSES 12 LOSES 12 LOSES 13 LOSE 14 LOSES 15 LOSE 15 L	LEVEL.		2.3	······································		<u>.</u>	······································		• •		1.2		ы 2	: :	MIN.	4 Y (AMC - 1001	IDENCE
I 1. 26	E COUNTY)	IE COUNTY)	IE COUNTY)			ALCULATED BY: CHECKED BY: AGE NUMBER 2 CHECKED BY: CHECKED CHECKED CHECK			26.8	25.7		24.4	6	1 1 1	21.8		20.6	·		MIN.		LEVEL
		NTY) SINEERING S Fm Fm A (Avg) .13 .125 .13 .125	NTY)			ALCULATED BY: CHECKED BY: AGE NUMBER 2 CHECKED BY: CHECKED BY: AGE NUMBER 2 CHECKED BY: CHECKED CHECKED C		•	*			· · · · · · · · · · · · · · · · · · ·	1.70		1.40	1.40				 I I I	ED EN	2

	-							-			
n=.0130 D= 8.4 126.0"-PIPE											3703.00
227.37 	227.37 675 .0036 14.	AF)=	VOLUME (AF)= - -		TIME OF PEAK(HR) = 16.7	OF PEAK(TIME OF		11	(CFS)=	PEAK FLOW RATE(CFS)=
3.03 1.00 = .0%	Z -	VALLEY(L			<u> </u>	-0%; 1HR =			N 11		AAINFALL(INCH): 5M = DEPTH-AREA FACTORS: 5M = S-GRAPH : VALLEY = 100.0
.104; Ybar = .435 NGTH = 19217.7 FEET	(N/HR) =	5.0 Fm(RSE = 328	RCOURS	NL (MIN.	.61 TIME INTERVAL(MIN.) = AM NODE OF LONGEST WATERCO	TIME	REAN I	LAG TIME(HR) = 1393.3 UPST	5	45.61 CRES)=	TC(MIN.) = 45.61 TOTAL AREA(ACRES)=
1 2 2 2 2 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5	3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		TEAM	VIN-STI	2 CONFLUENCED WITH MAIN-STREAM	JENCED	CONFLU		MEMORY BANK #	Ä	3702.00
51.0"-PIPE	* * * * * *		* * * *		<u> </u>	1.4	<u>.</u>	<u> </u>		*	3702.00
5.9 Qpipe= 67.7cfs	490 .0020 5	4 1 1 1 1						1 1 1			
ADD SURAPEA	<u> </u>	67.7	125		23.711.35	.9	60/AC -	0	61.4	D- D-	3725.00
n=.0130 D= 3.0 48.0"-PIPE ADD SUBAREA 5.7 qpipe= 61.6cfs		61.6	125		22.7 1.38		6D/AC	0	0 54.6	7.0	3724.00 3724.00
5.6 Opipe= 56.8cfs	298 .0020 5			$\frac{1}{1}$		$\frac{1}{11}$; ;	$\frac{1}{1}$			
	Ae(acres) NODE 47.58 3715.0 56.50 3718.0	m(avg) I(in/hr) A .126 1.40 .126 1.19	IG		Ap(avg) _50		Fp(avg) .250 .250	Tc(min) 21.85 29.12	91 20	Q(cfs) 56.81 56.20	
LARGEST	126	56.8 N.) = 21.8 .502; Fm(IN/HR) =	56.8 N.) = 2 .502; Fi	P = .	PEAK FLOW RATE(CFS) = 56.8 TIME OF CONCENTRATION(MIN.) = $p(IN/HR) = .250; Ap = .502$	CONCE	THE OF	PEAK FLOW TIME OF CO MEAN VALUES: FP(IN/HR) =	EAN VAL		FOR POINT#
				$\frac{1}{1}$	$\frac{1}{1}$						
S. AND NOTES	PATH SLOPE V (ft) ft/ft FPS.	SUM D	Fm (Avg)	- <u>''</u> Fa	Tc I MIN. in/h		SOIL DEV. TE	The second second	(ACRES)	AREA	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUM
A OF	CALCULATED BY: CHECKED BY: PAGE NUMBER	C 2/23/1994 THOD STUDY (AMC II LOSSES) P I(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE)-	ERING	ENGINE	II LOSSES) DVANCED ENG	(AMC 991 AD	2/23/1994 HOD STUDY (c) 1983-1	i m	10:4	A37.DAT F STUDY FORM RA	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC
				CUNTY	LEVEL	• m	F DRAIN CONFIL	PLAN O	MASTER	UF SIL	DESCRIPTION OF STUDT: CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL MAP # 37 MAP # 37

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			48.f			DEPT S-GR PEAK	TCCM TOTA		CONCE	FILE	MAR CI
3703.00	2 2 7 2 7	3729.00	48.ft-STREET FLOW TO PT.# 3728.00	3727.00	3703.00	DEPTH-AREA FACTORS: 5W S-GRAPH : VALLEY = 100 PEAK FLOW RATE(CFS)=	TC(MIN.) = 46.39 TOTAL AREA(ACRES)=	3703.00	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUB	NAME DATE YEAR	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE MAP # 37
	5 8 2 1 8 2 5	10.1	9.3	4.8		A FACTORS: VALLEY = 1: RATE(CFS)=	R 1		AREA (NAME:SA37.DAT /DATE OF STUDY: -YEAR STORM RAT	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENC MAP # 37
	* 5 5 5 7	26.2	14.1	4-8	72.9	.0%	LAG TIME(HR) = 1404.7 UPST	 6.8 1.9 2.7 1404.7	ACRES)	10:46 IONAL HI	IASTER P
		C 6D/AC	c 60/AC	C 60/AC		5M = .94; 30M = 100.0%; FOOTHILL : = 1069.06 TIM	UN11 HT TIME(HR) = 404.7 UPSTR		SOIL DEV. TT	2/23/1994 ETHOD STUDY -[(c) 1983-	LAN OF D
		200					MII HTURGGRAPH INFORMATION HR) = .62 TIME INTERVAL(MIN.) = 5.0 'UPSTREAM NODE OF LONGEST WATERCOURSE = DM = .59- THR = .78- 3HR = 1.31- 6H	60/AC 40/AC Park	V. Tt PEMIN.	2/23/1994 CAMC II LOSSES) PROFILE PROFILIPA PROFILI PROFILI PROFILI PROFILI PROFILI PROFILI PR	NFIDENCE
		24-5	22.0 1.40	15.9 1.75		- V C	TIME INFORMATION TIME INTERVAL(MIN.) DOE OF LONGEST WATER	46.4	Te MIN. i	ADVANCED ENG	E LEVEL
		1.33	40 .13	.75 .13	.91	3HR	ERVAL(MIN.	.91 .21	1 Fm in/h	SSES)	LEVEL
		.127	.125	-125		· O #	-) = 5.1 = 7.31	.105 1069.1	Fm (Avg)	ERING S	K B B F F S L
		28.3	16.2	7.0	1069.1		5.0 Fm() 8SE = 3280	1069.1	SUM D	OFTWARED	5 † † † † ;
	501 .0020			755 .0050	$\frac{1}{1}$.99; 6HR = 1.00; 24HR= .0%; VALLEY(UNDEV)/DESERT LUME(AF)= 229.00	Fm(IN/HR) = .105 3280.0 WITH LENGTH		PATH SLOPE V (ft) ft/ft FPS.	AG AL	, , , , , , , , , , , , , , , , , , ,
	4.7	<u> </u>	<u>. _ </u> ;			1 11 1	.105; LENGTH		ft FPS.	CULATED BY: CHECKED BY: E NUMBER 5	2 1 2 2 2 3 3 3
36.0"-P1PE	2pipe= 28.3cfs n=.0130 D= 2.4	4.1 up:pe= 10.201 n=.0130 D= 1.9 30.0"-PIPE ADD SUBAREA		1.5	FOR CONFLUENCE	.0%	.105; Ybar = .105; Ybar = ENGTH = 19892.7 HR= 3.03	ADD SUBAREA	HYDRAULICS AND NOTES	0F	4 4 7 7 8 4 8 8 8 8 8 8 8 8 8 8 8 8 8 8
	8.3cfs	D= 1.9 D= 1.9)"-PIPE JBAREA	12.3CTS 0*V= 1.0 0TH=29.3	SUBAREA	UENCE		.436 FEET	AREA	ILICS		t

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S-GRAPH : VALLEY = 100.0%; FOOTHILL = DEPTH-AREA FACTORS: 5M = CONCENTRATION | AREA (ACRES) PEAK FLOW RATE(CFS)= RAINFALL(INCH): 5M = TOTAL AREA(ACRES)= TC(MIN.) = PEAK FLOW RATE(CFS)= S-GRAPH : VALLEY = 100.0%; FOOTHILL = **DEPTH-AREA FACTORS:** TOTAL AREA(ACRES)= POINT NUMBER SUBAREA RAINFALL(INCH): 5M = Tc(MIN.) = FOR POINT# CONFLUENCE TIME/DATE FILE NAME: SA37.DAT MAP # 37 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEN CITY OF SANTA ANA MASTER PLAN OF DRAINAGE DESCRIPTION OF STUDY: ANALYSIS 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC 3704.00 3704.00 3704.00 3704-00 3703.00 OF STUDY: 10:46 47.17 46.39 4.3 6.5 MAIN-STREAM COPIED ONTO MEMORY BANK # 3 MEMORY BANK # 2 CLEARED .1 1441.9 MEAN VALUES: Fm(IN/HR) = LAG TIME(HR) = 5M # LAG TIME(HR) = 1 1 1441.9 ----- [(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE] --1430.9 TIME OF CONCENTRATION(MIN.) = SUM .26; 30M = 1085.67 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= .26; 30M = 1085.67 .94; 30M = .94; 30M = - UNIT HYDROGRAPH INFORMATION ---------UNIT TYPE TYPE MIN. 0 SOIL DEV. | Tt 0 0 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 19892.7 FEET UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 20566.4 FEET 2/23/1994 60/AC ----4D/AC 60/AC 1.1.1.1.1 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= PEAK FLOW RATE(CFS) = HYDROGRAPH INFORMATION -1 .63 .62 TOTAL AREA(ACRES) = .59; 1HR = .59; 1HR = -----.94; 1HR = .94; 1HR = 8 TIME INTERVAL(MIN.) = TIME INTERVAL(MIN.) = 00 .0%; MOUNTAIN = .0%; MOUNTAIN = ----MIN. ----.... 47.2 [ORANGE COUNTY] -Fo II LOSSES) .105; Ybar = ++ in/h 1 -78; 3HR = .78; 3HR = _94; 3HR = .90 .10 .105 1085.7 .94; 3HR = 46.4 Fa . 15 13 1085.7 1430.91 LAG TIME(HR) .438 (Avg) 1 Fm .0%; VALLEY(UNDEV)/DESERT = .0%; VALLEY(UNDEV)/DESERT = 1.31; 6HR = 1.31; 6HR = :99: .99: 5.0 5.0 : 6HR = 6HR = 1.00; 24HR= 1.00 SUM D Fm(IN/HR) =Fm(IN/HR) = (ft) ft/ft FPS. ---n PATH SLOPE V **** 1.00; 673 .0036 14.4 PAGE NUMBER CALCULATED BY: 234.22 1.81; 24HR= 232.55 1.81; 24HR= CHECKED BY: -62 ----.... 24HR= 1.00 ** .105; Ybar = .105; Ybar = 3.03 3.03 0 apipe=1085.7cfs n=.0130 D= 8.5 9 ADD SUBAREA .0% 126.0"-PIPE HYDRAULICS -0% AND NOTES .438 .438

	3733.00	48.ft-STREET FLOW TO PT.# 3732.00	3731.00	3733.00	3733.00	3805.00	3805.00	3805.00	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUM	MAP # 37 FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC	10-YEAR RETURN FREQUENCY AT 50% CONFIDENCI
	10.8	3.5	3	:		97 D T	 MEN 97 0	MEN	AREA (ACRES)	SA37.DAT OF STUDY: STORM RATI	IN FREQU
	18.8	7.9	ы 	1365.1			MEMORY BANK # Q(cfs) Tc 978.92 5		CRES) SUM	· · ·	IENCY A
	0 0	00	c	1		× -			SOL	ETHON	1 50
	6D/AC	6D/AC	60/AC	$\overline{ }$	Ī	 # 1 COP # 1 COP Te(min) 52.99	1 DEF (min) 2.99	1 CLE/	SOIL DEV. Tt		AT 50% CONFIDENCE
	<u> </u>	5.2			<u>tu</u>		 INED AS FO Fm(in/hr) .094 	NRED	MIN.	T CAMC	(11
	21.2	17.1	11.9	53.3		TO MA	for the		HIN.	EORAN	LEVEL
	1.42	1.66	2.03	.90		 1 COPIED ONTO MAIN-STREAM (min) Fm(in/hr) Ybar AR 2.99 .094 .39		<u> </u>	in/h	LORANGE COUNTY). II LOSSES)	C
	5.5.		-13			· . ლ · ·	AREA	<u> </u>		NTY]-	
	.127	.129	.125			EAM AREA(acres) 1365.15	AREA(acres) 1365.15		(Avg)		
	22.0	10.9	5	978.9		1 1			MUS	OFTWARE	
		1332	366		224		1 1	1	PATH (ft)		
			.0050		224 .0020 111.4		<u> </u>		PATH SLOPE V (ft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER	
		5	21:			ĪĪ	1	1	۲ FPS.	R 87:	
	2 . 0	D= .4 ,D*V= .9 FLOCOWIDTH=14.4 	INITIAL SUBAREA	FOR CONFLUENCE	apipe= 978.9cfs n=.0130 D= 8.8 138.0"-PIPE				HYDRAULICS AND NOTES	7 OF	

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48. ft-STREET FLOW TO PT.# PEAK FLOW RATE(CFS)= S-GRAPH : VALLEY = 100.0%; FOOTHILL = DEPTH-AREA FACTORS: 5M = RAINFALL(INCH): 5M = TOTAL AREA(ACRES)= TC(MIN.) = PEAK FLOW RATE(CFS)= CONCENTRATION | AREA (ACRES) |SOIL |DEV. | Tt S-GRAPH : DEPTH-AREA FACTORS: 5M = RAINFALL(INCH): 5M = TOTAL AREA(ACRES)= TC(MIN.) = POINT NUMBER SUBAREA FOR POINT# CONFLUENCE MAP # 37 ANALYSIS FILE NAME: SA37.DAT DESCRIPTION OF STUDY: TIME/DATE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 5.0-YEAR STORM RATIONAL METHOD STUDY CAMC 3736.00 3739.00 3735.00 3739.00 3739.00 3733.00 VALLEY = OF STUDY: 10:46 53.79 53.31 -----11.2 9.8 7.3 MEAN VALUES: Fm(IN/HR) = 100.0%; FOOTHILL = LAG TIME(HR) = LAG TIME(HR) = 1395.3 1 1395.3 UPSTREAM NODE OF LONGEST WATERCOURSE 17.2 30.2 1384.0 -26; 30M = TIME OF CONCENTRATION(MIN.) = SUM 7.3 ---- UNIT HYDROGRAPH INFORMATION --.26; 30M = 988.31 987.20 .94; 30M = -- UNIT HYDROGRAPH INFORMATION --.94; 30# = C -- [(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE] ---0 -----TYPE TYPE MIN. 0 -------C 4D/AC ----UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 20203.7 FEET 2/23/1994 60/AC 60/AC 10000 TIME OF PEAK(HR) = 16.8 60/AC * * * * * TIME OF PEAK(HR) = 16.8 VOLUME(AF)= PEAK FLOW RATE(CFS) = .59; 1HR = .72 TIME INTERVAL(MIN.) = .71 TOTAL AREA(ACRES) = .59; 1HR = .94; 1HR = .94; 3HR =94; 1HR = * * * * -4.5 TIME INTERVAL(MIN.) = ŝ .0%; MOUNTAIN = .0%; MOUNTAIN = 53.8 ***** - LORANGE COUNTY) -18.2 1.59 22.7 1.38 .13 53.8 MIN. in/h Tc I II LOSSES) .095; Ybar =78; 3HR = .78; 3HR = 1 .84 .84 * * * * .94; 3HR = .53.3 Fm .13 .13 .15 .095 987.2 VOLUME (AF)= 1384.00 . 125 .125 .393 LAG TIME(HR) = (Avg) .0%; VALLEY(UNDEV)/DESERT =0%; VALLEY(UNDEV)/DESERT = 1.31; 6HR = Fm 1.31; 6HR = .99; 6HR = 1.00; 24HR= 1.00 .99; 6HR = 1.00; 24HR= 1.00 5.0 5.0 -----988.3 988.3 19.4 = 3180.0 WITH LENGTH = 20530.0 FEET SUM 9.6 Fm(IN/HR) = Fm(IN/HR) = ø t 1 1 1 (ft) ft/ft FPS. 880 .0035 612 .0050 ----PATH SLOPE V 326 .0020 11.5 apipe= 987.2cts PAGE NUMBER CALCULATED BY: 1.81; 24HR= 239.27 1.81; 24HR= 237.47 .71 CHECKED BY: ----..... 1 2.4 Qest.= k F .095; Ybar = 1 .095; Ybar = 1 3.03 3.03 8 OF **** INITIAL SUBAREA FOR CONFLUENCE FLOODWIDTH=18.0 0= .5 n=.0130 D= 8.9 1 ADD SUBAREA .0% .0% 138.0"-PIPE HYDRAULICS AND NOTES ,D*V= 1.2 15.2cfs .394 .393

PEAK FLOW RATE(CFS)= S-GRAPH : VALLEY = 100.0%; FOOTHILL = DEPTH-AREA FACTORS: TC(MIN.) = RAINFALL(INCH): 5M = TOTAL AREA(ACRES)= CONCENTRATION | AREA (ACRES) POINT NUMBER CONFLUENCE FOR POINT# ANALYSIS FILE NAME: SA37.DAT MAP # 37 TIME/DATE CITY OF SANTA ANA MASTER PLAN OF DRAINAGE DESCRIPTION OF STUDY: 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC 3745.00 3739.00 3739.00 3739.00 3738.00 3738.00 3737.00 3737.00 OF STUDY: 53.79 SUBAREA 11.2 10.6 -1.4 7.0 MEAN VALUES: Fm(IN/HR) = 5H = LAG TIME(HR) = 1442.7 10:46 TIME OF CONCENTRATION(MIN.) 27.8 SUM .26; 30M = 47.4 36.1 1018.20 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= .94; 30M = -- UNIT HYDROGRAPH INFORMATION -0 0 0 1 - I(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE] ---UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 20530.0 FEET 0 TYPE | TYPE | MIN. SOIL DEV. | Tt 0 2/23/1994 4D/AC 60/AC PEAK FLOW RATE(CFS) = 40/AC 60/AC 60/AC **** TOTAL AREA(ACRES) = .72 TIME INTERVAL(MIN.) = .59; 1HR = .94; 1HR = -2.4 1.8 0 .0%; MOUNTAIN = 26.9 MIN. 30.0 1.16 24.5 1.33 Te [ORANGE COUNTY] . .096; Ybar = II LOSSES) .78; 3HR = 1.25 in/h .94; 3HR = -53.8 . 13 . 15 1018.2 - 15 . 13 . 13 Fm 1442.74 .399 LAG TIME(HR) .0%; VALLEY(UNDEV)/DESERT = 1 * (Avg) .125 . 126 . 126 1.31; 6HR = Fm .99; 6HR = 1.00; 24HR= 1.00 5.0 36.6 30.0 44.2 ----SUM Fm(IN/HR) = 11 D 1 11 1 1326 403 .0020 11.5 Qpipe=1018.2cfs (ft) ft/ft FPS. PATH SLOPE V 999 245.92 654 .0050 1.81; 24HR= PAGE NUMBER CALCULATED BY: .72 .0050 CHECKED BY: . .0050 .096; Ybar = 7.2 | apipe= 36.6cfs 6.1 apipe= 1 6.9 Opipe= 3.03 0 n=.0130 D= 9.2 n=.0130 D= 2.0 n=_0130 D= 1_9 n=.0130 D= 1.7 OF ADD SUBAREA ADD SUBAREA ADD SUBAREA 138.0"-PIPE .0% HYDRAULICS 36.0"-PIPE 33.0"-PIPE 27.0"-PIPE AND NOTES 30.0cfs 19.4cfs .399

3744.00	3744.00		 3743.00		3743.00	1 4 5 5 1 1 1 5 5 6 7 1 7 1 7 1 7 7 1 7 7 7 7 7 7 7 7 7 7	3742.00	48.ft-SIREET	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3741.00	<u>-</u>			3745.00	, ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	1	PEAK FLOW RATE(CFS)=		RAINFALL(INCH): 5M =	TOTAL AREA(ACRES)=	Tc(MIN.) = 54	5745.00				TUINI NUMBER SUDAREN	CONCENTRATION AREA (ACRES)			FILE NAME:SA37.DAT TIME/DATE OF STUDY		10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE
	° ⊻	_	1.6	<u>1 -1</u>			2.9	 	* * *	2.1	1.9				1		CFS)=	ORS:	5¥ #	=(S			- ¹ N	12.4	• •••		AREA (RM RAT	7.DAT STUDY:	F F F F	N FREC
25.0		1 2 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	15.8				9.8			4.2			3 1 1 1 1	60.2	1 1 1 1 1 1 1)= 1018.64 TIME		N	1455.5	LAG TIME(HR) =	0 1455.5				90m	ACRES)	1	IONAL I	:SA37.DAT OF STUDY: 10:46	2 2 2 2 2 2 1	NUENCY
	- — -	:	<u> </u>			:		<u> </u>	:	c	0	<u></u>		-	:	1 1	1018.64	94.	-26; 30M =		IE (HR		-	0		•		[(o	METHO	2/		AT 50
60/AC	A 		Apt 60/AC	Com		-	60/AC	Apt	9 9 9 9 9	60/AC	Apt	Com		·			TIME			TRE) = .72	C 4D/AC 54.4 .84 .1	60/AC	Apt	Com	 =	SOIL DEV. Tt	-[(c) 1983-1991 ADVANCED	onls o	2/23/1994		DX CONF
	2.7		· ·		1.9		4 1 1	5.0		*	† 1 1		1	1 1 1	8 8 8 8 8		PF -	.94;	-59; 1	NOD	72 T	47 42				1 7	li li	-1991	Y (AMC	4		IDENC
22.0 1.40			 19.3 1.51		<u> </u>		17.3) 5 7 8	12.4				54.4	4 1- 1- 1- 1- 1-		TIME OF PEAK(NR) = 16.8	.94; 1HR =			TIME INTERVAL(MIN.)	54.4				312.	Tc	ADVAN			- LORAN	JE LEVEL
1.40			1.51	<u> </u>			1-65		1	1.99				84	1	7 1 1 1	J = 16	.94	.78;	ONGEST	TERVAL	84							II LOSSES)		CORANGE COUNTY]-	F
- 35	2		.13	.03			.13	.03		.13		03	:		1 1 1 1	:		.94; 3HR =	3HR =	WATE	. (MIN.	.15	.13	.05	.03	:	Fa	VGINE	S		CALNG	
.068		-	.078			1 1 1 1 1 1	.085		1 1 1 5	.088					1 } ; ;		-UZ; VALL	" "		~~~	11			_		(AA)	Fm	ERING			•	
30.0			20.3			7 8 8 8 9 9	13.7		* ; ; ;	7.1				1018.6	6 7 7 8		.U%; VALLEY(UNDEV)/DESERT #	.99; 6HR = 1.00;	1; 6HR =	SE = 31	5.0 Fm	.096 1018.6						ENGINEERING SOFTWAREJ -			* * * * * *	
		997	t 9 5 9			651	† † 1		616	;	+ 2 1 +	070	7.57		;		(UNDE 243	- 1.0	- 1.81;	30.01	Fm(IN/HR) =						PATH	<u> </u>	PAG	CAL	8 8 8 8	
		997 .0050	8 8 8 8			0050			.0050	;				* * *	1 1 1 1		DEV)/DESE 248.55	0; 24HF		3180.0 WITH LENGTH =	R) =	1				TE/TE PPS. 	PATH SLOPE	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	PAGE NUMBER	CALCULATED BY: CHECKED BY:		
		6.1	1			5.6	1 1 1		2.2	3 7 7		; ;		F 6 1	† 1 1	* * *	2	24HR= 1.00	R.	NGTH	960					1 77%.	~ <	f f t	ER 10	0 8Y:		
ADD SUBAREA	27.0"-PIPE	@pipe= 20.3cfs n= 1130 n= 1 8	ADD SUBAREA		n=.0130 b= 1.5	apipe= 13	* * * * * * * * * * *	D= .4 ,D+V= 1.0	Qest.= 11.1cfs	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	* * * * * * * * * * * * * * * * * * *	INTITAL SUBAREA		FOR CONFLUENCE		* * * * * * * * * * * * * * * * * * * *	, 07	8	3.03	= 20933.9 FEET	.096; Ybar = .397	ADD SUBAREA				AND NOIES	HYDRAULICS		0 OF			

Ψ.

3748.00	3746.00	TOTAL AREA(ACRES)= RAINFALL(INCH): 5M = DEPTH-AREA FACTORS: S-GRAPH : VALLEY = 1 PEAK FLOW RATE(CFS)=	3746.00 3746.00	Total AREA(ACRES)= RAINFALL(INCH): 5M = DEPTH-AREA FACTORS: S-GRAPH : VALLEY = 1 PEAK FLOW RATE(CFS)=	CONFLUENCE ANALYSIS FOR POINT# 3745.00	374	CONCENTRATION	FILE NAME TIME/DATE 5.0-YEAR	10-YEAR MAP # 37
00	8	ACA INC	5.00	aca cinc cinc cinc	NCE IS NT#	3745.00	TION	AR S	RE RE
3.7		A(ACRES)= INCH): 5M = A FACTORS: 5 VALLEY = 10 VALLEY = 10		= 54.37 ((ACRES)= (NCH): 5M = () FACTORS: 1 () FACTORS: 1 VALLEY = 1 VALLEY = 1			I AREA (ACRES)	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY	MAP # 37
4.1	29.1	1484.6 UPSTREA = .26; 30M = . : 5M = .93; 30M = 100.0%; FOOTHILL = = 1035.65 TIME	4.1 1484.6	LAG TIME(HR) = . 1480.5 UPSTREA = .26; 30M = . 5M = .93; 30M = 100.0%; FOOTHILL = = 1035.65 TIME	TIME OF CONCENTRAT TIME OF CONCENTRAT MEAN VALUES: Fm(IN/HR) TOTAL		RES)	10:46	UENCY A
0 0		30M 30M 33; 33; 33; 33; 33; 33; 33; 33; 33; 33;	N n	TIME(HR) 80.5 UP 26; 30M 26; 30M 26; 500 37; 3 400 7; FOOTF 1035.65	UNI	1 11	-E(c	2/ 2/	T 50
Apt		4.6 UPSTREAM) 6; 30M = .59; .93; 30M = .5 ; FOOTHILL = 035.65 TIME 0 	Com T HYDRC	ME(HR) = .72).5 UPSTREAM) ; 30M = .59 ; 30M = .93 ; 30M = .9 ; 93; 30M = .9 ; 50THILL = ; 50THILL = ; 50THILL = ; 50THILL =	PEAK I ONCENTF Fm(IN/I Fm(IN/I T HYDRC		L(c) 1983-1991 SOIL DEV. Tt TYPE TYPE MIN.	2/23/1994 HOD STUDY	AT 50% CONFIDENCE
			JGRAP	.72 TIME AM NODE OF .59; 1HR = 	FLOW RATIO RATIO GRAP	3.2	-1991 Tt	r (AMC	IDENC
12.6 1.98	55.0			= .72 TIME INTERVAL(MIN.) = TREAM NODE OF LONGEST WATERCOU 	PEAK FLOW RATE(CFS) = 10 OF CONCENTRATION(MIN.) = 54.4 ES: Fm(IN/HR) = .095; Ybar = TOTAL AREA(ACRES) = UNIT HYDROGRAPH INFORMATION -		ADVANC	- [ORANGE COUNTY] C 11 LOSSES)	E LEVEL
1.98	.83	-78; -78; -93; -93; 	 .83	.78; .78; .93; .93; .11	E(CFS) = 10 IIN.) = 54.4 .095; Ybar = .(ACRES) = .NFORMATION -		CED EX	II LOSSES)	
.03		.78; 3HR = .78; 3HR = .93; 3HR = .NTAIN = 		EERVAL(MIN.) DNGEST WATER .78; 3HR = .93; 3HR = .93; 3HR = .93; 3HR = .94; 3HR = .94; 3H			I Fm	UNTY]	
.027		ERCOURSE = : = 1.31; 6HI = .99; 6HI .0%; VALLI VOLUME(AF)=	.095	<pre>L) = 5.0 ERCOURSE = : = 1.31; 6H = .99; 6H = .99; 6H 0%; VALLI VOLUME(AF)= </pre>	35.7 LAG TIME(HR) .396 1480.53		ERING S Fm (Avg)		
7.2	1035.7	COURSE = 3180.0 WITH LENG 1.31; 6HR = 1.81; 24HR= .99; 6HR = 1.00; 24HR= .0%; VALLEY(UNDEV)/DESERT LUME(AF)= 254.07 LUME(AF)= 254.07	1 64 1	HR) = .72 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .095;) UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = DM = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.0 30M = .93; 1HR = .93; 3HR = .99; 6HR = 1.00; 24HR= 1.00 7 30M = .93; 1HR = .93; 3HR = .99; 6HR = 1.00; 24HR= 1.00 OTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = 65 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 253.17	ME(HR)		-[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE] SOIL DEV. Tt Tc I Fm Fm G P TYPE TYPE MIN. MIN. in/h (Avg) SUM (
651		30.0 WI1 = 1.81 = 1.00; = 1.00; (UNDEV), 254.1 254.1	433 .00 	Fm(1N/HR) = 3180.0 WITH IR = 1.81; IR = 1.00; 2 IR = 1.00	I B	1326	PATH Cft)	CAL	
1 1 1 6 1		3180.0 WITH LENGTH = HR = 1.81; 24HR= 3.(HR = 1.00; 24HR= 1.00 HR = 1.00; 254.07 = 254.07		<pre>//HR) = .095; .0 WITH LENGTH = 1.81; 24HR= 3. .00; 24HR= 1.00 .DEV)/DESERT = 253.17 253.17</pre>	.72		PATH SLOPE V Cft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER 1	
		TH LENGTH = ; 24HR= 3.(24HR= 1.00 /DESERT =)7	11.5	.095 RT = 1.1		6.9	FPS.	BY: BY: R 1	
	FOR CON	H = 21367.3 3.03 .00 = .0%	.00220 11.5 apipe=1035	.095; Ybar = NGTH = 20933.9 R= 3.03 = 1.00 RT = .0%		6.9 apipe= 30.0cf n=.0130 b= 1.9 33.0"+PIPE	HYDR	1 OF	
SUBAREA	FOR CONFLUENCE	1	ipe=1035.7cfs .0130 D= 9.3 138.0"-PIPE ADD SUBAREA	.396 .9 FEET		e= 30.0cfs 1130 b= 1.9 33.0"-PIPE	HYDRAULICS AND NOTES		

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3746.00	3752.00	3752.00	3751.00	3751.00	3750.00	3750.00		POINT NUMBER	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE MAP # 37
	6.7 .0		.2		.2	5.3	5.2	AREA (ACRES)	SA37.DAT OF STUDY: STORM RATI	'A ANA MJ
	31.3		23.3		15.0		9.5	CRES) SUM	10:46	JENCY AT
	c Com c Apt c 4D/AC		C Com		C Apt	C Com	c Com	TYPE TYPE	2/23/1994 THOD STUDY (AMC II LOSSES)	AN OF D
<u>`</u> @		2.5		2.7				PE MIN.	994 994 UDY (AM	NFIDENC
	24.6		22.2		19.4		17.5	HIN.	- LOKANG C II L C II L	171
	.32 .15		1.40 .03		1.50 .05		11.64 .03	I Fm in/h 	IDRANGE COONITJ II LOSSES) II LOSSES)	n 2222
	5 .031		13 15 .026		15 .026	<u> </u>	.03			5
	36.3		28.7		19.9	1 3 3 4 1 1	13.7	NUS I		
336.0050						651	616	I V X	CALCUL CHE	
		and and a second		.0000.		.0050 5.	Contraction of the second second	SLOPE V ft/ft FPS. 	CALCULATED BY: CHECKED BY: PAGE NUMBER 12	
7.0 apipe= 36.3cfs n=.0130 D= 2.2 33.0"-PIPE	ADD SUBAREA	o.o(upipe= 20.7CTS) n=.0130 D= 1.8 33.0"-PIPE		0.1 qpipe= 19.9cts n=.0130 D= 1.7 27.0"-PIPE	ADD SUBAREA	5.6 qpipe= 13.7cfs n=.0130 D= 1.5 24.0"-PIPE	2.2 Qest.= 11.1cfs D= .5 ,D*V= 1.0 FLOODWIDTH=15.7	HYDRAULICS	Y: Y: 12 OF	

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								2.4		;			3764.00
ADD SUBAREA .9 0pipe= 32.3cf n=.0130 D= 2.0	+0050 6.9 Opipe=	80	32.3			19.0 1.53	19.0]	4D/AC	0	24.4		3763.00
					a second property.			· · · · · · · · · · · · ·	Com 60/AC	00		7.3	
n=.0130 D= 1.6 24.0"-PIPE								2.9					3763.00
5.7 Onine=	-	usuu 1800		- ucu.		16.0 1./4	16.0	1	60/AC	1	10.2	2.5	3762.00
D= .6 ,D*V= 1.0 FL000WIDTH=29.3				<u> </u>	.03			3,2	Com			N 10	48.ft-STREET FLOW TO PT.#
- 7 0est.=	.0020 1.	314	8.8	.026	- 13	12.9 1.96	12.9		60/AC	00	5.1	0.5	3761.00
INITIAL SUBAREA	0050	823 .0050			2			:		, ,		1	
- FOR CONFLUENCE		11	1050.6		1 1 2 	1.30	55.4				31.3		3766.00
7 apipe=1050.6cf n=.0130 D= 8.9 144.0"-PIPE	297 .0020 11.7 apipe=1050.6cfs n=.0130 D= 8.9 144.0"-PIPE	297 .							T	<u>+</u>		* * * *	3766.00
.074; fbar - NGTH = 21367 R= 3.03	LE 24H	3180.0 WITH R = 1.81;	= 3.0 Find COURSE = 3180 1.31; 68R =	1.31; 6	.78; 3HR =	TIME INTERVAL(MIN.) = ODE OF LONGEST WATERCOU THR = .78; 3HR = 1.	M NODE OF LO	./S TIME . .59; THR =	11ME(HR) = . 15.9 UPSTREA 26; 30M = .	515.9 UPS -26; 30M =	. 5	55.00 1 CRES)= H): 5M =	Tc(MIN.) = 55.00 LA TOTAL AREA(ACRES)= RAINFALL(INCH): 5M =
- -					N	DROGRAPH INFORMATIO	H INFO	OGRAPH		UNI		1.2	: 5
• •				.391	# 0	X		来) =	VALUES: Fm(IN/HR) = .094	JES:	MEAN VALUES: Fm(IN/HR) =	ME	FOR POINT#
	~	7	D.6	.6	= 1050.6	i S	PEAK FLOW RATE(CFS)	FLOW I	PEAK	2			CONFLUENCE
+++++++++++++++++++++++++++++++++++++++		1 1 1 1 1 1 1 1			$\frac{1}{1}$			$\overline{ }$		$\frac{1}{1}$			
·	PATH SLOPE V (ft) ft/ft FPS.	PATH SLOPE	Q P	Fm (Avg)	Fm	Tc I MIN. In/h	MIN.	MIN.	SOIL DEV. Tt		ACRES)	AREA ()	CONCENTRATION AREA (ACRES)
13 0	PAGE NUMBER 13 OF	PAGE	ETHOD STUDY (AMC II LOSSES) P.	VING SC	GINEER	II LOSSES)	ADVAN	- 1991	o stud	HETHO	IONAL M	TORM RAT	5.0-YEAR STORM RATIONAL METHOD STUDY (AMC
	CULATED BY: CHECKED BY:	CALCULATED					Lower	4	2/23/1994	2/	10:46	A37.DAT F STUDY:	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46
			* * * * *	1	NTY1	TORANGE COUNTYT	- TORAN						NAP # 37
								INAGE	OF DRA	T SO	ASTER F	TA ANA M	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE

3767.00	TC(MIN.) = 55.42 TOTAL AREA(ACRES)= RAINFALL(INCH): 5M = DEPTH-AREA FACTORS: S-GRAPH : VALLEY = 1 PEAK FLOW RATE(CFS)=	CONFLUENCE ANALYSIS FOR POINT# 3766.00	3766.00	3765.00	3764.00	CONCENTRATION AREA (ACRES)	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORN RATIONAL METHOD STUDY (AMC	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE MAP # 37
	= 55.42 A(ACRES)= INCH): 5M = A FACTORS: VALLEY = 1 VALLEY = 1	<u> </u>		0 5.2 9.0		N AREA (SA37.DAT OF STUDY: 10:46 STORM RATIONAL I	OF SANTA ANA MASTER PLAN OF DRAINAGE EAR RETURN FREQUENCY AT 50% CONFIDENC # 37
	LAG 15 5M =	HEAN VALUES: Fm(IN/HR)		52.6	5 38.5	(ACRES)	: 10:46 TIONAL M	MASTER P
 	TIME(HR) = . 568.5 UPSTREJ .26; 30M = . .26; 30M = . .26; 70M = .26; 70M = . .26; 70M = .26; 70M = . .26; 70M = .26; 70M	PEA PEA S: Fm(1		C Com	C Com C 6D/AC	SOIL DEV. Tt	2/23/1994 ETHOO STUDY -[(c) 1983-	LAN OF 1 T 50% C
 	.74 T .74 T .59; 1 .59; 1 .93; = .93; = .93;	FLOW I NTRATION N/HR) = TOTAL AS		AC	- <u>Ac</u>	SOIL DEV. Tt	3/1994 STUDY (AM 1983-1991	DRAINAGE ONFIDENC
	HR) = .74 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .093; Ybar = UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 21664 OM = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03 ; 30M = .93; 1HR = .93; 3HR = .99; 6HR = .99; 24HR= 1.00 OTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0% 17 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 270.15 1	RAT RAT		23.8	21.4 1.42	MIN.	IC II LOS	E DE LEVEL
 	TERVAL(MIN.) DNGEST WATER 78; 3HR = .73; 3HR = .93; 3HR = .93; 3HR = .93; 3HR = .93; 3HR))))))))))))))))))))))))))))))))))))))			1.42			LEVEL
 	IN.) = 5.0 ATERCOURSE = R = 1.31; 6H R = .99; 6H .0%; VALL VOLUME(AF)=	1077.2 5.4 LAG TIN - = .390 1568.48		.03 .13 .081	.03 .13 .078	m Fm (Avg)	SES) C	Y]
	= 5.0 Fm(1N/HR) = .0 COURSE = 3180.0 WITH LENG 1.31; 6HR = 1.81; 24HR= .99; 6HR = .99; 24HR= .0%; VALLEY(UNDEV)/DESERT LUME(AF)= 270.15	7.2 LAG TIME(HR) = .390 I568.48		59.8	B 46.4	SUM D	SOFTWA	
1203	Fm(IN/HR) = 3180.0 WITH 4R = 1.81; 4R = .99; 2 4R = .99; 2 EY(UNDEV)/DI 2 270.15	- 74	320			PATH S	AG	
 1203 ,0020 11.8 @pipe=1 n=.0130 144.	//HR) = .093; 0 WITH LENGTH = 1.81; 24HR= 3.1 .99; 24HR= 1.00 DEV)/DESERT = 270.15	4	.0050 8	and and and and a should be	.0050	PATH SLOPE V (ft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER 1	1 2 3 4 2 3
 .8 opipe=11 n=.0130 144.1	.093; Ybar = NGTH = 21664 R= 3.03 = 1.00 RT = .0%		8.1 apipe= n=.0130 42.0	n=.(7.6 Qpipe=		8Y: 8Y: ? 14 OF	
pe=1077.2cfs 0130	ar = ,390 1664,4 FEET .0%		ce= 59.8cfs 0130 D= 2.5 42.0"-PIPE	č o	SUBA	AND NOTES		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

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CONCENTRATION | AREA (ACRES) PEAK FLOW RATE(CFS)= S-GRAPH : DEPTH-AREA FACTORS: 5M = RAINFALL(INCH): 5M = TOTAL AREA(ACRES)= Tc(MIN.) = PEAK FLOW RATE(CFS)= S-GRAPH : DEPTH-AREA FACTORS: 5M = RAINFALL(INCH): 5M = TOTAL AREA(ACRES)= $Tc(MIN_{-}) =$ POINT NUMBER SUBAREA MAP # 37 DESCRIPTION OF STUDY: FILE NAME: SA37.DAT CITY OF SANTA ANA MASTER PLAN OF DRAINAGE TIME/DATE OF STUDY: 10:46 **10-YEAR RETURN FREQUENCY** 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC 3771.00 3704.00 3704.00 3704.00 3704.00 3767.00 1 1 1 1 1 1 VALLEY = VALLEY = 1 58.68 57.13 • 4.5 9.4 7.9 STORE HYDROLOGIC DATA TO A FILE **MEMORY BANK # 3 CLEARED** ţ. MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM 100.0%; FOOTHILL = .1 1585.9 100.0%; FOOTHILL = LAG TIME(HR) = LAG TIME(HR) = ł * 3 * 5 * 5 i 3027.8 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 23963.9 SUM 1585.9 UPSTREAM NODE OF LONGEST WATERCOURSE .26; 30M = .26; 30M = сл Сл 1077.17 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 1886.77 .86; 30M = --- UNIT HYDROGRAPH INFORMATION ----.93; 30M = AT 50% CONFIDENCE LEVEL -- [(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]-----0 * 1 UNIT HYDROGRAPH INFORMATION --TYPE TYPE MIN. SOIL DEV. Tt 0 n D 60/AC ---2/23/1994 4D/AC 60/AC * * * * f 1 1 1 6D/AC Com Com TIME OF PEAK(HR) = 16.8 .76 .78 .59; 1HR = .59; 1HR = .86; 1HR = .93; 1HR = * * * * 1 * * * * 1.6 : TIME INTERVAL(MIN.) = TIME INTERVAL(MIN.) = .0%; MOUNTAIN = .0%; MOUNTAIN = 1 **** * * * * * MIN. 14.2 1.87 .15 57.1 .81 .10 .093 1077.2 --[ORANGE COUNTY] -5 II LOSSES) in/h .78; 3HR = _78; 3HR = * * * * .86; 3HR = ----.93; 3HR = 1 : - Fm ; ł 1 1 1 . 13 - 13 .03 3 VOLUME(AF)= (Avg) : ï ----.132 1,31; .0%; VALLEY(UNDEV)/DESERT = .0%; VALLEY(UNDEV)/DESERT = Fin 1.31; 6HR = .98; 6HR = .99; 6HR = 5.0 5.0 1 7 6HR = = 3180.0 WITH LENGTH = 22867.8 SUM ((ft) ft/ft FPS. ----8.6 Ð Fm(IN/HR) =Fm(IN/HR) = -; : PATH SLOPE V 1096 .0020 11.8 apipe=1077.2cfs ł 882 .0035 PAGE NUMBER 15 OF CALCULATED BY: .99; 24HR= 1.81; 24HR= 273.43 1.81; 24HR= 504.26 .99; 24HR= 1.00 CHECKED BY: 1 t J * * * : ; .099; Ybar = .093; Ybar = * * * : . 8 3.03 3.03 i n=.0130 D= 9.1 INITIAL ADD SUBAREA ×0. 144.0"-PIPE 20% HYDRAULICS AND NOTES SUBAREA .414 .389 FEET FEET

3778.00		3790.00	3790.00	3776.00	3775.00	3774.00 3774.00	3773.00	64.ft-STREET FLOW TO PT.# 3772.00	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUM	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC	MAP # 37
2.3	5	HAIN-	16.4	6.7	8.3	13.2	7.7	5.7	AREA (J SUBAREA	SA37.DAT OF STUDY: 10:46 STORM RATIONAL	1 7 1 9
6.4 C		MAIN-STREAM COPIED	79.2 0	62.7	55.8	32.9	19.7	11.6		10:46 IONAL M	00401
and the second second	-		Com 60/AC	C Com	C 60/AC	C 60/AC	c 60/AC		SOIL DEV. Tt TYPE TYPE MIN.	[ORANGE COUNTY][2/23/1994 ETHOD STUDY (AMC II LOSSES)	1 20% 00
1	$\frac{ \cdot }{ \cdot }$	NTO ME	1.3	1.7	2.9	2.7			MIN.	94 94 107 (AH	AL JORU
17.6 1.63		ONTO MEMORY BANK	the second second second second second	28.3	26.6	23.7	20.9		HIN.	- LORAN	E LEVEL
5 million area		: ** !			.26	1.35	1.43	1.49	In/h	LORANGE COUNTY] II LOSSES)	f
- 15] - 1	<u></u> -	2		-03	<u> </u>	.13	.13	.03	Fm	INTY] -	
-134	- <u>-i</u> -	$\frac{1}{1}$	108	.104	.102	.129	.132	.137	(Avg)		
8.6 -			75.8	62.4	58.2	36.1	23.1	14.2	SUM	DETUAD	
$\left \frac{1}{1} \right $	812 .0	$\frac{1}{1}$ $\frac{1}{1}$	0010. 855	454 .0010	1219	1056 .0050	455	693	PATH (ft)		
	.0035	<u>t 1</u>	the second second second second			-0050	.0050	.0050	PATH SLOPE V (ft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER 1	
						6.4	5.6	2.2	FPS.	D BY: D BY: ER 10	
	INITIAL SUBAREA		4.5 Apipe= 62.4cfs	4.3 apipe= 58.2cfs n=.0130 D= 3.5 54.0"-PIPE ADD SUBAREA	7.0 apipe= 36.1cfs n=.0130 D= 2.2 33.0"-PIPE ADD SUBAREA	6.4 Qpipe= 23.1cfs n=.0130 D= 1.7 30.0"-PIPE ADD SUBAREA	opipe= 14.2cfs n=.0130 D= 1.5 24.0"-PIPE ADD SUBAREA	 aest.= 12.3cfs D= ,5 ,D*V= 1.1 FL000WJDTH=16.4	HYDRAULICS AND NOTES	Y: Y: 16 OF	

PLAW OF DRAINAGE AT 50% CONFIDENCE LEVEL 2/23/1994 FICHO STUDY (AMC II LOSSES) FICO 1983-1991 ADVANCED ENGINEERING SOFTWARE] SOIL DEV. TT TC 1 Fm Fm Q PATH TYPE TYPE MIN. In//h (Avg) SUM (ft) 	PLAN OF DRAIMAGE CONFIDENCE LEVEL CALCULATED 2/23/1994 CALCULATED CALCULATED SOLL DEV. TT LOSSES) PAGE NUMRE IPPE PRIMO STUDY (AMC 11 LOSSES) PAGE NUMRE CHECKED SOLL DEV. TT TC I Fm Fm SOL DEV. IPPE IPPE INV. IN/h KITMOS SUM (ft) FME IPPE IPPE IPPE IPPE IPPE IPPE IPPE IPPE IPPE <th>3781.00</th> <th>3786.00 3786.00</th> <th>3785.00 3785.00</th> <th>48.ft-STREET FLOW TO PT.# 3784.00</th> <th>3783.00</th> <th>3781.00</th> <th>3781.00</th> <th>3780_00</th> <th>48.ft-STREET FLOW TO PT.# 3779.00</th> <th>CONCENTRATION AREA (ACRES)</th> <th>FILE NAME:SA37.DAT TIME/DATE OF STUDY 5.0-YEAR STORM RA</th> <th>CITY OF SAN 10-YEAR RETL MAP # 37</th>	3781.00	3786.00 3786.00	3785.00 3785.00	48.ft-STREET FLOW TO PT.# 3784.00	3783.00	3781.00	3781.00	3780_00	48.ft-STREET FLOW TO PT.# 3779.00	CONCENTRATION AREA (ACRES)	FILE NAME:SA37.DAT TIME/DATE OF STUDY 5.0-YEAR STORM RA	CITY OF SAN 10-YEAR RETL MAP # 37
PLAW OF DRAINAGE AT 50% CONFIDENCE LEVEL 2/23/1994 IC (2) 1983-1991 ADVANCED ENGINEERING SOFTWARE] SOLL DEV. Tt Tc 1 Fm Fm 2 PATH ITYPE TYPE MIN. In//h (Avg) SUM (ft) 	PLAN OF DRAIMGE AT 50% CONFIDENCE LEVEL 2/23/1994 		9.3	9.0	7.4	4.2		10.6	3 4	2.8	AREA (J SUBAREA	37-DAT STUDY: ORM RAT	TA ANA MAS URN FREQUE
LEVEL	LEVEL	:				4.2	31.0	31.0	18.6	11.2		10:46	ASTER P
LEVEL	LEVEL		A DESCRIPTION OF A DESC					the second design of the second design of the		1	SOIL DEV		T 50% CON
LEVEL	LEVEL	2.6	<u></u>				1		1	t	E MIN.	94 94 DY (AM) 3-1991	IFIDENCI
SofTWARE]	CALCULATED PAGE NUMBE SOFTWAREJ SUM II3.4 II3.4 II3.4 II3.4 II3.4 II3.4 II3.4 II3.4 III3.4 IIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII				15.91	11.4 2	21.5		20.8		Tc	- LORANG	E LEVEL
SofTWARE]	CALCULATED PAGE NUMBE SOFTWAREJ SUM II3.4 II3.4 II3.4 II3.4 II3.4 II3.4 II3.4 II3.4 III3.4 IIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII			1 1			.42	t		the second secon	1 F	E COUNT	
SOFTWARE]	CAL CULATED PAGE PAGE NUMRE Q PATH SUM 13.4 20.5 21.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8 35.8										m Fm (Avg)	YJ	
CAL PAGE PAGE PAGE 289 289 279 279 279 279 279 279 279 279 279 27	CALCULATED CHECKED PAGE NUMBE 		38.8	28.2			35.8				SUX D	SOFTWAR	
			812			a state where we				289	DATH Cft)		
		n=.0130 b= 2.6 42.0"-PIPE	§ . 0	upipe= 17.0cts n=.0130 D= 1.5 27.0"-PIPE ADD SUBAREA ADD SUBAREA		1 5 1	FOR CONFLUENCE	ADD SUBAREA	0. 22		HYDRAULICS AND NOTES	9	

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	3790.00 17 17 16	3789.00 3789.00 3789.00	3788.00 3788.00	3787.00	CONFLUENCE ANALYSIS FOR POINT# 3781.00	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUM	TU-TEAR RETURN FREQUENCY AT 50% CONFIDENCE MAP # 37 FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC
	MEMORY Q(cfs) 175.76 175.72 169.96 TOTAL	·····	13.6	10.0	MEAN EFFEC Q(cfs) 74.30 74.32	AREA (ACF SUBAREA	SA37.DAT OF STUDY: 10:46
	' BANK # 2 CO Tc(min) Fp 26.44 26.83 29.60 AREA(ACRES)=	93.5 	84.1 C	70.5 C	VALUES: F TIVE AREA Tc(min) 21.49 21.10	SUM T	ACY AT
	# 2 CONI 1) Fp(a 3 .22 3 .22 3 .22	60/AC	60/AC		PEAK FLOW TIME OF C MEAN VALUES: FP(IN/HR) = EFFECTIVE AREA(ACRES) = cfs) Tc(min) Fp(avg) .30 21.49 .250 .32 21.10 .250	SOIL DEV. Tt Tc I Fm Fm Q PA	50% CONFI 2/23/1994 HOD STUDY
4-1	CONFLUENCED L Fp(avg) Ap(.250 . .250 . .250 . .250 . .250 .	2.4	13	<u> </u>	HE OF CON HE OF CON IN/HR) = IN/HR) = CRES) = Fp(avg) / .250 .250		94 94 97 (AMC
	CED WITH Ap(avg) .48 .48 .48 .48 .47 .47 .47 .47	24.0 1.34	23	21.7 1.41	PEAX FLOW RATE(CFS) = TIME OF CONCENTRATION(M) p(IN/HR) = .250; Ap = (ACRES) = .60.37 TC Fp(avg) Ap(avg) Fm(a .250 .51 .1	HIN. In	LEVEL LORANGE COUN
	CONFLUENCED WITH MAIN-STREAM Fp(avg) Ap(avg) Fm(avg) I .250 .48 .119 .250 .48 .119 .250 .47 .119 .250 .47 .119)= 173.24	34 .13	1.37 .13			I Fm	LEVEL LORANGE COUNTY]- JI LOSSES)
	2	.127	.128	.128	74.3 74.3 .515; Fm(IN/HR) = .515; Fm(IN/HR) = TAL AREA(ACRES) = Vg) I(in/hr) Ae(29 1.42 29 1.43	(Avg)	
		102.0	93.7	22	3 = 21.1 5; Fm(IN/HR 5; Fm(IN/HR 4REA(ACRES) 1(in/hr) 1.42 1.43	SUH SUH	
	Ae(acres) 164.21 165.83 173.24	1352		302 .0050		PATH S	CALCI
	s) NODE 1 3782.0 3 3777.0 4 37770.0	6 0500			(129 = - 60.93 +e(acres) NODE - 60.93 3777.0 - 60.37 3782.0	PATH SLOPE V (ft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER 18 OF
	<u> </u>	9.0 0pipe= 48 ADD \$ 9.2 0pipe= n=.0130 51.	8.0 upipe= n=.0130 45. ADD S	8.5 qpipe= n=.0130 45	<u> </u>	- <u></u>	3Y: 3Y: 18 OF
, , , , , , , , , , , , , , , , , , ,		9.0 000 000 95.7cfs n=.0130 D= 3.1 48.0"-PIPE ADD SUBAREA 9.2 000 000 000 000 n=.0130 D= 3.1 51.0"-PIPE	v		LARGEST CONFLUENCE D= 74.3	HYDRAULICS AND NOTES	

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 ANALYSIS FOR POINT# 3795.00	3795.00	3794.00	48.ft-STREET FLOW TO PT.# 3793.00	3792.00	3795.00	3795.00	POINT NUMBER SUBAREA SUM	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC	10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL MAP # 37
 MEAN EFFE Q(cfs) 215.31 215.36 209.13 214.24	1	3.9	4.6	6.4		3.2	AREA (A UBAREA	SA37.DAT OF STUDY: 10:46 STORM RATIONAL	IN FREQU
 MEAN VALUES: Fp(IN/HR) EFFECTIVE AREA(ACRES) cfs) Tc(min) Fp(avg) i.31 28.00 .250 i.06 28.40 .250 i.13 31.17 .250 i.24 29.00 .250		32.9	3.1	6.4	183.0	183.0	1 1	10:46 ONAL HE	IENCY AT
 070037	<u>;</u>		C C	c _6		<u> </u>	SOIL DEV. Tt TYPE TYPE MIN. 	2/23 1100	50%
 TIME OF CO Fp(IN/HR) = EA(ACRES) = n) Fp(avg) 0 .250 0 .250 7 .250 0 .250 0 .250	<u> -</u>	60/AC Park -	6D/AC Park	6D/AC	<u> </u>	60/AC	DEV.	2/23/1994 1000 STUDY 1000 STUDY	CONFI
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4.0		5.2	;: 	<u> </u>	1.6		(AHC	DENCE
 TIME OF CONCENTRATION(MIN.) = p(IN/HR) = .250; Ap = .497 (ACRES) = 214.72 TOTAL AI Fp(avg) Ap(avg) Fm(avg) . .250 .50 .124 .250 .50 .124 .250 .50 .124	1	25.0 1.31	22.5	17.3	28.0 1.22	28.0	MIN.	EORANGE COUNTY) II LOSSES) ADVANCED ENGINEE	LEVEL
	1	3	11.39	11.65	1.22	1.22	I in/h	DRANGE COUN 11 LOSSES) DVANCED ENG	
 N(MIN.) = p = .497; TOTAL ARE Fm(avg) I(.124 .124 .124	{ <u> </u>	.213	.13	.13		.13	<u> </u>	NTY)-	5
	•	. 141	.139	.125		. 121	Fm (Avg)	RING	
(MIN.) = 28.0 = .497; Fm(IN/HR) = TOTAL AREA(ACRES) = m(avg) I(in/hr) Ae(.124 1.22 2 .124 1.21 2 .124 1.19 2	1 1 1 1 1	34.6	14.7	8.7	180.9	180.9	SUX O	- [(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]	
14 14 19	1	1691	<u>8</u> 8	629			PATH (ft) 534		
	1	1691 .0050	0020	929 .0050			PATH SLOPE V (ft) ft/ft FPS. -534 .0010 5.7	CALCULATED BY: CHECKED BY: PAGE NUMBER 1	
4 4,88 NODE 3782.0 3777.0 3777.0 3777.0 3771.0	1				ĪĪ		V FPS. 		
LARGEST CONFLUENCE Q= 215.3	n=.0130 D= 2.1		D= .5 ,0 FLOODWID		FOR CONFLUENCE	n=.0130 D= 5.4 81.0"-PIPE ADD SUBAREA	HYDRAULICS AND NOTES 	11 12 19 OF	

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PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 2/23/1994 METHOD STUDY (AMC 11 LOSSES) - [(c) 1983-1991 ADVANCED ENGINEERING SOF SOIL DEV, Tt Tc 1 Fm Fm TYPE TYPE MIN. MIN. (n/h (Avg) 	PLAM OF DRAINAGE AT 50% CONFIDENCE LEVEL 	 3704.00 3268.2 3704.00 3268.2	Tc(MIN.) = 58.68 LAG TOTAL AREA(ACRES)= 32. RAINFALL(INCH): 5M = DEPTH-AREA FACTORS: 5M = S-GRAPH : VALLEY = 100.02 PEAK FLOW RATE(CFS)=	3704.00	3704.00	3704,00	3796.00 3796.00	POINT NUMBER SUBAREA	FILE NAME:SA37.DAT TIME/DATE OF STUDY: 10:46 5.0-YEAR STORM RATIONAL CONCENTRATION AREA (ACRES)	CITY OF SANTA ANA MAS 10-YEAR RETURN FREQUE MAP # 37
LEVEL [ORANGE COUNTY]	LEVEL I LOSSES) CALCULATE I LOSSES) CALCULATE CHECKEI II LOSSES) PAGE NUMBE DVANCED ENGINEERING SOFTUARE]	 3268.2 3268.2 RATION(MIN.)=	8.68 LAG TIME ES)= 3268.2 : 5M = .26; TORS: 5M = .8 TORS: 5M = .8 (CFS)= 100.0%; FG (CFS)= 2006; (CFS)= 2006;	MEMORY BAN	MEMORY BAN Q(cfs) 1886.77			1 1	A37.DAT STUDY: 10:46 ORM RATIONAL M	TA ANA MASTER F
LEVEL [ORANGE COUNTY]	LEVEL I LOSSES) To (I DENCINERING SOFTWARE) CALCULATE CALCULAT	 58.6	(HR) = .78 T UPSTREAM NOD 30M = .59; 1 5; 30M = .85; 5; 30M = .85; .55 TIME OF P 	 K # 3 CONFLUEN UNIT HYDROGRAP		1.5	 60/AC Park -	TYPE TYPE MIN	2/23/1994 ETHOD STUDY (A -[(c) 1983-199 SOIL DEV. Tt	PLAN OF DRAINAG
	CALCULATE CALCULATE CHECKE PAGE NUMB RG SOFTWARE]		IME INTERVAL(IME INTERVAL(HR .78; 3 HR .78; 3 HR .85; 1HR .85; COX; MOUNTAIN OX; MOUNTAIN EAK(HR) = 16.0 Image: Imag			<u> </u>		HIN.	MC II LOSSES	GE NCE LEVEL
CALCUL CHE PAGE W THAREJ PAGE W THAREJ THAREJ PAGE W THAREJ T	AGE NUMB AGE NUMB AGE NUMB 90].0010]	 	HIN.	 -STREAM	AREA(acres) 3027.80		-126	1 1	GINEERING SOF	NTV1
		 6.5 PEAK FLC0 : Fm(IN/HR) :	Fm(IN/HR) = 3180.0 WITH HR = 1.81; HR = .99; 2 LEY(UNDEV)/D = 538.32 = 538.32				16.4		TIA A	4 1 1 2 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4

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02/23/94

HYDRAULIC ANALYSIS SUMMARY

Page No. 1

	Road	av			Existing D	noin		-	Destan	-					the second second	ruge no.
ID	Name	Slope	K	Diam/Depth	Base Width	Side	Slope	ĸ	Design Runoff		tion Capaci Conduit	Total	Deficient Capacity	-Improvement	Alternatives-	
	2	(ft/ft)	-	(in)/ (ft)	(ft)	Slope	(ft/ft)	2	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	Replacement	New/Parallel	Improvement
Map Area	:38															
504-3801	ROUSELLE	0.0050		51.0			0.00500	1692	804.8	0.0	119.6	119.6	685.1	11x6.5 RCB	10.4 5 000	11
5811-3812	HALLADAY	0.0050	566						10.9	40.0	0.0	40.0	0.0	TIXO.5 KUB	10x6.5 RCB	11x6.5 RCB
5812-3813	OCCIDENTAL	0.0050	283						10.9	20.0	0.0	20.0	0.0			
5813-3801	OCCIDENTAL	0.0050	283						15.8	20.0	0.0	20.0	0.0			
\$801-3802	ROUSELLE	0.0050	566	51.0			0.00500	1692	807.2	40.0	119.6	159.7	647.5	11x6.5 RCB	9.5x6.5 RCB	11x6.5 RCB
1802-3803	ROUSELLE	0.0050	566	51.0			0.00500	1692	816.4	40.0	119.6	159.7	656.7	11x6.5 RCB	9.5x6.5 RCB	11x6.5 RCB
\$816-3817	ST. GERTRUDE	0.0020	283						14.7	12.7	0.0	12.7	2.0	TINO.5 NOD	18" RCP	18" RCP
\$817-3818	ST. GERTRUDE	0.0020	283						14.7	12.7	0.0	12.7	2.0		18" RCP	18" RCP
3818-3803	ST. GERTRUDE	0.0020	283						22.2	12.7	0.0	12.7	9.5		24" RCP	24" RCP
\$803-3804	ROUSELLE	0.0050	566	51.0			0.00500	1692	829.7	40.0	119.6	159.7	670.1	11x6.5 RCB	9.5x6.5 RCB	11x6.5 RCB
\$804-3805	ROUSELLE	0.0050		51.0			0.00500	1692		0.0	119.6	119.6	710.7	11.5x6.5 RCB	10x6.5 RCB	11.5x6.5 RCB
\$821-3822	STANDARD	0.0050	566						68.6	40.0	0.0	40.0	28.6	11.370.3 100	30" RCP	33" RCP
5822-3823	STANDARD	0.0050	566						79.1	40.0	0.0	40.0	39.0		36" RCP	36" RCP
5823-3824	STANDARD	0.0050	566						87.7	40.0	0.0	40.0	47.7		39" RCP	39" RCP
5824-3825	STANDARD	0.0050	566						102.7	40.0	0.0	40.0	62.7		42" RCP	42" RCP
\$825-3826	STANDARD	0.0050	566						112.2	40.0	0.0	40.0	72.2		45" RCP	45" RCP
\$826-3834	WARNER	0.0020	70	27.0			0.00200	310	121.7	3.1	13.9	17.0	104.8	63" RCP	60" RCP	63" RCP
3831-3832	EVERGREEN	0.0050	566						12.5	40.0	0.0	40.0	0.0	00 1101	OU KUP	UJ KUP
\$832-3833	EVERGREEN	0.0050	566						12.5	40.0	0.0	40.0	0.0			
5833-3834	EVERGREEN	0.0050	566						18.6	40.0	0.0	40.0	0.0			
\$834-3845	WARNER	0.0020	70	27.0			0.00200	310		3.1	13.9	17.0	131.1	66" RCP	63" RCP	66" RCP
5841-3842	CEDAR	0.0050	566						17.9	40.0	0.0	40.0	0.0	00 1101	OD NOT	OU KUP
\$842-3843	CEDAR	0.0050	566						17.9	40.0	0.0	40.0	0.0			
\$843-3844	ST. GERGTRUDE	0.0020	566						24.8	25.3	0.0	25.3	0.0			
\$844-3845	HALLADAY	0.0050	566						30.8	40.0	0.0	40.0	0.0			
\$845-3805	WARNER	0.0020	70	27.0			0.00200	310		3.1	13.9	17.0	173.0	72" RCP	72" RCP	72" RCP
1594-3821	STANDARD	0.0050	566						58.9	40.0	0.0	40.0	18.9		27" RCP	33" RCP

3813.00 3813.00	48.ft-STREET FLOW TO PT.# 3812.00	3811.00	3801.00	TC(MIN.) = 49.91 LAG TIME(HR) = . TOTAL AREA(ACRES)= 1080.4 UPSTREA RAINFALL(INCH): 5M = .26; 30M = . DEPTH-AREA FACTORS: 5M = .95; 30M = S-GRAPH : VALLEY = 100.0%; FOOTHILL = PEAK FLOW RATE(CFS)= 804.78 TIME	3801.00	3504.00	3504.00	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUM	FILE NAME:SA38.DAT TIME/DATE OF STUDY: 10:45 2/2 5.0-YEAR STORM RATIONAL METHOD	10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL MAP # 38
5.7 16.1	4.4 10.3	5.9 5.9	1080.4	LAG TIME 1080.4 .26; .5M = .5 500.0%; F 804		MEMORY BAN Q(cfs) 804.78	MEMORY BAN Q(cfs) 804.78		i fin	FREQUENCY AT
c 60/AC	c 60/AC	c 60/AC				-	MEMORY BANK # 1 DEFINED AS FOLLOWS: Q(cfs) Tc(min) Fm(in/hr) Ybar 804.78 48.60 .093 .38			10-YEAR RETURN FREQUENCY AT 50% CONFIDENC MAP # 38
2.7	2.6		49.9	77 TIME INTERVALION 77 TIME INTERVAL(M 1000E OF LONGEST W 97 THR = .78; 3H .95; THR = .95; 3I .0%; MOUNTAIN = 05 PEAK(HR) = 16.8 	1.3	ED ONTO MAIN-STI ED ONTO MAIN-STI Em(in/hr) Ybar _093 _38	NED AS FOLLOW Fm(in/hr) YE	It Tc I N. MIN. in/h	STUDY (AMC II LOSSES) P 1983-1991 ADVANCED ENGINEERING SOFTWAREJ-	ENCE LEVEL
	30 .13 .125	38 . 13 . 125	.87	= ; = ; = ;		- EA(a 106	-048: Ybar AREA(acres) .38 1061.12	/h Fm Fm	SES)	LEVEL
125 15.8	10.9	6.7	804.8	.) = 5.0 Fm(I ERCOURSE = 3180 = 1.31; 6HR = = .99; 6HR = .0%; VALLEY(U VOLUME(AF)= -	804.8			Fm a p	G SOFTWARED	9 2 9 1 1 2 2 2 2 2 2 2
1 1	vi i v	833 .0010) = 5.0 Fm(1N/HR) = .094; Ybar = CCOURSE = 3180.0 WITH LENGTH = 17140.0 1.31; 6HR = 1.81; 24HR= 3.03 = .99; 6HR = 1.00; 24HR= 1.00 .0%; VALLEY(UNDEV)/DESERT = .0% DLUME(AF)= 188.09	1206 0050 15.4			PATH SLOPE V (ft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER	6 6 9 2 2 2 2 2 2 2 2 2 2 3 2 3 2 3 3 3 3 3
	100	INITIAL SUBAREA	FOR CONFLUENCE	.094; Ybar = .380 NGTH = 17140.0 FEET R= 3.03 RT = .0%	qpipe= 804.8cfs n=.0130 D= 6.9 108.0"-PIPE ADD SUBAREA			HYDRAULICS	1 OF	

PEAK FLOW RATE(CFS)= DEPTH-AREA FACTORS: 5M = S-GRAPH : RAINFALL(INCH): 5M = TOTAL AREA(ACRES)= Te(MIN.) = PEAK FLOW RATE(CFS)= S-GRAPH : VALLEY = 100.0%; FOOTHILL = DEPTH-AREA FACTORS: CONCENTRATION RAINFALL(INCH): 5M = TOTAL AREA(ACRES)= TC(MIN.) = POINT NUMBER SUBAREA FOR POINT# CONFLUENCE TIME/DATE FILE NAME: SA38.DAT MAP # 38 CITY OF SANTA ANA MASTER PLAN OF DRAINAGE DESCRIPTION OF STUDY: 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL ANALYSIS 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC 3803.00 3802.00 3802.00 3801.00 3801.00 VALLEY = OF STUDY: 10:45 50.47 49.91 * * * **** AREA (ACRES) 12.1 100.0%; FOOTHILL = MEAN VALUES: Fm(IN/HR) = LAG TIME(HR) = 5# = 1108.6 LAG TIME(HR) = 1108.6 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 17658.5 FEET 1096.5 .26; 30M = TIME OF CONCENTRATION(MIN.) = SUM .26; 30# = 816.37 .95; 30M = -- UNIT HYDROGRAPH INFORMATION -807.20 .95; 30M = -- UNIT HYDROGRAPH INFORMATION TYPE TYPE MIN. SOIL DEV. 0 -[(c) 1983-1991 UPSTREAM NODE OF LONGEST WATERCOURSE = 2/23/1994 1 60/AC TIME OF PEAK(HR) = 16.8 VOLUME(AF)= TIME OF PEAK(HR) = 16.8 VOLUME(AF)= PEAK FLOW RATE(CFS) .67 .59; 1HR = TOTAL AREA(ACRES) = .59; 1HR = .67 .95; 1HR = ----.95; 1HR = -1.9 77 TIME INTERVAL(MIN.) = 0 TIME INTERVAL(MIN.) = 5.0 .0%; MOUNTAIN = .0%; MOUNTAIN = 3 5 9 2 1 50.5 ADVANCED ENGINEERING MIN. | in/h [ORANGE COUNTY] 10 .094; Ybar = II LOSSES) ----.78; 3HR = .78; 3HR = .95; 3HR = .87 .95; 3HR = ----49.9 * .13 .094 816.4 F 807.2 LAG TIME(HR) ----1096.49384 (Avg) -0%; VALLEY(UNDEV)/DESERT = .0%; VALLEY(UNDEV)/DESERT = 1.31; 6HR = 1.31; FB .99; 6HR = 1.00; 24HR= 1.00 .99; 6HR = 1.00; 24HR= 1.00 5.0 SOFTWARE] -***** 6HR = NUS Fm(IN/HR) = Ð Fm(IN/HR) = 3180.0 WITH LENGTH = *** 986 ŧ (ft) ft/ft FPS. PATH SLOPE V 518 .0050 15.4 opipe= 807.2cfs 685 192.06 1.81; 24HR= PAGE NUMBER CALCULATED BY: 1.81; 24HR= 4 190.13 .0050 15.4 167 CHECKED BY:0050 .094; Ybar = 5.9 apipe= .094; Ybar = 3.03 3.03 apipe= 816.4cfs 1 n=.0130 D= 7.0 -N 7= n=.0130 D= 1.4 0 ADD SUBAREA .0130 D= 17140.0 FEET .0% 108.0"-PIPE 108.0"-PIPE HYDRAULICS 0% 27.0"-PIPE AND NOTES 15.8cfs .385 .384 6.9

 3803.00	3818.00 3818.00	48.ft-STREET FLOW TO PT.# 3817.00	3816.00	3803.00	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE MAP # 38 FILE NAME:SA38.DAT TIME/DATE OF STUDY: 10:45 2/23/1994 5.0-YEAR STORM RATIONAL METHOO STUDY (AMC
 	6.	5.8	6.4		ANTA ANA MASTER ETURN FREQUENCY OF STUDY: 10:45 STORM RATIONAL J STORM STORM
 	19.1	12:3	6.4	32.3	va Master Plan OF FREQUENCY AT 50% C DAT JDY: 10:45 2/23/ JDY: 10:45 2/23/ RATIONAL METHOD S RATION S NREA SUM T112.7 C C 1112.7 UNIT H 4 LAG TIME(HR) = = 1112.7 PH .26; 30M = S: SM = .26; 30M =
 	0	0	<u> </u>	<u> </u>	R PLAN (Y AT 50;
	60/AC	60/AC	6D/AC		2 2/23/1994 S 2/23/1994 METHOD STUDY (AMC II LOSSES) [(c) 1983-1991 ADVANCED ENGIN SOIL DEV. Tt Tc I FD SOIL DEV. Tt Tc I FD METHOD STUDY (AMC II LOSSES) [(c) 1983-1991 ADVANCED ENGIN METHOD STUDY (AMC II LOSSES) [(c) 1983-1991 ADVANCED ENGIN METHOD STUDY (AMC II LOSSES) [] 1 Tc I FD METHOD STUDY (AMC II LOSSES) [(c) 1983-1991 ADVANCED ENGIN METHOD STUDY (AMC II LOSSES) [] </td
 <u>:</u>	<u></u>	2.7	1:		RAINAGE NFIDENCE LEVE 994 994 UDY (AMC II 83-1991 ADVAN 83-1991 ADVAN 84-1991 ADVAN 84
	21.4	20.2 1.45	17.6	51.5	<pre>clevel for and for any any any clevel for log for log for</pre>
 	1.42		1.63	.86	GE GE NCE LEVEL [ORANGE COUNTY] AMC II LOSSES) ADVANCED ENGINEERIN P1 ADVANCED ENGINEERI
		3	.13	<u> </u>	UNTY] - SS) UNTY] - NGINEE SS) Fm SHR = S SHR = S
	.125	. 125	.125] EERING SOFTW = [Avg) SU - [] - [] SU - []
	22.2	14.7	8.7	817.0	LAN OF DRAINAGE T 50% CONFIDENCE LEVEL
			970		
			970 .0050		CALCULATED BY: CALCULATED BY: CHECKED BY: PAGE NUMBER E]
					D BY: D BY: ER 3 FPS. FPS. FRT = R= 1.00
n=.0130 D= 2.2 33.0"-P1PE	60	D= .6 ,D*V= 1.0 FLOODWIDTH=29.3	INITIAL SUBAREA	FOR CONFLUENCE	STER PLAN OF DRAINAGE ENCY AT 50% CONFIDENCE LEVEL Interval Inte

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	3805.00	TOTAL AREA(ACRES)= 1139.0 UPSTREA RAINFALL(INCH): 5M = .26; 30M = . DEPTH-AREA FACTORS: 5M = .95; 30M = S-GRAPH : VALLEY = 100.0%; FOOTHILL = PEAK FLOW RATE(CFS)= 830.29 TIME	3804.1 3804.1 7c(MIN.) =	TC(MIN.) = 51.54 LAG TIHE(HR) = TOTAL AREA(ACRES)= 1131.8 UPSTREAN RAINFALL(INCH): 5M = .26; 30M = .1 DEPTH-AREA FACTORS: 5M = .95; 30M = .2 S-GRAPH : VALLEY = 100.0%; FOOTHILL = PEAK FLOW RATE(CFS)= 829.74 TIME	CONFLUENCE ANALYSIS FOR POINT# 3803.00	CONCENTRATION AREA (ACRES)	FILE NAME	CITY OF
		EA(ACRE (INCH): EA FACT : VALLE : VALLE A RATE(188 1) = 5 REA(ACRI .(INCH): .EEA FACI : VALLE : VALLE	LUENCE LYSIS POINT# 3803.00	ATION		
	same manager and	DRES)= +): 5M = ACTORS: 5M ACTORS: 5M ACTORS: 5M LEY = 100 E(CFS)= E(CFS)=	52.27 LA	51.54 L CRES)= H): 5M = H): 5M = ACTORS: 5J ACTORS: 5J LLEY = 100 LLEY = 100 LLEY = 100	MEA	AREA (A SUBAREA	SA38.DAT OF STUDY: 10:45 STORM RATIONAL 1	SANTA ANA MASTER PLAN OF DRAINAGE RETURN FREQUENCY AT 50% CONFIDENC B
		.26; 3 = .95 = .95; FC 830.		LAG TIME(HR) = 1131.8 UPSTF 26; 30M = 26; 30M = 25; 30M 95; 30M 95; 30M 95; 10M 	MEAN VALUES: Fm(IN/HR) = TOTAL AI	CRES)	10:45 IONAL M	ASTER P
		9.0 UPSTREA 6; 30M = . .95; 30M = ; FOOTHILL = ; FOOTHILL = 330.29 TIME		G TIME(HR) = .69 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .095; Ybar = 1131.8 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 18645.1 .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03 = .95; 30M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00 .0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0% 829.74 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 195.24	PEAK FLOW RATE(CFS) = 829.7 TIME OF CONCENTRATION(MIN.) = 51.5 LA VALUES: Fm(IN/HR) = .095; Ybar = .3 TOTAL AREA(ACRES) = 113 TOTAL AREA(ACRES) = 113		2/23/1994 ETHOD STUDY	LAN OF T 50% C
	many secondly advanta disciony	= .95; 1HR = .59; 1HR = = .95; 1HR = .0%; N = .0%; N HE OF PEAK()			PEAK FLOW RATE(CFS) NCENTRATION(MIN.) = 'm(IN/HR) = .095; ' TOTAL AREA(ACRES) HYDROGRAPH INFORMA	YPE 11	1994 1994 TUDY (/	DRAINA
	and and and an and an and an and an and	.95; 1HR = .95; 1HR = .95; 1HR = .0%; MQ OF PEAK(HR)	 	69 TIME IN M NODE OF LC 59; THR = .95; THR = .0%; MO OF PEAK(HR; 	- I RATE() ON(MIN = .01 AREA(AU AREA(AU	I. MIN.	MC II	ACE LEV
		DDE OF LONGEST WATE 1HR = .78; 3HR = ; 1HR = .95; 3HR - .0%; MOUNTAIN = PEAK(HR) = 16.8 V(TIME INTERVAL(MIN. DDE OF LONGEST WATEI 1HR = .78; 3HR = .78; 1HR = .95; 3HR + .0%; MOUNTAIN = PEAK(HR) = 16.8 V(1 1 in/h	IL LOSSES)	5 P 2
	state destates and spectral impacts and	STREAM NODE OF LONGEST WATERCOURSE = : = .59; 1HR = .78; 3HR = 1.31; 6H IOM = .95; 1HR = .95; 3HR = .99; 6H ILL = .0%; MOUNTAIN = .0%; VALLI TIME OF PEAK(HR) = 16.8 VOLUME(AF)=		.69 TIME INTERVAL(MIN.) = EAM NODE OF LONGEST WATERCOU .59; 1HR = .78; 3HR = 1. = .95; 1HR = .95; 3HR = . = .0%; MOUNTAIN = .0% ME OF PEAK(HR) = 16.8 VOLUM	= 829.7 = 829.7 51.5 LAG T bar = .389 = 1131.8 10N			
		RCOURSE = 3180.0 WITH LENGTH = 1.31; 6HR = 1.81; 24HR= 3. 99; 6HR = 1.00; 24HR= 1.00 .0%; VALLEY(UNDEV)/DESERT = DLUME(AF)= 196.39	668 .095 830.3) = 5.0 Fm(IN/HR) = .095 RCOURSE = 3180.0 WITH LENGTH 1.31; 6HR = 1.81; 24HR= 99; 6HR = 1.00; 24HR= 1. .0%; VALLEY(UNDEV)/DESERT = DLUME(AF)= 195.24 	1131.80	EKING SOF		
		3180.0 HR = 1 HR = 1	668 .00 	<pre>= 5.0 Fm(IN/HR) = .095; course = 3180.0 WITH LENGTH = 1.31; 6HR = 1.81; 24HR= 3. .99; 6HR = 1.00; 24HR= 1.00 0%; VALLEY(UNDEV)/DESERT = JME(AF)= 195.24 JME(AF)= 195.24</pre>	(HR) #	O PA		
		1.0 WITH LENG 1.81; 24HR= 1.00; 24HR= 1.00; 24HR= NDEV)/DESERT 196.39	68 .005	N/HR) = .0 .0 WITH LENG 1.81; 24HR= 1.00; 24HR= ' NDEV)/DESERT 195.24	.69	PATH SLOPE V (ft) ft/ft FP	CALCULATED E CHECKED E PAGE NUMBER	
	0 15.4	LENGTH 4HR= 1.0 HR= 1.0 SERT =	-	.095 LENGTH 24HR= 24HR= 1.		PE V ft Fps.	**	
	apipe= n=.013 108	rH = 1931 3.03 1.00 = .0%	15.4 opipe= n=.0130 108.1 ADD SI	.095; Ybar = NGTH = 18645 R= 3.03 = 1.00 RT = .0X		T	4 05	
	665 .0050 15.4 Opipe= 830.3cfs	UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 19314.0 FEET 50M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03 530M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00 50THILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0% 29 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 196.39 	668 .0050 15.4 opipe= 829.7cfs	= .389 5.1 FEET		HYDRAULICS AND NOTES		

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3822.00 3822.00	3821.00		3594.00	3594.00	3805.00	PEAK FLOW RATE(CFS)=	RAINFALL(INCH): 5M = DEPTH-AREA FACTORS: 5M = S-GRAPH : VALLEY = 100.05	TC(MIN.) = 52.99 TOTAL AREA(ACRES)=	3805.00	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUM	FILE WAME:SA38.DAT TIME/DATE OF STUDY: 10:45 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES)	10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL MAP # 38
	- 00 00	$-\frac{1}{1}$	81	8	118	RAT	FA	\$	8	ION	REOS	RET
10.7	8.8 N 8		MEMOR Q(cfs) 58.88 TOTAL	немоя Q(cfs) 58.88 Тотац	MA	E(CFS)=	0: 5M = (CTORS: LEY = 1)			AREA (SA38.DAT OF STUDY: 10:45 STORM RATIONAL I	10-YEAR RETURN FREQUENCY AT 50% CONFIDENC MAP # 38
70.9	59.9		4	AL	MAIN-STREAM COPIED ONTO MEMORY BANK # 2		= .26; 30M = .5 5M = .95; 30M = 100.0%: FOOTHILL =	LAG TIME(HR) = 1162.9 UPST	23.9 1162.9 C 660/AC		10:45 IONAL M	NENCY A
00	00		BANK # 3 Tc(min) 22.64 AREA(ACRE	BANK # 22.64 EA(AC	CC		30) 95;	Q L	Eni	ISO IS	ETHIC	4 5
Com 60/AC	Com		3 COPIED 3 FP(avg) .250 RES)=	BANK # 3 DEFINED Tc(min) Fp(avg) 22.64 .250 .22.64 .250 .REA(ACRES)=		10 TIME	26; 30M = . .95; 30M = .	I) = .	C (60/AC	SOIL DEV. TT	2/23/1994 7/23/1994 1400 STUDY	0% CONF
1.4		7 T		EFINED p(avg) .250 	DNTO	OF P	· 0 ·	M NO		HIN	-199	IDEN
24.9 1.31	3 23.5 1.36 			BANK # 3 DEFINED AS FOLLOWS: Tc(min) Fp(avg) Ap(avg) Fm(avg 22.64 .250 .38 .094 AREA(ACRES)= 50.84 	MEMORY BANK	840.10 TIME OF PEAK(HR) = 16.8	.59; 1HR = .78; 3H 95; 1HR = .95; 3H = .0%; MOUNTAIN =	AG TIME(HR) = .71 TIME INTERVAL(MIN.) = 5.0 1162.9 UPSTREAM NODE OF LONGEST WATERCOURSE =		SOIL DEV. Tt Tc 1 TYPE TYPE MIN. MIN. in/h	ETHOD STUDY (AMC II LOSSES) PA F(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE)	• m
	11.3	11	8 1N-S) 1 8	3) 3) 8 8 8 8 8 8 8	BAN) = 1		TERV	.85	1	LOSS	57 F
-13 -03			 STREAM Fm(avg) -094		* N	1	.78; 3HR = .95; 3HR = JNTAIN =	ALCMIN.	1	- <u>-</u>	ENGINEE	LEVEL
.075	.084		1	10		VOLUME(AF)=	•) = 5 RCOURS	960*	Fm ((Avg)	RINGS	
79.1	68.6		[1(in/hr) 1.38			(AF)= 200.10 	1.31; 6HR = 1.81; 24HR= 3. = .99; 6HR = 1.00; 24HR= 1.00 .0%: VALLEY(UNDEV)/DESERT =	5.0 Fm JRSE = 31	840.1	Q NUS	OFTWAR	* * * *
	- desired all and the state of	400	 Ae(acres) 50.84	Ae(acres) 50.84	$\overline{11}$	20	= 1. = 1.0	Fm(IN/HR) = 3180.0 WITH		PATH (ft)	1 6 F	F 1 1 1 1
	694 .0050	400 .0050				200.10	1.81; 24HR= 1.00; 24HR= 1 NDEV)/DESERT	R) = WITH L		Q PATH SLOPE V SUM ((ft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER	
1	8	8.1	NODE 3590.0	NODE 3590.0	$\frac{1}{1}$	$\overline{1}$	HR= 1 ERT	.09		FPS	D BY: D BY: ER	7
	2		- <u>-</u>	· <u>-</u>	$\frac{1}{1}$	$\frac{1}{1}$	3.03	H = H			i UT	1 7 8
n=.0130 D= 2.8 42.0"-P1PE ADD SUBAREA	42.0"-PIP	 apipe= 58.9cf n=.0130 D= 2.5					.0%	Fm(IN/HR) = .096; Ybar = 3180.0 WITH LENGTH = 19979.5	ADD SUBAREA	HYDRAULICS AND NOTES	Р.	*
1130 D= 2.8 42.0#-P1PE D SUBAREA	42.0"-PIPE D SUBAREA W= 68.6cfs	58.9cfs D= 2.5						.390 5 FEET	BAREA	AND NOTES		

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138.047 Common Finder Liver COMARGE COUNTY CALCULATED BY 138.047 Common Finder County CALCULATED BY CALCULATED BY 138.047 Common Finder County Fallowski County Fallowski County 138.047 Common Finder County Fallowski County Fallowski County Fallowski County 138.04 C Common Finder County Fallowski County Fallowski County Fallowski County 14.1 To I.0 I.1 I.1 I.1 I.1 I.1 Fallowski County <	48.ft-STREET FLOW TO PT.# 3832.00	3831.00	3834.00	3834.00 3834.00	3826.00	3825.00	3824.00 3824.00	3823.00	POINT NUMBER	FILE NAME:SA38.DAT TIME/DATE OF STUDY 5.0-YEAR STORH RA	10-YEAR RET MAP # 38
LEVEL CALCULATED BY I1 LOSSES) PAGE UNBER DVANCED ENGINEERING SOFTWARE] PAGE UNBER TC I Fm Fm Q PATH SLOPE V MIN. in/h (Avg) SUM (ft) ft/ft FPS	6.3	5.1	<u> </u>	10.3	10.2	9.8	14.1 3.9	7.5	AREA SUBARE	A38.DAT F STUDY TORM RA	SAWIA ANA MASTER PLAN OF DRAINAGE RETURN FREQUENCY AT 50% CONFIDENC 3
LEVEL CALCULATED BY CHECKED BY ILLOSSES) CALCULATED BY CHECKED BY PAGE UNMBER PAGE UNMBER			133.8	133.8	123.5	110.7	98.3	1	A	: 10:45	QUENCY
LEVEL CALCULATED BY CHECKED BY ILLOSSES) CALCULATED BY CHECKED BY PAGE UNMBER PAGE UNMBER	All states and states and states and states and states and		<u>i</u>		and the second second second second	0.0		And the state of the second second a			PLAN AT 5
LEVEL CALCULATED BY CHECKED BY ILLOSSES) CALCULATED BY CHECKED BY PAGE UNMBER PAGE UNMBER	sp/ac -	60/AC	<u> </u>		Com 60/AC	Com 60/AC	Com 60/AC	Com	IL DEV.	/23/19 00 STU	OX CON
LEVEL CALCULATED BY CHECKED BY ILLOSSES) CALCULATED BY CHECKED BY PAGE UNMBER PAGE UNMBER				<u> </u>	<u></u>	1.2	1.3		HR.	94 94 94 94	FIDENC
COUNTYJ		16.5	31.0		30.1	29.0	27,8	25.9	HIN.	- LOKA	E LEVEL
Image: construction of the state of the			1.14			1.19	1.23	1.28	I I I I I I I I I I I I I I I I I I I I	LOSSE CO	1
Image: construction of the state of the				<u>.</u>	.13	.13	.13 63		- Fa	UNITY	
ALCULATED BY CHECKED BY AGE NUMBER 	.125	.125		.068	.063	.065			Fm (Avg)	EDINC	
ALCULATED BY CHECKED BY AGE NUMBER 	12.5	7.2	129.6	129.6	121.7	112.2			SULL SUM		
CULATED BY CHECKED BY E NUMBER 	33.4			347	032			the same same trans when we are	PATH		
2.1 0 BY: 2.1 0 BY: 5.8 0 BY:		0050		0200			.0050		SLOPE	CULATE CHECKE	
				6.8	9.3			a second designs and a second design and	FPS	D BY	
: : : : : : : : : : : : : :		1 5 1	FOR CONFLUENCE	6.8 0pipe= 121.7cfs n=.0130 D= 4.1 63.0"-PIPE ADD SUBAREA	apipe= 112.2c n=.0130	n=.0130 b= 3.1 51.0"-PIPE ADD SUBAREA	n=.0130 48. 400 S	opipe= n=.0130 45.0		0	

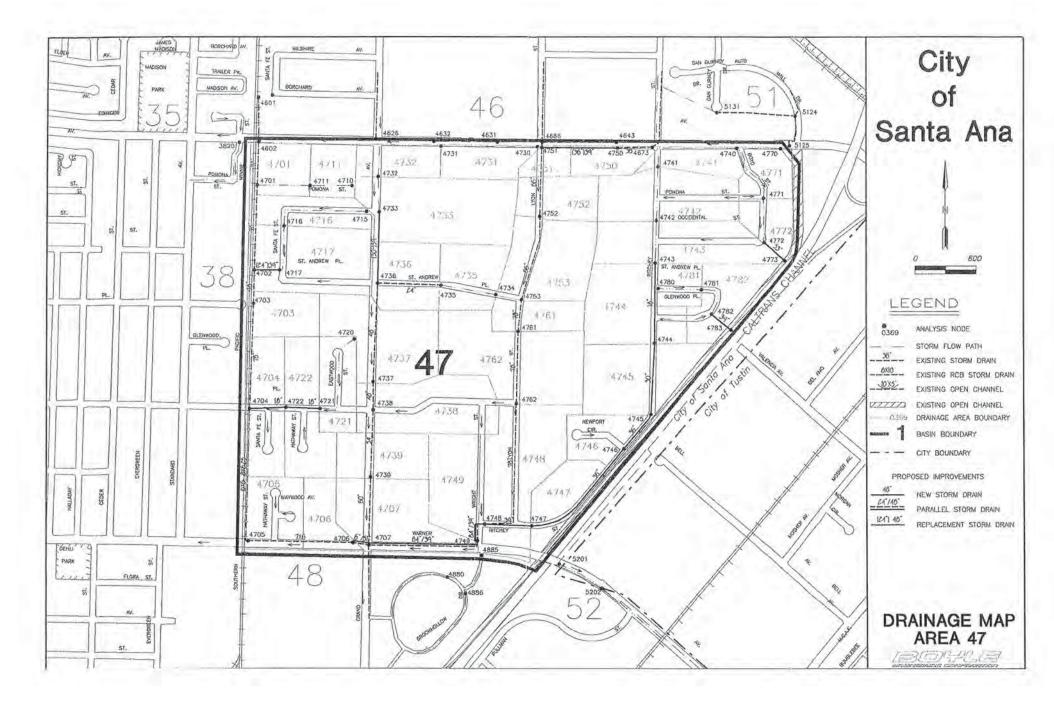
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3843.00 3843.00	48.ft-STREET FLOW TO PT.# 3842.00	3841.00	3845.00 3845.00 3845.00	CONFLUENCE ANALYSIS FOR POINT# 3834.00	3833.00	CONCENTRATION AREA (ACRES)	HU-TEAR REIDEN FREquency AF SUZ CONFIDENCE MAP # 38 FILE NAME:SA38.DAT TIME/DATE OF STUDY: 10:45 2/23/1994 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC	CITY OF SAN
7.8	10.8	5-4	19.3	HEAN HEAN BEFFE QCCFS 148.10 147.30	7.0	AREA () SUBAREA	STORM RATIONAL METHOD STUDY (AMC	SANIA ANA MASIER PLAN OF DRAINAGE
24.0	16.2		171.5	A VA	18.4	ACRES)	10:45	ASTER P
<u> </u>	0	0		1 1 LUES: F VE AREA VE AREA TC(min) 30.97 30.97	0	-ECc	т эс 2/	LAN
60/AC	60/AC	 60/AC	60/AC	PEAK FLOW TIME OF CO FP(IN/HR) = EA(ACRES) = EA(ACRES) = CA(ACRES)	60/AC	-[(c) 1983-1991 SOIL DEV. Tt TYPE TYPE MIN. 	2/23/1994 1400 STUDY	OF DRA
2.7	7.0		1.5	- FLOW OF COI /HR) = ES) = ES) = (avg) .250 .250	3.0	-1991 Tt HIN.	IDENC	INAGE
26.3 1.27	23.6		32.5	FLOW RATE(CFS) = 148.1 OF CONCENTRATION(MIN.) = .298 /HR) = .250; Ap = .298 ES) = 152.20 TOTAL AI (avg) Ap(avg) Fm(avg) .074 .250 .30 .075 .250 .30 .075	26.9 1.25	ADVAN Tc HIN.		
1.27	1.35	1.70	1.12	E(CFS) = NTRATION .250; Ap 152.20 (avg) Fr .30 .30	1.25	CED E	JRANGE COUN	
.13	:	- 13	.13	= 148.1 = 148.1 p = .298 h TOTAL AN Fm(avg) .074 .075	1.3	NGINE	UNTY)	
.125	.125	.125	.080	148.1 148.1 HIN.) = 31.0 = .298; Fm(IN/HR TOTAL AREA(ACRES) 1(3vg) I(in/hr) .074 1.14 .075 1.15	.125	ERING S Fm (Avg)		
24.8	17.9	7.6	160.1	148.1 148.1 .298; Fm(1N/HR) = TAL AREA(ACRES) = vg) I(in/hr) Ae(74 1.14 1 75 1.15 1	18.6	[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE] SOIL DEV. Tt Tc 1 Fm Fm Q PAT SOIL DEV. Tt Tc 1 Fm Fm Q PAT TYPE TYPE MIN. MIN. fn/h (Avg) SUM (ft		
		835	654) = .07 = 15 = 15 Ae(acres) Ae(acres) 152.20 152.32	995	PATH (ft)	CAL PAG	
		.0050			.0050	 PATH SLOPE V (ft) ft/ft FPS.	CALCULATED BY: CHECKED BY: PAGE NUMBER	
	6.0	<u>.</u>	7.2	NODE 3590.0		FPS.	BY:	
27.0"-PIPE ADD SUBAREA	D= .5 ,D*V= 1.1 FLOODWIDTH=17.3 6.0 Opipe= 17.9cfs	1 - 13	7.2 Qpipe= 148.1cfs n=.0130 D= 4.3 69.0"-PIPE ADD SUBAREA	LARGEST CONFLUENCE Q= 148.1	5.5 appipe= 12.5cfs n=.0130 D= 1.4 24.0"-PIPE ADD SUBAREA 6.1 appipe= 18.6cfs [n=.0130 D= 1.6 27.0"-PIPE	HYDR	 	

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CITY OF SAN 10-YEAR RET MAP # 38	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL MAP # 38	
FILE WAME:SA38.DAT TIME/DATE OF STUDY 5.0-YEAR STORM RA	FILE WAME:SA38.DAT CALCULATED BY: TIME/DATE OF STUDY: 10:45 2/23/1994 CHECKED BY: 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC 11 LOSSES) PAGE NUMBER 8 OF	#
CONCENTRATION POINT NUMBER	CONCENTRATION AREA (ACRES) SOIL DEV. Tt Tc I Fm Fm Q PATH SLOPE V POINT NUMBER SUBAREA SUM TYPE TYPE MIN. MIN. in/h (Avg) SUM (ft) ft/ft FPS.	HYDRAULICS AND NOTES
3844.00		Qpipe= 24.8cfs n=.0130 D= 2.1 36.0"-PIPE
3844.00 3845.00	6.7 30.7 C 60/AC 27.4 1.24 .13 .125 30.8 ADD : 1321.0050 6.9 opipe= 1321.0050 6.9 opipe= 1321.0050 6.9 opipe= 1321.0050 6.9 opipe= 1321.0050 6.9 opipe= 1321.0050 6.9 opipe= 	ADD SUBAREA Opipe= 30.8cfs n=.0130 D= 1.9 33.0"-PIPE
CONFLUENCE ANALYSIS FOR POINT# 3845.00	PEAK FLOW RATE(CFS) = 190.0 TIME OF CONCENTRATION(MIN.) = 32.5 MEAN VALUES: Fp(IN/HR) = .250; Ap = .348; Fm(IN/HR) = .087 EFFECTIVE AREA(ACRES) = 202.26 TOTAL AREA(ACRES) = 202.26	LARGEST CONFLUENCE
	Ap(avg) Fm(avg) I(in/hr) Ae(acr .35 .087 1.13 200.3 .35 .087 1.12 202.3 .35 .087 1.15 192.1	
3805.00	2.5	ipe= 190.0cfs .0130 D= 4.7 .75.0"-PIPE
3805.00	MEMORY BANK # 3 CONFLUENCED WITH MAIN-STREAM	
TC(MIN.) = 52.99 TOTAL AREA(ACRES)= RAINFALL(INCH): 5M =	52.99 LAG TIME(HR) = .71 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .094; Ybar = .785)= 1365.1 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 19979.5 (1): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03	bar = .391 19979.5 FEET 3 1
DEPTH-AREA FACTORS: 5M = S-GRAPH : VALLEY = 100.0 PEAK FLOW RATE(CFS)=	5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = . 00.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(U) 978.92 TIME OF PEAK(HR) = 16.8 VOLUME(AF)=	.0x
3805.00		The second secon

 TIME OF CONCENTRATION(MIN.)=	3805.00		5.0-YEAR STORM RATIONAL METHOD STUDY (AMC	FILE NAME:SA38.DAT	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE 10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL MAP # 38
		AREA (AC	ORM RATIO	:SA38.DAT OF STUDY: 10:45	A ANA MAS
	1365.1	And the second of the second of the	NAL MET	0:45	NCY AT
 		SOIL DEV. Tt	ETHOD STUDY (AMC II LOSSES) PA	2/23/1994	50% CON
 9 LAG TIME(HR)= 			3-1991 /	24	· •
 LAG TIME(HR)= 	53.0	HIN.	II LOSSES)		LEVEL
 which there was and and and and and and and and and a		1 Fm in/h	SES)		LEVEL
71 MEAN VALUES:		Fm (Avg)	ERING S		
	978.9	SUM	OFTWARE		
 PEAK FLOW Fm(IN/HR) =	$\frac{1}{1}$	PATH SLOPE	PAGE NUMBER	CALCUL	
	$\frac{1}{1}$	OPE V /ft FPS.	UMBER	CALCULATED BY: CHECKED BY:	
RATE(CFS)= .094; Ybar	- STREA		9 OF		\$ 2 5 5 5 5 5 5 5
978.92 ar = .391	STREAM SUMMARY	HYDRAULICS AND NOTES			



11/01/93

HYDRAULIC ANALYSIS SUMMARY

Page No. 1

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															Carrier Contraction Contraction	Page No.
ID	Name Road	Slope (ft/ft)	ĸ	Diam/Depth (in)/ (ft)	Existing D Base Width (ft)	side Slope	Slope (ft/ft)	κ	Design Runoff (cfs)	Roadway (cfs)	tion Capac Conduit (cfs)	Total (cfs)	Deficient Capacity (cfs)	Improvement Replacement	Alternatives-	Recommended Improvement
Map Area	:47								· · · · ·							
4602-4701	RXR	0.0050		73.0												
4711-4701	ALLEY HOBLS	0.0020	566	72.0			0.00540	4244	273.3	0.0	311.9	311.9	0.0			
4701-4702	RXR	0.0050	300	73.0					17.8	25.3	0.0	25.3	0.0			
4716-4717	SANTA FE	0.0050	566	72.0			0.00635	4244		0.0	338.2	338.2	0.0			
4717-4702	ESMT	0.0020	200	5/ 0					34.6	40.0	0.0	40.0	0.0			
4702-4703	RXR	0.0050		24.0			0.00200	227	34.6	0.0	10.2	10.2	24.4	39" RCP	36" RCP	39" RCP
4703-4704	RXR	0.0050		78.0 78.0			0.00480	5254	318.1	0.0	364.0	364.0	0.0			57 NO
4721-4722	ST. GERTRUDE	0.0020	566	10.0			0.00500	5254	318.1	0.0	371.5	371.5	0.0			
4722-4704	ST. GERTRUDE	0.0020	566						28.5	25.3	0.0	25.3	3.2		18" RCP	18" RCP
4704-4705	RXR	0.0050	200	6.0			-		28.5	25.3	0.0	25.3	3.2		18" RCP	18" RCP
4705-4706	WARNER	0.0010		6.0	6.		0.00600	6550		0.0	507.4	507.4	0.0		1997 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 - 1977 -	15
4706-4707	WARNER	0.0010			8.		0.00360	9862	342.0	0.0	591.7	591.7	0.0			
4731-4732	GRAND	0.0050	561	6.0	7.		0.00100	9336	342.0	0.0	295.2	295.2	46.8	11x6.5 RCB	51" RCP	51" RCP
4732-4733	GRAND	0.0050	561						15.6	39.7	0.0	39.7	0.0			
4733-4736	GRAND	0.0050	280	30.0			0.00400		15.6	39.7	0.0	39.7	0.0			
4735-4736	ST. ANDREWS	0.0020	566	24.0			0.00100	411	41.3	19.8	13.0	32.8	8.5	39" RCP	27" RCP	39" RCP
4736-4737	GRAND	0.0050	561	48.0			0.00240	227	15.6	25.3	11.1	36.4	0.0		200 C 83/48	a tract
4737-4738	GRAND	0.0050	561	48.0			0.00500	1440	64.2	39.7	101.8	141.5	0.0			
4738-4739	GROUND	0.0050	561	54.0			0.00760	1440	81.9	39.7	125.5	165.2	0.0			
4739-4707	GRAND	0.0050	561	60.0			0.00500	1971	104.2	39.7	139.4	179.0	0.0			
4741-4742	RITCHEY	0.0050	566	00.0			0.00200	2610	111.3	39.7	116.7	156.4	0.0			
4742-4743	RITCHEY	0.0050	566						26.3	40.0	0.0	40.0	0.0			
4743-4744	RITCHEY	0.0050	566						26.3	40.0	0.0	40.0	0.0			
4744-4745	RITCHEY	0.0050	566						45.5	40.0	0.0	40.0	5.5		18" RCP	18" RCP
4745-4746	RITCHEY	0.0050	566						68.9	40.0	0.0	40.0	11.3		24" RCP	30" RCP
4746-4747	RITCHEY	0.0050	566						76.1	40.0	0.0	40.0	28.8		30" RCP	36" RCP
4747-4748	RITCHEY	0.0050	566						81.8	40.0	0.0	40.0	36.1		33ª RCP	36" RCP
4673-4750	EDINGER	0.0020	1222	36.0			0.00780	668	34.3	0.0	0.0	40.0	41.8		36" RCP	39" RCP
4750-4751	EDINGER	0.0020		36.0			0.00320	668	40.5	0.0	37.8	59.0 37.8	0.0	704 000	A AND COURSE	and the second
4666-4751	LYON/EDINGER	0.0035		48.0			0.00600	1440	147.0	0.0	111.5	111.5	2.8	39" RCP	18" RCP	39" RCP
4751-4752	LYON	0.0050	566	66.0			0.00480	3365	183.7	40.0	233.1	273.2	0.0	54" RCP	33" RCP	54" RCP
4752-4753	LYON	0.0050	566	66.0			0.00760	3365	183.7	40.0	293.4	333.4	0.0			
4753-4761	LYON	0.0050	566	78.0			0.00500	5254	213.3	40.0	371.5	411.5	0.0			
4761-4762	LYON	0.0050	566	78.0			0.00500	5254	217.6	40.0	371.5	411.5	0.0			
4762-4748	LYON	0.0050	566	78.0			0.00500	5254	241.1	40.0	371.5	411.5	0.0			
4748-4749	WRIGHT	0.0050	566	84.0		3	0.00200	6402	340.0	40.0	286.3	326.3	13.7	7.5x6.5 RCB	27" RCP	39" RCP**
4749-4707	WARNER	0.0020	561	84.0		1.13	0.00200	6402	349.9	25.1	286.3	311.4	38.5	8x6.5 RCB	42" RCP	39" RCP**
4771-4772	BOYD	0.0050	566						16.5	40.0	0.0	40.0	0.0	ONGED NOD	AC ALP	DA. KChur
4772-4773	FWY	0.0010							16.5	0.0	0.0	0.0	16.5		33" RCP	33" RCP
4781-4782	GLENWOOD	0.0050	566				1		21.2	40.0	0.0	40.0	0.0		33" KLF	55" KUP
4782-4783	GLENWOOD	0.0010							21.2	0.0	0.0	0.0	21.2		39" RCP	39" RCP
4755-4756	ST. ANDREWS	0.0020	566	27.0		3	0.00200	310	9.3	25.3	13.9	39.2	0.0		ST NUT	
4756-4753	ST. ANDREWS	0.0020	566	36.0			0.00200	668	14.0	25.3	29.9	55.2	0.0			

8			748-474 749-470 750-475 772-477 782-477	744-47 745-47 746-47 747-47	221-1- 221-1- 221-1-1-	Map Area:4	ID	04/12/94
					54" RCP 39" RCP 18" RCP 18" RCP 39" RCP 18" RCP		Description	
		Engineering and Administrat	540040	200000 20110	53 158 247 331 17 56 17 792 17		COSTESTIMAT Quantity Unit (\$	PROPOSED WORKS COST OPINION
	Total	ive	tota	1112 130 130 130	182 174 138 138 138		T E Rate (\$/Unit)	
	1,195,490	199,24 195,49	5005,029 300,029 301,029 302,020 302,0000000000	8084	50404040		Amount (\$)	Page No.

Boyle Engineering Corporation

(cstrep1)

	4711.00	4701.00	4701.00				_					4602.00											4602.00			POINT NUMBER SUBAREA SUM TYPE TYPE MIN.	CONCENTRATION AREA (ACRES)		E D. VEND STORM BATTOWN	FILE NAME: SA47.DAT	10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL MAP # 47	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
	5.2			TOTAL	267.56	273.37	272.53	271.56	266.94	269.53	273.25	A(cfs)		101	267.56	271.76	273.37	272.53	271.56	266.94	269.53	U(CTS)		-		SUBAREA	AREA (NUKE KAI	OF STUDY	SA47.DAT	TURN FRE	NTA ANA I
	v. 2	211.6		ARE								RY		F								~	RY			MDS	ACRES)	IONAL	: 12:12		QUENCY	MASTER
		; ; ;	$\frac{1}{1}$ $ \frac{1}{1}$.	AREA(ACRES)=	28.06	23.93	23.07	22.35	21.51	27.64	24 57	BANK # 1 Tc(min)	11	AREA(ACRES)=	28.06	26.16	23.93	23.07	22.35	21.51	27.64	26 ET	ANK #		1	TYPE		[(c)	10/2		AT 50%	PLAN O
	Com			$\frac{1}{1}$.281	.280	.280	.280	.280	. 281	280	COPIED (.281	.281	.280	. 280	- 280	. 280	281	tp(avg)	DEFINED			TYPE MI	SOIL DEV. Tt	1983-19	10/29/1993		CONFID	FDRAIN
		24.5	- 6	231,63	.12	.12	.12	.12	. 12	. 12		BANK # 1 COPIED ONTO MAIN-STREAM Tc(min) Fp(avg) Ab(avg) fm(av		231.63								Apo				IN. MIN	nt Te			Turi	ំ ពា	AGE
	11.6 2.05	1.30						NI				(IN-STR			.12	.12	.12	.12	10	.12	10 . 12		S	+		MIN. in/h		11 LOSSES)		TORVAGE CODALL1	VEL	
	-03		<u> </u>	-	.034	.033	.033	.033	.033	.034	024	TREAM Fm(ava)			.034	.034	.033	.033	.033	-033	.034	Fm(avg)		:	1	I	Fm	S) NGINEE		TINU		
	.025		$\frac{1}{1}$ $\frac{1}{1}$ $\frac{1}{1}$ $\frac{1}{1}$ $\frac{1}{1}$			ي. بو ا				- e		I (in/hr)						-							1 1 1 1 1	(Avg)	Fm	RING				
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· · · · · · · · · · · · · · · · · · ·	INITIAL SUBAREA	FOR CONFLUENCE	423 .0054 12.1 opipe= 273.4cfs n=.0130 D= 4.5 72.0"-PIPE																							AND NOTES	HYDRAULICS	Ģ				

1-1-72

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4702.00	48.ft-STREET FLOW TO PT.# 4717.00	4716.00	4702.00	4702.00	FILE NAME:SA47.DAT TIME/DATE OF STUDY: 12:12 T0/29/1993 5.0-YEAR STORM RATIONAL METHOD STUDY POINT NUMBER STORM RATIONAL METHOD STUDY POINT NUMBER SUBAREA SUM HOW TO PT.# FLOW TO PT.# FOR POINT NUMBER SUM Store STORM RATIONAL METHOD STUDY CONCENTRATION AREA (ACRES) SUM ITYPE [TYPE] POINT NUMBER SUBAREA SUM 48.ft-STREET FLOW TO PT.# FLOW TO PT.# FOR POINT# MEAN VALUES: Fp(1M/HR 4701.00 EFFECTIVE AREA(ACRES) ANALYSIS TC(min) Fp(av) QC(fS) TC(min) Fp(av) 286.19 22.93 .27 287.48 24.52 .27 2885.14 26.74 .27 2882.43 28.23 .27 2882.43 28.65 .27 2882.43 28.65 .27 2882.43 28.65 .27 2882.45 28.65 .27 2882.45 2
	18.0	7.9	*		STORM RATIO STORM RATIO STORM RATIO RISUBAREA (AC BISUBAREA (AC BISUBARE
	26.0 c	7.9 C	223.7		
.8	Com	Com : :			10/29/1993 [CRANGE COUNTY] ETHOD STUDY (ANC II LOSSES) [AVANCED ENGINEERING SOFTWARE] [SOIL]DEV. [Tt] [Tc] [I] [Fm] [Avg] [PA [SOIL]DEV. [Tt] [Tc] [I] [Fm] [Avg] [PA [SOIL]DEV. [Tt] [Tc] [I] [Fm] [Avg] [PA [SOIL]DEV. [Tt] [I] [Fm] [Avg] [PA [ITYPE]TYPE [MIN.] [in/h] [Avg] [Avg] [PA [ITYPE]TYPE [MIN.] [in/h] [Avg] [Avg] [PA [ITYPE]TYPE [MIN.] [in/h] [Avg] [Avg] [PA [I] [S.5] [] [] [] [] [I] [] [] [] [] [] [I] [] [] [] [] [] [] [I] [] [] [] [] [] [] [] [I] [] [] [] [] [] [] [] [] [I] [] <td< td=""></td<>
	19,4 1.50	1.7	25.6 1.29		29/1993 29/1993 STUDY (AMC II LOSSES) 1983-1991 ADVANCED ENGINEERI 10EV. Tt 11 Tc 12 Fm 1983-1991 ADVANCED ENGINEERI 10EV. Tt 11 Tc 1983-1991 ADVANCED ENGINEERI 10EV. Tt 11 Tc 11 Fm 11 Fm 11 Fm 11 Fm 11 Fm 11 Fm 12 11 13 11 14 11 15.5 11 15.5 11 15.5 17 15.5 17.1 16.03 .03 15.5 287.5 TIME OF CONCENTRATION(MIN.) = PE(Avg) Ap(avg) PG(avg) Ap(avg) .278 .12 .279 .12 .279 .12 .279 <td< td=""></td<>
	.03				CCOUNTY) ENGINEERI Fm - - -
	.025		- 2		JMTY1 - - S) - - - VGINEERING SOFTWARE1- - - - I (Avg) SUM (Avg) - I - - - - - - - - - - - - - - - - - -287.5 117.8 - - - -287.5 2118; Fm(1N/HR) = - - - -033 1.37 2 - - - .033 1.31 2 - - - - .033 1.26 2 - - - - .033 1.20 2 - - - - .033 1.66 1 - - -
, , , , , ,	34.6	12.1	287.5		
	 0. 257			832 . 0	
	000 1 0000			064 12.	CALCULATED BY: CHECKED BY: PAGE NUMBER CHECKED BY: PAGE NUMBER CHECKED BY: PAGE NUMBER Cft) ft/ft FPS. Cft) ft/ft FPS. Cft FPS. Cft
m=.0130 D= 2.6 39.0"-PIPE	D= .6 ,[FLOODWII	INITIAL	- FOR CONFLUENCE	832 .0064 12.9 @pipe= 287.5cfs n=.0130 D= 4.6 69.0"-PIPE	Y: 2 OF 2 OF 2 OF 4 HYDRAULICS S. AND NOTES

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4722.00		4721.00 7.7	4704.00	4704.00 4704.00 12.1	4703.00 4703.00 7		306.18	310.38	314.18	317.35	318	317	314	,	4702.00	FOR POINT#	CONFLUENCE	POINT NUMBER SUBAREA CACKES		FILE NAME:SA47.DAT TIME/DATE OF STUDY: 12:12 10/29/1993 5.0-YEAR STORM RATIONAL METHOD STUDY (AMC	MAP # 47
4 20.1 0		7 7.7 c	263.0	1 263.0 C	7.1 250.9 C		.18 20.22			317.35 26.23			298.60 18.19 314.24 23.18	Q(cfs) Tc(min)	EFFECTIVE AREA(ACRES) =	TIME OF CO		S		STORM RATIONAL MET	REQUENCY AT
	3.6	Com		Com	Com .5		2 .275			.276	ŝ		19 .275 18 .275	in) Fp(avg)	EA(ACRES) =	FD(IN/HR)	PEAK FLOW		[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]	10/29/1993 ETHOD STUDY (A	50% CONFIDEN
18.0 1.60		14.5 1.85	26.6 1.26	26.6 1.26	25.2 1.30		- 12	.12	-12	-12	-12	.12	.12	~		NCE	PEAK FLOW RATE(CFS) =		1 ADVANCED E	MC II LOSSES)	LORANGE COUNTY] -
.03 .025		.03 .025		.03 .032	.03 -032		32 32			.032	6	.032	.032	Fm(avg) I(i	243.76 TOTAL AREA(APPES) =	I(MIN.) = 2	31	 Fm Fm) (Avg)	ENGINEERING	5	OUNTY]
28.5	331	12.6	318.2		318.2	3	1.17 2 1.45 2			1.29 2		1.34 2		I(in/hr) Ae((ACRES) =	24.7		SUM O	SOFTWARE]		
$\left -\frac{1}{1} \right $.0020					26 .0048 1	269.67 4501.0 205.60 4715.0			249.66 4530.0		238.11 4520.0		~ 5	200.		100	PATH SLOPE V (ft) ft/ft FPS.		CALCULATED BY: CHECKED BY:	
	1.7 qest.= 21.5cfs D= .6 ,D*V= 1.1 FLOODWIDTH=29.3	INITIAL SUBAREA	FOR CONFLUENCE	U W W	n=.0130 D= 5.1 75.0"-PIPE ADD SUBAREA	326 0048 11_8 00100 318 2010	5.0	0.0	0.0	0.0	0.0	0.0	4710.0	DE	L CONFLU	LARGEST		V HYDRAULICS FPS. AND NOTES		BY: BY:	* * * * * * * * * * * * * * * * * * * *

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PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 10/29/1993 ITYPE ITT	PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 10/29/1993	PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 10/29/1993	4707.00	4706.00	4705.00	MAP # 47 FILE NAME:SA47.DAT TIME/DATE OF STUDY: 12:12 5.0-YEAR STORM RATIONAL POINT NUMBER SUBAREA (ACRES) A704.00 4704.00 EFFECTIVE 4704.00 effective 326.06 332.47 338.83 341.90 341.34 341.34 340.18 340.18 329.20 325.77	CITY OF SANTA ANA MAS
PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 10/29/1993 I-10/29/1993 METHOD STUDY (AMC II LOSSES) - [C:] 1983-1991 ADVANCED ENGI ITYPE [TYPE MIN. MIN. in/h ITYPE [TYPE MIN. MIN. in/h ITYPE [TYPE MIN. MIN. in/h ITTYPE TYPE MIN. MIN. in/h ITTHE OF CONCENTRATION(HI IES: FP(IN/HR) = .277.5 T.23 ITTYPE .11 ITTYPE .11 ITTYPE .11 ITTYPE .11 ITTYPE .11 <td>PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 10/29/1993 </td> <td>PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 10/29/1993 </td> <td>·</td> <td></td> <td></td> <td>MEAA F STUDY: F STUDY: F STUDY: F STUDY: F STUDY: AREA (AI SUBAREA - - - </td> <td>A ANA MA RN FREQU</td>	PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 10/29/1993	PLAN OF DRAINAGE AT 50% CONFIDENCE LEVEL 10/29/1993	·			MEAA F STUDY: F STUDY: F STUDY: F STUDY: F STUDY: AREA (AI SUBAREA - - - 	A ANA MA RN FREQU
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E LEVEL - [ORANGE COUNT - [ORANGE COUNT ADVANCED ENGI Tc 1 F Tc 1 Tc 1 F Tc 1 Tc Tc Tc Tc Tc Tc	E LEVEL - [ORANGE COUNTY]	E LEVEL - [ORANGE COUNTY]	i	·		229/1993 229/1993 200 STUDY (201 STUDY (201 STUDY (201 PB3-19 201 PB3-19 2	OF DRAINA D% CONFIDE
E COUNT E COUNT ED ENGI I F I F I	E COUNTYJ	E COUNTYJ	· · · · · · · · · · · · · · · · · · ·		27.5	[ORANG 91 ADVANC t Tc 	NCE LEVEL
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ALCULATED BY: ALCULATED BY: AGE NUMBER 			4pipe= 342.1cfs n=.0130 D= 6.6 108.0"-PIPE ADD SUBAREA ADD SUBAREA	100 542.1018 n=.0130 D= 5.3 84.0"-PIPE ADD SUBAREA	Qpipe= 342.1cfs n=.0130 D= 4.9 75.0"-PIPE ADD SUBAREA	OF HYDRAULICS AND NOTES 	

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Q= 64.1	53	TAL AREA(ACRES) =	TOTAL AREA(ACRES)	5	N,	•	s) = -	EA(ACRES) =		CTIVE		4736.00
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FOR CONFLUENCE		41.3		* * * * * * * * * * * * * * * * * * *	2 1.27	26.2			- 	34.3	1 1 1 1 1 1	4736.00
upipe= 41.3cfs n=.0130 D= 3.1 48.0"-PIPE							2.9		+ + 		8 9 6 7 4 1	4736.00
800		41.3	.025	.0	3 1.36		1.0	Com		34.3	21.6	4733.00
	.0050 5.7	15.6	.025	.03	- 3 1.39	9 - 22.3 				12.7	6.2	64.ft-STREET FLOW TO PT.# 4732.00
INITIAL SUBAREA	955 .0020 955 .0020 	9.8	.025	.03	4 11.71	- 16.4	· · · · · · · · · · · · · · · · · · ·	Com	6.5	· · · · ·	6.5	4731.00
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		- <u> </u>		-	ONTO	COPIED	REAM C		MA	4707.00
HYDRAULICS	PATH SLOPE V (ft) ft/ft FPS.		Fm (Avg)		-	HIN.	MIN.	TYPE TYPE MIN.	· · · · · · · · · · · · · · · · · · ·	(ACRES)	AREA C	CONCENTRATION AREA (ACRES) POINT NUMBER SUBAREA SUM
Q T	ALCULATED BY: CHECKED BY: AGE NUMBER			ES)	II LOSSES	9/1993 STUDY (AMC 11 LOSS		10/29/1993 THOD STUDY	12 10/29 L METHOD	: 12:12 TIONAL M	SA47.DAT	FILE NAME:SA47.DAT TIME/DATE OF STUDY: 12:12 10/2 5.0-YEAR STORM RATIONAL METHOD
		- 0 0 0 0 0 1	P P 1 4 4 4 4	DINTYT	LEVEL	+ m	CONFIDENCE	AN OF DI 50% CO	R PLAN Y AT 5	MASTE	SANTA ANA MASTER PLAN OF DRAINAGE RETURN FREQUENCY AT 50% CONFIDENC	CITY OF SANTA ANA MASTER 10-YEAR RETURN FREQUENCY MAP # 47

1 2 4 1 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		3 6 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9		4		- 4									4/01.00		4707.00		4739.00	4739.00		00.001	4738.00			4737.00			2 7 7 2 7 7 7 8 7 8 7 8 8 8 8 8 8 8 8 8	POINT NUMBER SUBAREA	CONCENTRATION AREA (ACRES)	5.0-YEAR STORM RATIONAL METHOD STUDY (AMC	TIME/DATE OF	FILE NAME: SA47.DAT	10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE MAP # 47	CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
		1 1 1 1 1	TOTAL	425.78	432.42	438.95	440.88	442.43	443.45	420.09	433.97	434.60	439.34	420.43	Q(cfs)			;	9.3	<u> </u>		10.7	1 2 7		; ; ; ;	17.1				UBAREA		RM RATI	OF STUDY: 12:12	7.DAT	N FREQL	ANA MI
1 1 1 1	<u> </u>	1		34.81	33.31	31.69	31.05	30.19	29.47	28.67	23.71	22.91	31.57	20.73	Tc(min)	1			82.4				±		* * 1 7	56.3	~	1 1 7 7 7				ONAL ME		1	JENCY AT	ASTER PI
			AREA(ACRES)=	81	31	69	05	19	47	67	17	91	57		~ ~	, <u> </u>	<u> </u>		c Com	<u> </u>	_ ~-	ר. רסוו				с С				TYPEIT	soft bi	THOD S	10/29/1993	, , , ,	r 50% c	AN OF
1	<u></u>	1	. 200	.268	.267	.267	.267	.266	.266	.266	.264	-264	.267	.264	CUNFLUENCED WITH		1.7			1.2	·		י זיי			m _ ∠.0		, , ,		TYPE TYPE MIN. MIN.	-L(C) 1983-1999 ADVANCED ENGINEERING SOFTWAREJ-	FUDY (A	1993	t 8 8 8 8 8 8	ONFIDEN	DRAINAG
1 E 2 7 7			437.04	• • • •	•	.1		• 				. 11	•	- 11	CED WITH		<u> </u>	1 1 1 1	····· ,						:					MIN (T ADVAN	MC II		LORAN	רהו	μ.
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		+	407.04	436.27	429.85	420.88	416.34	409.33	402.74	305.13	342.35	333.23	420.17	306.78	Aplacreel			664 .			nron-1 rro	457				1 1 1 1 1 1 7		963		[(ft) ft/ft FPS_	E]	PAGE	ç			
	 ,		+ 4001.0		5 4540.0					4/15.0		3 4720.0		~				.0020	+ + + + +	<u>-</u> -	-				278 .0076 10.1 apipe=	1 1 1 1 1		963 .0050 8.2 apipe=		1/ft F	DATUISIODEL V	PAGE NUMBER	CHECKED BY:	CALCULATED BY:		
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, , , , , , , , , , , , , , , , , , ,																	3dId-n0*09	6.6 apipe= 111.3cfs	ADD SUBAREA	3414-m0.15	L & EU UXIOTEU S122"Ent madidale"A	ADD SUBAREA	42.0"-PIPE	0	pipe≕ 81.9cfs	42.0"-PIPE	n=.0130 D= 2.7	pipe= 64.1cfs		AND NOTES		0f		4 9 8 8 9 6 9 6 9 6 8 8 8		

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WARNER AVENUE FROM MAIN STREET TO GRAND AVENUE WIDENING PROJECT PRELIMINARY DRAINAGE STUDY

APPENDIX J: PROPOSED HYDROLOGY – RATIONAL METHOD

(AES OUTPUT)

Analysis prepared by:

IBI Group 10 Exchange Place, Suite 112 Salt Lake City, UT 84111 (801) 532-4233

_____ FILE NAME: HYDRO_TY.DAT TIME/DATE OF STUDY: 10:42 06/05/2009 _____ USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION: --*TIME-OF-CONCENTRATION MODEL*--USER SPECIFIED STORM EVENT(YEAR) = 10.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *DATA BANK RAINFALL USED* *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD* *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 (FT) (FT) SIDE / SIDE / WAY (FT) (FT) (FT) (FT) (n) NO. --- ---- ----- ----- ------ ----- -----

 1
 30.0
 20.0
 0.018/0.018/0.020
 0.67
 2.00
 0.0312
 0.167
 0.0150

 2
 43.0
 38.0
 0.020/0.020/0.020
 0.67
 2.00
 0.0312
 0.167
 0.0150

 3 40.0 4 35.0 35.0 0.020/0.020/0.020 0.67 2.00 0.0312 0.167 0.0150 30.0 0.020/0.020/0.020 0.67 2.00 0.0312 0.167 0.0150 GLOBAL STREET FLOW-DEPTH CONSTRAINTS: 1. Relative Flow-Depth = -0.10 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.* *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED FLOW PROCESS FROM NODE 0.00 TO NODE 3826.00 IS CODE = 21 _____ >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<< >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<< INITIAL SUBAREA FLOW-LENGTH(FEET) = 803.00 ELEVATION DATA: UPSTREAM(FEET) = 63.00 DOWNSTREAM(FEET) = 59.90 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.410 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.307 SUBAREA TC AND LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Ap SCS TC Fp GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.) LAND USE COMMERCIAL С 10.20 0.25 0.100 69 13.41 RESIDENTIAL

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"5-7 DWELLINGS/ACRE" C 2.60 0.25 0.500 69 17.16
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.181
 SUBAREA RUNOFF(CFS) = 26.05
 TOTAL AREA(ACRES) =
                  12.80 PEAK FLOW RATE(CFS) =
                                            26.05
FLOW PROCESS FROM NODE 3826.00 TO NODE 3826.00 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.) = 13.41
 RAINFALL INTENSITY(INCH/HR) = 2.31
 AREA-AVERAGED Fm(INCH/HR) = 0.05
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.18
 EFFECTIVE STREAM AREA(ACRES) =
                          12.80
 TOTAL STREAM AREA(ACRES) = 12.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                               26.05
FLOW PROCESS FROM NODE 3825.00 TO NODE 3826.00 IS CODE =
                                               7
  _____
 >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
_____
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN.) = 29.10 RAINFALL INTENSITY(INCH/HR) = 1.48
 EFFECTIVE AREA(ACRES) = 59.90
 TOTAL AREA(ACRES) = 59.90 PEAK FLOW RATE(CFS) = 112.20
 AREA-AVERAGED Fm(INCH/HR) = 0.04 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.16
 NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
      CONFLUENCE ANALYSES.
FLOW PROCESS FROM NODE 3826.00 TO NODE 3826.00 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.) = 29.10
 RAINFALL INTENSITY(INCH/HR) = 1.48
 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.16
 EFFECTIVE STREAM AREA(ACRES) = 59.90
TOTAL STREAM AREA(ACRES) = 59.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 112.20
 ** CONFLUENCE DATA **
  STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE
        26.0513.412.3070.25(0.05)0.1812.8112.2029.101.4800.25(0.04)0.1659.9
                                           12.8 0.00
59.9 3825.00
    1
    2
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
```

** PEAK FLOW RATE TABLE **

STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE 1107.4513.412.3070.25(0.04)0.1740.40.002128.7229.101.4800.25(0.04)0.1672.73825.00 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 128.72 Tc(MIN.) = 29.10 EFFECTIVE AREA(ACRES) = 72.70 AREA-AVERAGED Fm(INCH/HR) = 0.04 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.16 TOTAL AREA(ACRES) = 72.7LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3826.00 = 803.00 FEET. FLOW PROCESS FROM NODE 3826.00 TO NODE 3834.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< _____ UPSTREAM NODE ELEVATION(FEET) = 50.30 DOWNSTREAM NODE ELEVATION(FEET) = 49.45 FLOW LENGTH(FEET) = 355.00 MANNING'S N = 0.013 USER SPECIFIED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 3.71 PIPE-FLOW(CFS) = 14.77PIPEFLOW TRAVEL TIME(MIN.) = 1.59 Tc(MIN.) = 30.69 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.435 SUBAREA LOSS RATE DATA(AMC II): Fp DEVELOPMENT TYPE/ SCS SOIL AREA SCS Ap LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN RESIDENTIAL "5-7 DWELLINGS/ACRE" C 10.30 0.25 0.500 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.500 SUBAREA AREA(ACRES) = 10.30 SUBAREA RUNOFF(CFS) = 12.15 EFFECTIVE AREA(ACRES) = 83.00 AREA-AVERAGED Fm(INCH/HR) = 0.05 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.21 TOTAL AREA(ACRES) = 83.0 PEAK FLOW RATE(CFS) = 128.72NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 43.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 38.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 113.96 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 1.03HALFSTREET FLOOD WIDTH(FEET) = 61.34 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.51 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.59 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 355.0 FT WITH ELEVATION-DROP = 0.8 FT, IS 20.0 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3834.00

LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3834.00 = 1158.00 FEET. FLOW PROCESS FROM NODE 3834.00 TO NODE 3834.00 IS CODE = 1 _____ >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<< _____ TOTAL NUMBER OF STREAMS = 2CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE: TIME OF CONCENTRATION(MIN.) = 30.69 RAINFALL INTENSITY(INCH/HR) = 1.44 AREA-AVERAGED Fm(INCH/HR) = 0.05AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.21EFFECTIVE STREAM AREA(ACRES) = 83.00 TOTAL STREAM AREA(ACRES) = 83.00 PEAK FLOW RATE(CFS) AT CONFLUENCE = 128.72 FLOW PROCESS FROM NODE 3833.00 TO NODE 3834.00 IS CODE = 7 _____ >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<< _____ USER-SPECIFIED VALUES ARE AS FOLLOWS: TC(MIN.) = 26.90 RAINFALL INTENSITY(INCH/HR) = 1.55 EFFECTIVE AREA(ACRES) = 18.40 TOTAL AREA(ACRES) = 18.40 PEAK FLOW RATE(CFS) = 18.60 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.50NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL CONFLUENCE ANALYSES. FLOW PROCESS FROM NODE 3834.00 TO NODE 3834.00 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.) = 26.90 RAINFALL INTENSITY(INCH/HR) = 1.55 AREA-AVERAGED Fm(INCH/HR) = 0.12AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.50EFFECTIVE STREAM AREA(ACRES) = 18.40 TOTAL STREAM AREA(ACRES) = 18.40 PEAK FLOW RATE(CFS) AT CONFLUENCE = 18.60 ** CONFLUENCE DATA ** Q TC Intensity Fp(Fm) Ap Ae HEADWATER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE STREAM Q Tc Intensity Fp(Fm) NUMBER 107.4515.002.1630.25(0.06)0.2350.70.00128.7230.691.4350.25(0.05)0.2183.03825.0018.6026.901.5480.25(0.12)0.5018.43833.00 1 1 2 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS. ** PEAK FLOW RATE TABLE ** STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE 122.31 15.00 2.163 0.25(0.07) 0.28 61.0 0.00 1

142.1826.901.5480.25(0.07)0.2793.63833.00145.8530.691.4350.25(0.06)0.26101.43825.00 2 3 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: 30.69 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.26 TOTAL AREA(ACRES) = 101.40.00 TO NODE 3834.00 = 1158.00 FEET. LONGEST FLOWPATH FROM NODE FLOW PROCESS FROM NODE 3834.00 TO NODE 3845.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< _____ UPSTREAM NODE ELEVATION(FEET) = 49.45 DOWNSTREAM NODE ELEVATION(FEET) = 47.94 FLOW LENGTH(FEET) = 646.00 MANNING'S N = 0.013USER SPECIFIED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 3.67 PIPE-FLOW(CFS) = 14.59*NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW* PIPEFLOW TRAVEL TIME(MIN.) = 2.94 Tc(MIN.) = 33.63 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.362 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA SCS Fp Ap LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN RESIDENTIAL 19.30 "5-7 DWELLINGS/ACRE" C 0.25 0.500 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.500 SUBAREA AREA(ACRES) = 19.30 SUBAREA RUNOFF(CFS) = 21.49 EFFECTIVE AREA(ACRES) = 120.70 AREA-AVERAGED Fm(INCH/HR) = 0.07 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.30TOTAL AREA(ACRES) = 120.7 PEAK FLOW RATE(CFS) = 145.85NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 43.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 38.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 131.26 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 1.08HALFSTREET FLOOD WIDTH(FEET) = 63.42 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.60 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.79 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 646.0 FT WITH ELEVATION-DROP = 1.5 FT, IS 32.4 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3845.00 LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3845.00 = 1804.00 FEET.

```
FLOW PROCESS FROM NODE 3845.00 TO NODE 3845.00 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.) = 33.63
 RAINFALL INTENSITY(INCH/HR) = 1.36
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.30
 EFFECTIVE STREAM AREA(ACRES) = 120.70
 TOTAL STREAM AREA(ACRES) = 120.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                               145.85
FLOW PROCESS FROM NODE 3844.00 TO NODE 3845.00 IS CODE =
                                                 7
_____
 >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
_____
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN.) = 27.40 RAINFALL INTENSITY(INCH/HR) = 1.53
 EFFECTIVE AREA(ACRES) = 30.70
 TOTAL AREA(ACRES) = 30.70
                           PEAK FLOW RATE(CFS) = 
                                               30.80
 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.50
 NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
      CONFLUENCE ANALYSES.
FLOW PROCESS FROM NODE 3845.00 TO NODE 3845.00 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.) = 27.40
 RAINFALL INTENSITY(INCH/HR) = 1.53
 AREA-AVERAGED Fm(INCH/HR) = 0.12
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.50
 EFFECTIVE STREAM AREA(ACRES) = 30.70
 TOTAL STREAM AREA(ACRES) = 30.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                               30.80
 ** CONFLUENCE DATA **
          Q TC Intensity Fp(Fm) Ap Ae HEADWATER
(CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
  STREAM Q Tc Intensity Fp(Fm)
  NUMBER
        135.0317.941.9520.25(0.08)0.3380.3142.1829.841.4590.25(0.08)0.31112.9145.8533.631.3620.25(0.07)0.30120.730.8027.401.5320.25(0.12)0.5030.7
                                                  0.00
    1
    1
                                                   3833.00
                                          120.7 3825.00
30.7 3844.00
    1
    2
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE
        161.23 17.94 1.952 0.25( 0.09) 0.37 100.4
                                                 0.00
   1
```

171.5227.401.5320.25(0.09)0.36136.93844.00171.3829.841.4590.25(0.09)0.35143.63833.00172.9433.631.3620.25(0.08)0.34151.43825.00 2 3 4 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 172.94 Tc(MIN.) = 33.63 EFFECTIVE AREA(ACRES) = 151.40 AREA-AVERAGED Fm(INCH/HR) = 0.08 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.34 TOTAL AREA(ACRES) = 151.4LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3845.00 = 1804.00 FEET. FLOW PROCESS FROM NODE 3845.00 TO NODE 3805.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< UPSTREAM NODE ELEVATION(FEET) = 47.91 DOWNSTREAM NODE ELEVATION(FEET) = 44.72 FLOW LENGTH(FEET) = 1110.00 MANNING'S N = 0.013 USER SPECIFIED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 4.07PIPE-FLOW(CFS) = 16.18PIPEFLOW TRAVEL TIME(MIN.) = 4.55 Tc(MIN.) = 38.18 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.266 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS Ap LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN RESIDENTIAL 23.90 "5-7 DWELLINGS/ACRE" С 0.25 0.500 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.500 SUBAREA AREA(ACRES) = 23.90 SUBAREA RUNOFF(CFS) = 24.55 EFFECTIVE AREA(ACRES) = 175.30 AREA-AVERAGED Fm(INCH/HR) = 0.09 AREA-AVERAGED $F_p(INCH/HR) = 0.25$ AREA-AVERAGED $A_p = 0.36$ TOTAL AREA(ACRES) = 175.3 PEAK FLOW RATE(CFS) = 185.59 STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 43.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 38.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 169.41 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 1.12HALFSTREET FLOOD WIDTH(FEET) = 65.61 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.01 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 3.37 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 1110.0 FT WITH ELEVATION-DROP = 3.2 FT, IS 36.0 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3805.00 ** PEAK FLOW RATE TABLE **

STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE 0.00 180.87 22.49 1.715 0.25(0.10) 0.39 124.3 1 189.36 31.95 1.403 0.25(0.09) 0.38 160.8 2 3844.00 188.7334.391.3450.25(0.09)0.37167.53833.00185.5938.181.2660.25(0.09)0.36175.33825.00 3 4 NEW PEAK FLOW DATA ARE: PEAK FLOW RATE(CFS) = 189.36 Tc(MIN.) = 31.95 AREA-AVERAGED Fm(INCH/HR) = 0.09 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.38 EFFECTIVE AREA(ACRES) = 160.81LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3805.00 = 2914.00 FEET. FLOW PROCESS FROM NODE 3805.00 TO NODE 3805.00 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.) = 31.95 RAINFALL INTENSITY(INCH/HR) = 1.40 AREA-AVERAGED Fm(INCH/HR) = 0.10AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.39EFFECTIVE STREAM AREA(ACRES) = 160.81 TOTAL STREAM AREA(ACRES) = 175.30PEAK FLOW RATE(CFS) AT CONFLUENCE = 189.36 FLOW PROCESS FROM NODE 3804.00 TO NODE 3805.00 IS CODE = 7 _____ >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<< ______ USER-SPECIFIED VALUES ARE AS FOLLOWS: TC(MIN.) = 52.30 RAINFALL INTENSITY(INCH/HR) = 1.06 EFFECTIVE AREA(ACRES) = 1138.80 TOTAL AREA(ACRES) = 1138.80 PEAK FLOW RATE(CFS) = 830.30 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.50NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL CONFLUENCE ANALYSES. FLOW PROCESS FROM NODE 3805.00 TO NODE 3805.00 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.) = 52.30RAINFALL INTENSITY(INCH/HR) = 1.06 AREA-AVERAGED Fm(INCH/HR) = 0.12AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.50EFFECTIVE STREAM AREA(ACRES) = 1138.80 TOTAL STREAM AREA(ACRES) = 1138.80 PEAK FLOW RATE(CFS) AT CONFLUENCE = 830.30 ** CONFLUENCE DATA ** STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE 180.87 22.49 1.715 0.25(0.10) 0.39 124.3 0.00 1

1 1 1 2	189.3631188.7334185.5938830.3052	.95 1.403 .39 1.345 .18 1.266 .30 1.058	0.25(0.25(0.25(0.25(0.25(0.09) 0.09) 0.09) 0.12)	0.38 0.37 0.36 0.50	160.8 167.5 175.3 1138.8	3844.00 3833.00 3825.00 3804.00
		TIME OF CON D FOR 2 STR		ON RAI	DIO		
STREAM NUMBER 1 2 3 4	(CFS) (MI 789.71 22 884.28 31 902.78 34 927.55 38	E ** c Intensit N.) (INCH/HR .49 1.715 .95 1.403 .39 1.345 .18 1.266 .30 1.058	1 (INCH/ 0.25(0.25(0.25(0.25(0.25(0.25(0.25(HR) 0.12) 0.12) 0.12) 0.12) 0.12)	() 0.48 0.48 0.48 0.48	ACRES) 614.0 856.5 916.2 1006.7	NODE 0.00 3844.00 3833.00 3825.00
PEAK FLOW EFFECTIVE AREA-AVERA TOTAL AREA	RATE(CFS) = AREA(ACRES) GED Fp(INCH/ (ACRES) = OWPATH FROM	NODE 0.	Tc(MIN AREA- AREA-AV 00 TO NC	I.) = AVERAG VERAGED DDE 3	ED Fm(I) Ap = 8805.00	NCH/HR) = 0.48 = 2914	.00 FEET.
	SS FROM NODE	3805.00 I	O NODE	3733.	00 IS C		
>>>>USING =========== UPSTREAM N DOWNSTREAM FLOW LENGT USER SPECI	USER-SPECIF ======= ODE ELEVATIC NODE ELEVAT H(FEET) =	N(FEET) = ION(FEET) = 248.00 MAN AMETER(INCH)	E(EXISTIN ======== 44.57 43.53 NING'S N	IG) (PR ====== = 0.	2ESSURE	FLOW)<<<<	
PIPE-FLOW PIPE-FLOW(PIPEFLOW T * 10 YEAR	VELOCITY(FEE CFS) = 1 RAVEL TIME(M	T/SEC.) = 64.41 IN.) = 0.4 TENSITY(INCH	9 Tc(= 52.7	9	
DEVELOPME	NT TYPE/ USE	SCS SOIL GROUP (CS CN
"5-7 DWELL RESIDENTIA "3-4 DWELL SUBAREA AV SUBAREA AV SUBAREA AR EFFECTIVE AREA-AVERA	INGS/ACRE" L INGS/ACRE" ERAGE PERVIC ERAGE PERVIC EA(ACRES) = AREA(ACRES) GED Fp(INCH/	C C US LOSS RATE US AREA FRAC 10.90 = 1325.00 HR) = 0.25 1325.0	0.10 ; Fp(INC TION, Ap SUBAREA AREA- AREA-AV	0. H/HR) = 0. RUNOF AVERAG	25 = 0.25 501 FF(CFS) ED Fm(I Ap =	0.600 = 9.09 NCH/HR) = 0.48	0.12
CURB HEIGH DISTANCE F INSIDE STR OUTSIDE ST SPECIFIED MAXIMUM AL STREET PAR	T(INCHES) = ROM CROWN TO EET CROSSFAL REET CROSSFA NUMBER OF HA LOWABLE STRE KWAY CROSSFA	NFORMATION: 8.0 S CROSSFALL G L(DECIMAL) = LL(DECIMAL) LFSTREETS CA ET FLOW DEPT LL(DECIMAL) TOR for Stre	TREET HA RADEBREA 0.020 = 0.02 RRYING R H(FEET) = 0.02	K(FEET 20 2UNOFF = 0. 20	r) = 38 = 1 57	.00	0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 946.32 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 1.84HALFSTREET FLOOD WIDTH(FEET) = 101.44 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.38 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 9.87 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 248.0 FT WITH ELEVATION-DROP = 1.0 FT, IS 24.7 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3733.00 ** PEAK FLOW RATE TABLE ** STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE NUMBER 22.98 1.694 0.25(0.12) 0.48 885.35 624.9 0.00 1 867.4 927.1 992.21 1.390 0.25(0.12) 0.48 32.44 2 3844.00 1013.49 34.88 1.334 0.25(0.12) 0.48 3 3833.00 1.334 0.25(0.12) 0.48 1017.61042.33 38.67 4 3825.00 1110.73 52.79 1.052 0.25(0.12) 0.48 1325.0 5 3804.00 NEW PEAK FLOW DATA ARE: PEAK FLOW RATE(CFS) = 1110.73 Tc(MIN.) = 52.79 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.48 EFFECTIVE AREA(ACRES) = 1325.00 LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3733.00 = 3162.00 FEET. FLOW PROCESS FROM NODE 3733.00 TO NODE 3733.00 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.) = 52.79RAINFALL INTENSITY(INCH/HR) = 1.05 AREA-AVERAGED Fm(INCH/HR) = 0.12AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.48EFFECTIVE STREAM AREA(ACRES) = 1325.00 TOTAL STREAM AREA(ACRES) = 1325.00 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1110.73 FLOW PROCESS FROM NODE 3732.00 TO NODE 3733.00 IS CODE = 7 _____ >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<< ______ USER-SPECIFIED VALUES ARE AS FOLLOWS: TC(MIN.) = 21.20 RAINFALL INTENSITY(INCH/HR) = 1.77 EFFECTIVE AREA(ACRES) = 8.00 TOTAL AREA(ACRES) = 8.00 PEAK FLOW RATE(CFS) = 22.00AREA-AVERAGED Fm(INCH/HR) = 0.13 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.52NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL CONFLUENCE ANALYSES. FLOW PROCESS FROM NODE 3733.00 TO NODE 3733.00 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.) = 21.20 RAINFALL INTENSITY(INCH/HR) = 1.77 AREA-AVERAGED Fm(INCH/HR) = 0.13AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.528.00 EFFECTIVE STREAM AREA(ACRES) = TOTAL STREAM AREA(ACRES) = 8.00 PEAK FLOW RATE(CFS) AT CONFLUENCE = 22.00 ** CONFLUENCE DATA ** STREAM Q Tc Intensity Fp(Fm) Q TC Intensity Fp(Fm) Ap Ae HEADWAT (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE HEADWATER NUMBER 885.35 22.98 1.694 0.25(0.12) 0.48 624.9 1 0.00 992.21 32.44 1.390 0.25(0.12) 0.48 867.4 3844.00 1 1013.49 34.88 1.334 0.25(0.12) 0.48 927.1 3833.00 1 1042.3338.671.2570.25(0.12)0.481017.61110.7352.791.0520.25(0.12)0.481325.022.0021.201.7740.25(0.13)0.528.0 3825.00 1 1 3804.00 8.0 3732.00 2 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS. ** PEAK FLOW RATE TABLE ** STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE 880.2621.201.7740.25(0.12)0.48584.4906.2822.981.6940.25(0.12)0.48632.9 3732.00 1 632.90.00875.43844.00 2 1009.08 32.44 1.390 0.25(0.12) 0.48 3 1029.6034.881.3340.25(0.12)0.48935.13833.001057.4138.671.2570.25(0.12)0.481025.63825.001123.0752.791.0520.25(0.12)0.481333.03804.00 4 5 6 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 1123.07 Tc(MIN.) = 52.79 EFFECTIVE AREA(ACRES) = 1333.00 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.48 TOTAL AREA(ACRES) = 1333.0LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3733.00 = 3162.00 FEET. FLOW PROCESS FROM NODE 3733.00 TO NODE 3739.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) << << ______ UPSTREAM NODE ELEVATION(FEET) = 43.53 DOWNSTREAM NODE ELEVATION(FEET) = 42.23 FLOW LENGTH(FEET) = 278.00 MANNING'S N = 0.013 USER SPECIFIED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 8.83 PIPE-FLOW(CFS) = 173.61 PIPEFLOW TRAVEL TIME(MIN.) = 0.52 Tc(MIN.) = 53.32 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.046 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS Ap GROUP (ACRES) (INCH/HR) (DECIMAL) CN LAND USE RESIDENTIAL "5-7 DWELLINGS/ACRE" C 11.20 0.25 0.500 69

RESTDENTIAL "3-4 DWELLINGS/ACRE" C 0.10 0.25 0.600 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.501 9.36 SUBAREA AREA(ACRES) = 11.30 SUBAREA RUNOFF(CFS) = EFFECTIVE AREA(ACRES) = 1344.30 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.48 TOTAL AREA(ACRES) = 1344.3 PEAK FLOW RATE(CFS) = 1123.07NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 43.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 38.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE TC : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 949.45 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 1.80HALFSTREET FLOOD WIDTH(FEET) = 99.79 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.61 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 10.11 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 278.0 FT WITH ELEVATION-DROP = 1.3 FT, IS 25.3 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3739.00 LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3739.00 = 3440.00 FEET. FLOW PROCESS FROM NODE 3739.00 TO NODE 3739.00 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.) = 53.32 RAINFALL INTENSITY(INCH/HR) = 1.05 AREA-AVERAGED Fm(INCH/HR) = 0.12AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.48 EFFECTIVE STREAM AREA(ACRES) = 1344.30 TOTAL STREAM AREA(ACRES) = 1344.30 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1123.07 FLOW PROCESS FROM NODE 3738.00 TO NODE 3739.00 IS CODE = _____ >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<< USER-SPECIFIED VALUES ARE AS FOLLOWS: TC(MIN.) = 26.90 RAINFALL INTENSITY(INCH/HR) = 1.55 EFFECTIVE AREA(ACRES) = 36.10 TOTAL AREA(ACRES) = 36.10 PEAK FLOW RATE(CFS) = 36.60 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.50NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL CONFLUENCE ANALYSES.

FLOW PROCESS FROM NODE 3739.00 TO NODE 3739.00 IS CODE = 1 _____ >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<< >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<< _____ TOTAL NUMBER OF STREAMS = 2CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE: TIME OF CONCENTRATION(MIN.) = 26.90 RAINFALL INTENSITY(INCH/HR) = 1.55 AREA-AVERAGED Fm(INCH/HR) = 0.12AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.50EFFECTIVE STREAM AREA(ACRES) = 36.10 TOTAL STREAM AREA(ACRES) = 36.10 PEAK FLOW RATE(CFS) AT CONFLUENCE = 36.60 ** CONFLUENCE DATA **
 Q
 Tc
 Intensity
 Fp(Fm)
 Ap
 Ae
 HEADWATER

 (CFS)
 (MIN.)
 (INCH/HR)
 (INCH/HR)
 (ACRES)
 NODE

 880.26
 21.72
 1.749
 0.25(0.12)
 0.48
 595.7
 3732.00

 906.28
 23.51
 1.672
 0.25(0.12)
 0.48
 644.2
 0.00

 1009.08
 32.97
 1.378
 0.25(0.12)
 0.48
 886.7
 3844.00

 1029.60
 35.40
 1.322
 0.25(0.12)
 0.48
 946.4
 3833.00

 1057.41
 39.20
 1.247
 0.25(0.12)
 0.48
 1036.9
 3825.00

 1123.07
 53.32
 1.046
 0.25(0.12)
 0.48
 1344.3
 3804.00

 36.60
 26.90
 1.548
 0.25(0.12)
 0.50
 36.1
 3738.00
 STREAM Q NUMBER 1 1 1 1 1 1 2 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS. ** PEAK FLOW RATE TABLE ** STREAMQTcIntensityFp(Fm)ApAeHEADWATNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE Ae HEADWATER 914.01 21.72 1.749 0.25(0.12) 0.48 624.8 3732.00 1 675.7 2 941.06 23.51 1.672 0.25(0.12) 0.48 0.00 3 979.73 26.90 1.548 0.25(0.12) 0.48 767.2 3738.00 1041.30 32.97 1.378 0.25(0.12) 0.48 922.8 3844.00 4 982.5 3833.00 5 1060.40 35.40 1.322 0.25(0.12) 0.48 1086.28 39.20 1.247 0.25(0.12) 0.48 1073.0 3825.00 6 1146.75 53.32 1.046 0.25(0.12) 0.48 1380.4 3804.00 7 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.48 TOTAL AREA(ACRES) = 1380.4LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3739.00 = 3440.00 FEET. FLOW PROCESS FROM NODE 3739.00 TO NODE 3745.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< _____ UPSTREAM NODE ELEVATION(FEET) = 42.23 DOWNSTREAM NODE ELEVATION(FEET) = 40.67 FLOW LENGTH(FEET) = 377.00 MANNING'S N = 0.013

USER SPECIFIED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 8.31

PIPE-FLOW(CFS) = 163.32*NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW* PIPEFLOW TRAVEL TIME(MIN.) = 0.76 Tc(MIN.) = 54.07 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.037 SUBAREA LOSS RATE DATA(AMC II): Fp DEVELOPMENT TYPE/ SCS SOIL AREA SCS Ар GROUP (ACRES) (INCH/HR) (DECIMAL) CN LAND USE 0.10 0.25 0.100 69 12.40 0.25 0.200 69 COMMERCIAL С С APARTMENTS RESIDENTIAL "5-7 DWELLINGS/ACRE" C 0.25 0.500 69 0.20 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.204 SUBAREA AREA(ACRES) = 12.70 SUBAREA RUNOFF(CFS) = 11.28 EFFECTIVE AREA(ACRES) = 1393.10 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.48 TOTAL AREA(ACRES) = 1393.1 PEAK FLOW RATE(CFS) = 1150.36 STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 43.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 38.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0 57 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 987.04 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 1.87 HALFSTREET FLOOD WIDTH(FEET) = 103.15 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.40 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 10.09 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 377.0 FT WITH ELEVATION-DROP = 1.6 FT, IS 31.0 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3745.00 ** PEAK FLOW RATE TABLE ** STREAM Q Tc Intensity Fp(Fm) Q TC Intensity Fp(Fm) Ap Ae HEADWAT (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE HEADWATER NUMBER 916.2022.481.7160.25(0.12)0.47637.53732.00943.7924.271.6420.25(0.12)0.48688.40.00 1 943.79 24.27 2 779.9 3738.00 985.96 27.66 1.523 0.25(0.12) 0.48 3

 985.96
 27.66
 1.523
 0.25(0.12)
 0.48
 779.9
 3738.00

 1044.89
 33.72
 1.360
 0.25(0.12)
 0.47
 935.5
 3844.00

 1063.95
 36.16
 1.307
 0.25(0.12)
 0.47
 995.2
 3833.00

 1089.81
 39.96
 1.234
 0.25(0.12)
 0.47
 1085.7
 3825.00

 1150.36
 54.07
 1.037
 0.25(0.12)
 0.48
 1393.1
 3804.00

 4 5 6 7 NEW PEAK FLOW DATA ARE: PEAK FLOW RATE(CFS) = 1150.36 Tc(MIN.) = 54.07 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.48 EFFECTIVE AREA(ACRES) = 1393.10 LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3745.00 = 3817.00 FEET. FLOW PROCESS FROM NODE 3745.00 TO NODE 3745.00 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.) = 54.07
 RAINFALL INTENSITY(INCH/HR) = 1.04
 AREA-AVERAGED Fm(INCH/HR) = 0.12
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.48
 EFFECTIVE STREAM AREA(ACRES) = 1393.10
 TOTAL STREAM AREA(ACRES) = 1393.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1150.36
FLOW PROCESS FROM NODE 3744.00 TO NODE 3745.00 IS CODE = 7
_____
 >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
_____
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN.) = 22.00 RAINFALL INTENSITY(INCH/HR) = 1.74
 EFFECTIVE AREA(ACRES) = 25.00
 TOTAL AREA(ACRES) = 25.00 PEAK FLOW RATE(CFS) =
                                                        30.00
 AREA-AVERAGED Fm(INCH/HR) = 0.07 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.27
 NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
       CONFLUENCE ANALYSES.
FLOW PROCESS FROM NODE 3745.00 TO NODE 3745.00 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.) = 22.00
 RAINFALL INTENSITY(INCH/HR) = 1.74
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.27
 EFFECTIVE STREAM AREA(ACRES) = 25.00
 TOTAL STREAM AREA(ACRES) = 25.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                     30.00
 ** CONFLUENCE DATA **
            Q TC Intensity Fp(Fm) Ap Ae HEADWATER
(CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
  STREAM Q Tc Intensity Fp(Fm)
  NUMBER
          916.2022.481.7160.25(0.12)0.47637.53732.00943.7924.271.6420.25(0.12)0.48688.40.00
     1
     1
                                                   779.9 3738.00
          985.96 27.66 1.523 0.25( 0.12) 0.48
     1
         985.9627.661.5230.25(0.12)0.48779.93738.001044.8933.721.3600.25(0.12)0.47935.53844.001063.9536.161.3070.25(0.12)0.47995.23833.001089.8139.961.2340.25(0.12)0.471085.73825.001150.3654.071.0370.25(0.12)0.481393.13804.0030.0022.001.7370.25(0.07)0.2725.03744.00
     1
     1
     1
     1
     2
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE
          938.61 22.00 1.737 0.25( 0.12) 0.47 648.9
     1
                                                           3744.00
         945.8122.481.7160.25(0.12)0.47662.53732.00972.0924.271.6420.25(0.12)0.47713.40.001012.1327.661.5230.25(0.12)0.47804.93738.00
     2
     3
     4
```

1068.1133.721.3600.25(0.12)0.47960.53844.001086.2236.161.3070.25(0.12)0.471020.23833.001110.7739.961.2340.25(0.12)0.471110.73825.001167.7954.071.0370.25(0.12)0.481418.13804.00 5 6 7 8 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 1167.79 Tc(MIN.) = 54.07 EFFECTIVE AREA(ACRES) = 1418.10 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.48 TOTAL AREA(ACRES) = 1418.10.00 TO NODE 3745.00 = LONGEST FLOWPATH FROM NODE 3817.00 FEET. FLOW PROCESS FROM NODE 3745.00 TO NODE 3746.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< _____ UPSTREAM NODE ELEVATION(FEET) = 40.39 DOWNSTREAM NODE ELEVATION(FEET) = 39.40 FLOW LENGTH(FEET) = 385.00 MANNING'S N = 0.013 USER SPECIFIED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 6.98 PIPE-FLOW(CFS) = 166.00PIPEFLOW TRAVEL TIME(MIN.) = 0.92 Tc(MIN.) = 54.99 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.028 SUBAREA LOSS RATE DATA(AMC II): Fp DEVELOPMENT TYPE/ SCS SOIL AREA SCS Ap LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN COMMERCIAL C 1.50 0.25 0.100 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100 SUBAREA AREA(ACRES) = 1.50 SUBAREA RUNOFF(CFS) = 1.35 EFFECTIVE AREA(ACRES) = 1419.60 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED $F_p(INCH/HR) = 0.25$ AREA-AVERAGED $A_p = 0.48$ TOTAL AREA(ACRES) = 1419.6 PEAK FLOW RATE(CFS) = 1167.79 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 43.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 38.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 1001.79 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 2.06HALFSTREET FLOOD WIDTH(FEET) = 112.43 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.49 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 9.23 LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3746.00 = 4202.00 FEET. FLOW PROCESS FROM NODE 3746.00 TO NODE 3747.00 IS CODE = 43

_____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< _____ UPSTREAM NODE ELEVATION(FEET) = 39.27 DOWNSTREAM NODE ELEVATION(FEET) = 39.07 FLOW LENGTH(FEET) = 137.00 MANNING'S N = 0.013USER SPECIFIED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 5.42 PIPE-FLOW(CFS) = 140.82*NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW* PIPEFLOW TRAVEL TIME(MIN.) = 0.42 Tc(MIN.) = 55.42 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.023 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS GROUP (ACRES) (INCH/HR) (DECIMAL) CN LAND USE 2.60 0.25 С 69 COMMERCIAL 0.100 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100 SUBAREA RUNOFF(CFS) = SUBAREA AREA(ACRES) = 2.60 EFFECTIVE AREA(ACRES) = 1422.20 2.34 AREA-AVERAGED Fm(INCH/HR) = 0.12AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.48 TOTAL AREA(ACRES) = 1422.2PEAK FLOW RATE(CFS) = 1167.79 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 43.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 38.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 1026.97 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 2.31HALFSTREET FLOOD WIDTH(FEET) = 125.31 AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.61 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 8.36 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 137.0 FT WITH ELEVATION-DROP = 0.2 FT, IS 7.2 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3747.00 0.00 TO NODE 3747.00 = 4339.00 FEET. LONGEST FLOWPATH FROM NODE FLOW PROCESS FROM NODE 3747.00 TO NODE 3747.00 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.) = 55.42 RAINFALL INTENSITY(INCH/HR) = 1.02 AREA-AVERAGED Fm(INCH/HR) = 0.12AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.48

EFFECTIVE STREAM AREA(ACRES) = 1422.20 TOTAL STREAM AREA(ACRES) = 1422.20 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1167.79 FLOW PROCESS FROM NODE 3752.00 TO NODE 3747.00 IS CODE = 7 _____ >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<< USER-SPECIFIED VALUES ARE AS FOLLOWS: TC(MIN.) = 24.60 RAINFALL INTENSITY(INCH/HR) = 1.63 EFFECTIVE AREA(ACRES) = 31.30 TOTAL AREA(ACRES) = 31.30 PEAK FLOW RATE(CFS) = 36.30 AREA-AVERAGED Fm(INCH/HR) = 0.03 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.12NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL CONFLUENCE ANALYSES. FLOW PROCESS FROM NODE 3747.00 TO NODE 3747.00 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.) = 24.60 RAINFALL INTENSITY(INCH/HR) = 1.63 AREA-AVERAGED Fm(INCH/HR) = 0.03AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.12EFFECTIVE STREAM AREA(ACRES) = 31.30 TOTAL STREAM AREA(ACRES) = 31.30 PEAK FLOW RATE(CFS) AT CONFLUENCE = 36.30 ** CONFLUENCE DATA ** STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER (CFS) (MIN.) (INCH/HR) (INCH/HR) NUMBER (ACRES) NODE 938.61 23.34 1.679 0.25(0.12) 0.46 653.0 3744.00 1 945.8123.821.6600.25(0.12)0.46666.63732.00972.0925.611.5920.25(0.12)0.47717.50.001012.1329.001.4830.25(0.12)0.47809.03738.001068.1135.071.3300.25(0.12)0.47964.63844.00 1 1 1 1012.13 29.00 1.483 0.25(0.12) 0.47 1 1086.2237.501.2800.25(0.12)0.471024.33833.001110.7741.301.2110.25(0.12)0.471114.83825.001167.7955.421.0230.25(0.12)0.481422.23804.0036.3024.601.6290.25(0.03)0.1231.33752.00 1 1 1 2 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS. ** PEAK FLOW RATE TABLE **

 ** PEAK FLOW RATE TABLE **

 STREAM
 Q
 Tc
 Intensity
 Fp(Fm)
 Ap
 Ae
 HEADWATER

 NUMBER
 (CFS)
 (MIN.)
 (INCH/HR)
 (INCH/HR)
 (ACRES)
 NODE

 1
 974.13
 23.34
 1.679
 0.25(0.11)
 0.45
 682.7
 3744.00

 2
 981.63
 23.82
 1.660
 0.25(0.11)
 0.45
 696.9
 3732.00

 3
 993.58
 24.60
 1.629
 0.25(0.11)
 0.45
 720.1
 3752.00

 4
 1007.55
 25.61
 1.592
 0.25(0.11)
 0.45
 748.8
 0.00

 5
 1045.10
 29.00
 1.483
 0.25(0.11)
 0.45
 840.3
 3738.00

 6
 1097.62
 35.07
 1.330
 0.25(0.11)
 0.46
 995.9
 3844.00

 7
 114.58
 37.50
 1.280
 0.25(0.11)
 0.46
 1055.6
 3833.00

 8
 1137.57
 41.30
 1.211
 0.25(0.12)
 0.47
 1453.5
 3804.00

 9
 1190.33
 55.42
 1.023</td

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COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 1190.33 Tc(MIN.) = 55.42
 EFFECTIVE AREA(ACRES) = 1453.50 AREA-AVERAGED Fm(INCH/HR) = 0.12
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.47
 TOTAL AREA(ACRES) = 1453.5
 LONGEST FLOWPATH FROM NODE
                        0.00 TO NODE 3747.00 =
                                              4339.00 FEET.
FLOW PROCESS FROM NODE 3747.00 TO NODE 3766.00 IS CODE = 41
_____
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <<<<<
_____
 ELEVATION DATA: UPSTREAM(FEET) = 39.07 DOWNSTREAM(FEET) = 38.47
 FLOW LENGTH(FEET) = 300.00 MANNING'S N = 0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.35
 (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
 GIVEN PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1190.33
 PIPE TRAVEL TIME(MIN.) = 0.79
                          Tc(MIN.) =
                                    56.20
 LONGEST FLOWPATH FROM NODE
                        0.00 TO NODE 3766.00 =
                                              4639.00 FEET.
FLOW PROCESS FROM NODE 3766.00 TO NODE 3766.00 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.) = 56.20
 RAINFALL INTENSITY(INCH/HR) = 1.01
 AREA-AVERAGED Fm(INCH/HR) = 0.12
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.47
 EFFECTIVE STREAM AREA(ACRES) = 1453.50
 TOTAL STREAM AREA(ACRES) = 1453.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1190.33
FLOW PROCESS FROM NODE 3761.00 TO NODE 3761.00 IS CODE = 21
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
_____
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 735.00
 ELEVATION DATA: UPSTREAM(FEET) = 73.00 DOWNSTREAM(FEET) = 66.00
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 10.805
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.610
 SUBAREA TC AND LOSS RATE DATA(AMC II):
                  SCS SOIL AREA
                                         Ap SCS
  DEVELOPMENT TYPE/
                                  Fp
                                                    TC
                   GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
    LAND USE
 COMMERCIAL
                    С
                           5.00 0.25 0.100 69 10.81
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"
                   С
                            0.10 0.25 0.500 69 13.83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.108
 SUBAREA RUNOFF(CFS) = 11.86
TOTAL AREA(ACRES) = 5.10 PEAK FLOW RATE(CFS) = 11.86
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FLOW PROCESS FROM NODE 3761.00 TO NODE 3762.00 IS CODE = 61 _____ >>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<< >>>>(STANDARD CURB SECTION USED) << << _____ UPSTREAM ELEVATION(FEET) = 66.00 DOWNSTREAM ELEVATION(FEET) = 65.00 STREET LENGTH(FEET) = 315.00 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 18.00DISTANCE 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 = 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) = 17.00 ***STREET FLOWING FULL*** STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.56HALFSTREET FLOOD WIDTH(FEET) = 18.00 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.05 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.14 STREET FLOW TRAVEL TIME(MIN.) = 2.56 Tc(MIN.) = 13.36 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.311 SUBAREA LOSS RATE DATA(AMC II): SCS DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap GROUP (ACRES) (INCH/HR) (DECIMAL) CN LAND USE 2.60 0.25 0.100 69 COMMERCIAL С RESIDENTIAL "5-7 DWELLINGS/ACRE" 2.50 0.25 С 0.500 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.296 SUBAREA AREA(ACRES) = 5.10 SUBAREA RUNOFF(CFS) = 10.27 EFFECTIVE AREA(ACRES) = 10.20 AREA-AVERAGED Fm(INCH/HR) = 0.05 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.20 TOTAL AREA(ACRES) = 10.2 PEAK FLOW RATE(CFS) = 20.75 END OF SUBAREA STREET FLOW HYDRAULICS: DEPTH(FEET) = 0.59 HALFSTREET FLOOD WIDTH(FEET) = 18.00 FLOW VELOCITY(FEET/SEC.) = 2.22 DEPTH*VELOCITY(FT*FT/SEC.) = 1.30 LONGEST FLOWPATH FROM NODE 3761.00 TO NODE 3762.00 = 1050.00 FEET. FLOW PROCESS FROM NODE 3762.00 TO NODE 3763.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< UPSTREAM NODE ELEVATION(FEET) = 49.10 DOWNSTREAM NODE ELEVATION(FEET) = 47.10 FLOW LENGTH(FEET) = 1000.00 MANNING'S N = 0.013 USER SPECIFIED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 3.14 PIPE-FLOW(CFS) = 9.86 PIPEFLOW TRAVEL TIME(MIN.) = 5.32 Tc(MIN.) = 18.68 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.908 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS Ap LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN 0.100 69 COMMERCIAL С 7.30 0.25 RESIDENTIAL "5-7 DWELLINGS/ACRE" C 6.10 0.25 0.500 69 RESIDENTIAL "3-4 DWELLINGS/ACRE" C 0.80 0.25 0.600 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.300SUBAREA AREA(ACRES) = 14.20 SUBAREA RUNOFF(CFS) = 23.42 EFFECTIVE AREA(ACRES) = 24.40 AREA-AVERAGED Fm(INCH/HR) = 0.06 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.26 TOTAL AREA(ACRES) = 24.4PEAK FLOW RATE(CFS) = 40.47 STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 35.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 30.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 30.61 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.72HALFSTREET FLOOD WIDTH(FEET) = 30.69 AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.88 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.35 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 1000.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 25.0 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3763.00 LONGEST FLOWPATH FROM NODE 3761.00 TO NODE 3763.00 = 2050.00 FEET. FLOW PROCESS FROM NODE 3763.00 TO NODE 3764.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<< _____ UPSTREAM NODE ELEVATION(FEET) = 47.10 DOWNSTREAM NODE ELEVATION(FEET) = 45.10 FLOW LENGTH(FEET) = 1000.00 MANNING'S N = 0.013 USER SPECIFIED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 3.88 PIPE-FLOW(CFS) = 23.05PIPEFLOW TRAVEL TIME(MIN.) = 4.30 Tc(MIN.) = 22.98 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.694 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS qА LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN COMMERCIAL С 3.40 0.25 0.100 69 RESIDENTIAL "5-7 DWELLINGS/ACRE" C 10.60 0.25 0.500 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.403 SUBAREA AREA(ACRES) = 14.00 SUBAREA RUNOFF(CFS) = 20.08 EFFECTIVE AREA(ACRES) = 38.40 AREA-AVERAGED Fm(INCH/HR) = 0.08

AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.31 TOTAL AREA(ACRES) = 38.4 PEAK FLOW RATE(CFS) = 55.86 STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 35.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 30.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57STREET 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 = 0.0300 *NOTE: STREET-CAPACITY MAY BE EXCEEDED* STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 32.81 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.73HALFSTREET FLOOD WIDTH(FEET) = 32.22 AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.91 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.40 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS, AND L = 1000.0 FT WITH ELEVATION-DROP = 2.0 FT, IS 24.4 CFS, WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3764.00 LONGEST FLOWPATH FROM NODE 3761.00 TO NODE 3764.00 = 3050.00 FEET. FLOW PROCESS FROM NODE 3764.00 TO NODE 3765.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< _____ UPSTREAM NODE ELEVATION(FEET) = 45.10 DOWNSTREAM NODE ELEVATION(FEET) = 42.90 FLOW LENGTH(FEET) = 1100.00 MANNING'S N = 0.013 USER SPECIFIED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 4.11 PIPE-FLOW(CFS) = 29.07 PIPEFLOW TRAVEL TIME(MIN.) = 4.46 Tc(MIN.) = 27.44 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.530 SUBAREA LOSS RATE DATA(AMC II): Fp DEVELOPMENT TYPE/ SCS SOIL AREA Ap SCS LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN COMMERCIAL С 5.20 0.25 0.100 69 RESIDENTIAL "5-7 DWELLINGS/ACRE" C 9.00 0.25 0.500 69 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.354 SUBAREA AREA(ACRES) = 14.20SUBAREA RUNOFF(CFS) = 18.43EFFECTIVE AREA(ACRES) = 52.60AREA-AVERAGED Fm(INCH/HR) = 0.08AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.32 TOTAL AREA(ACRES) = 52.6PEAK FLOW RATE(CFS) = 68.63 STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 35.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 30.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

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Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 39.56
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) = 0.78
    HALFSTREET FLOOD WIDTH(FEET) = 36.43
    AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.97
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.53
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L = 1100.0 FT WITH ELEVATION-DROP = 2.2 FT, IS 24.3 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3765.00
  LONGEST FLOWPATH FROM NODE 3761.00 TO NODE 3765.00 = 4150.00 FEET.
FLOW PROCESS FROM NODE 3765.00 TO NODE 3766.00 IS CODE = 41
_____
  >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <<<<<
ELEVATION DATA: UPSTREAM(FEET) = 42.90 DOWNSTREAM(FEET) = 42.26
  FLOW LENGTH(FEET) = 320.00 MANNING'S N = 0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) = 4.56
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES =
  PIPE-FLOW(CFS) = 68.63
  PIPE TRAVEL TIME(MIN.) = 1.17 Tc(MIN.) = 28.61
  LONGEST FLOWPATH FROM NODE 3761.00 TO NODE 3766.00 =
                                                                    4470.00 FEET.
FLOW PROCESS FROM NODE 3766.00 TO NODE 3766.00 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.) = 28.61
  RAINFALL INTENSITY(INCH/HR) = 1.49
  AREA-AVERAGED Fm(INCH/HR) = 0.08
  AREA-AVERAGED Fp(INCH/HR) = 0.25
  AREA-AVERAGED Ap = 0.32
  EFFECTIVE STREAM AREA(ACRES) = 52.60
  TOTAL STREAM AREA(ACRES) = 52.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =
                                              68.63
  ** CONFLUENCE DATA **
               CICIntensityFp(Fm)ApAeHEADWATER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE974.1324.131647025.41
   STREAM Q Tc Intensity Fp(Fm)
   NUMBER

      974.13
      24.13
      1.647
      0.25(
      0.11)
      0.45
      682.7

      981.63
      24.61
      1.629
      0.25(
      0.11)
      0.45
      696.9

      993.58
      25.39
      1.600
      0.25(
      0.11)
      0.45
      720.1

      1007.55
      26.39
      1.565
      0.25(
      0.11)
      0.45
      748.8

                                                                         3744.00
      1

      981.63
      24.61
      1.629
      0.25(
      0.11)
      0.45
      696.9
      3732.00

      993.58
      25.39
      1.600
      0.25(
      0.11)
      0.45
      720.1
      3752.00

      1007.55
      26.39
      1.565
      0.25(
      0.11)
      0.45
      748.8
      0.00

      1045.10
      29.78
      1.460
      0.25(
      0.11)
      0.45
      840.3
      3738.00

      1097.62
      35.85
      1.313
      0.25(
      0.11)
      0.46
      995.9
      3844.00

      1
      1
      1
      1
      1
      1
            1114.58 38.29 1.264 0.25( 0.11) 0.46 1055.6 3833.00
           1137.5742.081.1980.25(0.11)0.461146.13825.001190.3356.201.0150.25(0.12)0.471453.53804.0068.6328.611.4940.25(0.08)0.3252.63761.00
      1
      1
      2
```

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE ** STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE 1038.28 24.13 1.647 0.25(0.11) 0.44 727.1 1 3744.00 1046.29 24.61 1.629 0.25(0.11) 0.44 742.2 2 3732.00 3 1059.04 25.39 1.600 0.25(0.11) 0.44 766.8 3752.00 4 1074.02 26.39 1.565 0.25(0.11) 0.44 797.4 0.00 1100.71 28.61 1.494 0.25(0.11) 0.45 861.2 3761.00 5 1112.07 29.78 1.460 0.25(0.11) 0.45 892.9 3738.00 6 1157.44 35.85 1.313 0.25(0.11) 0.45 1048.5 7 3844.00 1172.05 38.29 1.264 0.25(0.11) 0.45 1108.2 8 3833.00 1191.8142.081.1980.25(0.11)0.451198.73825.001235.6856.201.0150.25(0.12)0.461506.13804.00 9 10 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 1235.68 Tc(MIN.) = 56.20EFFECTIVE AREA(ACRES) = 1506.10 AREA-AVERAGED Fm(INCH/HR) = 0.12AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.46 TOTAL AREA(ACRES) = 1506.1LONGEST FLOWPATH FROM NODE 0.00 TO NODE 3766.00 = 4639.00 FEET. FLOW PROCESS FROM NODE 3766.00 TO NODE 3767.00 IS CODE = 43 _____ >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<< _____ UPSTREAM NODE ELEVATION(FEET) = 38.47 DOWNSTREAM NODE ELEVATION(FEET) = 36.07 FLOW LENGTH(FEET) = 1200.00 MANNING'S N = 0.013 USER SPECIFIED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY(FEET/SEC.) = 6.34PIPE-FLOW(CFS) = 164.83*NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW* PIPEFLOW TRAVEL TIME(MIN.) = 3.15 Tc(MIN.) = 59.36 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 0.984 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fp SCS Ap LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN COMMERCIAL С 7.90 0.25 0.100 69 RESIDENTIAL "5-7 DWELLINGS/ACRE" C 9.40 0.25 0.500 69 RESIDENTIAL "5-7 DWELLINGS/ACRE" D 0.10 0.20 0.500 75 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.318 SUBAREA AREA(ACRES) =17.40SUBAREA RUNOFF(CFS) =14.16EFFECTIVE AREA(ACRES) =1523.50AREA-AVERAGED Fm(INCH/HR) =0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.46 TOTAL AREA(ACRES) = 1523.5PEAK FLOW RATE(CFS) = 1235.68 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE STREET CROSS-SECTION INFORMATION: CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 40.00 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 35.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.57

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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 = 0.0300
 *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
 STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
 STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 1070.85
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) = 2.24
   HALFSTREET FLOOD WIDTH(FEET) = 118.70
   AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.14
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 9.27
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
       AND L = 1200.0 FT WITH ELEVATION-DROP = 2.4 FT, IS 29.3 CFS,
       WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE 3767.00
                           0.00 TO NODE 3767.00 = 5839.00 FEET.
 LONGEST FLOWPATH FROM NODE
FLOW PROCESS FROM NODE 3767.00 TO NODE 3704.00 IS CODE = 43
_____
 >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW) <<<<<
_____
 UPSTREAM NODE ELEVATION(FEET) = 36.07
DOWNSTREAM NODE ELEVATION(FEET) = 33.91
 FLOW LENGTH(FEET) = 1080.00 MANNING'S N = 0.013
 USER SPECIFIED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.34
 PIPE-FLOW(CFS) = 164.83
 *NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW*
 PIPEFLOW TRAVEL TIME(MIN.) = 2.84 Tc(MIN.) = 62.19
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 0.958
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/ SCS SOIL AREA
                                        Fp
                                                        SCS
                                                   Ap
     LAND USE
                      GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 RESIDENTIAL
                                6.50
 "5-7 DWELLINGS/ACRE" C
                                        0.25
                                                0.500
                                                          69
 RESIDENTIAL
                                4.30
                                         0.25
 "3-4 DWELLINGS/ACRE" C
                                                0.600
                                                          69
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE" D
                                0.10 0.20
                                                0.500
                                                          75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.539
 SUBAREA AREA(ACRES) = 10.90 SUBAREA RUNOFF(CFS) = 8.07
 EFFECTIVE AREA(ACRES) = 1534.40 AREA-AVERAGED Fm(INCH/HR) = 0.12
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.46
 TOTAL AREA(ACRES) = 1534.4 PEAK FLOW RATE(CFS) = 1235.68
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
 STREET CROSS-SECTION INFORMATION:
 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 35.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 30.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =
                                         0.57
 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 = 0.0300
 *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
 STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
```

	DRAULICS (ET FLOWING			FIMATED FLC	W(CFS)	= 1070.85	
				FIMATED FLC	W:		
	FLOW DEPT						
			(EET) = 12				
			ET/SEC.) =		FO		
			-	EC.) = 9 Th Subarea		TDC.	
				ATION-DROP			15.7 CFS.
				STREET CAPA			
							19.00 FEET.
==========	=======================================	=======	===========		======	===========	
	UDY SUMMAI		4 - 0 4 4			1.0	
				TC(MIN.) = AREA-AVERAG			0 10
				AREA-AVERAG AREA-AVERAG			0.12
	RATE(CFS			AIGA AVBILAC	пр чр -	0.101	
		,					
	LOW RATE						
STREAM	Q	Tc	Intensity	Fp(Fm) (INCH/HR)	Ap	Ae	HEADWATER
NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	1038.28	30.12	1.451	0.25(0.11) 0.44	755.4	3744.00
2 3							3732.00
	1059.04	31.30	1,41/ 1,200	0.25(0.11)) 0.44	795.1 025 7	3752.00
4 5	1074.02 1100.71	34 60	1 340	0.25(0.11)) 0.44	889 5	0.00 3761.00
6	1112.07	35 78	1.315	0.25(0.11) 0.45	921 2	3738.00
7	1157.44			0.25(0.11	-		
8	1172.05			0.25(0.11		1136.5	3833.00
9	1191.81	48.08		0.25(0.11		1227.0	3825.00
10				0.25(0.12			3804.00
	============	=======			======		
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END OF RATIONAL METHOD ANALYSIS

Analysis prepared by:

IBI Group 10 Exchange Place, Suite 112 Salt Lake City, UT 84111

_____ FILE NAME: HYDRO_E.DAT TIME/DATE OF STUDY: 15:03 05/29/2009 _____ USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION: --*TIME-OF-CONCENTRATION MODEL*--USER SPECIFIED STORM EVENT(YEAR) = 10.00 SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95 *DATA BANK RAINFALL USED* *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD* *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) (n) --- ---- ----- ----- ------ ----- -----
 1
 30.0
 20.0
 0.018/0.018/0.020
 0.67
 2.00
 0.0312
 0.167
 0.0150

 2
 43.0
 38.0
 0.020/0.020/0.020
 0.67
 2.00
 0.0312
 0.167
 0.0150
 35.00.020/0.020/0.0200.672.000.03120.1670.015033.00.020/0.020/0.0200.672.000.03120.1670.0150 3 40.0 4 38.0 GLOBAL STREET FLOW-DEPTH CONSTRAINTS: 1. Relative Flow-Depth = 0.10 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.* *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED FLOW PROCESS FROM NODE 0.00 TO NODE 4705.00 IS CODE = 21 _____ >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<< >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<< INITIAL SUBAREA FLOW-LENGTH(FEET) = 1060.00 ELEVATION DATA: UPSTREAM(FEET) = 64.00 DOWNSTREAM(FEET) = 62.56 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 18.467 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.920 SUBAREA TC AND LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Ap SCS TC Fp LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.) С 9.50 0.25 0.100 69 18.47 COMMERCIAL SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25

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SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 16.20
 TOTAL AREA(ACRES) =
                   9.50 PEAK FLOW RATE(CFS) =
                                            16.20
FLOW PROCESS FROM NODE 4705.00 TO NODE 4705.00 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.) = 18.47
 RAINFALL INTENSITY(INCH/HR) = 1.92
 AREA-AVERAGED Fm(INCH/HR) = 0.03
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) =
                            9.50
 TOTAL STREAM AREA(ACRES) = 9.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                               16.20
FLOW PROCESS FROM NODE 4704.00 TO NODE 4705.00 IS CODE = 7
_____
 >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
_____
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN.) = 25.90 RAINFALL INTENSITY(INCH/HR) = 1.58
 EFFECTIVE AREA(ACRES) = 277.50
 TOTAL AREA(ACRES) = 277.50 PEAK FLOW RATE(CFS) = 342.10
 AREA-AVERAGED Fm(INCH/HR) = 0.03 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.10
 NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
      CONFLUENCE ANALYSES.
FLOW PROCESS FROM NODE 4705.00 TO NODE 4705.00 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.) = 25.90
 RAINFALL INTENSITY(INCH/HR) = 1.58
 AREA-AVERAGED Fm(INCH/HR) = 0.03
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 277.50
 TOTAL STREAM AREA(ACRES) = 277.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 342.10
 ** CONFLUENCE DATA **
          ×ICIntensityFp(Fm)ApAeHEADWATER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE16.2018.471.920025(0022)010
  STREAM Q Tc Intensity Fp(Fm)
  NUMBER
        16.2018.471.9200.25(0.03)0.109.50.00342.1025.901.5820.25(0.03)0.10277.54704.00
    1
    2
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.
 ** PEAK FLOW RATE TABLE **
  STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE
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313.1318.471.9200.25(0.03)0.10207.40.00355.4125.901.5820.25(0.03)0.10287.04704.00 1 2 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 355.41 Tc(MIN.) = 25.90 EFFECTIVE AREA(ACRES) = 287.00 AREA-AVERAGED Fm(INCH/HR) = 0.03 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10 TOTAL AREA(ACRES) = 287.00.00 TO NODE 4705.00 = LONGEST FLOWPATH FROM NODE 1060.00 FEET. FLOW PROCESS FROM NODE 4705.00 TO NODE 4706.00 IS CODE = 46 _____ >>>>COMPUTE BOX-FLOW TRAVEL TIME THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED BOX SIZE (EXISTING ELEMENT) << << _____ ELEVATION DATA: UPSTREAM(FEET) = 51.75 DOWNSTREAM(FEET) = 48.00 FLOW LENGTH(FEET) = 1041.60 MANNING'S N = 0.013 GIVEN BOX BASEWIDTH(FEET) = 7.00 GIVEN BOX HEIGHT(FEET) = 6.00 FLOWDEPTH IN BOX IS 4.66 FEET BOX-FLOW VELOCITY(FEET/SEC.) = 10.89 BOX-FLOW(CFS) = 355.41BOX-FLOW TRAVEL TIME(MIN.) = 1.59 Tc(MIN.) = 27.49 2101.60 FEET. LONGEST FLOWPATH FROM NODE 0.00 TO NODE 4706.00 = FLOW PROCESS FROM NODE 4706.00 TO NODE 4706.00 IS CODE = 81 _____ >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<< _____ MAINLINE TC(MIN.) = 27.49 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.529 SUBAREA LOSS RATE DATA(AMC II): DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN C 5.90 0.25 0.100 69 COMMERCIAL SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100 SUBAREA AREA(ACRES) =5.90SUBAREA RUNOFF(CFS) =7.98EFFECTIVE AREA(ACRES) =292.90AREA-AVERAGED Fm(INCH/HR) =0.03 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10 TOTAL AREA(ACRES) = 292.9 PEAK FLOW RATE(CFS) = 396.36 ** PEAK FLOW RATE TABLE ** STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE 346.5120.081.8300.25(0.03)0.10213.30.00396.8927.431.5310.25(0.03)0.10292.94704.00 1 2 NEW PEAK FLOW DATA ARE: PEAK FLOW RATE(CFS) = 396.89 Tc(MIN.) = 27.43AREA-AVERAGED Fm(INCH/HR) = 0.03 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED AP = 0.10 EFFECTIVE AREA(ACRES) = 292.90 FLOW PROCESS FROM NODE 4706.00 TO NODE 4707.00 IS CODE = 46 _____ >>>>COMPUTE BOX-FLOW TRAVEL TIME THRU SUBAREA<<<<< >>>>USING USER-SPECIFIED BOX SIZE (EXISTING ELEMENT) << << _____ ELEVATION DATA: UPSTREAM(FEET) = 48.00 DOWNSTREAM(FEET) = 47.56 FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013 GIVEN BOX BASEWIDTH(FEET) = 7.00 GIVEN BOX HEIGHT(FEET) = 6.00 ASSUME FULL-FLOWING BOX BOX-FLOW VELOCITY(FEET/SEC.) = 9.45 BOX-FLOW(CFS) = 396.89

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BOX-FLOW TRAVEL TIME(MIN.) = 0.23 Tc(MIN.) = 27.67
 LONGEST FLOWPATH FROM NODE 0.00 TO NODE 4707.00 = 2234.60 FEET.
1
 FLOW PROCESS FROM NODE 4707.00 TO NODE 4707.00 IS CODE =
_____
 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
_____
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 27.67
 RAINFALL INTENSITY(INCH/HR) = 1.52
 AREA-AVERAGED Fm(INCH/HR) = 0.03
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 292.90
 TOTAL STREAM AREA(ACRES) = 292.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =
                               396.89
FLOW PROCESS FROM NODE 4738.00 TO NODE 4739.00 IS CODE =
                                                7
_____
 >>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
_____
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN.) = 26.90 RAINFALL INTENSITY(INCH/HR) = 1.55
 EFFECTIVE AREA(ACRES) = 36.10
 TOTAL AREA(ACRES) = 36.10
                          PEAK FLOW RATE(CFS) = 36.60
 AREA-AVERAGED Fm(INCH/HR) = 0.12 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.50
 NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
      CONFLUENCE ANALYSES.
FLOW PROCESS FROM NODE 4739.00 TO NODE 4707.00 IS CODE = 43
_____
 >>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING) (NON-PRESSURE FLOW) << <<
_____
 UPSTREAM NODE ELEVATION(FEET) = 50.54
 DOWNSTREAM NODE ELEVATION(FEET) = 47.61
 FLOW LENGTH(FEET) = 671.00 MANNING'S N = 0.013
 USER SPECIFIED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
 DEPTH OF FLOW IN 60.0 INCH PIPE IS 18.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.96
 PIPE-FLOW(CFS) = 36.60
 *NOTE: USER SPECIFIED PIPE SYSTEM CAN CARRY TOTAL UPSTREAM FLOW*
 PIPEFLOW TRAVEL TIME(MIN.) = 1.64 Tc(MIN.) = 28.54
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.496
 SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/
                  SCS SOIL AREA
                                Fp
                                          Ap SCS
                  GROUP (ACRES) (INCH/HR) (DECIMAL) CN
C 16.10 0.25 0.100 69
    LAND USE
 COMMERCIAL
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 16.10 SUBAREA RUNOFF(CFS) = 21.32
 EFFECTIVE AREA(ACRES) = 52.20 AREA-AVERAGED Fm(INCH/HR) = 0.09
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.38
 TOTAL AREA(ACRES) = 52.2
                          PEAK FLOW RATE(CFS) = 65.88
 STREET CROSS-SECTION INFORMATION:
 CURB HEIGHT(INCHES) = 8.0 STREET HALFWIDTH(FEET) = 43.00
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DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 38.00 INSIDE STREET CROSSFALL(DECIMAL) = 0.020 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) = 0.77 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 = 0.0300 STREETFLOW HYDRAULICS BASED ON MAINLINE Tc : STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 29.28 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW: STREET FLOW DEPTH(FEET) = 0.63HALFSTREET FLOOD WIDTH(FEET) = 23.74 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.51 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.59 LONGEST FLOWPATH FROM NODE 4738.00 TO NODE 4707.00 = 671.00 FEET. FLOW PROCESS FROM NODE 4707.00 TO NODE 4707.00 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.) = 28.54 RAINFALL INTENSITY(INCH/HR) = 1.50 AREA-AVERAGED Fm(INCH/HR) = 0.09AREA-AVERAGED Fp(INCH/HR) = 0.25AREA-AVERAGED Ap = 0.38EFFECTIVE STREAM AREA(ACRES) = 52.20 TOTAL STREAM AREA(ACRES) = 52.20 PEAK FLOW RATE(CFS) AT CONFLUENCE = 65.88 ** CONFLUENCE DATA ** STREAM Q Tc Intensity Fp(Fm) Ae HEADWATER Ap (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE NUMBER 346.5120.291.8190.25(0.03)0.10213.30.00396.8927.671.5230.25(0.03)0.10292.94704.00 1

 27.07
 1.523
 0.25(0.03)
 0.10
 292.9
 4704.00

 65.88
 28.54
 1.496
 0.25(0.09)
 0.38
 52.2
 4738
 00

 1 2 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS. ** PEAK FLOW RATE TABLE ** STREAMQTcIntensityFp(Fm)ApAeHEADWATERNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE 404.1420.291.8190.25(0.04)0.14250.40.00461.9827.671.5230.25(0.04)0.14343.54704.00 1 2 451.98 27.87 1.525 0.25(0.04) 0.14 345.5 4704.00 455.68 28.54 1.496 0.25(0.04) 0.14 345.1 4738.00 3 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 461.98 Tc(MIN.) = 27.67 EFFECTIVE AREA(ACRES) = 343.51 AREA-AVERAGED Fm(INCH/HR) = 0.04 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.14TOTAL AREA(ACRES) = 345.1LONGEST FLOWPATH FROM NODE 0.00 TO NODE 4707.00 = 2234.60 FEET. FLOW PROCESS FROM NODE 4749.00 TO NODE 4707.00 IS CODE = 81 _____ >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<< _____

MAINLINE TC(MIN.) = 27.67 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 1.523 SUBAREA LOSS RATE DATA(AMC II): Fp Ap DEVELOPMENT TYPE/ SCS SOIL AREA SCS GROUP (ACRES) (INCH/HR) (DECIMAL) CN LAND USE COMMERCIAL 259.50 0.25 0.100 69 С SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100 SUBAREA AREA(ACRES) = 259.50 SUBAREA RUNOFF(CFS) = 349.89 EFFECTIVE AREA(ACRES) = 603.01 AREA-AVERAGED Fm(INCH/HR) = 0.03 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.12 TOTAL AREA(ACRES) = 604.6 PEAK FLOW RATE(CFS) = 809.91 ** PEAK FLOW RATE TABLE ** STREAMQTcIntensityFp(Fm)ApNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR) Ae HEADWATER (ACRES) NODE 821.1320.291.8190.25(0.03)0.12509.90.00809.9127.671.5230.25(0.03)0.12603.04704.00 1 2 797.39 28.54 1.496 0.25(0.03) 0.12 603.0 3 4738.00 NEW PEAK FLOW DATA ARE: PEAK FLOW RATE(CFS) = 821.13 Tc(MIN.) = 20.29 AREA-AVERAGED Fm(INCH/HR) = 0.03 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED AP = 0.12 EFFECTIVE AREA(ACRES) = 509.87 _____ END OF STUDY SUMMARY: TOTAL AREA(ACRES) = 604.6 TC(MIN.) = 20.29 EFFECTIVE AREA(ACRES) = 509.87 AREA-AVERAGED Fm(INCH/HR) = 0.03 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.120 PEAK FLOW RATE(CFS) = 821.13 ** PEAK FLOW RATE TABLE ** STREAMQTcIntensityFp(Fm)ApAeHEADWATNUMBER(CFS)(MIN.)(INCH/HR)(INCH/HR)(ACRES)NODE Ae HEADWATER 821.13 20.29 1.819 0.25(0.03) 0.12 509.9 1 0.00 809.91 27.67 1.523 0.25(0.03) 0.12 603.0 4704.00 2 3 797.39 28.54 1.496 0.25(0.03) 0.12 604.6 4738.00 _____ END OF RATIONAL METHOD ANALYSIS

WARNER AVENUE FROM MAIN STREET TO GRAND AVENUE WIDENING PROJECT PRELIMINARY DRAINAGE STUDY

APPENDIX K: HYDRAULICS – PROPOSED CONDITION

MAIN STREET TO STANDARD AVE:

Summary of HGL Output (AES – Pipeflow):

Node	FL Elevation	MH Rim/ FS Elev	Maximum HGL (2' below gutter grade)*	Existing HGL	Proposed HGL
3826					
3834					
3845	47.91/47.94	57.80	55.80	1022.22	
3805	44.57/44.72	56.88	54.88	607.25	
3733	43.53				
3739	42.23	55.34	53.34	409.09	
3745	40.39/40.67				
3746	39.27/39.40	54.01	52.01	334.94	
3747	39.07	53.98	51.98	321.87	

*Assume Storm Drain is located at the CL of Warner Ave.

STANDARD AVE TO GRAND AVE:

Summary of HGL Output (AES – Pipeflow):

Node	FL Elevation	MH Rim/ FS Elev	Maximum HGL (2' below gutter grade)*	Existing HGL	Proposed HGL
4705	39.07	53.98	51.98	57.46	
4706	39.27/39.40	54.01	52.01	55.53	
4707	40.39/40.67				

*Assume Storm Drain is located at the CL of Warner Ave.

WARNER AVENUE FROM MAIN STREET TO GRAND AVENUE WIDENING PROJECT PRELIMINARY DRAINAGE STUDY

APPENDIX L: REFERENCES

1. Hromadka II, T.V.," Orange County Hydrology Manual", October, 1986

2. Local Drainage Committee, "Orange County Local Drainage Manual", County of Orange, Environmental Management Agency, Santa Ana, California; January, 1996

3. Advanced Engineering Software, AES Rational Method Hydrology Software package, 2008

4. Boyle Engineering, Drainage Study, 1993