



Professional **E**ngineering **C**onsultants, P.A.

303 S. TOPEKA ■ WICHITA, KANSAS 67202 ■ 316-262-2691 ■ FAX 316-262-3003 ■ www.pec1.com ■ designers@pec1.com

LETTER OF TRANSMITTAL

TO: Vicky Huang, P.E.

City of Wichita - Engineering Department

455 N Main Wichita, KS 67202

ATTENTION: _____

COPIES TO: _____

PROJECT NO.: 36-98696-4649

PROJECT: Angel Acres

DATE: 2/19/99

FROM: Karen Rand

REFERENCE: Drainage Plan

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via _____ the following items:

- ☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ AutoCAD Drawing Files - Version 14 on 3.5" diskette(s)

COPIES	DATE	NO.	DESCRIPTION
2	02/19/1999		Drainage Plan for Angel Acres, an Addition to Wichita

THESE ARE TRANSMITTED as checked below:

- ☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
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☐ For review and comment ☐ _____
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REMARKS:

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SIGNED _____

Karen Rand

If enclosures are not as noted, kindly notify us at once.



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Angel Acres

Wichita, Sedgwick County, Kansas

02/18/99

Angel Acres is a residential development in Wichita, Sedgwick County, Kansas. The plat encompasses approximately 24 acres, comprised of 56 - ¼ acre lots. The drainage plan, supporting computations and data for the Angel Acres drainage plan are presented herein.

Hydrology

The proposed plat lies in the SE ¼, SE ¼, Section 13, T28S, R1W. The existing landscape is grass and trees, with an apparent waterway along the western side of the property. The property drains primarily to the south.

Runoff coefficients were estimated based on tables presented in the Design Aids section and existing land use. Two large basins from the north and west drain to this site and under 47th Street South. The drainage plan for the plat directly north of Angel Acres (The Legacy) was used to model the two basins converging on this site. Angel Acres was incorporated into the HEC-1 run for The Legacy as a sub-basin draining to the two culverts under 47th Street South. A map showing the basin boundaries, drainage calculations and the pre and post HEC-1 models are included.

The Legacy drainage plan output along with additional flows from Angel Acres was used to size the drainage channel along the western property line of this plat. A 35' wide bottom, trapezoidal channel was used for the northern portion and a 60' wide bottom, trapezoidal channel was used for the southern section.

Calculating the peak runoff, it was realized that the 100 year storm volumes would not fit into the 2 - 36" RCP' s under 47th Street South. In the case of an extreme storm, water would back up until it could flow over 47th Street South. Weir flow was assumed over the road for approximately 175 feet. A high-water elevation was determined by the height of the road plus the height of the water over the road. This high-water elevation was calculated as 93.8 City Datum. A minimum opening elevations of 95.0 City Datum was used on most of the platted lots.

The 100-yr runoff that is being directed from the Legacy and Angel Acres to the existing 18" CMP under Meridian is in excess of the pipe's capacity. Due to this constriction at Meridian, minimum openings on Lots 13-20, Block 6 and Lots 2-5, Block 5 should be set at least 1' above the centerline of Meridian.

The analysis made is based on the available site data which includes the following: 1" = 100' topographic map with 2' contours of the site and adjacent areas, The Legacy drainage plan by MKEC, USGS topographic map, Sedgwick County Soil Survey Map and references noted herein.

Storm Sewer Design

Storm sewer systems were designed using Haestad Methods StormCAD program and a design storm of 2-years. Inlets were sized using City of Wichita Type 1A Curb Inlets and the FHWA's chart for depressed curb-opening inlet capacity in sump locations. The basins in this area included the unplatted land in the middle of the development in the anticipation that portion would be developed at a later date.

Culvert Sizing

For culvert control structures, the FHWA's Hydraulic Charts for the Selection of Highway Culverts was used. Culverts under the four proposed streets were sized using the estimated 100-yr storm runoff values.

The FHWA's Culvert program was used to aid in the design of the triple 10' x 4' RCB culvert under Angel Street at the drainage easement. This culvert was sized to fit in the designed channel and not overly constrict the 100-yr flow.

Design Aids

This section includes material used to assist in designing the drainage system. A 1"=100' scale drainage plan map is enclosed in the pocket.

References

Design of Urban Highway Drainage - The State of the Art, by Reitz & Jens, Inc., April 1980.

Drainage of Highway Pavements, Hydraulic Engineering Circular #12, by Tye Engineering, Inc., March 1984.

Hydraulic Charts for the Selection of Highway Culverts, Hydraulic Engineering Circular #5 by Hydraulics Branch, Bridge Division, Office of Engineering, Federal Highway Administration, December 1965.

Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation, City of Wichita, Kansas, 1985.

Preliminary Drainage Report, The Legacy, Mid-Kansas Engineering Consultants, Inc., MKEC Project 95138, June 24, 1998.

Soil Survey of Sedgwick County, Kansas, US Department of Agriculture, Soil Conservation Service, 1979.

Angel Acres
100-yr Storm Calculations
36-98696-4649

100-yr storm runoff is routed to the drainage easement along the western property boundary.

Basin Area 30.6 Acres
(Angel Acres Addition) 0.048 Sq. miles

Time of Concentration = 15 minutes

Existing Conditions

Agricultural CN = 76
50% B Soils
50% D Soils

Developed Conditions

1/4 Ac. Residential CN = 81
50% B Soils
50% D Soils

Basin	Q ₁₀₀ Pre- Development	Q ₁₀₀ Post- Development
Northern (The Legacy)	508	492
Western (James Place)	308	296
Angel	164	177
Peak at 47th St. South	812 cfs	780 cfs

From HEC-1
See Attached

Angel Acres Drainage Plan

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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* Lahey F77L-EM/32 version 5.01 *
* Dodson & Associates, Inc. *
* RUN DATE 02/17/99 TIME 13:54:26 *
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*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 *
*****
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X   X XXXXXX XXXX   X
X   X X   X   X   XX
X   X X   X   X   X
XXXXXX XXXX   X   XXXX X
X   X X   X   X   X
X   X X   X   X   X
X   X XXXXXX XXXX   XXX

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

Angel Acres Drainage Plan

HEC-1 INPUT

PAGE 1

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1	ID THE LEGACY PRE-DEVELOPMENT FILENAME LEGPRE.DAT 6/12/98 TKM
2	ID SCS 24 HR 15 MIN DISTRIBUTION.
3	ID 2, 5, 10, 25, 50 & 100 YEAR STORMS
4	IT 15 300
5	IO 3 0
6	JR PREC .457 .600 .686 .800 .914 1
	*DIAGRAM
7	KK 10
8	KM RUNOFF TO COTTONWOOD POND WEST OF SITE
9	BA 0.231
10	PB 7.80
	* STANDARD SCS 24-HOUR TYPE II DIMENSIONLESS 15 MIN CUMULATIVE DISTRIBUTION
11	PC 0 .002 .005 .008 .011 .014 .017 .020 .023 .026
12	PC .029 .032 .035 .038 .041 .044 .048 .052 .056 .060
13	PC .064 .068 .072 .076 .080 .085 .090 .095 .100 .105
14	PC .110 .115 .120 .126 .133 .140 .147 .155 .163 .172
15	PC .181 .191 .203 .218 .236 .257 .283 .307 .337 .370
16	PC .735 .758 .776 .791 .804 .815 .825 .834 .842 .849
17	PC .856 .863 .869 .875 .881 .887 .893 .898 .903 .908
18	PC .913 .918 .922 .926 .930 .934 .938 .942 .946 .950
19	PC .953 .956 .959 .962 .965 .968 .971 .974 .977 .980
20	PC .983 .986 .989 .992 .995 .998 1.00
21	LS 0 78.0 0
22	UD 0.68
23	KK POND
24	RS 1 ELEV 89.5
25	SA 2.28 2.35 2.49 2.64 2.78
26	SE 89.5 90 91 92 93
27	SQ 0.1 76 112 148 184 220 256 292 328 364
28	SE 89.5 89.61 89.88 90.39 90.86 91.31 91.90 92.60 93.24 93.53
29	KK OS1
30	KM ONSITE WATERSHED #1
31	BA .0280
32	LS 0 82 0
33	UD 0.45
34	KK SWSE
35	KM COMBINED FLOW TO SW QUARTER OF SE QUARTER
36	HC 2
37	KK OFF2
38	KM OFFSITE FLOW TO NORTH PERIMETER OF PARCEL
39	BA 0.5594
40	LS 0 73 0
41	UD 1.44
42	KK OS2
43	KM ONSITE WATERSHED #2
44	BA .0473
45	LS 0 77 0
46	UD 0.47

Angel Acres Drainage Plan

HEC-1 INPUT

PAGE 2

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
47	KK OS3
48	KM ONSITE WATERSHED #3
49	BA .0308
50	LS 0 73 0
51	UD 0.58
52	KK SOUT
53	KM SOUTH SIDE OUTFLOW COMBINED
54	EC 3
55	KK ANGEL
56	KM ADDITIONAL FLOW FROM ANGEL ACRES
57	BA 0.048
58	LS 0 76 20
59	UD 0.15
60	KK 47TH
61	KM APPROXIMATE FLOW TO 2-3 FT RCPS AT 47TH ST
62	EC 3
63	KK OS4
64	KM ONSITE WATERSHED #4
65	BA .0198
66	LS 0 73 0
67	UD 0.62
68	ZZ

Angel Acres Drainage Plan

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
7	10	
	V	
	V	
23	POND	
	.	
29	.	OS1
	.	.
34	SWSE.....	
	.	
37	.	OFF2
	.	.
42	.	OS2
	.	.
47	.	OS3
	.	.
52	SOUT.....	
	.	
55	.	ANGEL
	.	.
60	47TH.....	
	.	
63	.	OS4

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

Angel Acres Drainage Plan

 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * MAY 1991 *
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 * Lahey F77L-EM/32 version 5.01 *
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THE LEGACY PRE-DEVELOPMENT FILENAME LEGPRE.DAT 6/12/98 TKM
 SCS 24 HR 15 MIN DISTRIBUTION.
 2, 5, 10, 25, 50 & 100 YEAR STORMS

5 IO OUTPUT CONTROL VARIABLES
 IPRINT 3 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
 NMIN 15 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 4 0 ENDING DATE
 NDTIME 0245 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.25 HOURS
 TOTAL TIME BASE 74.75 HOURS

ENGLISH UNITS
 DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND
 STORAGE VOLUME ACRE-Feet
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
 NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 0.46 0.60 0.69 0.80 0.91 1.00

*** **

 * *
 7 KK * 10 *
 * *

RUNOFF TO COTTONWOOD POND WEST OF SITE

SUBBASIN RUNOFF DATA

9 BA SUBBASIN CHARACTERISTICS
 TAREA 0.23 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 0.00 0.00 0.00 0.00 0.01 0.01 0.00 0.01 0.00 0.01
 0.01 0.00 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 0.01 0.01 0.02 0.02 0.02 0.03 0.10 0.28 0.04 0.03
 0.02 0.02 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 0.01 0.01 0.01 0.01 0.01 0.01 0.00 0.00 0.00 0.00

Angel Acres Drainage Plan

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

21 LS SCS LOSS RATE
 STRTL 0.56 INITIAL ABSTRACTION
 CRVNR 78.00 CURVE NUMBER
 RTIMP 0.00 PERCENT IMPERVIOUS AREA

22 UD SCS DIMENSIONLESS UNITGRAPH
 TLAG 0.68 LAG

UNIT HYDROGRAPH 16 END-OF-PERIOD ORDINATES

28.	96.	138.	125.	86.	49.	30.	18.	11.	7.
4.	2.	1.	1.	0.	0.				

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.59, TOTAL EXCESS = 5.21

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	356.	12.50	(CFS)			
			103.	32.	11.	10.
		(INCHES)	4.151	5.206	5.206	5.206
		(AC-FT)	51.	64.	64.	64.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
 FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.02, TOTAL EXCESS = 1.55

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	101.	12.50	(CFS)			
			31.	10.	3.	3.
		(INCHES)	1.250	1.547	1.547	1.547
		(AC-FT)	15.	19.	19.	19.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
 FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.24, TOTAL EXCESS = 2.44

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	164.	12.50	(CFS)			
			49.	15.	5.	5.
		(INCHES)	1.972	2.442	2.442	2.442
		(AC-FT)	24.	30.	30.	30.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
 FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.34, TOTAL EXCESS = 3.01

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	204.	12.50	(CFS)			
			60.	19.	6.	6.

Angel Acres Drainage Plan

(INCHES) 2.426 3.012 3.012 3.012
(AC-FT) 30. 37. 37. 37.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.45, TOTAL EXCESS = 3.79

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	259. 12.50	76.	24.	8.	8.
	(INCHES)	3.043	3.792	3.792	3.792
	(AC-FT)	37.	47.	47.	47.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 2.54, TOTAL EXCESS = 4.59

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	314. 12.50	91.	29.	10.	9.
	(INCHES)	3.672	4.592	4.592	4.592
	(AC-FT)	45.	57.	57.	57.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.59, TOTAL EXCESS = 5.21

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	356. 12.50	103.	32.	11.	10.
	(INCHES)	4.151	5.206	5.206	5.206
	(AC-FT)	51.	64.	64.	64.

CUMULATIVE AREA = 0.23 SQ MI

*** **

* *
23 KK * POND *
* *

HYDROGRAPH ROUTING DATA

24 RS	STORAGE ROUTING	1	NUMBER OF SUBREACHES
	NSTPS	ELEV	TYPE OF INITIAL CONDITION
	ITYP	89.50	INITIAL CONDITION
	RSVRIC	0.00	WORKING R AND D COEFFICIENT
	X		

25 SA	AREA	2.3	2.3	2.5	2.6	2.8
-------	------	-----	-----	-----	-----	-----

Angel Acres Drainage Plan

26 SE	ELEVATION	89.50	90.00	91.00	92.00	93.00					
27 SQ	DISCHARGE	0.	76.	112.	148.	184.	220.	256.	292.	328.	364.
28 SE	ELEVATION	89.50	89.61	89.88	90.39	90.86	91.31	91.90	92.60	93.24	93.53

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	1.16	3.58	6.14	8.85
ELEVATION	89.50	90.00	91.00	92.00	93.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.25	0.88	1.16	2.08	3.23	3.58	4.36	5.88	6.14
OUTFLOW	0.10	76.00	112.00	120.47	148.00	184.00	195.20	220.00	256.00	261.14
ELEVATION	89.50	89.61	89.88	90.00	90.39	90.86	91.00	91.31	91.90	92.00
STORAGE	7.75	8.85	9.52	10.34						
OUTFLOW	292.00	314.50	328.00	364.00						
ELEVATION	92.60	93.00	93.24	93.53						

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 76.
 THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
 THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.46

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	97.	12.75	(CFS)			
			31.	10.	3.	3.
		(INCHES)	1.250	1.551	1.583	1.585
		(AC-FT)	15.	19.	20.	20.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
+	(AC-FT)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	1.	12.75	0.	0.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
+	(FEET)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	89.76	12.75	89.56	89.52	89.51	89.51

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.60

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	142.	13.00	(CFS)			
			49.	15.	5.	5.
		(INCHES)	1.972	2.446	2.478	2.480
		(AC-FT)	24.	30.	31.	31.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
+	(AC-FT)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	2.	12.75	0.	0.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
+	(FEET)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	90.30	13.00	89.66	89.54	89.51	89.51

CUMULATIVE AREA = 0.23 SQ MI

Angel Acres Drainage Plan

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR
+ (CFS)	(HR)				74.75-HR
		(CFS)			
+ 173.	13.00	60.	19.	6.	6.
		(INCHES)	2.426	3.015	3.047
		(AC-FT)	30.	37.	38.
					38.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE		
			6-HR	24-HR	72-HR
+ (AC-FT)	(HR)				74.75-HR
+ 3.	13.00	1.	0.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE		
			6-HR	24-HR	72-HR
+ (FEET)	(HR)				74.75-HR
+ 90.71	13.00	89.75	89.57	89.52	89.52

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.80

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR
+ (CFS)	(HR)				74.75-HR
		(CFS)			
+ 216.	13.00	76.	24.	8.	8.
		(INCHES)	3.043	3.794	3.826
		(AC-FT)	37.	47.	47.
					47.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE		
			6-HR	24-HR	72-HR
+ (AC-FT)	(HR)				74.75-HR
+ 4.	13.00	1.	0.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE		
			6-HR	24-HR	72-HR
+ (FEET)	(HR)				74.75-HR
+ 91.26	13.00	89.89	89.60	89.53	89.53

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.91

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR
+ (CFS)	(HR)				74.75-HR
		(CFS)			
+ 255.	13.00	91.	29.	10.	9.
		(INCHES)	3.672	4.594	4.627
		(AC-FT)	45.	57.	57.
					57.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE		
			6-HR	24-HR	72-HR
+ (AC-FT)	(HR)				74.75-HR
+ 6.	13.00	1.	0.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE		
			6-HR	24-HR	72-HR
+ (FEET)	(HR)				74.75-HR
+ 91.88	13.00	90.05	89.65	89.55	89.55

CUMULATIVE AREA = 0.23 SQ MI

Angel Acres Drainage Plan

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***          ***          ***          ***          ***
HYDROGRAPH AT STATION    POND
FOR PLAN 1, RATIO = 1.00

PEAK FLOW    TIME          MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)          6-HR    24-HR    72-HR    74.75-HR
+ 281.      13.00          (CFS)
                              103.     32.     11.     10.
                              (INCHES)  4.150   5.208   5.240   5.242
                              (AC-FT)   51.     64.     65.     65.

PEAK STORAGE  TIME          MAXIMUM AVERAGE STORAGE
+ (AC-FT)     (HR)          6-HR    24-HR    72-HR    74.75-HR
+ 7.          13.00          2.      0.      0.      0.

PEAK STAGE    TIME          MAXIMUM AVERAGE STAGE
+ (FEET)      (HR)          6-HR    24-HR    72-HR    74.75-HR
+ 92.39       13.00          90.19   89.68   89.56   89.56
  
```

CUMULATIVE AREA = 0.23 SQ MI

*** **

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*****
*      *
29 KK  *   OS1 *
*      *
*****
  
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ONSITE WATERSHED #1

SUBBASIN RUNOFF DATA

```

31 BA  SUBBASIN CHARACTERISTICS
      TAREA      0.03  SUBBASIN AREA
  
```

PRECIPITATION DATA

```

10 PB  STORM      7.80  BASIN TOTAL PRECIPITATION
  
```

```

11 PI  INCREMENTAL PRECIPITATION PATTERN
      0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
      0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
      0.00  0.00  0.00  0.00  0.01  0.01  0.00  0.01  0.00  0.01
      0.01  0.00  0.01  0.01  0.01  0.01  0.01  0.01  0.01  0.01
      0.01  0.01  0.02  0.02  0.02  0.03  0.10  0.28  0.04  0.03
      0.02  0.02  0.01  0.01  0.01  0.01  0.01  0.01  0.01  0.01
      0.01  0.01  0.01  0.01  0.01  0.01  0.00  0.00  0.00  0.00
      0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
      0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
      0.00  0.00  0.00  0.00  0.00  0.00
  
```

```

32 LS  SCS LOSS RATE
      STRTL      0.44  INITIAL ABSTRACTION
      CRVNR      82.00  CURVE NUMBER
      RTIMP      0.00  PERCENT IMPERVIOUS AREA
  
```

```

33 UD  SCS DIMENSIONLESS UNITGRAPH
      TLAG      0.45  LAG
  
```

UNIT HYDROGRAPH 11 END-OF-PERIOD ORDINATES

```

9.      23.      20.      10.      5.      3.      1.      1.      0.      0.
0.
  
```

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.13, TOTAL EXCESS = 5.67

```

PEAK FLOW    TIME          MAXIMUM AVERAGE FLOW
+ (CFS)      (HR)          6-HR    24-HR    72-HR    74.75-HR
+ (CFS)
  
```

Angel Acres Drainage Plan

+	60.	12.25	14.	4.	1.	1.
			(INCHES) 4.490	5.670	5.670	5.670
			(AC-FT) 7.	8.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 1.73, TOTAL EXCESS = 1.84

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	19.	12.25	(CFS)			
			4.	1.	0.	0.
			(INCHES) 1.488	1.836	1.836	1.836
			(AC-FT) 2.	3.	3.	3.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 1.89, TOTAL EXCESS = 2.79

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	29.	12.25	(CFS)			
			7.	2.	1.	1.
			(INCHES) 2.251	2.795	2.795	2.795
			(AC-FT) 3.	4.	4.	4.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 1.96, TOTAL EXCESS = 3.39

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	36.	12.25	(CFS)			
			8.	3.	1.	1.
			(INCHES) 2.724	3.395	3.395	3.395
			(AC-FT) 4.	5.	5.	5.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.03, TOTAL EXCESS = 4.21

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	44.	12.25	(CFS)			
			10.	3.	1.	1.
			(INCHES) 3.360	4.208	4.208	4.208
			(AC-FT) 5.	6.	6.	6.

CUMULATIVE AREA = 0.03 SQ MI

Angel Acres Drainage Plan

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 2.09, TOTAL EXCESS = 5.04

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+ 53.	12.25	12.	4.	1.	1.
		(INCHES) 4.003	5.037	5.037	5.037
		(AC-FT) 6.	8.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.13, TOTAL EXCESS = 5.67

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+ 60.	12.25	14.	4.	1.	1.
		(INCHES) 4.490	5.670	5.670	5.670
		(AC-FT) 7.	8.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

34 KK

* SWSE *
* *

COMBINED FLOW TO SW QUARTER OF SE QUARTER

36 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.46

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+ 109.	12.75	35.	11.	4.	4.
		(INCHES) 1.274	1.582	1.611	1.612
		(AC-FT) 18.	22.	22.	22.

CUMULATIVE AREA = 0.26 SQ MI

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.60

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+ 159.	12.75	56.	17.	6.	6.
		(INCHES) 2.001	2.484	2.512	2.514
		(AC-FT) 28.	34.	35.	35.

Angel Acres Drainage Plan

CUMULATIVE AREA = 0.26 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	192.	12.75	(CFS)			
			68.	21.	7.	7.
		(INCHES)	2.456	3.056	3.085	3.087
		(AC-FT)	34.	42.	43.	43.

CUMULATIVE AREA = 0.26 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.80

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	239.	12.75	(CFS)			
			86.	27.	9.	9.
		(INCHES)	3.076	3.839	3.868	3.869
		(AC-FT)	42.	53.	53.	53.

CUMULATIVE AREA = 0.26 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.91

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	280.	12.75	(CFS)			
			103.	32.	11.	10.
		(INCHES)	3.705	4.642	4.671	4.673
		(AC-FT)	51.	64.	65.	65.

CUMULATIVE AREA = 0.26 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	308.	12.75	(CFS)			
			117.	37.	12.	12.
		(INCHES)	4.186	5.258	5.287	5.289
		(AC-FT)	58.	73.	73.	73.

CUMULATIVE AREA = 0.26 SQ MI

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37 KK

* *
* OFF2 *
* *

OFFSITE FLOW TO NORTH PERIMETER OF PARCEL

Angel Acres Drainage Plan

SUBBASIN RUNOFF DATA

39 BA SUBBASIN CHARACTERISTICS
TAREA 0.56 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

40 LS SCS LOSS RATE
STRTL 0.74 INITIAL ABSTRACTION
CRVNER 73.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

41 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 1.44 LAG

UNIT HYDROGRAPH 31 END-OF-PERIOD ORDINATES

12.	37.	75.	125.	160.	172.	169.	151.	128.	97.
73.	56.	44.	34.	26.	20.	15.	12.	9.	7.
5.	4.	3.	2.	2.	2.	1.	1.	1.	0.
0.									

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	(HR)				
	(CFS)				
+	466.	219.	70.	23.	22.
	(INCHES)	3.647	4.633	4.633	4.633
	(AC-FT)	109.	138.	138.	138.

CUMULATIVE AREA = 0.56 SQ MI

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.34, TOTAL EXCESS = 1.22

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	(HR)				
	(CFS)				
+	115.	57.	18.	6.	6.
	(INCHES)	0.940	1.223	1.223	1.223
	(AC-FT)	28.	36.	36.	36.

CUMULATIVE AREA = 0.56 SQ MI

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.65, TOTAL EXCESS = 2.03

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	(HR)				
	(CFS)				

Angel Acres Drainage Plan

+	199.	13.50	96.	31.	10.	10.
			(INCHES)	1.590	2.032	2.032
			(AC-FT)	47.	61.	61.

CUMULATIVE AREA = 0.56 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.79, TOTAL EXCESS = 2.56

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	253.	13.50	121.	38.	13.	12.
			(INCHES)	2.012	2.559	2.559
			(AC-FT)	60.	76.	76.

CUMULATIVE AREA = 0.56 SQ MI

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HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.95, TOTAL EXCESS = 3.29

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	329.	13.50	156.	49.	16.	16.
			(INCHES)	2.592	3.289	3.289
			(AC-FT)	77.	98.	98.

CUMULATIVE AREA = 0.56 SQ MI

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HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 3.08, TOTAL EXCESS = 4.05

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	406.	13.50	192.	61.	20.	20.
			(INCHES)	3.188	4.047	4.047
			(AC-FT)	95.	121.	121.

CUMULATIVE AREA = 0.56 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	466.	13.50	219.	70.	23.	22.
			(INCHES)	3.647	4.633	4.633
			(AC-FT)	109.	138.	138.

CUMULATIVE AREA = 0.56 SQ MI

Angel Acres Drainage Plan

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42 KK * OS2 *
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ONSITE WATERSHED #2

SUBBASIN RUNOFF DATA

44 BA SUBBASIN CHARACTERISTICS
TAREA 0.05 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

45 LS SCS LOSS RATE
STRTL 0.60 INITIAL ABSTRACTION
CRVNER 77.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

46 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 0.47 LAG

UNIT HYDROGRAPH 11 END-OF-PERIOD ORDINATES

13.	37.	34.	19.	9.	5.	2.	1.	1.	0.
0.									

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.71, TOTAL EXCESS = 5.09

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	87.	21.	6.	2.	2.
	12.25	4.076	5.091	5.091	5.091
		(INCHES)			
		(AC-FT)	10.	13.	13.

CUMULATIVE AREA = 0.05 SQ MI

HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.09, TOTAL EXCESS = 1.48

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	24.	6.	2.	1.	1.
	12.25	1.200	1.479	1.479	1.479
		(INCHES)			
		(AC-PT)	3.	4.	4.

CUMULATIVE AREA = 0.05 SQ MI

Angel Acres Drainage Plan

HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.32, TOTAL EXCESS = 2.36

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	40.	10.	3.	1.	1.
	12.25	1.910	2.358	2.358	2.358
		5.	6.	6.	6.
		(INCHES)			
		(AC-FT)			
		CUMULATIVE AREA =	0.05 SQ MI		

HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.43, TOTAL EXCESS = 2.92

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	50.	12.	4.	1.	1.
	12.25	2.361	2.919	2.919	2.919
		6.	7.	7.	7.
		(INCHES)			
		(AC-FT)			
		CUMULATIVE AREA =	0.05 SQ MI		

HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.55, TOTAL EXCESS = 3.69

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	63.	15.	5.	2.	2.
	12.25	2.972	3.689	3.689	3.689
		7.	9.	9.	9.
		(INCHES)			
		(AC-FT)			
		CUMULATIVE AREA =	0.05 SQ MI		

HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 2.65, TOTAL EXCESS = 4.48

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	77.	18.	6.	2.	2.
	12.25	3.599	4.482	4.482	4.482
		9.	11.	11.	11.
		(INCHES)			
		(AC-FT)			
		CUMULATIVE AREA =	0.05 SQ MI		

HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.71, TOTAL EXCESS = 5.09

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+					

Angel Acres Drainage Plan

+ 87. 12.25 (CFS) 21. 6. 2. 2.
(INCHES) 4.076 5.091 5.091 5.091
(AC-FT) 10. 13. 13. 13.

CUMULATIVE AREA = 0.05 SQ MI

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* *
47 KK * OS3 *
* *

ONSITE WATERSHEED #3

SUBBASIN RUNOFF DATA

49 BA SUBBASIN CHARACTERISTICS
TAREA 0.03 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

50 LS SCS LOSS RATE
STRTL 0.74 INITIAL ABSTRACTION
CRVNER 73.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

51 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 0.58 LAG

UNIT HYDROGRAPH
14 END-OF-PERIOD ORDINATES

5.	17.	21.	16.	9.	5.	3.	2.	1.	0.
0.	0.	0.	0.						

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)				
	(CFS)	12.	4.	1.	1.
	(INCHES)	3.728	4.633	4.633	4.633
	(AC-FT)	6.	8.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

*** **

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.34, TOTAL EXCESS = 1.22

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)				
	(CFS)				

Angel Acres Drainage Plan

+	11.	12.50	3.	1.	0.	0.
			(INCHES) 0.984	1.223	1.223	1.223
			(AC-FT) 2.	2.	2.	2.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.65, TOTAL EXCESS = 2.03

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR
+	(CFS)	(HR)			
+	20.	12.50	(CFS)		
			5.	2.	1.
			(INCHES) 1.645	2.032	2.032
			(AC-FT) 3.	3.	3.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.79, TOTAL EXCESS = 2.56

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR
+	(CFS)	(HR)			
+	25.	12.50	(CFS)		
			7.	2.	1.
			(INCHES) 2.073	2.559	2.559
			(AC-FT) 3.	4.	4.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.95, TOTAL EXCESS = 3.29

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR
+	(CFS)	(HR)			
+	33.	12.50	(CFS)		
			9.	3.	1.
			(INCHES) 2.658	3.289	3.289
			(AC-FT) 4.	5.	5.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 3.08, TOTAL EXCESS = 4.05

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR
+	(CFS)	(HR)			
+	41.	12.50	(CFS)		
			11.	3.	1.
			(INCHES) 3.263	4.047	4.047
			(AC-FT) 5.	7.	7.

CUMULATIVE AREA = 0.03 SQ MI

Angel Acres Drainage Plan

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	47.	12.50			
		(CFS)			
		12.	4.	1.	1.
		(INCHES)	3.728	4.633	4.633
		(AC-FT)	6.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

*** **

* *
52 KK * SOUT *
* *

SOUTH SIDE OUTFLOW COMBINED

54 HC HYDROGRAPH COMBINATION
ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.46

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	125.	13.50			
		(CFS)			
		65.	21.	7.	7.
		(INCHES)	0.955	1.242	1.242
		(AC-FT)	32.	42.	42.

CUMULATIVE AREA = 0.64 SQ MI

*** **

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.60

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	216.	13.25			
		(CFS)			
		110.	35.	12.	11.
		(INCHES)	1.607	2.057	2.057
		(AC-FT)	55.	70.	70.

CUMULATIVE AREA = 0.64 SQ MI

*** **

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	275.	13.25			
		(CFS)			
		139.	44.	15.	14.
		(INCHES)	2.030	2.585	2.585
		(AC-FT)	69.	88.	88.

CUMULATIVE AREA = 0.64 SQ MI

Angel Acres Drainage Plan

*** *** *** *** ***

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.80

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	358.	13.25	(CFS)			
			179.	57.	19.	18.
		(INCHES)	2.613	3.318	3.318	3.318
		(AC-FT)	89.	113.	113.	113.

CUMULATIVE AREA = 0.64 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.91

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	443.	13.25	(CFS)			
			220.	70.	23.	22.
		(INCHES)	3.212	4.079	4.079	4.079
		(AC-FT)	109.	139.	139.	139.

CUMULATIVE AREA = 0.64 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	508.	13.25	(CFS)			
			252.	80.	27.	26.
		(INCHES)	3.673	4.667	4.667	4.667
		(AC-FT)	125.	159.	159.	159.

CUMULATIVE AREA = 0.64 SQ MI

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* *
55 KK * ANGEL *
* *

ADDITIONAL FLOW FROM ANGEL ACRES

SUBBASIN RUNOFF DATA

57 BA SUBBASIN CHARACTERISTICS
TAREA 0.05 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Angel Acres Drainage Plan

0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

58 LS SCS LOSS RATE
STRTL 0.63 INITIAL ABSTRACTION
CRVNR 76.00 CURVE NUMBER
RTIMP 20.00 PERCENT IMPERVIOUS AREA

59 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 0.15 LAG

UNIT HYDROGRAPH
5 END-OF-PERIOD ORDINATES

83. 32. 7. 2. 0.
TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.26, TOTAL EXCESS = 5.54

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	(HR)				
		(CFS)			
+	164.	12.00	22.	7.	2.
		(INCHES)	4.284	5.536	5.541
		(AC-FT)	11.	14.	14.

CUMULATIVE AREA = 0.05 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 1.72, TOTAL EXCESS = 1.84

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	(HR)				
		(CFS)			
+	53.	12.00	7.	2.	1.
		(INCHES)	1.400	1.841	1.843
		(AC-FT)	4.	5.	5.

CUMULATIVE AREA = 0.05 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 1.92, TOTAL EXCESS = 2.76

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	(HR)				
		(CFS)			
+	81.	12.00	11.	4.	1.
		(INCHES)	2.121	2.753	2.755
		(AC-FT)	5.	7.	7.

CUMULATIVE AREA = 0.05 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.02, TOTAL EXCESS = 3.33

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	(HR)				
		(CFS)			
+	98.	12.00	13.	4.	1.
		(INCHES)	2.572	3.329	3.332
		(AC-FT)	7.	9.	9.

Angel Acres Drainage Plan

CUMULATIVE AREA = 0.05 SQ MI

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HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.12, TOTAL EXCESS = 4.12

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
+	(CFS)	6-HR	24-HR	72-HR	74.75-HR
+	122.	(CFS)			
	12.00	(INCHES)			
		(AC-FT)			

CUMULATIVE AREA = 0.05 SQ MI

HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 2.21, TOTAL EXCESS = 4.92

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
146.	12.00	(CFS)			
		(INCHES)			
		(AC-FT)			
		20.	6.	2.	2.
		3.809	4.919	4.924	4.924
		10.	13.	13.	13.

CUMULATIVE AREA = 0.05 SQ MI

★★★ ★★★ ★★★ ★★★ ★★★★★

HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.26, TOTAL EXCESS = 5.54

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+ (CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
		(CFS)				
+ 164.	12.00		22.	7.	2.	2.
		(INCHES)	4.284	5.536	5.541	5.541
		(AC-FT)	11.	14.	14.	14.

CUMULATIVE AREA = 0.05 SQ MI

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*****
*                                     *
60 KK                               47TH *
*                                     *
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APPROXIMATE FLOW TO 2-3 FT RCPS AT 47TH ST

62 HC HYDROGRAPH COMBINATION
 ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.46

Angel Acres Drainage Plan

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	222.	13.00	(CFS)			
			107.	35.	12.	11.
		(INCHES)	1.058	1.364	1.374	1.374
		(AC-FT)	53.	69.	69.	69.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.60

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	368.	13.00	(CFS)			
			176.	56.	19.	18.
		(INCHES)	1.731	2.206	2.217	2.218
		(AC-FT)	87.	111.	112.	112.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	461.	13.00	(CFS)			
			220.	70.	23.	23.
		(INCHES)	2.161	2.749	2.760	2.761
		(AC-FT)	109.	138.	139.	139.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.80

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	590.	13.00	(CFS)			
			280.	89.	30.	29.
		(INCHES)	2.753	3.498	3.510	3.510
		(AC-FT)	139.	176.	177.	177.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.91

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	717.	13.00	(CFS)			
			341.	108.	36.	35.
		(INCHES)	3.360	4.272	4.284	4.285
		(AC-FT)	169.	215.	216.	216.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 1.00

Angel Acres Drainage Plan

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 812.	13.00		388.	124.	41.	40.
		(INCHES)	3.824	4.868	4.881	4.882
		(AC-FT)	193.	245.	246.	246.

CUMULATIVE AREA = 0.94 SQ MI

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* *
63 KK * OS4 *
* *

ONSITE WATERSHED #4

SUBBASIN RUNOFF DATA

65 BA SUBBASIN CHARACTERISTICS
TAREA 0.02 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

66 LS SCS LOSS RATE
STRTL 0.74 INITIAL ABSTRACTION
CRVNR 73.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

67 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 0.62 LAG

UNIT HYDROGRAPH
14 END-OF-PERIOD ORDINATES

3.	10.	13.	11.	6.	4.	2.	1.	1.	0.
0.	0.	0.	0.						

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 29.	12.50		8.	2.	1.	1.
		(INCHES)	3.726	4.633	4.633	4.633
		(AC-FT)	4.	5.	5.	5.

CUMULATIVE AREA = 0.02 SQ MI

*** **

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.34, TOTAL EXCESS = 1.22

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
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Angel Acres Drainage Plan

			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	7.	12.50	2.	1.	0.	0.
			(INCHES)	0.983	1.223	1.223
			(AC-FT)	1.	1.	1.

CUMULATIVE AREA = 0.02 SQ MI

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.65, TOTAL EXCESS = 2.03

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	12.	12.50	4.	1.	0.	0.
			(INCHES)	1.644	2.032	2.032
			(AC-FT)	2.	2.	2.

CUMULATIVE AREA = 0.02 SQ MI

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.79, TOTAL EXCESS = 2.56

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	16.	12.50	4.	1.	0.	0.
			(INCHES)	2.071	2.559	2.559
			(AC-FT)	2.	3.	3.

CUMULATIVE AREA = 0.02 SQ MI

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.95, TOTAL EXCESS = 3.29

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	20.	12.50	6.	2.	1.	1.
			(INCHES)	2.657	3.289	3.289
			(AC-FT)	3.	3.	3.

CUMULATIVE AREA = 0.02 SQ MI

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 3.08, TOTAL EXCESS = 4.05

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
			(CFS)			
+	25.	12.50	7.	2.	1.	1.
			(INCHES)	3.261	4.047	4.047
			(AC-FT)	3.	4.	4.

CUMULATIVE AREA = 0.02 SQ MI

Angel Acres Drainage Plan

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW				
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR	
+	29.	12.50	8.	2.	1.	1.
		(CFS)				
		(INCHES)	3.726	4.633	4.633	4.633
		(AC-FT)	4.	5.	5.	5.

CUMULATIVE AREA = 0.02 SQ MI

Angel Acres Drainage Plan

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION					
				RATIO 1 0.46	RATIO 2 0.60	RATIO 3 0.69	RATIO 4 0.80	RATIO 5 0.91	RATIO 6 1.00
HYDROGRAPH AT									
+	10	0.23	1	FLOW TIME	101. 12.50	164. 12.50	204. 12.50	259. 12.50	314. 12.50
ROUTED TO									
+	POND	0.23	1	FLOW TIME	97. 12.75	142. 13.00	173. 13.00	216. 13.00	255. 13.00
** PEAK STAGES IN FEET **									
			1	STAGE TIME	89.76 12.75	90.30 13.00	90.71 13.00	91.26 13.00	91.88 13.00
HYDROGRAPH AT									
+	OS1	0.03	1	FLOW TIME	19. 12.25	29. 12.25	36. 12.25	44. 12.25	53. 12.25
2 COMBINED AT									
+	SWSE	0.26	1	FLOW TIME	109. 12.75	159. 12.75	192. 12.75	239. 12.75	280. 12.75
HYDROGRAPH AT									
+	OFF2	0.56	1	FLOW TIME	115. 13.50	199. 13.50	253. 13.50	329. 13.50	406. 13.50
HYDROGRAPH AT									
+	OS2	0.05	1	FLOW TIME	24. 12.25	40. 12.25	50. 12.25	63. 12.25	77. 12.25
HYDROGRAPH AT									
+	OS3	0.03	1	FLOW TIME	11. 12.50	20. 12.50	25. 12.50	33. 12.50	41. 12.50
3 COMBINED AT									
+	SOUT	0.64	1	FLOW TIME	125. 13.50	216. 13.25	275. 13.25	358. 13.25	443. 13.25
HYDROGRAPH AT									
+	ANGEL	0.05	1	FLOW TIME	53. 12.00	81. 12.00	98. 12.00	122. 12.00	146. 12.00
3 COMBINED AT									
+	47TH	0.94	1	FLOW TIME	222. 13.00	368. 13.00	461. 13.00	590. 13.00	717. 13.00
HYDROGRAPH AT									
+	OS4	0.02	1	FLOW TIME	7. 12.50	12. 12.50	16. 12.50	20. 12.50	25. 12.50

*** NORMAL END OF HEC-1 ***

Angel Acres Drainage Plan - Developed Conditions

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*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* Lahey F77L-EM/32 version 5.01 *
* Dodson & Associates, Inc. *
* RUN DATE 02/17/99 TIME 14:10:39 *
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*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 *
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X   X XXXXXX XXXX   X
X   X X   X   X   XX
X   X X   X   X   X
XXXXXX XXXX   X   XXXX X
X   X X   X   X   X
X   X X   X   X   X
X   X XXXXXX XXXX   XXX

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

Angel Acres Drainage Plan - Developed Conditions

HEC-1 INPUT

PAGE 1

LINE	ID	1	2	3	4	5	6	7	8	9	10
1	ID	THE LEGACY POST DEVELOPMENT FILENAME LEGPOST.DAT TKM 6/12/98									
2	ID	SCS 24 HR 15 MIN DISTRIBUTION.									
3	ID	2, 5, 10, 25, 50 & 100 YEAR STORMS									
4	IT	15	300								
5	IO	3	0								
6	JR	PREC	.457	.600	.686	.800	.914	1			
	*DIAGRAM										
7	KK	10									
8	KM	RUNOFF TO COTTONWOOD POND WEST OF SITE									
9	BA	0.231									
10	PB	7.80									
	* STANDARD SCS 24-HOUR TYPE II DIMENSIONLESS 15 MIN CUMULATIVE DISTRIBUTION										
11	PC	0	.002	.005	.008	.011	.014	.017	.020	.023	.026
12	PC	.029	.032	.035	.038	.041	.044	.048	.052	.056	.060
13	PC	.064	.068	.072	.076	.080	.085	.090	.095	.100	.105
14	PC	.110	.115	.120	.126	.133	.140	.147	.155	.163	.172
15	PC	.181	.191	.203	.218	.236	.257	.283	.387	.663	.707
16	PC	.735	.758	.776	.791	.804	.815	.825	.834	.842	.849
17	PC	.856	.863	.869	.875	.881	.887	.893	.898	.903	.908
18	PC	.913	.918	.922	.926	.930	.934	.938	.942	.946	.950
19	PC	.953	.956	.959	.962	.965	.968	.971	.974	.977	.980
20	PC	.983	.986	.989	.992	.995	.998	1.00			
21	LS	0	78.0	0							
22	UD	0.68									
23	KK	POND									
24	RS	1	ELEV	89.5							
25	SA	2.28	2.35	2.49	2.64	2.78					
26	SE	89.5	90	91	92	93					
27	SQ	0.1	76	112	148	184	220	256	292	328	364
28	SE	89.5	89.61	89.88	90.39	90.86	91.31	91.90	92.60	93.24	93.53
29	KK	OS1									
30	KM	ONSITE WATERSHED #1									
31	BA	.0280									
32	LS	0	85	0							
33	UD	0.26									
34	KK	SWSE									
35	KM	COMBINED FLOW TO SW QUARTER OF SE QUARTER									
36	HC	2									
37	KK	OFF2									
38	KM	OFFSITE FLOW TO NORTH PERIMETER OF PARCEL									
39	BA	0.5594									
40	LS	0	73	0							
41	UD	1.44									
42	KK	OS2									
43	KM	ONSITE WATERSHED #2									
44	BA	.0473									
45	LS	0	80	0							
46	UD	0.27									

Angel Acres Drainage Plan - Developed Conditions

HEC-1 INPUT

PAGE 2

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
47	KK OS3
48	KM ONSITE WATERSHEED #3
49	BA .0308
50	LS 0 75 0
51	UD 0.33
52	KK SOUT
53	KM SOUTH SIDE OUTFLOW COMBINED
54	HC 3
55	KK ANGEL
56	KM RUNOFF FROM ANGEL ACRES TO DRAINAGE DITCH
57	BA 0.048
58	LS 0 81 20
59	UD 0.15
60	KK 47TH
61	KM APPROXIMATE FLOW TO 2-3 FT RCPS AT 47TH ST
62	HC 3
63	KK OS4
64	KM ONSITE WATERSHEED #4
65	BA .0198
66	LS 0 75 0
67	UD 0.35
68	ZZ

Angel Acres Drainage Plan - Developed Conditions

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
7	10	
	V	
	V	
23	POND	
	.	
29	.	OS1
	.	
34	SWSE.....	
	.	
37	.	OFF2
	.	
42	.	OS2
	.	
47	.	OS3
	.	
52	SOUT.....	
	.	
55	.	ANGEL
	.	
60	47TH.....	
	.	
63	.	OS4

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

Angel Acres Drainage Plan - Developed Conditions

 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * MAY 1991 *
 * VERSION 4.0.1E *
 * Lahey F77L-EM/32 version 5.01 *
 * Dodson & Associates, Inc. *
 * RUN DATE 02/17/99 TIME 14:10:39 *

 * U.S. ARMY CORPS OF ENGINEERS *
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 * 609 SECOND STREET *
 * DAVIS, CALIFORNIA 95616 *
 * (916) 551-1748 *

THE LEGACY POST DEVELOPMENT FILENAME LEGPOST.DAT TKM 6/12/98
 SCS 24 HR 15 MIN DISTRIBUTION.
 2, 5, 10, 25, 50 & 100 YEAR STORMS

5 IO OUTPUT CONTROL VARIABLES
 IPRNT 3 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

 IT HYDROGRAPH TIME DATA
 NMIN 15 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 4 0 ENDING DATE
 NDTIME 0245 ENDING TIME
 ICENT 19 CENTURY MARK

 COMPUTATION INTERVAL 0.25 HOURS
 TOTAL TIME BASE 74.75 HOURS

ENGLISH UNITS
 DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND
 STORAGE VOLUME ACRE-FEET
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
 NPLAN 1 NUMBER OF PLANS

 JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 0.46 0.60 0.69 0.80 0.91 1.00

*** **

 *
 7 KK 10 *
 *

 RUNOFF TO COTTONWOOD POND WEST OF SITE

SUBBASIN RUNOFF DATA

9 BA SUBBASIN CHARACTERISTICS
 TAREA 0.23 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00

Angel Acres Drainage Plan - Developed Conditions

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

21 LS SCS LOSS RATE
 STRTL 0.56 INITIAL ABSTRACTION
 CRVNR 78.00 CURVE NUMBER
 RTIMP 0.00 PERCENT IMPERVIOUS AREA

22 UD SCS DIMENSIONLESS UNITGRAPH
 FLAG 0.68 LAG

UNIT HYDROGRAPH 16 END-OF-PERIOD ORDINATES

28.	96.	138.	125.	86.	49.	30.	18.	11.	7.
4.	2.	1.	1.	0.	0.				

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.59, TOTAL EXCESS = 5.21

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+		(CFS)				
+	356.	12.50	103.	32.	11.	10.
		(INCHES)	4.151	5.206	5.206	5.206
		(AC-FT)	51.	64.	64.	64.

CUMULATIVE AREA = 0.23 SQ MI

HYDROGRAPH AT STATION 10
 FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.02, TOTAL EXCESS = 1.55

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+		(CFS)				
+	101.	12.50	31.	10.	3.	3.
		(INCHES)	1.250	1.547	1.547	1.547
		(AC-FT)	15.	19.	19.	19.

CUMULATIVE AREA = 0.23 SQ MI

HYDROGRAPH AT STATION 10
 FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.24, TOTAL EXCESS = 2.44

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+		(CFS)				
+	164.	12.50	49.	15.	5.	5.
		(INCHES)	1.972	2.442	2.442	2.442
		(AC-FT)	24.	30.	30.	30.

CUMULATIVE AREA = 0.23 SQ MI

HYDROGRAPH AT STATION 10
 FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.34, TOTAL EXCESS = 3.01

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+		(CFS)				
+	204.	12.50	60.	19.	6.	6.

Angel Acres Drainage Plan - Developed Conditions

(INCHES) 2.426 3.012 3.012 3.012
(AC-FT) 30. 37. 37. 37.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.45, TOTAL EXCESS = 3.79

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+		(CFS)			
+	259. 12.50	76.	24.	8.	8.
		(INCHES) 3.043	3.792	3.792	3.792
		(AC-FT) 37.	47.	47.	47.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 2.54, TOTAL EXCESS = 4.59

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+		(CFS)			
+	314. 12.50	91.	29.	10.	9.
		(INCHES) 3.672	4.592	4.592	4.592
		(AC-FT) 45.	57.	57.	57.

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 10
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.59, TOTAL EXCESS = 5.21

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+		(CFS)			
+	356. 12.50	103.	32.	11.	10.
		(INCHES) 4.151	5.206	5.206	5.206
		(AC-FT) 51.	64.	64.	64.

CUMULATIVE AREA = 0.23 SQ MI

*** **

* *
23 KK * POND *
* *

HYDROGRAPH ROUTING DATA

24 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP ELEV TYPE OF INITIAL CONDITION
RSVRIC 89.50 INITIAL CONDITION
X 0.00 WORKING R AND D COEFFICIENT

25 SA AREA 2.3 2.3 2.5 2.6 2.8

Angel Acres Drainage Plan - Developed Conditions

26 SE	ELEVATION	89.50	90.00	91.00	92.00	93.00					
27 SQ	DISCHARGE	0.	76.	112.	148.	184.	220.	256.	292.	328.	364.
28 SE	ELEVATION	89.50	89.61	89.88	90.39	90.86	91.31	91.90	92.60	93.24	93.53

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	1.16	3.58	6.14	8.85
ELEVATION	89.50	90.00	91.00	92.00	93.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.25	0.88	1.16	2.08	3.23	3.58	4.36	5.88	6.14
OUTFLOW	0.10	76.00	112.00	120.47	148.00	184.00	195.20	220.00	256.00	261.14
ELEVATION	89.50	89.61	89.88	90.00	90.39	90.86	91.00	91.31	91.90	92.00
STORAGE	7.75	8.85	9.52	10.34						
OUTFLOW	292.00	314.50	328.00	364.00						
ELEVATION	92.60	93.00	93.24	93.53						

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 76.
 THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
 THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.46

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	(CFS)	6-HR	24-HR	72-HR	74.75-HR
+	97.	12.75	31.	10.	3.	3.
		(INCHES)	1.250	1.551	1.583	1.585
		(AC-FT)	15.	19.	20.	20.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	1.	12.75	0.	0.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
(FEET)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	89.76	12.75	89.56	89.52	89.51	89.51

CUMULATIVE AREA = 0.23 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION POND FOR PLAN 1, RATIO = 0.60

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	(CFS)	6-HR	24-HR	72-HR	74.75-HR
+	142.	13.00	49.	15.	5.	5.
		(INCHES)	1.972	2.446	2.478	2.480
		(AC-FT)	24.	30.	31.	31.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	2.	12.75	0.	0.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
(FEET)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	90.30	13.00	89.66	89.54	89.51	89.51

CUMULATIVE AREA = 0.23 SQ MI

Angel Acres Drainage Plan - Developed Conditions

***		***		***		***	
		HYDROGRAPH AT STATION		POND			
		FOR PLAN 1, RATIO = 0.69					
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW			
+ (CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 173.	13.00	(CFS)	60.	19.	6.	6.	
		(INCHES)	2.426	3.015	3.047	3.049	
		(AC-FT)	30.	37.	38.	38.	
PEAK STORAGE	TIME			MAXIMUM AVERAGE STORAGE			
+ (AC-FT)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 3.	13.00	1.	0.	0.	0.		
PEAK STAGE	TIME			MAXIMUM AVERAGE STAGE			
+ (FEET)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 90.71	13.00	89.75	89.57	89.52	89.52		
		CUMULATIVE AREA =		0.23 SQ MI			

***		***		***		***	
		HYDROGRAPH AT STATION		POND			
		FOR PLAN 1, RATIO = 0.80					
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW			
+ (CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 216.	13.00	(CFS)	76.	24.	8.	8.	
		(INCHES)	3.043	3.794	3.826	3.828	
		(AC-FT)	37.	47.	47.	47.	
PEAK STORAGE	TIME			MAXIMUM AVERAGE STORAGE			
+ (AC-FT)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 4.	13.00	1.	0.	0.	0.		
PEAK STAGE	TIME			MAXIMUM AVERAGE STAGE			
+ (FEET)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 91.26	13.00	89.89	89.60	89.53	89.53		
		CUMULATIVE AREA =		0.23 SQ MI			

***		***		***		***	
		HYDROGRAPH AT STATION		POND			
		FOR PLAN 1, RATIO = 0.91					
PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW			
+ (CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 255.	13.00	(CFS)	91.	29.	10.	9.	
		(INCHES)	3.672	4.594	4.627	4.628	
		(AC-FT)	45.	57.	57.	57.	
PEAK STORAGE	TIME			MAXIMUM AVERAGE STORAGE			
+ (AC-FT)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 6.	13.00	1.	0.	0.	0.		
PEAK STAGE	TIME			MAXIMUM AVERAGE STAGE			
+ (FEET)	(HR)	6-HR	24-HR	72-HR	74.75-HR		
+ 91.88	13.00	90.05	89.65	89.55	89.55		
		CUMULATIVE AREA =		0.23 SQ MI			

Angel Acres Drainage Plan - Developed Conditions

*** *** *** *** ***

HYDROGRAPH AT STATION POND
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	281.	13.00	103.	32.	11.	10.
		(CFS)				
		(INCHES)	4.150	5.208	5.240	5.242
		(AC-FT)	51.	64.	65.	65.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	7.	13.00	2.	0.	0.	0.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
(FEET)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	92.39	13.00	90.19	89.68	89.56	89.56

CUMULATIVE AREA = 0.23 SQ MI

*** **

* *
29 KK OS1
* *

ONSITE WATERSHED #1

SUBBASIN RUNOFF DATA

31 BA SUBBASIN CHARACTERISTICS
TAREA 0.03 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

32 LS SCS LOSS RATE
STRTL 0.35 INITIAL ABSTRACTION
CRVNR 85.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

33 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 0.26 LAG

UNIT HYDROGRAPH
7 END-OF-PERIOD ORDINATES
26. 30. 11. 4. 1. 0. 0.

TOTAL RAINFALL = 7.80, TOTAL LOSS = 1.78, TOTAL EXCESS = 6.02

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	74.	12.25	14.	5.	2.	1.
		(CFS)				

Angel Acres Drainage Plan - Developed Conditions

(INCHES) 4.730 6.020 6.020 6.020
(AC-FT) 7. 9. 9. 9.

CUMULATIVE AREA = 0.03 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 1.49, TOTAL EXCESS = 2.07

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	26.	12.25	(CFS)			
			5.	2.	1.	1.
	(INCHES)		1.674	2.073	2.073	2.073
	(AC-FT)		3.	3.	3.	3.

CUMULATIVE AREA = 0.03 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 1.61, TOTAL EXCESS = 3.07

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	39.	12.25	(CFS)			
			7.	2.	1.	1.
	(INCHES)		2.463	3.074	3.074	3.074
	(AC-FT)		4.	5.	5.	5.

CUMULATIVE AREA = 0.03 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 1.66, TOTAL EXCESS = 3.69

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	46.	12.25	(CFS)			
			9.	3.	1.	1.
	(INCHES)		2.946	3.694	3.694	3.694
	(AC-FT)		4.	6.	6.	6.

CUMULATIVE AREA = 0.03 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 1.71, TOTAL EXCESS = 4.53

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	56.	12.25	(CFS)			
			11.	3.	1.	1.
	(INCHES)		3.591	4.529	4.529	4.529
	(AC-FT)		5.	7.	7.	7.

CUMULATIVE AREA = 0.03 SQ MI

*** *** *** *** ***

Angel Acres Drainage Plan - Developed Conditions

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 1.75, TOTAL EXCESS = 5.38

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	66.	12.25	13.	4.	1.	1.
		(CFS)				
		(INCHES)	4.239	5.376	5.376	5.376
		(AC-FT)	6.	8.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

HYDROGRAPH AT STATION OS1
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 1.78, TOTAL EXCESS = 6.02

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	74.	12.25	14.	5.	2.	1.
		(CFS)				
		(INCHES)	4.730	6.020	6.020	6.020
		(AC-FT)	7.	9.	9.	9.

CUMULATIVE AREA = 0.03 SQ MI

*
34 KK * SWSE *
*

COMBINED FLOW TO SW QUARTER OF SE QUARTER

36 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.46

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	105.	12.75	36.	11.	4.	4.
		(CFS)				
		(INCHES)	1.291	1.608	1.636	1.638
		(AC-FT)	18.	22.	23.	23.

CUMULATIVE AREA = 0.26 SQ MI

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.60

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	74.75-HR
+	154.	12.75	56.	18.	6.	6.
		(CFS)				
		(INCHES)	2.020	2.514	2.542	2.544
		(AC-FT)	28.	35.	35.	35.

Angel Acres Drainage Plan - Developed Conditions

CUMULATIVE AREA = 0.26 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	185.	12.75	(CFS)			
			69.	22.	7.	7.
		(INCHES)	2.476	3.088	3.117	3.119
		(AC-FT)	34.	43.	43.	43.

CUMULATIVE AREA = 0.26 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.80

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	230.	12.75	(CFS)			
			86.	27.	9.	9.
		(INCHES)	3.096	3.874	3.902	3.904
		(AC-FT)	43.	54.	54.	54.

CUMULATIVE AREA = 0.26 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 0.91

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	269.	12.75	(CFS)			
			104.	33.	11.	11.
		(INCHES)	3.727	4.679	4.708	4.709
		(AC-FT)	51.	65.	65.	65.

CUMULATIVE AREA = 0.26 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SWSE
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
+	(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	296.	13.00	(CFS)			
			117.	37.	12.	12.
		(INCHES)	4.208	5.296	5.325	5.326
		(AC-FT)	58.	73.	74.	74.

CUMULATIVE AREA = 0.26 SQ MI

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37 KK

* OFF2 *
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OFFSITE FLOW TO NORTH PERIMETER OF PARCEL

SUBBASIN RUNOFF DATA

Angel Acres Drainage Plan - Developed Conditions

39 BA SUBBASIN CHARACTERISTICS
TAREA 0.56 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

40 LS SCS LOSS RATE
STRTL 0.74 INITIAL ABSTRACTION
CRVNR 73.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

41 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 1.44 LAG

UNIT HYDROGRAPH 31 END-OF-PERIOD ORDINATES

12.	37.	75.	125.	160.	172.	169.	151.	128.	97.
73.	56.	44.	34.	26.	20.	15.	12.	9.	7.
5.	4.	3.	2.	2.	2.	1.	1.	1.	0.
0.									

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	466.	219.	70.	23.	22.
	(INCHES)	3.647	4.633	4.633	4.633
	(AC-FT)	109.	138.	138.	138.

CUMULATIVE AREA = 0.56 SQ MI

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.34, TOTAL EXCESS = 1.22

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	115.	57.	18.	6.	6.
	(INCHES)	0.940	1.223	1.223	1.223
	(AC-FT)	28.	36.	36.	36.

CUMULATIVE AREA = 0.56 SQ MI

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.65, TOTAL EXCESS = 2.03

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	199.	96.	31.	10.	10.

Angel Acres Drainage Plan - Developed Conditions

(INCHES) 1.590 2.032 2.032 2.032
(AC-FT) 47. 61. 61. 61.

CUMULATIVE AREA = 0.56 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.79, TOTAL EXCESS = 2.56

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+		(CFS)			
+	253. 13.50	121.	38.	13.	12.
		(INCHES) 2.012	2.559	2.559	2.559
		(AC-FT) 60.	76.	76.	76.

CUMULATIVE AREA = 0.56 SQ MI

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HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.95, TOTAL EXCESS = 3.29

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+		(CFS)			
+	329. 13.50	156.	49.	16.	16.
		(INCHES) 2.592	3.289	3.289	3.289
		(AC-FT) 77.	98.	98.	98.

CUMULATIVE AREA = 0.56 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 3.08, TOTAL EXCESS = 4.05

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+		(CFS)			
+	406. 13.50	192.	61.	20.	20.
		(INCHES) 3.188	4.047	4.047	4.047
		(AC-FT) 95.	121.	121.	121.

CUMULATIVE AREA = 0.56 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OFF2
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.17, TOTAL EXCESS = 4.63

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+		(CFS)			
+	466. 13.50	219.	70.	23.	22.
		(INCHES) 3.647	4.633	4.633	4.633
		(AC-FT) 109.	138.	138.	138.

CUMULATIVE AREA = 0.56 SQ MI

Angel Acres Drainage Plan - Developed Conditions

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42 KK * OS2 *
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ONSITE WATERSHED #2

SUBBASIN RUNOFF DATA

44 BA SUBBASIN CHARACTERISTICS
TAREA 0.05 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

45 LS SCS LOSS RATE
STRTL 0.50 INITIAL ABSTRACTION
CRVNR 80.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

46 UD SCS DIMENSIONLESS UNITGRAPH
FLAG 0.27 LAG

UNIT HYDROGRAPH
7 END-OF-PERIOD ORDINATES

	41.	51.	19.	7.	2.	1.	0.
TOTAL RAINFALL =	7.80,	TOTAL LOSS =	2.36,	TOTAL EXCESS =	5.44		
PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW					
		6-HR	24-HR	72-HR	74.75-HR		
+	(CFS)	(HR)	(CFS)				
+	116.	12.25	22.	7.	2.	2.	
		(INCHES)	4.332	5.438	5.438	5.438	
		(AC-FT)	11.	14.	14.	14.	
CUMULATIVE AREA =		0.05 SQ MI					

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HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL =	3.56,	TOTAL LOSS =	1.88,	TOTAL EXCESS =	1.69
PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)	(CFS)		
+	36.	12.25	7.	2.	1.
		(INCHES)	1.373	1.688	1.688
		(AC-FT)	3.	4.	4.
CUMULATIVE AREA =		0.05 SQ MI			

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HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.60

Angel Acres Drainage Plan - Developed Conditions

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.06, TOTAL EXCESS = 2.62

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 57.	12.25		11.	3.	1.	1.
		(INCHES)	2.117	2.616	2.616	2.616
		(AC-FT)	5.	7.	7.	7.
CUMULATIVE AREA =			0.05 SQ MI			

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HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.15, TOTAL EXCESS = 3.20

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 69.	12.25		13.	4.	1.	1.
		(INCHES)	2.582	3.201	3.201	3.201
		(AC-FT)	7.	8.	8.	8.
CUMULATIVE AREA =			0.05 SQ MI			

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HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.24, TOTAL EXCESS = 4.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 86.	12.25		16.	5.	2.	2.
		(INCHES)	3.211	3.998	3.998	3.998
		(AC-FT)	8.	10.	10.	10.
CUMULATIVE AREA =			0.05 SQ MI			

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HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 2.32, TOTAL EXCESS = 4.81

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 103.	12.25		20.	6.	2.	2.
		(INCHES)	3.848	4.814	4.814	4.814
		(AC-FT)	10.	12.	12.	12.
CUMULATIVE AREA =			0.05 SQ MI			

*** *** *** *** ***

HYDROGRAPH AT STATION OS2
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.36, TOTAL EXCESS = 5.44

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 116.	12.25		22.	7.	2.	2.

Angel Acres Drainage Plan - Developed Conditions

(INCHES) 4.332 5.438 5.438 5.438
(AC-FT) 11. 14. 14. 14.

CUMULATIVE AREA = 0.05 SQ MI

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47 KK * OS3 *
* *

ONSITE WATERSHED #3

SUBBASIN RUNOFF DATA

49 BA SUBBASIN CHARACTERISTICS
TAREA 0.03 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

50 LS SCS LOSS RATE
STRTL 0.67 INITIAL ABSTRACTION
CRVNER 75.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

51 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 0.33 LAG

UNIT HYDROGRAPH
9 END-OF-PERIOD ORDINATES

19. 33. 17. 7. 3. 1. 0. 0.
TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.94, TOTAL EXCESS = 4.86

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	67. 12.25	13.	4.	1.	1.
	(INCHES)	3.909	4.862	4.862	4.862
	(AC-FT)	6.	8.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

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HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.22, TOTAL EXCESS = 1.35

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+	(CFS)				
+	18. 12.25	4.	1.	0.	0.
	(INCHES)	1.096	1.348	1.348	1.348
	(AC-FT)	2.	2.	2.	2.

Angel Acres Drainage Plan - Developed Conditions

CUMULATIVE AREA = 0.03 SQ MI

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HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.49, TOTAL EXCESS = 2.19

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 30.	12.25		6.	2.	1.	1.
		(INCHES)	1.782	2.192	2.192	2.192
		(AC-FT)	3.	4.	4.	4.

CUMULATIVE AREA = 0.03 SQ MI

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HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.61, TOTAL EXCESS = 2.74

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 38.	12.25		7.	2.	1.	1.
		(INCHES)	2.221	2.737	2.737	2.737
		(AC-FT)	4.	4.	4.	4.

CUMULATIVE AREA = 0.03 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.75, TOTAL EXCESS = 3.49

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 48.	12.25		9.	3.	1.	1.
		(INCHES)	2.822	3.488	3.488	3.488
		(AC-FT)	5.	6.	6.	6.

CUMULATIVE AREA = 0.03 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 2.87, TOTAL EXCESS = 4.26

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 59.	12.25		11.	4.	1.	1.
		(INCHES)	3.438	4.263	4.263	4.263
		(AC-FT)	6.	7.	7.	7.

CUMULATIVE AREA = 0.03 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS3
FOR PLAN 1, RATIO = 1.00

Angel Acres Drainage Plan - Developed Conditions

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.94, TOTAL EXCESS = 4.86

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 67.	12.25	13.	4.	1.	1.	
		(INCHES)	3.909	4.862	4.862	4.862
		(AC-FT)	6.	8.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

*** **

*
*
52 KK * SOUT *
*

SOUTH SIDE OUTFLOW COMBINED

54 HC HYDROGRAPH COMBINATION
ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.46

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 123.	13.50	66.	22.	7.	7.	
		(INCHES)	0.966	1.264	1.264	1.264
		(AC-FT)	33.	43.	43.	43.

CUMULATIVE AREA = 0.64 SQ MI

*** **

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.60

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 211.	13.50	111.	36.	12.	11.	
		(INCHES)	1.623	2.083	2.083	2.083
		(AC-FT)	55.	71.	71.	71.

CUMULATIVE AREA = 0.64 SQ MI

*** **

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 268.	13.50	140.	45.	15.	14.	
		(INCHES)	2.046	2.615	2.615	2.615
		(AC-FT)	70.	89.	89.	89.

CUMULATIVE AREA = 0.64 SQ MI

*** **

Angel Acres Drainage Plan - Developed Conditions

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.80

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
347.	13.50	180.	57.	19.	18.
		(INCHES) 2.628	3.351	3.351	3.351
		(AC-FT) 89.	114.	114.	114.

CUMULATIVE AREA = 0.64 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 0.91

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
428.	13.25	221.	71.	24.	23.
		(INCHES) 3.226	4.114	4.114	4.114
		(AC-FT) 110.	140.	140.	140.

CUMULATIVE AREA = 0.64 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION SOUT
FOR PLAN 1, RATIO = 1.00

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
492.	13.25	253.	81.	27.	26.
		(INCHES) 3.684	4.704	4.704	4.704
		(AC-FT) 125.	160.	160.	160.

CUMULATIVE AREA = 0.64 SQ MI

*** **

*
* ANGEL *
*

RUNOFF FROM ANGEL ACRES TO DRAINAGE DITCH

SUBBASIN RUNOFF DATA

57 BA SUBBASIN CHARACTERISTICS
TAREA 0.05 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Angel Acres Drainage Plan - Developed Conditions

58 LS SCS LOSS RATE
 STRTL 0.47 INITIAL ABSTRACTION
 CRVNR 81.00 CURVE NUMBER
 RTIMP 20.00 PERCENT IMPERVIOUS AREA

59 UD SCS DIMENSIONLESS UNITGRAPH
 TLAG 0.15 LAG

UNIT HYDROGRAPH
 5 END-OF-PERIOD ORDINATES
 83. 32. 7. 2. 0.

TOTAL RAINFALL = 7.80, TOTAL LOSS = 1.80, TOTAL EXCESS = 6.00

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	177.	12.00			
		(CFS)	24.	8.	3.
		(INCHES)	4.623	5.998	6.003
		(AC-FT)	12.	15.	15.

CUMULATIVE AREA = 0.05 SQ MI

HYDROGRAPH AT STATION ANGEL
 FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 1.44, TOTAL EXCESS = 2.12

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	62.	12.00			
		(CFS)	8.	3.	1.
		(INCHES)	1.634	2.119	2.122
		(AC-FT)	4.	5.	5.

CUMULATIVE AREA = 0.05 SQ MI

HYDROGRAPH AT STATION ANGEL
 FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 1.58, TOTAL EXCESS = 3.10

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	92.	12.00			
		(CFS)	12.	4.	1.
		(INCHES)	2.397	3.097	3.100
		(AC-FT)	6.	8.	8.

CUMULATIVE AREA = 0.05 SQ MI

HYDROGRAPH AT STATION ANGEL
 FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 1.64, TOTAL EXCESS = 3.71

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
(CFS)	(HR)	6-HR	24-HR	72-HR	74.75-HR
+	110.	12.00			
		(CFS)	15.	5.	2.
		(INCHES)	2.868	3.705	3.708
		(AC-FT)	7.	9.	9.

CUMULATIVE AREA = 0.05 SQ MI

Angel Acres Drainage Plan - Developed Conditions

☆☆☆ ☆☆☆ ☆☆☆ ☆☆☆ ☆☆☆

HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 1.71, TOTAL EXCESS = 4.53

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
+ 134.	12.00	(CFS)			
		(INCHES)	18.	6.	2.
		(AC-FT)	3.500	4.526	4.530
			9.	12.	12.
					4.530
					12.

CUMULATIVE AREA = 0.05 SQ MI

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HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 1.76, TOTAL EXCESS = 5.37

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)				
+ 158.	12.00	21.	7.	2.	2.
	(INCHES)	4.139	5.362	5.366	5.366
	(AC-FT)	11.	14.	14.	14.

CUMULATIVE AREA = 0.05 SQ MI

*** **

HYDROGRAPH AT STATION ANGEL
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 1.80, TOTAL EXCESS = 6.00

PEAK FLOW		TIME	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				
+	177.	12.00	24.	8.	3.	2.
		(INCHES)	4.623	5.998	6.003	6.003
		(AC-FT)	12.	15.	15.	15.

CUMULATIVE AREA = 0.05 SQ MI

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*                                     *
60 KK                               47TH *
*                                     *
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APPROXIMATE FLOW TO 2-3 FT RCPS AT 47TH ST

62 HC HYDROGRAPH COMBINATION
ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

☆☆☆ ☆☆☆ ☆☆☆ ☆☆☆ ☆☆☆

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.46

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
100	1	100	100	100	100
200	2	200	200	200	200
300	3	300	300	300	300
400	4	400	400	400	400
500	5	500	500	500	500
600	6	600	600	600	600
700	7	700	700	700	700
800	8	800	800	800	800
900	9	900	900	900	900
1000	10	1000	1000	1000	1000
1100	11	1100	1100	1100	1100
1200	12	1200	1200	1200	1200
1300	13	1300	1300	1300	1300
1400	14	1400	1400	1400	1400
1500	15	1500	1500	1500	1500
1600	16	1600	1600	1600	1600
1700	17	1700	1700	1700	1700
1800	18	1800	1800	1800	1800
1900	19	1900	1900	1900	1900
2000	20	2000	2000	2000	2000
2100	21	2100	2100	2100	2100
2200	22	2200	2200	2200	2200
2300	23	2300	2300	2300	2300
2400	24	2400	2400	2400	2400
2500	25	2500	2500	2500	2500
2600	26	2600	2600	2600	2600
2700	27	2700	2700	2700	2700
2800	28	2800	2800	2800	2800
2900	29	2900	2900	2900	2900
3000	30	3000	3000	3000	3000
3100	31	3100	3100	3100	3100
3200	32	3200	3200	3200	3200
3300	33	3300	3300	3300	3300
3400	34	3400	3400	3400	3400
3500	35	3500	3500	3500	3500
3600	36	3600	3600	3600	3600
3700	37	3700	3700	3700	3700
3800	38	3800	3800	3800	3800
3900	39	3900	3900	3900	3900
4000	40	4000	4000	4000	4000
4100	41	4100	4100	4100	4100
4200	42	4200	4200	4200	4200
4300	43	4300	4300	4300	4300
4400	44	4400	4400	4400	4400
4500	45	4500	4500	4500	4500
4600	46	4600	4600	4600	4600
4700	47	4700	4700	4700	4700
4800	48	4800	4800	4800	4800
4900	49	4900	4900	4900	4900
5000	50	5000	5000	5000	5000
5100	51	5100	5100	5100	5100
5200	52	5200	5200	5200	5200
5300	53	5300	5300	5300	5300
5400	54	5400	5400	5400	5400
5500	55	5500	5500	5500	5500
5600	56	5600	5600	5600	5600
5700	57	5700	5700	5700	5700
5800	58	5800	5800	5800	5800
5900	59	5900	5900	5900	5900
6000	60	6000	6000	6000	6000
6100	61	6100	6100	6100	6100
6200	62	6200	6200	6200	6200

Angel Acres Drainage Plan - Developed Conditions

+	215.	13.00	(CFS)	110.	36.	12.	11.
			(INCHES)	1.083	1.399	1.410	1.410
			(AC-FT)	55.	70.	71.	71.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.60

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR	
+	(CFS)	(HR)					
+	355.	13.00	(CFS)	179.	57.	19.	18.
			(INCHES)	1.760	2.250	2.261	2.261
			(AC-FT)	89.	113.	114.	114.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR	
+	(CFS)	(HR)					
+	444.	13.00	(CFS)	223.	71.	24.	23.
			(INCHES)	2.193	2.797	2.808	2.809
			(AC-FT)	110.	141.	141.	141.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.80

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR	
+	(CFS)	(HR)					
+	568.	13.00	(CFS)	283.	90.	30.	29.
			(INCHES)	2.786	3.550	3.562	3.563
			(AC-FT)	140.	179.	179.	179.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 0.91

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR	
+	(CFS)	(HR)					
+	690.	13.00	(CFS)	345.	110.	37.	35.
			(INCHES)	3.393	4.328	4.341	4.341
			(AC-FT)	171.	218.	219.	219.

CUMULATIVE AREA = 0.94 SQ MI

HYDROGRAPH AT STATION 47TH
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME		6-HR	24-HR	72-HR	74.75-HR
+	(CFS)	(HR)				

Angel Acres Drainage Plan - Developed Conditions

+ 780. 13.00 (CFS) 392. 125. 42. 40.
 (INCHES) 3.857 4.927 4.940 4.941
 (AC-FT) 194. 248. 249. 249.
 CUMULATIVE AREA = 0.94 SQ MI

*** **

63 KK *****
 * *
 * OS4 *
 * *

ONSITE WATERSHED #4

SUBBASIN RUNOFF DATA

65 BA SUBBASIN CHARACTERISTICS
 TAREA 0.02 SUBBASIN AREA

PRECIPITATION DATA

10 PB STORM 7.80 BASIN TOTAL PRECIPITATION

11 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.02	0.02	0.02	0.03	0.10	0.28	0.04	0.03
0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

66 LS SCS LOSS RATE
 STRTL 0.67 INITIAL ABSTRACTION
 CRVNR 75.00 CURVE NUMBER
 RTIMP 0.00 PERCENT IMPERVIOUS AREA

67 UD SCS DIMENSIONLESS UNITGRAPH
 TLAG 0.35 LAG

UNIT HYDROGRAPH 9 END-OF-PERIOD ORDINATES

11. 20. 12. 5. 2. 1. 0. 0. 0.

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.94, TOTAL EXCESS = 4.86

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)			
+ 42.	12.25	8.	3.	1.	1.
		(INCHES)	3.908	4.862	4.862
		(AC-FT)	4.	5.	5.

CUMULATIVE AREA = 0.02 SQ MI

*** **

HYDROGRAPH AT STATION OS4
 FOR PLAN 1, RATIO = 0.46

TOTAL RAINFALL = 3.56, TOTAL LOSS = 2.22, TOTAL EXCESS = 1.35

PEAK FLOW	TIME	6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)			
+ 11.	12.25	2.	1.	0.	0.

Angel Acres Drainage Plan - Developed Conditions

(INCHES) 1.095 1.348 1.348 1.348
(AC-FT) 1. 1. 1. 1.

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.60

TOTAL RAINFALL = 4.68, TOTAL LOSS = 2.49, TOTAL EXCESS = 2.19

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 19.	12.25	4.	1.	0.	0.	
		(INCHES)	1.781	2.192	2.192	2.192
		(AC-FT)	2.	2.	2.	2.

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.35, TOTAL LOSS = 2.61, TOTAL EXCESS = 2.74

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 24.	12.25	5.	1.	0.	0.	
		(INCHES)	2.220	2.737	2.737	2.737
		(AC-FT)	2.	3.	3.	3.

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.80

TOTAL RAINFALL = 6.24, TOTAL LOSS = 2.75, TOTAL EXCESS = 3.49

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 30.	12.25	6.	2.	1.	1.	
		(INCHES)	2.821	3.488	3.488	3.488
		(AC-FT)	3.	4.	4.	4.

CUMULATIVE AREA = 0.02 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 0.91

TOTAL RAINFALL = 7.13, TOTAL LOSS = 2.87, TOTAL EXCESS = 4.26

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)	(CFS)				
+ 37.	12.25	7.	2.	1.	1.	
		(INCHES)	3.437	4.263	4.263	4.263
		(AC-FT)	4.	5.	5.	5.

CUMULATIVE AREA = 0.02 SQ MI

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Angel Acres Drainage Plan - Developed Conditions

HYDROGRAPH AT STATION OS4
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 2.94, TOTAL EXCESS = 4.86

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)				
		(CFS)			
+ 42.	12.25	8.	3.	1.	1.
		(INCHES)	3.908	4.862	4.862
		(AC-FT)	4.	5.	5.

CUMULATIVE AREA = 0.02 SQ MI

Angel Acres Drainage Plan - Developed Conditions

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION						
				RATIO 1 0.46	RATIO 2 0.60	RATIO 3 0.69	RATIO 4 0.80	RATIO 5 0.91	RATIO 6 1.00	
HYDROGRAPH AT										
+	10	0.23	1	FLOW TIME	101. 12.50	164. 12.50	204. 12.50	259. 12.50	314. 12.50	356. 12.50
ROUTED TO										
+	POND	0.23	1	FLOW TIME	97. 12.75	142. 13.00	173. 13.00	216. 13.00	255. 13.00	281. 13.00
** PEAK STAGES IN FEET **										
			1	STAGE TIME	89.76 12.75	90.30 13.00	90.71 13.00	91.26 13.00	91.88 13.00	92.39 13.00
HYDROGRAPH AT										
+	OS1	0.03	1	FLOW TIME	26. 12.25	39. 12.25	46. 12.25	56. 12.25	66. 12.25	74. 12.25
2 COMBINED AT										
+	SWSE	0.26	1	FLOW TIME	105. 12.75	154. 12.75	185. 12.75	230. 12.75	269. 12.75	296. 13.00
HYDROGRAPH AT										
+	OFF2	0.56	1	FLOW TIME	115. 13.50	199. 13.50	253. 13.50	329. 13.50	406. 13.50	466. 13.50
HYDROGRAPH AT										
+	OS2	0.05	1	FLOW TIME	36. 12.25	57. 12.25	69. 12.25	86. 12.25	103. 12.25	116. 12.25
HYDROGRAPH AT										
+	OS3	0.03	1	FLOW TIME	18. 12.25	30. 12.25	38. 12.25	48. 12.25	59. 12.25	67. 12.25
3 COMBINED AT										
+	SOUT	0.64	1	FLOW TIME	123. 13.50	211. 13.50	268. 13.50	347. 13.50	428. 13.25	492. 13.25
HYDROGRAPH AT										
+	ANGEL	0.05	1	FLOW TIME	62. 12.00	92. 12.00	110. 12.00	134. 12.00	158. 12.00	177. 12.00
3 COMBINED AT										
+	47TH	0.94	1	FLOW TIME	215. 13.00	355. 13.00	444. 13.00	568. 13.00	690. 13.00	780. 13.00
HYDROGRAPH AT										
+	OS4	0.02	1	FLOW TIME	11. 12.25	19. 12.25	24. 12.25	30. 12.25	37. 12.25	42. 12.25

*** NORMAL END OF HEC-1 ***

Angel Acres
Storm Sewer Design
36-98696-4649

Basin	Area (acres)	Q_2 (cfs)	Q_{100} (cfs)
A	0.96	1.71	4.88
B	1.45	2.59	7.36
C	1.46	2.61	7.41
D	2.48	4.43	12.59
E	4.36	7.79	22.14
F	5.69	10.16	28.90
G	1.8	3.21	9.14
H	7.36	13.14	37.38
J	1.25	2.23	6.35
K	4.09	7.30	20.77
L	2.76	4.93	14.02

1/4 Acre Residential

50% B Soils

50% D Soils

$C_2 = 0.47$

$C_{100} = 0.69$

Time of Concentration = 15 minutes

$i_2 = 3.80$

$i_{100} = 7.36$

Angel Acres
Inlet Sizing
36-98696-4649

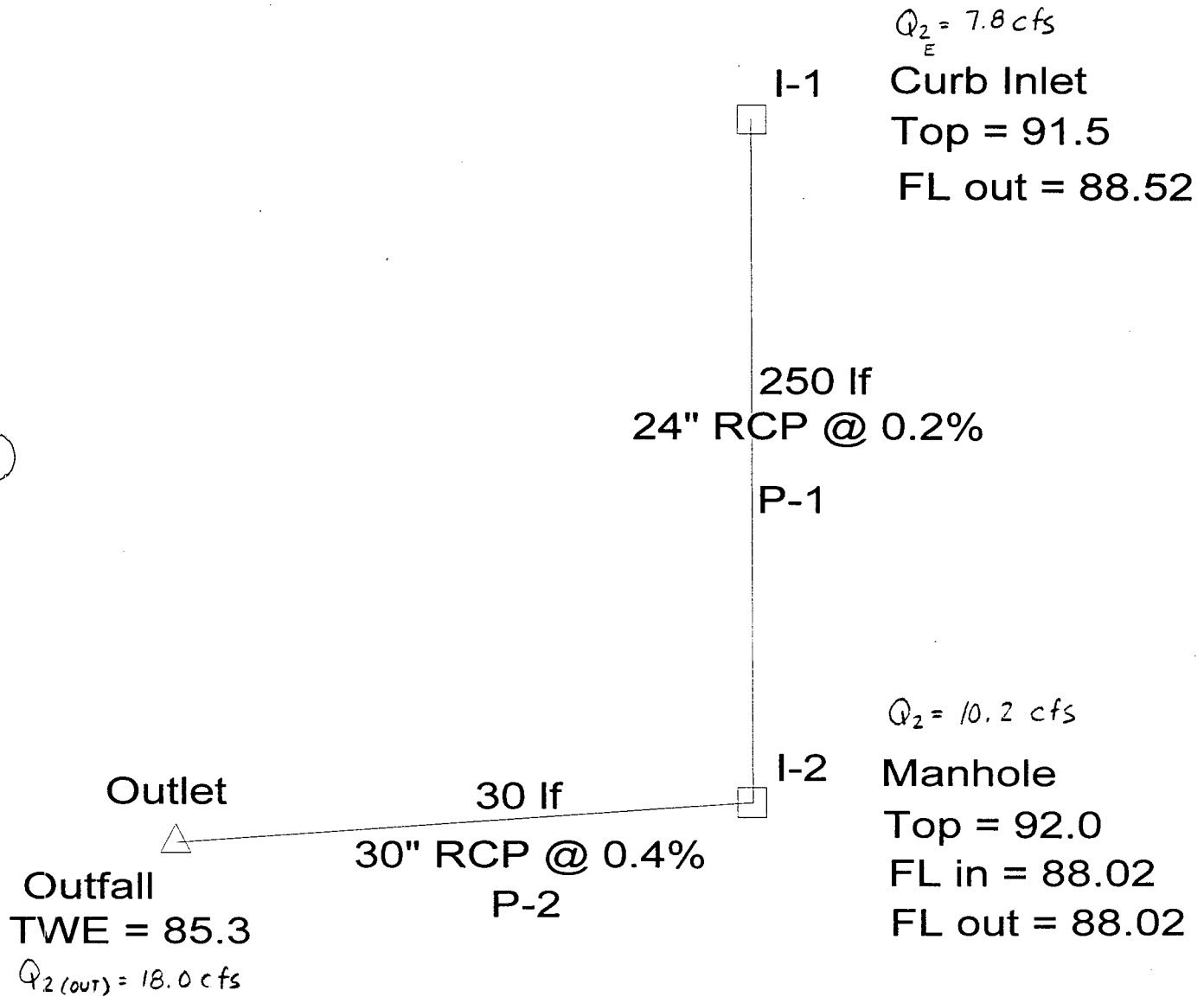
2-year Storm

Inlet Location			Q ₂ (cfs)	Size of Type 1A Inlet (L)	Ponding Depth (ft)	Remarks
West side of Richmond	Line #1	Sump	7.8	6'-4"	0.58	<0.9' OK
East side of Edwards	Line #2	Sump	4.4	6'-4"	0.38	OK
West side of Edwards	Line #2	Sump	2.6	6'-4"	0.26	OK
East side of Gordon	Line #3	Sump	2.6	6'-4"	0.26	OK
West Side of Gordon	Line #3	Sump	1.7	6'-4"	0.21	OK
North Side of Angel		Sump	7.3	6'-4"	0.56	OK
South Side of Angel		Sump	2.2	6'-4"	0.21	OK

Note: Used City of Wichita Type 1A Curb Inlet for Inlet Sizing

2-yr storm

Line #1



```

----- Beginning Calculation Cycle -----
Discharge: 7.80 cfs at node I-1
Discharge: 18.00 cfs at node I-2
Discharge: 18.00 cfs at node Outlet
Beginning iteration 1
Discharge: 7.80 cfs at node I-1
Discharge: 18.00 cfs at node I-2
Discharge: 18.00 cfs at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error: 0.0
Warning: No Duration data exists in IDF Table
----- Calculations Complete -----

```

```

** Analysis Options **
Friction method: Manning's Formula
HGL Convergence Test: 0.001000
Maximum Network Traversals: 5
Number of Pipe Profile Steps: 5
Discharge Convergence Test: 0.001000
Maximum Design Passes: 3

```

----- Network Quick View -----

Label	Length	Size	Discharge	Hydraulic Grade	
				Upstream	Downstream
P-1	250.00	24 inch	7.80	90.06	89.80
P-2	30.00	30 inch	18.00	89.54	89.34

Label	Discharge	Elevations		
		Ground	Upstream HGL	Downstream HGL
I-1	7.80	91.50	90.06	90.06
I-2	18.00	92.00	89.80	89.54
Outlet	18.00	92.00	85.30	85.30

Elapsed: 0 minute(s) 0 second(s)

Pipe	-Node- Upstream Downstream	Inlet Area (acres)	Inlet CA (acres)	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-1	I-1	0.00	0.00	0.00	91.50	90.06	0.001184	7.80	Circular	50.00	2.82	
	I-2				92.00	89.80	0.002000	10.12	24 inch			
P-2	I-2	0.00	0.00	0.00	92.00	89.54	0.004275	18.00	Circular	30.00	5.96	
	Outlet				92.00	89.34	0.004000	25.94	30 inch			

2-yr storm

Line #2

$Q_{2c} = 2.6 \text{ cfs}$

Curb Inlet I-4
Top = 91.5
FL in = 87.65
FL out = 87.55

$Q_{2d} = 4.4 \text{ cfs}$

Curb Inlet I-1
Top = 91.5
FL out = 87.77

P-5
32 lf
15" RCP @ 0.38%

P-6
210 lf
18" RCP @ 0.3%

$Q_2 = 18.0 \text{ cfs}$

I-5 Manhole
Top = 92.0
FL in = 86.92
FL out = 86.82

Outlet

P-7
30 lf
30" RCP @ 0.4%

Outfall
TWE = 85.3

$Q_{2out} = 25.0 \text{ cfs}$

```

----- Beginning Calculation Cycle -----
Discharge: 4.43 cfs at node I-1
Discharge: 7.04 cfs at node I-4
Discharge: 25.04 cfs at node I-5
Discharge: 25.04 cfs at node Outlet
Beginning iteration 1
Discharge: 4.43 cfs at node I-1
Discharge: 7.04 cfs at node I-4
Discharge: 25.04 cfs at node I-5
Discharge: 25.04 cfs at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error: 0.0
Warning: No Duration data exists in IDF Table
Information: P-6 Surcharged condition
Information: P-5 Surcharged condition
----- Calculations Complete -----

```

```

** Analysis Options **
Friction method: Manning's Formula
HGL Convergence Test: 0.001000
Maximum Network Traversals: 5
Number of Pipe Profile Steps: 5
Discharge Convergence Test: 0.001000
Maximum Design Passes: 3

```

----- Network Quick View -----

Label	Length	Size	Discharge	Hydraulic Grade	
				Upstream	Downstream
P-5	32.00	15 inch	4.43	90.22	90.07
P-6	210.00	18 inch	7.04	89.94	89.00
P-7	30.00	30 inch	25.04	88.69	88.41

Label	Discharge	Ground	Elevations	
			Upstream HGL	Downstream HGL
I-1	4.43	91.50	90.22	90.22
Outlet	25.04	92.00	85.30	85.30
I-4	7.04	91.50	90.07	89.94
I-5	25.04	92.00	89.00	88.69

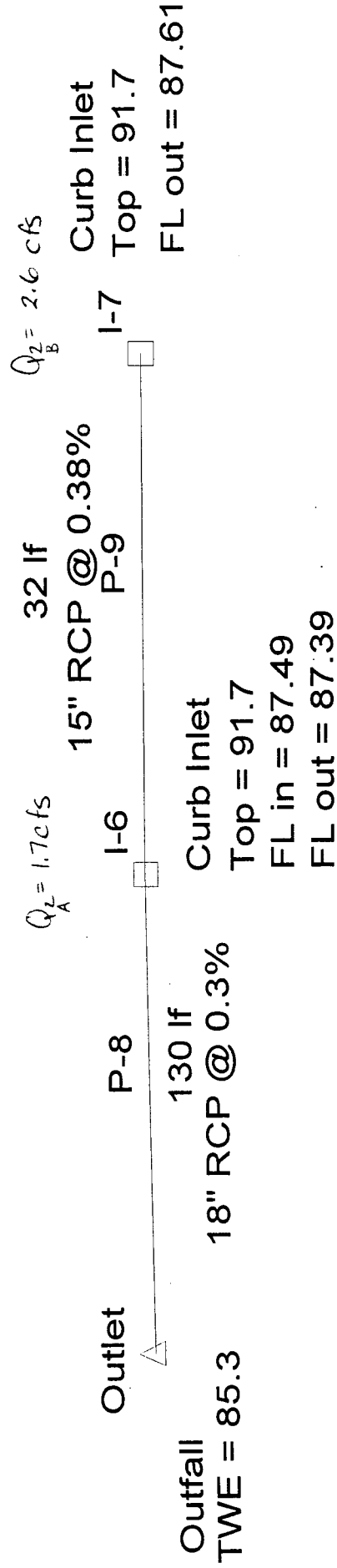
Elapsed: 0 minute(s) 1 second(s)

DOT Report

Pipe	-Node- Upstream Downstream	Inlet Area (acres)	Inlet CA (acres)	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-5	I-1	0.00	0.00	0.00	91.50	90.22	0.004703	4.43	Circular	32.00	3.61	
	I-4				91.50	90.07	0.003750	3.96	15 inch			
P-6	I-4	0.00	0.00	0.00	91.50	89.94	0.004492	7.04	Circular	10.00	3.98	
	I-5				92.00	89.00	0.003000	5.75	18 inch			
P-7	I-5	0.00	0.00	0.00	92.00	88.69	0.004854	25.04	Circular	30.00	6.70	
	Outlet				92.00	88.41	0.004000	25.94	30 inch			

2-yr storm

Line #3



```

----- Beginning Calculation Cycle -----
Discharge: 2.60 cfs at node I-7
Discharge: 4.31 cfs at node I-6
Discharge: 4.31 cfs at node Outlet
Beginning iteration 1
Discharge: 2.60 cfs at node I-7
Discharge: 4.31 cfs at node I-6
Discharge: 4.31 cfs at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error: 0.0
Warning: No Duration data exists in IDF Table
----- Calculations Complete -----

```

```

** Analysis Options **
Friction method: Manning's Formula
HGL Convergence Test: 0.001000
Maximum Network Traversals: 5
Number of Pipe Profile Steps: 5
Discharge Convergence Test: 0.001000
Maximum Design Passes: 3

```

----- Network Quick View -----

Label	Length	Size	Discharge	Hydraulic Grade	
				Upstream	Downstream
P-8	130.00	18 inch	4.31	88.36	87.80
P-9	32.00	15 inch	2.60	88.50	88.46

Label	Discharge	Ground	Elevations	
			Upstream HGL	Downstream HGL
Outlet	4.31	91.00	85.30	85.30
I-6	4.31	91.70	88.46	88.36
I-7	2.60	91.70	88.50	88.50

Elapsed: 0 minute(s) 1 second(s)

Pipe	-Node- Upstream Downstream	Inlet Area (acres)	Inlet CA (acres)	Total CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-9	I-7	0.00	0.00	0.00	91.70	88.50	0.002007	2.60	Circular 15 inch	32.00	2.67	
P-8	I-6	0.00	0.00	0.00	91.70	88.46	0.003750	3.96	Circular 18 inch	130.00	4.05	
	Outlet				91.00	87.80	0.003000	5.75				

Northern Channel (along Lots 1-4, Block 6 & Lot 5, Block 4)

$Q_{100} = 492$ cfs

- From The Legacy Drainage Plan, HEC-1, Basin SOUT

Side Slopes 3:1
Class C-D Vegetative
Permissible shear stress = 1 lb/sq. ft

$$\tau = \gamma \cdot D \cdot S$$

$\gamma = 62.4$
 $D = \text{depth}$
 $S = \text{slope}$
 $S = 0.002$

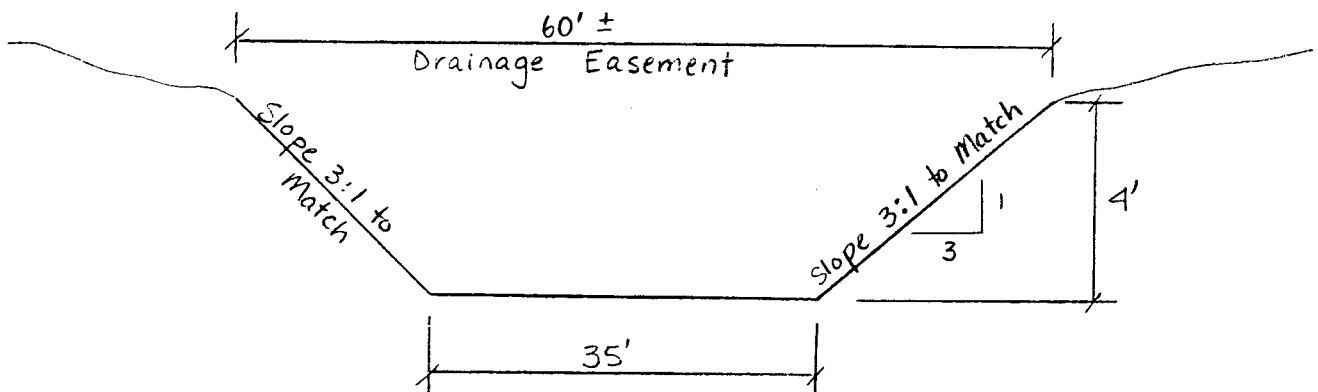
Class C Vegetative:

$$n = \frac{1}{R^{0.4875}}$$
$$n = \frac{1}{30.2 + 19.97 \log(R^{1.4875} S^{0.4875})}$$

R = Hydraulic Radius

$n \sim 0.05$

Using FEMA's Quick2 Program:
Ditch slope = 0.002



Southern Channel (along Lots 1-4, Block 4)

$$Q_{100} = 780 \text{ cfs}$$

- From The Legacy Drainage Plan, HEC-1, Basins SOUT & SWSE
- Additional runoff from Angel Acres

Side Slopes 3:1
Class C-D Vegetative
Permissible shear stress = 1 lb/sq. ft

$$\tau = \gamma \cdot D \cdot S$$

$\gamma := 62.4$
 $D := \text{depth}$
 $S := \text{slope}$
 $S := 0.002$

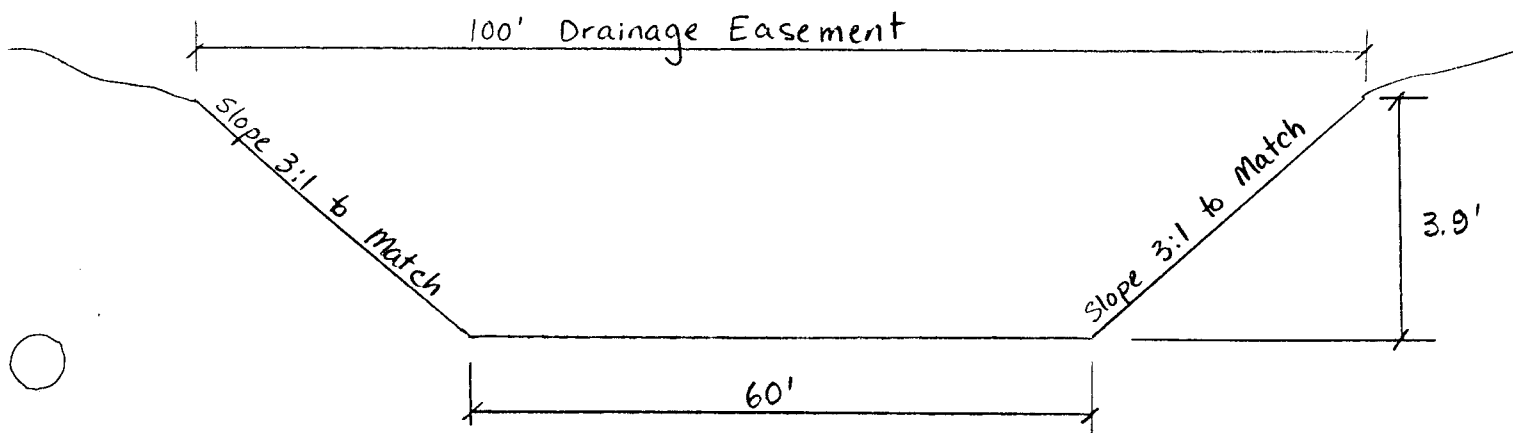
Class C Vegetative:

$$n := \frac{R^{\frac{1}{6}}}{30.2 + 19.97 \cdot \log(R^{1.4} \cdot S^{0.4})}$$

R = Hydraulic Radius

$$n \sim 0.05$$

Using FEMA's Quick2 Program:
Ditch slope = 0.002



Channel from The Legacy

Side Slopes of 3.5:1

Bottom Width	n (estimated)	slope of channel	Q	Depth	Hydraulic Radius R	Shear Stress	n(calc)	Total Channel Width
35	0.055	0.002	413	3.6	2.8	0.44928	0.056153	60.2
35	0.054	0.002	492	3.93	3	0.490464	0.054638	62.5

Side Slopes of 3:1

35	0.054	0.002	492	4	3.1	0.4992	0.05396	59
----	-------	-------	-----	---	-----	--------	---------	----

Combined Channel

Side Slope of 3:1

Bottom Width	n (estimated)	slope of channel	Q	Depth	Hydraulic Radius R	Shear Stress	n(calc)	Total Channel Width
55	0.054	0.002	780	4.13	3.4	0.5154	0.0522	79.8
60	0.052	0.002	780	3.86	3.3	0.4817	0.0527	83.2
65	0.053	0.002	780	3.74	3.2	0.4668	0.0533	87.4
70	0.053	0.002	780	3.59	3.1	0.4480	0.0540	91.5

Angel Acres
Box Culvert Design
36-98696-4649

Box Culvert under Angel at drainage easement

Concrete $n = 0.013$

Size 10' x 4'

Quantity 3

Inlet Elevation = 87.00

Outlet Elevation = 86.88

Length 60 feet

Tailwater Rating Curve based on:
- 35' bottom on trapazoidal channel
- 3:1 Side slopes
- $Q = 492$ cfs

From FHWA Culvert Program

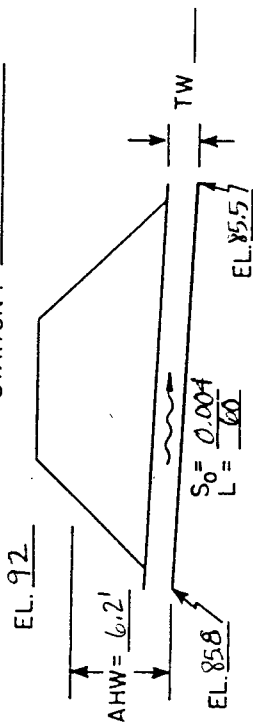
Q (cfs)	HWE (feet)	TWE (feet)	Velocity (ft/sec)
0	87.00	86.88	0.00
80	88.40	88.30	1.88
160	89.17	89.00	2.52
240	89.79	89.55	3.00
320	90.32	90.02	3.40
400	90.80	90.44	3.75
480	91.24	90.82	4.06
492	91.30	90.87	4.11
640	92.23	91.49	5.33
720	92.74	91.79	6.00
800	93.24	92.08	6.67

DESIGNER: KER
DATE: 2/17/99

SKETCH

STATION: _____

Q_1	$=$	<u>80.18</u>	TW_1	$=$	<u> </u>
Q_2	$=$	<u> </u>	TW_2	$=$	<u> </u>

$$\begin{pmatrix} Q_1 = \text{DESIGN DISCHARGE, SAY } Q_{25} \\ Q_2 = \text{CHECK DISCHARGE, SAY } Q_{50} \text{ OR } Q_{100} \end{pmatrix}$$


MEAN STREAM VELOCITY =
MAX. STREAM VELOCITY =

[illegible]

SUMMARY & RECOMMENDATIONS:

Use 42" RCP under Gordon

Figure 7

PROJECT: <u>Angel Acres</u>		DESIGNER: <u>KER</u>																																																																																																																																																																																																																										
DATE: <u>2/17/99</u>		STATION: _____																																																																																																																																																																																																																										
HYDROLOGIC AND CHANNEL INFORMATION <u>Edwards</u> <u>100-yr storm</u> $Q_1 = \underline{51.0 \text{ cfs}}$ $TW_1 = \underline{\hspace{2cm}}$ $Q_2 = \underline{\hspace{2cm}}$ $TW_2 = \underline{\hspace{2cm}}$ (Q_1 = DESIGN DISCHARGE, SAY Q_{25} Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})		SKETCH 																																																																																																																																																																																																																										
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="3">CULVERT DESCRIPTION (ENTRANCE TYPE)</th> <th rowspan="3">Q</th> <th rowspan="3">SIZE</th> <th colspan="10">HEADWATER COMPUTATION</th> <th rowspan="3">CONTROLLING H #</th> <th rowspan="3">OUTLET VELOCITY</th> <th rowspan="3">COST</th> <th rowspan="3">COMMENTS</th> </tr> <tr> <th colspan="2">INLET CONT.</th> <th colspan="6">OUTLET CONTROL</th> <th colspan="2">HW = H + h₀ - LS₀</th> </tr> <tr> <th>HW/D</th> <th>HW</th> <th>K_e</th> <th>H</th> <th>d_c</th> <th>d_c+D/2</th> <th>TW</th> <th>h₀</th> <th>LS₀</th> <th>HW</th> </tr> </thead> <tbody> <tr> <td>30" RCP</td> <td>51</td> <td>2.5</td> <td>2</td> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>36" RCP</td> <td>51</td> <td>3</td> <td>1.2</td> <td>3.6</td> <td>0.5</td> <td>1.6</td> <td>2.3</td> <td>2.3</td> <td>-</td> <td>2.3</td> <td>0.24</td> <td>3.66</td> <td></td> <td></td> <td></td> <td></td> <td>OK</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>				CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										CONTROLLING H #	OUTLET VELOCITY	COST	COMMENTS	INLET CONT.		OUTLET CONTROL						HW = H + h ₀ - LS ₀		HW/D	HW	K _e	H	d _c	d _c +D/2	TW	h ₀	LS ₀	HW	30" RCP	51	2.5	2	5														36" RCP	51	3	1.2	3.6	0.5	1.6	2.3	2.3	-	2.3	0.24	3.66					OK																																																																																																																																																
CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										CONTROLLING H #	OUTLET VELOCITY	COST	COMMENTS																																																																																																																																																																																																												
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SUMMARY & RECOMMENDATIONS: Use 36" RCP under Edwards -revise SWS outfall on Line #2 to 36" RCP																																																																																																																																																																																																																												

Figure 7

PROJECT: <u>Angel Acres</u>		DESIGNER: <u>KEK</u>	
DATE: <u>2/16/99</u>		STATION: _____	

HYDROLOGIC AND CHANNEL INFORMATION <u>Angel 100-yr storm</u> $Q_1 = 87.4 \text{ cfs}$ $TW_1 =$ _____ $Q_2 =$ _____ $TW_2 =$ _____ (Q_1 = DESIGN DISCHARGE, SAY Q_{25} Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})	 MEAN STREAM VELOCITY = _____ MAX. STREAM VELOCITY = _____
--	--

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										COMMENTS			
			INLET CONT.		OUTLET CONTROL					CONTROLLING				COST		
			HW D	HW	K_e	H	d_c	$\frac{d_c + D}{2}$	TW	h_0	LS_0	HW			OUTLET VELOCITY	
2 - 30" RCP	43.7	2.5	1.73	4.3												
2 - 36" RCP	43.7	3	1.1	3.3								.18				36" pipe will not fit in ditch

SUMMARY & RECOMMENDATIONS: Since the 18" CMP under Meridian will cause a downstream constriction, Use 24" RCP under Angel
--

Figure 7

Maximum Q through 2-36" RCP

Assume maximum velocity = 8 ft/sec

$D := 3 \text{ ft}$

velocity := 8 ft/sec

number_of_pipes := 2

$$\text{Area} := \pi \left(\frac{D}{2} \right)^2$$

$Q_{\max} := \text{Area} \cdot \text{velocity} \cdot \text{number_of_pipes}$

$Q_{\max} = 113.097 \text{ cfs}$

Since the 100-yr flow of 780 cfs will not fit in the 2-36" RCP, flow over 47th Street South has been assumed.

Assume sharp crested weir flow

Length := 175 ft

Road_Elevation := 92.5 City Datum

$Q := 780 \text{ cfs}$

$C := 3$

$$Q := C \cdot \text{Length} \cdot h^{\frac{3}{2}}$$

Assume total 100-yr Q with no detention and the 2-36" RCP's are plugged as the worst case scenario.

$$h := \left(\frac{Q}{C \cdot \text{Length}} \right)^{\frac{2}{3}}$$

$h = 1.302 \text{ ft}$

Highwater_Elevation := Road_Elevation + h

Highwater_Elevation = 93.802 City Datum

Minimum Openings for:

Lots 1-4, Block 1	95.0 City Datum
Lots 1-9, Block 2	95.0 City Datum
Lots 1-10, Block 3	95.0 City Datum
Lots 1-8, Block 4	95.0 City Datum
Lot 1, Block 5	95.0 City Datum
Lots 1-16, Block 6	95.0 City Datum

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:05	4.77	5.52	6.56	7.32	8.44	9.32	10.20
0:06	4.53	5.26	6.27	7.02	8.11	8.96	9.81
0:07	4.33	5.04	6.03	6.76	7.82	8.65	9.48
0:08	4.16	4.85	5.82	6.52	7.55	8.36	9.17
0:09	4.00	4.67	5.61	6.30	7.30	8.09	8.87
0:10	3.85	4.50	5.42	6.08	7.06	7.82	8.58
0:11	3.71	4.34	5.23	5.88	6.83	7.56	8.30
0:12	3.58	4.19	5.06	5.69	6.60	7.32	8.04
0:13	3.45	4.05	4.90	5.51	6.40	7.10	7.79
0:14	3.34	3.92	4.75	5.34	6.21	6.89	7.57
0:15	3.23	3.80	4.61	5.19	6.04	6.70	7.36
0:16	3.13	3.69	4.48	5.05	5.88	6.53	7.17
0:17	3.03	3.58	4.36	4.92	5.73	6.37	7.00
0:18	2.94	3.48	4.25	4.80	5.60	6.22	6.84
0:19	2.86	3.39	4.14	4.69	5.47	6.09	6.70
0:20	2.78	3.30	4.05	4.58	5.35	5.96	6.56
0:21	2.70	3.21	3.95	4.48	5.24	5.84	6.43
0:22	2.63	3.14	3.87	4.39	5.14	5.72	6.30
0:23	2.56	3.06	3.78	4.30	5.04	5.61	6.19
0:24	2.50	2.99	3.71	4.21	4.94	5.51	6.07
0:25	2.44	2.93	3.63	4.13	4.85	5.41	5.97
0:26	2.38	2.86	3.56	4.05	4.76	5.31	5.86
0:27	2.33	2.80	3.49	3.98	4.68	5.22	5.76
0:28	2.28	2.75	3.43	3.91	4.59	5.13	5.66
0:29	2.23	2.69	3.36	3.84	4.52	5.04	5.57
0:30	2.19	2.64	3.30	3.77	4.44	4.96	5.48
0:31	2.14	2.59	3.24	3.71	4.37	4.88	5.39
0:32	2.10	2.54	3.19	3.64	4.30	4.80	5.31
0:33	2.06	2.50	3.14	3.58	4.23	4.73	5.22
0:34	2.02	2.45	3.08	3.53	4.16	4.65	5.14
0:35	1.99	2.41	3.03	3.47	4.10	4.58	5.07
0:36	1.95	2.37	2.99	3.42	4.03	4.51	4.99
0:37	1.92	2.33	2.94	3.36	3.97	4.45	4.92
0:38	1.89	2.30	2.89	3.31	3.91	4.38	4.84
0:39	1.86	2.26	2.85	3.27	3.86	4.32	4.77
0:40	1.83	2.23	2.81	3.22	3.80	4.26	4.71
0:41	1.80	2.19	2.77	3.17	3.75	4.20	4.64
0:42	1.77	2.16	2.73	3.13	3.70	4.14	4.58
0:43	1.75	2.13	2.69	3.08	3.65	4.08	4.52
0:44	1.72	2.10	2.65	3.04	3.60	4.03	4.46
0:45	1.70	2.07	2.62	3.00	3.55	3.97	4.40

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

DURATION, HR:MIN	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:46	1.67	2.04	2.58	2.96	3.50	3.92	4.34
0:47	1.65	2.01	2.55	2.92	3.46	3.87	4.29
0:48	1.63	1.98	2.51	2.88	3.41	3.82	4.23
0:49	1.60	1.96	2.48	2.85	3.37	3.78	4.18
0:50	1.58	1.93	2.45	2.81	3.33	3.73	4.13
0:51	1.56	1.91	2.42	2.78	3.29	3.68	4.08
0:52	1.54	1.88	2.39	2.74	3.25	3.64	4.03
0:53	1.52	1.86	2.36	2.71	3.21	3.60	3.98
0:54	1.50	1.84	2.33	2.68	3.17	3.55	3.94
0:55	1.48	1.81	2.30	2.65	3.13	3.51	3.89
0:56	1.46	1.79	2.28	2.62	3.10	3.47	3.85
0:57	1.45	1.77	2.25	2.59	3.06	3.43	3.80
0:58	1.43	1.75	2.23	2.56	3.03	3.40	3.76
0:59	1.41	1.73	2.20	2.53	3.00	3.36	3.72
1:00	1.39	1.71	2.18	2.50	2.96	3.32	3.68
1:05	1.32	1.62	2.06	2.37	2.81	3.15	3.49
1:10	1.25	1.53	1.96	2.25	2.67	3.00	3.33
1:15	1.18	1.46	1.87	2.15	2.55	2.86	3.17
1:20	1.13	1.39	1.78	2.05	2.44	2.74	3.04
1:25	1.07	1.33	1.70	1.97	2.34	2.63	2.91
1:30	1.03	1.27	1.63	1.89	2.24	2.52	2.80
1:35	0.98	1.22	1.57	1.81	2.16	2.43	2.69
1:40	0.94	1.17	1.51	1.75	2.08	2.34	2.60
1:45	0.91	1.13	1.46	1.69	2.01	2.26	2.51
1:50	0.87	1.09	1.41	1.63	1.94	2.18	2.42
1:55	0.84	1.05	1.36	1.57	1.88	2.11	2.35
2:00	0.81	1.02	1.32	1.52	1.82	2.05	2.28
2:05	0.79	0.98	1.28	1.48	1.76	1.99	2.21
2:10	0.76	0.95	1.24	1.43	1.71	1.93	2.14
2:15	0.74	0.92	1.20	1.39	1.67	1.88	2.08
2:20	0.72	0.90	1.17	1.36	1.62	1.82	2.03
2:25	0.70	0.87	1.14	1.32	1.58	1.78	1.98
2:30	0.68	0.85	1.11	1.29	1.54	1.73	1.93
2:35	0.66	0.83	1.08	1.25	1.50	1.69	1.88
2:40	0.64	0.81	1.05	1.22	1.46	1.65	1.83
2:45	0.62	0.79	1.03	1.19	1.43	1.61	1.79
2:50	0.61	0.77	1.00	1.17	1.40	1.57	1.75
2:55	0.59	0.75	0.98	1.14	1.37	1.54	1.71
3:00	0.58	0.73	0.96	1.12	1.34	1.51	1.68

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
3:15	0.54	0.69	0.90	1.05	1.26	1.42	1.58
3:30	0.51	0.65	0.85	0.99	1.19	1.34	1.49
3:45	0.48	0.61	0.80	0.94	1.12	1.27	1.41
4:00	0.46	0.58	0.76	0.89	1.07	1.21	1.34
4:15	0.44	0.55	0.73	0.85	1.02	1.15	1.28
4:30	0.42	0.53	0.70	0.81	0.98	1.10	1.23
4:45	0.40	0.51	0.67	0.78	0.94	1.06	1.18
5:00	0.38	0.49	0.64	0.75	0.90	1.02	1.13
5:15	0.37	0.47	0.62	0.72	0.87	0.98	1.09
5:30	0.35	0.45	0.60	0.70	0.83	0.94	1.05
5:45	0.34	0.44	0.58	0.67	0.81	0.91	1.01
6:00	0.33	0.42	0.56	0.65	0.78	0.88	0.98
6:30	0.31	0.40	0.52	0.61	0.73	0.83	0.92
7:00	0.30	0.38	0.50	0.58	0.69	0.78	0.87
7:30	0.28	0.36	0.47	0.55	0.66	0.74	0.83
8:00	0.27	0.34	0.45	0.52	0.62	0.70	0.78
8:30	0.26	0.33	0.43	0.50	0.60	0.67	0.75
9:00	0.25	0.31	0.41	0.48	0.57	0.64	0.72
9:30	0.24	0.30	0.39	0.46	0.55	0.62	0.69
10:00	0.23	0.29	0.38	0.44	0.52	0.59	0.66
10:30	0.22	0.28	0.36	0.42	0.50	0.57	0.63
11:00	0.21	0.27	0.35	0.41	0.49	0.55	0.61
11:30	0.21	0.26	0.34	0.39	0.47	0.53	0.59
12:00	0.20	0.25	0.33	0.38	0.45	0.51	0.57
13:00	0.19	0.24	0.31	0.36	0.43	0.48	0.53
14:00	0.18	0.22	0.29	0.34	0.40	0.45	0.50
15:00	0.17	0.21	0.27	0.32	0.38	0.43	0.47
16:00	0.16	0.20	0.26	0.30	0.36	0.40	0.45
17:00	0.15	0.19	0.25	0.29	0.34	0.38	0.43
18:00	0.15	0.18	0.24	0.27	0.33	0.37	0.41
19:00	0.14	0.18	0.23	0.26	0.31	0.35	0.39
20:00	0.14	0.17	0.22	0.25	0.30	0.34	0.37
21:00	0.13	0.16	0.21	0.24	0.29	0.32	0.36
22:00	0.13	0.16	0.20	0.23	0.28	0.31	0.34
23:00	0.12	0.15	0.19	0.22	0.27	0.30	0.33
24:00	0.12	0.15	0.19	0.22	0.26	0.29	0.32

ATTACHMENT D

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

<u>Land Use or Surface Characteristics</u>	<u>Percent Impervious</u>	<u>Frequency</u>			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
<u>Single Family (Soil Group D)</u>					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
<u>Multi-Family (Soil Group D)</u>					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
<u>Single Family (Soil Group C)</u>					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
<u>Multi-Family (Soil Group C)</u>					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
<u>Single-Family (Soil Group B)</u>					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
<u>Multi-Family (Soil Group B)</u>					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<u>Single Family (Soil Group A)</u>					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
<u>Multi-Family (Soil Group A)</u>					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:	15	0.33	0.35	0.42	0.55
Schools:	40	0.49	0.51	0.56	0.66
Railroad Yard Areas:	30	0.43	0.45	0.50	0.62
7. Undeveloped Urban Areas:					
Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	0.89
10. Roofs:	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
<u>Soil Group A</u>					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
<u>Soil Group B</u>					
Slope less than 1%	00	0.26	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
<u>Soil Group C</u>					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%.	00	0.28	0.31	0.39	0.55

<u>Land Use or Surface Characteristics</u>	<u>Percent Impervious</u>	<u>Frequency</u>			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<u>Soil Group D</u>					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for large basins.

ATTACHMENT E

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forrest with Heavy Ground Litter or Meadow																				
	0.08	0.11	0.14	0.16	0.18	0.19	0.20	0.22	0.23	0.25	0.35	0.42	0.50	0.55	0.60	0.66	0.70	0.75	0.80	1.10
Fallow or Minimum Tillage Cultivation																				
	0.15	0.21	0.26	0.29	0.33	0.35	0.39	0.41	0.44	0.46	0.65	0.80	0.92	1.10	1.20	1.30	1.40	1.50	1.60	2.10
Short Grass Pasture or Lawns																				
	0.23	0.32	0.38	0.44	0.50	0.53	0.58	0.62	0.66	0.70	1.00	1.20	1.40	1.60	1.80	1.90	2.00	2.10	2.20	3.20
Almost Bare Ground																				
	0.32	0.44	0.53	0.62	0.69	0.75	0.82	0.87	0.92	0.98	1.40	1.70	1.90	2.10	2.30	2.50	2.70	2.90	3.10	4.40
Grassed Waterway																				
	0.50	0.68	0.83	0.95	1.10	1.20	1.30	1.40	1.50	1.60	2.20	2.60	3.00	3.40	3.70	4.00	4.30	4.60	4.80	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow																				
	0.63	0.89	1.10	1.30	1.50	1.60	1.70	1.80	1.90	2.00	2.80	3.40	4.00	4.50	4.90	5.30	5.70	6.00	6.20	9.00

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TABLE 16.--SOIL AND WATER FEATURES

ence of an entry indicates the feature is not a concern. The definitions of "flooding" and "water table" in the Glossary explain such terms as "rare," "brief," and "perched." The symbol > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					<u>Ft</u>			<u>In</u>	
Albion:									
1Aa:									
Albion part-----	B	None-----	---	---	>6.0	---	---	>60	---
Shellabarger part-----	B	None-----	---	---	>6.0	---	---	>60	---
1Ab:									
Albion part-----	B	None-----	---	---	>6.0	---	---	>60	---
Shellabarger part-----	B	None-----	---	---	>6.0	---	---	>60	---
Blanket:									
Ba, Bb-----	C	None-----	---	---	>6.0	---	---	>60	---
Canadian:									
Ca-----	B	Rare-----	---	---	>6.0	---	---	>60	---
1Cb:									
Canadian part--	B	Rare-----	---	---	>6.0	---	---	>60	---
Waldeck part---	C	Occasional	Brief-----	Mar-Oct	2.0-6.0	Apparent	Oct-Apr	>60	---
Carwile:									
-----	D	Occasional	Brief to very long.	Apr-Oct	2.0-6.0	Apparent	Oct-Apr	>60	---
Clark:									
1Cd:									
Clark part-----	B	None-----	---	---	>6.0	---	---	>60	---
Ost part-----	B	None-----	---	---	>6.0	---	---	>60	---
Clime:									
Ce-----	C	None-----	---	---	>6.0	---	---	20-40	Rippable
Elandco:									
Ea, Eb, Ec-----	B	Rare to common.	Brief-----	Oct-May	>6.0	---	---	>60	---
Farnum:									
Fa, Fb, Fc-----	B	None-----	---	---	>6.0	---	---	>60	---
Goessel:									
Ga, Gb-----	D	None-----	---	---	>6.0	---	---	>60	---
Irwin:									
Ia, Ib, Ic-----	D	None-----	---	---	>6.0	---	---	>40	Hard
Lesho:									
La-----	C	Occasional	Very brief	Mar-Jul	2.0-6.0	Apparent	Jan-Dec	>60	---
Lincoln:									
Lb-----	A	Common-----	Very brief to brief.	Apr-Oct	5.0-8.0	Apparent	Nov-May	>60	---
Milan:									
Ma, Mb, Mc-----	B	None-----	---	---	>6.0	---	---	>60	---

See footnote at end of table.

SOIL SURVEY

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth Ft	Kind	Months	Depth In	Hardness
Naron: Na-----	B	None-----	---	---	>6.0	---	---	>60	---
Owens: Oc-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable
¹ Od: Owens part-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable
Rock outcrop part.									
Pits: Pa.									
Plevna: Pb-----	D	Frequent-----	Brief to long.	Mar-Oct	0-4.0	Apparent	Jan-Dec	>60	---
Pratt: Pc-----	A	None-----	---	---	>6.0	---	---	>60	---
¹ Pd: Pratt part-----	A	None-----	---	---	>6.0	---	---	>60	---
Tivoli part-----	A	None-----	---	---	>6.0	---	---	>60	---
Renfrow: Ra, Rb-----	D	None-----	---	---	>6.0	---	---	>60	---
¹ Rc: Renfrow part-----	D	None-----	---	---	>6.0	---	---	>60	---
Owens part-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable
Rosehill: Rd-----	D	None-----	---	---	>6.0	---	---	20-40	Rippable
Shellabarger: Sa, Sb, Sc-----	B	None-----	---	---	>6.0	---	---	>60	---
Tabler: Ta-----	D	None-----	---	---	2.5-3.5	Perched	Oct-Apr	>60	---
¹ Tb: Tabler part-----	D	None-----	---	---	2.5-3.5	Perched	Oct-Apr	>60	---
Drummond part--	D	Rare-----	---	---	2.0-6.0	Apparent	Nov-Apr	>60	---
Urban land: ¹ Ua: Urban land part.									
Canadian part--	B	Rare-----	---	---	>6.0	---	---	>60	---
¹ Ub: Urban land part.									
Elandco part---	B	Rare to common.	Brief-----	Oct-May	>6.0	---	---	>60	---
¹ Uc: Urban land part.									
Farnum part---	B	None-----	---	---	>6.0	---	---	>60	---

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth Ft	Kind	Months	Depth In	Hardness
Urban land: 1Ud: Urban land part.									
Irwin part----	D	None-----	---	---	>6.	---	---	>40	Hard
1Ue: Urban land part.									
Tabler part----	D	None-----	---	---	2.5-3.5	Perched	Oct-Apr	>60	---
Vanoss: Va, Vb, Vc, Vd----	B	None-----	---	---	>6.0	---	---	>60	---
Vernon: Ve, Vf-----	D	None-----	---	---	>6.0	---	---	>60	---
Waldeck: Wa-----	C	Occasional	Brief-----	Mar-Oct	2.0-6.0	Apparent	Oct-Apr	>60	---
Waurika: Wb-----	D	None-----	---	---	1.0-2.0	Perched	Mar-May	>60	---

¹This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

Table 2-2.--Runoff curve numbers for selected agricultural, suburban, and urban land use. (Antecedent moisture condition II, and $I_a = 0.2S$)

LAND USE DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Cultivated land ^{1/} : without conservation treatment	72	81	83	91
: with conservation treatment	62	71	76	81
Pasture or range land: poor condition	68	79	86	89
good condition	39	61	74	80
Meadow: good condition	30	58	71	78
Wood or Forest land: thin stand, poor cover, no mulch	45	66	77	83
good cover ^{2/}	25	55	70	77
Open Spaces, lawns, parks, golf courses, cemeteries, etc.				
good condition: grass cover on 75% or more of the area	39	61	74	80
fair condition: grass cover on 50% to 75% of the area	49	69	79	84
Commercial and business areas (85% impervious)	89	92	94	95
Industrial districts (72% impervious).	81	88	91	93
Residential: ^{3/}				
Average lot size Average % Impervious ^{4/}				
1/8 acre or less 65	77	85	90	92
1/4 acre 38	61	75	83	87
1/3 acre 30	57	72	81	86
1/2 acre 25	54	70	80	85
1 acre 20	51	68	79	84
Paved parking lots, roofs, driveways, etc. ^{5/}	98	98	98	98
Streets and roads:				
paved with curbs and storm sewers ^{5/}	98	98	98	98
gravel	76	85	89	91
dirt	72	82	87	89

^{1/} For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, Aug. 1972.

^{2/} Good cover is protected from grazing and litter and brush cover soil.

^{3/} Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

^{4/} The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

^{5/} In some warmer climates of the country a curve number of 95 may be used.

TABLE 2. Runoff Curve Numbers for Hydrologic Soil-Cover Complexes
(Antecedent Moisture Condition II, and $I_a = 0.2 S$)

Land Use Description/Treatment/Hydrologic Condition			Hydrologic Soil Group			
Residential: ^{1/}			A	B	C	D
Average lot size	Average % Impervious ^{2/}					
1/8 acre or less	65		77	85	90	92
1/4 acre	38		61	75	83	87
1/3 acre	30		57	72	81	86
1/2 acre	25		54	70	80	85
1 acre	20		51	68	79	84
Paved parking lots, roofs, driveways, etc. ^{3/}			98	98	98	98
Streets and roads:						
paved with curbs and storm sewers ^{3/}			98	98	98	98
gravel			76	85	89	91
dirt			72	82	87	89
Commercial and business areas (85% impervious)			89	92	94	95
Industrial districts (72% impervious)			81	88	91	93
Open Spaces, lawns, parks, golf courses, cemeteries, etc.						
good condition: grass cover on 75% or more of the area			39	61	74	80
fair condition: grass cover on 50% to 75% of the area			49	69	79	84
Fallow	Straight row	---	77	86	91	94
Row crops	Straight row	Poor	72	81	88	91
	Straight row	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	Contoured	Good	65	75	82	86
	Contoured & terraced	Poor	66	74	80	82
	Contoured & terraced	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	Contoured & terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes ^{4/} or rotation meadow	Straight row	Poor	66	77	85	89
	Straight row	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	Contoured	Good	55	69	78	83
	Contoured & terraced	Poor	63	73	80	83
	Contoured & terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	Contoured	Fair	25	59	75	83
	Contoured	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods or Forest land		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		---	59	74	82	86

^{1/} Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

^{2/} The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

^{3/} In some warmer climates of the country a curve number of 95 may be used.

^{4/} Close-drilled or broadcast.

SECTION 7

ESTIMATING THE TIME-OF-CONCENTRATION

Time is an important element in hydrologic forecasting. This is reflected in the fact that most hydrologic methods include a time variable as input. The SCS methods are no different, and the time-of-concentration was selected as the best indicator of the effects of time.

The time-of-concentration (t_c) is a measure of the time for a particle of water to travel from the hydrologically most distant point in the watershed to the point where the design is to be made. Additionally, the following operational definition is sometimes used with respect to unit hydrographs: the time-of-concentration is the time from the end of rainfall excess to the point of inflection on the recession. While this operational definition will be used in developing the SCS unit hydrograph, the former definition should be understood for the computation of time-of-concentration estimates.

Hydrologists have developed numerous methods for estimating the time-of-concentration. Two methods are recommended within NEH-4 and TR-55, the lag method and the upland, or velocity, method. Almost all methods of estimating the time-of-concentration use the slope, the hydraulic length, and some measure of land use; the lag and velocity methods are no different in that they use these three factors. The hydraulic length is the distance from the hydrologically most distant point in the watershed to the point where the design is to be made.

The Lag Method

The lag method relates the time lag (L) which is defined as the time in hours from the center of mass of rainfall excess to the peak discharge, to the slope (Y) in percent, the hydraulic length (ℓ) in feet, and the maximum retention (S):

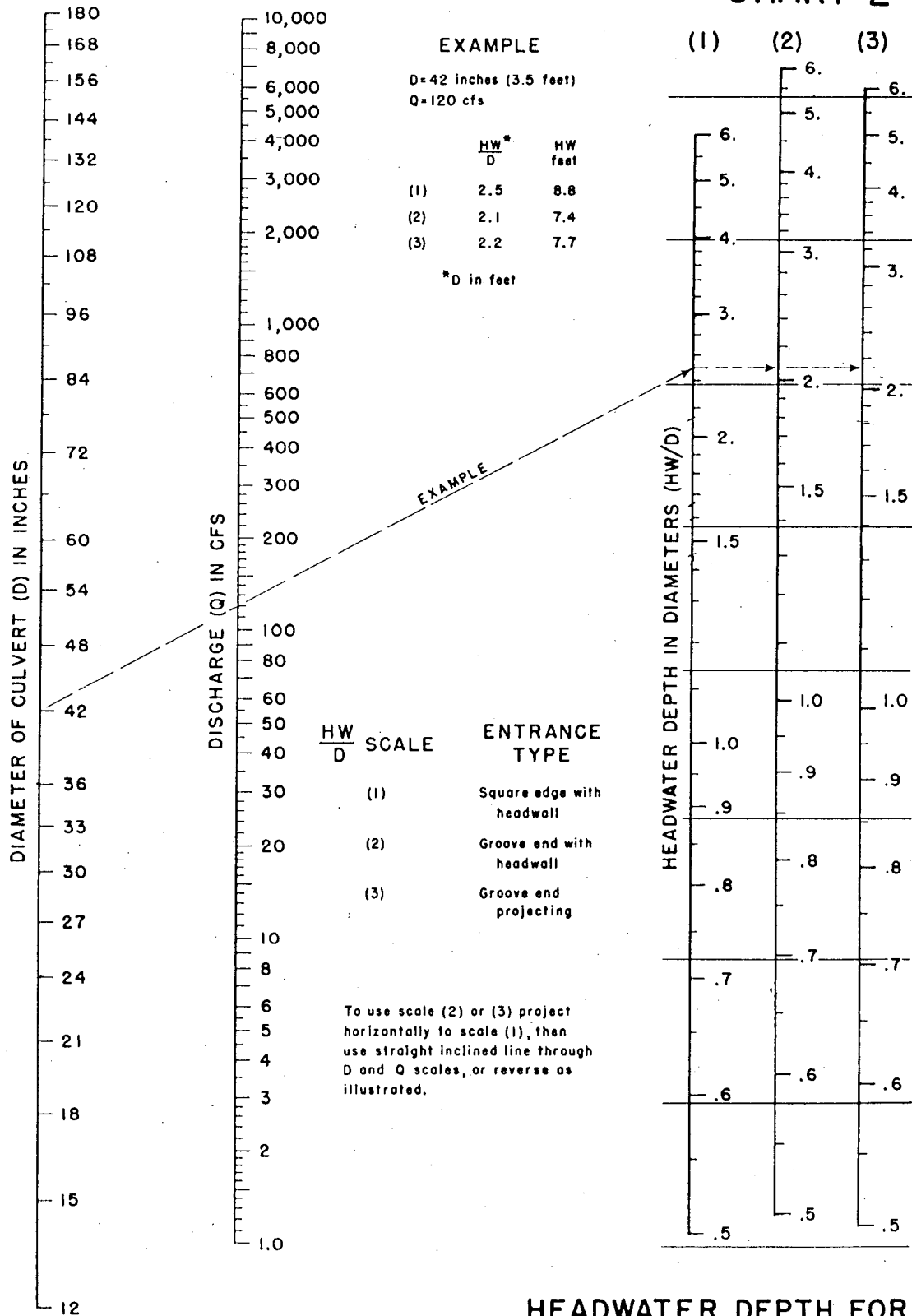
$$L = \frac{\ell^{0.8} (S+1)^{0.7}}{1900 Y^{0.5}} \quad (9)$$

in which S is given by Eq. 8. The time lag can also be determined from the nomograph of Fig. 7. Empirical evidence used in developing the SCS methods resulted in the following relationship between the time-of-concentration and the lag:

$$t_c = \frac{5}{3} L \quad (10)$$

in which t_c is measured in hours.

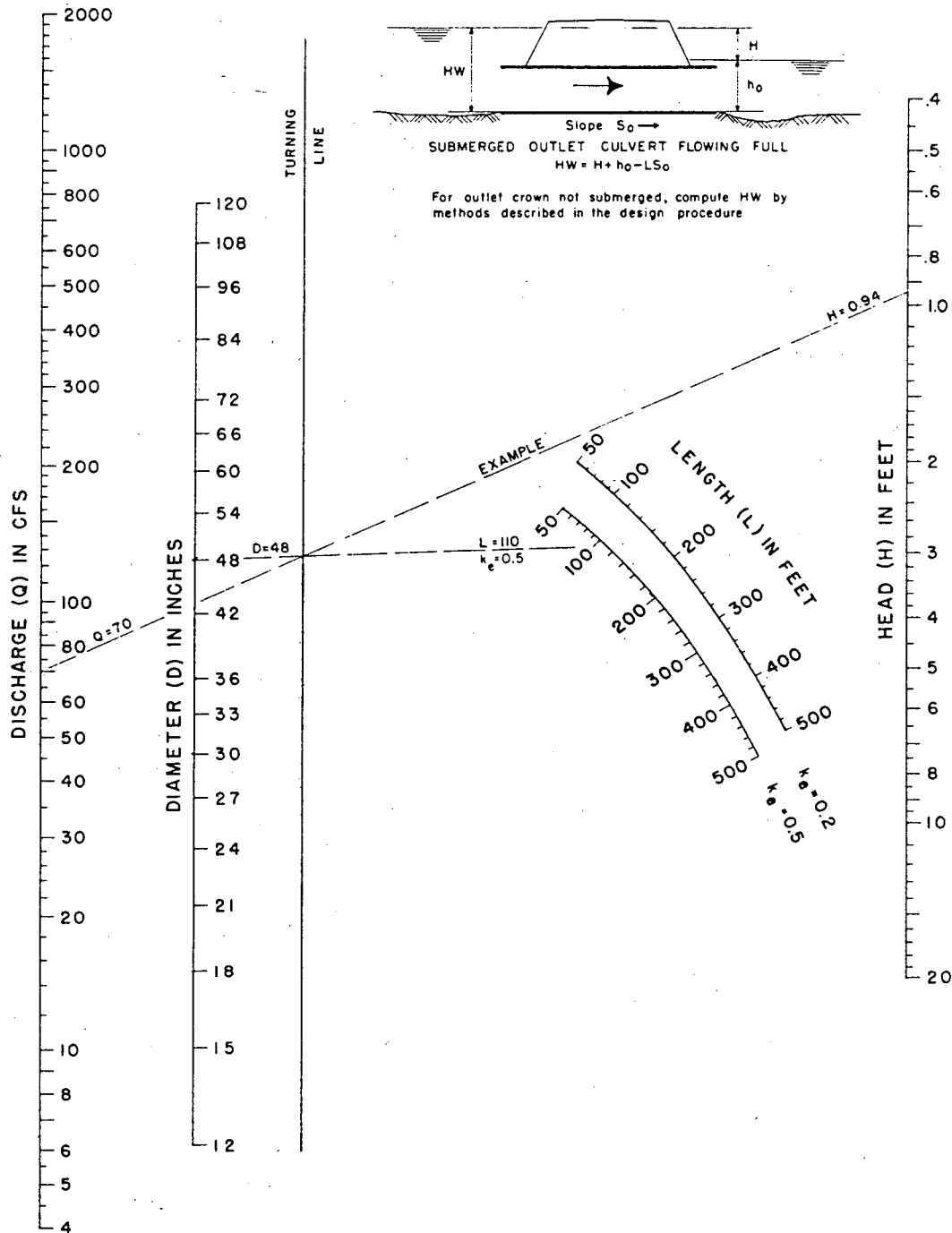
CHART 2



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

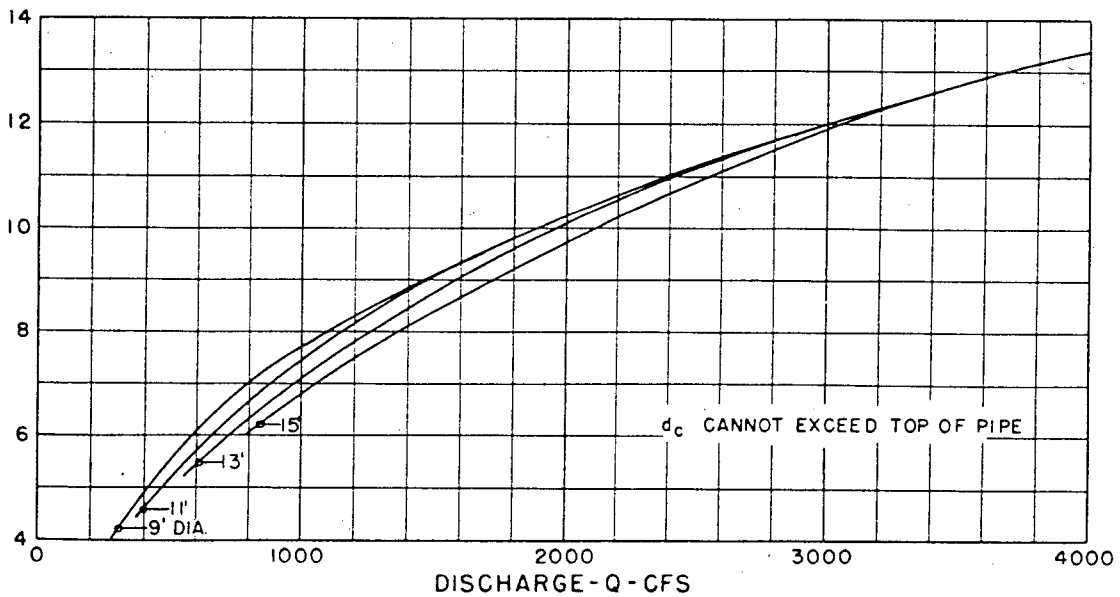
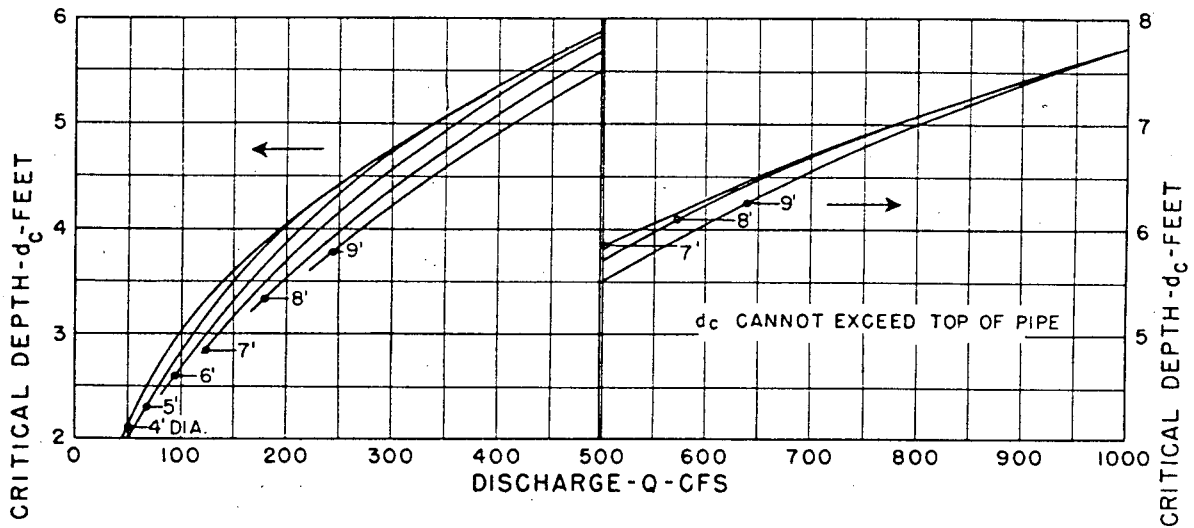
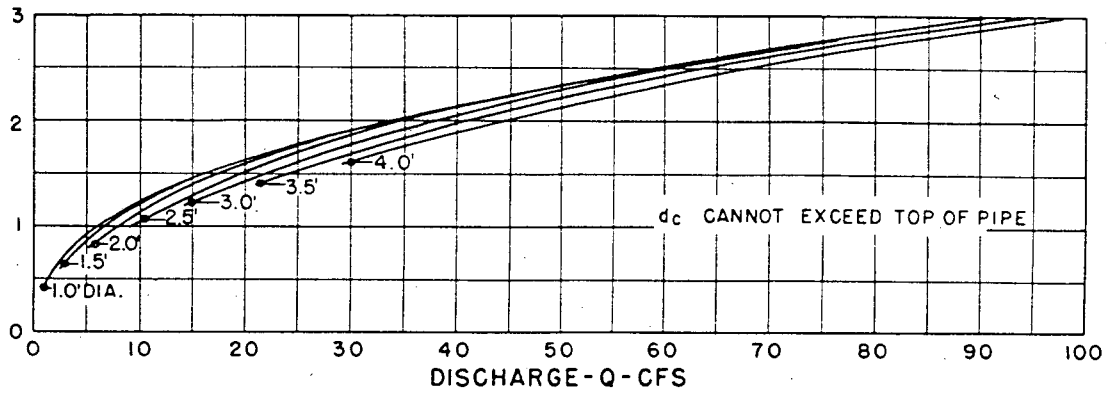
HEADWATER SCALES 2 & 3
REVISED MAY 1964

CHART 9



HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
 $n = 0.012$

CHART 16



BUREAU OF PUBLIC ROADS
JAN. 1964

CRITICAL DEPTH
CIRCULAR PIPE