MID-KANSAS ENGINEERING CONSULTANTS P.A.
3500 NORTH ROCK ROAD, BLDG. #800
WICHITA, KANSAS 67226 1-316-682-6561

CALCULATIONS & SKETCHES

Proj. No. _____
By FBN Date 5/20/86
Chkd By _____ Date _____
Sheet 1 Of _____

Location Deer Run
Reference Drainage & Utility Plan
Drainage

Determine Street Slopes & Street Flows

Street	Areas	Min. Slope	Min Q_{LANE}*	Min Q_{STREET}*	Max Q_2 per lane
Lakepoint	C & F	0.004%	12.8 cfs	25.7 cfs	2.61 cfs
Lakepoint	D & G	0.006%	15.7 cfs	31.5 cfs	3.51 cfs
Lakepoint	E & H	0.006%	15.7 cfs	31.5 cfs	
Plumthicket	I & J	0.004%	12.8 cfs	25.7 cfs	
Deer Run	J & K	0.008%	12.16 cfs	36.3 cfs	

* Based on Flow to top of curb.

Determine Q_i @ Inlet W of Area C.

For Q_2 = 2.61 cfs, S_o = 0.006%, S_x = 0.03125%, n = 0.016, W = 2.1667', Eff = .8,

L_i = 5', Q_i = 1.39 cfs; for Q_{100} = 5.76 cfs, Q_i = 2.19 cfs

Total Q_{100} = 32.42 + 2.19 = 34.60 cfs for pipe design

Determine Q_i @ Inlet on E. side of Lakepoint

For Q_2 = 3.38 cfs, S_o = 0.006%, S_x = 0.3125%, n = 0.016, W = 2.1667', Eff = 0.80

L_i = 10', Q_i = 2.27 cfs. For Q_{100} = 7.49 cfs, Q_i = 4.35 cfs

Total Q_{100} = 34.60 + 4.35 = 38.95 cfs for pipe design

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CALCULATIONS & SKETCHES

Proj. No. _____
By FBN Date 5/20/86
Chkd By _____ Date _____
Sheet 2 Of _____

Location Deer Run
Reference Drainage & Utility Plan
Drainage

Determine Q_i for Inlet @ N. end of Lakepoint

For $Q_2 = 9.14 - 2.27 = 6.87$ cfs, $S_o = 0.006$ ft/ft, $L_i = 5'$, $Q_i = 2.41$ cfs

For $Q_{100} = 20.24 - 4.35 = 15.89$ cfs, $Q_i = 3.82$ cfs

Total $Q_{100} = 38.95 \left(\frac{3.82}{3.96}\right) + 3.82 = 41.79$ cfs for pipe design

Check Sump Condition on E. side of Lakepoint

$Q_{100} = 33.95 - [(4.35 + 3.82)(\frac{8.37}{8.55})] = 25.95$ cfs

Try $L_i = 10'$, $h = 0.7'$; By orifice formula, $d = 1.18'$

Check Sump Condition on W. side of Lakepoint

$Q_{100} = 10.85 - [(2.19)(\frac{8.37}{8.55})] = 8.71$ cfs

Try $L_i = 10'$, $h = 0.36'$; $d = 0.43'$

Check Combined Sump Condition ⇒ $Q_{100} = 25.95 + 8.71 = 34.66$ cfs

Try 2 $L_i = 10'$ by orifice formula, $d_{max} = 0.67' < 0.80$ R.O.W.

For Pipe Design across Lakepoint, $Q_{100} = 41.79 + \frac{34.66}{2} = 59.12$ cfs

Determine Q_{100} thru Reserves H & J from offsite flow

Drainage Area = 127.20 acres = 0.199 sq.mi.; Present CN = 80

for open space w/ good grass cover; $L = 4,400'$, $Y = \frac{239 - 208}{4400} =$

0.7% $S = \frac{1000}{80} - 10 = 2.5$

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CALCULATIONS & SKETCHES

Proj. No. _____
By FBN Date 5/21/86
Chkd By _____ Date _____
Sheet 3 Of _____

Location Deer Run
Reference Drainage & Utility Plan

$L = \frac{(4,400)^{.8}(2.5+1)^{.7}}{1,900(.7)^{.5}} = 1.24$ hr HLM = 50% Imp = 3%

$F_{HLm} = 0.71$ $F_{Imp} = .98$

$T_c = 1.24(.71)(.98)\frac{60}{8.6} = 86.28$ min $= 1.44$ hr

Estimate Q_{100} by Rational Formula $Q_{100} = 0.3 \times 2.99 \times 127.2 = 114.1$ cfs

Design Ditch: Assume S = 0.4%; To keep V = 4 fps,

$A_{reqd} = \frac{114.1}{4} = 28.53$ sq. ft. Try B = 2', Side slopes = 6:1

D = 2' Q = 78.33; Try B = 4', Q = 93.19 cfs < 114.1 cfs N.G

Try S = 0.5%, D = 2', Side Slope = 6:1, B = 4', Q = 104.19 cfs

Try S = 0.5%, D = 2.1', Side Slope = 6:1, B = 4', Q = 116.35 cfs > 114.1 cfs

Check ✓ : $V = \frac{116.35}{34.86} = 3.35$ fps < 4' OK

Bank full Elev. = 207

Elev	Q	A	Elev	Q	A
203.5	0	0	206.0	176.78	47.5
204.0	5.19	3.5	206.5	274.41	66.0
204.5	21.80	10.0	207.0	399.93	87.5
205.0	53.62	19.5	207.5	556.08	112.0
205.5	104.19	32.0			

Based on TR 20 Run DEERUN1 for 100 yr, 6 hr rainfall, $Q_{Peak} = 174.91$ cfs

Try 2 - 53" x 34" HERCP for culvert. Assume Top of Curb = 208

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CALCULATIONS & SKETCHES

Proj. No. _____
By FSN Date 5/22/86
Chkd By _____ Date _____
Sheet 4 Of _____

Location Deer Run
Reference Drainage & Utility Plan

$HW = 2.42 + \frac{34+5}{12} + 1 = 4.67'$; $\frac{HW}{D} = \frac{4.67}{2.83} = 1.65$

Assume Square Edge w/ headwall $\quad Q = 85$ cfs $\quad Q_{TOTAL} = 170$ cfs < 174.91

Try 3 - 36" RCP's, $\quad HW = 2.42 + \frac{36+9}{12} - 1 = 4.75'$; $\frac{HW}{D} = \frac{4.75}{3} = 1.58$

$Q = 56$ cfs; $Q_{TOTAL} = 168$ cfs < 174.91 cfs N.G.

Try 2 - 60" x 38" HERCP. $\quad HW = 2.92 + \frac{38+5.5}{12} - 1 = 5.05'$

$\frac{HW}{D} = \frac{5.05}{3.167} = 1.59$ $\quad Q = 110$ cfs $\quad Q_{TOTAL} = 220$ cfs > 174.91

Try 2 - 48" RCP's. $\quad HW = 2.42 + \frac{48+5}{12} - 1 = 6.84'$; $\frac{HW}{D} = 1.71$

$Q = 228$ cfs, $\quad Q_{TOTAL} = 254$ cfs

Try 3 - 42" RCP's. $\quad HW = 2.42 + \frac{42+5.5}{12} - 1 = 5.30'$; $\frac{HW}{D} = 1.51$

$Q = 80$ cfs $\quad Q_{TOTAL} = 240$ cfs

Use TR20 to add Q_{100} for Woodspring 3rd & Deer Run.

$Q_{100} = 192.37$ cfs $\quad Q_2 \approx (.43)(192.37) = 83$ cfs

Use 2 - 36" RCPs

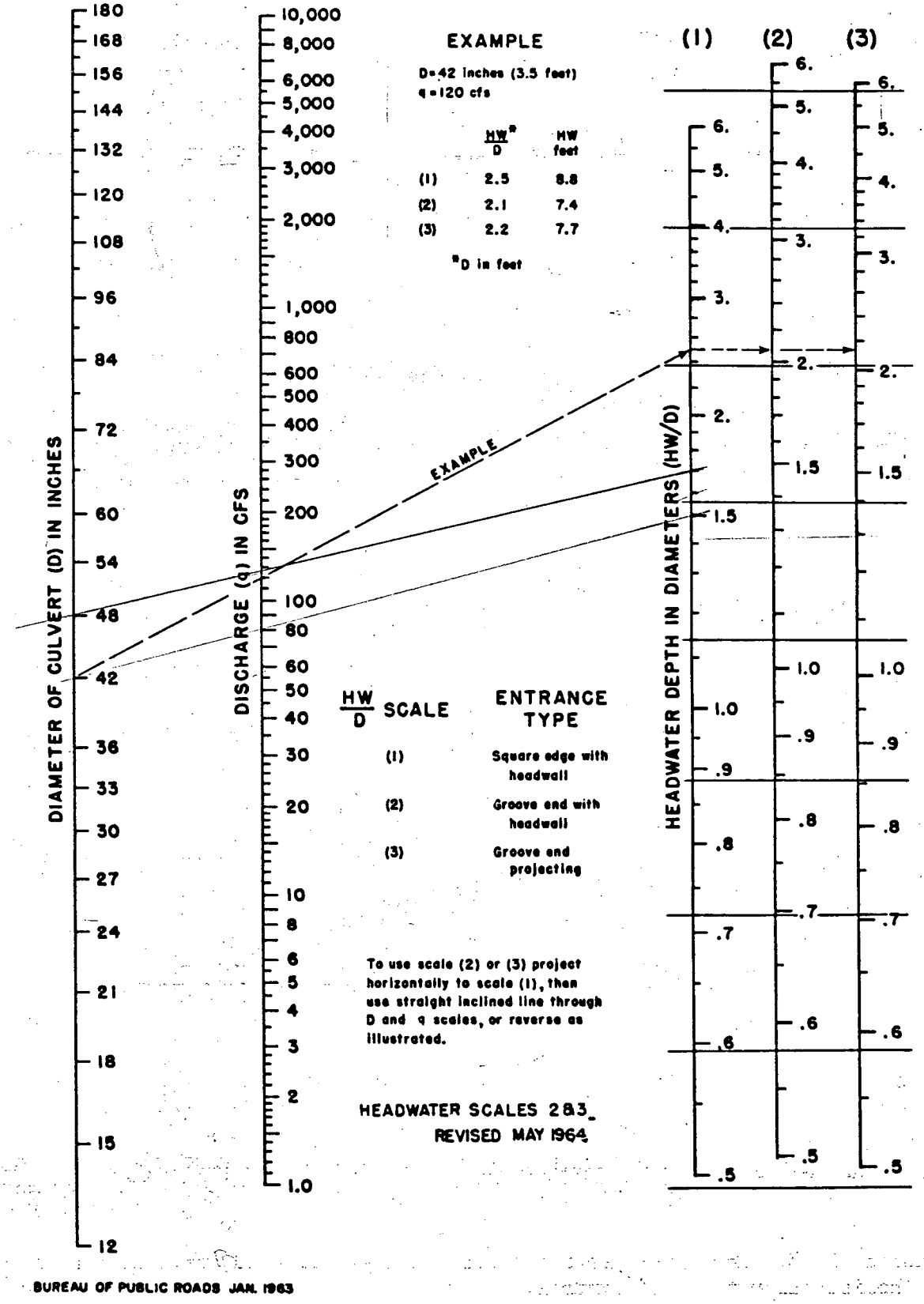
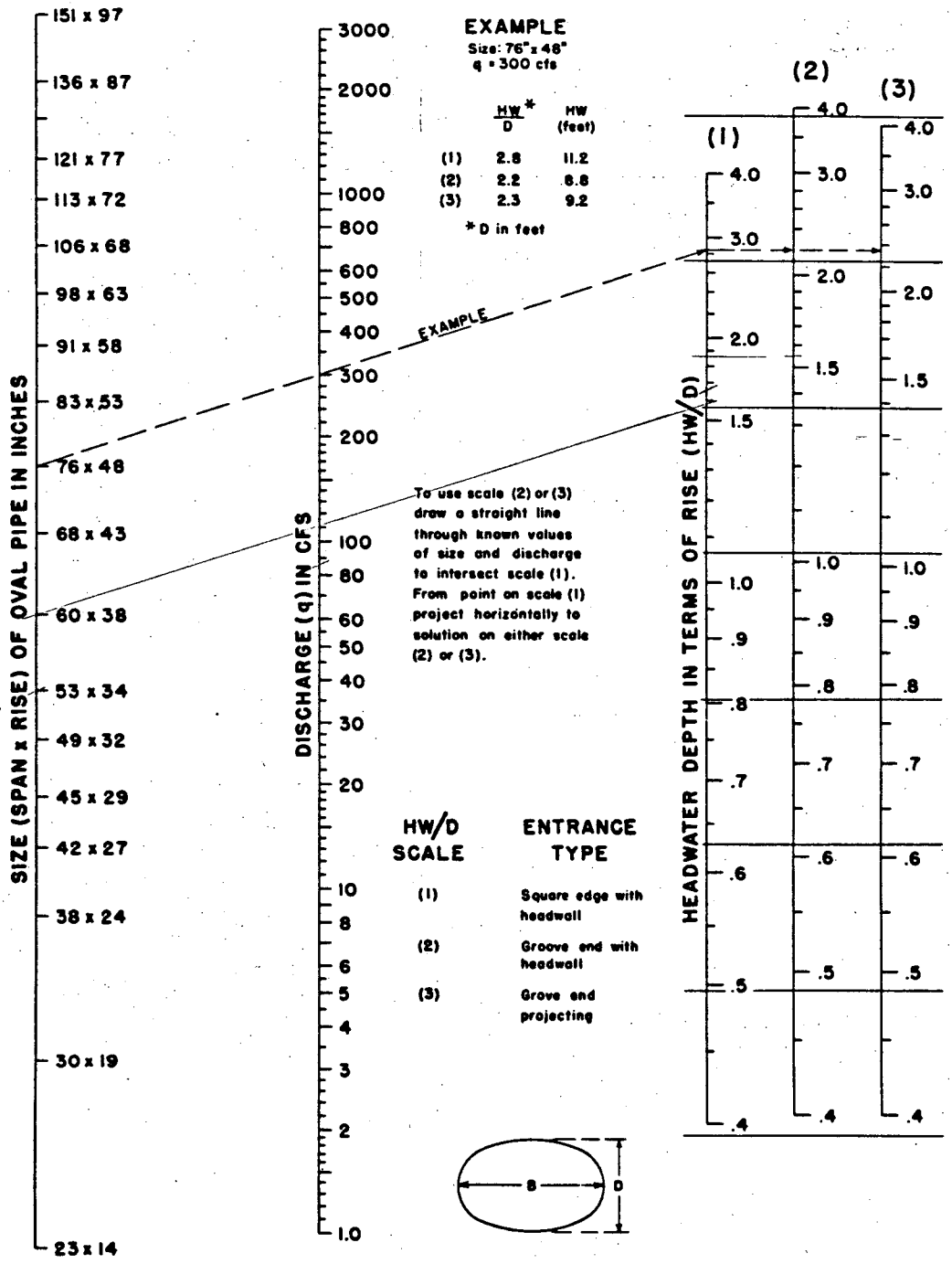


Exhibit 14-7. Headwater depth for concrete pipe culverts with inlet control.



BUREAU OF PUBLIC ROADS JAN. 1963

Exhibit 14-8. Headwater depth for oval concrete pipe culverts long axis horizontal with inlet control.

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********************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY********************

JOB TR-20                    FULLPRINT          SUMMARY
TITLE 001 DEERUN1   DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
TITLE     RAINFALL
 5 RAINFL 7                   1.0
 8              0.0         0.50        1.30        4.10        5.00
 8              5.50        5.90        5.90        5.90        5.90
 9 ENDTBL
 2 XSECTN   001             1.00      207.00
 8                        203.50        0.00        0.00
 8                        204.00        5.19        3.50
 8                        204.50       21.85       10.90
 8                        205.00       53.62       19.50
 8                        205.50      104.19       32.00
 8                        206.00      176.78       47.50
 8                        206.50      274.41       66.00
 8                        207.00      399.93       87.50
 8                        207.50      556.08      112.00
 9 ENDTBL
 6 RUNOFF 1 001       6       0.199      80.0        1.44   1 1   1   1
 6 REACH  3 001   6   5   4400.0                          1 1   1   1
   ENDATA
 7 INCREM 6                   0.04
 7 COMPUT 7 001   001                    1.0         1.0   7 2  01  06
   ENDCMP 1
   ENDJOB 2

********************************END OF 80-80 LIST********************************
```

FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERVAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-0933, FORT WORTH, TX (SOUTH) -- 334-6242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE A-9 TO A-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

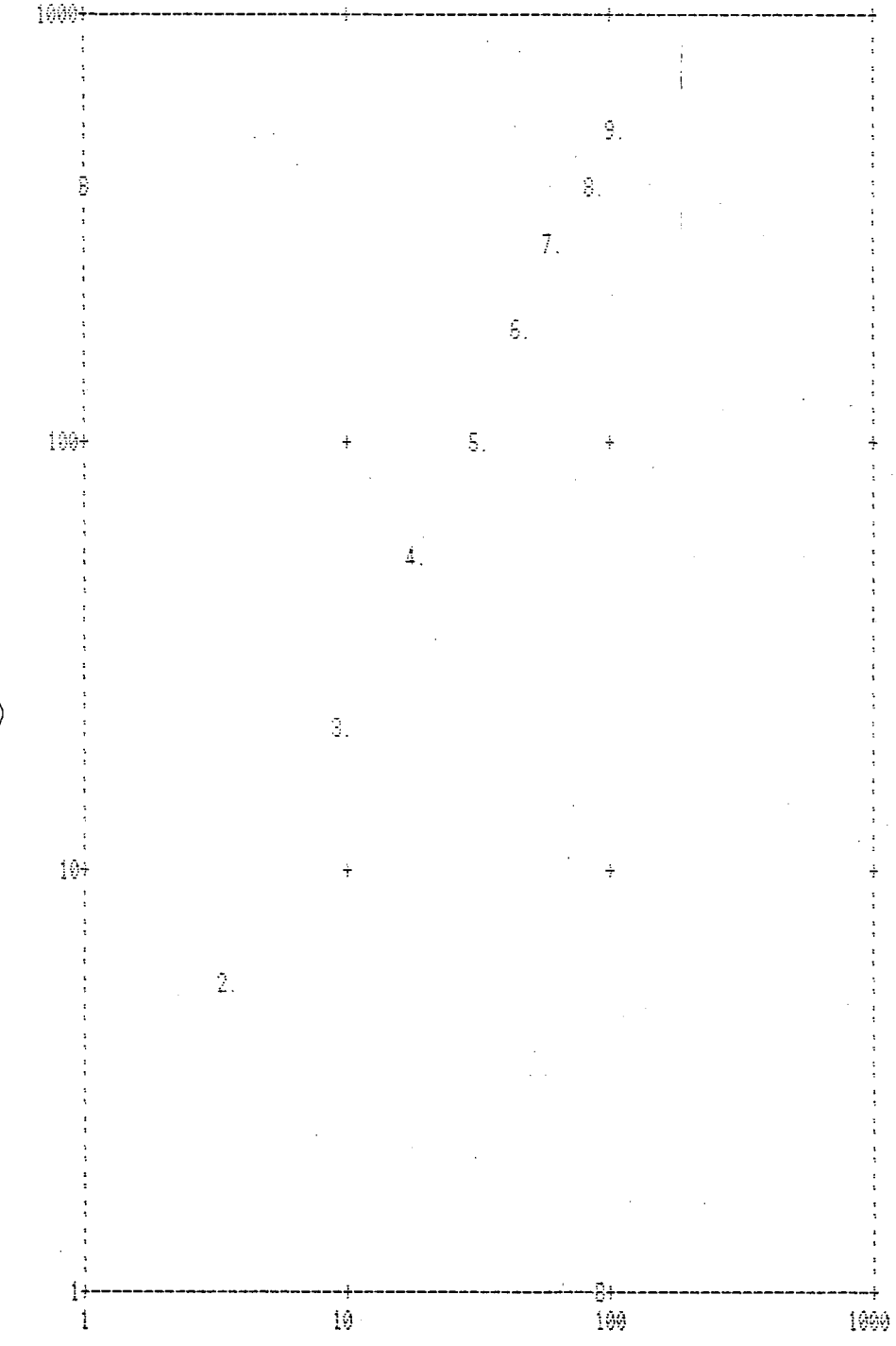
CUMULATIVE RAINFALL TABLE 7 TIME INCREMENT= 1.00

```
8          .0000     .5000    1.3000    4.1000    5.0000
8         5.5000    5.9000    5.9000    5.9000    5.9000
 9 ENDTBL                                              79
```

CROSS-SECTION DATA, CROSS-SECTION NO. 1 DRAINAGE AREA= 1.00 BANKFULL ELEV.= 207.00

	ELEVATION	DISCHARGE	END AREA
8	203.50	.00	.00
8	204.00	5.19	3.50
8	204.50	21.85	10.00
8	205.00	53.62	19.50
8	205.50	104.19	32.00
8	206.00	176.78	47.50
8	206.50	274.41	66.00
8	207.00	399.93	87.50
8	207.50	556.00	112.00

9 ENDTBL



CROSS SECTION 1 END AREA VS DISCHARGE

REFERENCE NO'S	DISCHARGE (CFS)	END AREA (SQ.FT.)	M
1	.00	.00	1.37
2	5.19	3.50	1.37
3	21.85	10.00	1.37
4	53.62	19.50	1.35
5	104.19	32.00	1.35
6	176.76	47.50	1.34
7	274.41	66.00	1.34
8 ---	399.93	87.50	1.34
9	556.00	112.00	1.34

LEGEND

+ = GRID REFERENCE
. = LOCATION OF PLOTTED VALUE
3 = REFERENCE NO. OF PLOTTED VALUE
X = MULTIPLE REFERENCE NUMBERS
B = BANKFULL RELATION SHOWN ON AXIS
AREA= 87.5 SQ FT DISCHARGE= 399.9 CFS

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 1 RECORD ID 150
OUTPUT HYDROGRAPH = 6 DATA FIELD VALUES = .1990 80.0000 1.4400
OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

STANDARD CONTROL OPERATION REACH CROSS SECTION 1 RECORD ID 200
INPUT HYDROGRAPH = 6 OUTPUT HYDROGRAPH = 5 DATA FIELD VALUES = 4400.0000 .0000 .0000
OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

EXECUTIVE CONTROL OPERATION INCREM MAIN TIME INCREMENT = .04 HOURS RECORD ID 220

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 1 TO XSECTION 1 RECORD ID 230
STARTING TIME = .00 RAIN DEPTH = 1.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 7 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 6 MAIN TIME INCREMENT = .04 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 6
AREA= .20 SQ MI INPUT RUNOFF CURVE= 80. TIME OF CONCENTRATION= 1.44 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0400 HOURS

PEAK TIME(HRS) PEAK DISCHARGE(CFS) PEAK ELEVATION(FEET)
3.65 184.61 (RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS			TIME INCREMENT = .04 HOURS				DRAINAGE AREA =		.20 SQ.MI.
.80	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.02
1.20	DISCHG	.03	.05	.10	.15	.22	.32	.44	.59	.78	1.01
1.60	DISCHG	1.28	1.60	1.98	2.41	2.90	3.44	4.05	4.71	5.43	6.20
2.00	DISCHG	7.03	7.95	8.93	10.13	11.46	12.95	14.65	16.56	18.73	21.16
2.40	DISCHG	23.90	26.98	30.43	34.29	38.58	43.28	48.39	53.89	59.74	65.92
2.80	DISCHG	72.39	79.11	86.05	93.15	100.41	107.77	115.16	122.50	129.69	136.67
3.20	DISCHG	143.39	149.89	155.87	161.51	166.69	171.33	175.34	178.68	181.27	183.09
3.60	DISCHG	184.19	184.61	184.39	183.65	182.38	180.70	178.64	176.26	173.64	170.80
4.00	DISCHG	167.80	164.62	161.36	158.06	154.71	151.35	147.98	144.62	141.27	137.95
4.40	DISCHG	134.71	131.53	128.47	125.51	122.65	119.86	117.14	114.45	111.81	109.20
4.80	DISCHG	106.66	104.16	101.72	99.35	97.03	94.77	92.57	90.44	88.39	86.41
5.20	DISCHG	84.52	82.70	80.95	79.27	77.66	76.11	74.62	73.21	71.87	70.59
5.60	DISCHG	69.36	68.18	67.05	65.95	64.89	63.87	62.90	61.96	61.06	60.19
6.00	DISCHG	59.35	58.54	57.74	56.94	56.14	55.34	54.51	53.66	52.77	51.84
6.40	DISCHG	50.86	49.82	48.71	47.52	46.24	44.89	43.47	41.97	40.43	38.84
6.80	DISCHG	37.22	35.59	33.94	32.30	30.67	29.05	27.45	25.89	24.37	22.90
7.20	DISCHG	21.49	20.10	18.79	17.53	16.33	15.19	14.12	13.14	12.23	11.39
7.60	DISCHG	10.61	9.90	9.24	8.62	8.05	7.52	7.02	6.56	6.13	5.72
8.00	DISCHG	5.34	4.98	4.64	4.33	4.03	3.76	3.50	3.27	3.04	2.84
8.40	DISCHG	2.64	2.46	2.29	2.13	1.98	1.85	1.72	1.60	1.49	1.39
8.80	DISCHG	1.29	1.20	1.12	1.04	.97	.90	.84	.78	.72	.67
9.20	DISCHG	.62	.58	.53	.49	.45	.42	.39	.36	.33	.30
9.60	DISCHG	.28	.26	.24	.22	.20	.18	.17	.15	.14	.13
10.00	DISCHG	.11	.10	.09	.08	.07	.06	.05	.05	.04	.03
10.40	DISCHG	.03	.02	.02	.01	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 3.69 WATERSHED INCHES, 474.00 CFS-HRS, 39.17 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 1
INPUT HYDROGRAPH= 6 OUTPUT HYDROGRAPH= 5
LENGTH = 4400.00 FEET INPUT = RATING CURVE REPRESENTATIVE OF REACH

COEFFICIENTS USED IN ROUTING RELATED TO CROSS SECTION AREA, X= .99 M= 1.04

MODIFIED ATT-KIN ROUTING COEFFICIENT = .15 PEAK TRAVEL TIME = .28 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
3.92	174.91	205.59

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .04 HOURS			DRAINAGE AREA =		.20 SQ.MI.
1.20	DISCHG	.00	.00	.01	.03	.05	.07	.11	.16	.22	.31
1.60	DISCHG	.41	.55	.71	.90	1.13	1.40	1.71	2.07	2.47	2.92
2.00	DISCHG	3.42	3.97	4.58	5.25	6.00	6.83	7.77	8.82	10.00	11.34
2.40	DISCHG	12.84	14.53	16.43	18.57	20.97	23.66	26.66	29.98	33.63	37.62
2.80	DISCHG	41.95	46.60	51.57	56.83	62.38	68.19	74.24	80.50	86.91	93.45
3.20	DISCHG	100.06	106.69	113.27	119.78	126.15	132.35	138.30	143.96	149.27	154.16
3.60	DISCHG	158.59	162.49	165.87	168.70	170.99	172.73	173.95	174.66	174.90	174.71
4.00	DISCHG	174.11	173.15	171.84	170.24	168.38	166.29	164.01	161.56	158.97	156.26
4.40	DISCHG	153.46	150.60	147.68	144.74	141.80	138.88	135.97	133.09	130.24	127.43
4.80	DISCHG	124.64	121.89	119.18	116.51	113.89	111.31	108.78	106.31	103.88	101.51
5.20	DISCHG	99.20	96.95	94.78	92.67	90.62	88.64	86.72	84.87	83.09	81.37
5.60	DISCHG	79.72	78.14	76.62	75.15	73.75	72.39	71.09	69.84	68.63	67.47
6.00	DISCHG	66.36	65.29	64.26	63.26	62.29	61.35	60.43	59.53	58.63	57.73
6.40	DISCHG	56.83	55.92	54.99	54.03	53.03	51.99	50.91	49.77	48.58	47.33
6.80	DISCHG	46.03	44.69	43.29	41.86	40.40	38.91	37.41	35.88	34.36	32.83
7.20	DISCHG	31.31	29.81	28.33	26.87	25.44	24.05	22.69	21.38	20.12	18.91
7.60	DISCHG	17.76	16.67	15.64	14.66	13.73	12.86	12.05	11.28	10.56	9.88
8.00	DISCHG	9.24	8.65	8.08	7.56	7.06	6.60	6.16	5.76	5.38	5.02
8.40	DISCHG	4.68	4.37	4.08	3.81	3.55	3.31	3.09	2.88	2.68	2.50
8.80	DISCHG	2.33	2.17	2.02	1.88	1.75	1.63	1.52	1.42	1.32	1.23
9.20	DISCHG	1.14	1.06	.99	.92	.85	.79	.73	.68	.63	.58
9.60	DISCHG	.54	.50	.46	.43	.40	.37	.34	.31	.28	.26
10.00	DISCHG	.24	.22	.20	.19	.17	.15	.14	.13	.11	.10
10.40	DISCHG	.09	.08	.07	.06	.05	.05	.04	.03	.03	.02
10.80	DISCHG	.02	.01	.01	.01	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 3.69 WATERSHED INCHES, 473.96 CFS-HRS, 39.17 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 1 RECORD ID 24

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID 25

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 6													
XSECTION 1	RUNOFF	.20	7	2	.04	.0	5.90	6.00	3.69	---	3.65	164.61	927.7
XSECTION 1	REACH	.20	7	2	.04	.0	5.90	6.00	3.69	205.99	3.92	174.91	878.5

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK TRAVEL TIME	
		INFLOW		OUTFLOW		OUTFLOW+ INTERV. AREA			VOLUME	MAIN	ITER-	Q AND A EQUATION				PEAK	S/Q	ATT-	STOR-	KINE-
XSEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	BASE-FLOW (CFS)	ABOVE BASE (IN)	TIME INCR (HR)	ATION #	COEFF (X)	POWER (M)	FACTOR (KM)		RATIO O/I (O*)	#PEAK (SEC)	KIN COEFF (C)	AGE (HR)	MATIC (HR)
ALTERNATE 1 STORM S																				
1	4400	185	3.6	175	3.9	---	---	0	3.69	.04	1	.987	1.04	.062	.947	870	.15	.28	.24

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 6
XSECTION 1 20		
ALTERNATE 1		174.91

END OF 1 JOBS IN THIS RUN

```
xxxxxxxxxxxxxxxxxxxxS0-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGYxxxxxxxxxxxxxxxxxxxx

JOB TR-20                    FULLPRINT          SUMMARY                          10
TITLE 001 DEERUN1   DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR               20
TITLE     RAINFALL
 5 RAINFL 7                  1.0                                                 40
 8              0.0          0.50        1.30        4.10        5.00           50
 8              5.50         5.90        5.90        5.90        5.90           60
 9 ENDTBL                                                                       70
 2 XSECTN   001               1.00      207.00                                   80
 8                          203.50        0.00        0.00                      90
 8                          204.00        5.19        3.50                     100
 8                          204.50       21.85       10.00                     110
 8                          205.00       53.62       19.50                     120
 8                          205.50      104.19       32.00                     130
 8                          206.00      176.78       47.50                     140
 8                          206.50      274.41       66.00                     150
 8                          207.00      399.93       87.50                     160
 8                          207.50      556.08      112.00                     170
 9 ENDTBL                                                                      180
 6 RUNOFF 1 001       6      0.199      80.0         1.44   1 1   1   1        190
 6 RUNOFF 1 001       5      0.027      87.0         0.32   1 1   1   1        200
 6 ADDHYD 4 001   6 5 7                                    1 1   1   1        210
 6 REACH  3 001   7   5   4400.0                           1 1   1   1        220
   ENDATA                                                                      230
 7 INCREM 6                  0.04                                              240
 7 COMPUT 7 001   001                    1.0         1.0    7 2  01  06       250
   ENDCMP 1                                                                    260
   ENDJOB 2                                                                    270

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxEND OF 80-80 LISTxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
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FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (K,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERVAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-0933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

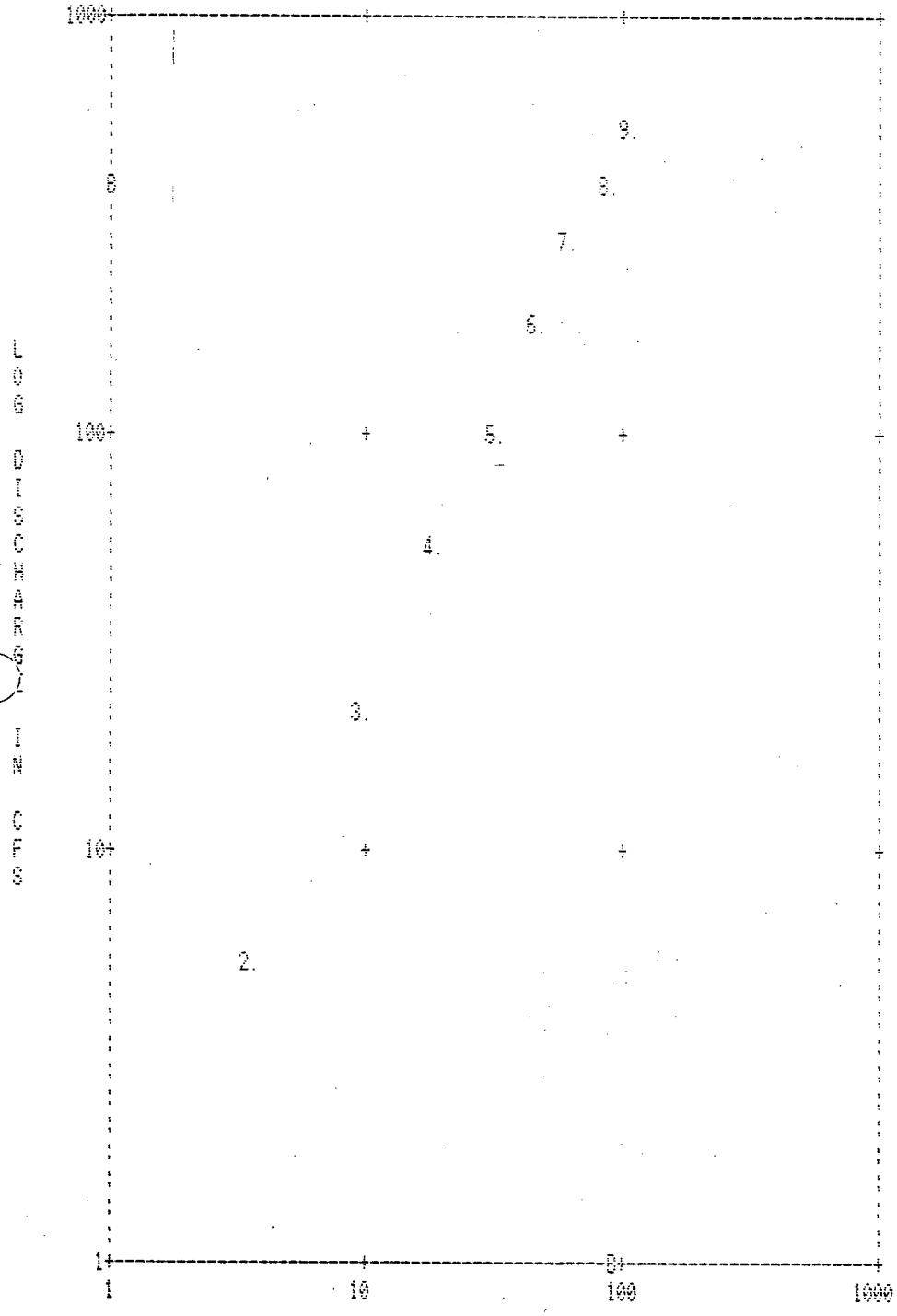
CUMULATIVE RAINFALL TABLE 7 TIME INCREMENT= 1.00

```
8          .0000    .5000   1.3000   4.1000   5.0000
8         5.5000   5.9000   5.9000   5.9000   5.9000
 9 ENDTBL                                          70
```

CROSS-SECTION DATA, CROSS-SECTION NO. 1 DRAINAGE AREA= 1.00 BANKFULL ELEV.= 207.00

	ELEVATION	DISCHARGE	END AREA
8	203.50	.00	.00
8	204.00	5.19	3.50
8	204.50	21.85	10.00
8	205.00	53.62	19.50
8	205.50	104.19	32.00
8	206.00	176.78	47.50
8	206.50	274.41	66.00
8	207.00	399.93	87.50
8	207.50	556.00	112.00

9 ENDTBL



LOG CROSS SECTION END AREA IN SQ. FT.

CROSS SECTION 1 END AREA VS DISCHARGE

REFERENCE NO'S	DISCHARGE (CFS)	END AREA (SQ.FT.)	M
1	.00	.00	1.37
2	5.19	3.50	1.37
3	21.85	10.00	1.37
4	53.62	19.50	1.35
5	104.19	32.00	1.35
6	176.78	47.50	1.34
7	274.41	66.00	1.34
8	399.93	87.50	1.34
9	556.00	112.00	1.34

LEGEND

+ = GRID REFERENCE
. = LOCATION OF PLOTTED VALUE
9 = REFERENCE NO. OF PLOTTED VALUE
X = MULTIPLE REFERENCE NUMBERS
B = BANKFULL RELATION SHOWN ON AXIS
AREA= 87.5 SQ FT DISCHARGE= 399.9 CFS

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 1 — RECORD ID 199
OUTPUT HYDROGRAPH = 6 — DATA FIELD VALUES = .1990 80.0000 1.4400
OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 1 — RECORD ID 200
OUTPUT HYDROGRAPH = 5 — DATA FIELD VALUES = .0270 87.6000 .3200
OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

STANDARD CONTROL OPERATION ADDHYD CROSS SECTION 1 RECORD ID 210
INPUT HYDROGRAPHS = 6,5 OUTPUT HYDROGRAPH = 7 DATA FIELD VALUES = .0000 .0000 .0000
OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

STANDARD CONTROL OPERATION REACH CROSS SECTION 1 RECORD ID 220
INPUT HYDROGRAPH = 7 OUTPUT HYDROGRAPH = 5 DATA FIELD VALUES = 4400.0000 .0000 .0000
OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

EXECUTIVE CONTROL OPERATION INCREM MAIN TIME INCREMENT = .04 HOURS RECORD ID 240

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 1 TO XSECTION 1 RECORD ID 250
STARTING TIME = .00 RAIN DEPTH = 1.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 7 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 6 MAIN TIME INCREMENT = .04 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 6
AREA= .20 SQ MI INPUT RUNOFF CURVE= 80. TIME OF CONCENTRATION= 1.44 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0400 HOURS

PEAK TIME(HRS) PEAK DISCHARGE(CFS) PEAK ELEVATION(FEET)
3.65 184.61 (RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .04 HOURS DRAINAGE AREA = .20 SQ.MI.

.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.02
1.20	DISCHG	.03	.06	.10	.15	.22	.32	.44	.59	.78	1.01
1.60	DISCHG	1.28	1.60	1.98	2.41	2.90	3.44	4.05	4.71	5.43	6.20
2.00	DISCHG	7.03	7.95	8.98	10.13	11.46	12.95	14.65	16.56	18.73	21.16
2.40	DISCHG	23.90	26.98	30.43	34.29	38.58	43.28	48.39	53.89	59.74	65.92
2.80	DISCHG	72.39	79.11	86.05	93.15	100.41	107.77	115.16	122.50	129.69	136.67
3.20	DISCHG	143.39	149.80	155.87	161.51	166.69	171.33	175.34	178.68	181.27	183.09
3.60	DISCHG	184.19	184.61	184.39	183.66	182.38	180.70	178.64	176.26	173.64	170.80
4.00	DISCHG	167.80	164.62	161.36	158.06	154.71	151.35	147.98	144.62	141.27	137.95
4.40	DISCHG	134.71	131.53	128.47	125.51	122.65	119.86	117.14	114.45	111.81	109.20
4.80	DISCHG	106.66	104.16	101.72	99.35	97.03	94.77	92.57	90.44	88.39	86.41
5.20	DISCHG	84.52	82.70	80.95	79.27	77.65	76.11	74.62	73.21	71.87	70.59
5.60	DISCHG	69.36	68.18	67.05	65.95	64.89	63.87	62.90	61.96	61.06	60.19
6.00	DISCHG	59.36	58.54	57.74	56.94	56.14	55.34	54.51	53.66	52.77	51.84
6.40	DISCHG	50.86	49.82	48.71	47.52	46.24	44.89	43.47	41.97	40.43	38.84
6.80	DISCHG	37.22	35.58	33.94	32.30	30.67	29.05	27.45	25.89	24.37	22.90
7.20	DISCHG	21.48	20.10	18.79	17.53	16.33	15.19	14.12	13.14	12.23	11.39
7.60	DISCHG	10.61	9.90	9.24	8.62	8.05	7.52	7.02	6.56	6.13	5.72
8.00	DISCHG	5.34	4.98	4.64	4.33	4.03	3.76	3.50	3.27	3.04	2.84
8.40	DISCHG	2.64	2.46	2.29	2.13	1.98	1.85	1.72	1.60	1.49	1.39
8.80	DISCHG	1.29	1.20	1.12	1.04	.97	.90	.84	.79	.72	.67
9.20	DISCHG	.62	.58	.53	.49	.46	.42	.39	.36	.33	.30
9.60	DISCHG	.28	.26	.24	.22	.20	.19	.17	.15	.14	.13
10.00	DISCHG	.11	.10	.09	.08	.07	.06	.05	.05	.04	.03
10.40	DISCHG	.03	.02	.02	.01	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 3.69 WATERSHED INCHES, 474.00 CFS-HRS, 39.17 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 5
AREA= .03 SQ MI INPUT RUNOFF CURVE= 87. TIME OF CONCENTRATION= .32 HOURS

INTERNAL HYDROGRAPH TIME INCREMENT= .0427 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
3.00	43.32	(RUNOFF)
5.94	6.65	(RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .04 HOURS			DRAINAGE AREA =		.03 SQ.MI.
.40	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.03	.03
.80	DISCHG	.16	.26	.39	.54	.69	.87	1.06	1.29	1.58	1.93
1.20	DISCHG	2.33	2.74	3.17	3.57	3.95	4.31	4.64	4.96	5.27	5.56
1.60	DISCHG	5.83	6.09	6.34	6.58	6.80	7.02	7.22	7.42	7.61	7.79
2.00	DISCHG	8.00	8.52	9.70	11.87	14.96	18.54	22.18	25.57	28.49	30.85
2.40	DISCHG	32.77	34.37	35.73	36.99	37.87	38.72	39.45	40.11	40.68	41.20
2.80	DISCHG	41.66	42.08	42.46	42.81	43.13	43.32	43.00	42.01	39.70	36.22
3.20	DISCHG	32.19	28.23	24.75	22.02	20.02	18.57	17.51	16.72	16.14	15.72
3.60	DISCHG	15.42	15.19	15.03	14.92	14.84	14.78	14.74	14.72	14.70	14.69
4.00	DISCHG	14.67	14.57	14.29	13.75	12.99	12.10	11.24	10.47	9.86	9.42
4.40	DISCHG	9.10	8.86	8.69	8.57	8.49	8.41	8.36	8.33	8.30	8.29
4.80	DISCHG	8.27	8.27	8.26	8.26	8.26	8.25	8.23	8.16	8.03	7.83
5.20	DISCHG	7.60	7.38	7.19	7.04	6.93	6.85	6.79	6.75	6.72	6.69
5.60	DISCHG	6.68	6.67	6.66	6.65	6.65	6.65	6.65	6.65	6.65	6.65
6.00	DISCHG	6.62	6.51	6.21	5.66	4.88	3.98	3.09	2.31	1.69	1.23
6.40	DISCHG	.90	.67	.49	.36	.26	.19	.14	.10	.07	.05
6.80	DISCHG	.04	.02	.02	.01	.00					

RUNOFF VOLUME ABOVE BASEFLOW = 4.42 WATERSHED INCHES, 76.98 CFS-HRS, 6.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 1
INPUT HYDROGRAPHS= 6,5 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
3.63	199.81	206.12

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .04 HOURS			DRAINAGE AREA =		.23 SQ.MI.
.40	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.03	.06
.80	DISCHG	.16	.26	.39	.54	.69	.87	1.06	1.29	1.58	1.95
1.20	DISCHG	2.36	2.80	3.26	3.72	4.17	4.63	5.08	5.56	6.05	6.56
1.60	DISCHG	7.11	7.70	8.32	8.99	9.70	10.45	11.27	12.13	13.04	13.99
2.00	DISCHG	15.03	16.47	18.67	22.01	26.42	31.50	36.84	42.14	47.21	52.01
2.40	DISCHG	56.67	61.35	66.16	71.17	76.45	81.99	87.84	94.00	100.42	107.12
2.80	DISCHG	114.05	121.19	128.51	135.96	143.53	151.09	158.24	164.51	169.38	172.89
3.20	DISCHG	175.57	178.03	180.62	183.53	186.71	189.90	192.85	195.41	197.41	198.81
3.60	DISCHG	199.60	199.90	199.43	198.57	197.22	195.48	193.39	190.97	188.34	185.49
4.00	DISCHG	182.47	179.19	175.65	171.81	167.70	163.45	159.21	155.09	151.12	147.37
4.40	DISCHG	143.81	140.39	137.16	134.09	131.12	128.27	125.51	122.78	120.11	117.49
4.80	DISCHG	114.93	112.43	109.98	107.61	105.29	103.03	100.80	98.60	96.41	94.24
5.20	DISCHG	92.12	90.00	88.14	86.31	84.59	82.96	81.41	79.96	78.59	77.28
5.60	DISCHG	76.04	74.85	73.71	72.61	71.54	70.52	69.54	68.60	67.70	66.83

6.00	DISCHG	65.98	65.05	63.95	62.61	61.02	59.31	57.60	55.97	54.45	53.07
6.40	DISCHG	51.76	50.48	49.20	47.88	46.51	45.08	43.61	42.07	40.50	38.89
6.80	DISCHG	37.25	35.60	33.95	32.31	30.67	29.05	27.45	25.89	24.37	22.90
7.20	DISCHG	21.48	20.10	18.79	17.53	16.33	15.19	14.12	13.14	12.23	11.39
7.60	DISCHG	10.61	9.90	9.24	8.62	8.05	7.52	7.02	6.56	6.13	5.72
8.00	DISCHG	5.34	4.98	4.64	4.33	4.03	3.76	3.50	3.27	3.04	2.84
8.40	DISCHG	2.64	2.46	2.29	2.13	1.99	1.85	1.72	1.60	1.49	1.39
8.80	DISCHG	1.29	1.20	1.12	1.04	.97	.90	.84	.78	.72	.67
9.20	DISCHG	.62	.58	.53	.49	.46	.42	.39	.36	.33	.30
9.60	DISCHG	.28	.26	.24	.22	.20	.18	.17	.15	.14	.13
10.00	DISCHG	.11	.10	.09	.08	.07	.06	.05	.05	.04	.03
10.40	DISCHG	.03	.02	.02	.01	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 3.78 WATERSHED INCHES, 550.97 CFS-HRS, 45.53 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH. CROSS SECTION 1
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 5
LENGTH = 4400.00 FEET INPUT = RATING CURVE REPRESENTATIVE OF REACH

COEFFICIENTS USED IN ROUTING RELATED TO CROSS SECTION AREA, X= .99 M= 1.34

MODIFIED ATT-KIN ROUTING COEFFICIENT = .16 PEAK TRAVEL TIME = .24 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
3.00	192.37	206.08

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .04 HOURS DRAINAGE AREA = .23 SQ.MI.

.40	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.80	DISCHG	.02	.04	.07	.12	.18	.26	.36	.47	.59	.75
1.20	DISCHG	.93	1.15	1.41	1.70	2.01	2.35	2.70	3.07	3.46	3.86
1.60	DISCHG	4.28	4.72	5.18	5.67	6.19	6.73	7.31	7.93	8.58	9.27
2.00	DISCHG	10.01	10.79	11.67	12.76	14.20	16.10	18.50	21.35	24.58	28.10
2.40	DISCHG	31.82	35.69	39.68	43.80	48.06	52.48	57.07	61.86	66.86	72.08
2.80	DISCHG	77.53	83.22	89.13	95.25	101.55	108.11	114.80	121.56	128.24	134.65
3.20	DISCHG	140.60	146.04	151.02	155.62	159.96	164.13	168.14	171.98	175.63	179.02
3.60	DISCHG	182.10	184.82	187.15	189.06	190.54	191.58	192.19	192.37	192.15	191.56
4.00	DISCHG	190.61	189.35	187.76	185.88	183.69	181.20	178.44	175.45	172.28	168.99
4.40	DISCHG	165.62	162.23	158.83	155.46	152.13	148.86	145.65	142.52	139.45	136.44
4.80	DISCHG	133.49	130.60	127.77	125.00	122.29	119.65	117.06	114.53	112.05	109.62
5.20	DISCHG	107.22	104.87	102.57	100.32	98.14	96.03	94.00	92.04	90.16	88.36
5.60	DISCHG	86.63	84.98	83.41	81.90	80.45	79.06	77.73	76.46	75.24	74.06
6.00	DISCHG	72.94	71.85	70.79	69.73	68.62	67.44	66.17	64.84	63.46	62.06
6.40	DISCHG	60.66	59.27	57.90	56.55	55.20	53.85	52.48	51.10	49.69	48.26
6.80	DISCHG	46.80	45.32	43.81	42.27	40.72	39.15	37.58	36.01	34.43	32.87
7.20	DISCHG	31.31	29.78	28.28	26.80	25.36	23.95	22.59	21.27	20.00	18.79
7.60	DISCHG	17.64	16.55	15.51	14.53	13.61	12.75	11.93	11.17	10.45	9.78
8.00	DISCHG	9.14	8.55	7.99	7.47	6.98	6.52	6.09	5.69	5.31	4.96
8.40	DISCHG	4.63	4.32	4.03	3.76	3.50	3.27	3.05	2.84	2.65	2.47
8.80	DISCHG	2.30	2.14	1.99	1.86	1.73	1.61	1.50	1.40	1.30	1.21
9.20	DISCHG	1.13	1.05	.97	.90	.84	.78	.72	.67	.62	.58
9.60	DISCHG	.53	.49	.46	.42	.39	.36	.33	.31	.28	.26

10.00	DISCHG	.24	.22	.20	.18	.17	.15	.14	.13	.11	.10
10.40	DISCHG	.09	.08	.07	.06	.05	.05	.04	.03	.03	.02
10.80	DISCHG	.02	.01	.01	.01	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 3.78 WATERSHED INCHES, 550.94 CFS-HRS, 45.53 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 1 RECORD ID 260

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID 270

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

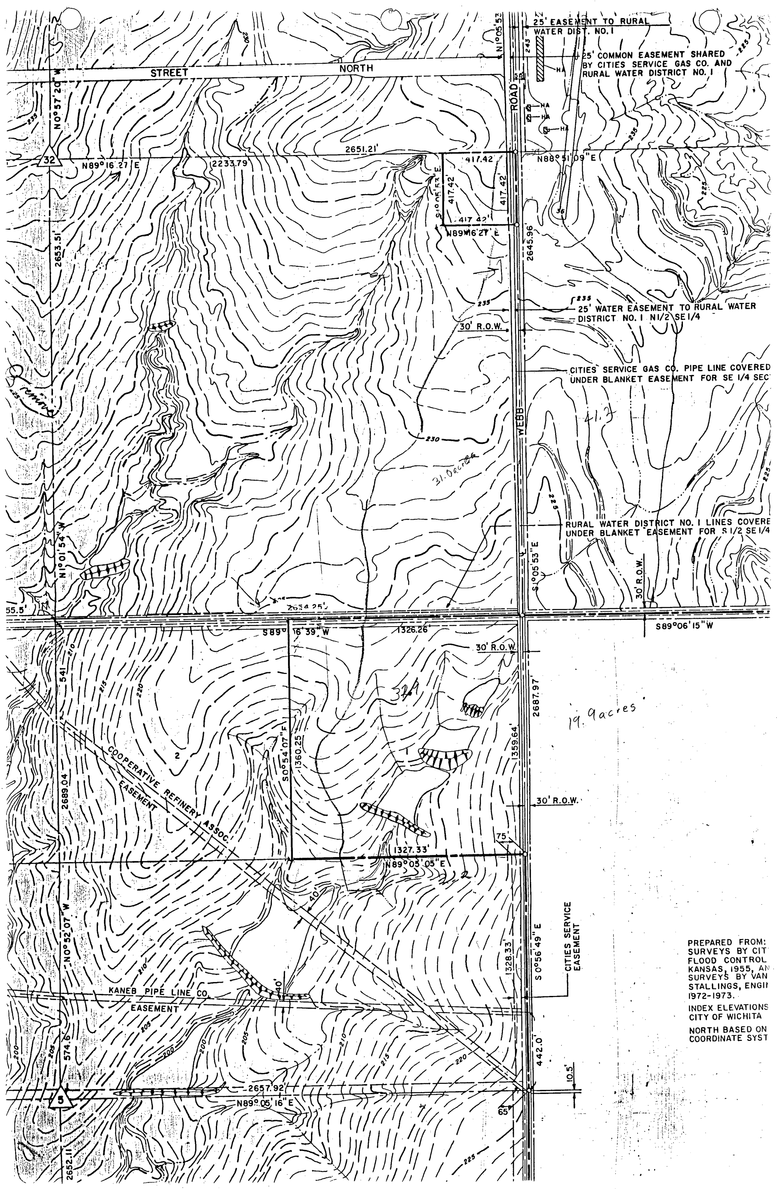
SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 6													
XSECTION 1	RUNOFF	.20	7	2	.04	.0	5.90	6.00	3.69	---	3.65	184.61	927.7
XSECTION 1	RUNOFF	.03	7	2	.04	.0	5.90	6.00	4.42	---	3.00	43.32	1604.3
XSECTION 1	ADDHYD	.23	7	2	.04	.0	5.90	6.00	3.78	206.12	3.63	199.81	884.1
XSECTION 1	REACH	.23	7	2	.04	.0	5.90	6.00	3.78	206.00	3.68	192.37	851.2

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION								ROUTING PARAMETERS								PEAK	
		INFLOW		OUTFLOW		OUTFLOW+ INTERV. PEAK	AREA TIME	BASE- FLOW	VOLUME ABOVE BASE	MAIN TIME INCR	ITER- ATION	Q AND A EQUATION		LENGTH	PEAK RATIO	S/Q	ATT- KIN	TRAVEL TIME STOR-	TIME KINE-
XSEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	(CFS)	(HR)	(CFS)	(IN)	(HR)	#	COEFF (X)	POWER (M)	FACTOR (KS)	O/I (Q*)	#PEAK (K) (SEC)	COEFF (C)	AGE (HR)	MATIC (HR)
ALTERNATE 1 STORM 6																			
1	4400	209	3.6	192	3.9	---	---	0	3.79	.04	1	.989	1.34	.055	.963	863	.16	.24	.24

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 6
XSECTION 1	22	
ALTERNATE 1		192.37


STREET
NORTH
ROAD
25' EASEMENT TO RURAL WATER DIST. NO. 1
25' COMMON EASEMENT SHARED BY CITIES SERVICE GAS CO. AND RURAL WATER DISTRICT NO. 1
25' WATER EASEMENT TO RURAL WATER DISTRICT NO. 1 N1/2 SE1/4
CITIES SERVICE GAS CO. PIPE LINE COVERED UNDER BLANKET EASEMENT FOR SE 1/4 SEC
RURAL WATER DISTRICT NO. 1 LINES COVERE UNDER BLANKET EASEMENT FOR S1/2 SE1/4
30' R.O.W.
COOPERATIVE REFINERY ASSOCIATION EASEMENT
KANEB PIPE LINE CO. EASEMENT
CITIES SERVICE EASEMENT
19.9 acres
PREPARED FROM: SURVEYS BY CIT FLOOD CONTROL KANSAS, 1955, AN SURVEYS BY VAN STALLINGS, ENGI 1972-1973.
INDEX ELEVATIONS CITY OF WICHITA
NORTH BASED ON COORDINATE SYST

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