

GIRL SCOUT ADDITION
WICHITA, KANSAS

DRAINAGE STUDY

Park Permission to Drain
In Writing

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS
WICHITA
SEPTEMBER 1991

GIRL SCOUT ADDITION
DRAINAGE STUDY

The site being evaluated, is presently occupied by a school building that was formerly known as Fabrique Elementary School, a part of the Wichita school system. Redeemer Lutheran Church purchased the property after the school was removed from the public system, and now is preparing to sell the property to the Girl Scout Council. The Council intends to remove the existing building and construct a new building for the Girl Scout Services Center.

The property is generally located Northwest of the intersection of Lexington and Ridgecrest Roads. The area of the property is 3.19 Acres, and according to the SCS Soils Map contains soils in both the "B" and "D" hydrologic groups.

Topographically, the property has no channels or drainage swales and is as high or higher than surrounding property and/or streets. This is true for both existing conditions and for post-developed conditions following construction of the new building.

Under "Pre-Developed" or present conditions, 0.25 Ac. flows overland to Ridgecrest; 0.43 Ac. flows overland toward Lexington; the balance of the property, 2.51 Ac., flows toward Cypress Park primarily as sheet flow.

Under "Post-Developed" conditions, following the construction of the new building and parking areas, 0.56 Ac. will flow toward Cypress Park as sheet flow; 0.25 acres of lawn area will flow overland to Lexington as sheet flow, and the balance of 2.38 Ac. will flow toward Lexington, discharging through the driveway.

Enclosed are the computations used to compute the runoff from both the Pre-Developed and the Post-Developed conditions for this site.

The publication "Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation, City of Wichita", revised 7/1/87, was used as guide for the hydrologic and hydraulic computations. This publication is hereinafter referred to as the "Policy Manual"

The Rational Method was used for the hydrologic analysis. Runoff coefficients and rainfall intensities were based on the tables provided in the "Policy Manual". The overland flow times were determined by the Kinematic Wave Theory. Hydrologic Soil groups were identified from SCS Soil Maps for Sedgwick County

The five-year return period storm was used as the basis of evaluation of Post-Developed runoff, per Table 1 of the "Policy Manual". Also, a check of the runoff from the 100-year return period storm was made for the Post-Developed conditions, in order to confirm that this runoff could reasonably be contained within the Lexington Road right-of-way.

COMPUTATION PROCEDURE -

Enclosed are computer print out(s), Pages C-1 thru C-11 inclusive, of the calculations for determining time of concentration (Tc) and peak discharges (Q) for each sub-basin under both Pre-developed and Post-Developed conditions.

PAGE	PROCEDURE	RESULTS
C-1	Tc, for Pre-Developed conditions, toward Ridgecrest	0.31 hrs.
C-2	Q, for Pre-Developed conditions, toward Ridgecrest	0.36 cfs
C-3	Tc, for Pre-Developed conditions, toward Park	0.45 hrs.
C-4	Q, for Pre-Developed conditions, toward Park	3.77 cfs
C-5	Tc, for Pre-Developed conditions, toward Lexington	0.29 hrs.
C-6	Q, for Pre-Developed conditions, toward Lexington	0.46 cfs
C-7	Tc, for Post-Developed conditions, toward Park	0.37 hrs.
C-8	Q, for Post-Developed conditions, toward Park	0.49 cfs
C-9	Tc, for Post-Developed conditions, toward Lexington	0.65 hrs.
C-10	Q, for Post-Developed conditions, toward Lexington	4.12 cfs
C-11	Q, for Post-Developed conditions, Toward Lexington (100-Yr)	9.01 cfs

SUMMARY -

The results of the calculations indicate that the peak discharges resulting from the 5-year storm, under Post Developed conditions, directed to Cypress Park are less than Pre-Developed conditions.

The discharge to Ridgecrest can be eliminated, and at the same time virtually all of the runoff toward Lexington can be directed to and discharged thru the driveway, which is an acceptable method to introduce the flow into the street drainage system.

We have included an exhibit representing a cross-section of the Lexington street right-of-way, opposite the proposed driveway. The existing street pavement is 30' face to face, and the existing gradient is 1.61 percent. Employing Mannings Equation, and with a weighted "n" value of 0.0232, we have determined the conveyance capacity within street right-of-way to be 99.2 cubic feet/second.

From previous calculations (Page C-11), the 100-year peak discharge into the street was 9.01 cubic feet/second, or approximately 10% of existing capacity. It would seem reasonable to assume that the discharge from the proposed improvement will not over burden the street drainage system.

From this study it is apparent that with the construction of improvements as planned, the discharge to Cypress Park will be all but eliminated and at the same time existing drainage patterns can accomodate peak discharges without additional drainage impairments

Respectfully Submitted,

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS.

Quick TR-55 Ver.5.43 S/N:1240540379
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GIRL SCOUT ADDITION
 PRE-DEVELOPED CONDITIONS
 TO RIDGECREST

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		A-B	
Surface description		LAWN	
Manning's roughness coeff., n			0.1700
Flow length, L (total < or = 300)	ft		115.0
Two-yr 24-hr rainfall, P2	in		3.500
Land slope, s	ft/ft		0.0063
	0.8		
	.007 * (n*L)		
T =	-----	hrs	0.31 = 0.31
	0.5 0.4		
	P2 * s		

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft		0.0
Watercourse slope, s	ft/ft		0.0000
	0.5		
Avg.V = Csf * (s)	ft/s		0.0000
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs		0.00 = 0.00

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft		0.00
Wetted perimeter, Pw	ft		0.00
Hydraulic radius, r = a/Pw	ft		0.000
Channel slope, s	ft/ft		0.0000
Manning's roughness coeff., n			0.0000
	2/3 1/2		
	1.49 * r * s		
V =	-----	ft/s	0.0000
	n		
Flow length, L	ft		0
T = L / (3600*V)	hrs		0.00 = 0.00

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 TOTAL TIME (hrs) 0.31

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GIRL SCOUT ADDITION
 PRE-DEVELOPED CONDITIONS
 TO RIDGECREST

***** SUMMARY OF RATIONAL METHOD PEAK DISCHARGES *****

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
D LAWNS	0.350	0.25	18.60	0.350	0.350	4.145	0.25	0.367

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GIRL SCOUT ADDITION
 PRE-DEVELOPED CONDITIONS
 TO PARK

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		A-B	
Surface description		LAWN	
Manning's roughness coeff., n		0.1700	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.500	
Land slope, s	ft/ft	0.0167	
	0.8		
	.007 * (n*L)		
T =	-----	hrs	0.45 = 0.45
	0.5 0.4		
	P2 * s		

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
	0.5		
Avg.V = Csf * (s)	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	0.00	
Wetted perimeter, Pw	ft	0.00	
Hydraulic radius, r = a/Pw	ft	0.000	
Channel slope, s	ft/ft	0.0000	
Manning's roughness coeff., n		0.0000	
	2/3 1/2		
V =	-----	ft/s	0.0000
	1.49 * r * s		
	n		
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

.....
 TOTAL TIME (hrs) 0.45

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GIRL SCOUT ADDITION
 PRE-DEVELOPED CONDITIONS
 FLOW TOWARD PARK

***** SUMMARY OF RATIONAL METHOD PEAK DISCHARGES *****

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
B LAWNS	0.220	0.85						
D LAWNS	0.350	0.51						
ROOF & WALKS	0.850	0.73						
GRAVEL DRIVE	0.260	0.42						
			27.00	0.436	0.436	3.438	2.51	3.77

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GIRL SCOUT ADDITION
 PRE-DEVELOPED? CONDITIONS
 TO LEXINGTON?

Tc COMPUTATIONS FOR: 0

SHEET FLOW (Applicable to Tc only)

Segment ID		A-B	
Surface description		LAWN	
Manning's roughness coeff., n		0.1700	
Flow length, L (total < or = 300)	ft	180.0	
Two-yr 24-hr rainfall, P2	in	3.500	
Land slope, s	ft/ft	0.0178	
	0.8		
	.007 * (n*L)		
T =	-----	hrs	0.29 = 0.29
	0.5 0.4		
	P2 * s		

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
	0.5		
Avg.V = Csf * (s)	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	0.00	
Wetted perimeter, Pw	ft	0.00	
Hydraulic radius, r = a/Pw	ft	0.000	
Channel slope, s	ft/ft	0.0000	
Manning's roughness coeff., n		0.0000	
	2/3 1/2		
	1.49 * r * s		
V =	-----	ft/s	0.0000
	n		
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

.....
 TOTAL TIME (hrs) 0.29 17

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GIRL SCOUT ADDITION
 PRE-DEVELOPED CONDITIONS
 TO LEXINGTON

***** SUMMARY OF RATIONAL METHOD PEAK DISCHARGES *****

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
B LAWNS	0.220	0.28						
D LAWNS	0.350	0.08						
GRAVEL DRIVE	0.260	0.07						
			17.40	0.251	0.251	4.269	0.43	0.46

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GIRL SCOUT ADDITION
 POST-DEVELOPED CONDITIONS
 TO PARK

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		A-B	
Surface description		LAWN	
Manning's roughness coeff., n		0.1700	
Flow length, L (total < or = 300)	ft	230.0	
Two-yr 24-hr rainfall, P2	in	3.500	
Land slope, s	ft/ft	0.0161	
	0.8		
	.007 * (n*L)		
T =	-----	hrs	0.37 = 0.37
	0.5 0.4		
	P2 * s		

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
	0.5		
Avg.V = Csf * (s)	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	0.00	
Wetted perimeter, Pw	ft	0.00	
Hydraulic radius, r = a/Pw	ft	0.000	
Channel slope, s	ft/ft	0.0000	
Manning's roughness coeff., n		0.0000	
	2/3 1/2		
V =	-----	ft/s	0.0000
	1.49 * r * s		
	n		
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

.....
 TOTAL TIME (hrs) 0.37

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GIRL SCOUT ADDITION
 POST-DEVELOPED CONDITIONS
 TO PARK

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
B LAWNS	0.220	0.52						
D LAWNS	0.350	0.04						
			22.20	0.229	0.229	3.794	0.56	0.49

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GIRL SCOUT ADDITION
 POST-DEVELOPED CONDITIONS
 TO LEXINGTON

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		A-B	
Surface description		LAWNS	
Manning's roughness coeff., n		0.1700	
Flow length, L (total < or = 300)	ft	200.0	
Two-yr 24-hr rainfall, P2	in	3.500	
Land slope, s	ft/ft	0.0040	
	0.8		
	.007 * (n*L)		
T =	-----	hrs	0.57 = 0.57
	0.5 0.4		
	P2 * s		

SHALLOW CONCENTRATED FLOW

Segment ID		B-C	
Surface (paved or unpaved)?		Paved	
Flow length, L	ft	330.0	
Watercourse slope, s	ft/ft	0.0032	
	0.5		
Avg.V = Csf * (s)	ft/s	1.1499	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.08	= 0.08

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	0.00	
Wetted perimeter, Pw	ft	0.00	
Hydraulic radius, r = a/Pw	ft	0.000	
Channel slope, s	ft/ft	0.0000	
Manning's roughness coeff., n		0.0000	
	2/3 1/2		
	1.49 * r * s		
V =	-----	ft/s	0.0000
	n		
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

.....
 TOTAL TIME (hrs) 0.65

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GIRL SCOUT ADDITION
 POST-DEVELOPED CONDITIONS
 TO LEXINGTON

***** SUMMARY OF RATIONAL METHOD PEAK DISCHARGES *****

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 5 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PAVED PARKNG	0.870	0.78						
ROOF	0.850	0.40						
B LAWNS	0.220	0.44						
D LAWNS	0.350	1.01						
			39.00	0.559	0.559	2.808	2.63	4.12

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GIRL SCOUT ADDITION
 POST-DEVELOPED CONDITIONS
 TO LEXINGTON

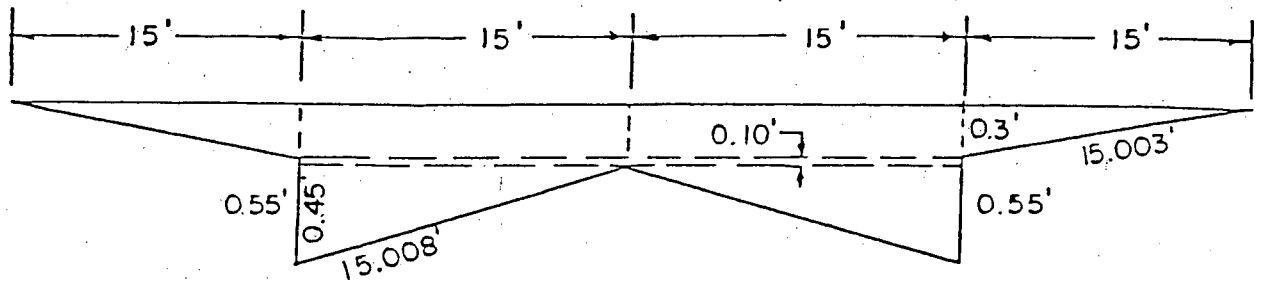
***** SUMMARY OF RATIONAL METHOD PEAK DISCHARGES *****

$Q = \text{adj} * C * I * A$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
PAVED PARKNG	0.890	0.78						
ROOF	0.930	0.40						
B LAWNS	0.410	0.44						
D LAWNS	0.650	1.01						
			39.00	0.724	0.724	4.734	2.63	9.01



"N" = 0.030 Grass

60' R/W

"N" = 0.013 Conc. C & G

0.3' Min. Walk Gr.

"N" = 0.016 Asph. Pvm't

30' Fc. to Fc. Pvm't.

$$Q = \frac{1.486}{N} AR^{2/3}S^{1/2}$$

$$\text{Weighted "N"} = \frac{2(14.5 \times 0.030) + 2(2.5 \times 0.013) + 2(15 \times 0.016)}{61.12}$$

$$\text{"N"} = \frac{1.415}{61.12} = 0.0232$$

$$\text{Wetted "P"} = 61.12$$

$$\text{Area, "A"} = 2 \left[\frac{0.3 \times 15}{2} + \frac{0.45 \times 15}{2} + (0.10 \times 15) + (0.3 \times 15) \right]$$

$$= 2(2.25 + 3.375 + 1.50 + 4.50)$$

$$\text{"A"} = 23.25 \text{ sq.ft.}$$

$$R_h = \frac{A}{P} = \frac{23.25}{61.12} = 0.3804; R^{2/3} = 0.5250$$

$$\therefore Q = \frac{1.486}{0.0232} (23.25) (0.5250) S^{1/2}$$

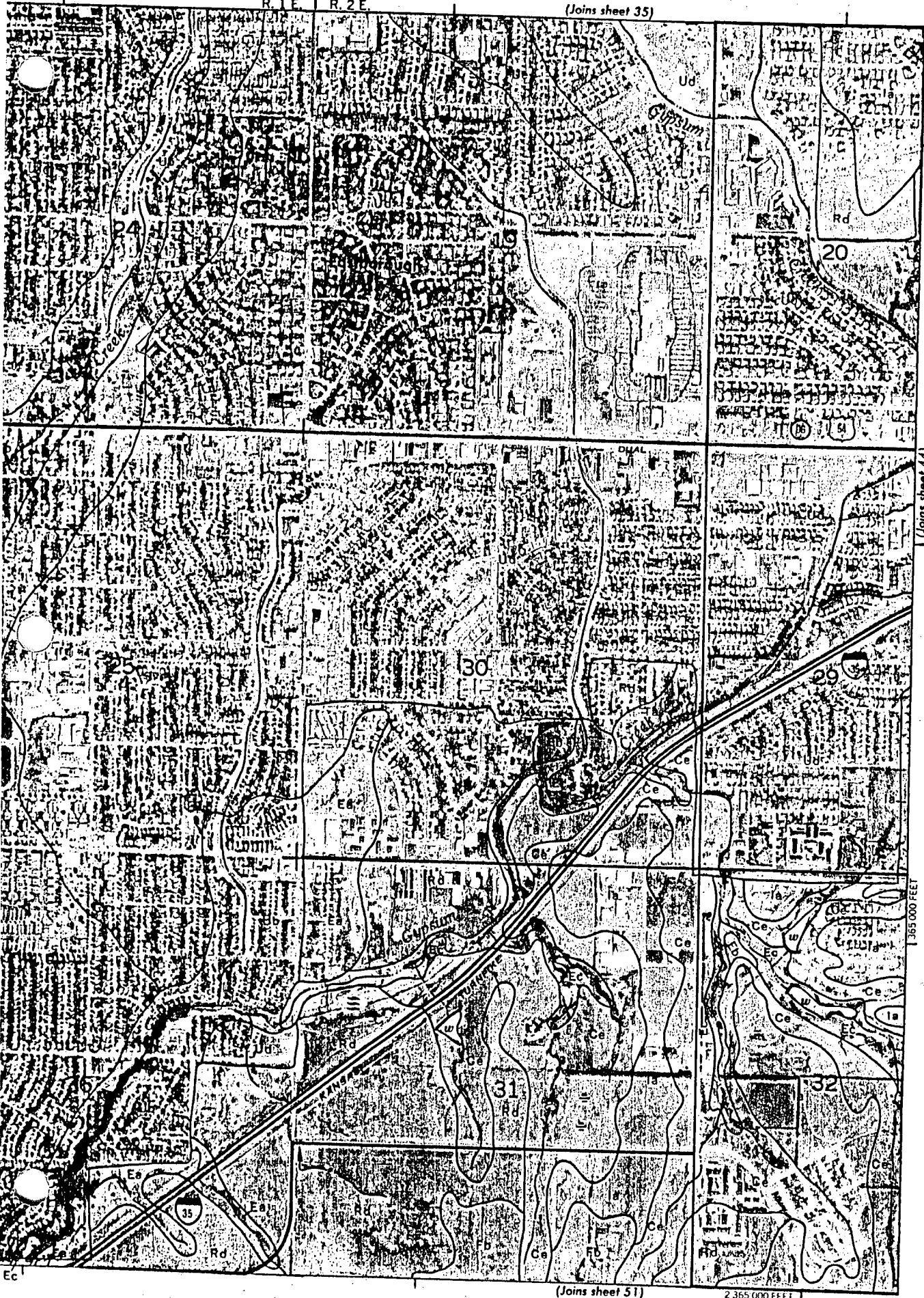
$$Q = 781.83 (S^{1/2})$$

$$\text{Then, } Q = 99.20 @ 1.61\%$$

R. 1 E. | R. 2 E.

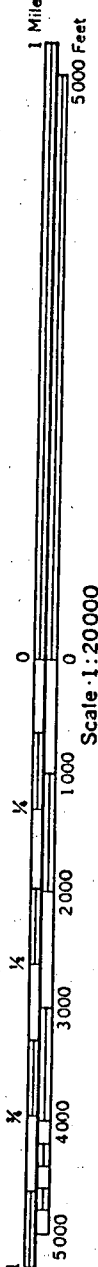
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1 365 000 FEET



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2 365 000 FEET

Ec

EXHIBIT NO. 1

SOIL LEGEND

<u>SYMBOL</u>	<u>HYDROLOGIC GROUP</u>	<u>NAME</u>
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loams, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loam, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loam
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Cline silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
Va	B	Vanoss silt loam, 0 to 1 percent slopes
Vb	B	Vanoss silt loam, 1 to 3 percent slopes
Vc	B	Vanoss silt loam, 3 to 6 percent slopes
Vd	B	Vanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent slopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

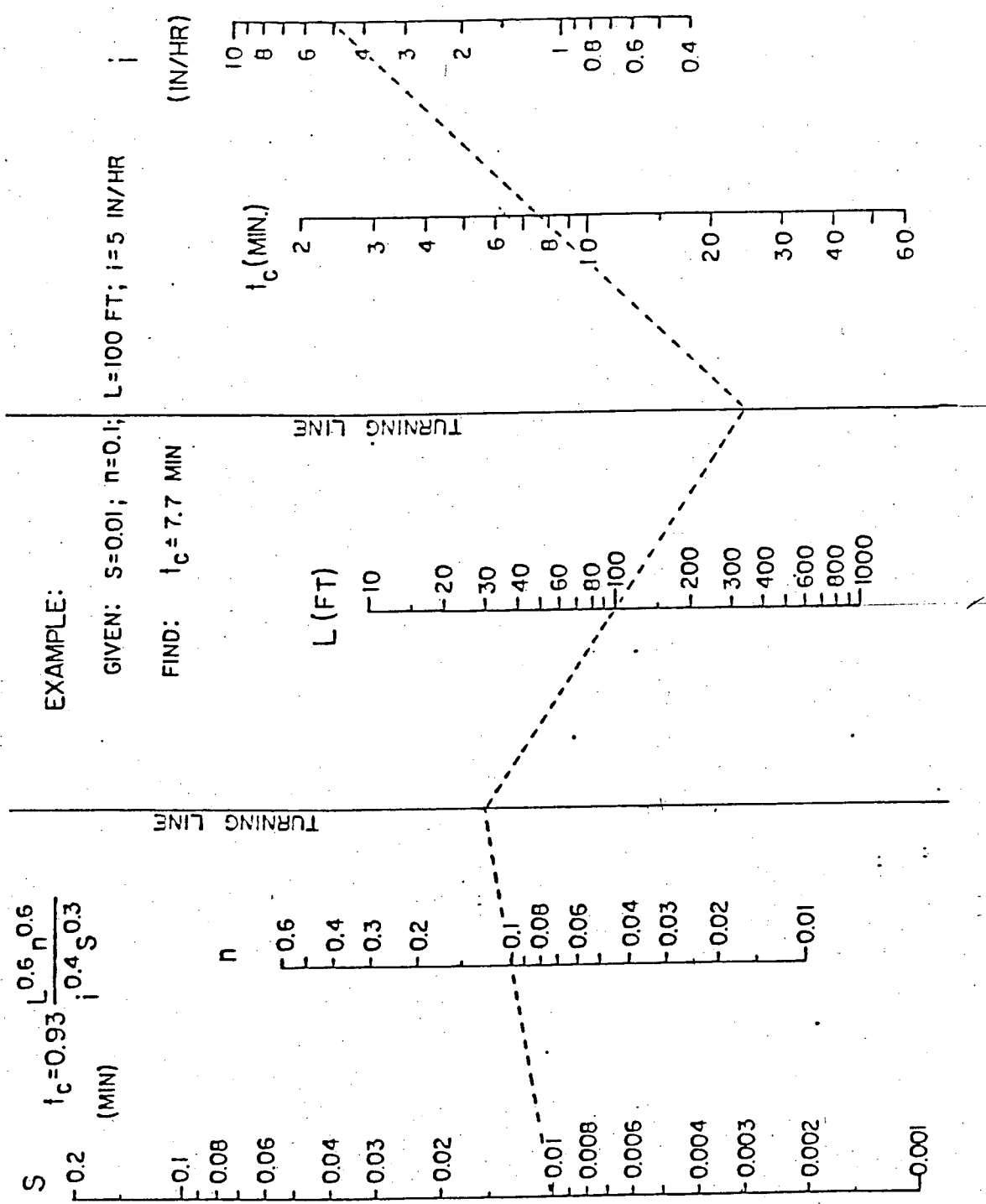


CHART 1. Kinematic wave formulation for determining time of concentration.

ATTACHMENT A
DRAINAGE CRITERIA MANUAL

CITY OF WICHITA, KANSAS

RAINFALL INTENSITY TABLE FOR SEDGWICK COUNTY, KANSAS

The following tabulation contains rainfall intensity in inches
per hour as derived from ESSA Weather Bureau Technical Paper
40 Modified to NWS Hydro-35, 1977 During First Hour

DURATION IN MINUTES	RETURN PERIODS OF						
	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
11	3.27	4.36	5.16	5.89	6.81	7.61	8.27
12	3.18	4.21	4.99	5.71	6.60	7.38	8.02
13	3.05	4.08	4.84	5.53	6.41	7.17	7.79
14	2.96	3.95	4.69	5.37	6.23	6.97	7.57
15	2.87	3.83	4.56	5.22	6.06	6.78	7.37
16	2.78	3.72	4.43	5.08	5.90	6.60	7.18
17	2.71	3.61	4.31	4.95	5.75	6.44	7.00
18	2.63	3.51	4.20	4.83	5.61	6.29	6.84
19	2.56	3.42	4.10	4.71	5.47	6.14	6.68
20	2.50	3.33	4.00	4.60	5.35	6.00	6.53
21	2.44	3.25	3.90	4.50	5.23	5.87	6.39
22	2.38	3.17	3.81	4.40	5.12	5.75	6.26
23	2.32	3.10	3.73	4.31	5.01	5.63	6.13
24	2.27	3.03	3.65	4.22	4.91	5.52	6.01
25	2.22	2.96	3.57	4.13	4.81	5.41	5.90
26	2.20	2.90	3.50	4.05	4.72	5.31	5.79
27	2.16	2.84	3.43	3.98	4.63	5.21	5.69
28	2.14	2.78	3.37	3.90	4.55	5.12	5.59
29	2.11	2.72	3.30	3.83	4.47	5.03	5.49
30	2.08	2.67	3.24	3.76	4.39	4.94	5.40
31	2.05	2.62	3.19	3.70	4.32	4.86	5.32
32	2.02	2.57	3.10	3.63	4.25	4.79	5.22
33	1.99	2.52	3.05	3.57	4.18	4.71	5.14
34	1.96	2.48	3.01	3.51	4.11	4.63	5.07
35	1.93	2.44	2.98	3.46	4.05	4.56	5.00
36	1.91	2.39	2.93	3.41	3.99	4.50	4.93
37	1.89	2.35	2.88	3.36	3.93	4.43	4.86
38	1.87	2.32	2.84	3.31	3.87	4.37	4.79
39	1.85	2.28	2.80	3.26	3.82	4.31	4.73
40	1.83	2.24	2.76	3.22	3.76	4.25	4.66
41	1.81	2.21	2.72	3.17	3.71	4.19	4.60
42	1.79	2.18	2.68	3.13	3.66	4.13	4.54
43	1.77	2.14	2.64	3.09	3.61	4.08	4.49
44	1.75	2.11	2.61	3.05	3.57	4.03	4.43
45	1.73	2.08	2.57	3.01	3.52	3.98	4.38

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

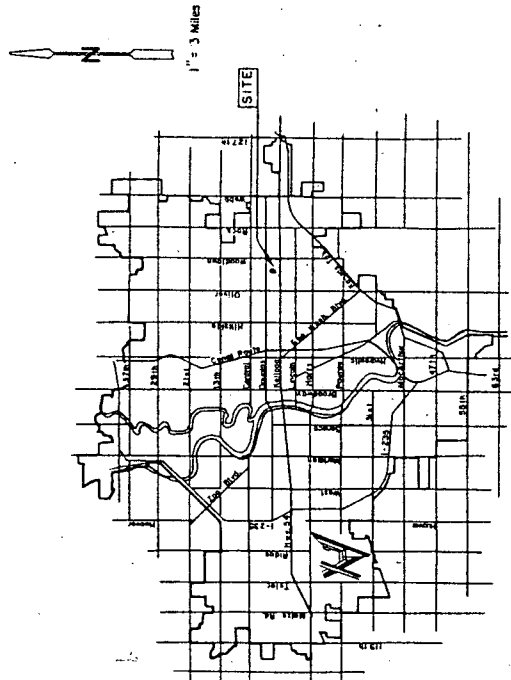
Land Use or Surface Characteristics	Percent Impervious	Frequency			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<u>Single Family (Soil Group A)</u>					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	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
5. Schools:	40	0.49	0.51	0.56	0.66
6. 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	0.16	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

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		<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.

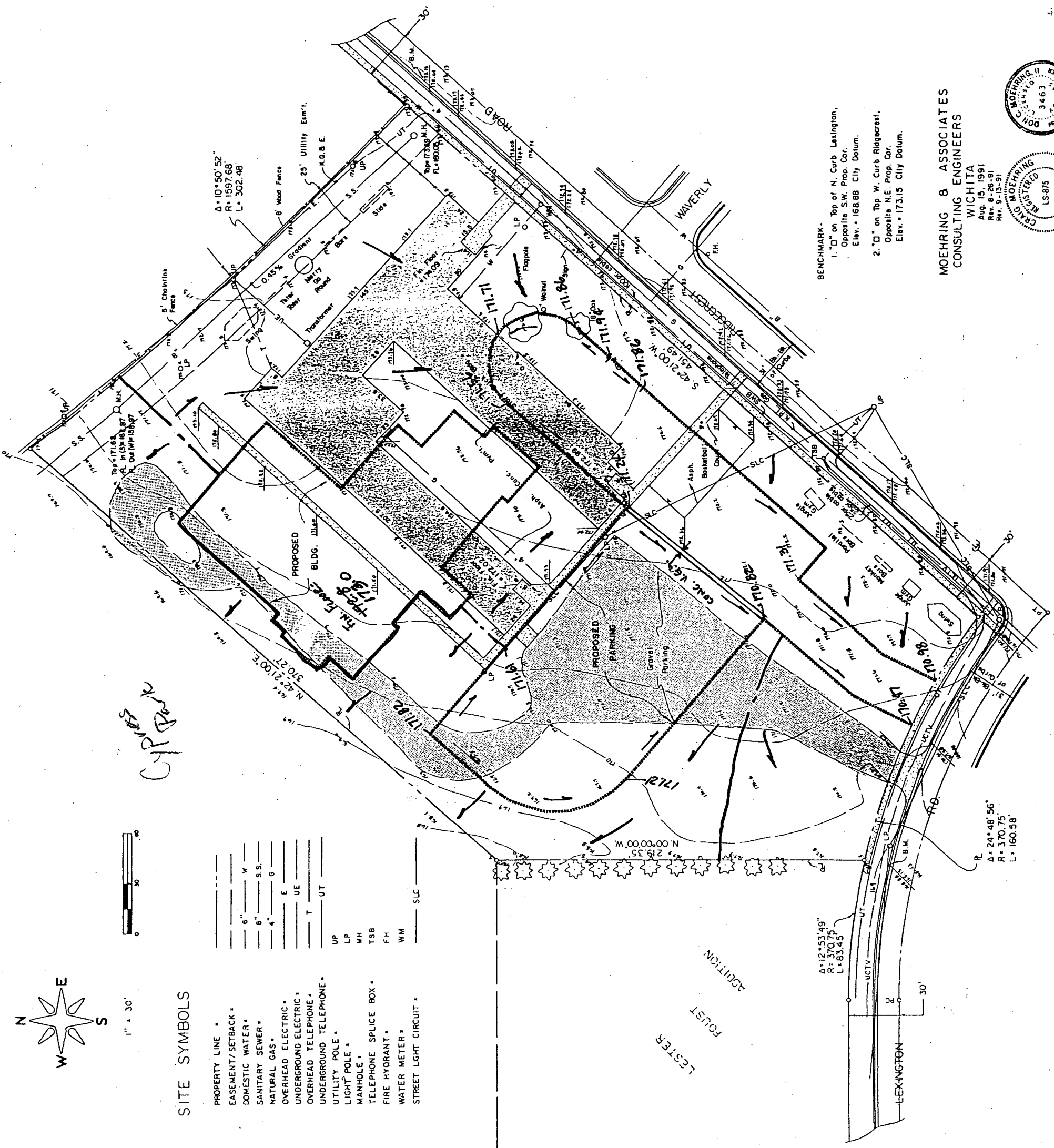
GENERAL NOTE: These Rational Formula Coefficients may not be valid for basins 320 acres or larger.

Post-Developed
DRAINAGE PLAN
for
GIRL SCOUT ADDITION
To Wichita, Ks.



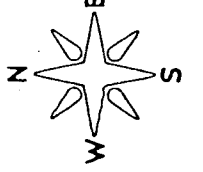
VICINITY MAP

Spot Elev's = E Perimeter C & G



BENCHMARK -
1. "D" on Top of N. Curb Lexington,
Opposite S.W. Penn. Co.
Elev. = 168.88 City Datum.
2. "D" on Top of W. Curb Ridgeway,
Opposite N.E. Prop. Car.
Elev. = 173.15 City Datum.

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS
WICHITA
Aug 15, 1951
No. 8-15-51



1" = 30'

SITE SYMBOLS

- PROPERTY LINE
- EASEMENT/SETBACK
- DOMESTIC WATER
- SANITARY SEWER
- NATURAL GAS
- OVERHEAD ELECTRIC
- UNDERGROUND ELECTRIC
- OVERHEAD TELEPHONE
- UNDERGROUND TELEPHONE
- UTILITY POLE
- LIGHT POLE
- MANHOLE
- TELEPHONE SPICE BOX
- FIRE HYDRANT
- WATER METER
- STREET LIGHT CIRCUIT

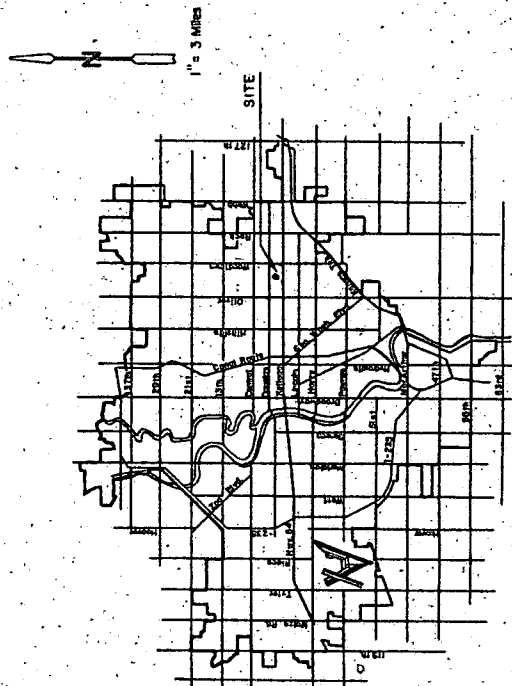
- UP
- LP
- MH
- TSB
- FH
- WM
- SLC

Cy R...

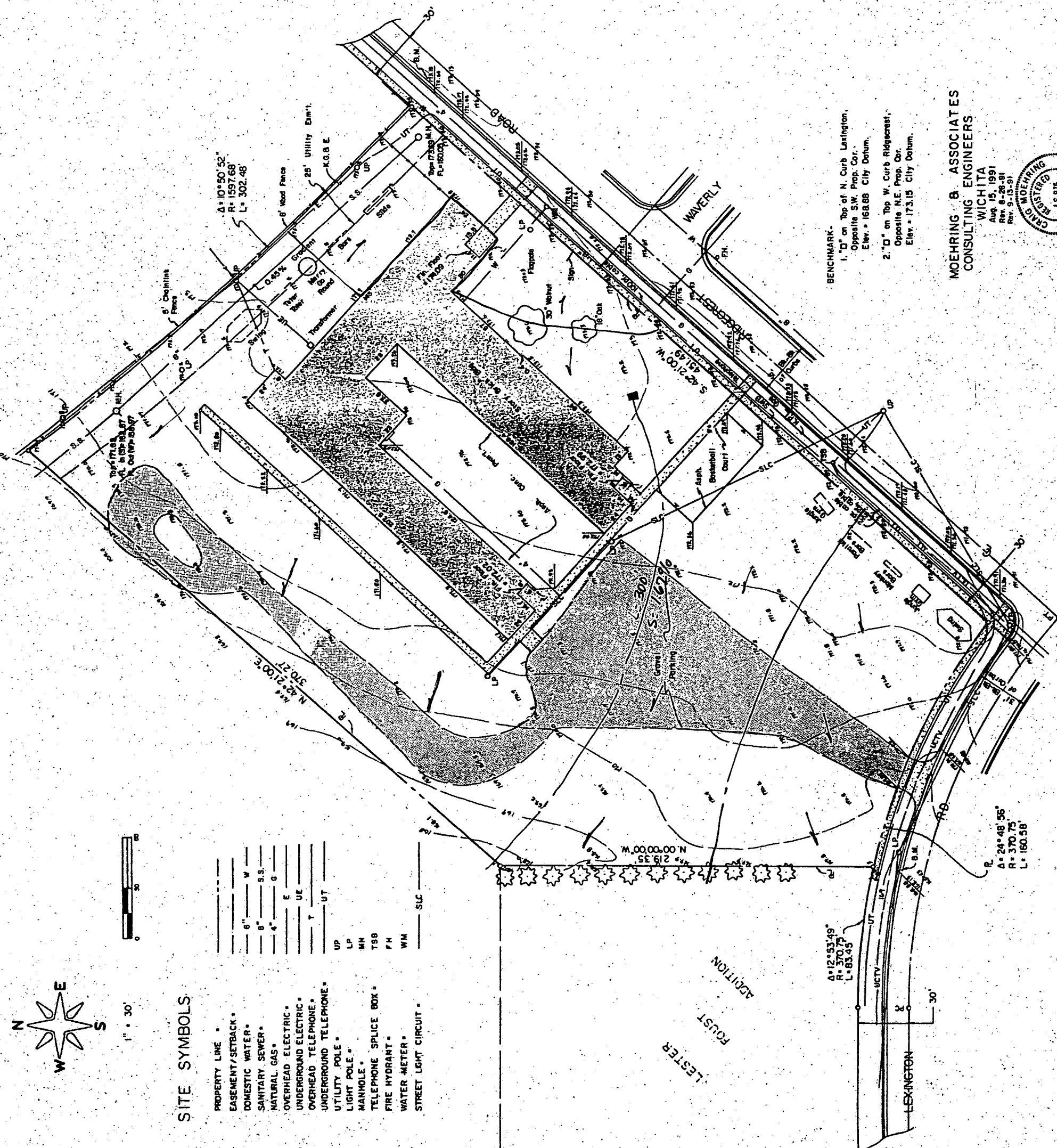
PRE-DEVELOPED
VICINITY MAP

of

GIRL SCOUT ADDITION
To Wichita, Ks.

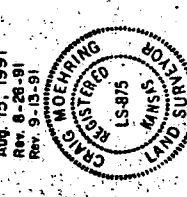


VICINITY MAP



BENCHMARK - Top of N. Corp. Leister, 1. D. Smith & W. Prop. Co. Elev. = 168.88 City Datum.
2. "D" on Top W. Corp. Lexington, Opposite N.E. Prop. Co. Elev. = 173.15 City Datum.

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WICHITA



SITE SYMBOLS

- PROPERTY LINE *
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- WATER METER *
- STREET LIGHT CIRCUIT *

