

**P**ROFESSIONAL  
**E**NGINEERING  
**C**ONSULTANTS  
PROFESSIONAL ASSOCIATION

DRAINAGE PLAN  
AND  
SUPPORTING CALCULATIONS

FOR  
EXPRESSWAY CENTER  
AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY  
PROFESSIONAL ENGINEERING CONSULTANTS, P.A.  
ENGINEERS  
WICHITA, KANSAS

OCTOBER 21, 1988



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Project Expressway Center

Item Drainage Plan - Storm Sewer

I HYDROLOGY Use Rational Formula  $Q = CIA$

Determine "C"

<u>Node</u>	<u>Soil Type</u>	<u>Hydrologic Grp</u>	<u>Proposed Land Use</u>	<u>C<sub>s</sub></u>	<u>C<sub>100</sub></u>
103	Fb	B	Neighborhood Bus.	0.69	0.80
102	Fb	B	Neighborhood Bus.	0.69	0.80
101	Fb	B	Neighborhood Bus.	0.69	0.80
100	(End section)				

Determine "I"

<u>Node</u>	<u>t<sub>c</sub></u>	<u>I<sub>s</sub></u>	<u>I<sub>100</sub></u>
103	15	4.56	7.37
102	15	4.56	7.37
101	15	4.56	7.37
100	(End Section)		

Determine "A"

<u>Node</u>	<u>Plan. Units</u>	<u>Area - S.F.</u>	<u>Area - Ac.</u>
103	583	98,280	2.14
102	934	149,440	3.43
101	830	132,800	3.05
100	(End Section)		



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Project Expressway Center

Item Drainage Plan - Storm Sewer

Determine "Q<sub>5</sub>"

<u>Node</u>	<u>C<sub>5</sub></u>	<u>I<sub>5</sub></u>	<u>A</u>	<u>Q<sub>5</sub></u>
103	0.69	4.56	2.14	6.7
102	0.69	4.56	3.43	10.8
101	0.69	4.56	3.05	9.6
100	(End Section)			

Determine "Q<sub>100</sub>"

<u>Node</u>	<u>C<sub>100</sub></u>	<u>I<sub>100</sub></u>	<u>A</u>	<u>Q<sub>100</sub></u>
103	0.80	7.37	2.14	12.6
102	0.80	7.37	3.43	20.2
101	0.80	7.37	3.05	18.0
100	(End Section)			



Date: 10-19-1988  
Time: 10:50:33

Input File: express

expressway center addition  
drainage plan  
storm water sewer system 100 analysis

Storm Frequency = 5-Year

\*\*\* HYDROLOGY \*\*\*

Tributary Area										Hydrology Summation				Conduit Data			
Node to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)	
103	102	0.69	2.14	0.00	0.0	15.00	5.22	6.70	15.00	5.22	6.70	6.70	18"	3.79	350.00	1.54	16.54
102	101	0.69	3.42	0.00	0.0	15.00	5.22	10.80	16.54	5.02	10.40	17.10	27"	4.30	410.00	1.59	18.13
101	100	0.69	3.05	0.00	0.0	15.00	5.22	9.60	18.13	4.85	8.92	26.01	36"	3.68	210.00	0.95	19.08





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Project Expressway Center

Item Drainage Plan - 37th St. Ditch

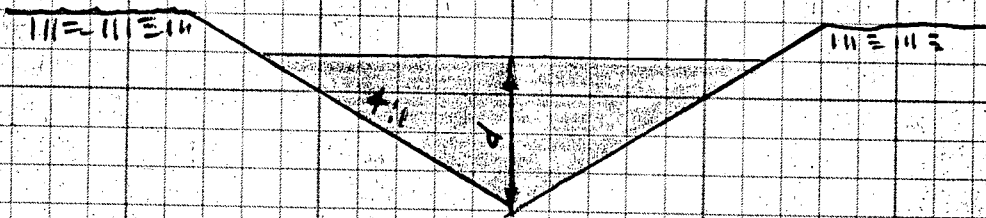
Reach #1

General Location: From Mo. Pac R.R. downstream to W.L. Lot 4.

$$Q = C I A$$

$$Q_{100} = 0.80 \times 7.37 \times 2.30 = 13.6 \text{ cfs}$$

Ditch Section:



Use Mannings Equation  $Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

$$13.6 = \frac{1.486}{0.03} A R^{2/3} (0.019)$$

$$A R^{2/3} = 2.24$$

$d$	$A$	$P$	$R$	$R^{2/3}$	$A R^{2/3}$
1.0	4.0	8.25	0.485	0.617	2.47
0.9	3.24	7.42	0.437	0.575	1.86

USE  $d = 1.0$        $V = Q/A = \frac{13.6}{4.0} = 3.4 \text{ fps (OK)}$



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Project Expressway Center

Item Drainage Plan - 37th St. Ditch

Reach #2

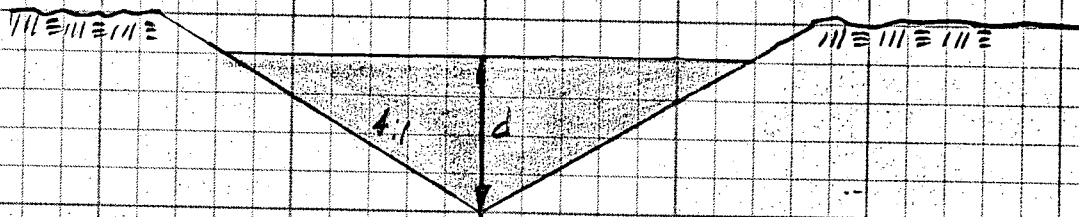
General Location: From W.L. Lot 4 downstream to W.L. Lot 3

$$Q = cIA$$

$$Q_{100} = (0.80 \times 7.37 \times 2.3) + 13.6 \text{ from Reach #1}$$

$$Q_{100} = 13.6 \text{ cfs} + 13.6 = 27.2 \text{ cfs}$$

Ditch Section:



Use Manning's Eq'n  $Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

$$27.2 = \frac{1.486}{0.03} A R^{2/3} (0.01)^{1/2}$$

$$27.2 = 49.53 \times A R^{2/3} \times 0.1$$

$$A R^{2/3} = 54.9$$

<u>d</u>	<u>A</u>	<u>p</u>	<u>R</u>	<u>R<sup>2/3</sup></u>	<u>A R<sup>2/3</sup></u>
1.0	4.0	8.25	0.485	0.617	2.47
1.2	5.76	9.90	0.582	0.697	4.02
1.3	6.76	10.72	0.631	0.735	4.97
1.4	7.84	11.54	0.679	0.773	6.05

USE  $d = 1.3'$   $V = Q/A = 27.2 / 6.76 = 4.0 \text{ fps ok}$



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Project Expressway Center

Item Drainage Plan - 37th St. Ditch

Reach #3

General Location: W.L. Lot 3 downstream to E.L. Floodway

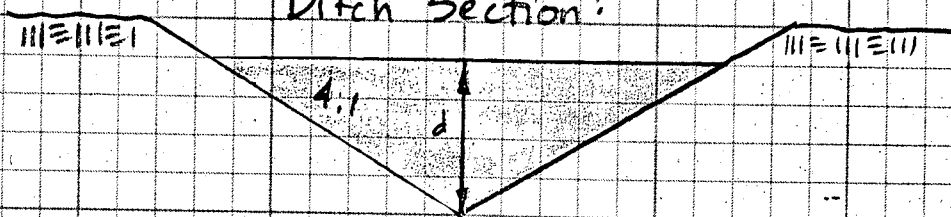
$$Q = CIA$$

$$Q_{100} = (0.80 \times 7.37 \times 3.08) + 27.2 \text{ from Reach \#1 \& Reach \#2}$$

$$= 18.2 + 27.2$$

$$= 45.4 \text{ cfs}$$

Ditch Section:



Use Manning's Equation  $Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$

$$45.4 = \frac{1.486}{0.03} AR^{2/3} (0.01)^{1/2}$$

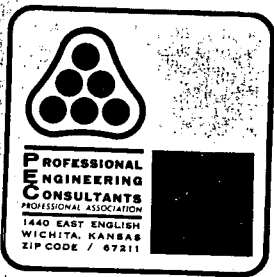
$$45.4 = 49.53 \times AR^{2/3} \times 0.1$$

$$AR^{2/3} = 9.17$$

<u>d</u>	<u>A</u>	<u>p</u>	<u>R</u>	<u>R<sup>2/3</sup></u>	<u>AR<sup>2/3</sup></u>
1.8	12.96	14.84	0.873	0.914	11.83
1.7	11.56	14.02	0.825	0.879	10.17
1.6	10.24	13.19	0.776	0.845	8.64

USE  $d = 1.6$

$$V = Q/A = 45.4 / 10.24 = 4.4$$



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Project Expressway Center

Item Drainage Plan - Culverts

Use RCP on all culverts

Culvert #1 Location: W.L. Lot 4

$Q_{100} = 13.6 \text{ cfs}$

Inlet Control:

<u>HW</u>	<u>D</u>	<u>Hw/D</u>	<u>Q</u>	
3.0'	15"	2.4	9.0	
3.0'	18"	2.0	12.5	
3.0'	24"	1.5	20.0	← USE

Outlet Control:

$HW = H + h_o - LS_o$   
 $3.0 = H + 1.3 - 0.5$   
 $H = 2.2'$

<u>D</u>	<u>L</u>	<u>K<sub>e</sub></u>	<u>H</u>	<u>Q</u>
15"	50'	0.5	2.2'	9.5
18"	50'	0.5	2.2'	12.0
24"	50'	0.5	2.2'	25.0 ←

CULVERT #1 : USE 24" RCP w/ End sections.



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Project Expressway Center

Item Drainage Plan - Culverts

Culvert #2: Location: Joint Access Location between Lots 2 & 3.

$$Q_{100} = 27.2 \text{ cfs}$$

Inlet Control:

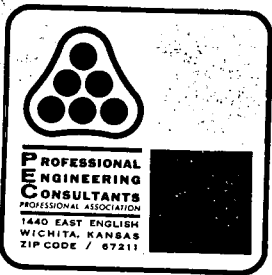
<u>HW</u>	<u>D</u>	<u>HW/D</u>	<u>Q</u>
3.0	24"	1.5	20.0
3.0	30"	1.2	28.0 ←

Outlet Control:

$$HW = H + h_o - LS_o$$
$$3.0 = H + 1.6 - 0.5$$
$$H = 1.9'$$

<u>D</u>	<u>L</u>	<u>k_c</u>	<u>H</u>	<u>Q</u>
24"	50'	0.5	1.9	24
30"	50'	0.5	1.9	40 ←

CULVERT #2: USE 30" RCP w/ End Sections.



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Project Expressway Center

Item Drainage Plan - Culverts

Culvert #3 : Location: W.L. Lot 2

$$Q = \frac{45.4}{100}$$

Inlet Control

$\frac{HW}{D}$	$\frac{D}{L}$	$\frac{HW}{D}$	$\frac{Q}{36}$
4.0	30"	1.6	36
4.0	36"	1.33	50 ←

Outlet Control

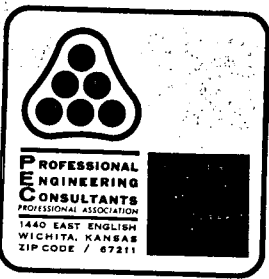
$$HW = H + h_o - LS_o$$

$$4.0 = H + 1.6 - 0.5$$

$$H = 2.9$$

$\frac{D}{L}$	$\frac{L}{K_e}$	$\frac{H}{D}$	$\frac{Q}{30}$
30"	50'	0.5	2.9
24"	50'	0.5	2.9
			50 ←
			30

Culvert #3 : Use 36" RCP w/ End sections



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Project Expressway Center

Item Drainage Plan - Culverts

Culvert # 4

Location: SW Corner Lot 1

$Q = 50.8$  (from Nodes 101-103)  
<sub>100</sub>

Inlet Control

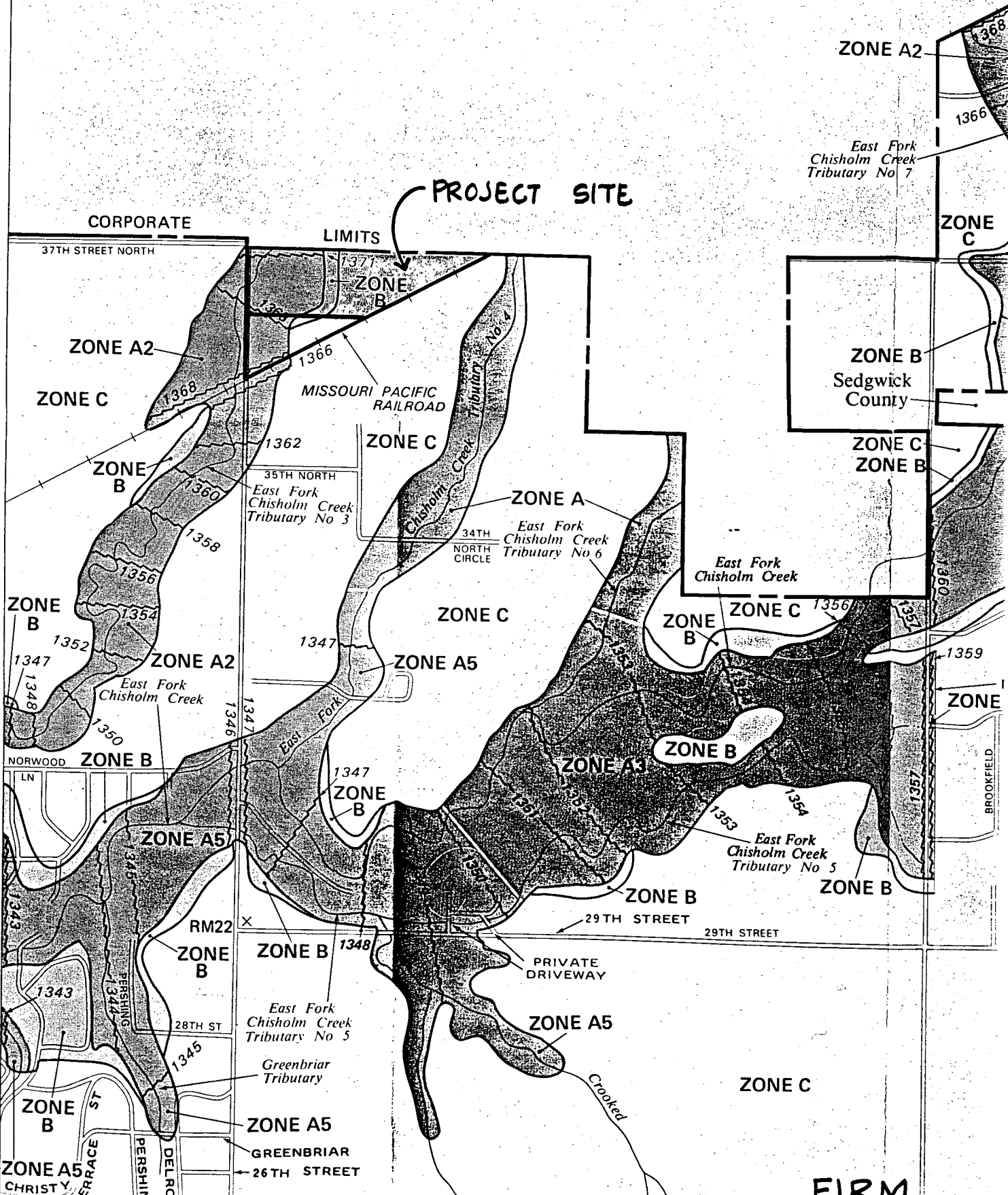
$\frac{HW}{D}$	$\frac{D}{L}$	$\frac{HW}{D}$	$\frac{Q}{D^3}$
4.0	36"	1.33	50 ←

Outlet Control

$\frac{D}{L}$	$\frac{L}{D}$	$K_e$	$\frac{H}{D}$	$\frac{Q}{D^3}$
30"	50'	0.5'	2.9	50 ←

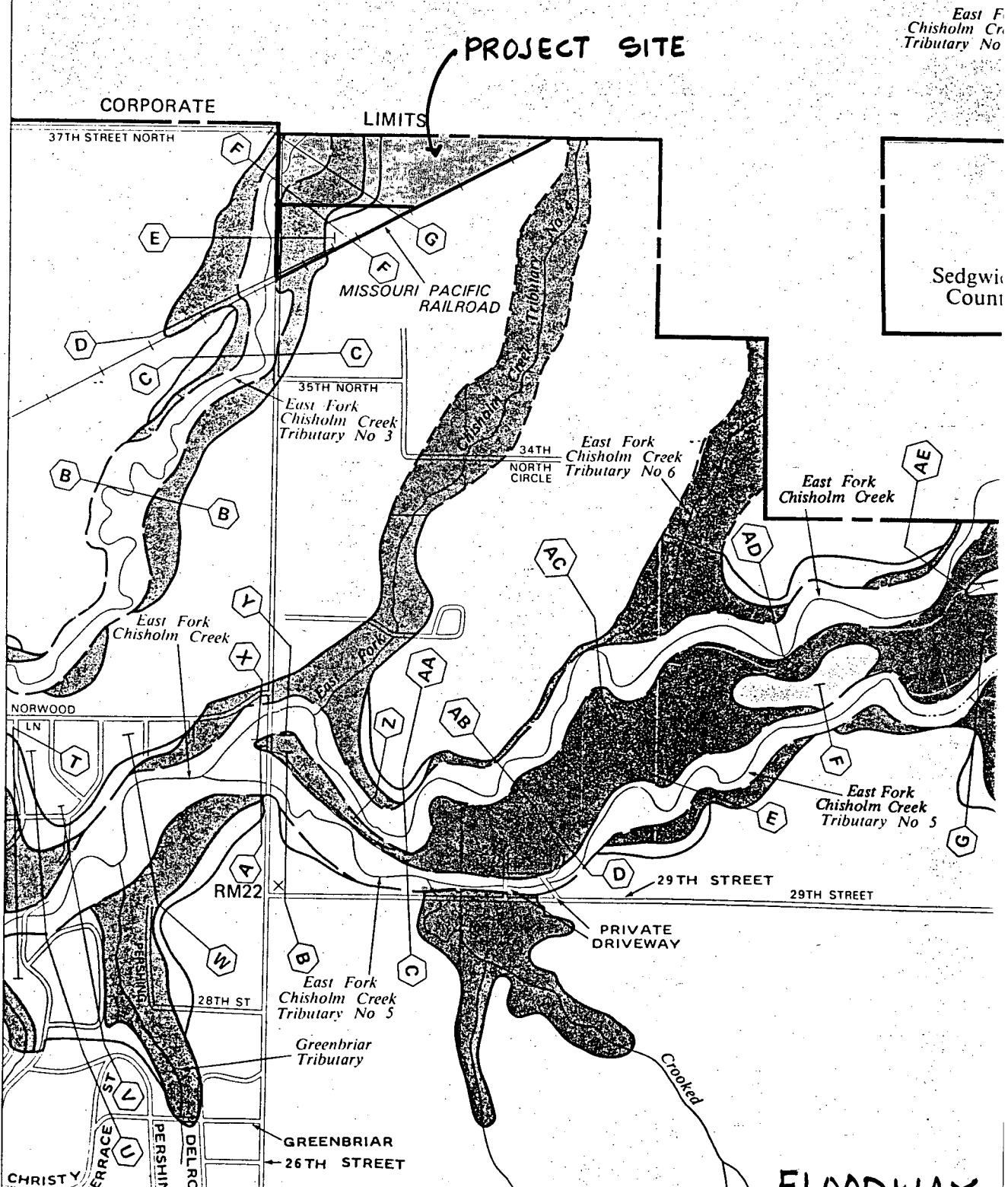
Culvert #4: Use 36" RCP w/ End Sections.

- RM 23      1386.80      City of Wichita disk located 40 feet south of 13th Street centerline, 42.5 feet east of Woodlawn Avenue centerline.
- RM 24      1388.05      City of Wichita disk located 45.4 feet north of 21st Street centerline, 45 feet east of Woodlawn Avenue centerline.



RM 23 1386.80 City of Wichita disk located 40 feet south of 13th Street centerline, 42.5 feet east of W Avenue centerline.

RM 24 1388.05 City of Wichita disk located 45.4 feet north of 21st Street centerline, 45 feet east of W Avenue centerline.



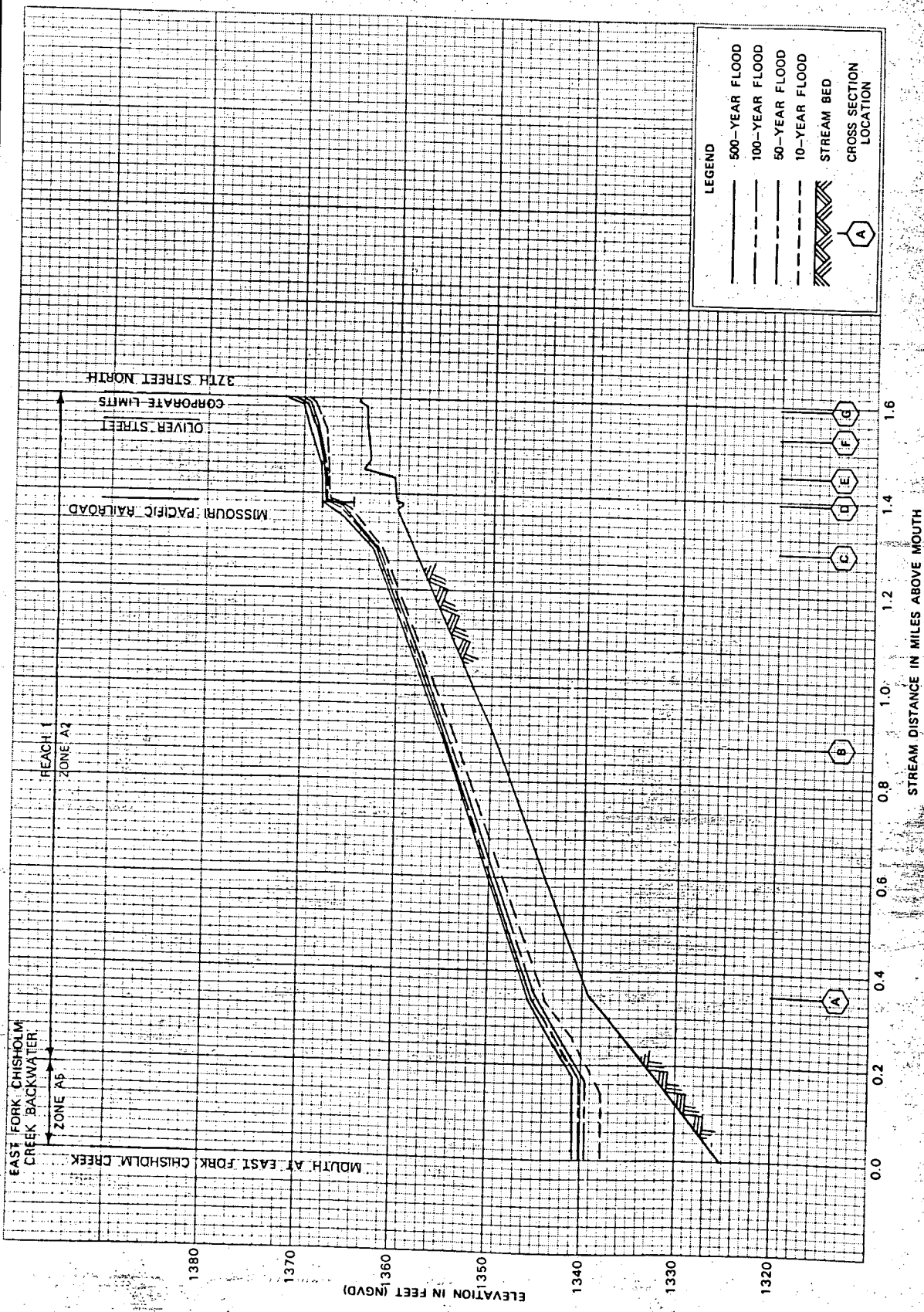
East F  
Chisholm Cr  
Tributary No

Sedgwick  
County

ELADLAW

FLOOD PROFILES

FEDERAL EMERGENCY MANAGEMENT AGENCY  
 CITY OF WICHITA, KS  
 (SEDGWICK CO.)



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
<b>EAST FORK CHISHOLM CREEK TRIBUTARY NO. 3</b>								
A	0.35	107	352	5.6	1345.3	1345.3	1345.7	0.4
B	0.88	357	816	2.4	1354.3	1354.3	1354.9	0.6
C	1.29	180	328	6.0	1362.1	1362.1	1362.5	0.4
D	1.39	313	1123	1.8	1367.6	1367.6	1367.9	0.3
E	1.45	201	617	3.2	1367.7	1367.7	1368.1	0.4
F	1.53	193	640	3.1	1368.5	1368.5	1368.9	0.4
G	1.59	335	693	2.0	1369.7	1369.7	1370.3	0.6
<b>EAST FORK CHISHOLM CREEK TRIBUTARY NO. 5</b>								
A	400 <sup>2</sup>	360	1940	1.1	1345.8	1345.5 <sup>3</sup>	1345.9	0.4
B	600 <sup>2</sup>	360	1916	1.2	1346.8	1346.0 <sup>3</sup>	1346.4	0.4
C	1760 <sup>2</sup>	205	911	2.5	1348.0	1346.5 <sup>3</sup>	1346.8	0.3
D	2240 <sup>2</sup>	116	496	4.6	1348.3	1347.2 <sup>3</sup>	1347.4	0.2
E	3750 <sup>2</sup>	185	735	2.0	1352.0	1351.0 <sup>3</sup>	1351.5	0.5
F	5250 <sup>2</sup>	115	379	3.9	1353.5	1352.3 <sup>3</sup>	1352.4	0.1
G	7250 <sup>2</sup>	150	473	3.1	1356.5	1355.4 <sup>3</sup>	1356.4	1.0
H	7375 <sup>2</sup>	150	504	2.9	1356.6	1355.7 <sup>3</sup>	1356.7	1.0

<sup>1</sup>MILES ABOVE MOUTH  
<sup>2</sup>FEET ABOVE MOUTH  
<sup>3</sup>ELEVATIONS WITHOUT CONSIDERING OVERFLOW EFFECT FROM EAST FORK CHISHOLM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CITY OF WICHITA, KS**  
 (SEDGWICK CO.)

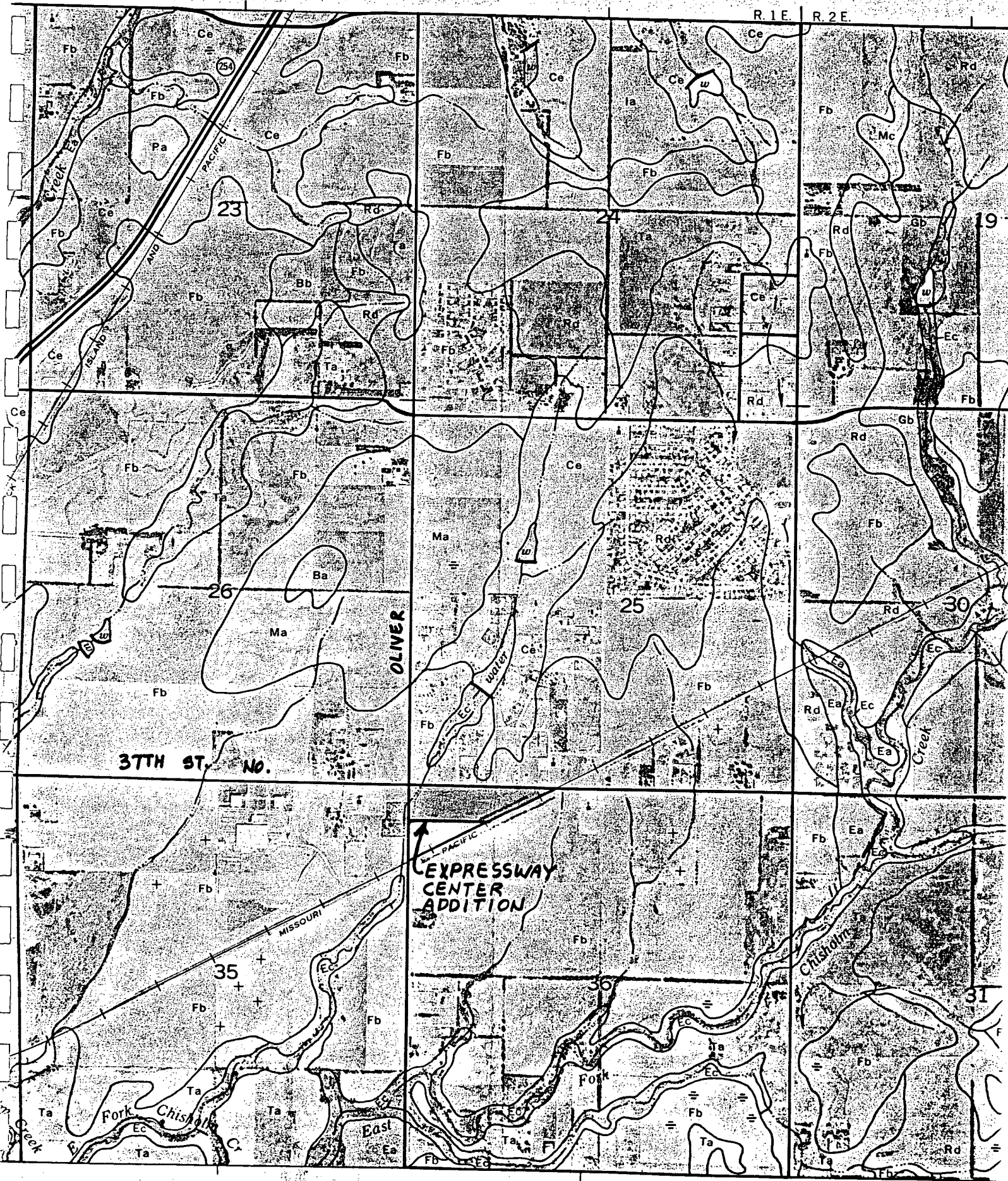
**FLOODWAY DATA**

**EAST FORK CHISHOLM CREEK TRIBUTARY NO. 3**  
**EAST FORK CHISHOLM CREEK TRIBUTARY NO. 5**

**TABLE 4**

TABLE 3 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA SQ MILES	PEAK DISCHARGES (CFS)		
		10-YEAR	50-YEAR	500-YEAR
CENTER DRAIN TRIBUTARY at confluence with Wichita Drainage Canal	3.12	1,430	2,500	4,250
CENTER DRAIN EAST TRIBUTARY mouth at Storm Water Management Basin	2.1	840	1,330	2,080
EAST FORK CHISHOLM CREEK at confluence with Wichita Drainage Canal	13.8	3,250	5,580	9,420
upstream of confluence of East Fork Chisholm Creek Tributary No. 5 at 45th Street	6.3 1.6	2,240 860	3,310 1,270	5,850 2,240
EAST FORK CHISHOLM CREEK TRIBUTARY NO. 3 at mouth	1.0	890	1,610	3,000
EAST FORK CHISHOLM CREEK TRIBUTARY NO. 5 downstream of Woodlawn Avenue	2.7	800	1,180	2,200
EAST FORK CHISHOLM CREEK TRIBUTARY NO. 7 at mouth	0.6	720	1,300	2,400
MIDDLE FORK CHISHOLM CREEK at mouth	13.54	3,280	5,000	5,000
at 45th Street North	11.14	2,850	5,000	8,500

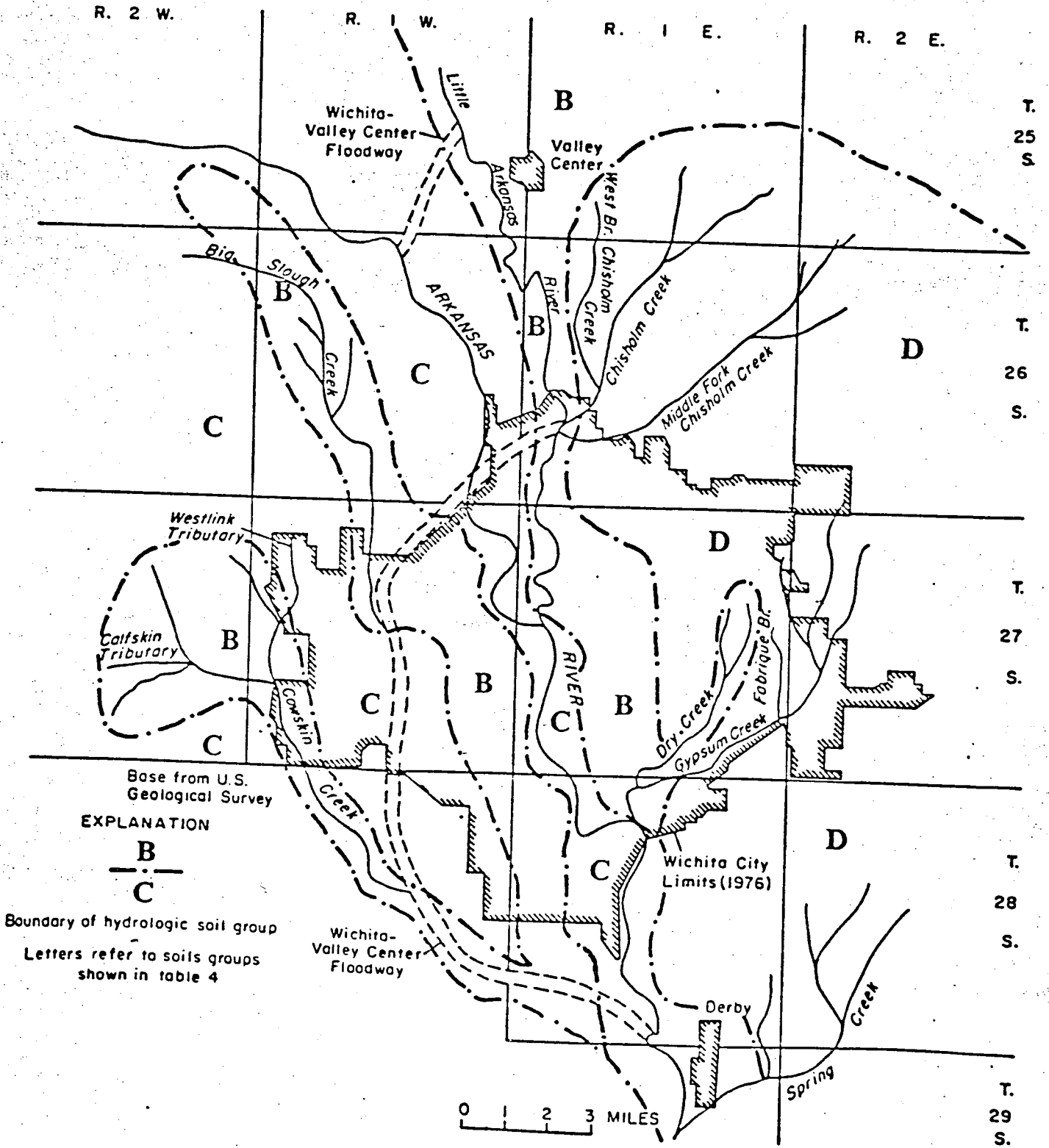


## EXHIBIT NO. 1

## 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

EXHIBIT NO. 2



## ATTACHMENT D

## DRAINAGE CRITERIA

## CITY OF WICHITA, KANSAS

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

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		<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.

April 15, 1986

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 A CONTINUED  
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DURATION IN MINUTES	RETURN PERIODS OF						
	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
46	1.70	2.05	2.54	2.97	3.48	3.93	4.33
47	1.67	2.02	2.50	2.93	3.44	3.88	4.28
48	1.66	2.00	2.47	2.90	3.39	3.84	4.23
49	1.64	1.97	2.44	2.86	3.35	3.79	4.18
50	1.61	1.95	2.41	2.83	3.32	3.75	4.13
51	1.59	1.92	2.38	2.79	3.28	3.71	4.09
52	1.56	1.89	2.35	2.76	3.24	3.67	4.05
53	1.54	1.86	2.33	2.73	3.20	3.63	4.00
54	1.52	1.84	2.30	2.70	3.17	3.59	3.96
55	1.50	1.81	2.27	2.67	3.14	3.55	3.92
56	1.47	1.79	2.25	2.64	3.10	3.51	3.88
57	1.45	1.76	2.22	2.61	3.07	3.48	3.84
58	1.43	1.74	2.20	2.59	3.04	3.44	3.81
59	1.42	1.72	2.18	2.56	3.01	3.41	3.77
60	1.40	1.69	2.15	2.53	2.98	3.37	3.73
61	1.38	1.67	2.13	2.51	2.95	3.34	3.70
62	1.36	1.65	2.11	2.48	2.92	3.31	3.67
63	1.34	1.63	2.09	2.46	2.89	3.28	3.63
64	1.33	1.61	2.07	2.44	2.86	3.25	3.60
65	1.31	1.59	2.05	2.41	2.84	3.22	3.57
66	1.30	1.57	2.03	2.39	2.81	3.19	3.54
67	1.28	1.56	2.01	2.37	2.79	3.16	3.51
68	1.26	1.54	1.99	2.35	2.76	3.13	3.48
69	1.25	1.52	1.97	2.33	2.74	3.10	3.45
70	1.24	1.50	1.95	2.31	2.71	3.08	3.42
71	1.22	1.49	1.93	2.28	2.69	3.05	3.39
72	1.21	1.47	1.92	2.26	2.67	3.02	3.36
73	1.20	1.46	1.90	2.25	2.64	3.00	3.34
74	1.18	1.44	1.88	2.23	2.63	2.98	3.31
75	1.17	1.43	1.86	2.21	2.61	2.95	3.29
76	1.16	1.41	1.85	2.19	2.58	2.93	3.26
77	1.15	1.40	1.83	2.17	2.55	2.90	3.24
78	1.13	1.38	1.82	2.15	2.53	2.88	3.22
79	1.12	1.37	1.80	2.14	2.50	2.86	3.19
80	1.11	1.36	1.79	2.12	2.48	2.84	3.16
81	1.10	1.34	1.77	2.10	2.46	2.82	3.13
82	1.09	1.33	1.76	2.08	2.43	2.79	3.10
83	1.08	1.32	1.74	2.06	2.41	2.76	3.07
84	1.07	1.31	1.73	2.04	2.39	2.74	3.04
85	1.06	1.30	1.72	2.02	2.37	2.71	3.01
86	1.05	1.28	1.70	2.00	2.34	2.69	2.99
87	1.04	1.27	1.69	1.99	2.32	2.66	2.96
88	1.03	1.26	1.68	1.97	2.30	2.64	2.93
89	1.02	1.25	1.68	1.95	2.28	2.62	2.91
90	1.01	1.24	1.66	1.93	2.26	2.59	2.88

ATTACHMENT A CONTINUED  
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DURATION IN MINUTES	RETURN PERIODS OF						
	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
91	1.00	1.23	1.65	1.92	2.24	2.57	2.86
92	1.00	1.22	1.63	1.90	2.22	2.55	2.83
93	0.99	1.21	1.62	1.89	2.20	2.53	2.81
94	0.98	1.20	1.61	1.87	2.19	2.51	2.79
95	0.97	1.19	1.59	1.85	2.17	2.49	2.76
96	0.96	1.18	1.58	1.84	2.15	2.46	2.74
97	0.96	1.17	1.57	1.82	2.13	2.44	2.72
98	0.95	1.16	1.56	1.81	2.12	2.42	2.70
99	0.94	1.15	1.54	1.80	2.10	2.41	2.67
100	0.93	1.14	1.53	1.78	2.08	2.39	2.65
101	0.93	1.13	1.52	1.77	2.07	2.39	2.65
102	0.92	1.13	1.51	1.75	2.05	2.35	2.61
103	0.91	1.12	1.50	1.74	2.04	2.33	2.59
104	0.90	1.11	1.49	1.73	2.02	2.31	2.57
105	0.90	1.10	1.47	1.72	2.01	2.30	2.55
106	0.89	1.09	1.46	1.70	1.99	2.28	2.54
107	0.88	1.09	1.45	1.69	1.98	2.26	2.52
108	0.88	1.08	1.44	1.68	1.96	2.25	2.50
109	0.87	1.07	1.43	1.67	1.95	2.23	2.48
110	0.87	1.06	1.42	1.65	1.93	2.21	2.46
111	0.86	1.06	1.41	1.64	1.92	2.20	2.45
112	0.85	1.05	1.40	1.63	1.91	2.18	2.43
113	0.85	1.04	1.39	1.62	1.89	2.17	2.41
114	0.84	1.03	1.38	1.61	1.88	2.15	2.40
115	0.84	1.03	1.37	1.60	1.87	2.14	2.38
116	0.83	1.02	1.36	1.59	1.86	2.12	2.36
117	0.82	1.01	1.36	1.58	1.84	2.11	2.35
118	0.82	1.01	1.35	1.57	1.83	2.09	2.33
119	0.81	1.00	1.34	1.56	1.82	2.08	2.32
120	0.81	0.99	1.33	1.55	1.81	2.07	2.30

DURATION IN HOURS	RETURN PERIODS OF						
	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
2	0.81	0.99	1.33	1.55	1.81	2.07	2.30
3	0.59	0.72	0.97	1.13	1.32	1.51	1.68
4	0.47	0.58	0.78	0.91	1.06	1.21	1.35
5	0.40	0.49	0.66	0.77	0.89	1.02	1.14
6	0.35	0.42	0.57	0.67	0.78	0.89	0.99
8	0.28	0.34	0.46	0.53	0.62	0.71	0.79
10	0.23	0.29	0.39	0.45	0.52	0.60	0.67
12	0.20	0.25	0.33	0.39	0.45	0.52	0.58
18	0.15	0.18	0.24	0.28	0.33	0.38	0.42
24	0.12	0.15	0.20	0.23	0.27	0.31	0.34