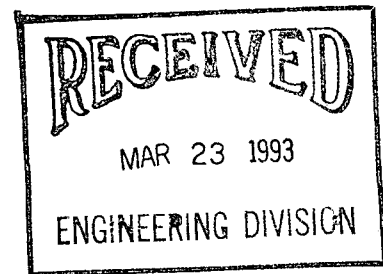


DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS

WEST YARD ADDITION
SEDGWICK COUNTY, KANSAS



PREPARED BY
MOEHRING & ASSOCIATES
CONSULTING ENGINEERS

MARCH 1993

PREFACE

Attached hereto are the computations and exhibits for the referenced drainage plan.

The computations and subsequent computer print-outs contained in this report employed portions of computer programs entitled " Quick TR-55, Hydrology For Small Watersheds " and also " Pond - 2, Detention Pond Design & Analysis ", compiled and published by Haestad Methods Inc., Waterbury CT. The " Quick TR-55 " computer program uses methodologies defined in Technical Release No. 55 -- " Urban Hydrology for Small Watersheds " by the United States Soil Conservation Service.

The " Quick TR-55 " program as produced by Haestad Methods contains not only the typical SCS Graphical Peak and the Tabular Hydrograph methods, but also the Modified Rational Method for determination of peak discharges from small watersheds. The Graphical Peak Method does not yield a hydrograph for routing purposes, while the Tabular Hydrograph Method does not lend itself to the configuration of the watershed that is here being evaluated, and therefore the option of the Modified Rational Method has been utilized for the determination of the peak discharge (Q).

The TR-55 program is used for the calculation of the Time of concentration (Tc), which in this case is the sum of the travel times for overland sheet flow and shallow concentrated flow.

Rainfall intensities, for each respective time of concentration (Tc), are based on the Intensity - Duration - Frequency (I-D-F) values for this area, based on data from NOAA Tech. Memorandum NWS HYDRO - 35, National Weather Service.

For the Post Developed condition, it is anticipated that a detention/retention pond will, for the immediate future, be employed to diminish run-off. An inflow hydrograph, as required for pond routing, is generated by use of the SCS Dimensionless Unit Hydrograph relationships which express the ratio of discharge to the peak discharge (Q/Qp), as related to that point in time, to the time to peak (T/Tp).

There are no off-site drainage basins contributing to the area being evaluated, and the topographic map developed from field surveys, is used to determine the areas and gradients of the site.

The Soil Survey of Sedgwick County, published by the SCS, was used to determine the hydrologic soil group for this site. The " Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation ", City of Wichita, provides a source of Rational "C" values for various land uses, correlated to each hydrologic soil group, for each of the 2, 5, 10 and 100 year rainfall events.

INITIAL DATA

The area being platted as " WEST YARD ADDITION " is located in the E 1/2 of the S.E. 1/4 of Section 14, T. 28 S., R. 1 W. of the 6th P.M., Sedgwick County, Kansas, and is generally located North of 47th St. South and on the West side of West Street. The total area of the site is 30.0 Ac., exclusive of Street Rights of Way.

The soil is identified as Tabler (Ta), hydrologic soil group "D". The land use is presently in wheat, in straight row cultivation. The land slopes generally to the East, with an average gradient of less than 1% .

There are no natural watercourses in or adjacent to the site, and road side ditches provide the only positive drainage outlets, for the near future.

Long range planning to alleviate local flooding in adjacent areas within the same watershed, calls for the future construction of an outlet channel parallel to 47th Street, discharging into the Wichita-Valley Center floodway. The site development plan has reserved a strip of land parallel to 47th St., approximately 145' in width, for future construction of the outlet channel.

For the interim period, the plan is to utilize this reserved area as a surface water detention facility, which will serve to reduce the peak rate of discharge to the existing watershed.

The enclosed Exhibit "A" is a Xerox copy of a portion of the "Bayneville" Quadrangle showing the study area.

The enclosed Exhibit "B" is from the SCS Soils map which identifies the soil in the study area to be Tabler (Ta), which is in hydrologic soil group "D".

The area being evaluated is 30.0 Acres, all of which is presently in cultivation (wheat). Under developed conditions, there are plans for approximately 6.5 Acres of impervious area, and the remaining 23.5 Acres will be sown with grass and considered as lawns.

The Rational "C" values used in this study are taken from the City of Wichita "Drainage Policy", and for the 100 yr. storm, are as follows:

Cultivated - "D" Soils - Slope less than 1%	"C" = 0.67
Lawns - "D" Soils - Slope less than 1%	"C" = 0.63
Paved Areas - "D" Soils - 96% impervious	"C" = 0.89

COMPUTATION PROCEDURE

The following computer print out, Pages C-1 and C-2 are the computations to determine the time of concentration (T_c), and the corresponding peak discharge (Q), from the 30 Acre site under pre-developed conditions, for the 100 yr. rainfall event. This discharge is directed toward the West ditch of West Street.

On pages C-3 and C-4 are the computations for peak "Q" and resulting hydrograph ordinates, under Post Developed conditions. This discharge is from the impervious area and the lawn area to the West, which is directed toward the Detention Pond.

Page C-5 is the determination of detention pond volumes, based upon planimeter survey of the pond as drawn on the drainage plan.

Page C-6 is the data input for the pond outlet control structure, which is to be a 24" Reinforced Concrete Pipe, having a flow line elevation of 1280.20.

Page C-7 is the rating table for the pipe as a control structure, at 0.25' increments, between elevations 1280.20 and 1283.00.

Page C-8 combines the Outlet Structure file, the Planimeter Input file (Pond Volume File), which results in a Outflow Rating Table in preparation for the flood routing procedure.

Pages C-9, C-10, and C-11 are the flood routing computations and summaries, which result in the peak rate of outflow, the maximum water surface elevation and corresponding storage requirements.

On Page C-12 is a plot of the inflow and outflow hydrographs through the detention pond and outlet structure for the 100 yr. event.

Page C-13 is the computation of peak "Q" to West Street under Post-Developed conditions, for that part of the site that does not discharge through the detention pond.

SUMMARY

As computed on C-2, the Pre-Developed discharge from the site is approximately 105 cfs, which is in excess of the capacity of the roadside ditches into which the discharge is presently flowing.

Under Post-Developed conditions, the peak rate of discharge directed to the Detention Pond is approximately 64 cfs (peak inflow on Page C-11), while the peak discharge from the remainder of the site is approximately 50 cfs, (peak discharge on Page C-13), which is directed to the roadside ditch in West Street.

However, the peak outflow from the Detention Pond is reduced to approximately 9 cfs, and has a time lag of nearly an hour later than the time to peak for the discharge from the remainder of the site. Then, for all practical purposes, the West ditch of West Street needs only to have a section and gradient capable of conveying 50 cfs.

The existing West ditch of West Street, has essentially a flat bottom varying in width from 4 to 7 feet and has a gradient of approximately 0.15%, from the North line of 47th Street, North to an existing RCBC under West Street, a distance of approximately 1860 feet.

To provide a positive drainage outlet, this section of ditch needs some regrading in two areas, each of which are 200 to 300 feet in length. At one point, the depth of the regrading operation will approach 1 1/4 feet. On a following page is a suggested cross section that will convey 50 cfs, at a gradient of 0.15% .

To provide positive drainage from the detention pond outlet structure to the West ditch of West Street, a new road side ditch will need to be constructed along the North side of 47th St., with a 0.15% gradient, and for a length of approximately 390 feet. A simple "V" ditch, with 3.5 : 1 side slopes, flowing at a depth of 1.5 feet, will be adequate for the detention pond discharge.

Quick TR-55 Ver.5.43 S/N:1240540379
 Executed: 16:30:46 03-12-1993 C:\PONDPACK\SEDGWICK.TCT

WEST YARD ADDITION
 PRE-DEVELOPED Tc COMPUTATION
 100 yr. Storm

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		A-B	
Surface description		WHEAT	SR+C
Manning's roughness coeff., n			0.0600
Flow length, L (total < or = 300)	ft		300.0
Two-yr 24-hr rainfall, P2	in		3.500
Land slope, s	ft/ft		0.0077
		0.8	
T =	$\frac{.007 * (n*L)}{P2 * s}$	hrs	0.26 = 0.26

SHALLOW CONCENTRATED FLOW

Segment ID		B-C	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft		1135.0
Watercourse slope, s	ft/ft		0.0049
		0.5	
Avg.V =	$Csf * (s)$	ft/s	1.1294
where:	Unpaved Csf = 16.1345		
	Paved Csf = 20.3282		
T =	$L / (3600*V)$	hrs	0.28 = 0.28

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
		$\frac{2}{3}$	$\frac{1}{2}$
V =	$\frac{1.49 * r * s}{n}$	ft/s	0.0000
Flow length, L	ft		0
T =	$L / (3600*V)$	hrs	0.00 = 0.00

.....
 TOTAL TIME (hrs) 0.54

Quick TR-55 Ver.5.43 S/N:1240540379
 Executed: 14:19:56 03-16-1993

WEST YARD ADDITION
 PRE-DEVELOPED Q100 TO WEST STREET

***** 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)
CULTIV. SR	0.670	30.00						
			32.40	0.670	0.670	5.222	30.00	104.97

Quick TR-55 Ver.5.43 S/N:1240540379
 Executed: 14:43:18 03-16-1993

WEST YARD ADDITION
 POST-DEVELOPED RUNOFF TO DETENTION POND

***** 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 & BLDG	0.890	6.50						
LAWNS	0.630	4.70						
POND AREA	1.000	3.50						
			32.40	0.833	0.833	5.222	14.70	63.95

Quick TR-55 Ver.5.43 S/N:1240540379
Executed: 14:43:18 03-16-1993

WEST YARD ADDITION
POST-DEVELOPED RUNOFF TO DETENTION POND

**** Rational Method Hydrograph Using Q/Qp Template ****
Weighted C = 0.833 Area= 14.700 acres Tc = 32.40 minutes

Adjusted C = 0.833 Tc= 32.40 min. I= 5.22 in/hr Qp= 63.95 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.00
Q/Qp Template: IDF Output file: POND100 .HYD

HYDROGRAPH ORDINATES (cfs)

Time increment = 0.283 Hours

Time Hours	Time on left represents time for first Q in each row.						
0.257	27.53	63.95	41.59	16.75	7.17	3.04	1.30
2.240	0.59	0.21	0.00				

POND-2 Version: 5.14
S/N: 1220510530

WEST YARD ADDITION
RETENTION POND

CALCULATED 03-16-1993 12:41:42
DISK FILE: C:\PONDPACK\SEDGWICK.VOL

Planimeter scale: 1 inch = 100 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
1,280.00	6.82	1.57	0.00	0.00	0.00
1,281.00	7.82	1.80	5.04	1.68	1.68
1,282.00	8.82	2.02	5.73	1.91	3.59
1,283.00	9.82	2.25	6.42	2.14	5.73

$$IA = (\text{sq. rt}(\text{Area1}) + ((E_i - E_1) / (E_2 - E_1)) * (\text{sq. rt}(\text{Area2}) - \text{sq. rt}(\text{Area1})))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1, Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (EL2 - EL1) * (\text{Area1} + \text{Area2} + \text{sq. rt.}(\text{Area1} * \text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment
Area1, Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

POND-2 Version: 5.14

S/N: 1220510530

Date Executed:

Time Executed:

WEST YARD ADDITION
STRUCTURE ANALYSIS
24 " R.C.P. OUTLET STRUCTURE

>>>>> Structure No. 1 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	1280.2
E2 elev.(ft)?	1283
Diam. (ft)?	2
Inv. el.(ft)?	1280.2
Slope (ft/ft)?	.0046
T1 ratio?	
T2 ratio?	
K Coeff.?	.0045
M Coeff.?	2
c Coeff.?	.0317
Y Coeff.?	.69
Form 1 or 2?	1
Slope factor?	-0.5

POND-2 Version: 5.14
 Date Executed:

S/N: 1220510530
 Time Executed:

WEST YARD ADDITION
 STRUCTURE ANALYSIS
 24 " R.C.P. OUTLET STRUCTURE

Outflow Rating Table for Structure #1
 CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation	Messages
1280.20	0.0	No headwater	
1280.45	0.3	Equ.1: HW =.25	dc=.184 Ac=.144
1280.70	1.1	Equ.1: HW =.5	dc=.369 Ac=.398
1280.95	2.5	Equ.1: HW =.750	dc=.547 Ac=.697
1281.20	4.3	Equ.1: HW =1.0	dc=.727 Ac=1.032
1281.45	6.3	Equ.1: HW =1.25	dc=.889 Ac=1.349
1281.70	8.8	Equ.1: HW =1.5	dc=1.057 Ac=1.685
1281.95	11.1	Equ.1: HW =1.75	dc=1.193 Ac=1.954
1282.20	13.7	Equ.1: HW =2.0	dc=1.334 Ac=2.226
1282.45	16.3	Transition: HW =2.25	
1282.70	18.7	Submerged: HW =2.5	
1282.95	20.7	Submerged: HW =2.75	
1283.00	0.0	E = or > E2=1283	

Used Unsubmerged Equ. Form (1) for elev. less than 1282.39 ft
 Used Submerged Equation for elevations greater than 1282.59 ft
 HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:

E1=1282.39 ft; Q1=15.55 cfs; Dc=1.42 ft; E2=1282.59 ft; Q2=17.77 cfs

POND-2 Version: 5.14

S/N: 1220510530

Date Executed:

Time Executed:

WEST YARD ADDITION
STRUCTURE ANALYSIS
24 " R.C.P. OUTLET STRUCTURE

Outlet Structure File: C:\PONDPACK\SESGWICK.STR
Planimeter Input File: C:\PONDPACK\SESGWICK.VOL
Rating Table Output File: C:\PONDPACK\SESGWICK.PND

Min. Elev.(ft) = 1280.2 Max. Elev.(ft) = 1283 Incr.(ft) = .25

Additional elevations (ft) to be included in table:

SYSTEM CONNECTIVITY

Structure	No.	Q Table	Q Table
-----	---	-----	-----
CULVERT-CR	1		-> 1

Outflow rating table summary was stored in file:
C:\PONDPACK\SESGWICK.PND

POND-2 Version: 5.14 S/N: 1220510530
 EXECUTED: 03-16-1993 16:41:55

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*****
*
*
*      WEST YARD ADDITION
*      STRUCTURE ANALYSIS
* 24 " R.C.P. OUTLET STRUCTURE
*
*****
    
```

Inflow Hydrograph: C:\PONDPACK\POND100 .HYD
 Rating Table file: C:\PONDPACK\SEDGWICK.PND

----INITIAL CONDITIONS----
 Elevation = 1280.20 ft
 Outflow = 0.00 cfs
 Storage = 0.32 ac-ft

GIVEN POND DATA

INTERMEDIATE ROUTING
 COMPUTATIONS

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
1280.20	0.0	0.318	27.1	27.1
1280.45	0.3	0.727	62.1	62.4
1280.70	1.1	1.151	98.3	99.4
1280.95	2.5	1.590	135.8	138.3
1281.20	4.3	2.043	174.5	178.8
1281.45	6.3	2.510	214.4	220.7
1281.70	8.6	2.991	255.5	264.1
1281.95	11.1	3.487	297.8	308.9
1282.20	13.7	3.997	341.4	355.1
1282.45	16.2	4.522	386.2	402.4
1282.70	18.7	5.061	432.2	450.9
1282.95	20.7	5.614	479.5	500.2

Time increment (t) = 0.283 hrs.

POND-2 Version: 5.14 S/N: 1220510530
 EXECUTED: 03-16-1993 16:41:55

Page 2

Pond File: C:\PONDPACK\SEDGWICK.PND
 Inflow Hydrograph: C:\PONDPACK\POND100 .HYD
 Outflow Hydrograph: C:\PONDPACK\OUT .HYD

INFLOW HYDROGRAPH

ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - 0 (cfs)	2S/t + 0 (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.257	27.53	-----	27.1	27.1	0.00	1280.20
0.540	63.95	91.5	115.0	118.6	1.79	1280.82
0.823	41.59	105.5	208.0	220.6	6.30	1281.45
1.107	16.75	58.3	248.9	266.3	8.72	1281.71
1.390	7.17	23.9	254.6	272.8	9.09	1281.75
1.673	3.04	10.2	247.5	264.8	8.64	1281.70
1.957	1.30	4.3	236.0	251.9	7.95	1281.63
2.240	0.59	1.9	223.4	237.9	7.21	1281.55
2.523	0.21	0.8	211.3	224.2	6.49	1281.47
2.807	0.00	0.2	199.7	211.5	5.86	1281.40

POND-2 Version: 5.14 S/N: 1220510530
EXECUTED: 03-16-1993 16:41:55

***** SUMMARY OF ROUTING COMPUTATIONS *****

Pond File: C:\PONDPACK\SEDGWICK.PND
Inflow Hydrograph: C:\PONDPACK\POND100 .HYD
Outflow Hydrograph: C:\PONDPACK\OUT .HYD

Starting Pond W.S. Elevation = 1280.20 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 63.95 cfs
Peak Outflow = 9.09 cfs
Peak Elevation = 1281.75 ft

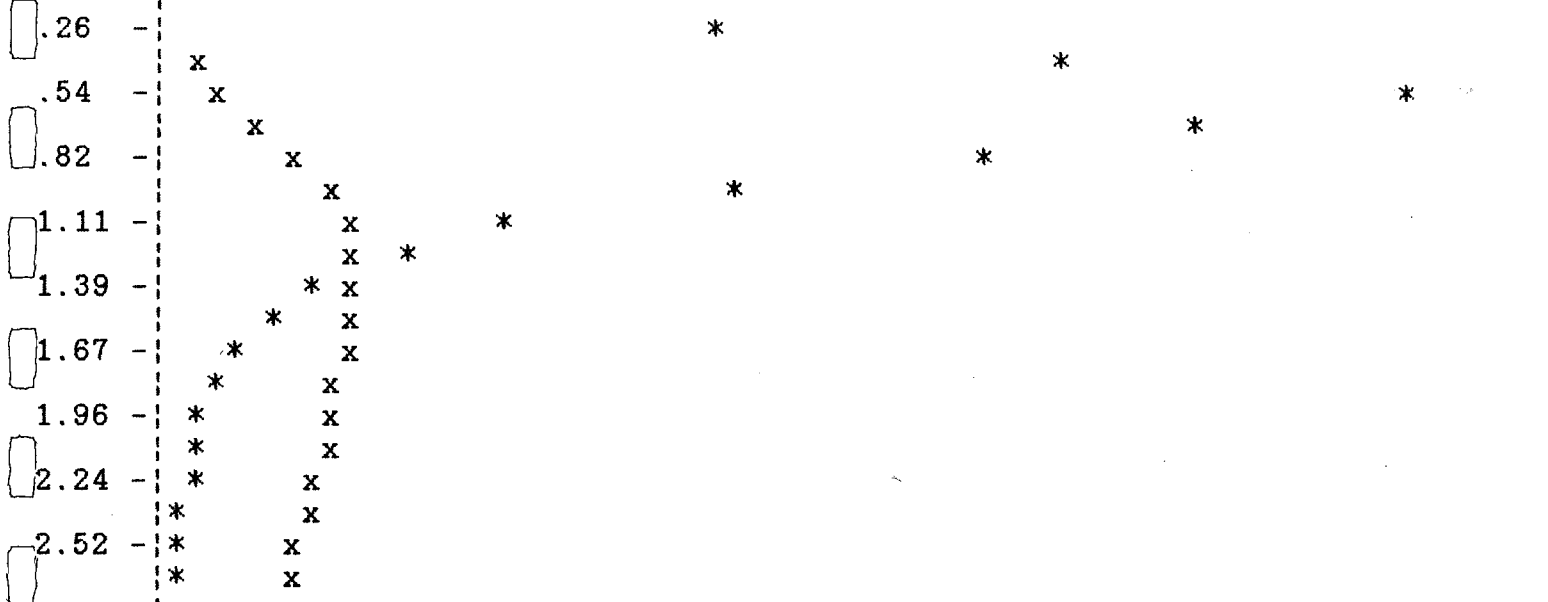
***** Summary of Approximate Peak Storage *****

Initial Storage = 0.32 ac-ft
Peak Storage From Storm = 2.77 ac-ft

Total Storage in Pond = 3.09 ac-ft

Warning: Inflow hydrograph truncated on left side.

Flow (cfs) 0.0 6.0 12.0 18.0 24.0 30.0 36.0 42.0 48.0 54.0 60.0 66.0



TIME (hrs)

* File: C:\PONDPACK\POND100 .HYD Qmax = 64.0 cfs
x File: C:\PONDPACK\OUT .HYD Qmax = 9.1 cfs

Quick TR-55 Ver.5.43 S/N:1240540379
 Executed: 17:50:54 03-16-1993

WEST YARD ADDITION
 POST-DEVELOPED RUNOFF TO WEST STREET

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

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

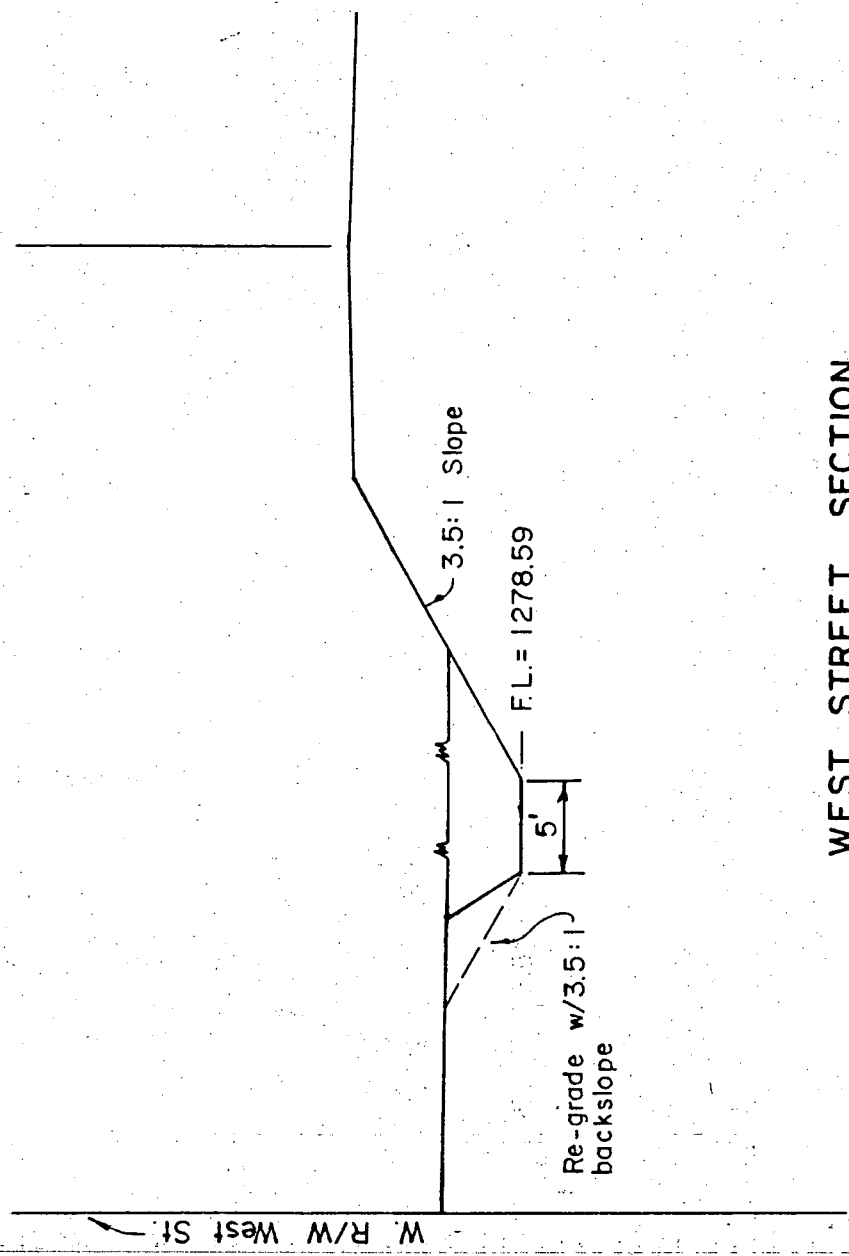
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

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)
LAWNS	0.630	15.30						
			32.40	0.630	0.630	5.222	15.30	50.34

48%

West St



A = 24 Sq. Ft. Flow Depth = 2'
WP = 19.56'
S = 0.15%
n = 0.030
V = 2.20 fps
Q = 52.8 cfs

WEST STREET SECTION

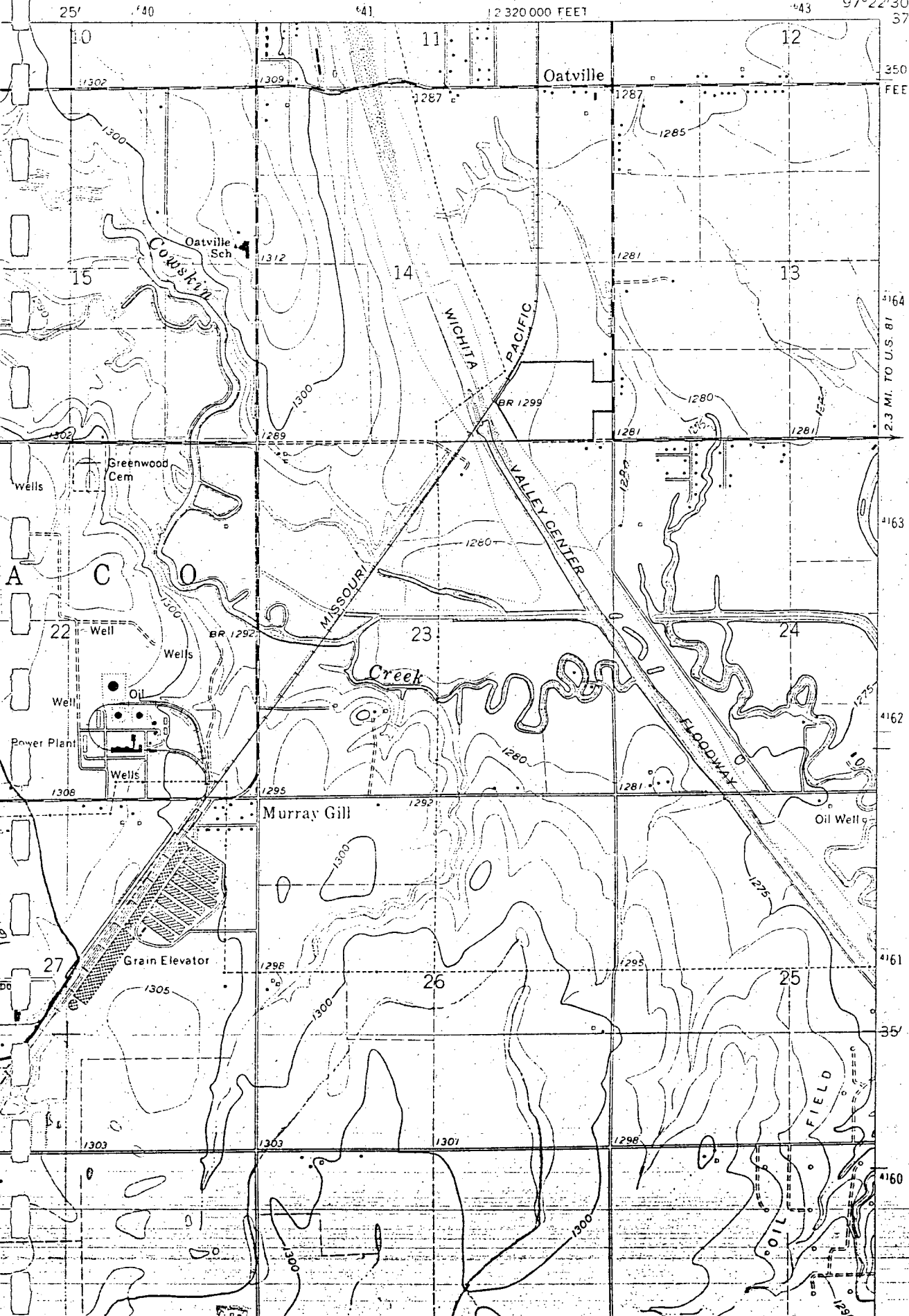
1285

1280

1275

BAYNEVILLE QUADRANGLE
KANSAS—SEDGWICK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

6559 111 NE
WICHITA EAST 1



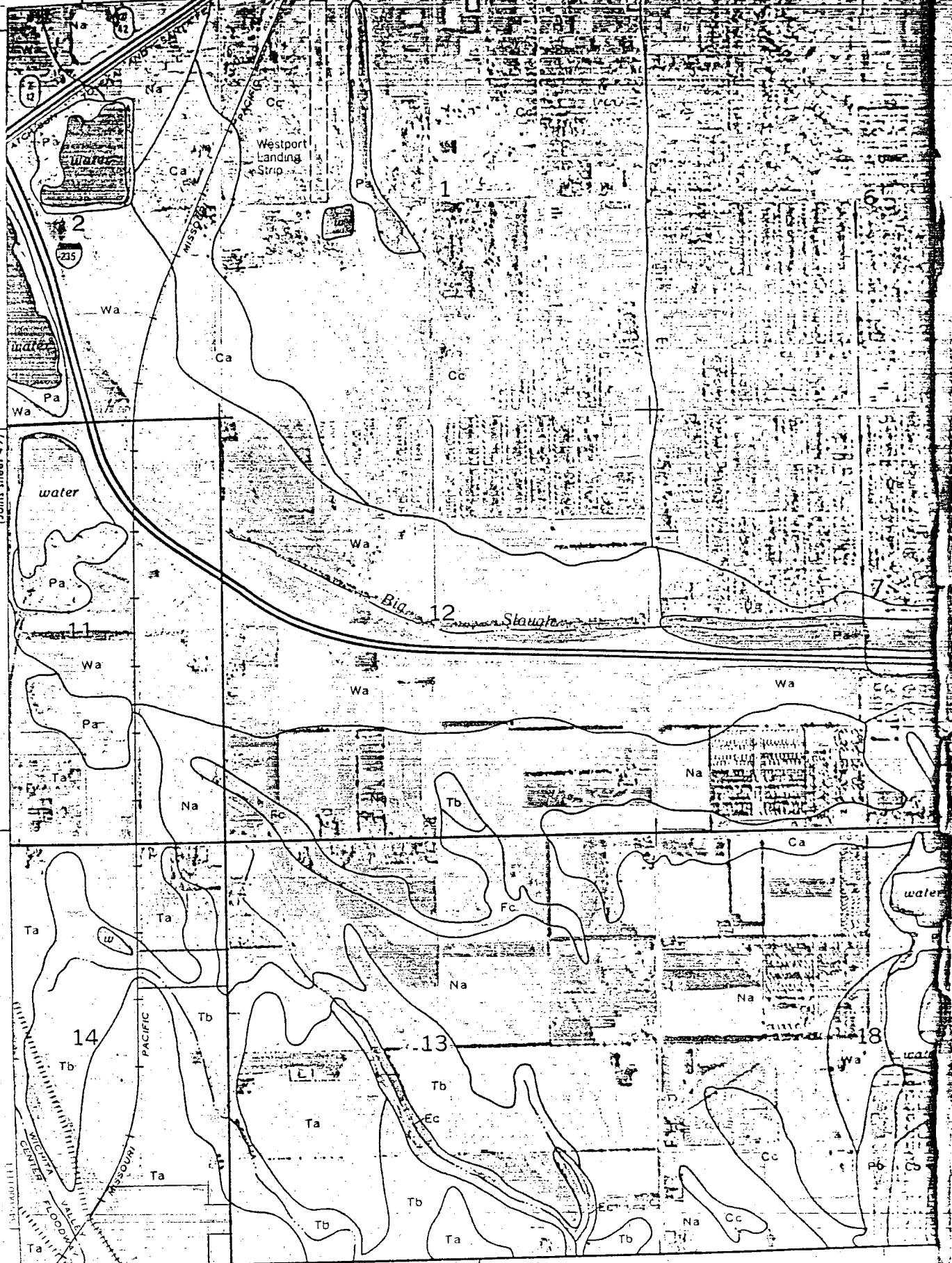
J-10-11

Exhibit
"A"

TT 3241 B
1273.56 Elev
[X]
U.S.G.S.
BM

(Joins sheet 42)

R. 1 W. | R. 1 E.

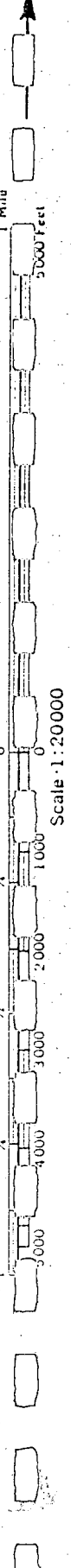


(Joins sheet 49)

1:250,000 FEET

(Joins sheet 58)

Exhibit "B"



- ATTACHMENT A
DRAINAGE CRITERIA MANUAL

April 15, 1986

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	3.99	4.60	5.35	6.00	6.53
21	2.44	3.25	3.87	4.50	5.23	5.87	6.39
22	2.38	3.17	3.73	4.40	5.12	5.75	6.26
23	2.32	3.10	3.65	4.31	5.01	5.63	6.13
24	2.27	3.03	3.57	4.22	4.91	5.52	6.01
25	2.22	2.96	3.50	4.13	4.81	5.41	5.90
26	2.20	2.90	3.43	4.05	4.72	5.31	5.79
27	2.16	2.84	3.37	3.98	4.63	5.21	5.69
28	2.14	2.78	3.30	3.90	4.55	5.12	5.59
29	2.11	2.72	3.24	3.83	4.47	5.03	5.49
30	2.08	2.67	3.19	3.76	4.39	4.94	5.40
31	2.05	2.62	3.10	3.70	4.32	4.86	5.32
32	2.02	2.57	3.05	3.63	4.25	4.79	5.22
33	1.99	2.52	3.01	3.57	4.18	4.71	5.14
34	1.96	2.48	2.98	3.51	4.11	4.63	5.07
35	1.93	2.44	2.93	3.46	4.05	4.56	5.00
36	1.91	2.39	2.88	3.41	3.99	4.43	4.93
37	1.89	2.35	2.84	3.36	3.93	4.37	4.86
38	1.87	2.32	2.80	3.31	3.87	4.31	4.79
39	1.85	2.28	2.76	3.26	3.82	4.25	4.73
40	1.83	2.24	2.72	3.22	3.76	4.19	4.66
41	1.81	2.21	2.68	3.17	3.71	4.13	4.60
42	1.79	2.18	2.64	3.13	3.66	4.08	4.54
43	1.77	2.14	2.61	3.09	3.61	4.03	4.48
44	1.75	2.11	2.57	3.05	3.57	3.98	4.42
45	1.73	2.08	2.54	3.01	3.52	3.93	4.36

Land Use or Surface Characteristics

Percent Impervious

Frequency
2 5 10 100

Land Use or Surface Characteristics	Percent Impervious	2	5	10	100
<u>Single Family (Soil Group A)</u>					
1/8 Acre	50				
1/4 Acre	38	0.47			
1/3 Acre	30	0.39	0.50		
1/2 Acre	25	0.33	0.41	0.54	
3/4 Acre	22	0.30	0.35	0.45	0.60
1 Acre	20	0.28	0.31	0.39	0.52
<u>Multi-Family (Soil Group A)</u>					
Multi-Unit (detached)	60	0.26	0.29	0.33	0.44
Multi-Unit (attached)	65	0.26	0.28	0.32	0.42
Apartment	75	0.55	0.57	0.61	0.40
3. Industrial:					
Light Areas	70	0.65	0.60	0.67	0.67
Heavy Areas	80	0.65	0.68	0.72	0.70
1. Playgrounds:					
Schools:	15	0.68	0.69	0.73	0.80
Railroad Yard Areas:	40	0.74	0.76	0.79	0.84
Undeveloped Urban Areas:	30	0.33	0.35	0.42	0.55
Offsite Flow Analysis (when land use not defined)	30	0.49	0.51	0.56	0.66
Streets:	45	0.43	0.45	0.50	0.62
Paved		0.52	0.54	0.59	0.68
Gravel	99	0.87	0.88	0.90	0.93
Drives, Parking Lots and Walks:	00	0.24	0.26	0.33	0.48
Lawns:	96	0.87	0.87	0.88	0.89
Group A	90	0.80	0.85	0.90	0.93
Group B					
less than 1%	00	0.08	0.09	0.13	0.23
1% to 4%	00	0.12	0.13	0.17	0.27
more than 4%	00	0.16	0.17	0.21	0.31
Group C					
less than 1%	00	0.16	0.18	0.24	0.37
1% to 4%	00	0.20	0.22	0.28	0.41
more than 4%	00	0.24	0.26	0.32	0.45
Group D					
less than 1%	00	0.24	0.27	0.35	0.51
1% to 4%	00	0.26	0.29	0.37	0.53
more than 4%	00	0.28	0.31	0.39	0.55

Land Use or Surface Characteristics

Soil Group D

- Slope less than 1%
- Slope 1% to 4%
- Slope more than 4%

Percent Impervious

- 00
- 00
- 00

Frequency

<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
0.28	0.33	0.43	0.63
0.30	0.35	0.45	0.65
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.

DRAINAGE PLAN

PRELIMINARY PLAT

of

WEST YARD ADDITION
SEDGWICK COUNTY, KANSAS



1" = 100'

