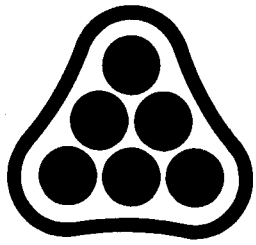

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

DRAINAGE PLAN

AND

SUPPORTING CALCULATIONS

FOR

MÈRÈ RIDGE

AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

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

AUGUST 12, 1988

1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

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Date Aug. 3, 1988 Page 1 of 6

Project Mère Ridge

Item Drainage Plan System 100

I. HYDROLOGY Use Rational Formula $Q = CIA$

Determine "C"

Node	Soil Type	Hyd. Group	Land Use	C_2	C_{100}
101	Fa	B	Res; 1 Ac. Lot	0.33	0.51
100	(Headwall)				

Determine "I"

Node	t_c	I_2	I_{100}
101	15	3.83	7.37
100	(Headwall)		

Determine "A"

Node	plan. units	Area (SF)	Area (Acre)
101	855	136,800	3.14
100	(Headwall)		

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Date Aug. 3, 1988 Page 2 of 6

Project Mère Ridge

Item Drainage Plan System 100

Determine "Q_2"

Node	C_2	I_2	A	Q_2
101	0.33	3.83	3.14	4.0
100	(Headwall)			

Determine "Q_{100}"

Node	C_{100}	I_{100}	A	Q_{100}
101	0.51	7.37	3.14	11.8

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Date Aug 3, 1988 Page 3 of 6

Project Mère Ridge

Item Drainage Plan System 100

II INLET SIZING (100-year)

Node	Inlet condition	Q_{100}	Max HW	Q_{max} (5' inlet)	Q_{max} (10' Inlet)	Use L=
101	Sump	11.8	1.22'	13.0	27.0	5'
100	(Headwall)					

III STREET FLOW

2 YR

Node	Q_2	Distribution	street slope	d	d_{max}	Comment
101	4.0	60% (W) = 2.4	0.5%	0.27'	0.3'	OK
		40% (E) = 1.6	0.5%	0.23'	0.3'	OK
100	(Headwall)					

100-YR

Location	Contributing Areas	Q_{100}	Q_{pipe}	Q_{street}	street slope	Q_{max}	Comment
Approaching Node 101 (S)	101	11.8	0.0	11.8	0.5	28.6	OK Roll Cb w/ 0.3' WK Gr

```
100 j, 1322.5000  100    3    2    1
110 t,mere ridge addition
120 t,drainage plan
130 t,storm water sewer system 100 analysis
140 i,  101     0.33     0.51     0.00     0.00    11.80    15.00  1327.50
150 m,  100  1322.50
160 p,  101  100   170.00   18 0.013   0.00   0.00
170 e
```

Date: 08-03-1988
Time: 14:14:38

Input File: mere100

mere ridge addition
drainage plan
storm water sewer system 100 analysis

Storm Frequency = 100-Year

* * * HYDROLOGY * * *

Tributary Area								Hydrology Summation				Conduit Data				
Node to Node		C	Area (Ac)	Slope (%)	Length (Ft)	TC(Ø) (Min)	I(Ø) (In/Hr)	Q(Ø) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
101	100	Ø.33	Ø.5!	Ø.ØØ	Ø.Ø	15.ØØ	8.97	11.8Ø	15.ØØ	8.97	11.8Ø	11.8Ø	18"	6.68	17Ø.ØØ	Ø.42	15.42

Date: 08-03-1988
Time: 14:14:38

Input File: mere100

mere ridge addition
drainage plan
storm water sewer system 100 analysis

Storm Frequency = 100-Year

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
101	0.01262	2.1452	0.0000	0.0000	0.0000	0.0000	0.0000	2.1452	1324.6453	1327.5000	2.85
100	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1322.5000	1322.5000	0.00

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Date August 3, 1988 Page 1 of 6

Project Mère Ridge

Item Drainage Plan System 200

I. HYDROLOGY

Use Rational Formula $Q = cIA$

Determine "c"

Node	Soil Type	Hyd. Group	Land Use	c_2	c_{100}
202	Fa, Ea	B	Res; 1 Ac. Lot	0.33	0.51
201	Fa, Ea	B	Res; 1 Ac Lot	0.33	0.51
200	(Headwall)				

Determine "I"

Node	t_c	I_2	I_{100}
202	15	3.83	7.37
201	15	3.83	7.37
200	(Headwall)		

Determine "A"

Node	Plan. Units	Area SF	Area Ac.
202	531	84,960	1.95
201	1331	212,960	4.89
200	(Headwall)		

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Date August 3, 1988 Page 2 of 6

Project Mère Ridge

Item Drainage Plan System 200

Determine "Q_2"

Node	C_2	I_2	A	Q_2
202	0.33	3.83	1.95	2.5
201	0.33	3.83	4.89	6.2
200	(Headwall)			

Determine "Q_{100}"

Node	C_{100}	I_{100}	A	Q_{100}
202	0.51	7.37	1.95	7.3
201	0.51	7.37	4.89	18.4
200	(Headwall)			

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Date Aug. 3, 1988 Page 3 of 6

Project Meré Ridge

Item Drainage Plan System 200

II. INLET SIZING (100-yr)

Node	Inlet Condition	Q_{100}	Max HW	Q_{max} (5' inlet)	Q_{max} (10' Inlet)	Use L=
202	Sump	7.3	1.22	13.0	27.0	5'
201	Sump	18.4	1.22	13.0	27.0	10'
200	(Headwall)					

III STREET FLOW

2-yr.

Node	Q_2	Distribution		street slope	d	d_{max}	Comment
202	2.5	25% E =	0.6	0.32%	0.18	0.55'	OK
		75% W =	1.9	0.4%	0.25	0.55'	OK
201	6.2	20% E =	1.2	0.32%	0.23	0.55'	OK
		80% W =	5.0	0.4%	0.37	0.55'	OK
200	(Headwall)						

100-YR

Location	Contributing Areas	Q_{100}	Q_{pipe}	Q_{street}	street slope	Q_{max}	Comment
Approaching 202 & 201 (N)	75% 202 =	5.5					
	80% 201 =	14.7					
		20.2	0.0	20.2	0.4%	48.9	OK Std. Co w/ 0.3' wk gr.

```
100 j, 1322.5000  200    3    3    2
110 t,mere ridge addition
120 t,drainage plan
130 t,storm water sewer system 200 analysis
140 i,  202     0.51     1.95     0.00     0.00     7.30    15.00  1326.00
150 i,  201     0.51     4.89     0.00     0.00    18.40    15.00  1326.00
160 m,  200  1322.50
170 p,  202  201    40.00   15 0.013   0.00   0.00
180 p,  201  200   210.00   30 0.013   0.00   0.00
190 e
```

Date: 08-03-1988
Time: 14:12:35

Input File: mere200

mere ridge addition
drainage plan
storm water sewer system 200 analysis

Storm Frequency = 100-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)
202	201	0.51	1.95	0.00	0.0	15.00	8.97	7.30	15.00	8.97	7.30	7.30	15"	5.95	40.00	0.11	15.11
201	200	0.51	4.89	0.00	0.0	15.00	8.97	18.40	15.11	8.95	18.35	25.65	30"	5.22	210.00	0.67	15.78

Date: 08-03-1988
Time: 14:12:35

Input File: mere200

mere ridge addition
drainage plan
storm water sewer system 200 analysis

Storm Frequency = 100-Year

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
202	0.01277	0.5108	0.0000	0.0000	0.0000	0.0000	0.0000	0.5108	1324.8173	1326.0000	1.18
201	0.00391	0.8210	0.0000	0.0251	0.0000	0.0000	0.9602	1.8064	1324.3064	1326.0000	1.69
200	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1322.5000	1322.5000	0.00

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Date Aug. 3, 1988 Page 1 of 6

Project Mère Ridge

Item Drainage Plan System 300

I HYDROLOGY Use Rational Formula $Q = cIA$

Determine "C"

Node	Soil Type	Hyd Group	Land Use	C_2	C_{100}
302	Fa, Ea	B	Res; 1 Ac. Lot	0.33	0.51
301	Fa, Ea	B	Res; 1 Ac. Lot	0.33	0.51
300	(Headwall)				

Determine "I"

Node	tc	I_2	I_{100}
302	15	3.83	7.37
301	15	3.83	7.37
300	(Headwall)		

Determine "A"

Node	Plan. Units	Area - SF	Area - Ac.
302	733	117,280	2.69
301	320	51,200	1.18
300	(Headwall)		

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Date Aug. 3, 1988 Page 2 of 6

Project Meré Ridge

Item Drainage Plan System 300

Determine "Q_2"

Node	C_2	I_2	A	Q_2
302	0.33	3.83	2.69	3.4
301	0.33	3.83	1.18	1.5
300	(Headwall)			

Determine "Q_{100}"

Node	C_{100}	I_{100}	A	Q_{100}
302	0.51	7.37	2.69	10.1
301	0.51	7.37	1.18	4.4
300	(Headwall)			

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Date Aug. 3, 1988 Page 3 of 6

Project Mere Ridge

Item Drainage Plan System 300

II INLET SIZING (100-yr)

Node	Inlet Condition	Q_{100}	Max HW	Q_{max} (5' Inlet)	Q_{max} (10' Inlet)	Use L=
302	Sump	10.1	1.22	13.0	27.0	5'
301	Sump	4.4	1.22	13.0	27.0	5'
300	(Headwall)					

III STREET FLOW

2-year

Node	Q_2	Distribution	street slope	d	d_{max}	Comment
302	3.4	50% (N) = 1.7	1.2%	0.20	0.55'	OK
		50% (S) = 1.7	1.0%	0.21	0.55'	OK
301	1.5	50% (N) = 0.8	1.2%	0.15	0.55'	OK
		50% (S) = 0.7	1.0%	0.15	0.55'	OK
300	(Headwall)					

100-year

Location	Contributing Areas	Q_{100}	Q_{pipe}	Q_{street}	street slope	Q_{max}	Comment
Approaching Nodes 302 & 301 (S)	50% 302 =	5.1					
	50% 301 =	2.2					
		7.3	0.0	7.3	1.0%	77.3	OK
							Std cb. w/ 0.3' Wk. Gr
Approaching Nodes 302 & 301 (N)	50% 302 =	5.0					
	50% 301 =	2.2					
		7.2	0.0	7.2	1.2%	84.6	OK
							Std Cb. w/ 0.3' Wk. Gr

```
100 j, 1322.5000  300    3    3    2
110 t,mere ridge addition
120 t,drainage plan
130 t,storm water sewer system 300 analysis
140 i,  302     0.51     2.69     0.00     0.00    10.10    15.00  1323.50
150 i,  301     0.51     1.18     0.00     0.00     4.40    15.00  1323.50
160 m,  300  1322.50
170 p,  302  301    40.00   18 0.013   0.00   0.00
180 p,  301  300   210.00   24 0.013   0.00   0.00
190 e
```

Date: 08-03-1988
Time: 15:48:42

Input File: mere300

mere ridge addition
drainage plan
storm water sewer system 300 analysis

Storm Frequency = 100-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(Ø) (Min)	I(Ø) (In/Hr)	Q(Ø) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
302	301	0.51	2.69	0.00	0.0	15.00	8.97	10.10	15.00	8.97	10.10	10.10	18"	5.72	40.00	0.12	15.12
301	300	0.51	1.18	0.00	0.0	15.00	8.97	4.40	15.12	8.95	4.39	14.49	24"	4.61	210.00	0.76	15.88

Date: 08-03-1988
Time: 15:48:42

Input File: mere300

mere ridge addition
drainage plan
storm water sewer system 300 analysis

Storm Frequency = 100-Year

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)	
302	0.00924	0.3698	0.0000	0.0000	0.0000	0.0000	0.0000	0.3698	1323.9148	1323.5000	-0.41	*
301	0.00410	0.8612	0.0000	0.0354	0.0000	0.0000	0.1485	1.0450	1323.5450	1323.5000	-0.05	*
300	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1322.5000	1322.5000	0.00	

* HGL allowed above T.C. during 100-yr. storm.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
BIG SLOUGH NORTH								
M	11,487	197	1168	3.5	1317.1	1317.1	1317.5	0.4
N	11,887	681	1140	3.6	1317.7	1317.7	1318.0	0.3
O	13,437	659	2650	1.6	1319.0	1319.0	1319.1	0.1
P	15,417	192	774	5.3	1319.7	1319.7	1319.7	0.0
Q	15,942	318	1391	3.0	1320.7	1320.7	1320.7	0.0
R	16,491	165	973	3.5	1320.9	1320.9	1320.9	0.0
S	17,144	886	2288	1.5	1321.5	1321.5	1321.8	0.3
T	17,943	1285[2]	2123	1.6	1322.3	1322.3	1323.0	0.7
Z	22,628	730	1407	1.7	1325.8	1325.8	1326.1	0.3
AA	24,072	1070	2392	1.0	1326.6	1326.6	1327.3	0.7
AB	25,703	500	1215	2.0	1328.0	1328.0	1328.7	0.7
AC	27,342	762	2424	1.0	1330.4	1330.4	1331.2	0.8
AD	28,846	604	1565	1.5	1331.0	1331.0	1332.0	1.0
AE	30,882	600	1829	1.3	1332.7	1332.7	1333.7	1.0
AF	33,742	741	1325	1.4	1334.0	1334.0	1334.8	0.8
AG	35,486	151	880	2.2	1337.1	1337.1	1337.8	0.7
AH	39,318	930	2487	0.7	1337.2	1337.2	1338.2	1.0
AI	42,108	236	704	2.6	1338.1	1338.1	1338.6	0.5
AJ	42,978	240	969	1.9	1339.8	1339.8	1340.8	1.0
AK	48,418	264	1048	1.8	1342.9	1342.9	1343.7	0.8
AL	49,418	409	1243	1.5	1343.5	1343.5	1344.3	0.8
AM	51,693	56	350	5.3	1346.0	1346.0	1346.3	0.3

[1]FEET ABOVE MOUTH
[2]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED

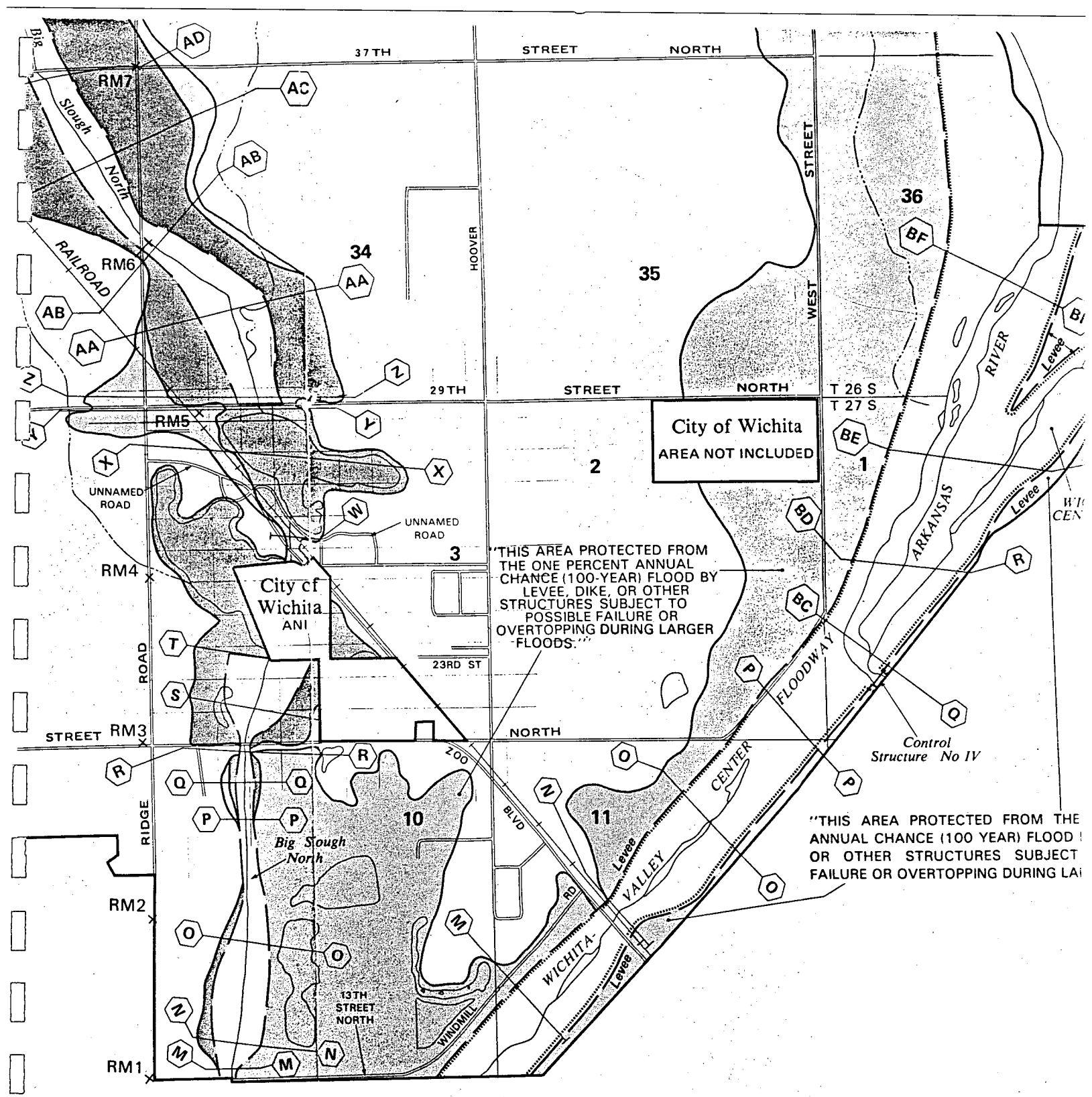
TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

SEDGWICK COUNTY, KS
(UNINCORPORATED AREAS)

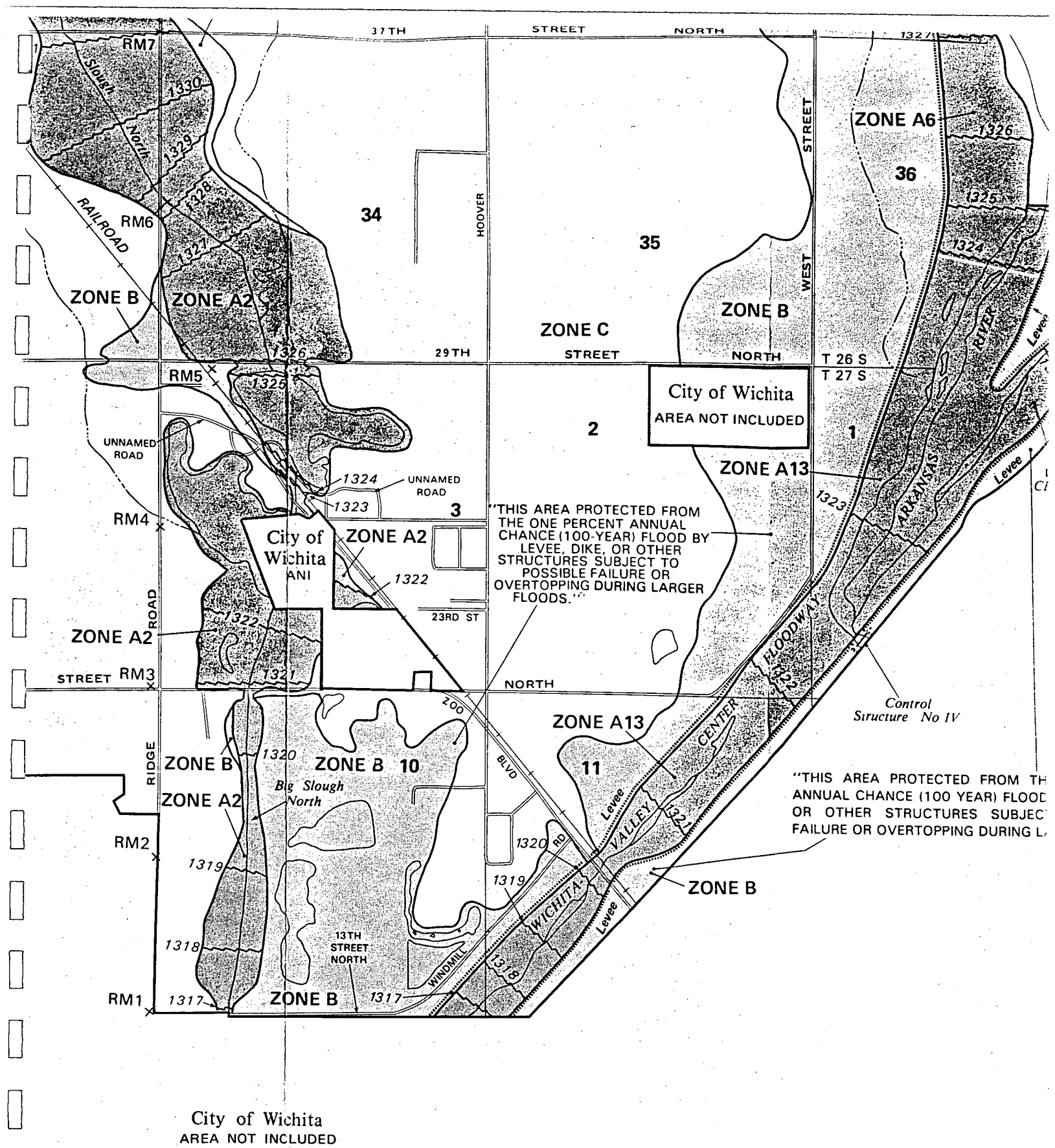
FLOODWAY DATA

BIG SLOUGH NORTH

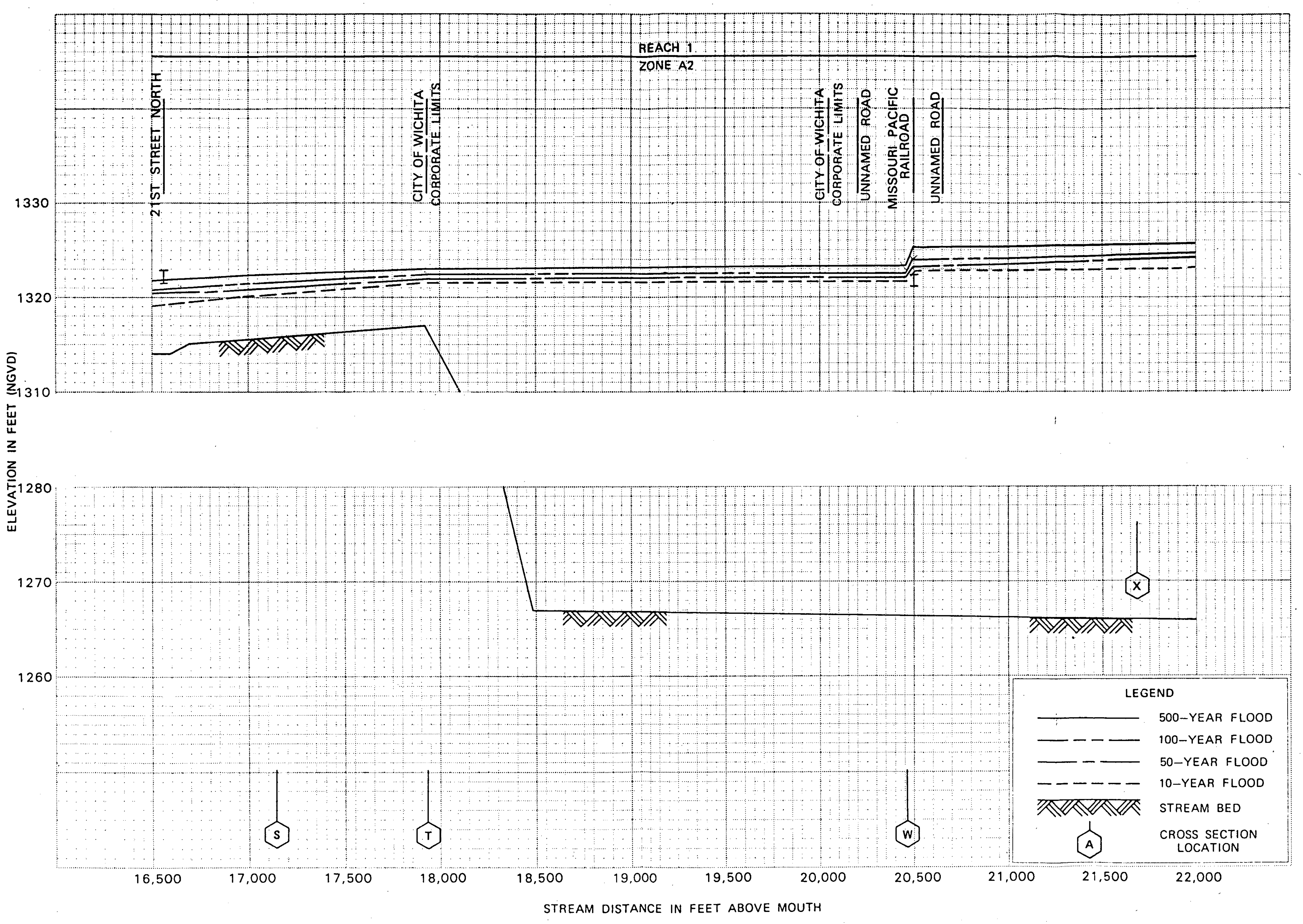


City of Wichita
AREA NOT INCLUDED

FOR DESCRIPTION OF ELEVATION REFERENCE MARKS, SEE PANEL 200321 0075



FOR DESCRIPTION OF ELEVATION REFERENCE MARKS, SEE PANEL 200321 0075



FEDERAL EMERGENCY MANAGEMENT AGENCY

SEDGWICK COUNTY, KS
(UNINCORPORATED AREAS)

FLOOD PROFILES

BIG SLOUGH NORTH

27P

TY, KANSAS — SHEET NUMBER 33

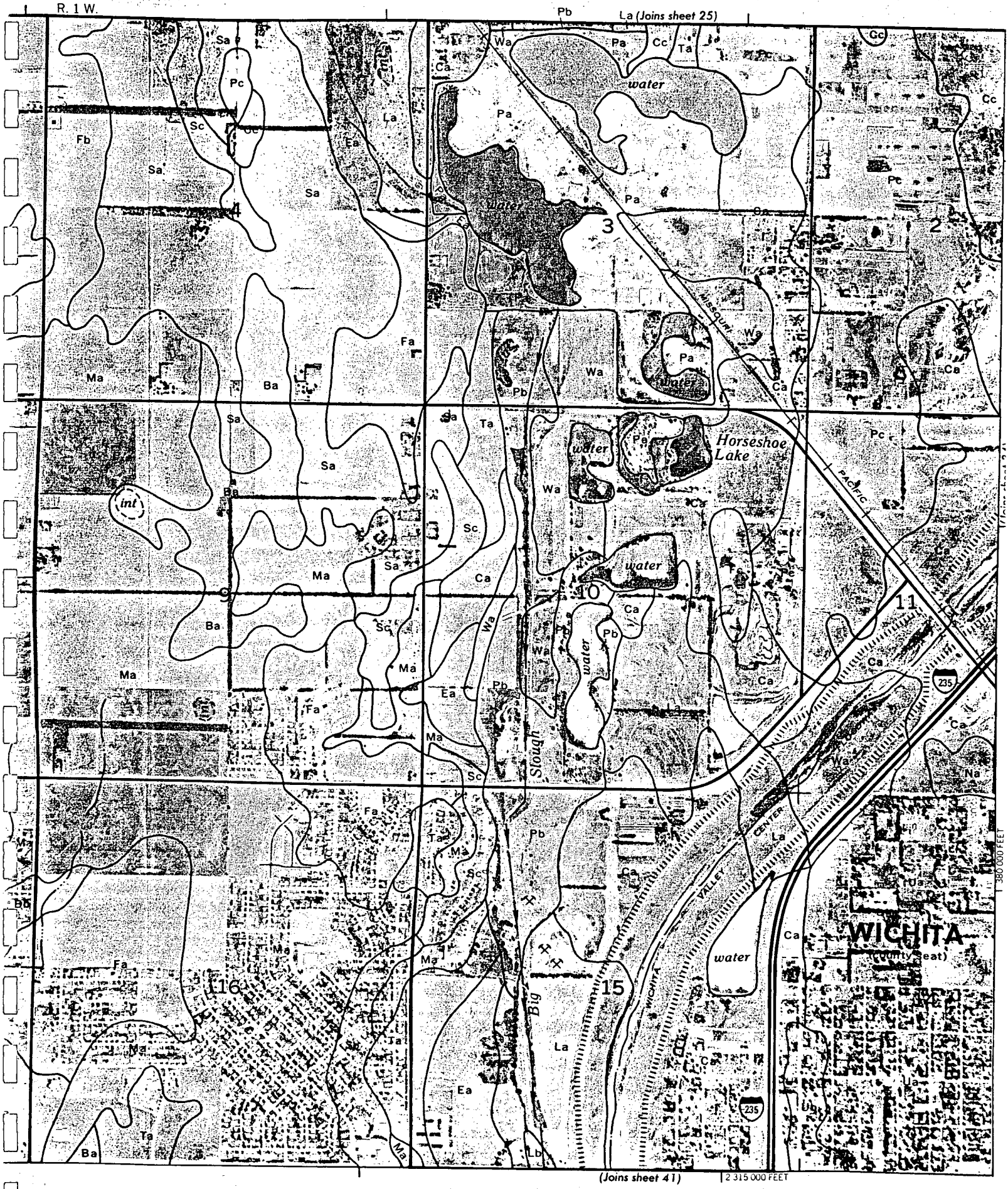


EXHIBIT NO. 1

SOIL LEGEND

SYMBOL	HYDROLOGIC GROUP	NAME
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loans, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loan, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loan
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	Clime 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 lopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

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
Page 2

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

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

(3 pages)

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 2	5	10	100
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:					
Single Family (Soil Group D)					
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
Multi-Family (Soil Group D)					
Multi-Unit (detacned)	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
Single Family (Soil Group C)					
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
Multi-Family (Soil Group C)					
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
Single-Family (Soil Group B)					
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
Multi-Family (Soil Group B)					
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 2	5	10	100
Single Family (Soil Group A)					
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
Multi-Family (Soil Group A)					
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):					
Soil Group A					
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
Soil Group B					
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
Soil Group C					
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 2	5	10	100
Soil Group D					
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.

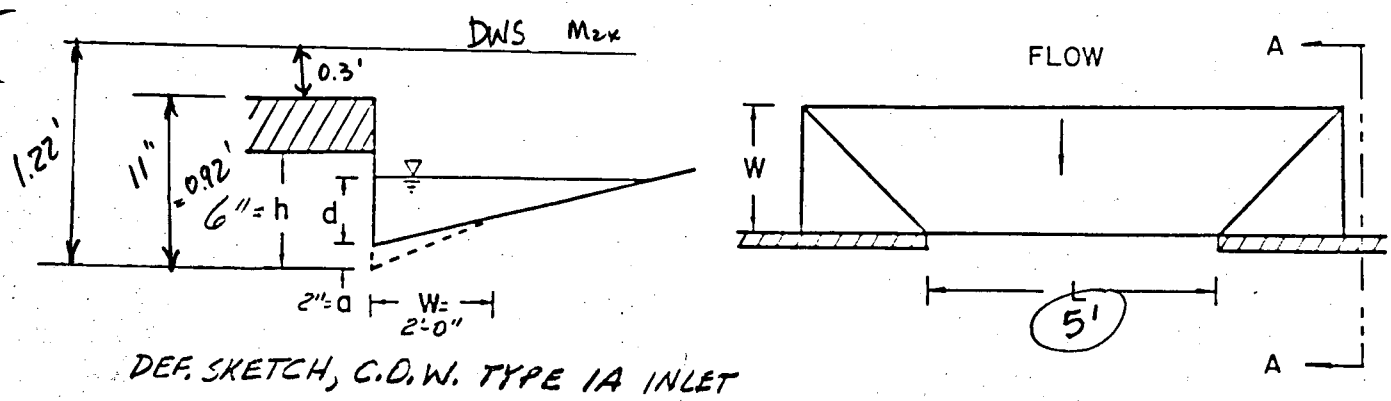
ATTACHMENT E

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forest with Heavy Ground Litter or Meadow	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.21	0.28	0.33	0.39	0.46	0.53	0.60	0.72	1.10
Fallow or Minimum Tillage Cultivation	0.06	0.08	0.10	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.29	0.40	0.51	0.66	0.78	0.91	1.05	1.20	1.44	2.10
Short Grass Pasture or Lawns	0.09	0.13	0.15	0.18	0.20	0.21	0.23	0.25	0.26	0.28	0.45	0.60	0.77	0.96	1.17	1.33	1.50	1.68	1.98	3.20
Almost Bare Ground	0.16	0.22	0.28	0.31	0.35	0.38	0.41	0.44	0.46	0.49	0.70	0.85	1.05	1.26	1.50	1.75	2.03	2.32	2.79	4.40
Grassed Waterway	0.35	0.48	0.58	0.67	0.77	0.84	0.91	0.98	1.05	1.12	1.54	1.82	2.10	2.38	2.78	3.20	3.66	4.14	4.56	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.44	0.62	0.77	0.91	1.05	1.12	1.19	1.26	1.33	1.40	2.00	2.55	3.20	3.83	4.41	5.04	5.70	6.00	6.20	9.00



DEF. SKETCH, C.O.W. TYPE 1A INLET

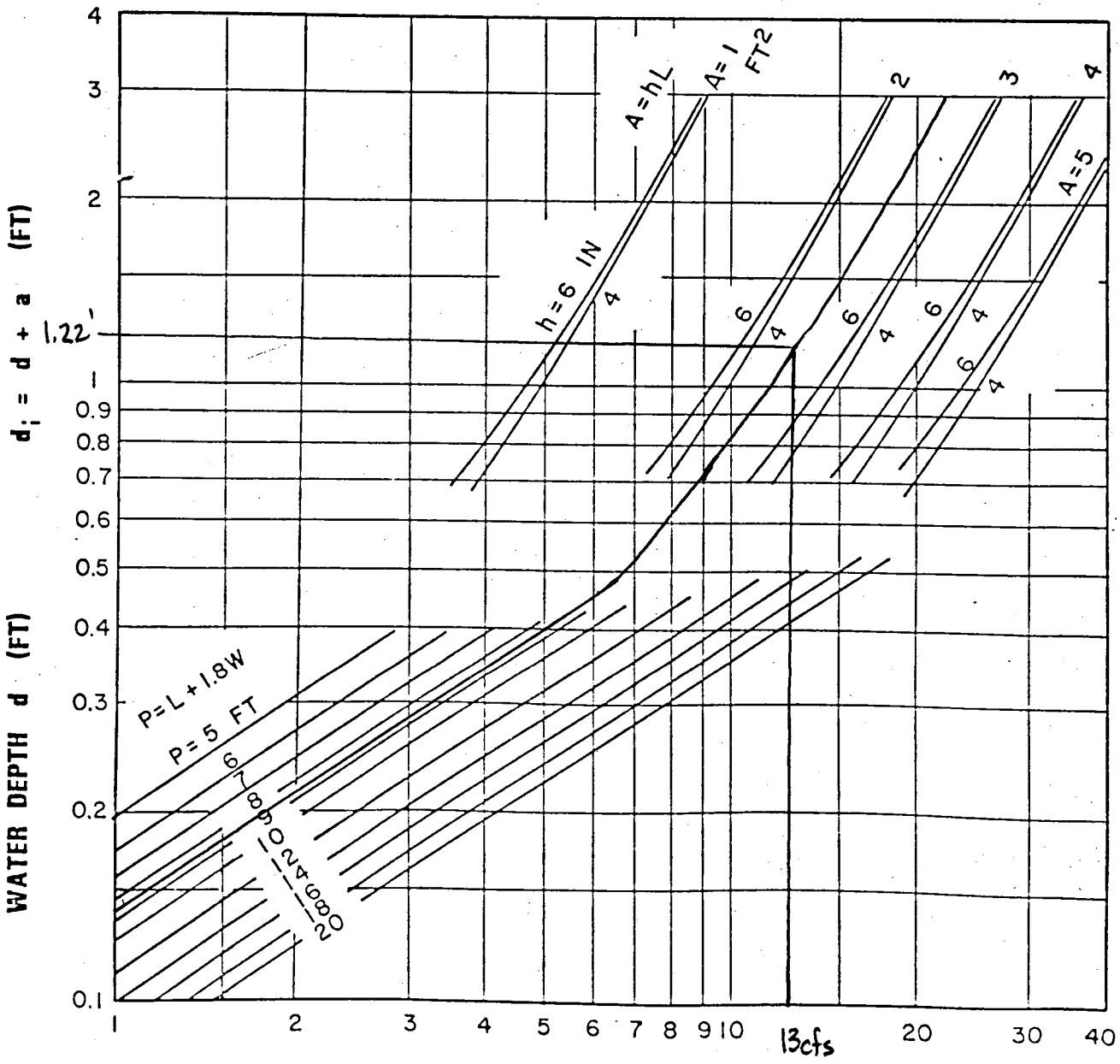
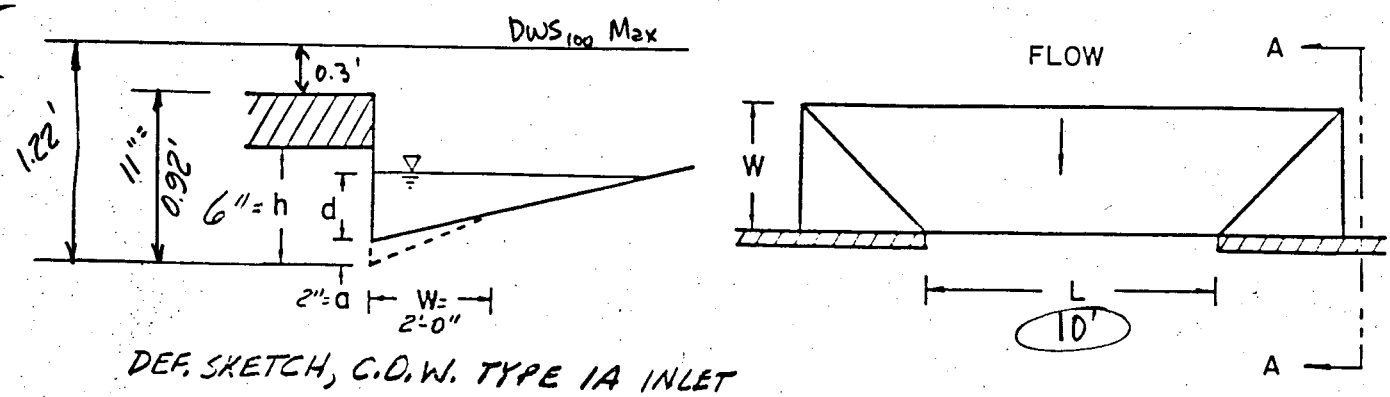


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR., 1984



DEF. SKETCH, C.O.W. TYPE 1A INLET

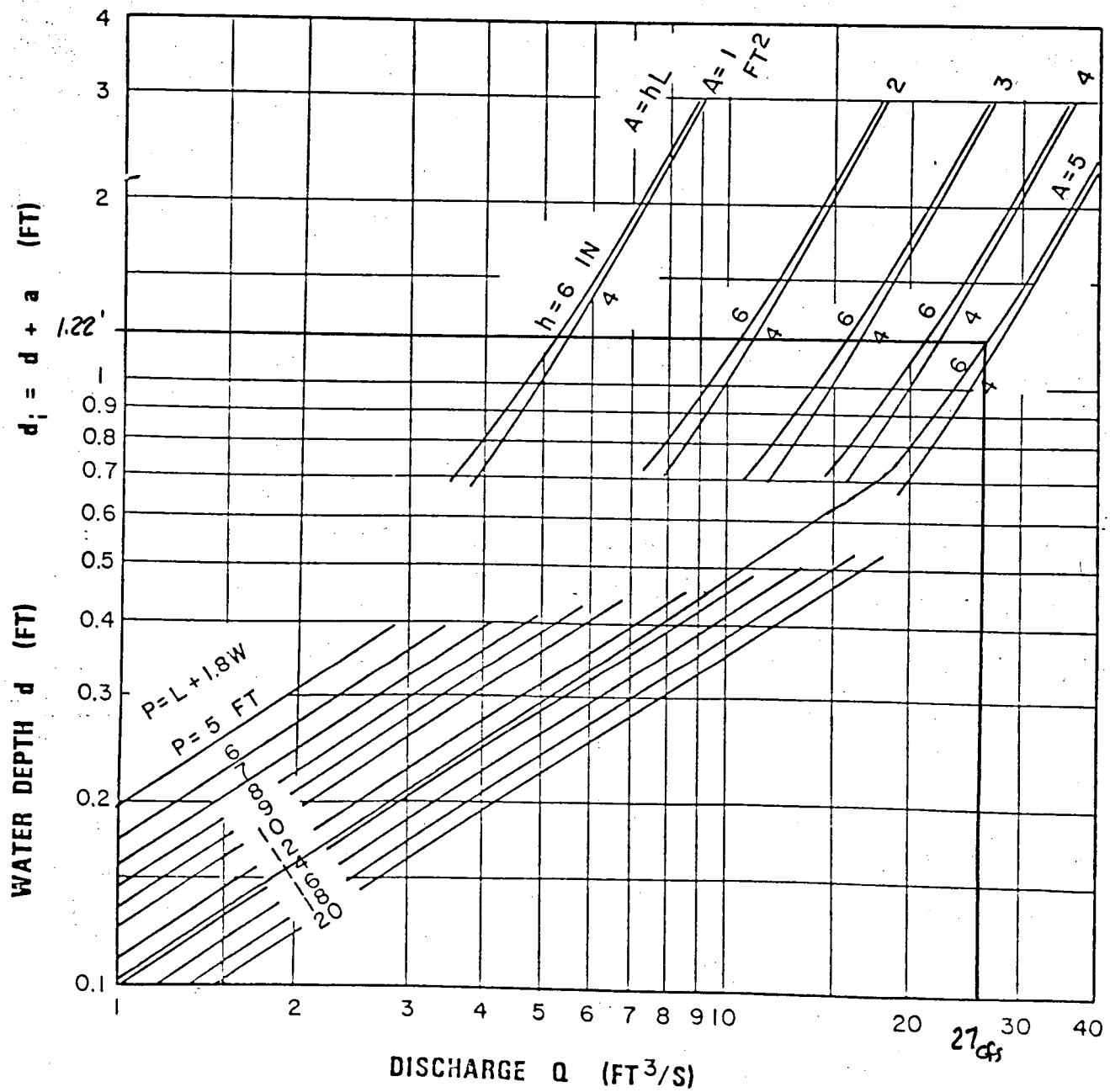


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR., 1984

Mere Ridge

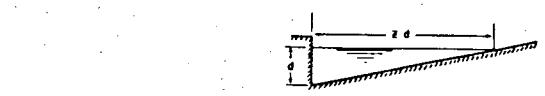
X-slope = 3/8"/Ft = 0.03125 1/1

1/X-slope = 1/0.03125 = 32

n = 0.016

Z/n = 32/0.016 = 2000

Chart 1



EQUATION: $Q = 0.56\left(\frac{z}{n}\right) s^{\frac{1}{2}} d^{\frac{8}{3}}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B. PROCEEDINGS 1948, PAGE 150, EQUATION (14)

EXAMPLE (SEE INSTRUCTION 1)

GIVEN: S = 0.03

z = 24, n = .02] z/n = 1200

Q = 20 CFS

FIND: d = 0.22 BY FOLLOWING DASHED LINES

RATIO z/n: 10000, 9000, 8000, 7000, 6000, 5000, 4000, 3000, 2000, 1000, 900, 800, 700, 600, 500, 400, 300, 200, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10

TURNING LINE

DISCHARGE (Q) IN CFS: 100, 70, 50, 30, 20, 10, 7, 5, 3, 2, 1, .7, .5, .3, .2, .1, .07, .05, .03, .02, .01

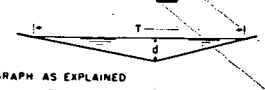
SLOPE OF CHANNEL (S) IN FT./FT.: .10, .08, .07, .06, .05, .04, .03, .02, .01, .008, .007, .006, .005, .004, .003, .002, .001

DEPTH AT CURB OR DEEPEST POINT (d) IN FT.: 2.0, 1.0, .80, .70, .60, .50, .40, .30, .20, .10, .08, .07, .06, .05, .04, .03, .02, .01

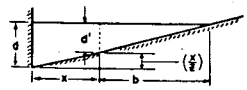
INSTRUCTIONS

1. CONNECT z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH POINT WHERE LINE CROSSES TURNING LINE. READ DEPTH AT CURB (d). Q CAN BE FOUND FROM d BY CONNECTING d WITH CROSSING OF TURNING LINE.

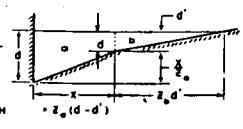
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH AS EXPLAINED IN INSTRUCTION 1 BUT WITH $z = \frac{T}{d}$.



3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH d FOR TOTAL DISCHARGE IN ENTIRE SECTION AS EXPLAINED IN 1. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION OF WIDTH b FOR DEPTH $d' = d - \left(\frac{x}{z}\right)$. THEN $Q_x = Q - Q_b$.



4. TO DETERMINE DISCHARGE (Q_T) IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE (Q_a) IN SECTION a AT ASSUMED DEPTH d BASED ON AN EXTENSION OF SLOPE RATIO z_a TO INTERSECT WATER SURFACE; OBTAIN Q_b FOR SLOPE RATIO z_b AND DEPTH d'; $d' = d - \frac{x}{z_a}$. THEN $Q_T = Q_a + Q_b$.



BUREAU OF PUBLIC ROADS

REV. JAN. 1968

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

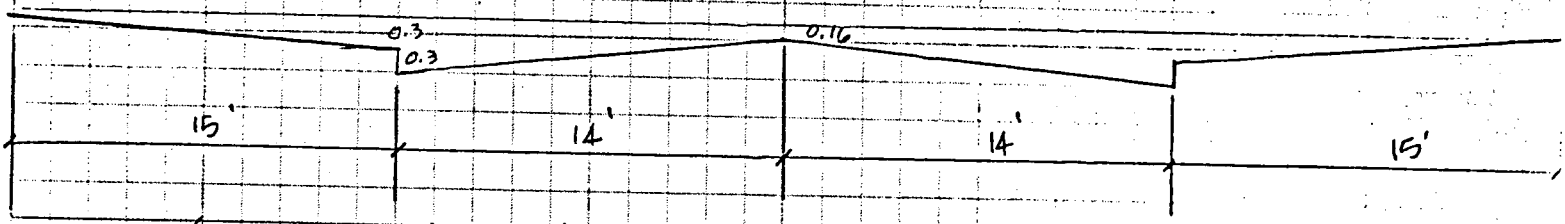
Date 7-31-88 Page ____ of ____

Project Mère Ridge

Item Drainage Plan

Determine capacities of Roll-curb streets w/ various walk grades for 100-year storm analysis (58' R-O-W)

0.3' Walk Grade



$$n = \frac{(2 \times 14.5 \times 0.03) + (2 \times 2.8 \times 0.013) + (2 \times 12 \times 0.016)}{58.6}$$

$$= \frac{(0.87) + (0.0728) + (0.384)}{58.6} = \frac{1.3268}{58.6} = 0.0226$$

$$A = (2 \times \tfrac{1}{2} \times 15 \times 0.3) + (28 \times 0.16) + (2 \times \tfrac{1}{2} \times 14 \times 0.44)$$

$$= 4.5 + 4.48 + 6.16$$

$$= 15.14 \text{ SF}$$

$$P = 58.6$$

$$R = A/P = 15.14/58.6 = 0.258362 \qquad R^{2/3} = 0.40565$$

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

$$= \frac{1.486}{0.0226} \times 15.14 \times 0.40565 \times S^{1/2}$$

$$Q = 403.82 \sqrt{S}$$

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

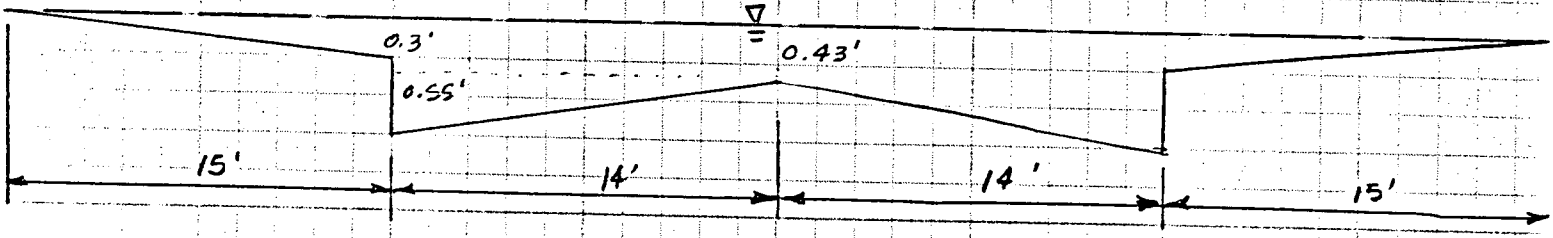
Date 7.31.88 Page ____ of ____

Project Mère Ridge

Item Drainage Plan

Determine Capacities of Standard Curb Streets w/ Various Walk Grades for 100-year storm analysis (58' R-O-W)

0.3' WALK GRADE



$$n = \frac{(2 \times 14.5 \times 0.03) + (2 \times 3.05 \times 0.013) + (2 \times 12 \times 0.016)}{59.1}$$

$$= \frac{(0.87) + (0.0793) + (0.384)}{59.1} = \frac{1.3333}{59.1} = 0.0226$$

$$A = (2 \times 1/2 \times 15 \times 0.3) + (28 \times 0.43) + (2 \times 1/2 \times 14 \times 0.42)$$

$$= (4.5) + (12.04) + (5.88)$$

$$= 22.42$$

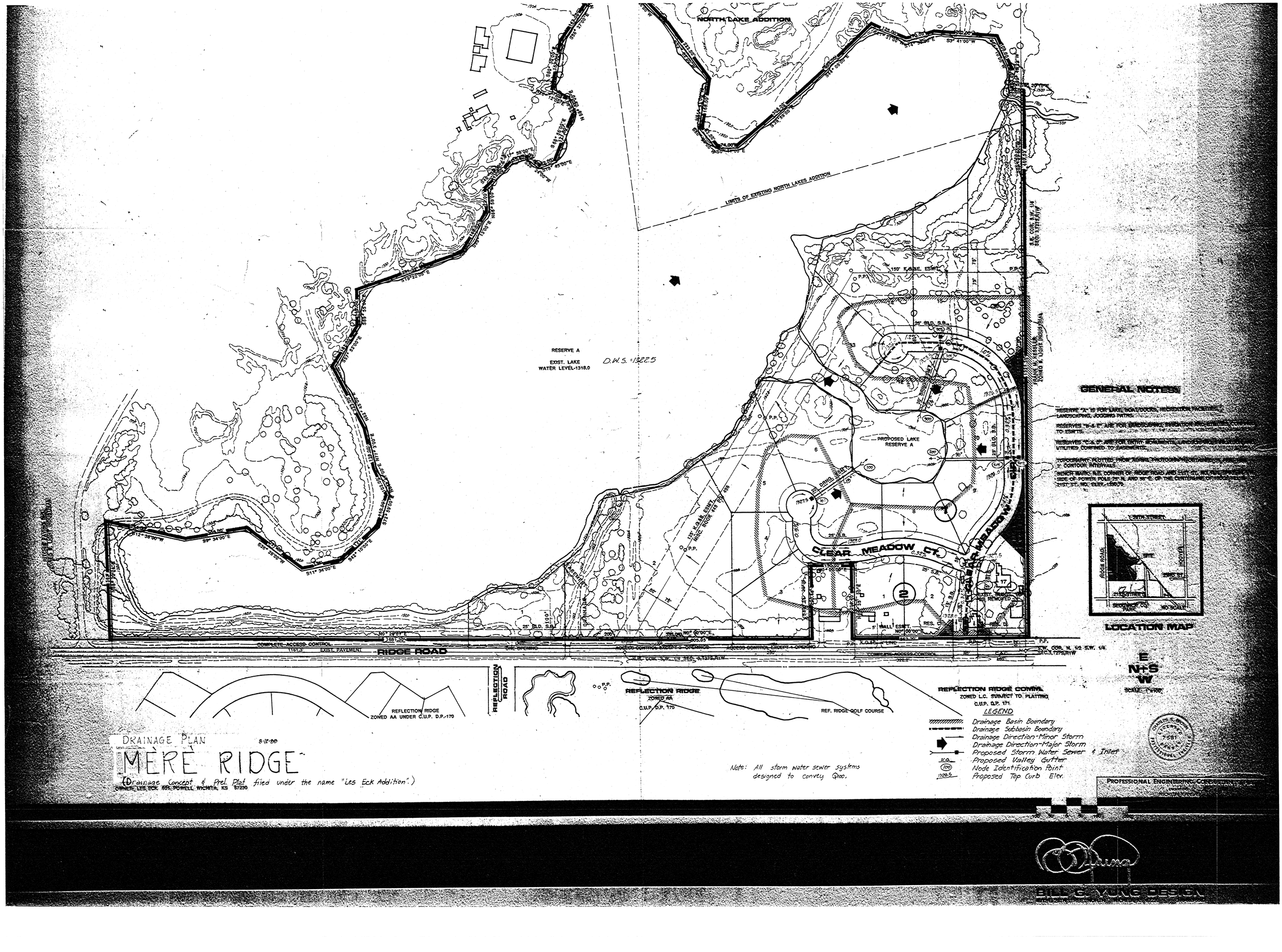
$$P = 59.1$$

$$R = A/P = 22.42/59.1 = 0.379357 \qquad R^{2/3} = 0.52404$$

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

$$Q = \frac{1.486}{0.0226} \times 22.42 \times 0.52404 \times S^{1/2}$$

$$Q = 772.5\sqrt{S}$$


NORTH LAKE ADDITION
LIMITS OF EXISTING NORTH LAKES ADDITION
RESERVE A
EXIST. LAKE
WATER LEVEL-1318.0
O.W.S. =1322.5
PROPOSED LAKE
RESERVE A
CLEAR MEADOW CT.
RIDGE ROAD
REFLECTION ROAD
REFLECTION RIDGE
ZONED AA
C.U.P. D.P. 170
REFLECTION RIDGE
ZONED AA UNDER C.U.P. D.P.-170
REF. RIDGE GOLF COURSE
REFLECTION RIDGE COMM.
ZONED L.C. SUBJECT TO PLATTING
C.U.P. D.P. 171
RIDGE TOWERS INC.
ZONED L.C. UNDER C.U.P. D.P.-170
FRANK M. KESSLER
ZONED R. LIGHT INDUSTRIAL
GENERAL NOTES:
RESERVE "A" IS FOR LAKE, BOAT DOCKS, RECREATION FACILITIES, LANDSCAPING, JOGGING PATHS.
RESERVES "B-1 & 2" ARE FOR LANDSCAPING, IRRIGATION AND UTILITIES CONFIRMED TO ESMTS.
RESERVES "C & D" ARE FOR ENTRY MONUMENTS, LANDSCAPING, IRRIGATION AND UTILITIES CONFIRMED TO EASEMENTS.
TOPOGRAPHY, PLOTTED FROM AERIAL PHOTOGRAPHS OBTAINED FROM PRECISE, 2' CONTOUR INTERVALS
BENCH MARK: N.E. CORNER OF RIDGE ROAD AND 21ST ST. NO. ALTA MARKER ON SIDE OF POWER POLE 25' N. AND 35' E. OF THE CENTERLINE OF RIDGE ROAD AND 21ST. ST. NO. ELEV.=1309.5
LOCATION MAP
21ST STREET
RIDGE ROAD
HOOVER
SITE
SEDGWICK CO. PARK
NO SCALE
E
N+S
W
SCALE: 1"=100'
LEGEND
Drainage Basin Boundary
Drainage Subbasin Boundary
Drainage Direction-Minor Storm
Drainage Direction-Major Storm
Proposed Storm Water Sewer & Inlet
Proposed Valley Gutter
Node Identification Point
Proposed Top Curb Elev.
Note: All storm water sewer systems designed to convey Q100.
DRAINAGE PLAN 8-12-88
MERE RIDGE
(Drainage Concept & Prel. Plat filed under the name "Les Eck Addition".)
OWNER: LES ECK 651 POWELL WICHITA, KS 67230
PROFESSIONAL ENGINEERING CONSULTANTS
WICHITA, KANSAS
BILL G. YUNG DESIGN