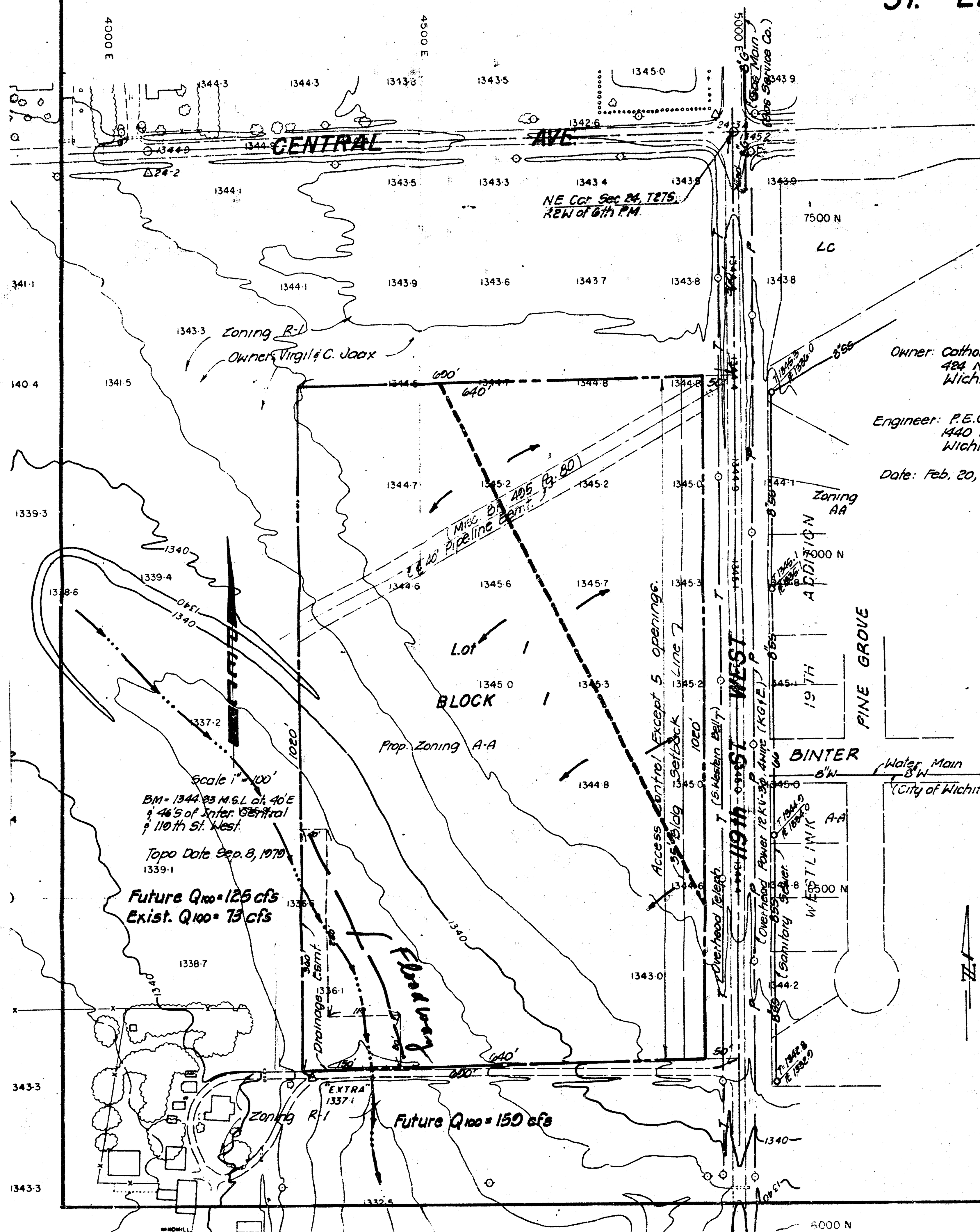
DRAINAGE PLAN

PRELIMINARY PLAT

ST. ELIZABETH ANN SETON ADD.

TO WICHITA, SEDGWICK COUNTY, KANSAS.

3-2-84

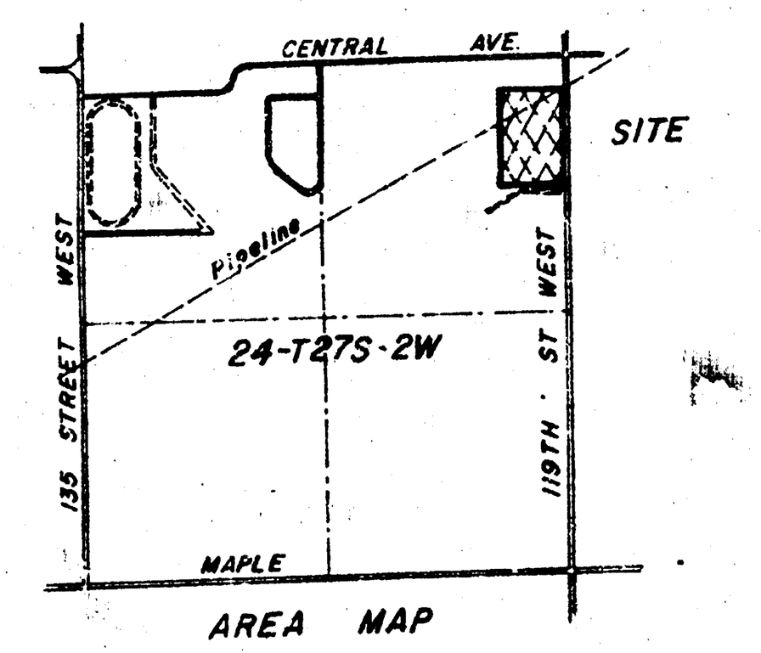


Owner: Catholic Diocese of Wichita
424 N Broadway
Wichita, Ks. 67202

Engineer: P.E.C.
1440 English
Wichita, Ks. 67211

Date: Feb. 20, 1984

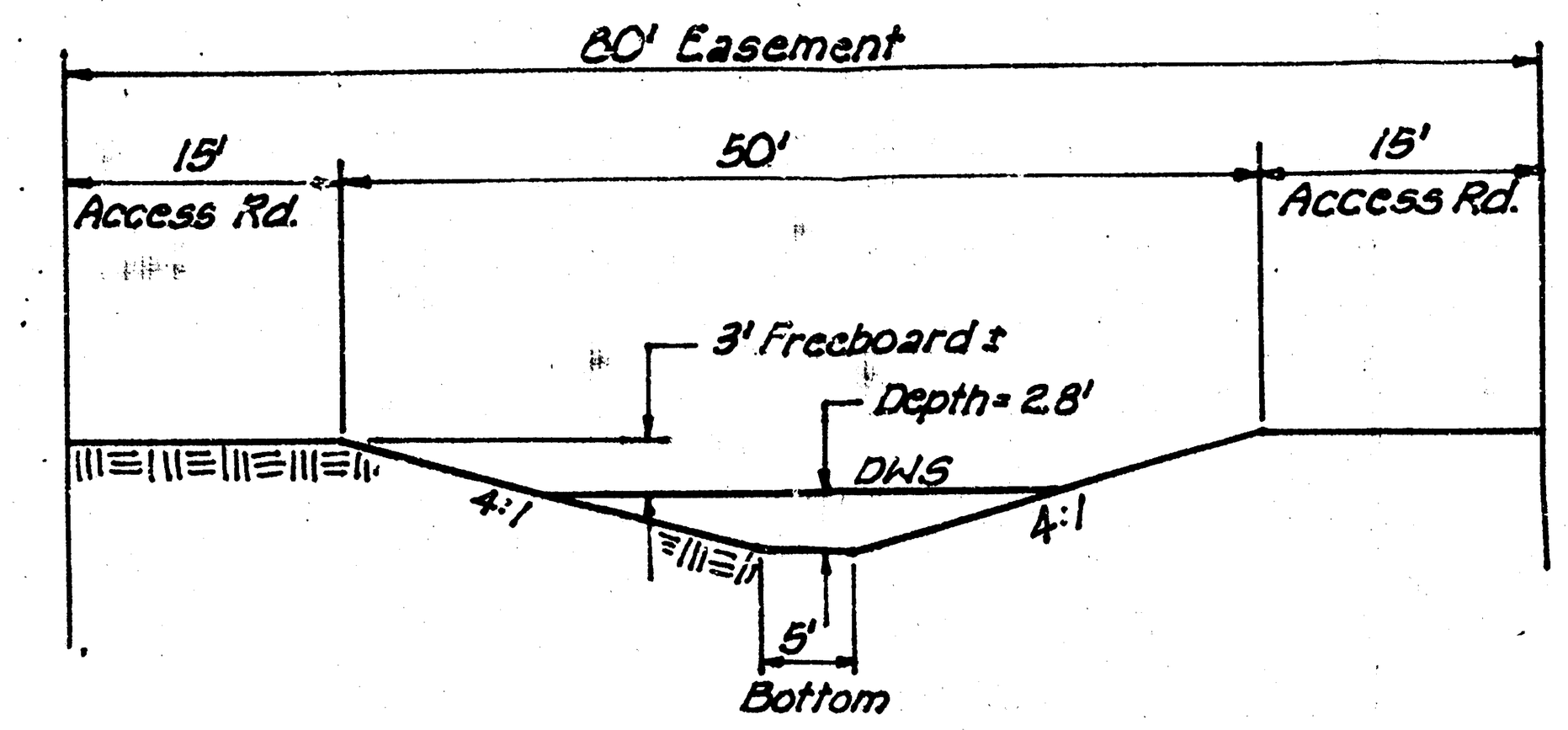
NOTE: The front of the lot shall be graded to drain to existing streets, ditches, gutters, and/or storm sewers via drives, flumes, private storm sewers and/or other approved drainage facilities. The rear of the lot shall be graded to the proposed drainage easement via drives, flumes, private storm sewers and/or other approved drainage facilities.



AREA MAP

LEGEND

DRAINAGE FLOW DIRECTION
DRAINAGE BASIN BOUNDARY
EXISTING DRAINAGE SWALE



TYPICAL SECTION

ST. ELIZABETH ANN SETON ADDITION
(Drainage)

MEMO

TO: City of Wichita
Engineering Department
7th Floor - City Hall
455 N. Main
Wichita, KS 67202

ATTN: Chris Breiterstein, P. E.

PROJECT NO. 36-83697-1-237
PROJECT: St. Elizabeth Ann Seton Addition
DATE: February 24, 1984

COPIES TO:
File
Louise Olivarez, MAPD
Jim Weber, SCDPW

FROM: Charles S. Brown, P. E.
REFERENCE: Drainage Plan

PLEASE ADVISE IMMEDIATELY OF ANY MISCONCEPTIONS OR OMISSIONS YOU BELIEVE TO BE CONTAINED HEREIN

Transmitted herewith is one copy of the Drainage Plan and supporting calculations for the proposed St. Elizabeth Ann Seton Addition to Wichita, Kansas.

The preliminary plat will be submitted on March 2, 1984, for hearing by the Sub-Division Committee on March 15, 1984.

If you have any questions or need any additional information, please advise.

FEB 1984
DESIGN DIVISION

Date February 16, 1984 Page 1 of 5
Project St. Elizabeth Addition
Item Drainage 36-83697-1-237

Existing D.A. (DA 36) → ← (DA 12) St Eliz. Internal Drainage

(I) DETERMINE Q of Existing D.A. (North & West)

Use Rational Formula $Q = CIA$

where $c = 0.35$
$A = 36$ Ac.

t_c = 500' @ 1% = 31 min
1500 @ 4 fps = 6 min
= 37

$I_{100} = 5.76$

$Q_{100} = 0.35 \times 5.76 \times 36 = 73$ cfs

$Q_2 = 0.35 \times 2.46 \times 36 = 31$ cfs

(II) DETERMINE Q of Proposed D.A. (North & West)

$Q = CIA$ $c = 0.5$
t_c = 300' @ 1% + 1600' @ 4 fps = 29 min
$I_{100} = 6.95$

$Q_{100} = 0.5 \times 6.95 \times 36 = 125$ cfs

$Q_2 = 0.5 \times 2.97 \times 36 = 53$ cfs

Date February 16, 1984 Page 2 of 5
Project St. Elizabeth Addition
Item Drainage

III DETERMINE RUNOFF FROM PROJECT SITE.

$Q = CIA$ where c = 1/3 @ 0.9 = .30
2/3 @ 0.3 = .20
= 0.50

t_c = 300' @ 1% + 800' @ 4 fps = 25 min
$I_{100} = 7.36$ A = 12 Ac.

$Q_{100} = 0.50 \times 7.36 \times 12 = 44$ cfs

$Q_2 = 0.50 \times 3.32 \times 12 = 20$ cfs

IV TOTAL Q SOUTH OF PROPERTY

A. Existing condition basin + proposed cond @ church

73 cfs + $\frac{5.76}{7.36}$ (44)
= 73 + 34 = 107 cfs

B. Proposed condition basin + proposed condition @ church

125 + $\frac{5.76}{7.36}$ (44)
= 125 + 34
= 159 cfs

Date Feb. 16, 1984 Page 3 of 5
Project St. Elizabeth's Addition
Item Drainage

(IV) DETERMINE CHANNEL GEOMETRICS FOR VARIOUS RUNOFFS.

Use Manning's Equation

$Q = \frac{1.486}{n} AR^{2/3} s^{1/2}$ where n = 0.035, s = 0.4% (10' drop / 2800')

$AR^{2/3} = \frac{Qn}{1.486(s^{1/2})} = Q\frac{0.035}{1.486(.0632)}$

$AR^{2/3} = 0.37267\,Q$

for Q = 73 cfs : $AR^{2/3}$ = 27.2
Q = 107 cfs : $AR^{2/3}$ = 39.9
Q = 125 cfs : $AR^{2/3}$ = 46.6
Q = 159 cfs : $AR^{2/3}$ = 59.3 ← Design Easement for Ultimate Condition

ALT. NO. 1 20' CHANNEL BOTTOM (4:1, d, b = 20')

d	A	P	R	$R^{2/3}$	$AR^{2/3}$
1.0	24.0	28.25	0.85	0.90	21.5
1.5	39.0	32.37	1.20	1.13	44.2
2.0	56.0	36.49	1.53	1.33	74.5

Date Feb 16, 1984 Page 4 of 5
Project St. Elizabeth
Item Drainage

ALT. #2 - 10' BOTTOM (4:1, d, b = 10)

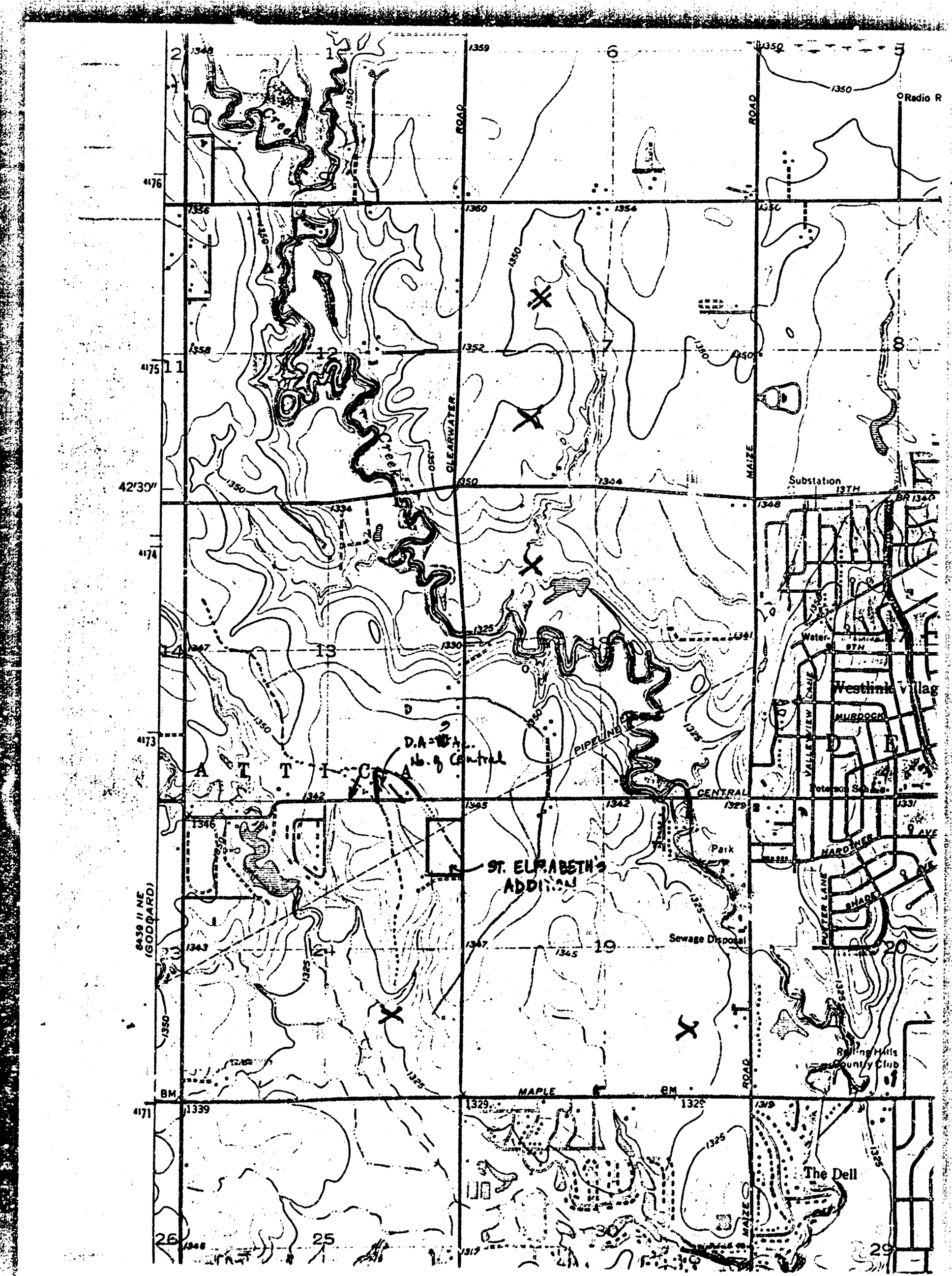
d	A	P	R	$R^{2/3}$	$AR^{2/3}$
1.0	14.0	18.25	0.77	0.838	11.7
1.5	24.0	22.37	1.07	1.048	25.2
2.0	36.0	26.49	1.36	1.227	44.2
2.5	50.0	30.62	1.63	1.387	69.3

ALT. #3 - 5' BOTTOM (27.4', 4:1, d = ?, b = 5')

d	A	P	R	$R^{2/3}$	$AR^{2/3}$
2.0	26.0	21.49	1.21	1.138	29.5
2.5	37.5	25.62	1.46	1.289	48.3
3.0	51.0	29.74	1.71	1.432	73.1
→ 2.8	45.4	28.09	1.62	1.377	62.5 ← USE

VELOCITY = $\frac{159}{45.4}$ = 3.5 fps

TOTAL ESMT = 27.4' + 3' × 4 × 2 (FREEBOARD) + 2 × 15 (ACCESS RD)



Page 1 of 3

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.

DURATION IN MINUTES	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
			RETURN PERIODS OF				
5	4.67	6.23	8.00	9.34	10.67	12.23	13.79
6	4.35	5.80	7.45	8.70	9.94	11.39	12.84
7	4.09	5.46	7.02	8.19	9.36	10.72	12.09
8	3.88	5.18	6.66	7.77	8.89	10.18	11.48
9	3.71	4.95	6.36	7.43	8.49	9.72	10.96
10	3.56	4.75	6.11	7.13	8.15	9.33	10.52
11	3.43	4.58	5.89	6.87	7.85	8.99	10.14
12	3.32	4.43	5.69	6.64	7.59	8.69	9.80
13	3.21	4.29	5.51	6.43	7.35	8.42	9.50
14	3.12	4.17	5.36	6.25	7.14	8.18	9.23
15	3.04	4.06	5.21	6.08	6.95	7.97	8.98
16	2.96	3.96	5.09	5.93	6.78	7.77	8.76
17	2.90	3.86	4.97	5.79	6.62	7.59	8.55
18	2.83	3.78	4.86	5.67	6.48	7.42	8.37
19	2.77	3.70	4.76	5.55	6.34	7.27	8.19
20	2.72	3.63	4.66	5.44	6.22	7.12	8.03
21	2.67	3.56	4.57	5.34	6.10	6.99	7.88
22	2.62	3.49	4.49	5.24	5.99	6.86	7.74
23	2.57	3.43	4.41	5.15	5.89	6.74	7.60
24	2.53	3.38	4.34	5.07	5.79	6.63	7.48
25	2.49	3.32	4.27	4.99	5.70	6.53	7.36
26	2.45	3.23	4.21	4.91	5.61	6.43	7.25
27	2.42	3.13	4.15	4.84	5.53	6.33	7.14
28	2.38	3.05	4.09	4.77	5.45	6.25	7.04
29	2.35	2.97	4.02	4.68	5.38	6.16	6.95
30	2.32	2.89	3.92	4.56	5.31	6.08	6.79
31	2.29	2.82	3.82	4.44	5.19	6.00	6.62
32	2.26	2.75	3.73	4.33	5.07	5.87	6.45
33	2.24	2.68	[illegible]	4.23	4.95	5.73	6.30
34	2.19	2.62	3.55	4.13	4.83	5.60	6.16
35	2.14	2.57	3.47	4.04	4.73	5.47	6.02
36	2.09	2.51	3.40	3.95	4.62	5.35	5.89
37	2.05	2.46	3.33	3.87	4.52	5.23	5.76
38	2.00	2.41	3.26	3.79	4.43	5.13	5.64
39	1.96	2.36	3.19	3.71	4.34	5.02	5.53
40	1.92	2.32	3.13	3.64	4.26	4.92	5.42
41	1.89	2.27	3.07	3.57	4.18	4.83	5.32

DURATION IN MINUTES	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
			RETURN PERIODS OF				
46	1.72	2.08	2.81	3.27	3.82	4.41	4.86
47	1.69	2.04	2.76	3.21	3.75	4.33	4.78
48	1.67	2.01	2.72	3.16	3.69	4.26	4.70
49	1.64	1.98	2.67	3.11	3.63	4.19	4.63
50	1.61	1.95	2.63	3.06	3.58	4.13	4.56
51	1.59	1.92	2.59	3.01	3.52	4.06	4.49
52	1.56	1.89	2.55	2.97	3.47	4.00	4.42
53	1.54	1.86	2.51	2.92	3.42	3.94	4.35
54	1.52	1.84	2.48	2.88	3.37	3.88	4.29
55	1.50	1.81	2.44	2.84	3.32	3.83	4.23
56	1.47	1.79	2.41	2.80	3.27	3.77	4.17
57	1.45	1.76	2.37	2.76	3.23	3.72	4.11
58	1.43	1.74	2.34	2.73	3.19	3.67	4.06
59	1.42	1.72	2.31	2.69	3.14	3.62	4.01
60	1.40	1.69	2.28	2.65	3.10	3.57	3.95
61	1.38	1.67	2.25	2.62	3.06	3.53	3.90
62	1.36	1.65	2.22	2.59	3.02	3.48	3.85
63	1.34	1.63	2.20	2.55	2.99	3.44	3.81
64	1.33	1.61	2.17	2.52	2.95	3.40	3.76
65	1.31	1.59	2.14	2.49	2.92	3.35	3.71
66	1.30	1.57	2.12	2.46	2.88	3.31	3.67
67	1.28	1.56	2.09	2.44	2.85	3.27	3.63
68	1.26	1.54	2.07	2.41	2.81	3.24	3.59
69	1.25	1.52	2.05	2.38	2.78	3.20	3.54
70	1.24	1.50	2.02	2.35	2.75	3.16	3.51
71	1.22	1.49	2.00	2.33	2.72	3.13	3.47
72	1.21	1.47	1.98	2.30	2.69	3.09	3.43
73	1.20	1.46	1.96	2.28	2.66	3.06	3.39
74	1.18	1.44	1.94	2.25	2.63	3.03	3.36
75	1.17	1.43	1.92	2.23	2.61	3.00	3.32
76	1.16	1.41	1.90	2.21	2.58	2.96	3.29
77	1.15	1.40	1.88	2.18	2.55	2.93	3.25
78	1.13	1.38	1.86	2.16	2.53	2.90	3.22
79	1.12	1.37	1.84	2.14	2.50	2.88	3.19
80	1.11	1.36	1.82	2.12	2.48	2.85	[illegible]
81	1.10	1.34	1.81	2.10	2.46	2.82	3.13
82	1.09	1.33	1.79	2.08	2.43	2.79	3.10
83	1.08	1.32	1.77	2.06	2.41	2.76	3.07
84	1.07	1.31	1.75	2.04	2.39	2.74	3.04
85	1.06	1.30	1.74	2.02	2.37	2.71	3.01
86	1.05	1.28	1.72	2.00	2.34	2.69	2.99
87	1.04	1.27	1.71	1.99	2.32	2.66	2.96
88	1.03	1.26	1.69	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	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
			RETURN PERIODS OF				
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	[illegible]
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	[illegible]	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
121	0.80	0.99	1.32	1.54	1.80	2.05	2.29
122	0.80	0.98	1.31	1.53	1.79	2.04	2.27
123	0.79	0.97	1.30	1.52	1.77	2.03	2.26
124	0.79	0.97	1.30	1.51	1.76	2.01	2.24
125	0.78	0.96	1.29	1.50	1.75	2.00	2.23
126	0.78	0.96	1.28	1.49	1.74	1.99	2.22
127	0.77	0.95	1.27	1.48	1.73	1.98	2.20
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129							
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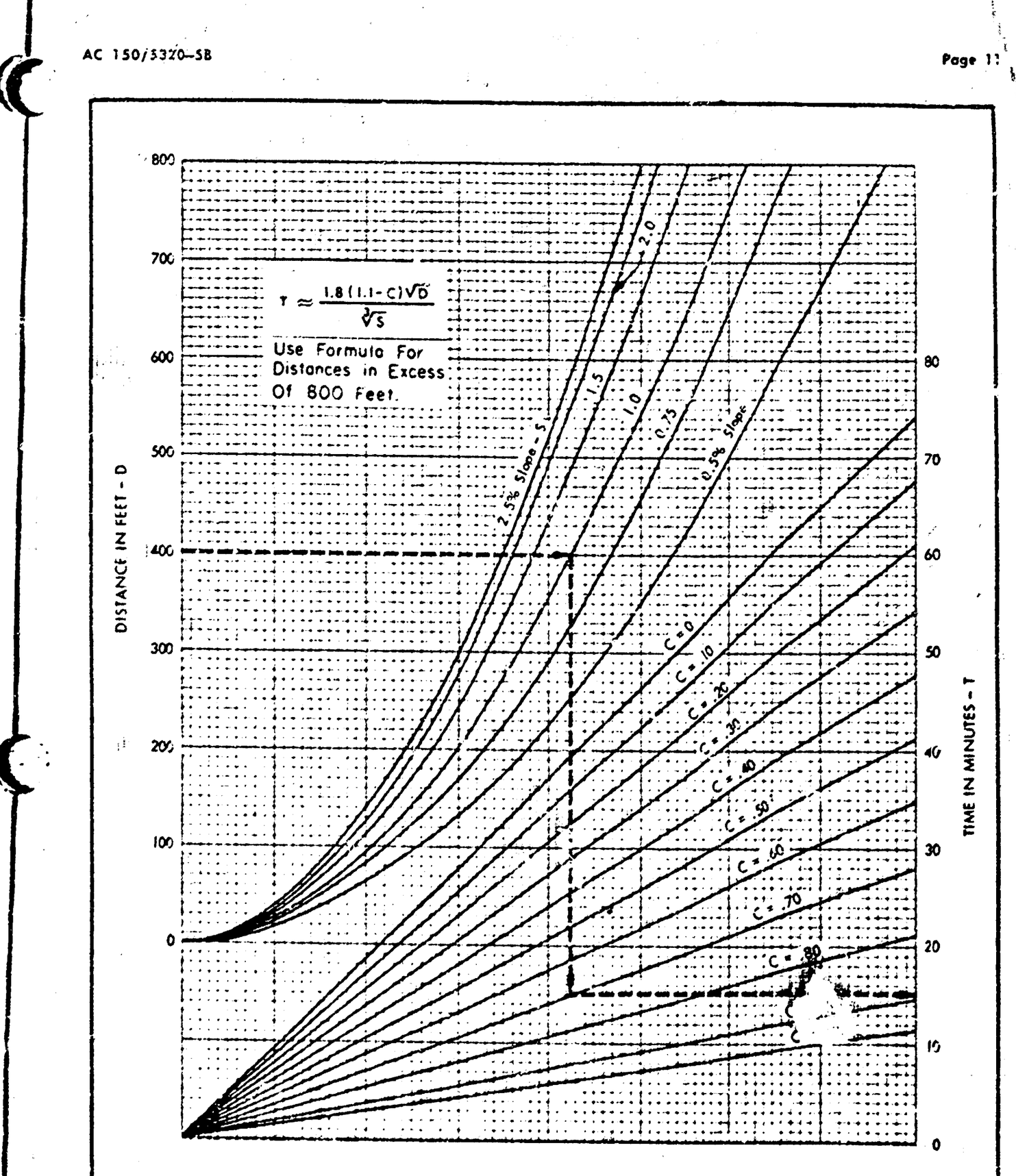
135							



ST. ELIZABETH ANN SETON ADDITION (Drainage)