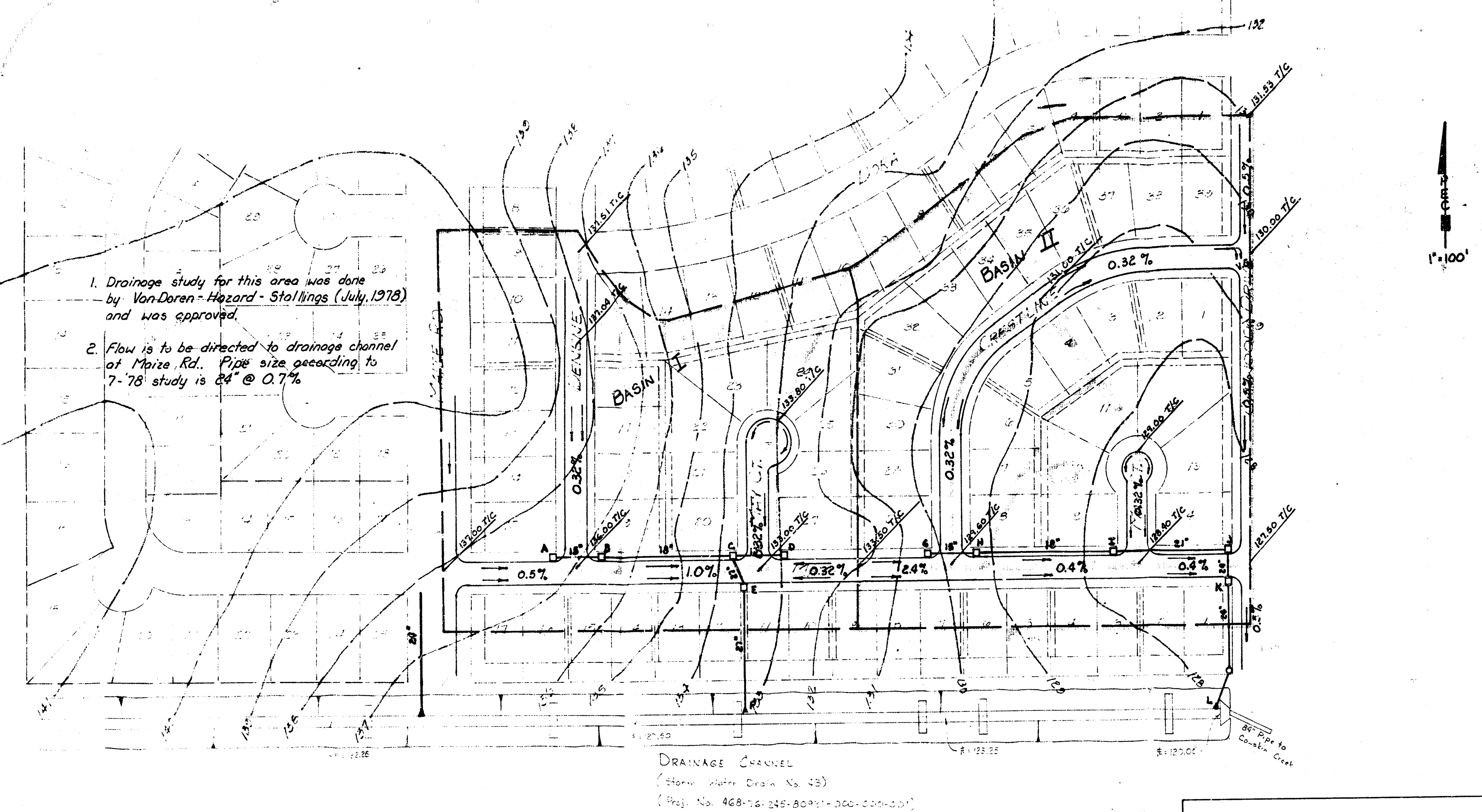


PRAIRIE PARK 2ND ADDITION
DRAINAGE STUDY
MAY 1984

PROFESSIONAL ENGINEERING CONSULTANTS

34-84261

HYDROLOGY DATA SHEET — PAGE 1 OF ___

PROFESSIONAL ENGINEERING CONSULTANTS

PROJECT: PRAIRIE PARK 2ND ADDITION PROJECT NO. 34-84261-1767

ITEM: DRAINAGE STUDY DATE: MAY 1984

RETURN PERIOD: 2 YR COMPUTATIONS BY: KLR REVISIONS BY: ___

SCHEMATIC DIAGRAM:

ANALYSIS OF BASIN I

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_0} (minutes) (6)	I_0 in./hr. (7)	Q_0 (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	ΣQ (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
A	0.5	2.6	1.0		16	3.96	5.1	16	3.96	5.1	5.1	15	0.9	4.1	80	1	17
B	0.5	1.2	1.0		15	4.06	2.4	17	3.86	2.3	7.4	18	0.7	4.2	230	1	18
BRANCH D	0.5	1.3	0.5		20	3.63	2.3	20	3.63	2.3	2.3	15	0.2	1.8	40	0	20
C	0.5	2.0	0.5		20	3.63	3.6	20	3.63	3.6	12.9	21	0.9	5.3	40	0	20
E	0.5	1.1	1.2		15	4.06	2.2	20	3.63	2.0	14.9	21	1.3	6.0	200	1	21

HYDROLOGY DATA SHEET — PAGE 2 OF ___

PROFESSIONAL ENGINEERING CONSULTANTS

PROJECT: PRAIRIE PARK 2ND ADDITION PROJECT NO. 34-84261-1767

ITEM: DRAINAGE STUDY DATE: MAY 1984

RETURN PERIOD: 100 YR COMPUTATIONS BY: KLR REVISIONS BY: ___

SCHEMATIC DIAGRAM:

ANALYSIS OF BASIN I

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_0} (minutes) (6)	I_0 in./hr. (7)	Q_0 (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	ΣQ (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
A	0.5	2.6	1.0		16	8.76	11.4										
B	0.5	1.2	1.0		15	8.98	5.3										
BRANCH D	0.5	1.3	0.5		20	8.03	5.2										
C	0.5	2.0	0.5		20	8.03	8.0										
E	0.5	1.1	1.2		15	8.98	4.9										
	0.5	8.2						20	8.03		32.9						

HYDROLOGY DATA SHEET — PAGE 3 OF ___

PROFESSIONAL ENGINEERING CONSULTANTS

PROJECT: PRAIRIE PARK 2ND ADDITION PROJECT NO. 34-84261-1767

ITEM: DRAINAGE STUDY DATE: MAY 1984

RETURN PERIOD: 2 YR COMPUTATIONS BY: KLR REVISIONS BY: ___

SCHEMATIC DIAGRAM:

ANALYSIS OF BASIN II.

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_0} (minutes) (6)	I_0 in./hr. (7)	Q_0 (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	ΣQ (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
G	0.5	2.5	1.4		17	3.86	4.8	17	3.86	4.8	4.8	15	0.8	3.7	90	1	18
H	0.5	1.2	1.0		15	4.06	2.4	18	3.78	2.3	7.1	18	0.7	4.0	240	1	19
I	0.5	1.1	1.0		15	4.06	2.2	19	3.70	2.0	9.1	21	0.5	3.6	200	1	20
J	0.5	4.7	1.2		19	3.70	8.7	20	3.63	8.5	17.6	24	0.9	5.5	50	0	20
K	0.5	1.5	1.5		15	3.86	2.9	20	3.63	2.7	20.3	27	0.6	5.0	200	1	21

HYDROLOGY DATA SHEET — PAGE 4 OF ___

PROFESSIONAL ENGINEERING CONSULTANTS

PROJECT: PRAIRIE PARK 2ND ADDITION PROJECT NO. 34-84261-1767

ITEM: DRAINAGE STUDY DATE: MAY 1984

RETURN PERIOD: 100 YR COMPUTATIONS BY: KLR REVISIONS BY: ___

SCHEMATIC DIAGRAM:

ANALYSIS OF BASIN II.

TRIBUTARY AREA								HYDROLOGY SUMMATION				CONDUIT DATA					
SUB-BASIN (1)	C (2)	AREA (acres) (3)	SLOPE (%) (4)	LENGTH (feet) (5)	T_{c_0} (minutes) (6)	I_0 in./hr. (7)	Q_0 (cfs) (8)	T_c (minutes) (9)	I in./hr. (10)	Q (cfs) (11)	ΣQ (cfs) (12)	PIPE (inches) (13)	SLOPE (%) (14)	VELOCITY (ft/sec.) (15)	LENGTH (feet) (16)	T_t (minutes) (17)	$T_c + T_t$ (minutes) (18)
G	0.5	2.5	1.4		17	8.55	10.7										
H	0.5	1.2	1.0		15	8.98	5.4										
I	0.5	1.1	1.0		15	8.98	4.9										
J	0.5	4.7	1.2		19	8.19	19.3										
K	0.5	1.5	1.5		15	8.98	6.7										

PROFESSIONAL ENGINEERING CONSULTANTS

Date: MAY 29, 1984 Page ___ of ___

Project: PRAIRIE PARK 2ND ADDITION

Item: DRAINAGE STUDY

CAPACITY OF CURB INLET

TWO YR STORM

INLET CAPACITY IN SUMP 2.0 cfs/ft OR 10 cfs

100 YR STORM

INLET CAPACITY IN SUMP 2.6 cfs/ft. OR 13. cfs

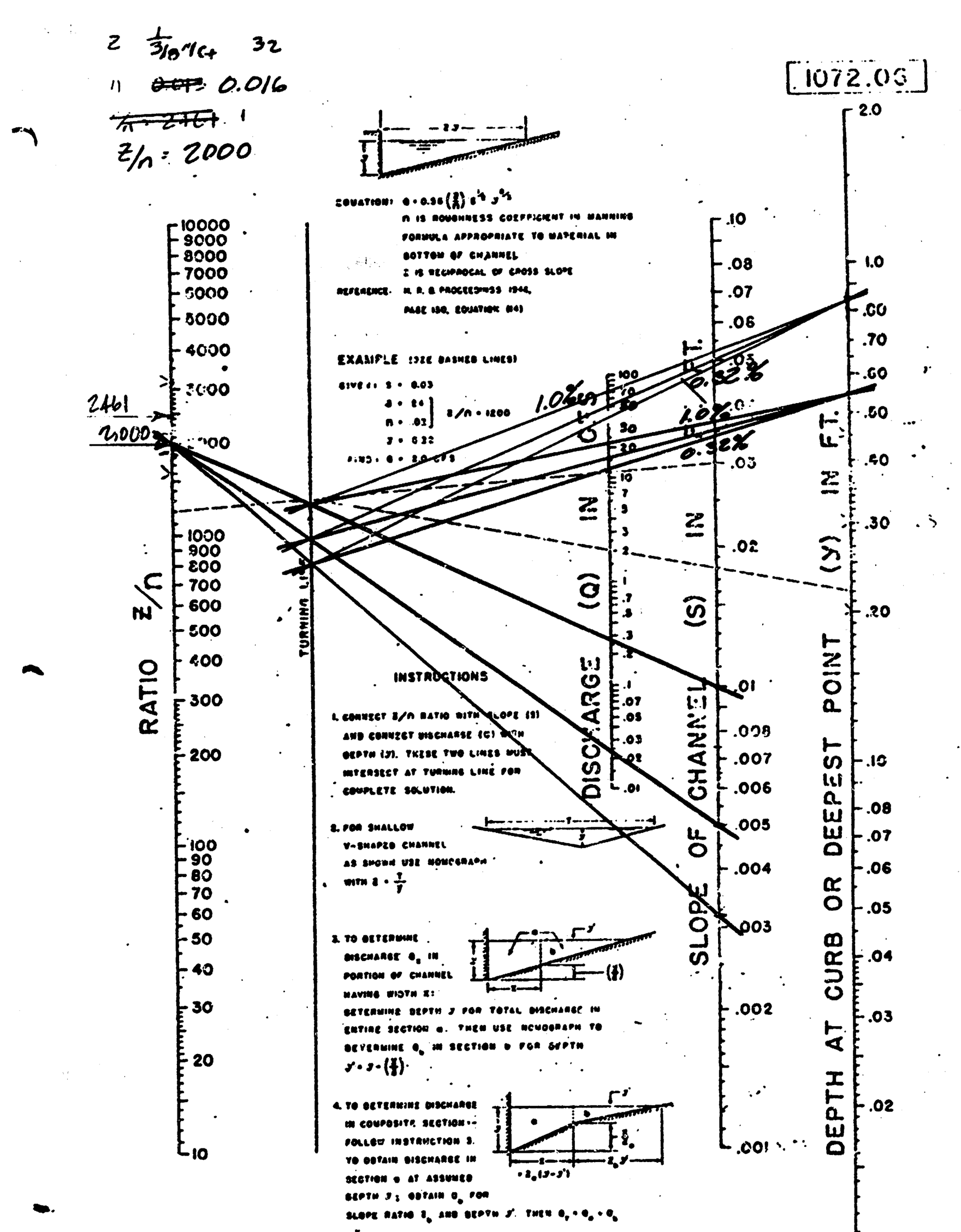
STREET FLOW PER CURB

TWO YR STORM

- 0.32% SLOPE → 12 cfs
- 0.5 % SLOPE → 15 cfs
- 1.0 % SLOPE → 22 cfs

100 YR STORM

- 0.32% SLOPE → 40 cfs
- 0.5 % SLOPE → 50 cfs
- 1.0 % SLOPE → 70 cfs



U. S. PUBLIC ROADS ADMINISTRATION DIVISION TWO WASHINGTON, D. C.

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

PROFESSIONAL ENGINEERING CONSULTANTS

Date: MAY 29, 1984 Page 1 of ___

Project: PRAIRIE PARK 2ND DRAINAGE STUDY

Item: BACK WATER ANALYSIS

1) MANNING'S EQUATION $Q = \frac{1.49}{N}(A)(R)^{2/3}(S)^{1/2}$

2) $N = 0.015$ — PIPE FULL

3) $\left(Q \cdot 0.00320 \cdot R^{-2} \cdot \left(\frac{R}{2}\right)^{-2/3}\right)^2 = S$

4) $0.0032 \cdot R^{-2} \cdot \left(\frac{R}{2}\right)^{-2/3} = X$

15" PIPE	R = 0.625	x = 0.01729
18" PIPE	R = 0.750	x = 0.01094
21" PIPE	R = 0.875	x = 0.00725
24" PIPE	R = 1.0	x = 0.00508
27" PIPE	R = 1.125	x = 0.00371
30" PIPE	R = 1.250	x = 0.0028
36" PIPE	R = 1.50	x = 0.00172

5 $(Q \cdot x)^2 = S$

BASIN I

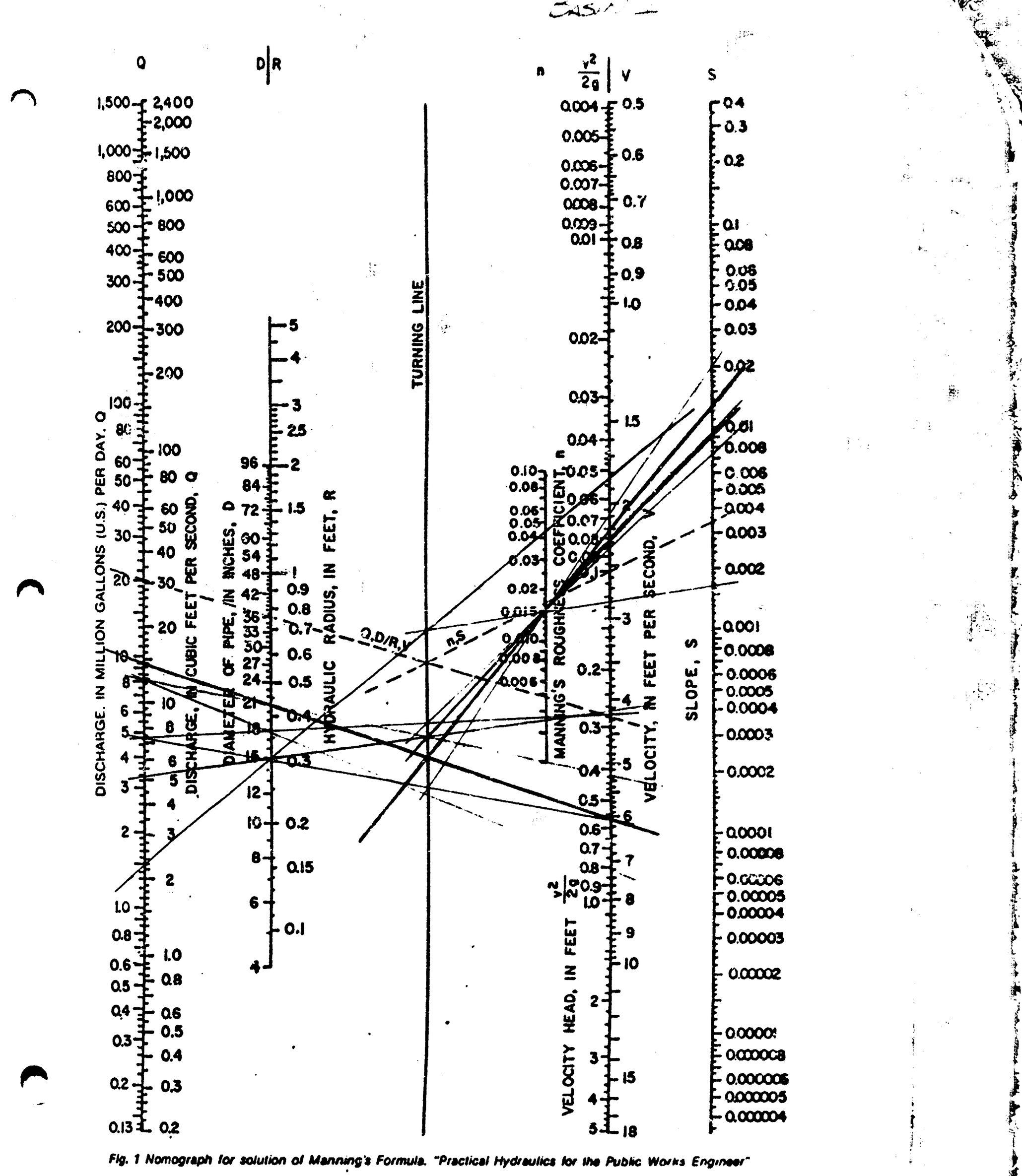


Fig. 1 Nomograph for solution of Manning's Formula. "Practical Hydraulics for the Public Works Engineer"

-11-

BASIN II

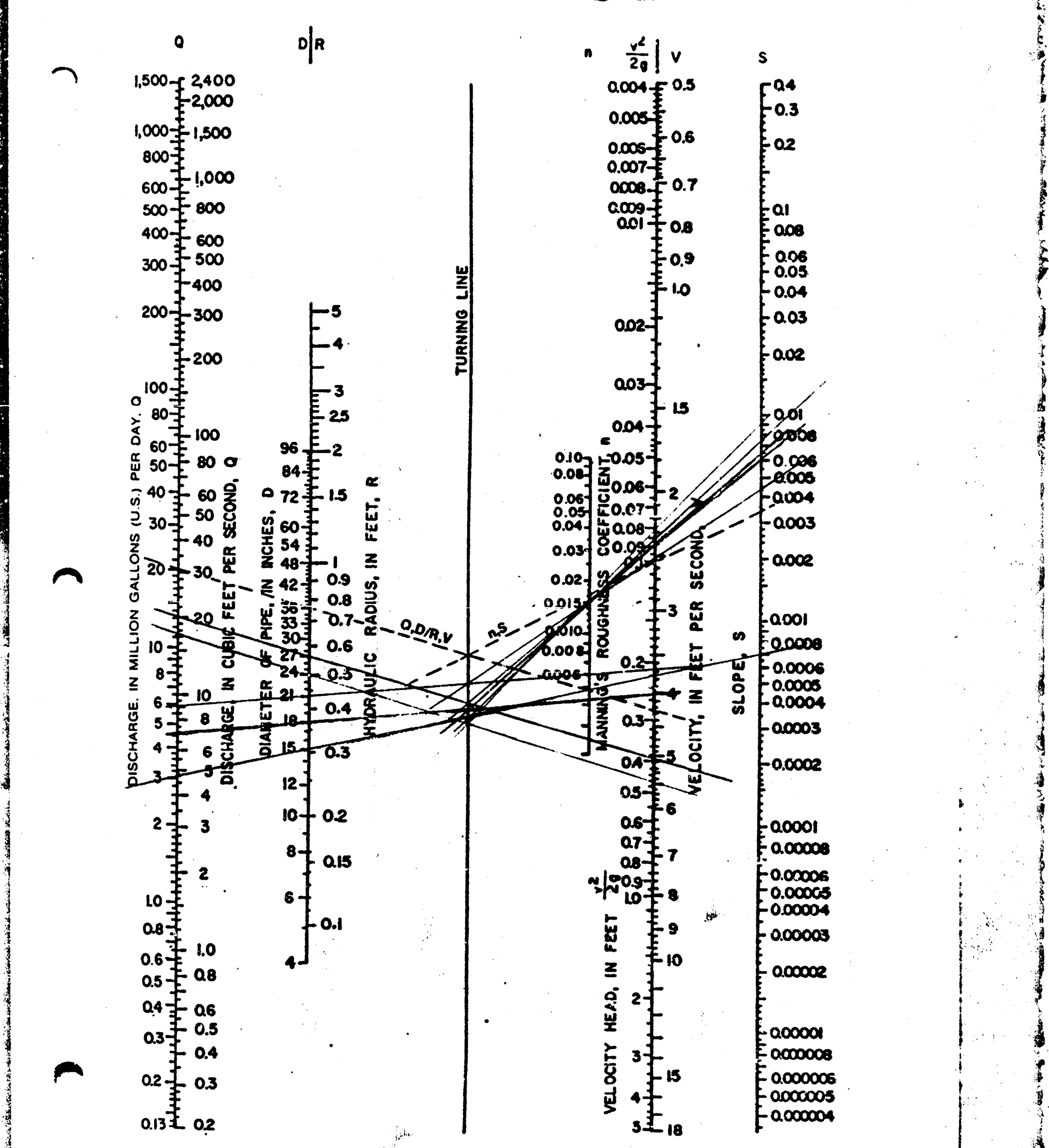
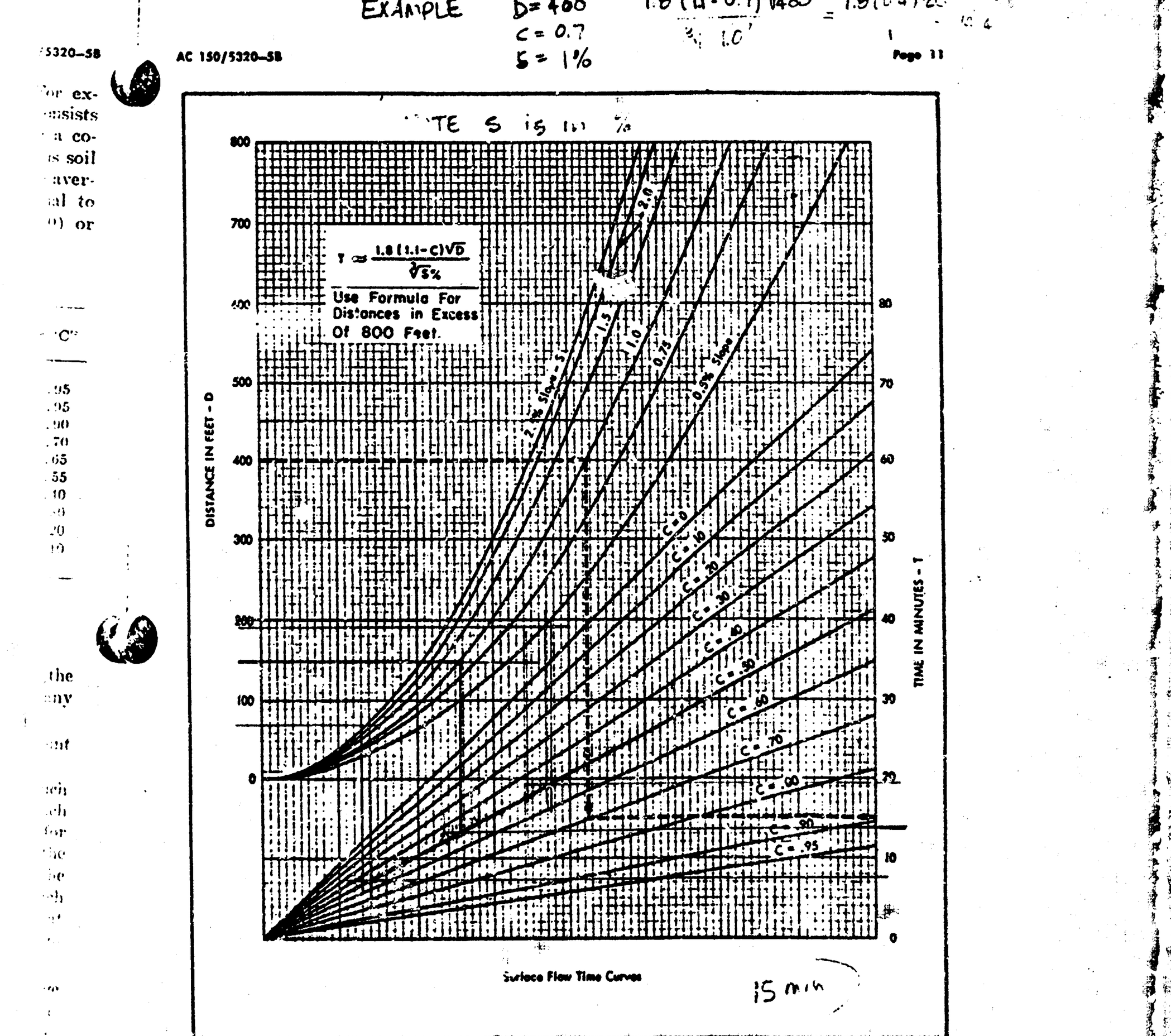


Fig. 1 Nomograph for solution of Manning's Formula. "Practical Hydraulics for the Public Works Engineer"

-11-

EXAMPLE D = 400, C = 0.7, S = 1%



Surface Flow Time Curves

Date May 29, 1984 Page 2 of ____
Project Prairie Park 2nd Drainage Study
Item Backwater Analysis

Basin No. I – Two Year Storm

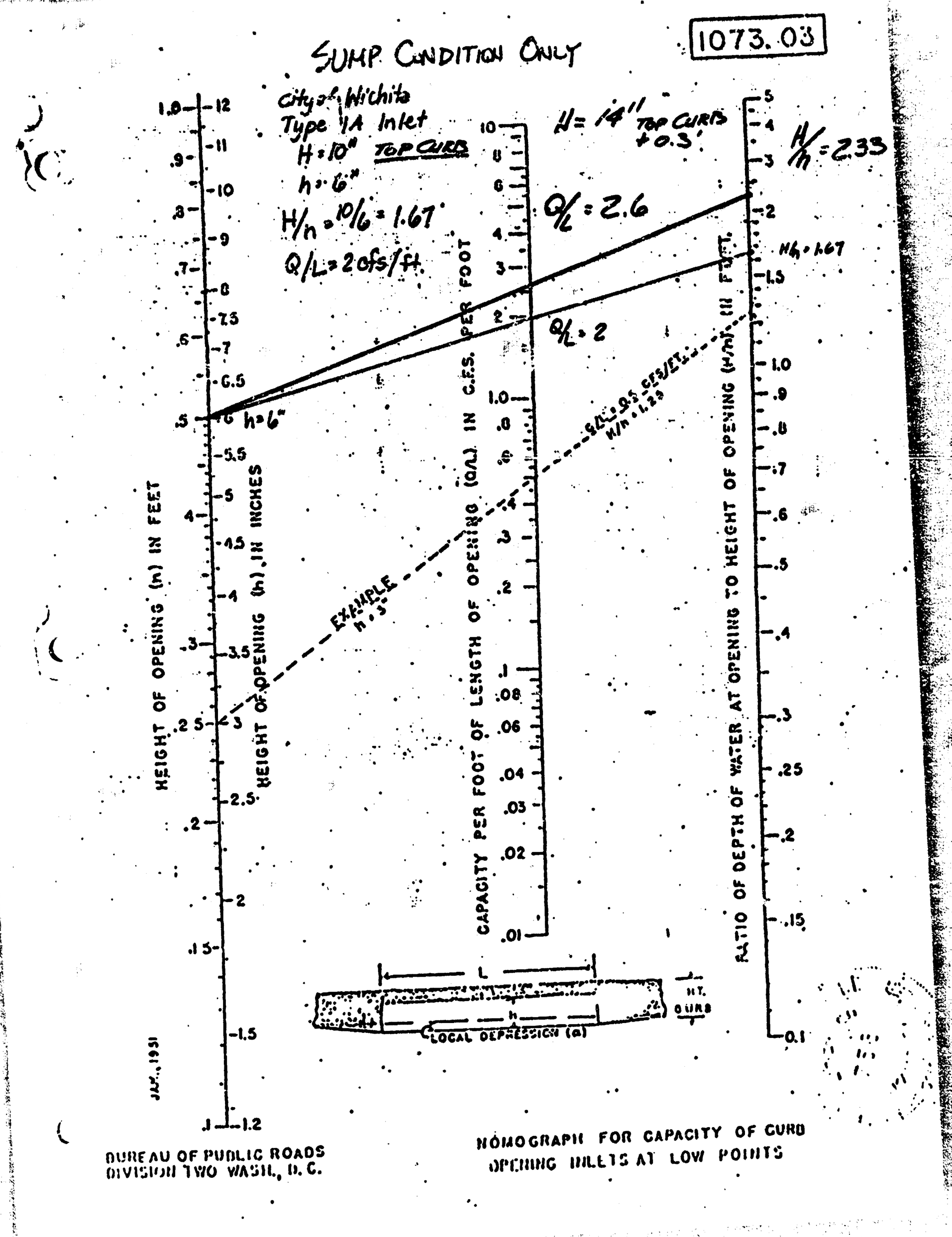
F-E → 14.5 cfs 21-inch ELEV = 130 Top Pipe
$(14.5 \cdot 0.00725)^2 = S$
S = 0.0110 L = 200 ft h = 2.20 ELEV = 132.20
0.8 Below Top Curb

E-C → 12.5 cfs 21-inch ELEV 132.2
$(12.5 \cdot 0.00725)^2 = S$
S = 0.00821 L = 45 ft h = 0.37 ELEV = 132.6
0.4 Below Top Curb

F-E → 14.5 cfs 24-inch ELEV = 130 Top Pipe
$(14.5 \cdot 0.00508)^2 = S$
S = 0.00543 L = 200 ft h = 1.09 ELEV = 131.1
1.9 Below Top Curb

E-C → 21-inch ELEV = 131.1
as above h = 0.37 ELEV 131.5
1.5 Below Top Curb

C-B → 7.4 cfs 18-inch ELEV = 131.5
$(7.4 \cdot 0.01094)^2 = S$
S = 0.00655 L = 230 ft h = 1.5 ELEV = 133.0
3.0 Below Top Curb



Date May 29, 1984 Page 3 of ____
Project Prairie Park 2nd Drainage Study
Item Backwater Analysis

B-A → 5.1 cfs 15-inch ELEV = 133.0
$(5.1 \cdot 0.01779)^2 = S$
S = 0.00823 L = 80 ft h = 0.65 ELEV = 133.7
2.3 ft Below Top Curb

C-D → 2.3 cfs 15-inch ELEV = 131.5
$(2.3 \cdot 0.01779)^2 = S$
S = 0.00167 L = 45 ft h = 0.08 ELEV = 131.6
1.4 ft Below Top Curb

Basin I – 100 yr Storm

F-E → 32.9 cfs 27-inch ELEV = 130.0 Top of Pipe
$(32.9 \cdot 0.00371)^2 = S$
S = 0.01490 L = 200 ft h = 3.0 ELEV = 133.0
0 Below Top of Curb

Hydraulic = Street slope of 1%
18-inch Pipe

$$Q = \frac{1.49}{0.013} \pi (0.75)^2 \left(\frac{0.75}{2}\right)^{2/3} (0.01)^{1/2}$$

Q = 9.1 cfs in Pipe

Date May 29, 1984 Page 4 of ____
Project Prairie Park 2nd Addition
Item Backwater Analysis

Intersection May Ct & May 100 yr Storm

ELEV = Top + 0.3
□ Rate = 13.5 cfs
9.1 in Pipe
6.8 → ⑥
5.2
11.3 in Pipe 21-inch Pipe
16.1 in Pipe 24-inch Pipe
4.4 → ⑦ ← 22.0 in Pipe 27-inch Pipe
32.9 in Pipe

27-inch btwn inlets ⑥ & ⑦
22.0 cfs in Pipe
− 9.1 cfs Pipe up stream
12.9 cfs for inlets OK

Total Q to Inlet ⑥ & Inlet ⑦ = 19.4 cfs
Bypass to Inlet ⑦ 6.5 cfs
Q to Inlet ⑦ 4.4 cfs
10.9 cfs for Inlet OK

Date May 29, 1984 Page 5 of ____
Project Prairie Park 2nd Drainage Study
Item Backwater Analysis

Basin II – Two Year Storm

L-K → 20.3 cfs 27-inch ELEV = 123.3 Top of Pipe
$(20.3 \cdot 0.00371)^2 = S$
S = 0.00567 L = 200 ft h = 1.1 ELEV = 124.4
3.1' Below Top of Curb

K-J → 17.6 cfs 24-inch ELEV = 124.5
$(17.6 \cdot 0.00508)^2 = S$
S = 0.00799 L = 50 ft h = 0.40 ELEV = 124.9
2.6 Below Top of Curb — 1.6 Below Top of Curb

J-I → 9.1 cfs 21-inch ELEV = 124.9
$(9.1 \cdot 0.00725)^2 = S$
S = 0.00435 L = 200 ft h = 0.87 ELEV = 125.8
2.6 Below Top of Curb — 1.6 Below Top [illegible]

I-H → 7.1 cfs 18-inch ELEV = 125.8
$(7.1 \cdot 0.01094)^2 = S$
S = 0.00603 L = 240 h = 1.45 ELEV = 127.3
2.3 Below Top of Curb — 1.3 Below Top of Curb

Date May 29, 1984 Page 6 of ____
Project Prairie Park 2nd Drainage Study
Item Backwater Analysis

H-G → 4.8 cfs 15-inch ELEV = 127.3
$(4.8 \cdot 0.01779)^2 = S$
S = 0.00729 L = 90 h = 0.65 ELEV = 128.0
1.6 Below Top of Curb — 0.6 Below Top of Curb

L-K → 20.3 cfs 24-inch ELEV = 123.3 Top of Pipe
$(20.3 \cdot 0.00508)^2 = S$
S = 0.01063 L = 200 h = 2.13 ELEV = 125.4
* 2.1 Below Top of Curb

Basin II – 100 yr Storm

I–H Hydraulic slope = Street slope = 0.4%
18-inch Pipe
Q = 5.8 cfs

16.1 — Crestline — 5.4
G — H 5.8 cfs in Pipe
May 10.3 cfs Bypass

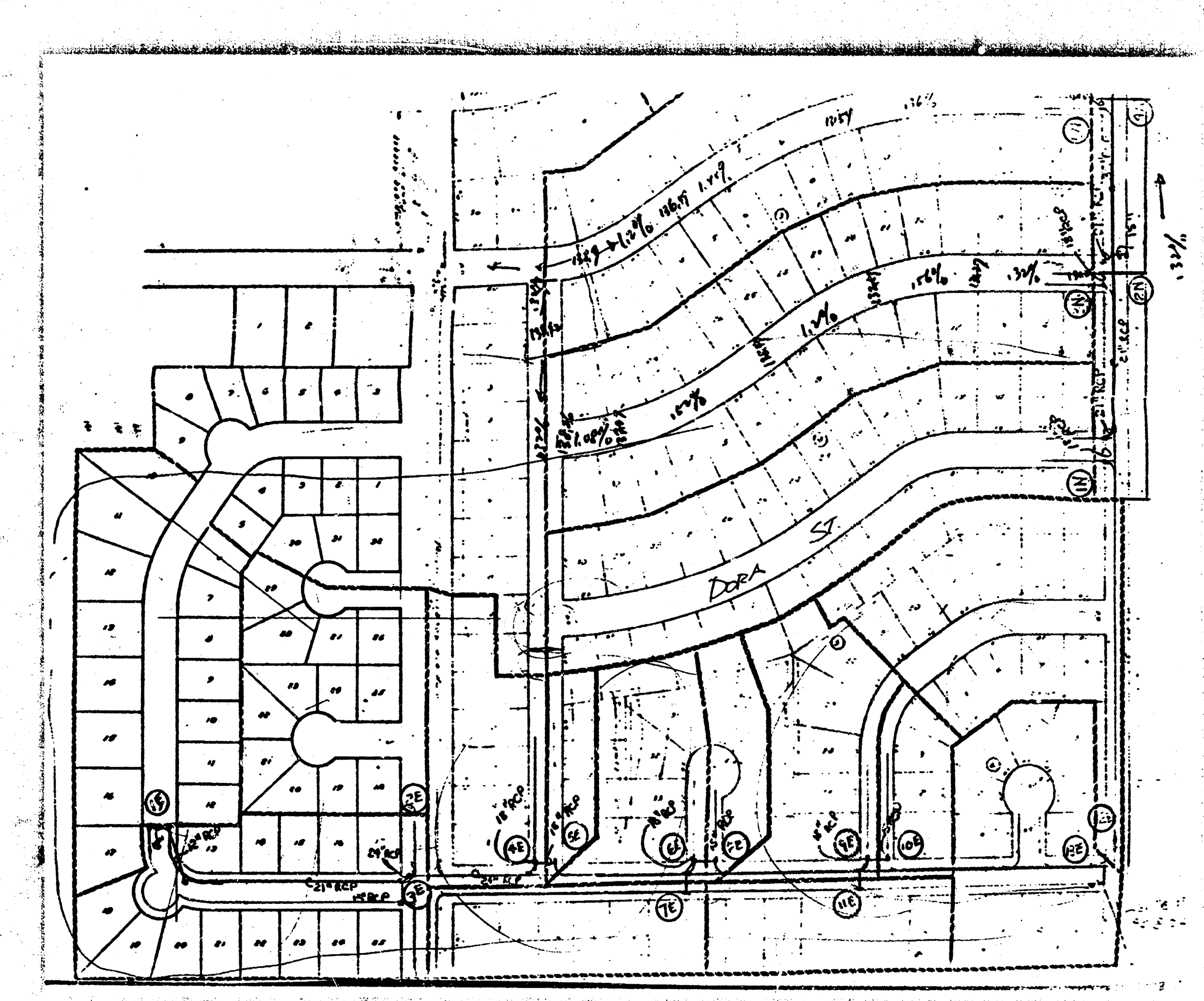
Date May 29, 1984 Page 7 of ____
Project Prairie Park 2nd Drainage Study
Item Backwater Analysis

J–I Hydraulic slope = Street slope = 0.4%
21-inch Pipe
Q = 8.72 cfs

May Ct
5.8 cfs in Pipe — I
10.3 cfs
8.72 cfs in Pipe
11.8 cfs Bypass
May

K–J Hydraulic slope = 0.3 + Curb @ Inlet ⑩ to Top Outfall Pipe
127.8 Inlet ⑩ 123.8 Top of Pipe h = 4.0
L = 250 ft S = 0.0160
Q = 24.9 cfs

8.7 in Pipe — J — 19.3
11.8
C.O. — K
20.9 cfs Bypass
Carrwood



Prairie Park 2nd Addition. KHS / KH Bergkamp / 7-78 686-7303

1/3

	Area (acres)	Area Accum. (acres)	C	T_c (min)	I_2 (in/hr)	I_{10}	I_{100}	Q_2 (cfs)	Q_{10}	Q_{100}	V (ft/sec)	Comments
1N	4.2		.55	20	2.8	4.3	6.2	10.3 ③	15.8	22.8		
2N	.9		.55	15	3.3	4.8	6.8	.8 ①	2.4	3.4		21" @ 0.4% [illegible]
3N	8.2	7.6	"	21	2.8	4.3	6.7	11.7	18.0	25.5		
				20	2.8	4.3	6.2	12.6 ③	19.4	28.0		
4N	.7	15.8	"	21	2.8	4.3	6.1	24.3	37.4	53.0		
			"	15	3.3	4.8	6.8	1.3 ①	1.8	2.6		36" @ 0.4% [illegible]
5N	8.2	16.5	"	22	2.7	4.2	6.0	24.5	38.1	54.4		
			"	20	2.8	4.3	6.2	12.6 ③	19.4	28.0		
6N	.7	24.7	"	23	2.6	4.1	5.9	55.3	55.7	80.2		
			"	15	3.3	4.8	6.8	1.3 ①	1.8	2.6		[illegible]
7N	5.9	25.4	"	24	2.6	4.0	5.8	34.9	55.9	81.0		
		31.3	"	26	2.8	4.3	6.2	9.1 ③	14.0	20.1		
			"	24	2.5	4.0	5.8	42.0	66.9	99.8		36" @ 0.5% 51.53
1S	5.0		.55	20	2.8	4.3	6.1	3.7 ①	11.8	16.8		
2S	4.1		"	15	3.3	4.8	6.8	2.4 ①	5.5	15.3		21" @ 0.3% [illegible]
3S	3.5	12.6	.56	15	"	"	"	.64 ①	9.2	13.1		
4S			"	23	2.6	4.1	5.9	18.0	28.4	40.9		24" @ 0.7% [illegible]
5S	1.6		.55	15	3.3	4.8	6.8	2.9 ①	4.2	6.0		
6S	.8	15.0	.55	15	"	"	"	1.4 ①	2.1	3.0		
7S	1.5		.55	24	2.5	4.0	5.8	20.6	33.	47.8		
8S	2.1		"	15	3.3	4.8	6.8	2.7 ①	4.0	5.6		30" @ 0.3% [illegible]
	1.0	19.6	"	"	"	"	"	2.8 ①	5.5	2.9		
9S			.55	25	2.5	4.0	5.7	1.8 ①	2.6	3.7		
10S	2.6							27.0	43.1	61.4		30" @ 0.5% 31.4 cfs
11S	1.1		.55	15	3.3	4.8	6.8	4.7 ①	[illegible]	9.7		
	1.3		"	"	"	"	"	2.0	2.9	4.1		
12S		24.6	.55	26	2.5	3.9	5.6	2.4 ①	3.4	4.9		
13S	4.4		.55	20	2.8	4.3	6.1	33.8	52.8	75.8		30" @ 0.7% [illegible]
	2.9		.55	15	3.3	4.8	6.8	6.8 ①	10.4	14.8		
		31.9	.55	27	2.4	3.8	5.5	5.3	7.7	10.8		
								47.1	66.7	96.5		[illegible] 42" @ 2%

MEMO

TO: City of Wichita, Department of Engineering, 455 N. Main - 7th Floor, Wichita, KS 67202	PROJECT NO. 34-84261-1767
	PROJECT: Prairie Park 2nd Drainage Study
ATTN: Mr. Chris Breitenstein, P.E.	DATE: May 30, 1984

COPIES TO:

FROM: Kevin Rood, Design Engineer
REFERENCE:

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

Transmitted herewith, for your review and approval, are the Drainage Plan and Drainage Calculations for Phase II and Phase III developments of Prairie Park 2nd Addition. Basin I in the calculations corresponds to Phase II development and Basin II in the calculations corresponds to Phase III development.

If you have any questions, please call.

cn

Enc. 2

Revised Drainage Plan drawings
Previous Plans
[initials]
6/13/84