

DRAINAGE PLAN

FOR

AUDUBON ESTATES

8-21-87

MORLEY & ASSOCIATES

DRAINAGE SUMMARY

PREDEVELOPED RUNOFF = 48 CFS

POST DEVELOPED RUNOFF = 124.88 CFS

PREDEVELOPED RUNOFF - 25 YR STORM

$$AREA = 50 \text{ ACRES}$$

$$C = 0.40$$

$$i = 2.4$$

$$T_c = 1 \text{ hr}$$

$$Q = CIA = 0.40(2.4)(50) = 48 \text{ CFS}$$

POST DEVELOPED RUNOFF - 25 YR STORM

AUDUBON ESTATES

$$AREA = 25 \text{ ACRES}$$

$$Q = 25.8 \text{ CFS}$$

$$8.6 \text{ CFS}$$

$$2.84 \text{ CFS}$$

$$1.46 \text{ CFS}$$

$$1.58 \text{ CFS}$$

$$1.40 \text{ CFS}$$

$$41.68 \text{ CFS}$$

AUDUBON ESTATES SOUTH

$$AREA = 25 \text{ ACRES}$$

$$Q = 3.4 \text{ CFS}$$

$$5.3 \text{ "}$$

$$5.9 \text{ "}$$

$$15.4 \text{ "}$$

$$4.85 \text{ "}$$

$$25.0 \text{ "}$$

$$5.68 \text{ "}$$

$$17.7 \text{ "}$$

$$83.2 \text{ CFS}$$

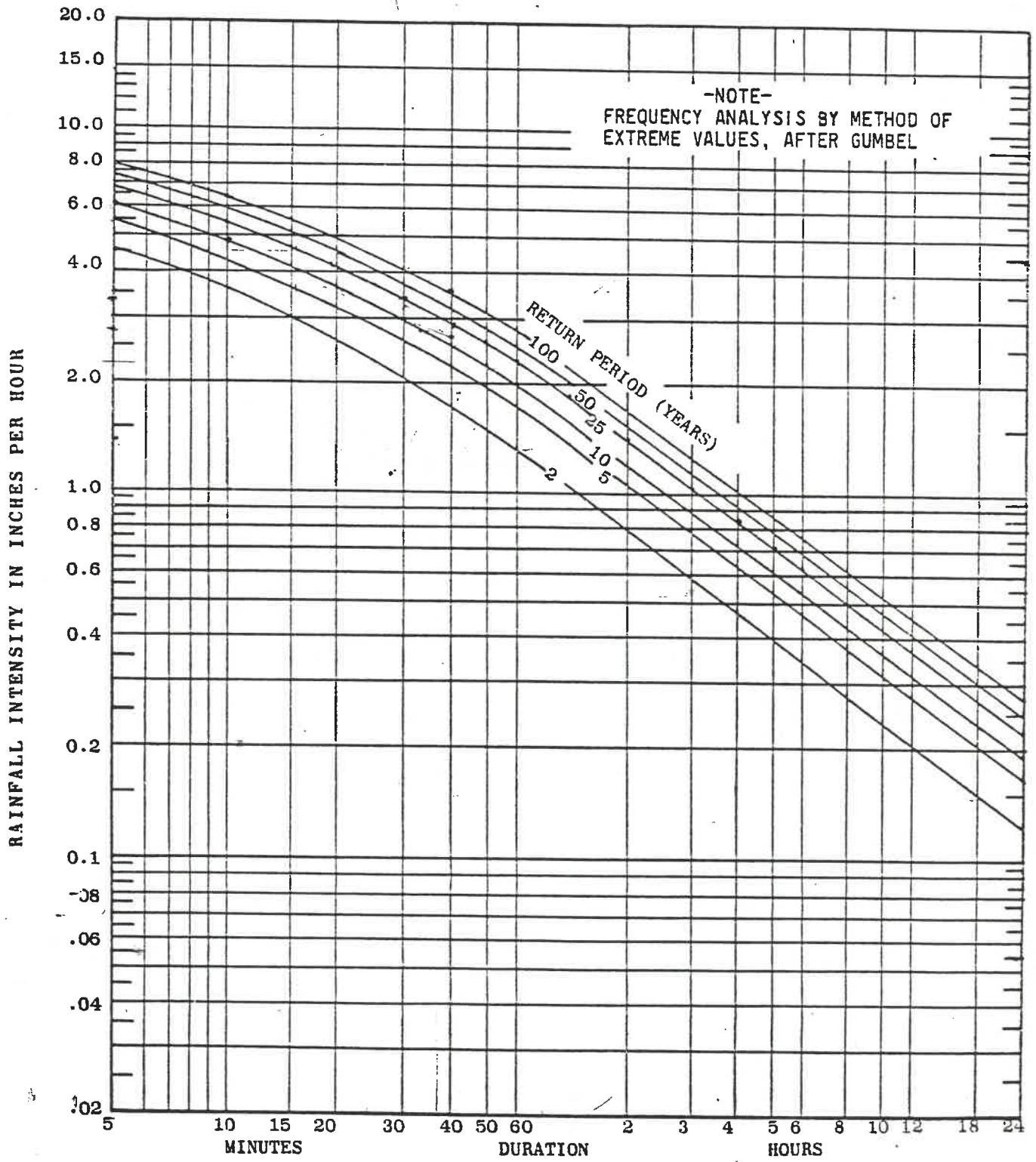
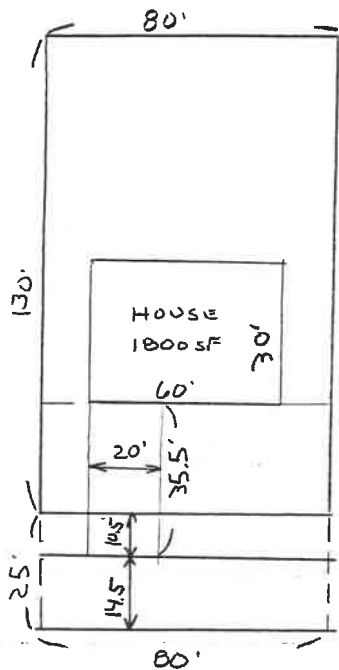


Figure 2.16 Rainfall Intensity-Duration-Frequency Curves

Evansville, Indiana 1903 - 1951

(U.S. Department of Commerce - Weather Bureau - Cooperative Studies Section)



IMPERVIOUS

* HOUSE	1800 SF
DRIVE	710 SF
STREET	1160 SF
	<u>3670 SF</u>
TOTAL AREA	<u>12400 SF</u>
PERVIOUS AREA	8730 SF

COMPOSITE "C" VALUE

<u>AREA</u>	<u>"C"</u>	<u>A X C</u>
3670	.90	3303
<u>8730</u>	<u>.20</u>	<u>1746</u>
12,400		5049

AVG "C" = 0.41

NOMOGRAPH FOR SOLUTION OF MANNING'S
FORMULA FOR FLOW IN STORM SEWERS

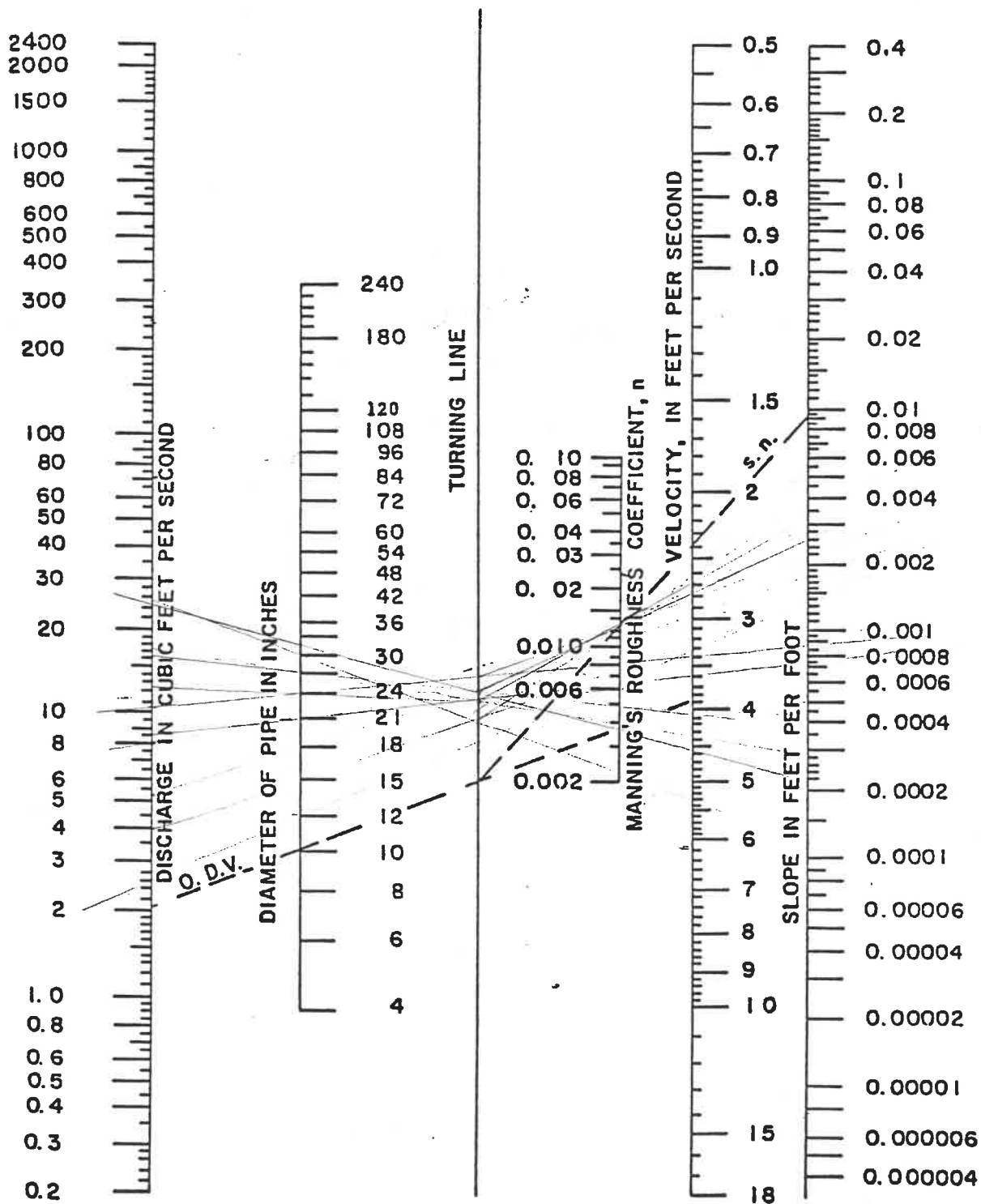


FIG. 7-415.04 D

DITCHES

EAST — Lots 10-18

$$\text{AREA} = 770' \times 65' = 1.14$$

$$C = 0.25$$

$$i = 5.5$$

$$Q = CIA = 0.25 (5.5)(1.14) = 1.58 \text{ cfs}$$

NORTH — Lots 9-1

$$\text{AREA} = 660' \times 65' = 1.01$$

$$C = 0.25$$

$$i = 5.5$$

$$Q = CIA = 0.25 (5.5)(1.01) = 1.40 \text{ cfs}$$

SOUTH — Lots 19-24

$$\text{AREA} = 450' \times 75' = 0.77$$

$$C = 0.25$$

$$i = 5.5$$

$$Q = CIA = 0.25 (5.5)(.77) = 1.07 \text{ cfs}$$

SOUTH — Lots 25-29

$$\text{AREA} = 700' \times 65' = 1.04$$

$$\text{AREA} = 400' \times 55' = .50$$

$$C = 0.25$$

$$i = 5.5$$

$$Q = CIA = 0.25 (5.5)(1.54) = 0.39 \text{ cfs}$$

WEST LOTS 45-34

30-29

$$AREA = 1385 \times 65' = 2.07$$

$$C = 0.25$$

$$i = 5.5$$

$$Q = CIA = 0.25(5.5)(2.07) = 2.84 \text{ cfs}$$

STORM SEWER DESIGN SHEET -- RATIONAL METHOD

PROJECT AUDUBON ESTATES SOUTH DATE 8-20-07 SHEET OF

ENGINEER MARLEY & Assoc. *J. Allen* DESIGN STORM 25 YR MANNINGS n 0.0125

Line Number	Upstream Manhole	Downstream Manhole	Length (Ft)	C ₁	A _j (Acres)	C ₁ A _j	Σ(C ₁ A _j)	t ₁ (min)	i [inches/hr]	Q (CFS)	D (inches)	Pipe Slope (%)	Pipe Capacity (CFS)	Velocity (Ft/Sec)	Travel Time (min)	Rim Elevation Upstream	Rim Elevation Downstream	Invert Elevation Upstream	Invert Elevation Downstream	Upstream Pipe Cover	Downstream Pipe Cover	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	13	19	130	0.60	0.78	0.47	5.25	10	5.4	284	15	0.20	28.4	4.0	0.5							
	19	20	80	0.60	1.03	0.61	7.16	10	5.4	307	15	0.15	30.7	4.0	0.3							
	20	21	150	0.60	0.65	0.41	7.57	10	5.4	408	15	0.17	40.8	4.2								
	22	23	30	0.60	1.04	0.64	0.64	10	5.5	352	15	0.40	3.92	3.3	0.2							
	23	19	250	0.60	1.09	0.66	1.30	10	5.5	7.15	18	0.50	7.15	4.0	1.0							
	24	24	-	0.6	1.6	0.96	0.96	10	5.5	5.3												
	25	25	-	0.6	1.8	1.08	1.08	10	5.5	5.9												
	26	27	100	0.60	1.03	0.62	0.62	10	5.5	3.4	15	0.35	3.4	2.9	0.6							
	28	29	70	0.60	0.88	0.53	0.53	10	5.5	2.9	15	0.26	2.9	2.5	0.5							
	31	29	150	0.60	1.00	0.60	0.60	10	5.5	3.3	15	0.26	3.3	2.6	1.0							
	29	30	130	0.60	0.5	0.30	1.43	10	5.5	7.9	18	0.60	7.9	4.5	0.5							

Figure 7.1 Storm Sewer Design Sheet - Rational Method

NOMOGRAPH FOR SOLUTION OF MANNING'S
FORMULA FOR FLOW IN STORM SEWERS

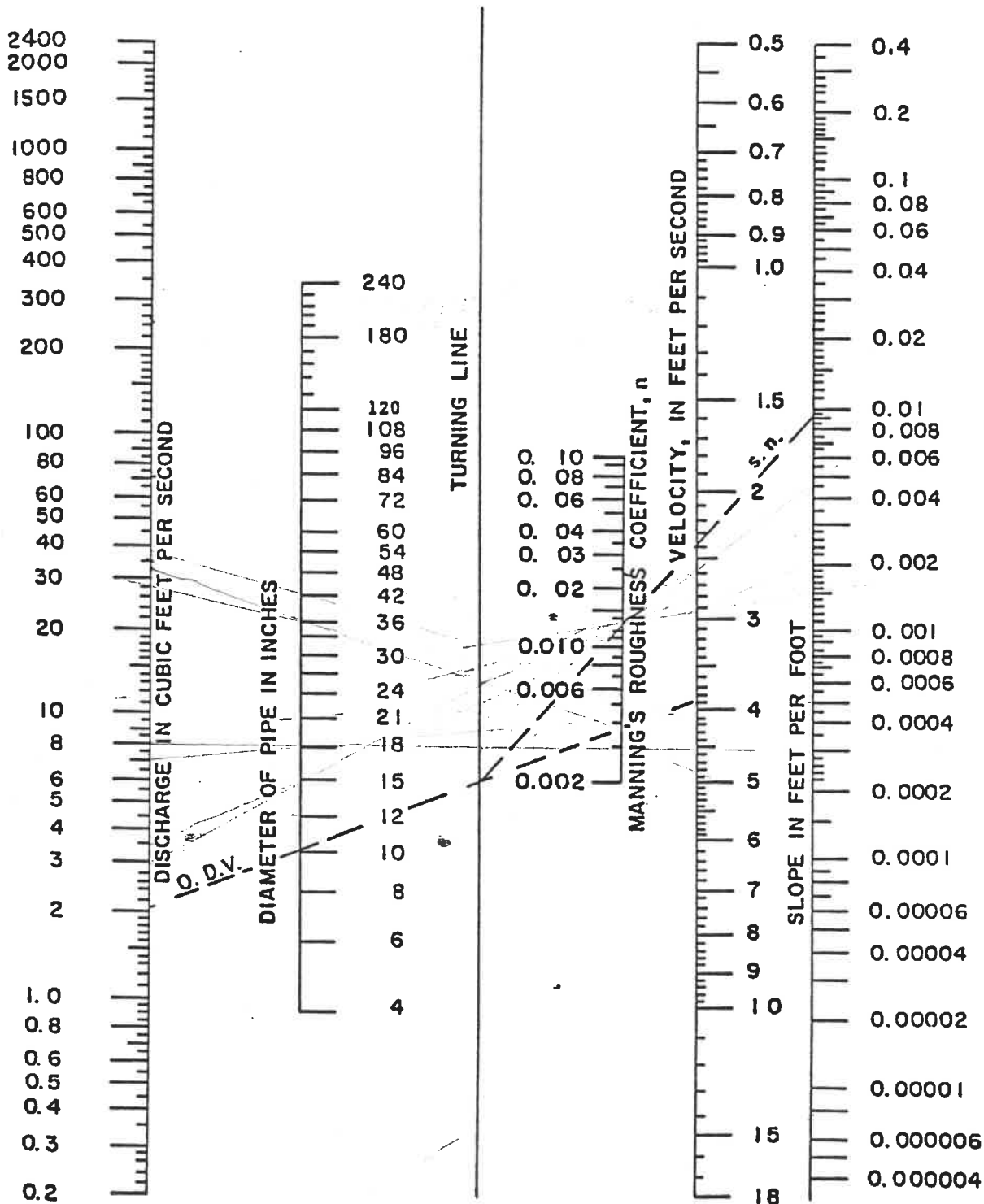


FIG. 7-415.04 D

SURFACE DRAINAGE FROM UNPLATTED AREA
SOUTH OF AUDUBON ESTATES

THIS PROPERTY IS ZONED R-3

"C" FACTOR = 0.60

EAST LINE

AREA 1070 X 70 = 1.72 ACRES

C = 0.60

i = 5.5

$Q = CIA = 0.60 (5.5)(1.72) = 5.68 \text{ CFS}$

WEST LINE

AREA = 800' X 80' = 1.47 ACRES

C = 0.60

i = 5.5

$Q = CIA = 0.60 (5.5)(1.47) = 4.85 \text{ CFS}$

SOUTH LINE

$$\text{AREA} = 900' \times 260' = 5.37 \text{ ACRES}$$

$$C = 0.60$$

$$i = 5.5$$

$$Q = CIA = 0.60(5.5)(5.37) = 17.7 \text{ CFS}$$

MIDDLE DITCHES

$$\text{AREA} = 1200' \times 170' = 4.60 \text{ ACRES}$$

$$C = 0.60$$

$$i = 5.5$$

$$Q = CIA = 0.60(5.5)(4.60) = 15.44 \text{ CFS}$$

KOLB DITCH RELOCATION

CONTRIBUTION FROM AUDUBAN ESTATES

POINT	Q
13	25.0 CFS
18	8.6 CFS
WEST LOTS	2.84 CFS
SOUTH LOTS	1.46 CFS
	<hr/>
	38.7 CFS

CONTRIBUTION FROM AUDUBAN ESTATES SOUTH

POINT	Q
27	3.4 CFS
24	5.3 CFS
25	5.9 CFS
MIDDLE DITCHES	15.4 CFS
WEST DITCHES	4.85 CFS
	<hr/>
	34.85 CFS

CONTRIBUTION FROM TRIBUTARY AREA WEST OF SUBDIVISION

$$AREA = 84 \text{ ACRES}$$

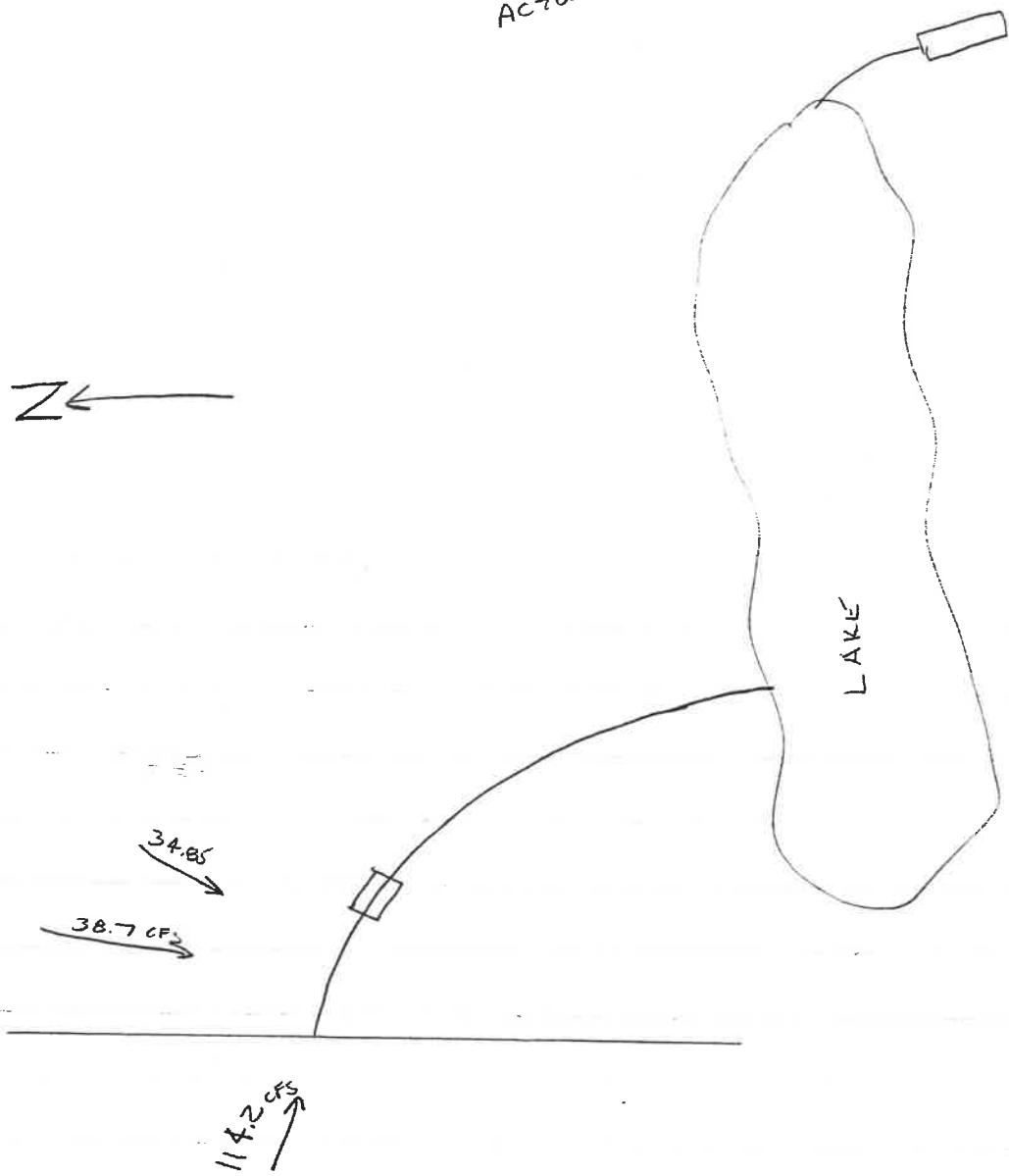
$$C = 0.40$$

$$T_c = 30 \text{ MINUTES}$$

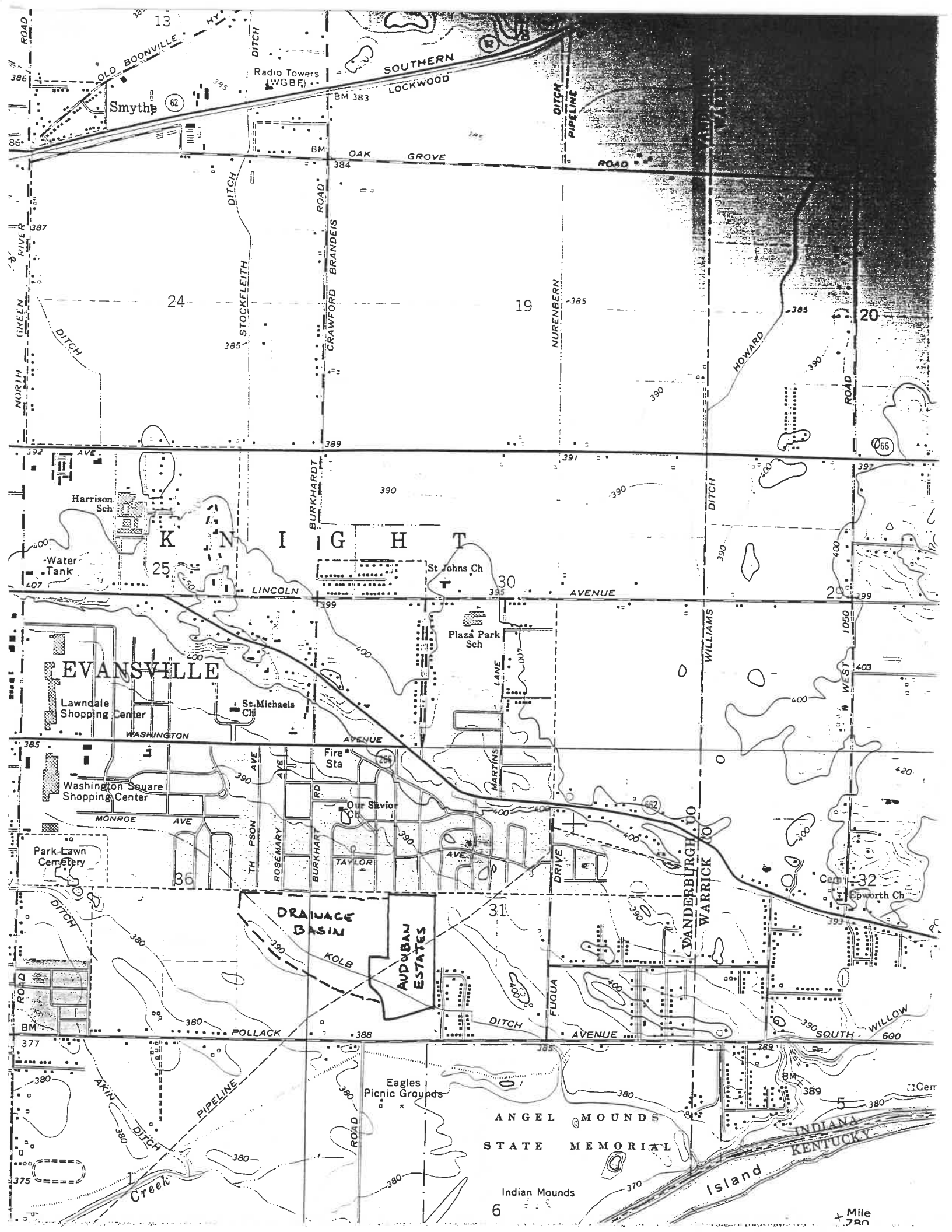
$$i = 3.4 \text{ "/HR}$$

$$Q = CIA = 0.40 (3.4)(84) = 114.2 \text{ CFS}$$

PROPOSED $8' \times 6' = 48 \text{ A}'$
 ACTUAL OPENING = $8' \times 4.21' = 33.68 \text{ A}'$ - $Q = 220 \text{ CFS}$
 For $H = 1.1'$
25 YR



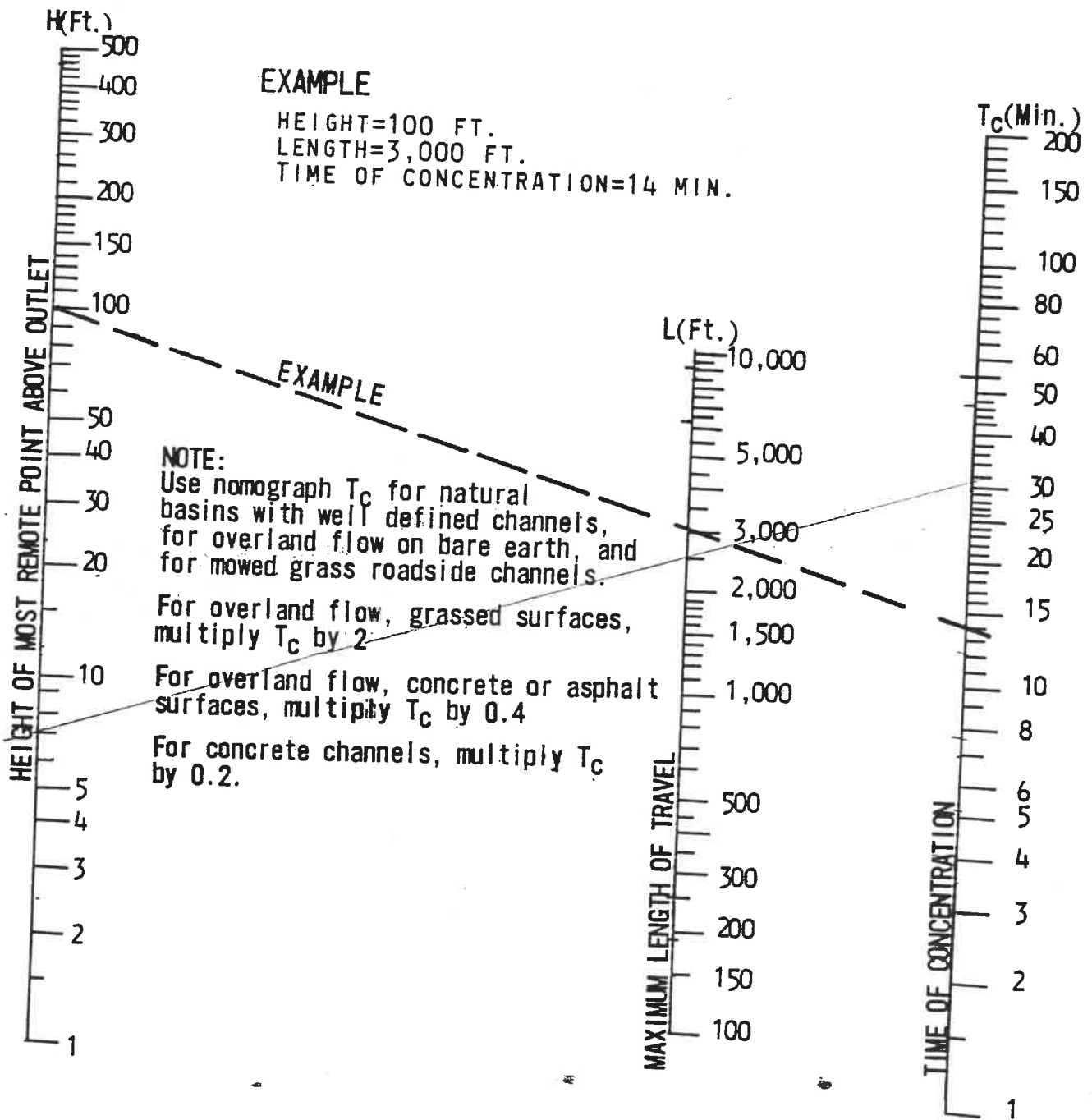
TOTAL Q @ PIPE & DITCH = 187.75 CFS
 76" X 48" $Q = 190 \text{ CFS}$



13
24
19
20
25
30
31
32
6
Smyth
Radio Towers (WGBF)
SOUTHERN LOCKWOOD
DITCH
PIPELINE
DITCH
ROAD
DITCH
STOCKFLEITH
CRAWFORD BRANDEIS
NUREMBERN
HOWARD
ROAD
DITCH
HARRISON SCH
WATER TANK
K N I G H T
LINCOLN AVENUE
ST. JOHN'S CH
PLAZA PARK SCH
EVANSVILLE
LAWDALE SHOPPING CENTER
ST. MICHAEL'S CH
WASHINGTON AVENUE
WASHINGTON SQUARE SHOPPING CENTER
FIRE STA
OUR SAVIOR
PARK LAWN CEMETERY
DRAINAGE BASIN
AUDUBAN ESTATES
KOLB
FUGUA AVENUE
WANDERBURGH RD
WARRICK RD
SOUTH WILLOW
ANGEL MOUNDS STATE MEMORIAL
INDIAN MOUNDS
INDIANA KENTUCKY
Island
Mile 1/8

7-425.04A

JAN. 1971



TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

FOR EXAMPLE: SEE 3) PAGE 41

FIG. 7-425.04 A

KOLB DITCH SIZING

FOR $Q = 188$ CFS

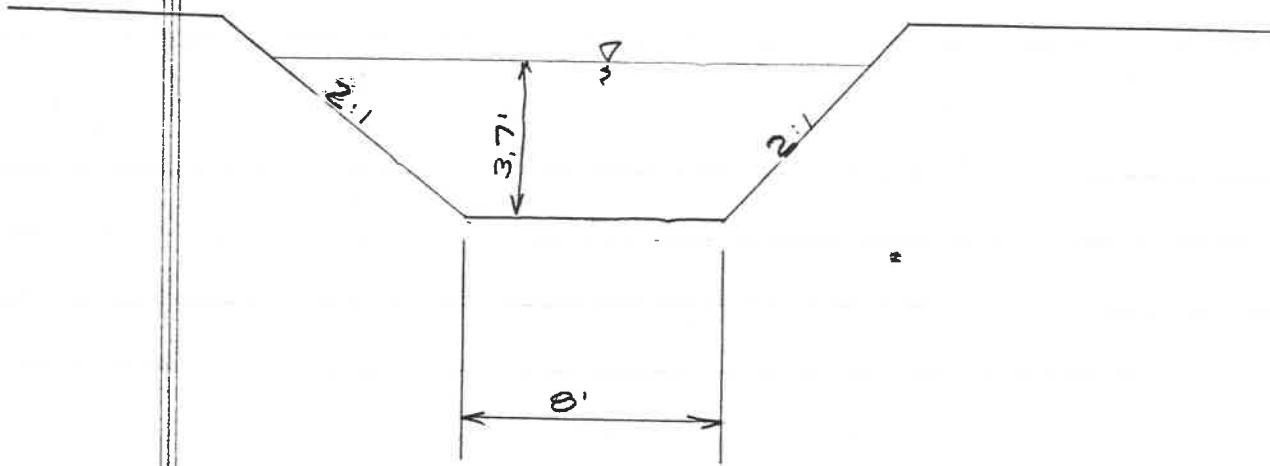
2:1 SLOPES

0.10 LONGITUDINAL SLOPE

8' BOTTOM

CHART 27 IDOH

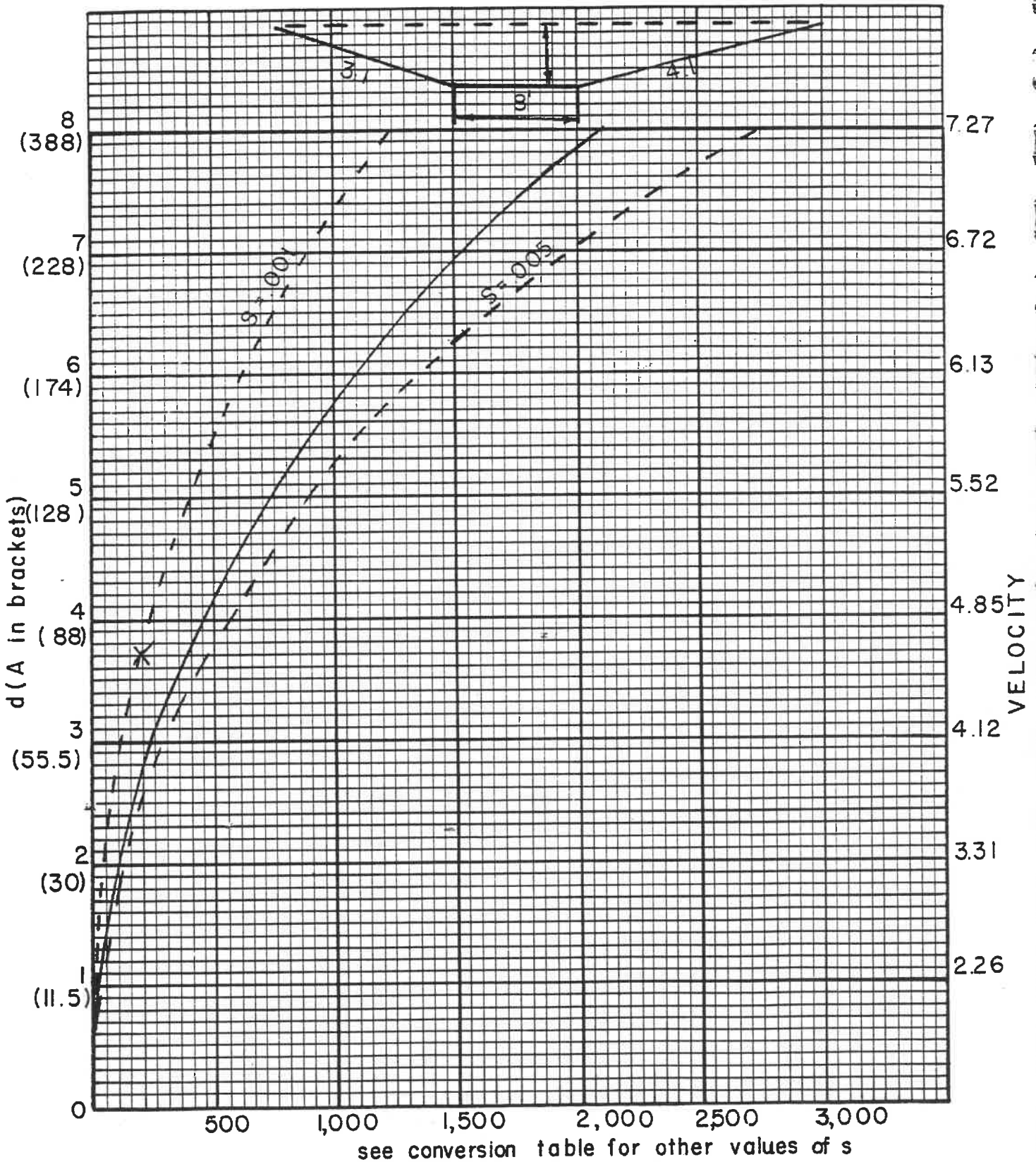
REQUIRED DEPTH = 3.7 FEET 25 YR STORM



FLOW CHART - OPEN CHANNELS

$n = .03$
 $s = .003$

$A = 3.5d^2 + 8d$
 $WP = 7.28d + 8$



DISCHARGE (Q)

CHART 27

VELOCITY