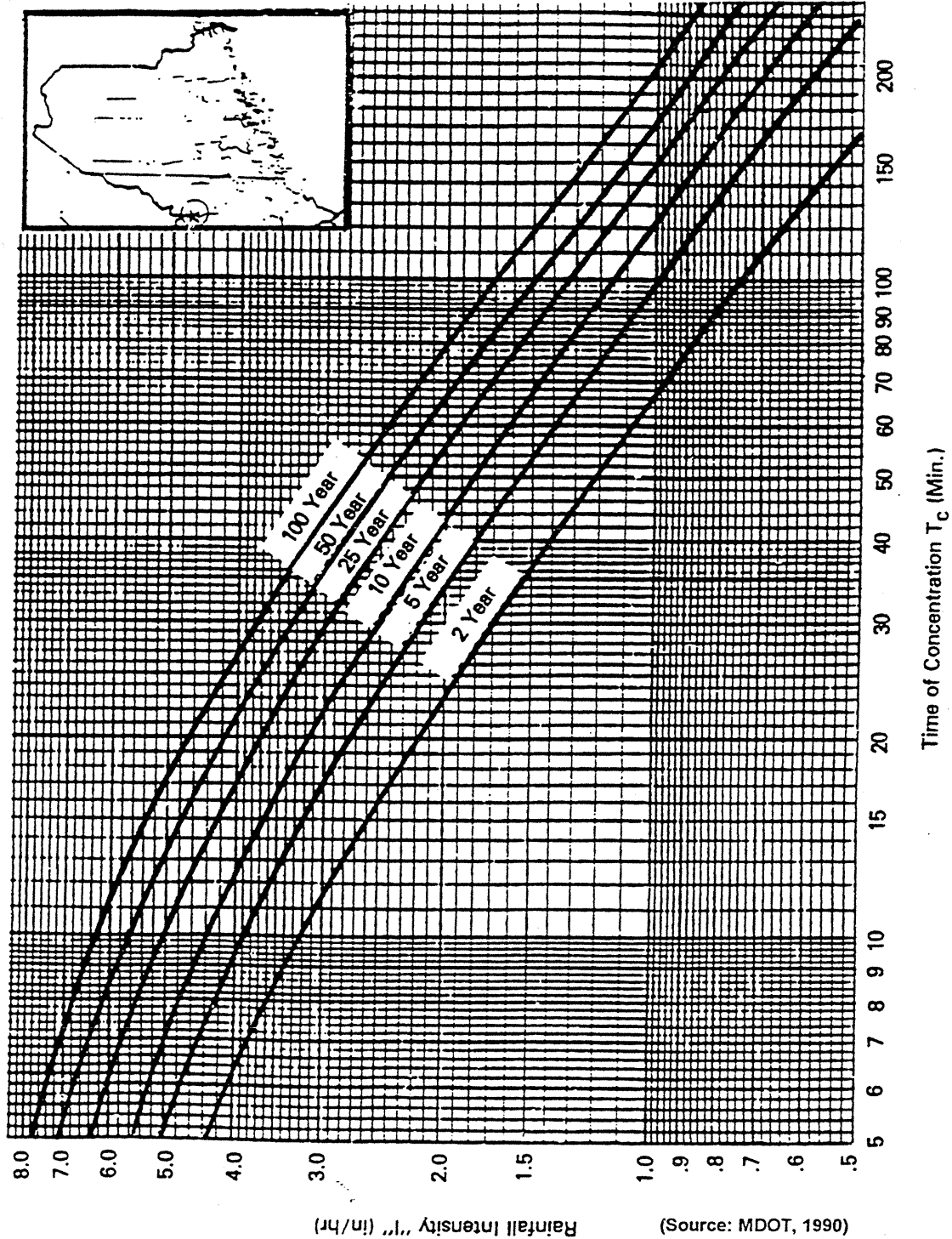


ATTACHMENT A

APPENDIX D-7: IDF Curve for Town of Rangeley



IDF CURVE FOR TOWN OF RANGELEY
(Rational Method)

Figure D.7.

Project _____		Station _____		Engineer _____							
Town _____		Coordinates _____		Date _____							
HYDROLOGIC INFORMATION											
Area No. _____	Area (A) Acres _____	Area (A) Sq Mi _____	Slope (S) Ft/Mi _____	Sketch							
Potter's > 10 acres Slope: N/A	P = _____	K = _____	$Q_{50} = 1.74 Q_{10}^{1.007} =$ _____								
BPR 1021 1-1000 acres Slope: N/A	$Q_{10} =$ _____	LF = _____	$Q_{50} = RF \times LF \times Q_1 =$ _____								
Benson's > 10 acres Slope: 50 - 150	$Q_{10} = 0.67 Q_{50} =$ _____	$Q_{10} = DF \times TF \times RF =$ _____	$Q_{50} = C \times I_{50} \times A =$ _____								
Rational < 200 acres Slope: N/A	St = _____	$Q_{10} = C \times I_{10} \times A =$ _____	$Q_{50} = 42.7 A^{0.915} S^{0.346} St^{-0.275} =$ _____								
USGS > 100 acres Slope: 2 - 300	$Q_{10} = 26.9 A^{0.936} S^{0.346} St^{-0.252} =$ _____										
DISCHARGE CALCULATIONS											
Avg $Q_{10} =$ _____		Avg $Q_{50} =$ _____									
$Q_{DES} =$ _____		$TW_{DES} =$ _____									
$Q_{CHECK} =$ _____		$TW_{CHECK} =$ _____									
HEADWATER CALCULATIONS											
Culvert Description	Q	Size	OUTLET CONTROL: $HW = H + h_o - LS_o$			Comments					
			INLET CONT.	HW	HW		HW				
			$\frac{HW}{D}$	k_e	H	d_c	$\frac{d_c + D}{2}$	h_o^*	LS_o	HW Cont.	Out. Vel.
SUMMARY AND RECOMMENDATIONS											

* h_o will be TW or $(d_c + D)/2$, whichever is larger.

CULVERT DESIGN FORM
Figure 12-20

CULVERT DESIGN FORM

Figure 12-20

12"

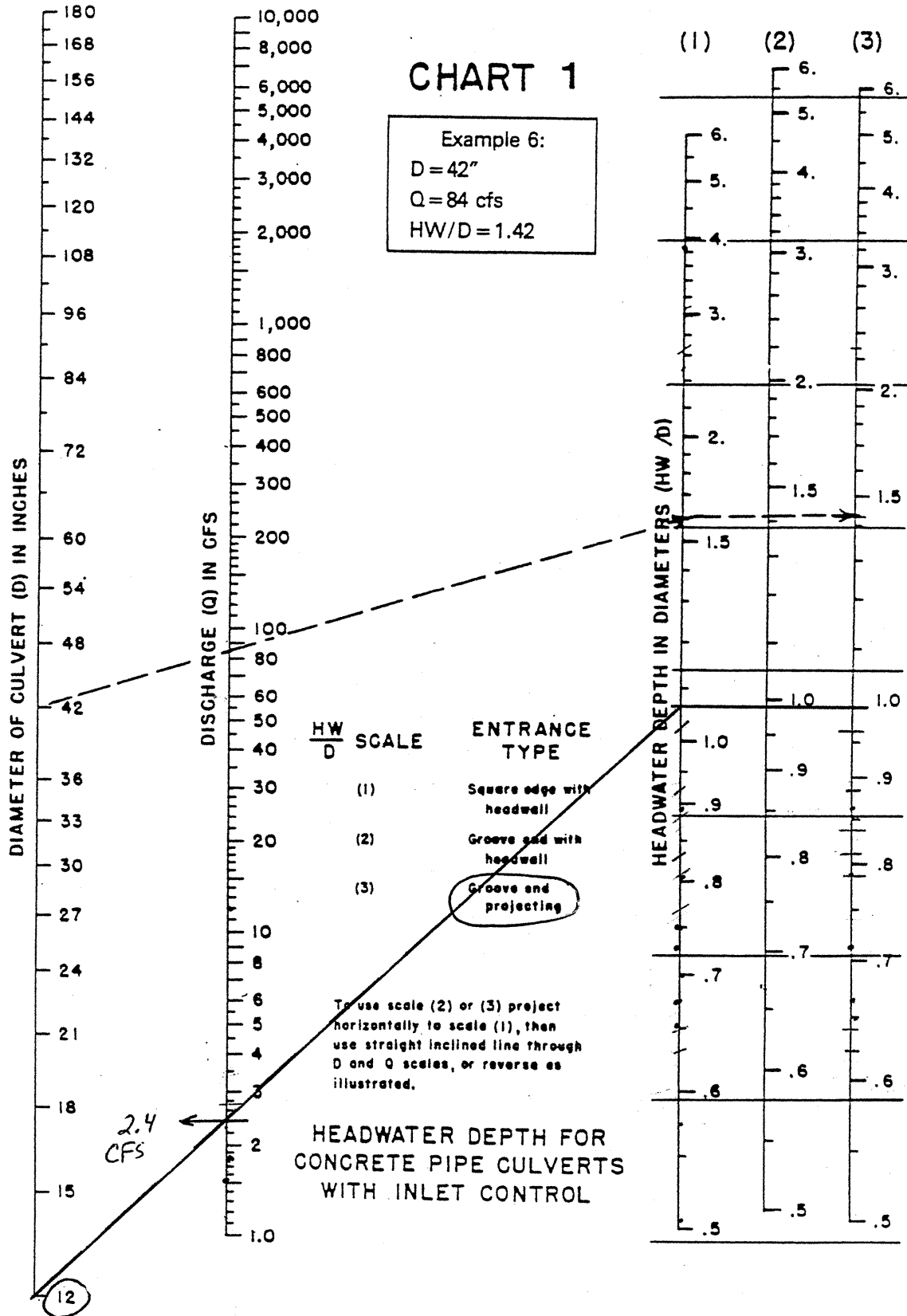


CHART 1 FROM HDS #5

Figure 12-21

15"

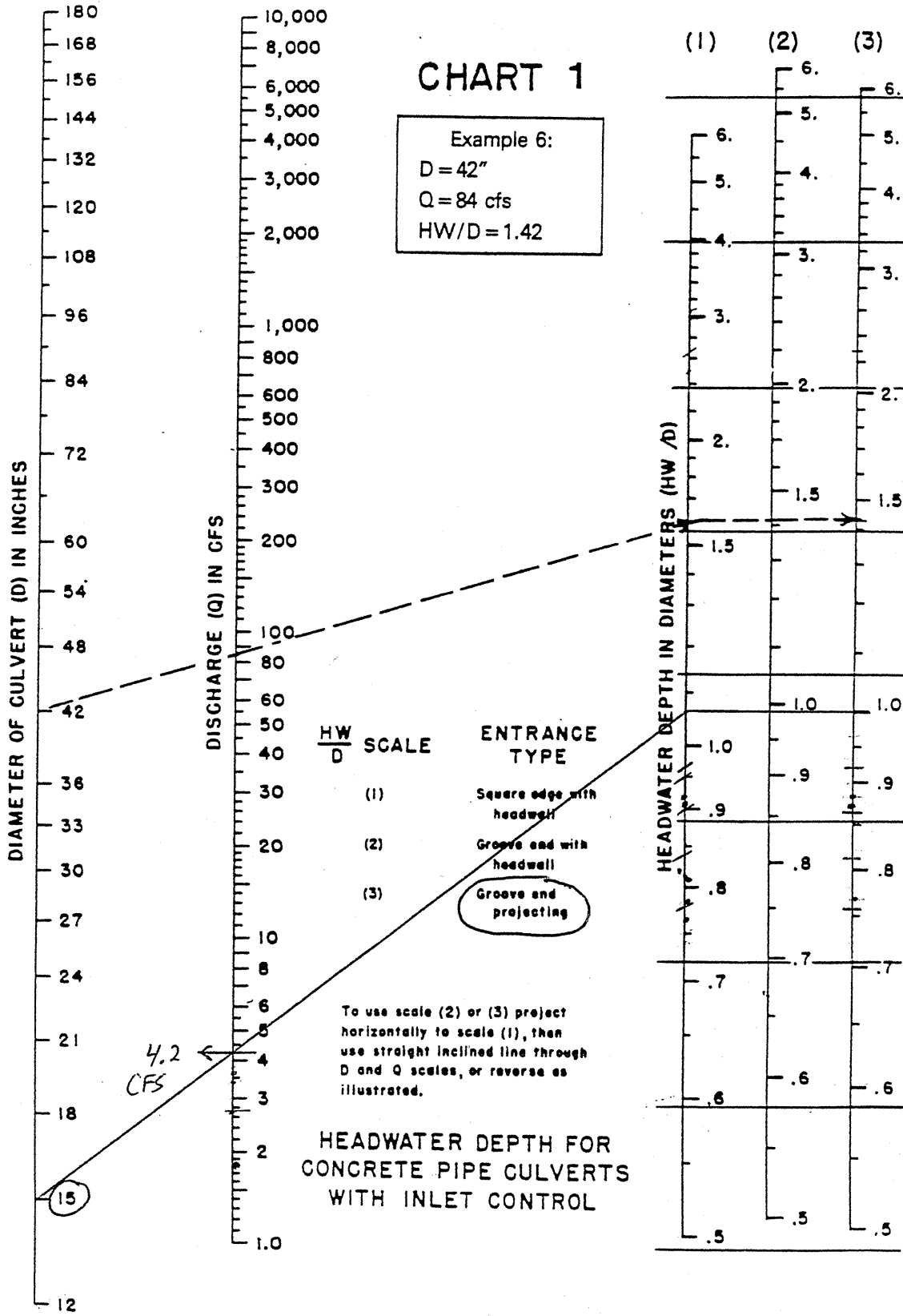


CHART 1 FROM HDS #5

Figure 12-21

18"

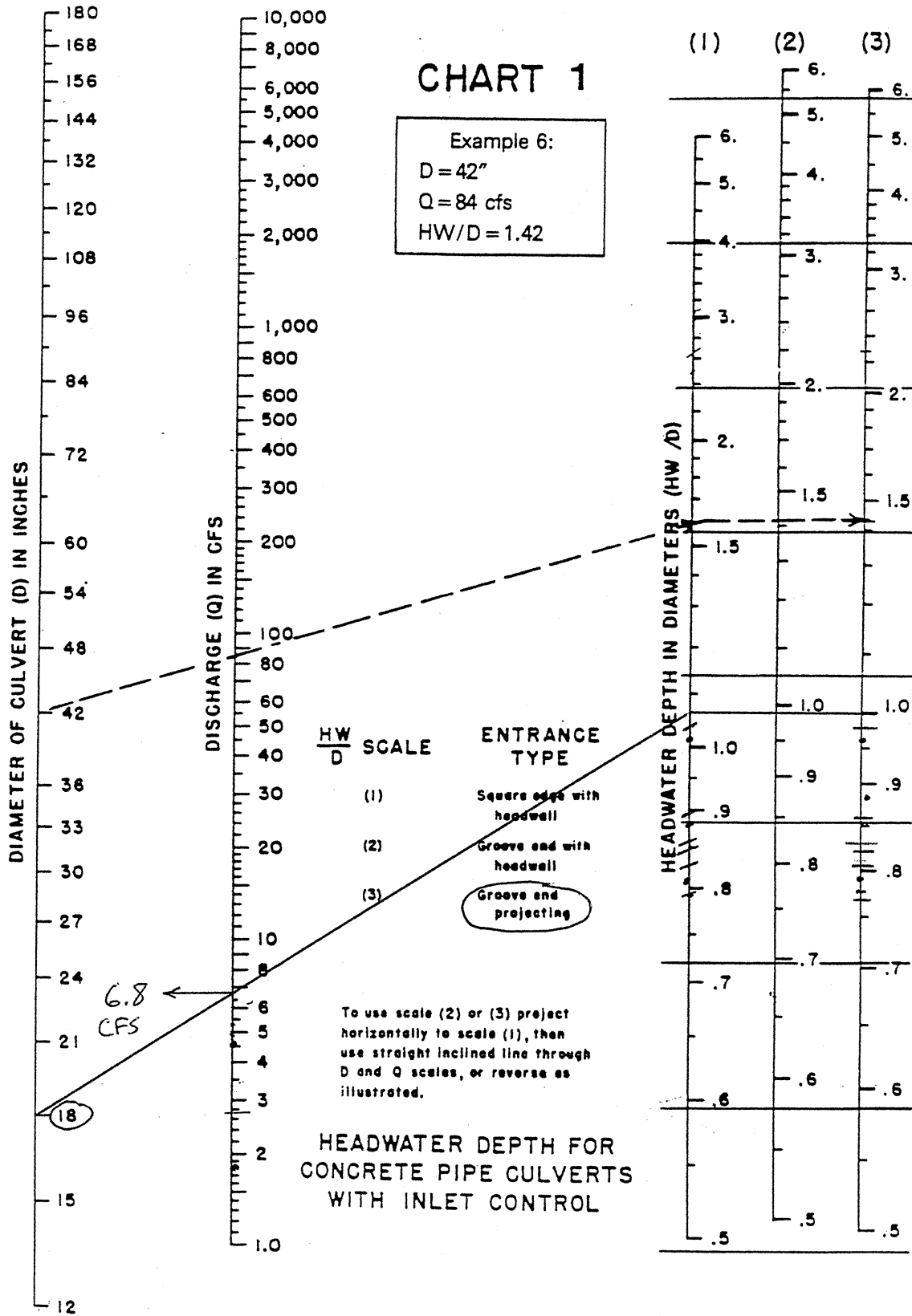


CHART 1 FROM HDS #5

Figure 12-21

24"

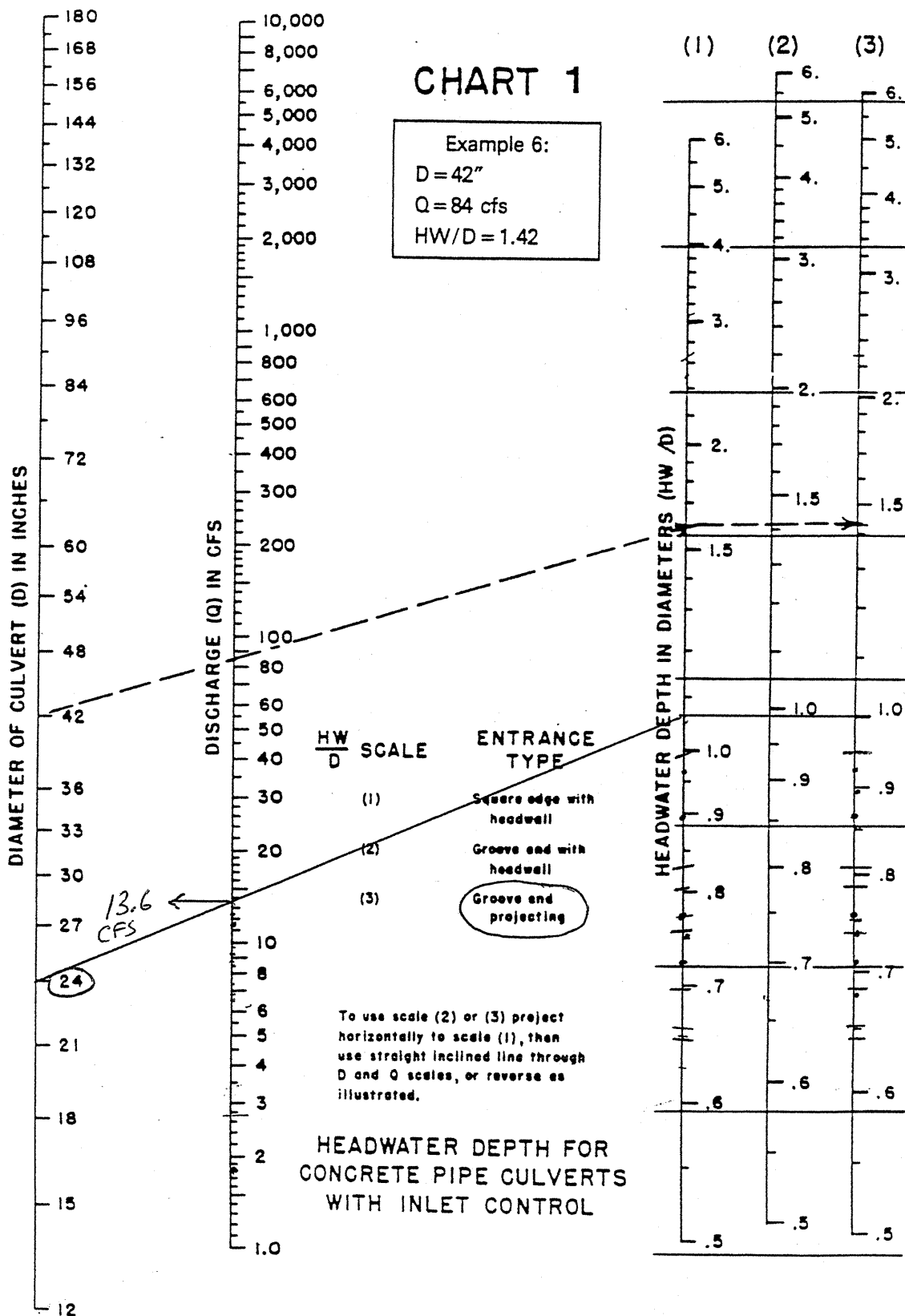


CHART 1 FROM HDS #5

Figure 12-21

30"

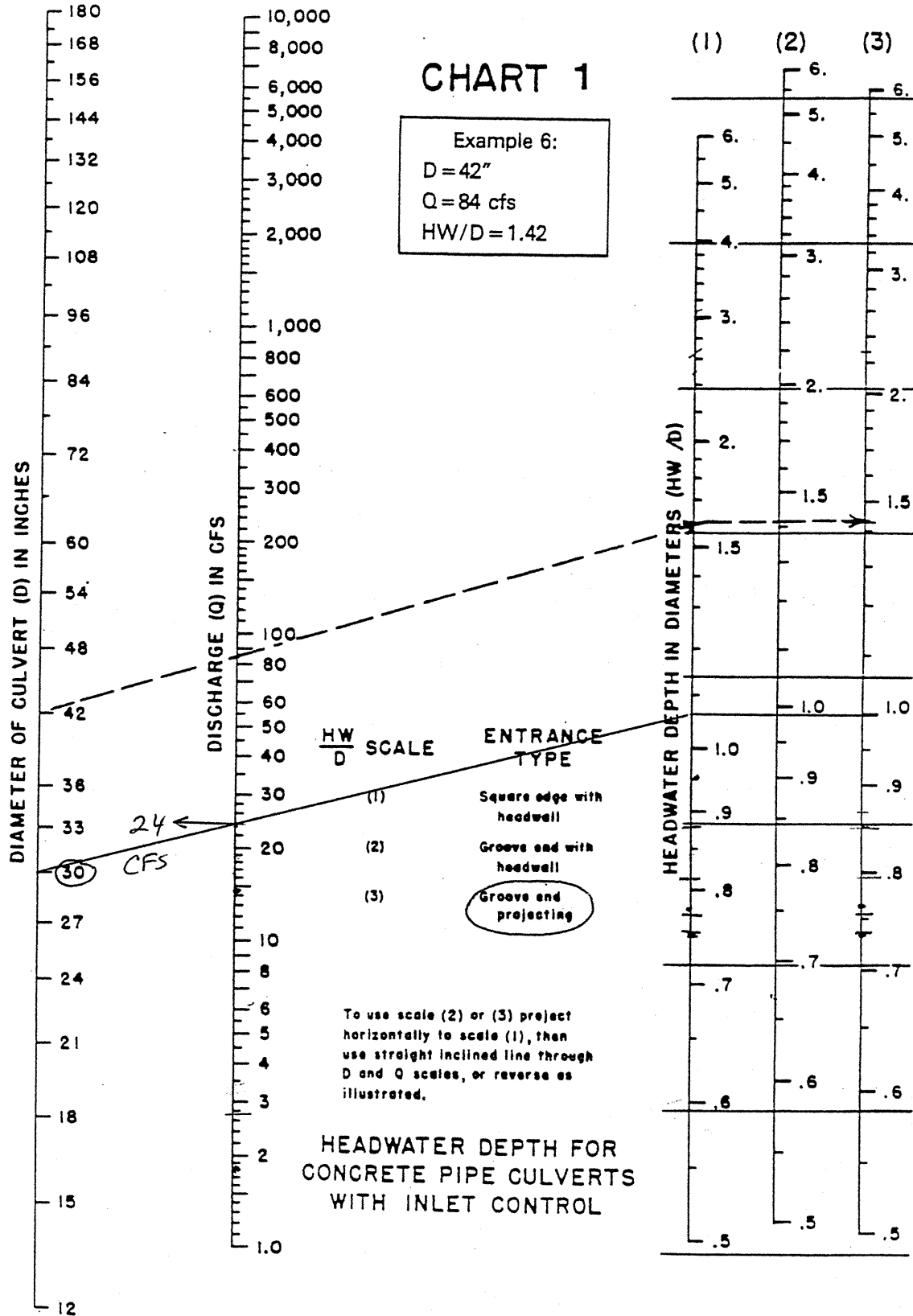


CHART 1 FROM HDS #5

Figure 12-21

36"

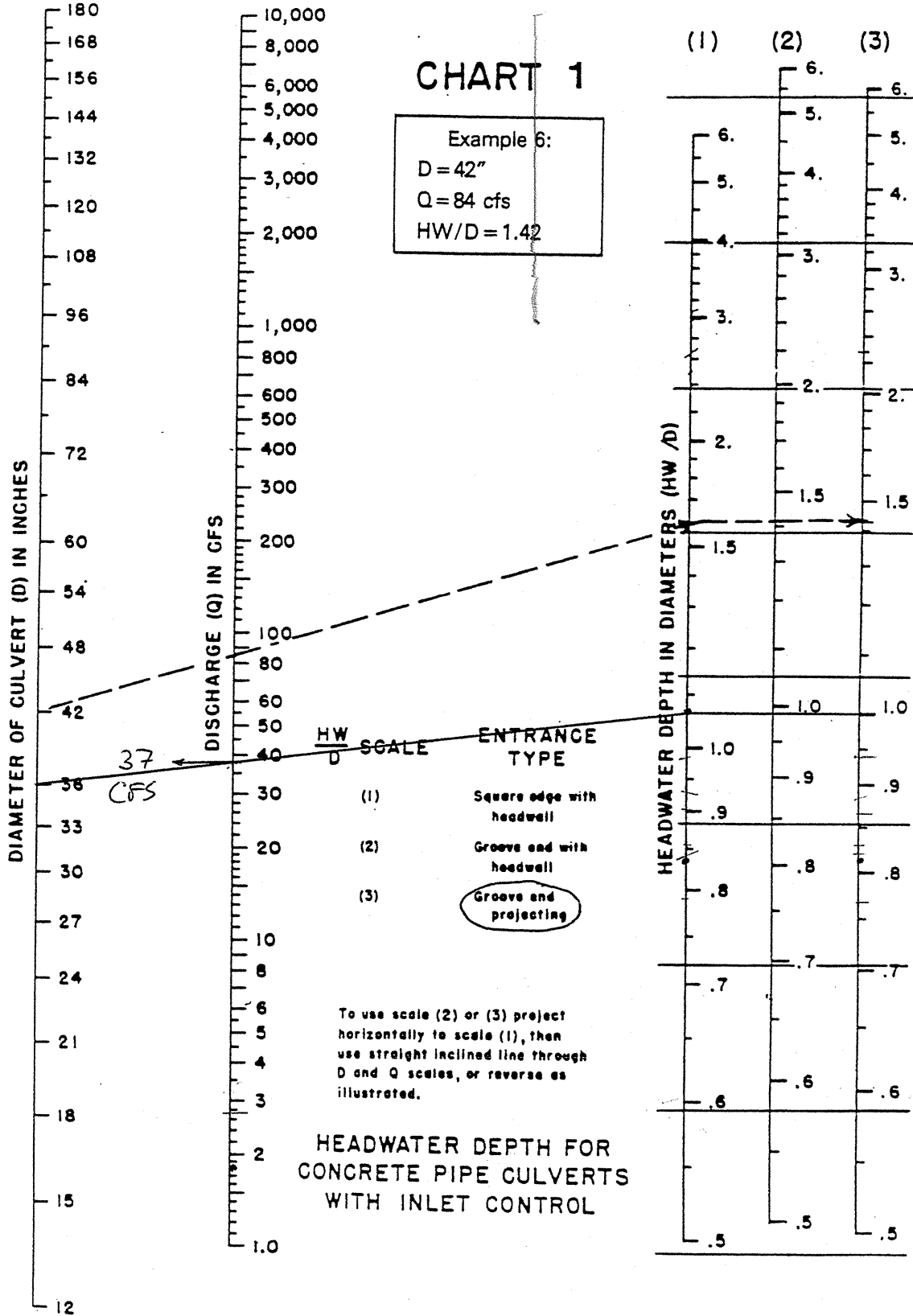


CHART 1 FROM HDS #5

Figure 12-21

APPENDIX D-1: One Day Precipitation Values (SCS)

County	Storm Type	Return Interval or Frequency								Annual	
		1-Yr	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr	500-Yr			
Androscoggin		2.5	3.0	3.9	4.6	5.4	6.5	7.8	45.3		
Aroostook C		2.1	2.1	3.2	3.6	4.2	5.0	5.9	36.1	(Presque Isle Area)	
Aroostook N		2.0	2.3	3.0	3.5	4.0	4.8	5.7	36.1	(Fort Kent Area)	
Aroostook S	S	2.2	2.5	3.3	3.8	4.4	5.3	6.4	39.0	(Houlton Area)	
Cumberland NW	E	2.8	3.3	4.3	5.0	5.8 ¹	6.9	8.3	43.4	(NW of St. Route 11)	
Cumberland SE	E	2.5	3.0	4.0	4.7	5.5	6.7	8.1	44.4	(SE of St. Route 11)	
Franklin		2.4	2.9	3.7	4.2	4.9	5.9	7.0	45.6		
Hancock		2.4	2.7	3.6	4.2	4.9	6.0	7.2	45.2		
Kennebec	N	2.4	3.0	3.8	4.4	5.1	6.1	7.2	41.7		
Knox-Lincoln	O	2.5	2.9	3.8	4.4	5.1	6.2	7.4	46.1		
Oxford E	T	2.5	3.0	4.0	4.6	5.3	6.4	7.6	43.0	(E of St. Route 26)	
Oxford W	E	3.0	3.5	4.5	5.2	6.0	7.1	8.4	43.8	(W of St. Route 26)	
Penobscot N	S	2.2	2.5	3.3	3.8	4.4	5.4	6.4	41.5	(N of Can.-Atl. Rwy)	
Penobscot S		2.4	2.7	3.5	4.1	4.8	5.8	6.9	39.5	(S of Can.-Atl. Rwy)	
Piscataquis N	1	2.2	2.5	3.3	3.8	4.4	5.3	6.3	38.5	(N of Can.-Atl. Rwy)	
Piscataquis S		2.3	2.6	3.4	4.0	4.6	5.5	6.6	41.0	(S of Can.-Atl. Rwy)	
Sagadahoc	A	2.5	3.0	3.9	4.6	5.4	6.5	7.8	45.3		
Somerset N	N	2.2	2.5	3.3	3.8	4.4	5.3	6.3	37.3	(N of Can.-Atl. Rwy)	
Somerset S	D	2.4	2.7	3.5	4.1	4.7	5.7	6.8	39.5	(S of Can.-Atl. Rwy)	
Waldo		2.5	2.8	3.7	4.3	4.9	6.0	7.1	47.2		
Washington	2	2.4	2.5	3.4	4.0	4.8	5.9	7.1	44.2		
York		2.5	3.0	4.0	4.6	5.4	6.6	7.8	46.7		

NOTES: REVISED 4/10/92 Lew P. Crosby

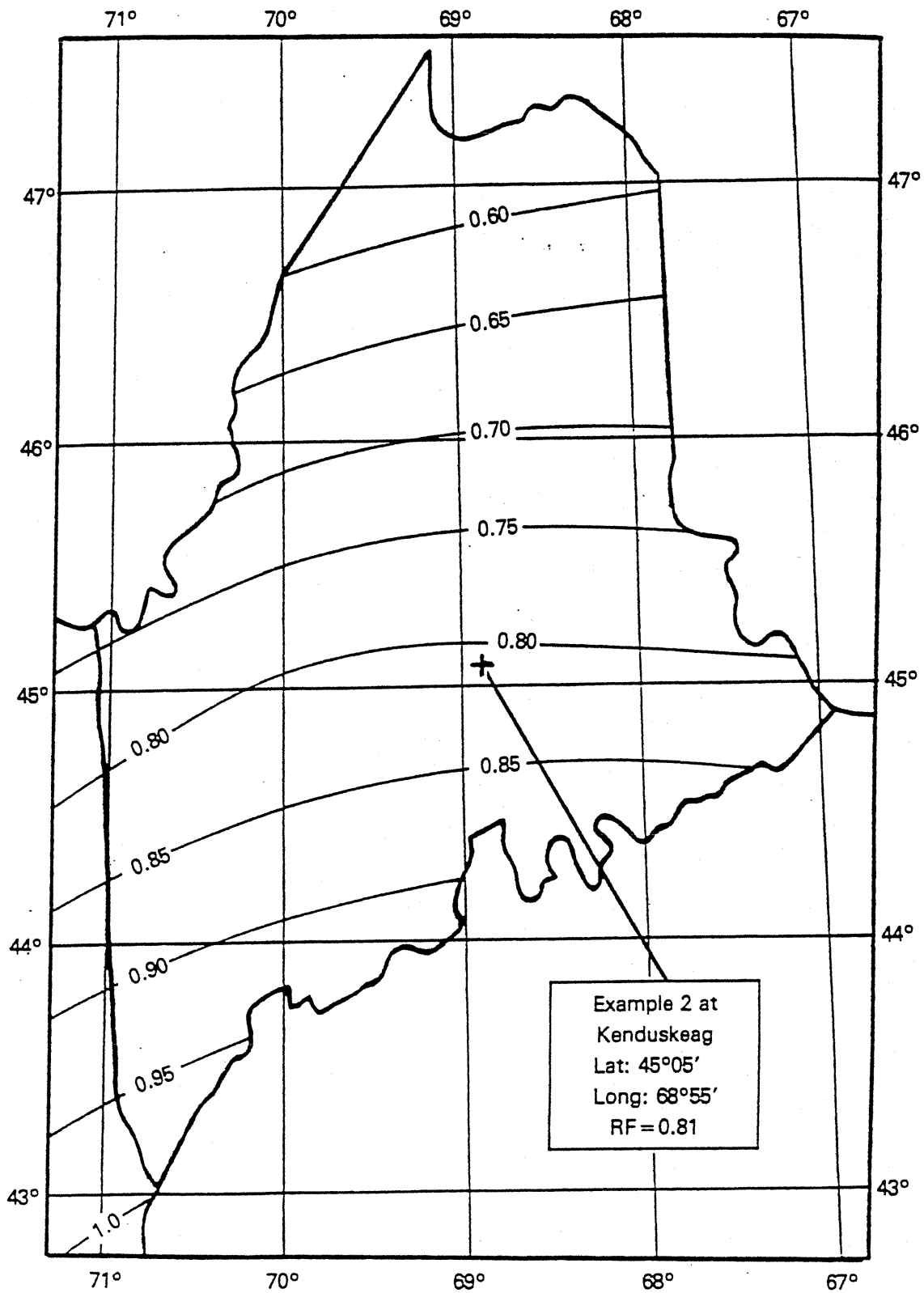
24-HR. DURATION RAINFALL

SOURCES: 24-HR. DATA — TP 40

ANNUAL DATA — CDAN

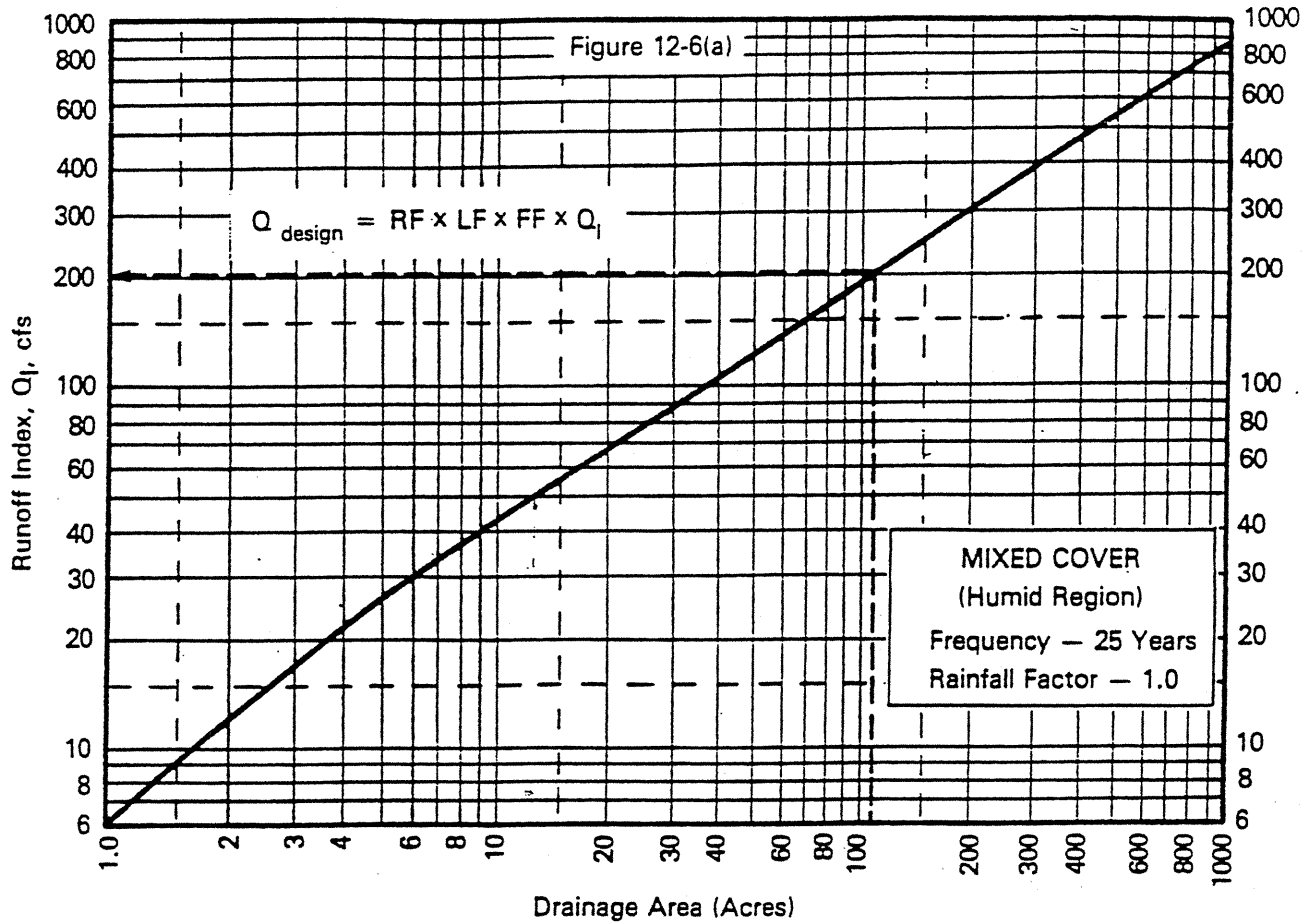
Note 1: ¹Use **Type II** for Oxford County (with the exception of towns listed below) and Penobscot County (with the exception of towns listed below) and all Maine counties not listed below.

Note 2: ²Use **Type III** for York, Cumberland, Androscoggin, Sagadahoc, Kennebec, Waldo, Knox, Piscataquis, Somerset, Franklin, Aroostook, Lincoln, Hancock, Washington Counties; the following Oxford County Towns: Porter, Brownfield, Hiram, Denmark, Oxford, Hebron, Buckfield, and Hartford; and the following Penobscot County towns: Dixmont, Newburgh, Hampden, Bangor, Veazie, Orono, Bradley, Clifton, Eddington, Holden, Brewer, Orrington, Plymouth, Etna, Carmel, Hermon, Glenburn, Old Town, Milford, and Greenfield.



RAINFALL FACTOR "RF"
(BPR 1021 Series)

Figure 12-5



Land-Use Factor (LF) (Figure 12-6(b))

Land Type	Average Slope		
	>2%	0.2% - 2.0%	<0.2%
100% Cultivated	1.2	0.8	0.25
Mixed Cover	1.0	0.6	0.2
Pasture	0.6	0.4	0.1
Woods	0.3	0.2	0.05

(b)

For Area "A" > 6 acres,
 $Q_i = 8.8166A^{0.75}$

Example 2:

A = 111 acres
 $Q_i = 200$ cfs

Note: The LF will be provided in the Drainage Report.

Frequency Factors (FF) (Figure 12-6(c))

Frequency, Years	5	10	25	50	100
Factor	0.66	0.79	1.00	1.18	1.39

(c)

PEAK RATES OF RUNOFF
 (BPR 1021 Series)

Figure 12-6

**APPENDIX D-12: Runoff Coefficients for the Rational Formula
by Hydrologic Soil Group and Slope**

Runoff Coefficients for the Rational Formula by Hydrologic Soil Group and Slope												
Range	A			B			C			D		
Land use	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Cultivated land	0.08	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
	0.14	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Residential												
Lot size 1/4 acre (0.05 ha)	0.25	0.28	0.31	0.27	0.30	0.35	0.30	0.33	0.38	0.33	0.36	0.42
	0.33	0.37	0.40	0.35	0.39	0.44	0.38	0.42	0.49	0.41	0.45	0.54
Lot size 1/2 acre (0.10 ha)	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
	0.30	0.34	0.37	0.33	0.37	0.42	0.36	0.40	0.47	0.38	0.42	0.52
Lot size 3/4 acre (0.13 ha)	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
	0.28	0.32	0.35	0.30	0.35	0.39	0.33	0.38	0.45	0.36	0.40	0.50
Lot size 1 acre (0.2 ha)	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
	0.25	0.29	0.32	0.28	0.32	0.36	0.31	0.35	0.42	0.34	0.38	0.48
Lot size 1 acre (0.4 ha)	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
	0.22	0.26	0.29	0.24	0.28	0.34	0.28	0.32	0.40	0.31	0.35	0.46
Industrial	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.69	0.69	0.69	0.69	0.70
	0.85	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.86	0.88
Commercial	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.89	0.89	0.90
Streets	0.70	0.71	0.72	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
	0.76	0.77	0.79	0.80	0.82	0.84	0.84	0.85	0.89	0.89	0.91	0.95
Open space	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.16	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Parking	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

*First row of each entry gives runoff coefficients for storm recurrence intervals less than 25 years; second row gives runoff coefficients for storm recurrence intervals of 25 years or more.

(Source: Rawls et al., 1981)

Figure D.12. Runoff Coefficients for the Rational Formula.

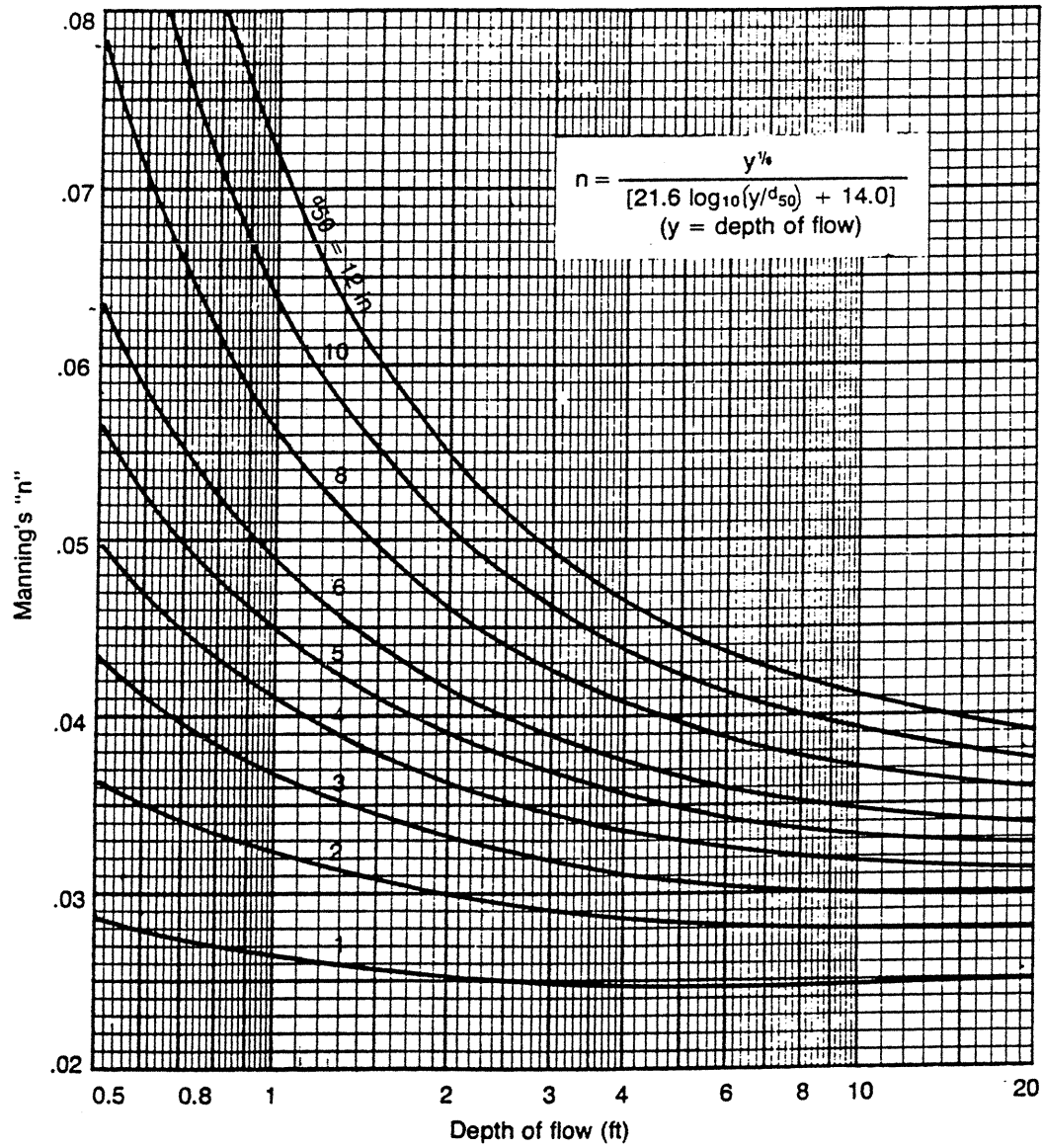
(Source: Rawls et al., 1981, and Browne, 1990)

APPENDIX D-13: Runoff Curve Numbers for use in TR-55 and TR-20

Land Use/Cover type and hydrologic condition	Hydrologic Soil Group			
	A	B	C	D
Cultivated Land				
without conservation	72	81	88	91
with conservation	62	71	78	81
Pasture land				
poor condition: heavily grazed, no mulch	68	79	86	89
fair condition: 50 to 75% ground cover	49	69	79	84
good condition: lightly grazed, > 75% ground cover	39	61	74	80
Meadow (protected from grazing)	30	58	71	78
Wood or forest land				
Thin stand - poor cover, no mulch, burned over	45	66	77	83
Good stand - good cover, litter and brush cover soil	25	55	70	77
Wood yard (log storage)	72	82	87	89
Open space, lawns, parks, golf courses, cemeteries, etc.				
Good condition: grass cover on 75% or more of the area	39	61	74	80
Fair condition: grass cover on 50 to 75 % of the area	49	69	79	84
Commercial and business areas (85% impervious)	89	92	94	95
Industrial districts (72% impervious)	81	88	91	93
Residential: Development completed, vegetation established, house and driveway drains toward road				
<u>Average lot size</u> <u>Average % impervious</u>				
1/8 acre or less (town houses) 65	77	85	90	92
1/4 acre 38	61	75	83	87
1/3 acre 30	57	72	81	86
1/2 acre 25	54	70	80	85
1 acre 20	51	68	79	84
2 acre 15	46	65	77	82
Paved parking lots, roofs, driveways, etc.(excluding R-O-W)	98	98	98	98
Streets and roads				
Paved with curb and storm sewers (excluding R-O-W)	98	98	98	98
Paved with ditches (including R-O-W)	83	89	92	93
Gravel (including R-O-W)	76	85	89	91
Dirt (including R-O-W)	72	82	87	89
Newly graded area (denuded)	77	86	91	94

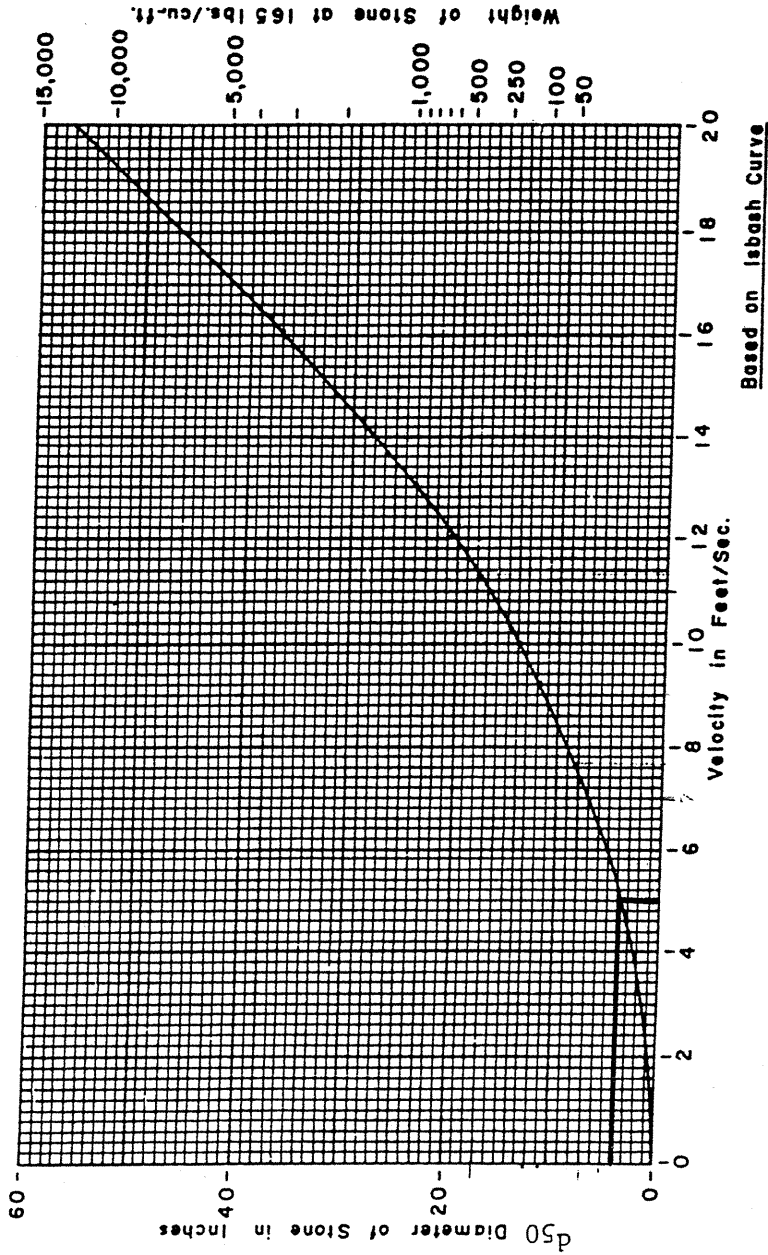
Note: Average runoff condition and $I_a = 0.2S$
Source: SCS, 1986 and DEP staff.

Figure 70.2 DETERMINING "N" FOR RIPRAP CHANNELS



y = Depth of water in feet
 D₅₀ = Riprap diameter in feet

Figure 70.1 STONE SIZE FOR RIPRAP (USDA Soil Conservation Service)



Vel. = 4.94 fps

D₅₀ = 4"

USE D₅₀ = 6"