APPENDIX 2

Consider changing to Zoning instead of Land Use & Slope

Delete

Do give chart just "C"

Slope	Land Use	Soil Classification			
		Sand or Sandy Loam Soils (Pervious)		High Clay Soils (Impervious)	
		Min.	Max.	Min.	Max.
Flat (0 to 1%)	Cultivated	0.25	0.35	0.30	0.40
	Woodlands	0.15	0.20	0.10	0.15
	Pasture	0.20	0.25	0.30	0.40
	Residential	0.50	0.60	0.50	0.60
	Commercial/Industrial	0.60	0.90	0.60	0.90
	Paved	0.90	0.90	0.90	0.90
Rolling (1 to 3.5%)	Cultivated	0.45	0.65	0.50	0.70
	Woodlands	0.15	0.20	0.18	0.25
	Pasture	0.30	0.40	0.35	0.45
	Residential	0.50	0.60	0.50	0.60
	Commercial/Industrial	0.60	0.90	0.60	0.90
	Paved	0.90	0.90	0.90	0.90
Hilly (3.5 to 5.5%)	Cultivated	0.60	0.75	0.70	0.85
	Woodlands	0.20	0.25	0.25	0.30
	Pasture	0.35	0.45	0.45	0.55
	Residential	0.50	0.60	0.50	0.60
	Commercial/Industrial	0.60	0.90	0.60	0.90
	Paved	0.90	0.90	0.90	0.90
Mountainous (over 5.5%)	Woodlands			0.70	0.80
	Bare			0.80	0.90
Grassed ROW slopes		0.70	0.70	0.70	0.70

NOTE: The maximum value for High Clay Soils shall be used unless approved by City Staff.

Duration (min)	Frequency 2yr	5yr	10yr	25yr	50yr	100yr
5	5.61	6.49	7.21	8.27 0.815	9.26 0.912	10.15
6	5.38	6.23	6.92	7.94	8.90	9.74
7	5.17	5.98	6.66	7.64	8.56	9.38
8	4.97	5.76	6.41	7.36	8.25	9.04
9	4.79	5.56	6.19	7.10	7.97	8.74
10	4.62	5.37	5.98	6.87 .813	7.71 .912	8.45
11	4.47	5.20	5.79	6.65 .812	7.47 .912	8.19
12	4.32	5.03	5.62	6.45 .811	7.25	7.95
13	4.19	4.88	5.45	6.26 .811	7.04	7.72
14	4.06	4.74	5.29	6.09 0.811	6.85 .912	7.51
15	3.94	4.61	5.15	5.92 0.810	6.67 .912	7.31
16	3.83	4.48	5.01	5.77 .809	6.50 .912	7.13
17	3.72	4.37	4.88	5.62	6.33	6.95
18	3.63	4.25	4.76	5.48	6.18	6.79
19	3.53	4.15	4.65	5.36	6.04	6.63
20	3.44	4.05	4.54	5.23 0.805	5.90 0.910	6.49
21	3.36	3.96	4.44	5.12	5.78	6.35
22	3.28	3.87	4.34	5.01	5.65	6.21
23	3.20	3.78	4.24	4.90	5.54	6.09
24	3.13	3.70	4.16	4.80	5.43	5.97
25	3.06	3.62	4.07	4.71	5.32	5.85
26	3.00	3.55	3.99	4.62	5.22	5.75
27	2.93	3.48	3.91	4.53	5.13	5.64
28	2.87	3.41	3.84	4.45	5.03	5.54
29	2.82	3.35	3.77	4.37	4.95	5.45
30	2.76	3.29	3.70	4.29 0.802	4.86 0.908	5.35
31	2.71	3.23	3.64	4.22	4.78	5.27
32	2.66	3.17	3.57	4.15	4.70	5.18
33	2.61	3.12	3.51	4.08	4.63	5.10
34	2.56	3.06	3.46	4.01	4.55	5.02
35	2.52	3.01	3.40	3.95	4.49	4.95
36	2.47	2.96	3.35	3.89	4.42	4.87
37	2.43	2.92	3.30	3.83	4.35	4.80
38	2.39	2.87	3.25	3.78	4.29	4.74
39	2.35	2.83	3.20	3.72	4.23	4.67
40	2.31	2.78	3.15	3.67 0.800	4.17 0.905	4.61
41	2.28	2.74	3.11	3.62	4.12	4.55
42	2.24	2.70	3.06	3.57	4.06	4.49
43	2.21	2.67	3.02	3.52	4.01	4.43
44	2.17	2.63	2.98	3.48	3.96	4.37
45	2.14	2.59	2.94	3.43	3.91	4.32
46	2.11	2.56	2.90	3.39	3.86	4.27
47	2.08	2.52	2.86	3.34	3.81	4.22
48	2.05	2.49	2.83	3.30	3.76	4.17
49	2.02	2.46	2.79	3.26	3.72	4.12
50	2.00	2.43	2.76	3.23	3.68	4.07
51	1.97	2.40	2.72	3.19	3.64	4.03
52	1.94	2.37	2.69	3.15	3.59	3.98
53	1.92	2.34	2.66	3.12	3.55	3.94
54	1.89	2.31	2.63	3.08	3.52	3.90

SOURCE: NOAA Hy

City of
SPRINGDALE
Arkansas

RAINFALL INTENSITY CHART
(In inches per hour)

Table 2.2

Duration (min)	Frequency 2yr	5yr	10yr	25yr	50yr	100yr
55	1.87	2.28	2.60	3.05	3.48	3.86
56	1.85	2.26	2.57	3.01	3.44	3.82
57	1.82	2.23	2.54	2.98	3.41	3.78
58	1.80	2.21	2.51	2.95	3.37	3.74
59	1.78	2.18	2.49	2.92	3.34	3.70
60	1.76	2.16	2.46	2.89	3.30	3.67
120	1.05	1.33	1.54	1.85	2.14	2.40
180	0.75	0.99	1.16	1.40	1.63	1.84
6hr	0.42	0.58	0.69	0.86	1.01	1.16
12hr	0.23	0.34	0.41	0.52	0.62	0.72
24hr	0.13	0.19	0.24	0.31	0.38	0.45

SOURCE: NOAA Hydro-35

City of
SPRINGDALE
Arkansas

RAINFALL INTENSITY CHART
(In inches per hour)

Table 2.2

Table 2-3a. – Runoff Curve Numbers for Urban Areas[a]

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type and Hydrologic Condition	Average Percent Impervious Area[b]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[c]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding ROW)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding ROW)		98	98	98	98
Paved; open ditches (including ROW)		83	89	92	93
Gravel (including ROW)		76	85	89	91
Dirt (including ROW)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[d]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1-to-2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
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 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[e]		77	86	91	94
Idle lands (CNs are determined using cover types similar to those in Table 2-2c).					

[a]Average runoff condition, and $I_a = 0.2S$.
[b]The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CNs for other combinations of conditions may be computed using Figure 2-3 or 2-4.
[c]CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space cover type.
[d]Composite CNs for natural desert landscaping should be computed using Figure 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CNs are assumed equivalent to desert shrub in poor hydrologic condition.
[e]Composite CNs to use for the design of temporary measures during grading and construction should be computed using Figure 2-3 or 2-4, based on the degree of development (impervious area percentage) and the CNs for the newly graded pervious areas.

Notes: CN = Curve number.
ROW = Right-of-way.

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Table 3-7

Soil Names and Hydrological Classification in Arkansas

Acadia D
Adaton D
Agnos B
Alaga A
Allen B
Alligator D
Amagon D
Amy D
Angie C
Apison B
Arkabutla C
Ashton B
Ashwood C
Askew C
Avilla B

Barling C
Baxter B
Beasley C
Beulah B
Bibb D
Billyhaw D
Blevins B
Boden C
Bodine B
Bonn D
Bosket B
Boswell D
Bowdre C
Bowie B
Brandon B
Briley B
Britwater B
Brocket C
Broseley B
Bruno A
BudeC
Buxin D
Brockwell B

Caddo D
Cahaba B
Calhoun D
Calloway C
Cane C
Captina C
Carnasaw C
Carytown D
Cascilla B
Caspiana B
Catalpa C
Ceda B
Chastain D
Chennely C
Cherokee D
Christian C
Clarksville B
Clebit D
Cleora B
Collins C
Commerce C
Conasauga C
Convent C
Corydon D
Coushatta B
Crevassee A
Crowley D
Cuthbert C

Darco A
Dardanelle B
Demopolis C
Desha D
Dexter B
Doniphan B
Dubbs B
Dundee C
Dunning D

Earle D
Egam C
Elsah B
Emory B
Enders C
Ennis B
Estate C
Etowah B
Eutaw D
Eylau C

Falaya C
Falkner C
Fatima B
Fayetteville B
Felker D
Foley D
Forrestdale D
Fountain D

Gallion B
Gasconade D
Gassville C
Geep B
Gladwater D
Goldsboro C
Goldston C
Gore D
Grenda C
Grubbs D
Guin A
Guthrie D
Guyton D

Harleston C
Hartsells B
Hatchie C
Hayti D
Healing B
Hebert C
Hector D
Henry D
Hillemann C
Hollywood D
Holston B
Houlka D
Houston D
Huntington B

Iberia D
Iuka C
Izagora C

Jackport D
Jay C
Jeanerette D
Johnsburg D

Kalmia B
Kamie B
Karma B
Kaufman D
Keo B
Kiematia A
Kipling D
Kirvin C
Kobel D

Lafe D
Lagrange D
Latanier D
Latonia B
Leadvale C
Leaf D
Leeper D
Leesburg B
Lexington B
Lindside C
Lily B
Linker B
Lobelville C
Locust C
Lonoke B
Loring C
Lucy A
Luverne C

Mantachie C
Marietta C
Marvell B
Mashulaville D
Mayes D
Mayhew D
McCrory D
McGehee C
McKamic D
McLaurin B
Melvin D
Memphis B
Mhoon D
Miller D
Millwood D
Moko C
Monongahela C
Montevallo D
Moreland D
Morganfield B
Morse D
Mountainburg D
Muldrow D
Muskogee C
Myatt D

Nacogdoches B
Natchez B
Nella B
Newardk C
Newellton D
Newtonia B
Nixa C
Noark B
Norfolk B
Norwood B
Nugent A

Oaklimeter C
Oklared B
Ochlockonee B
Oktibbeha B
Ora C
Orangeburg B
Ouachita C
Ozan D

Patterson C
Pembroke B
Peridge B
Perry D
Pheba D
Philo C
Pickens D
Pickwick B
Pikeville B
Pirum B
Pipe B
Protia C
Portland D
Prentiss C
Providence C
Ramsey D
Razort B
Rexor A
Rilla B
Roanoke D
Robinsville B
Roellen D
Routon D
Ruston B

Sacul D
Saffell B
Sallisaw B
Samba D
Sardis C
Savannah C
Sawyer C
Secesh B
Sequatchie B
Sessum D
Sharkey D
Sherwood B
Shubuta C
Sidon C
Sloan D
Smithdale B
Smithton D
Sogn D
Spadra B
Stanser B
State B
Steele B
Steprock B
Sterlington B
Stough C
Sturkie B
Stuttgart D
Summit C
Sumter C
Susquehanna D

Taft C
Talbott C
Taloka D
Terouge D
Tiak C
Tichnor D
Tippah C
Tiptonville B
Toine B
Townley C
Trebloc D
Trinity D
Troup A
Tuckerman D
Tunica D
Tuscumbia D
Tutwiler B

Una D

Vaiden D
Ventris D

Wabbaseka D
Wabeh B
Wardell C
Waverly D
Waynesboro B
Weston D
Wickham B
Wideman A
Wilcox D
Wilson S

Table 2-3b.—Runoff Curve Numbers for Cultivated Agricultural Lands[a]

Cover Description			Curve Numbers for Hydrologic Soil Group			
Cover Type	Treatment[b]	Hydrologic Condition[c]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured and terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T = CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T +CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[a]Average runoff condition, and $I_a = 0.2S$.
[b]*Crop residue cover* applies only if residue is on at least 5% of the surface throughout the year.
[c]Hydrologic condition is based on combination of factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes in rotations, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Notes: *Poor* = Factors impair infiltration and tend to increase runoff.
Good = Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-3c.—Runoff Curve Numbers for Other Agricultural Lands[a]

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type	Hydrologic Condition[c]	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing[b]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element[e]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30[d]	48	65	73
Woods—grass combination (orchard or tree farm)[e]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods[f]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30[d]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots	—	59	74	82	86

[a]Average runoff condition, and $I_a = 0.2S$.
[b]*Poor* = < 50% ground cover or heavily grazed with no mulch.
Fair = 50 to 75% ground cover and not heavily grazed.
Good = 75% ground cover and lightly or only occasionally grazed.
[c]*Poor* = < 50% ground cover.
Fair = 50 to 75% ground cover.
Good = 75% ground cover.
[d]Actual curve number is less than 30; use CN = 30 for runoff computations.
[e]CNs shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CNs for woods and pasture.
[f]*Poor* = Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair = Woods are grazed but not burned, and some forest litter covers the soil.
Good = Woods are protected from grazing, and litter and brush adequately cover the soil.

Rainfall (inches)	Runoff Curve Number (RCN)								
	60	65	70	75	80	85	90	95	98
1.0	0	0	0	0.03	0.08	0.17	0.32	.56	.79
1.2	0	0	0.03	0.07	0.15	0.28	0.46	.74	.99
1.4	0	0.02	0.06	0.13	0.24	0.39	0.61	.92	1.18
1.6	0.01	0.05	0.11	0.20	0.34	0.52	0.76	1.11	1.38
1.8	0.03	0.09	0.17	0.29	0.44	0.65	0.93	1.29	1.58
2.0	0.06	0.14	0.24	0.38	0.56	0.80	1.09	1.48	1.77
2.5	0.17	0.30	0.46	0.65	0.89	1.18	1.53	1.96	2.27
3.0	0.33	0.51	0.72	0.96	1.25	1.59	1.98	2.45	2.78
4.0	0.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
5.0	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	1.92	2.35	2.80	3.28	3.78	4.31	4.85	5.41	5.76
7.0	2.60	3.10	3.62	4.15	4.69	5.26	5.82	6.41	6.76
8.0	3.33	3.90	4.47	5.04	5.62	6.22	6.81	7.40	7.76
9.0	4.10	4.72	5.34	5.95	6.57	7.19	7.79	8.40	8.76
10.0	4.90	5.57	6.23	6.88	7.52	8.16	8.78	9.40	9.76
11.0	5.72	6.44	7.13	7.82	8.48	9.14	9.77	10.39	10.76
12.0	6.56	7.32	8.05	8.76	9.45	10.12	10.76	11.39	11.76

1/ To obtain runoff depths for RCN's and other rainfall amounts not shown in this Table, use an arithmetic interpolation.

DIRECT RUNOFF VALUES
BY RCN'S AND RAINFALL AMOUNTS

Source: U.S. Soil Conservation Service
Technical Release No. 55

RUNOFF CURVE NUMBER WORKSHEET

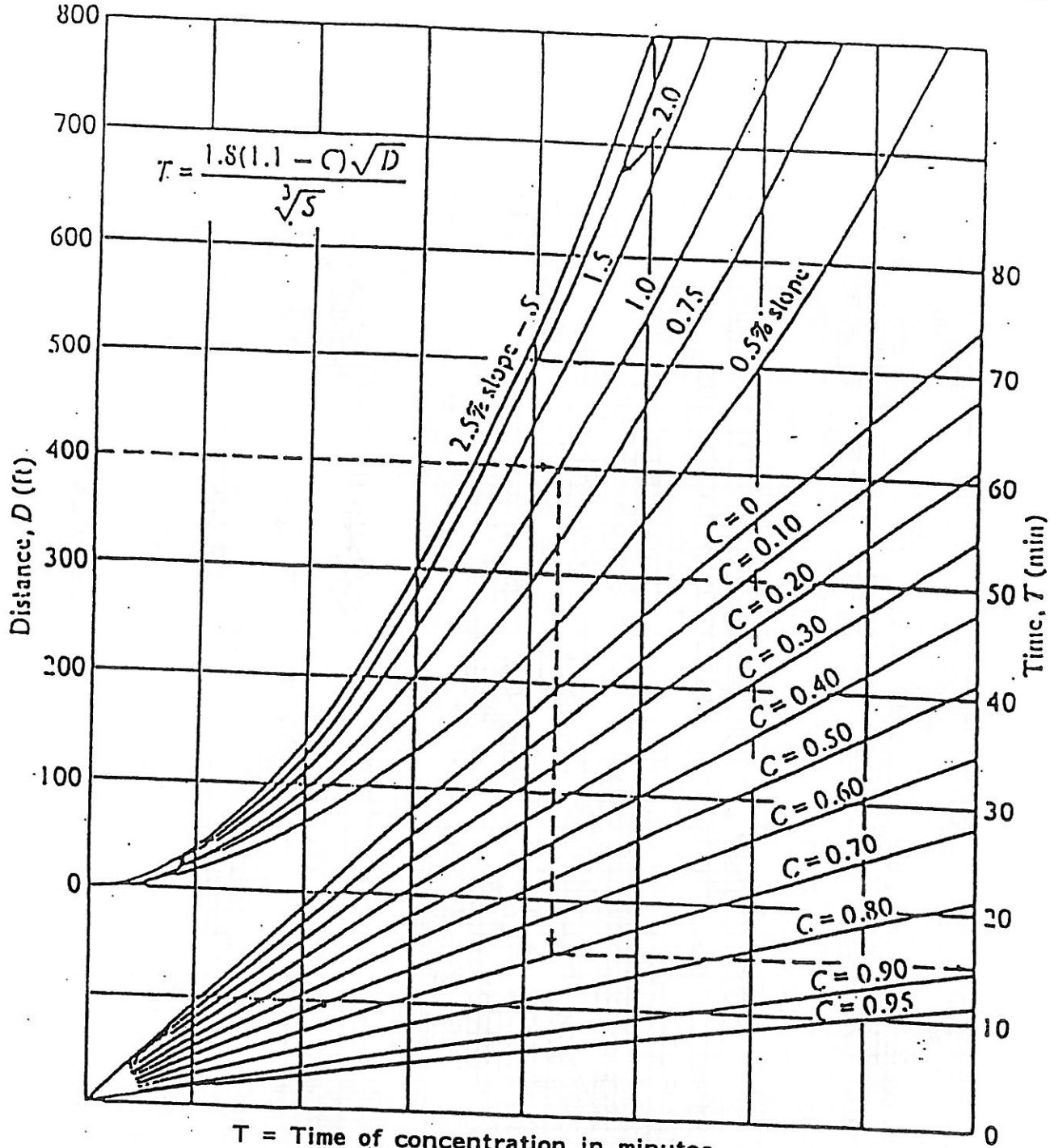
Subbasin _____

_____

_____

LAND USE	RCN	ACRES	RCN X ACRES
	TOTALS		

$$\text{WEIGHTED RCN} = \frac{\text{Total (RCN X Acres)}}{\text{TOTAL ACRES}} =$$

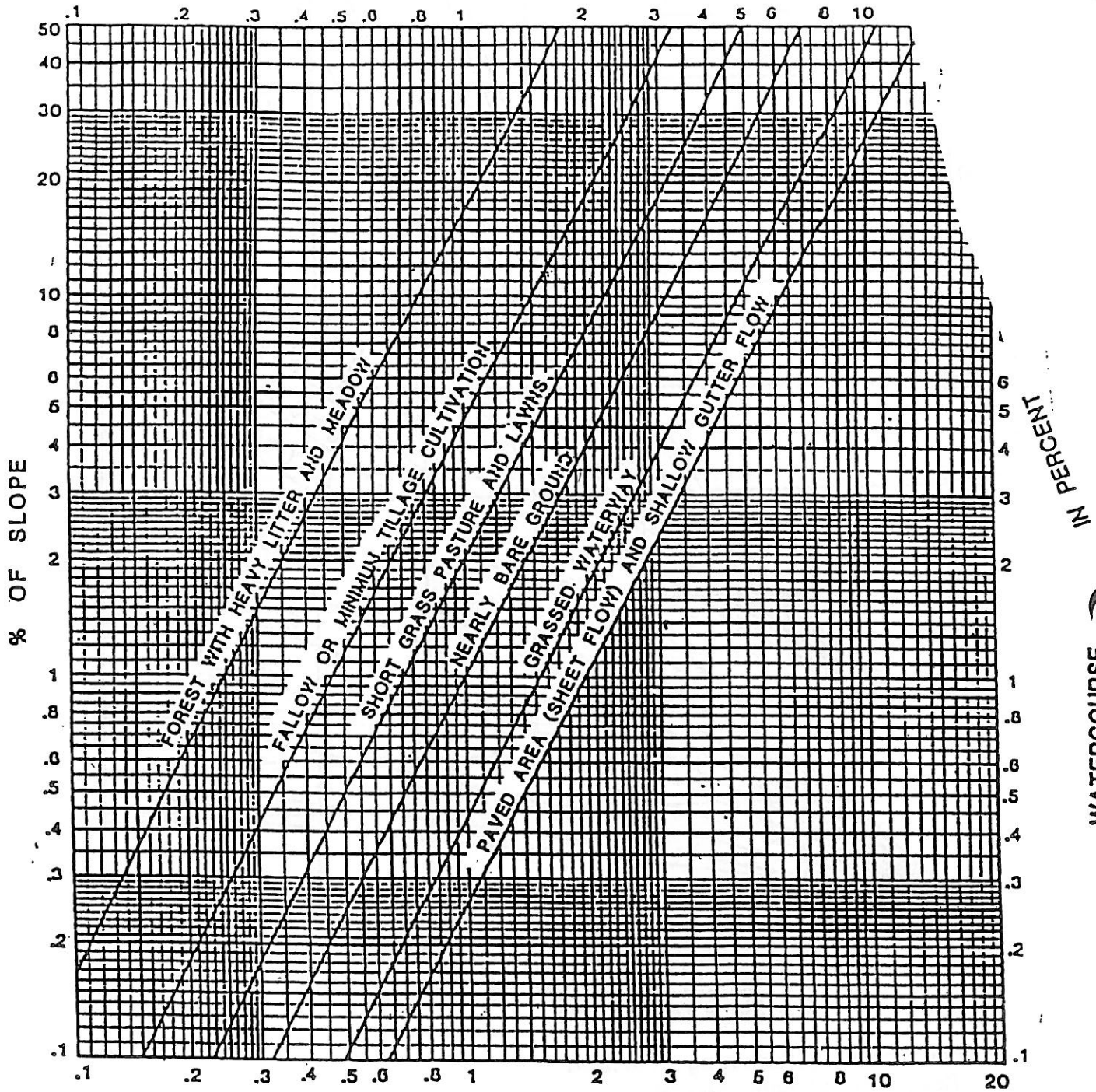


T = Time of concentration in minutes
C = Average Runoff Coefficient
D = Length of overland flow in feet
S = Slope percentage

NOTE: For use in determining overland flow, time of concentration

SOURCE: "AIRPORT DRAINAGE" FEDERAL AVIATION AGENCY DEPARTMENT OF TRANSPORTATION

City of SPRINGDALE Arkansas	RATIONAL METHOD TRAVEL TIME FOR OVERLAND FLOW/ NON-URBANIZED WATERSHEDS	Figure 2.1



SOURCE: U.S. SOIL CONSERVATION SERVICE. TECHNICAL RELEASE #55

City of
SPRINGDALE
Arkansas

RATIONAL METHOD
TRAVEL TIME VELOCITY FOR RATIONAL METHOD
CHANNELIZED FLOW

Figure 2.2