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HYDROLOGIC SOIL GROUPS
FOR INDIANA

Soil properties influence the process of generation of runoff from rainfall and must be considered in methods of runoff estimation. When runoff from individual storms is the major concern, the properties can be represented by a hydrologic parameter which reflects the minimum rate of infiltration obtained for a bare soil after prolonged wetting. The influences of both the surface and the horizons of a soil are therefore included.

The soils are classified into four hydrologic groups (A, B, C, and D) on the basis of water intake at the end of a long-duration storm occurring after prior wetting and after an opportunity for swelling, and without the protective effects of vegetation. By definition, the infiltration rate is the rate at which water enters the soil at the surface and which is controlled by surface conditions, and the transmission rate is the rate at which the water moves in the soil and which is controlled by the horizons.

Table IN-2-2 gives the hydrologic soil group for each soil series found in Indiana, and in some instances, gives more than one hydrologic soil group classification for a series. In using this table, the first group shown is the probable maximum improvement that can be made through artificial drainage and the maintenance or improvement of soil structure; the second group shown is the native or natural group that the soil series is usually classified under when its water intake characteristics have not been significantly changed by artificial drainage, land use, or other factors. Generally speaking, those series having more than one classification are soils with relatively high water tables where artificial drainage measurably improves their ability to absorb rainfall and thus reduces runoff.

TABLE IN 2-2
HYDROLOGIC SOIL GROUPS FOR INDIANA SOILS

SOIL NAME	HYDRO GROUP	SOIL NAME	HYDRO GROUP	SOIL NAME	HYDRO GROUP
ABSCOTA	A	BELLEVILLE	B/D	CARMEL	C
ACKERMAN	A/D 1/	BELMORE	B	CARMI	B
ADE	A	BERKS	C	CASCO	B
ADRIAN	A/D	BETHESDA	C	CATLIN	B
ALFORD	B	BEWLEYVILLE	B	CELINA	C
ALGANSEE	B	BILLETT	B	CERESCO	B
ALGIERS	C/D	BIRDS	C/D	CHAGRIN	B
ALIDA	B	BIRKBECK	B	CHALMERS	B/D
ALLISON	B	BLOOMFIELD	A	CHATTERTON	A
ALVIN	B	BLOUNT	C	CHEEKTOWAGA	D
AMBRAW	B/D	BOBTOWN	C	CHELSEA	A
ANDRES	B	BONNELL	C	CHETWYND	B
APTAKISIC	B	BONNIE	C/D	CINCINNATI	C
ARMIESBURG	B	BONO	D	CLARENCE	D
ASHKUM	B/D	BOOKER	D	CLERMONT	D
ATKINS	D	BOONESBORO	B	CLYDE	B/D
AUBBEENAUBBEE	B	BOOTS	A/D	COBBSFORD	D
AVA	C	BOURBON	B	COESSE	C/D
AVONBURG	D	BOWES	B	COHOCTAH	B/D
AYR	B	BOYER	B	COLOMA	A
AYRMOUNT	B	BRADY	B	COLYER	D
AYRSHIRE	C	BRANCH	B	COMFREY	B/D
BANLIC	C	BREMS	A	CONOTTON	B
BARCE	B	BRENTON	B	CONOVER	C
BARRY	B/D	BROMER	C	CONRAD	A/D
BARTLE	D	BRONSON	B	COOLVILLE	C
BATTLEGROUND	B	BROOKSTON	B/D	CORWIN	B
BAXTER	B	BRUNO	A	CORY	C
BEANBLOSSOM	B	BRYCE	D	CORYDON	D
BEASLEY	C	BURNSIDE	B	COUPEE	B
BEAUCOUP	B/D	CADIZ	B	CRAIGMILE	B/D
BECKVILLE	B	CAMDEN	B	CRANE	B
BEDFORD	C	CANA	C	CRAWLEYVILLE	B
BEECHER	C	CANEYVILLE	C	CRIDER	B
BELKNAP	C	CARLISLE	A/D	CROSBY	C

Notes: Two hydrologic soil groups such as B/C indicate the drained/undrained situation.
Modifiers shown, e.g., bedrock substratum, refer to a specific soil series phase found in soil map legend.

TABLE IN 2-2
HYDROLOGIC SOIL GROUPS FOR INDIANA SOILS

SOIL NAME	HYDRO GROUP	SOIL NAME	HYDRO GROUP	SOIL NAME	HYDRO GROUP
CROSIER	C	FAXON	B/D	HICKORY	C
CUBA	B	FINCASTLE	C	HIGH GAP	C
CYCLONE	B/D	FLANAGAN	B	HILLSDALE	B
DANA	B	FORESMAN	B	HOLTON	C
DARROCH	B	FOX	B	HOMER	B
DARROCH, BEDROCK SUBSTRATUM	C	FREDERICK	B	HONONEGAH	A
		FREE	B/D	HOOPESTON	B
DEARBORN	B	FULTON	D	HOOSIERVILLE	C
DEL REY	C	GENESEE	B	HOSMER	C
DEPUTY	C	GESSIE	B	HOUGHTON	A/D
DERINDA	C	GILBOA	B	HOYTVILLE	C/D
DESKER	A	GILFORD	B/D	HUNTINGTON	B
DICKINSON	B	GILFORD, STRAT. SUBSTRATUM	D	HUNTSVILLE	B
DIGBY	B			IONA	B
DOOR	B	GILPIN	C	IPAVA	B
DOWAGIAC	B	GINAT	D	IROQUOIS	B/D
DRIFTWOOD	C/D	GLENHALL	B	IVA	C
DRUMMER	B/D	GLYNWOOD	C	JASPER	B
DU PAGE	B	GOSPORT	C	JENNINGS	C
DUBOIS	C	GRANBY	A/D	JOHNSBURG	D
DUNNING	D	GRAVELTON	B/D	JULES	B
EBAL	B	GRAYFORD	B	JUNIUS	C
EDEN	C	GRISWOLD	B	KALAMAZOO	B
EDENTON	C	GROVECITY	B	KENDALLVILLE	B
EDWARDS	B/D	GUDGEL	C	KENTLAND	A/D
EEL	B	GUTHRIE	D	KERSTON	A/D
ELDEAN	B	HAGERSTOWN	C	KIBBIE	B
ELKINSVILLE	B	HANEY	B	KINGS	D
ELLIOTT	C	HANNA	B	KOKOMO	B/D
ELSTON	B	HARPSTER	B/D	KOSCIUSKO	B
EVANSVILLE	B/D	HASKINS	C	KURTZ	C
FABIUS	B	HAUBSTADT	C	LAFAYETTE	B
FAIRMOUNT	D	HAYMOND	B	LA HOGUE	B
FAIRPOINT	C	HENNEPIN	B	LANDES	B
FARMINGTON	C	HENSHAW	C	LASH	B

Notes: Two hydrologic soil groups such as B/C indicate the drained/undrained situation.
Modifiers shown, e.g., bedrock substratum, refer to a specific soil series phase found in soil map legend.

TABLE IN 2-2
HYDROLOGIC SOIL GROUPS FOR INDIANA SOILS

SOIL NAME	HYDRO GROUP	SOIL NAME	HYDRO GROUP	SOIL NAME	HYDRO GROUP
LAURAMIE	B	MILLGROVE	B/D	OSHTEMO	B
LAWRENCE	C	MILLSDALE	B/D	OTWELL	C
LENAWEE	B/D	MILTON	C	OUIATENON	A
LINDSIDE	C	MONITOR	C	OWOSSO	B
LINKVILLE	C	MONTGOMERY	D	PALMS	A/D
LINWOOD	A/D			PAPINEAU	C
LISBON	B	MONTMORENCI	B	PARKE	B
LOBDELL	B	MORLEY	C	PARR	B
LOMAX	B	MOROCCO	B	PATE	C
LONGLOIS	B	MOUNDHAVEN	A	PATTON	B/D
LOSANTVILLE	C	MUDLAVIA	B	PEKIN	C
LUCAS	D	MULVEY	B	PELLA	B/D
LYDICK	B	MUNDELEIN	B	PEOGA	C
LYLES	B/D	MUREN	B	PEOTONE	B/D
MAHALASVILLE	B/D	MUSKEGO	A/D	PETROLIA	B/D
MAPLEHILL	C	MUSKINGUM	C	PEWAMO	C/D
MARKER	B	MUSSEY	B/D	PHILO	B
MARKHAM	C	NAPOLEON	A/D	PIANKESHAW	B
MARKLAND	C	NAPPANEE	D	PIKE	B
MARKTON	C	NEGLEY	B	PINEVILLAGE	B
MARTINSVILLE	B	NESIUS	A	PINHOOK	B/D
MARTISCO	B/D	NEWARK	C	PIOPOLIS	C/D
MAUMEE	A/D	NEWGLARUS	B	PIPESTONE	B
MCGARY	C	NEWTON	A/D	PLAINFIELD	A
MEDORA	B	NICHOLSON	C	PLANO	B
MEDWAY	B	NINEVEH	B	POPE	B
MELLOTT	B	NOLIN	B	PRINCETON	A
MERMILL	B/D	OAKVILLE	A	PROCHASKA	A/D
METAMORA	B	OCKLEY	B	PROCTOR	B
METEA	B	OCTAGON	B	QUINN	B/D
MIAMI	B	ODELL	B	RAGSDALE	B/D
MIAMIAN	C	OLDENBURG	B	RAGSDALE, OVERWASH	B
MIDDLEBURY	B	ONARGA	B	RAHM	C
MILFORD	B/D	ORMAS	B	RAINSVILLE	B
MILLBROOK	B	ORRVILLE	C		

Notes: Two hydrologic soil groups such as B/C indicate the drained/undrained situation.

TABLE IN 2-2
HYDROLOGIC SOIL GROUPS FOR INDIANA SOILS

SOIL NAME	GROUP	SOIL NAME	GROUP	SOIL NAME	GROUP
RANDOLPH	C	SELFRIDGE	B	TAMA	B
RARDEN	C	SELMA	B/D	TAWAS	A/D
RAUB	C	SEWARD	B	TECUMSEH	B
RAWSON	B	SHADELAND	C	TEDROW	B
REDDICK	B/D	SHAKAMAK	C	THACKERY	B
REESVILLE	C	SHIPSHE	B	THROCKMORTON	B
RENSSELAER	B/D	SHOALS	C	TICE	B
RENSSELAER, NONSTRATIFIED SUBSTRATUM	B C	SIDELL	B	TILSIT	C
		SIMONIN	B	TIPPECANOE	B
		SISSON	B	TOLEDO	D
RICHARDSVILLE	B	SKELTON	B	TORONTO	C
RIDDLES	B	SLEETH	C	TOTO	B/D
RIDGEVILLE	B	SLOAN	B/D	TRACY	B
RIMER	C	SPARTA	A	TRAPPIST	C
RIVERDALE	A	SPINKS	A	TREATY	B/D
ROBY	C	ST. CHARLES	B	TREVLAC	B
ROCKCASTLE	D	ST. CLAIR	D	TROXEL	B
ROCKFIELD	B	STARKS	C	TUSCOLA	B
ROCKTON	B	STEFF	C	TYNER	A
RODMAN	A	STENDAL	C	UNIONTOWN	B
ROSS	B	STOCKLAND	B	VARNA	C
ROSSMOYNE	C	STONELICK	B	VIGO	D
RUARK	B/D	STOY	C	VINCENNES	C/D
RUSH	B	STRAWN	B	VOLINIA	B
RUSSELL	B	STROLE	C	WABASH	D
RYKER	B	SUMAN	B/D	WAKELAND	C
SABLE	B/D	SUMAVA	B	WALLKILL	C/D
SARANAC	C/D	SUNBURY	B	WARNERS	C/D
SARANAC, GRAVELLY SUBSTRATUM	C	SWANWICK	D	WARSAW	B
		SWITZERLAND	B	WASEPI	B
SAUGATUCK	C	SWYGERT	C	WASHTENAW	C/D
SAWABASH	B	SYLVAN	B	WATSEKA	B
SCIOTOVILLE	C	SYMERTON	B	WAUPECAN	B
SEAFIELD	B	TAFTOWN	B	WAUSEON	B/D
SEBEWA	B/D	TAGGART	C	WAWASEE	B

Notes: Two hydrologic soil groups such as B/C indicate the drained/undrained situation.
Modifiers shown, e.g., bedrock substratum, refer to a specific soil series phase found in soil map legend.

TABLE IN 2-2
HYDROLOGIC SOIL GROUPS FOR INDIANA SOILS

SOIL NAME	HYDRO GROUP	SOIL NAME	HYDRO GROUP	SOIL NAME	HYDRO GROUP
WAYNETOWN	C				
WEA	B				
WEIKERT	C/D				
WEINBACH	C				
WEISBURG	C				
WELLSTON	B				
WESTLAND	B/D				
WHEELING	B				
WHITAKER	C				
WHITSON	D				
WILBUR	B				
WILHITE	C/D				
WILLETTE	A/D				
WILLIAMSPORT	C				
WILLIAMSTOWN	C				
WINGATE	B				
WIRT	B				
WOLCOTT	B/D				
WOODMERE	B				
WOOLPER	C				
WYNN	B				
XENIA	B				
ZABOROSKY	B				
ZADOG	A/D				
ZANESVILLE	C				
ZIPP	D				

Notes: Two hydrologic soil groups such as B/C indicate the drained/undrained situation.
Modifiers shown, e.g., bedrock substratum, refer to a specific soil series phase found in soil map legend.

(EFM Notice IN-52, October 1989)

Adjustment For Pond and Swamp Areas

The values obtained by the procedure in this chapter provide reasonable peak discharges for small watersheds except on areas where ponds or swampy areas occur in the watershed. Where these conditions occur, a considerable amount of the surface runoff may be retained in temporary storage and the peak rate of runoff should be reduced to reflect this condition. A pond and swamp adjustment factor is obtained from table IN-2-1 (rounded to the nearest table value). The Fp factor can be applied only for ponds or swamps that are not in the Tc flow path. If pond and swamp areas occur in the Tc flow path area, a flood routing procedure should be used.

Table IN-2-1 Adjustment Factor (Fp) For Pond And Swamp Areas

Percentage of Watershed Area	Fp
0	1.00
0.2	0.97
1.0	0.87
2.0	0.81
3.0	0.75
5.0	0.72

Indiana Hydrology Maps

The following figures have been developed on Indiana maps to provide more detailed information for use with various hydrologic calculations in Indiana.

Figure IN 2-1 (7 sheets) shows the rainfall for 24 hour duration storms for 1, 2, 5, 10, 25, 50 and 100 year frequencies.

Figure IN-2-2 (3 sheets) shows the rainfall for 10 day duration storms for 25, 50, and 100 year frequencies.

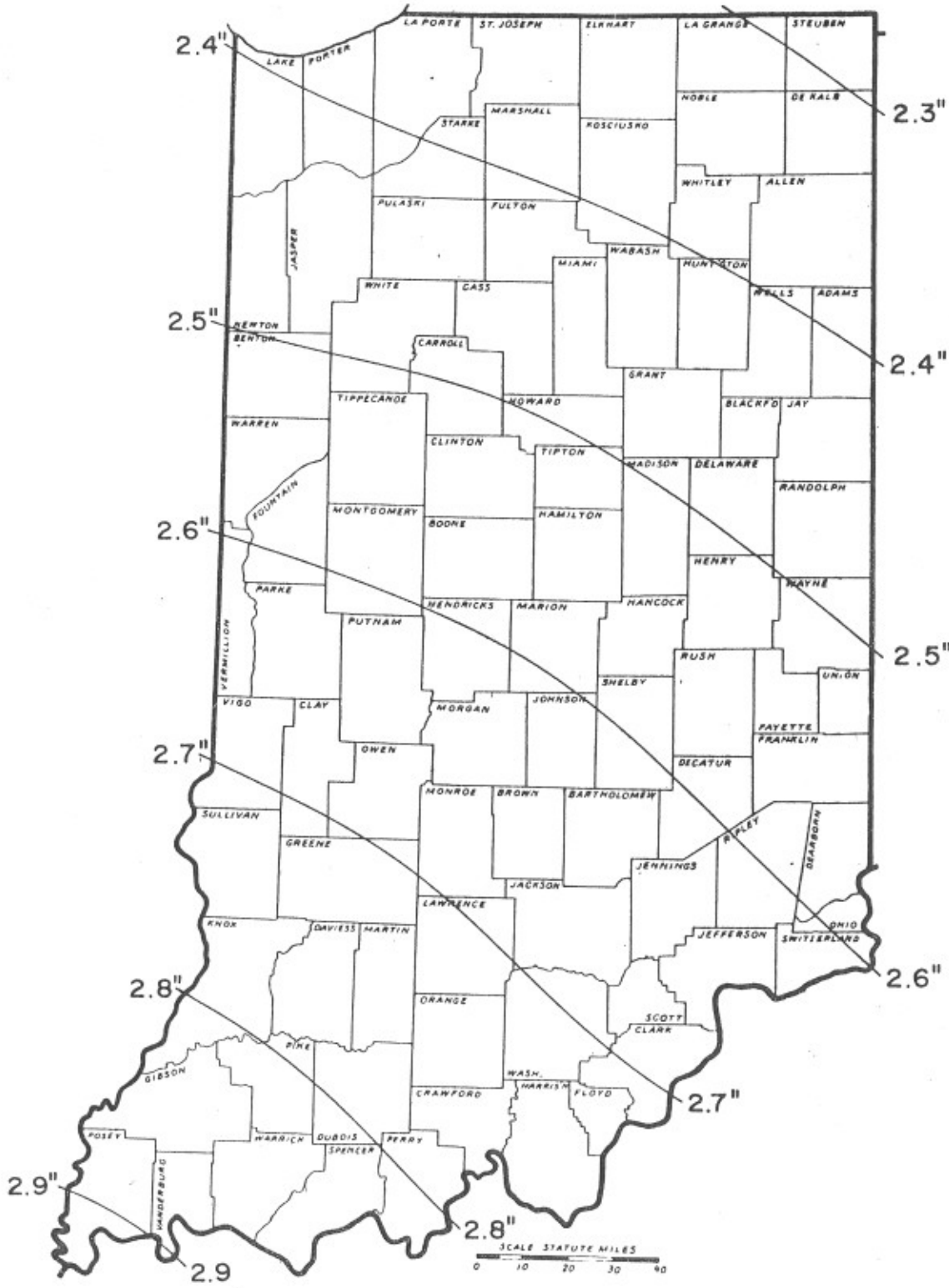
Figure IN-2-3 (1 sheet) shows the runoff for a 100 year storm frequency of 10 day duration. It also shows multiplier values to convert to 5, 10, 25 and 50 year frequencies with 10 day duration runoff values and to 1 day duration storms.

Figure IN-2-4 (6 sheets) shows the various 6 hour duration precipitation data required for the emergency spillway and freeboard hydrographs by Technical Release No. 60 - Earth Dams and Reservoirs, October 1985.

Figure IN-2-5 (1 sheet) shows the quick return flow.

Figure IN-2-6 (1 sheet) shows the Indiana Department of Natural Resources Minimum Freeboard Rainfall required for all structures requiring a permit from them for construction. The total storage in acre-feet below the maxmimum stage of the principal spillway hydrograph determines the percentage of probable maximum precipitation, Figure IN-2-4, sheet 6 of 6, to be used to determine the overtopping storm or minimum top of fill elevation.

RAINFALL - 1 YEAR FREQUENCY - 24 HOUR DURATION



REFERENCE

Technical Paper No. 40
Weather Bureau
U.S. Dept. of Commerce

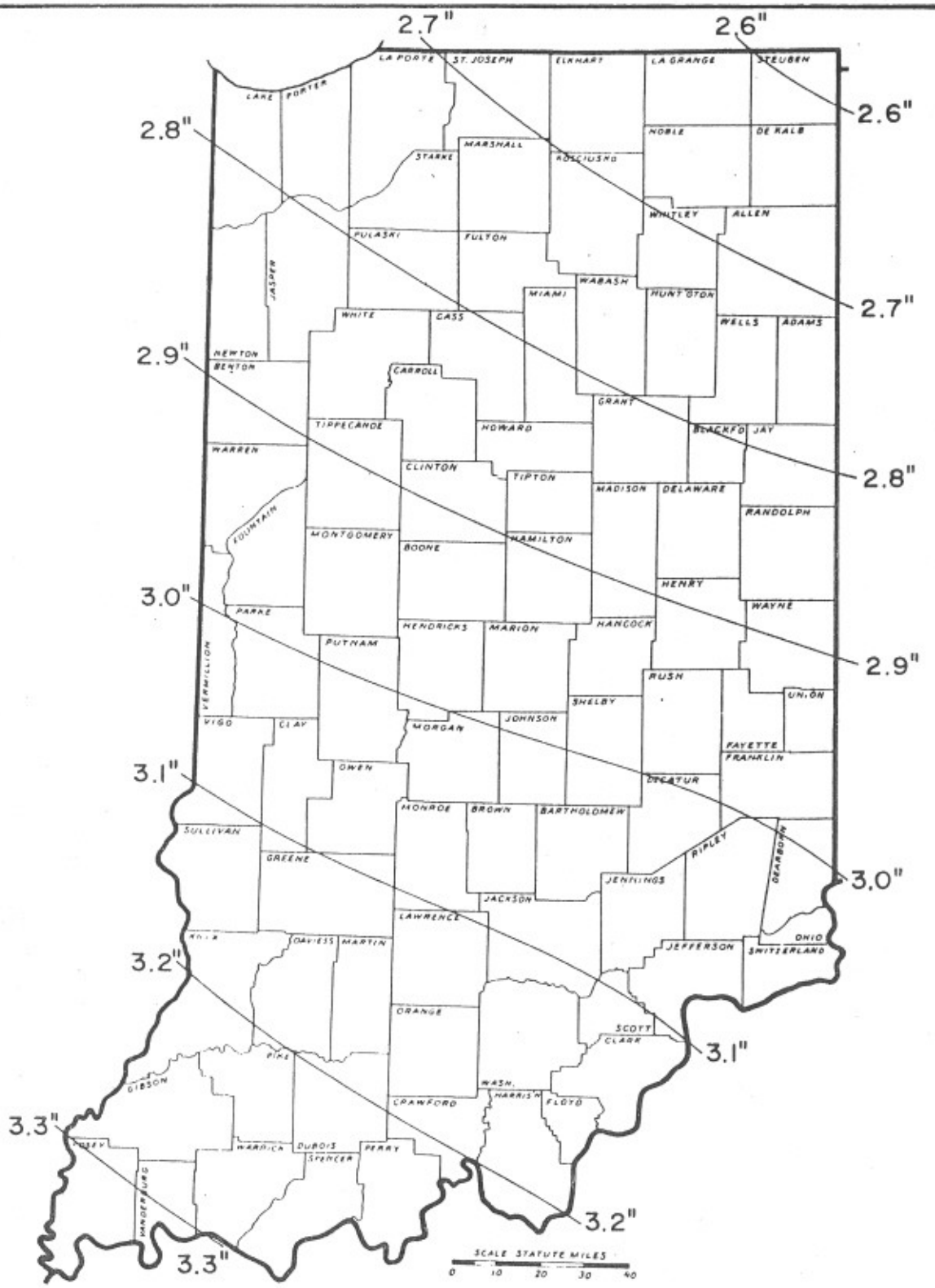
US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
INDIANA

Figure IN-2-1

Sheet 1 of 7

(EFM Notice IN-52, October 1989)

RAINFALL - 2 YEAR FREQUENCY - 24 HOUR DURATION



REFERENCE

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U.S. Dept. of Commerce

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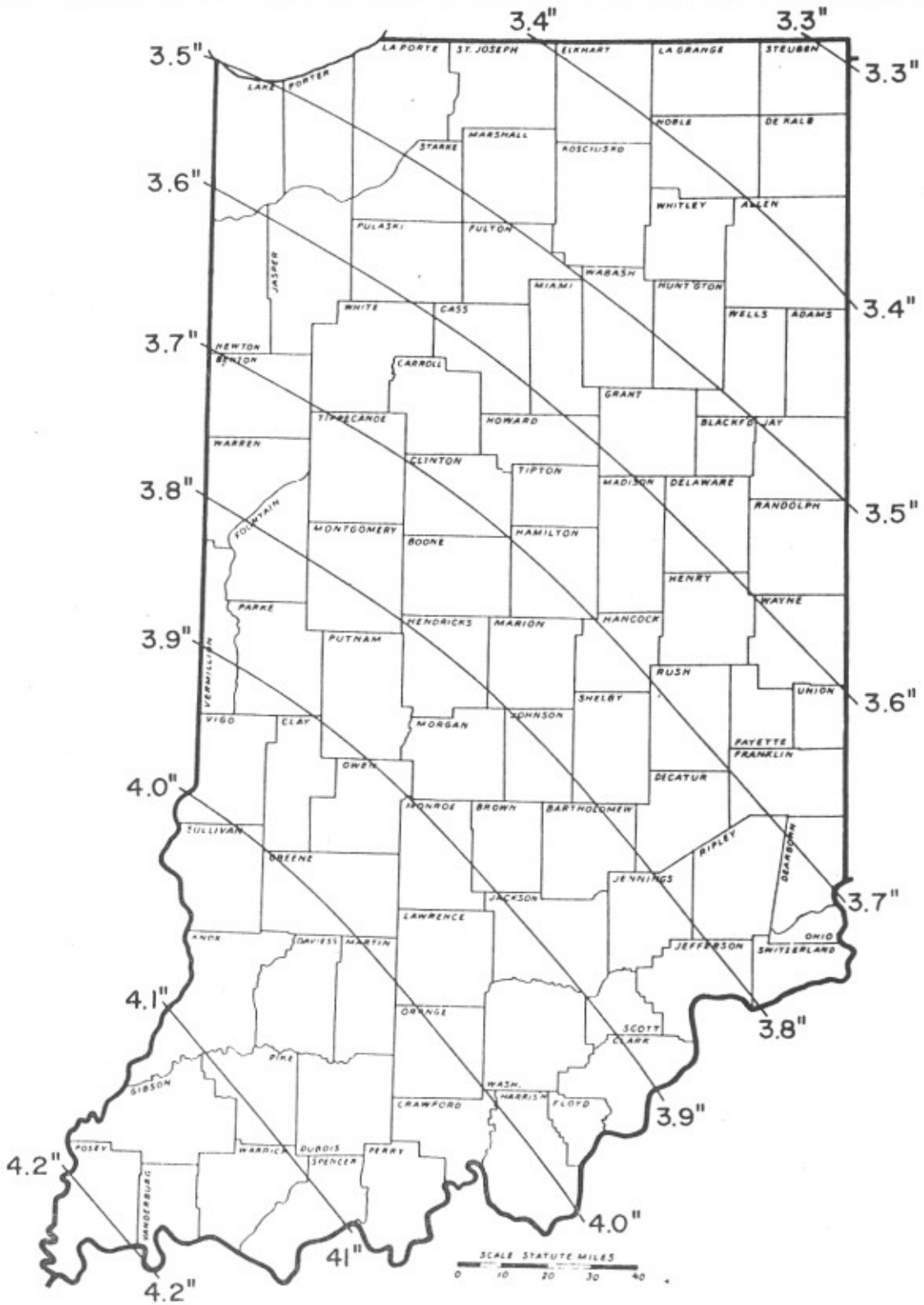
INDIANA

Figure IN-2-1

Sheet 2 of 7

(EFM Notice IN-52, October 1989)

RAINFALL - 5 YEAR FREQUENCY - 24 HOUR DURATION



REFERENCE
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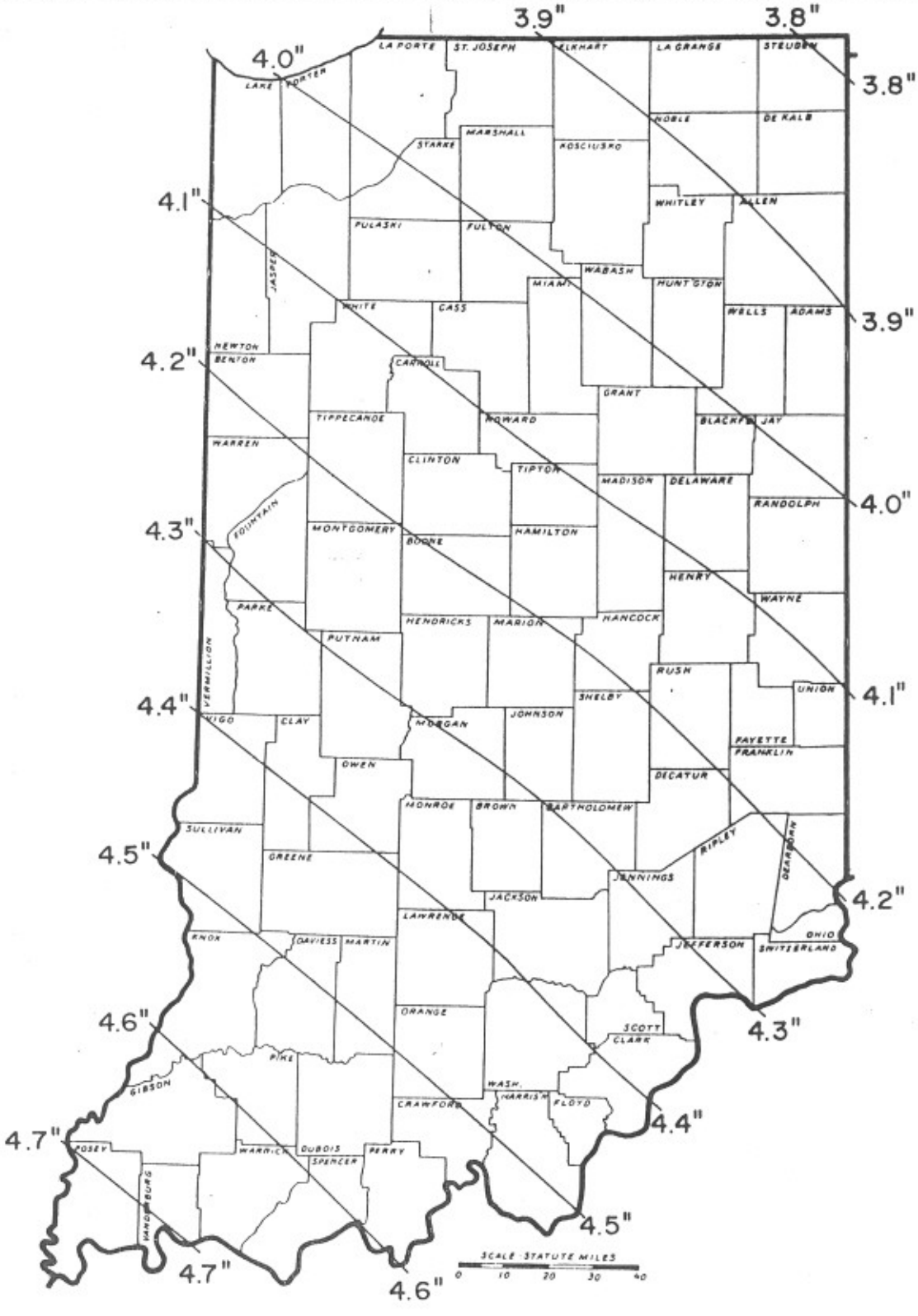
INDIANA

Figure IN-2-1

Sheet 3 of 7

(EFM Notice IN-52, October 1989)

RAINFALL - 10 YEAR FREQUENCY - 24 HOUR DURATION



REFERENCE
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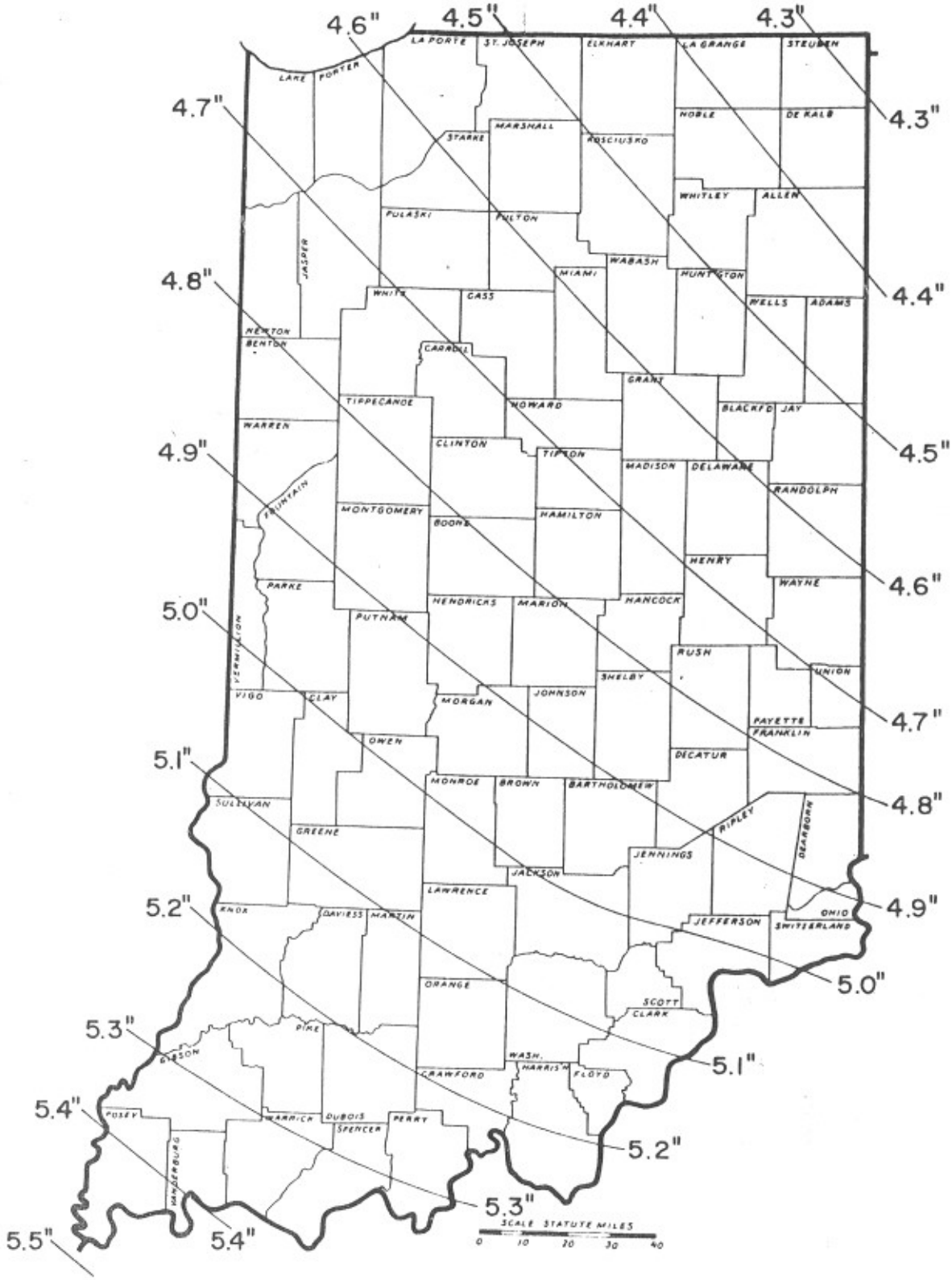
SOIL CONSERVATION SERVICE
INDIANA

Figure IN-2-1

Sheet 4 of 7

RAINFALL - 25 YEAR FREQUENCY - 24 HOUR DURATION



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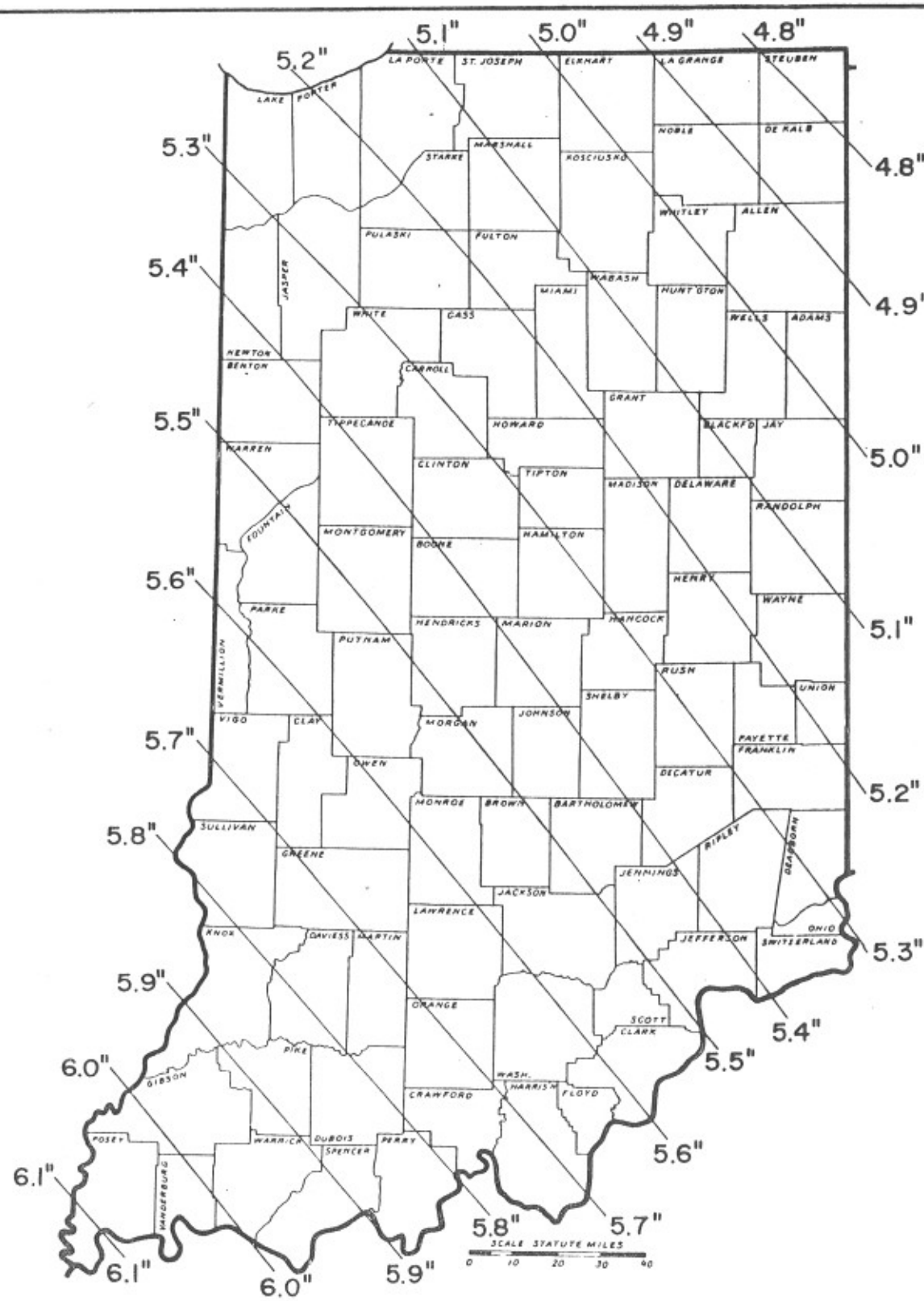
SOIL CONSERVATION SERVICE
INDIANA

Figure IN-2-1

Sheet 5 of 7

(EFM Notice IN-52, October 1989)

RAINFALL - 50 YEAR FREQUENCY - 24 HOUR DURATION



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INDIANA

Figure IN-2-1

Sheet 6 of 7

RAINFALL - 100 YEAR FREQUENCY - 24 HOUR DURATION

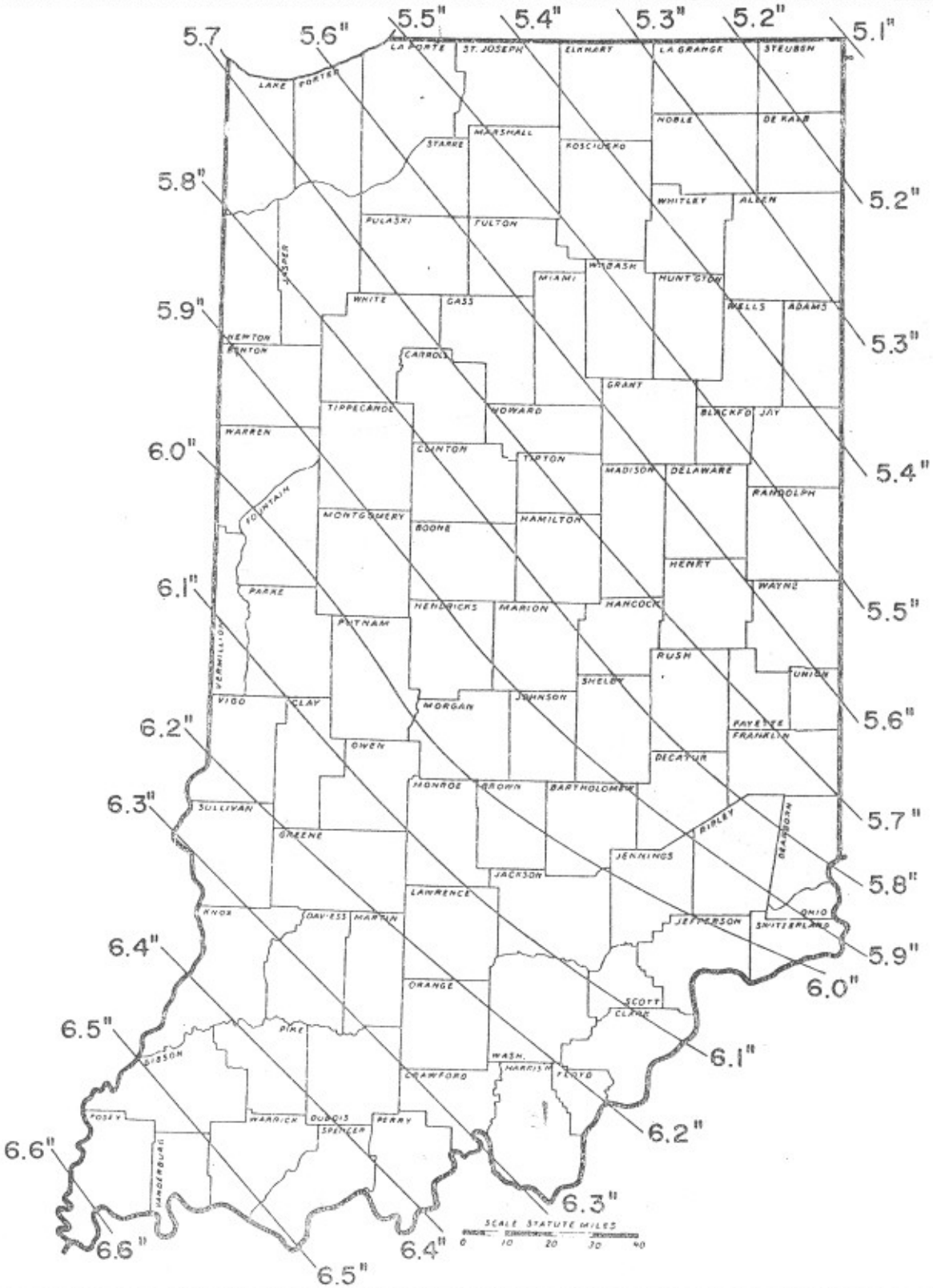

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Figure IN-2-1

Sheet 7 of 7

(EFM Notice IN-52, October 1989)

Exhibit IN-2-II —Unit peak discharge (q_u) for SCS Type II rainfall distribution

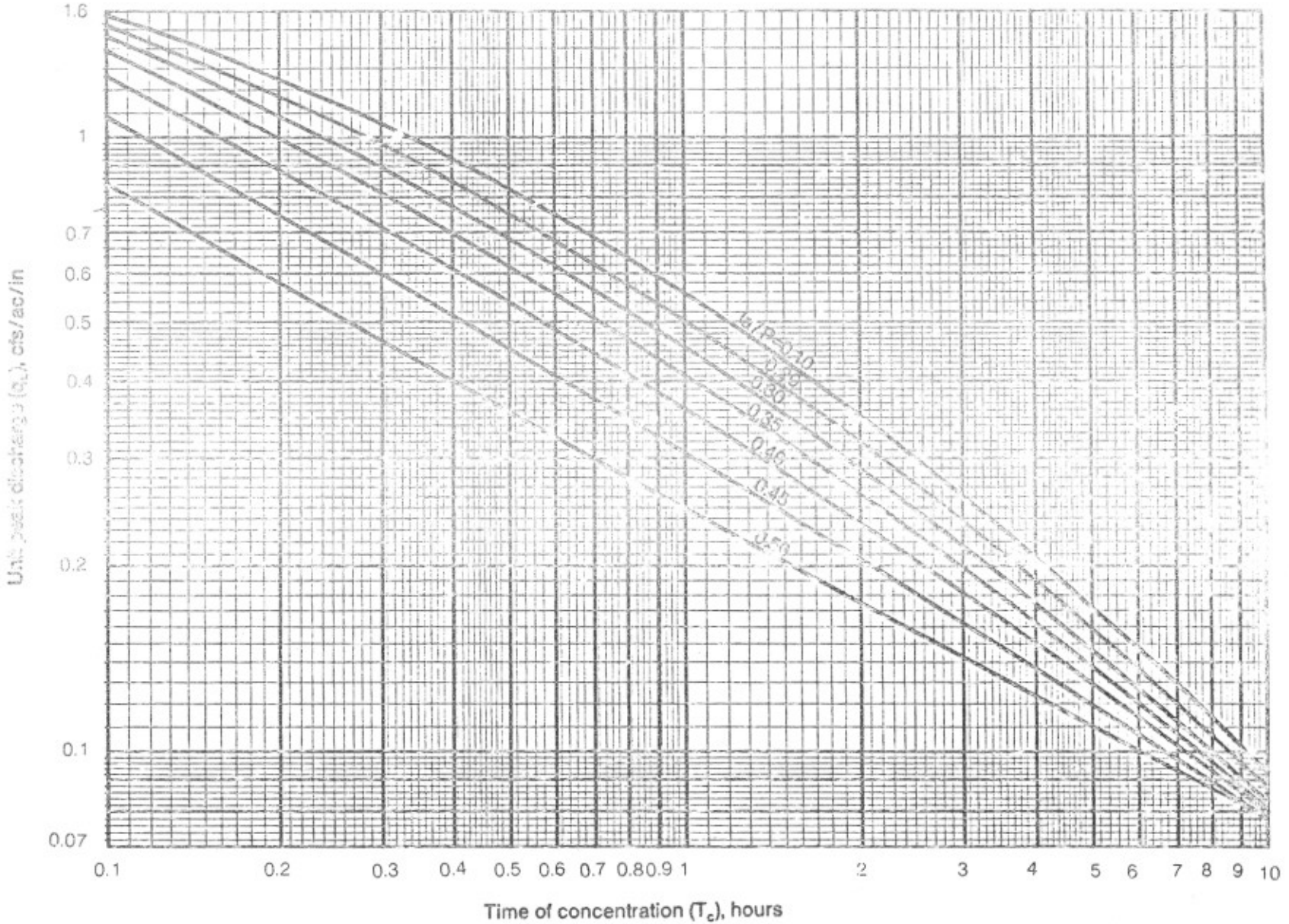


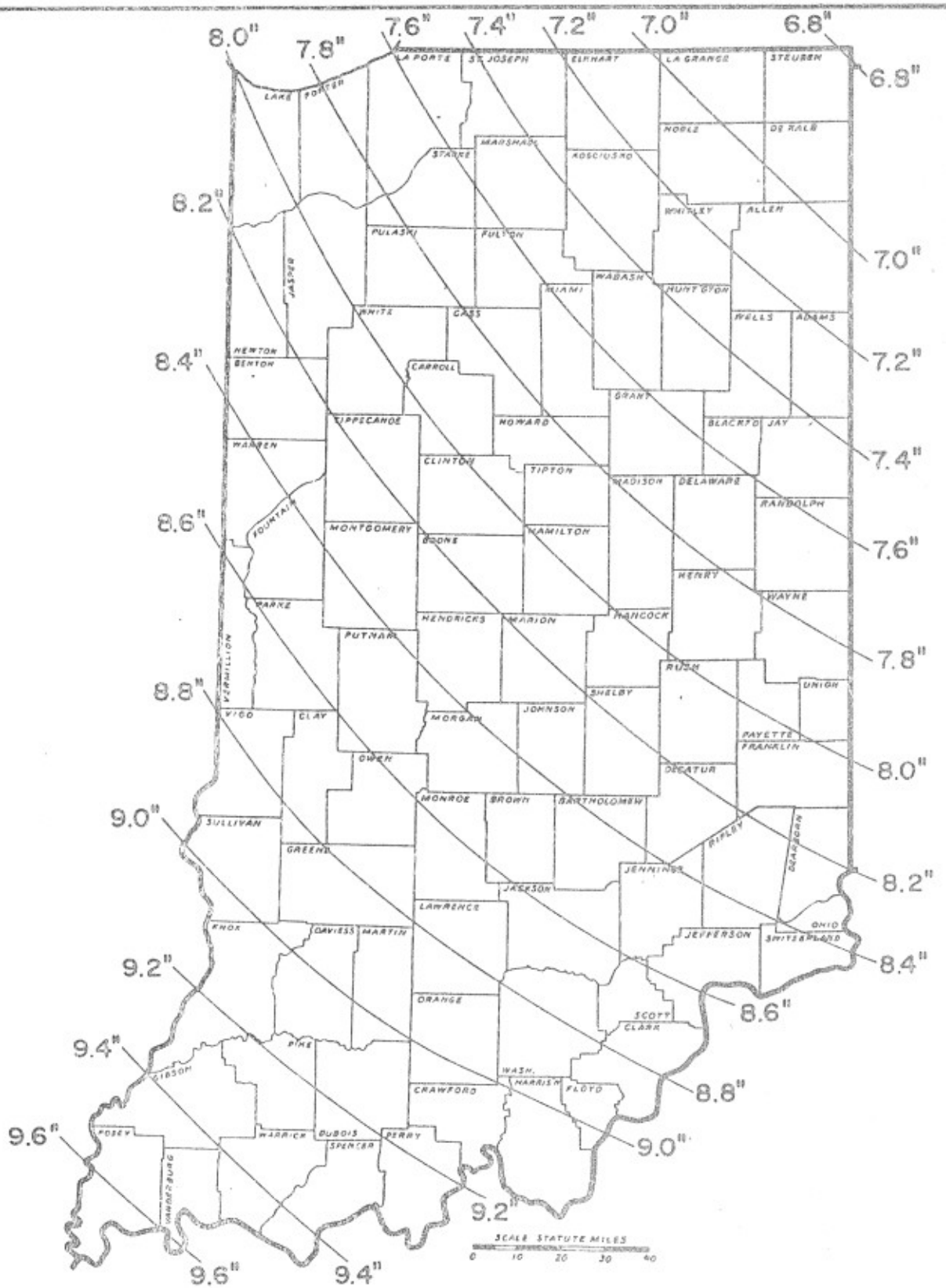
EXHIBIT IN-2-II-A - UNIT PEAK DISCHARGE (qu) - cfs/acre/inch
for SCS Type II rainfall distribution

Ia/p	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.35	0.40	0.45	0.50
Tc															
0.10	1.58	1.57	1.55	1.54	1.53	1.52	1.51	1.50	1.49	1.47	1.46	1.38	1.26	1.08	0.79
0.12	1.49	1.48	1.47	1.45	1.44	1.43	1.41	1.40	1.39	1.37	1.36	1.27	1.15	0.98	0.73
0.14	1.42	1.41	1.39	1.38	1.36	1.35	1.33	1.32	1.30	1.29	1.28	1.19	1.07	0.90	0.67
0.16	1.36	1.34	1.33	1.31	1.29	1.28	1.26	1.25	1.23	1.22	1.20	1.11	1.00	0.84	0.63
0.18	1.30	1.28	1.27	1.25	1.24	1.22	1.20	1.19	1.17	1.16	1.14	1.05	0.94	0.79	0.59
0.20	1.25	1.23	1.22	1.20	1.18	1.17	1.15	1.14	1.12	1.10	1.09	1.00	0.89	0.75	0.56
0.22	1.20	1.19	1.17	1.15	1.14	1.12	1.10	1.09	1.07	1.06	1.04	0.95	0.85	0.71	0.54
0.24	1.16	1.14	1.13	1.11	1.09	1.08	1.06	1.05	1.03	1.02	1.00	0.91	0.81	0.68	0.51
0.26	1.12	1.11	1.09	1.07	1.06	1.04	1.02	1.01	0.99	0.98	0.96	0.88	0.77	0.65	0.49
0.28	1.09	1.07	1.05	1.04	1.02	1.01	0.99	0.97	0.96	0.94	0.93	0.84	0.74	0.62	0.48
0.30	1.06	1.04	1.02	1.01	0.99	0.97	0.96	0.94	0.93	0.91	0.90	0.81	0.72	0.60	0.46
0.32	1.03	1.01	0.99	0.98	0.96	0.94	0.93	0.91	0.90	0.88	0.87	0.79	0.69	0.58	0.45
0.34	1.00	0.98	0.96	0.95	0.93	0.92	0.90	0.89	0.87	0.86	0.84	0.76	0.67	0.56	0.43
0.36	0.97	0.96	0.94	0.92	0.91	0.89	0.88	0.86	0.85	0.83	0.82	0.74	0.65	0.54	0.42
0.38	0.95	0.93	0.91	0.90	0.88	0.87	0.85	0.84	0.82	0.81	0.79	0.72	0.63	0.53	0.41
0.40	0.92	0.91	0.89	0.88	0.86	0.85	0.83	0.82	0.80	0.79	0.77	0.70	0.61	0.51	0.40
0.42	0.90	0.89	0.87	0.86	0.84	0.82	0.81	0.80	0.78	0.77	0.75	0.68	0.60	0.50	0.39
0.44	0.88	0.87	0.85	0.84	0.82	0.81	0.79	0.78	0.76	0.75	0.74	0.66	0.58	0.49	0.38
0.46	0.86	0.85	0.83	0.82	0.80	0.79	0.77	0.76	0.74	0.73	0.72	0.65	0.57	0.47	0.37
0.48	0.84	0.83	0.81	0.80	0.78	0.77	0.76	0.74	0.73	0.71	0.70	0.63	0.55	0.46	0.36
0.50	0.83	0.81	0.80	0.78	0.77	0.75	0.74	0.73	0.71	0.70	0.69	0.62	0.54	0.45	0.36
0.52	0.81	0.79	0.78	0.77	0.75	0.74	0.72	0.71	0.70	0.68	0.67	0.60	0.53	0.44	0.35
0.54	0.79	0.78	0.76	0.75	0.74	0.72	0.71	0.70	0.68	0.67	0.66	0.59	0.52	0.43	0.34
0.56	0.78	0.76	0.75	0.74	0.72	0.71	0.69	0.68	0.67	0.66	0.64	0.58	0.51	0.42	0.34
0.58	0.76	0.75	0.74	0.72	0.71	0.69	0.68	0.67	0.66	0.64	0.63	0.57	0.50	0.42	0.33
0.60	0.75	0.74	0.72	0.71	0.69	0.68	0.67	0.66	0.64	0.63	0.62	0.56	0.49	0.41	0.32
0.62	0.74	0.72	0.71	0.70	0.68	0.67	0.66	0.64	0.63	0.62	0.61	0.55	0.48	0.40	0.32
0.64	0.72	0.71	0.70	0.68	0.67	0.66	0.64	0.63	0.62	0.61	0.60	0.54	0.47	0.39	0.31
0.66	0.71	0.70	0.69	0.67	0.66	0.65	0.63	0.62	0.61	0.60	0.59	0.53	0.46	0.39	0.31
0.68	0.70	0.69	0.67	0.66	0.65	0.64	0.62	0.61	0.60	0.59	0.58	0.52	0.45	0.38	0.30
0.70	0.69	0.68	0.66	0.65	0.64	0.62	0.61	0.60	0.59	0.58	0.57	0.51	0.45	0.37	0.30

EXHIBIT IN-2-II-A - UNIT PEAK DISCHARGE (qu) - cfs/acre/inch - continued
for SCS Type II rainfall distribution

Ia/p	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.35	0.40	0.45	0.50
Tc															
0.70	0.69	0.68	0.66	0.65	0.64	0.62	0.61	0.60	0.59	0.58	0.57	0.51	0.45	0.37	0.30
0.75	0.66	0.65	0.64	0.62	0.61	0.60	0.59	0.58	0.57	0.55	0.54	0.49	0.43	0.36	0.29
0.80	0.64	0.63	0.61	0.60	0.59	0.58	0.57	0.56	0.54	0.53	0.52	0.47	0.41	0.35	0.28
0.85	0.62	0.60	0.59	0.58	0.57	0.56	0.55	0.54	0.52	0.51	0.50	0.45	0.40	0.34	0.27
0.90	0.60	0.58	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.44	0.38	0.33	0.26
0.95	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.42	0.37	0.32	0.26
1.00	0.56	0.55	0.54	0.53	0.52	0.50	0.49	0.48	0.48	0.47	0.46	0.41	0.36	0.31	0.25
1.1	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.43	0.39	0.34	0.29	0.24
1.2	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.43	0.42	0.41	0.41	0.37	0.32	0.28	0.23
1.3	0.47	0.46	0.45	0.45	0.44	0.43	0.42	0.41	0.40	0.39	0.39	0.35	0.31	0.26	0.22
1.4	0.45	0.44	0.43	0.42	0.42	0.41	0.40	0.39	0.38	0.38	0.37	0.33	0.29	0.25	0.21
1.5	0.43	0.42	0.41	0.40	0.40	0.39	0.38	0.37	0.37	0.36	0.35	0.32	0.28	0.24	0.20
1.6	0.41	0.40	0.40	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.30	0.27	0.23	0.20
1.7	0.40	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.32	0.29	0.26	0.23	0.19
1.8	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.28	0.25	0.22	0.18
1.9	0.37	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.31	0.30	0.27	0.24	0.21	0.18
2.0	0.35	0.35	0.34	0.33	0.33	0.32	0.31	0.31	0.30	0.29	0.29	0.26	0.24	0.21	0.17
2.2	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.25	0.22	0.19	0.17
2.4	0.31	0.30	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.25	0.23	0.21	0.18	0.16
2.6	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.22	0.20	0.18	0.15
2.8	0.27	0.27	0.26	0.26	0.25	0.25	0.25	0.24	0.24	0.23	0.23	0.21	0.19	0.17	0.15
3.0	0.26	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.22	0.22	0.22	0.20	0.18	0.16	0.14
3.5	0.23	0.23	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.18	0.16	0.15	0.13
4.0	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.16	0.15	0.14	0.12
4.5	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.14	0.13	0.11
5.0	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.13	0.12	0.11
5.5	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.13	0.12	0.11	0.10
6.0	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.12	0.11	0.11	0.10
7.0	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.09
8.0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.08
9.0	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08
10.0	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.07

RAINFALL - 25 YEAR FREQUENCY - 10 DAY DURATION



REFERENCE
Technical Paper No. 49
Weather Bureau
U.S. Dept. of Commerce

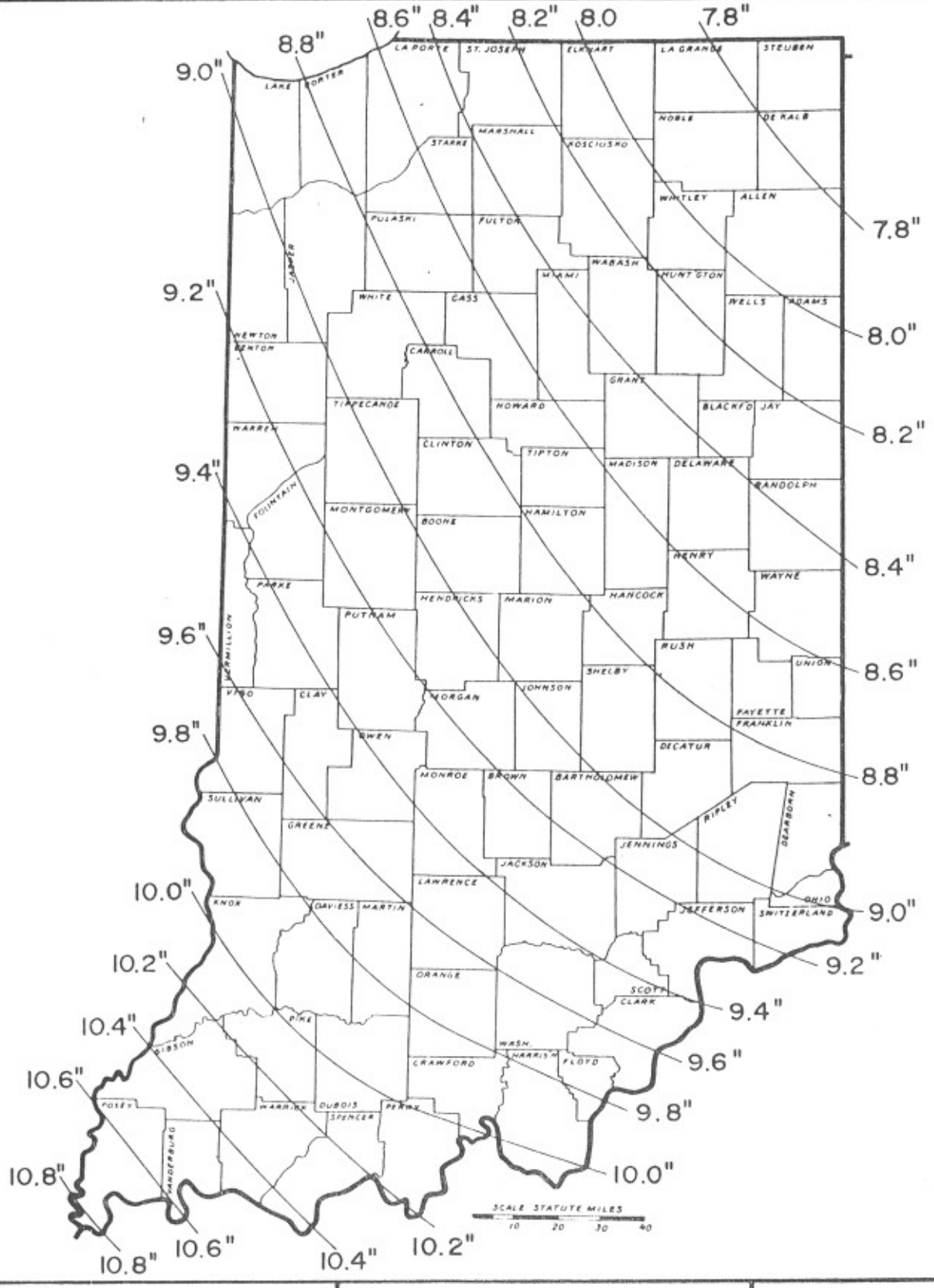
US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
INDIANA

Figure IN-2-2

Sheet 1 of 3

(EFM Notice IN-52, October 1989)

RAINFALL – 50 YEAR FREQUENCY – 10 DAY DURATION



REFERENCE

Technical Paper No. 49
Weather Bureau
U.S. Dept. of Commerce

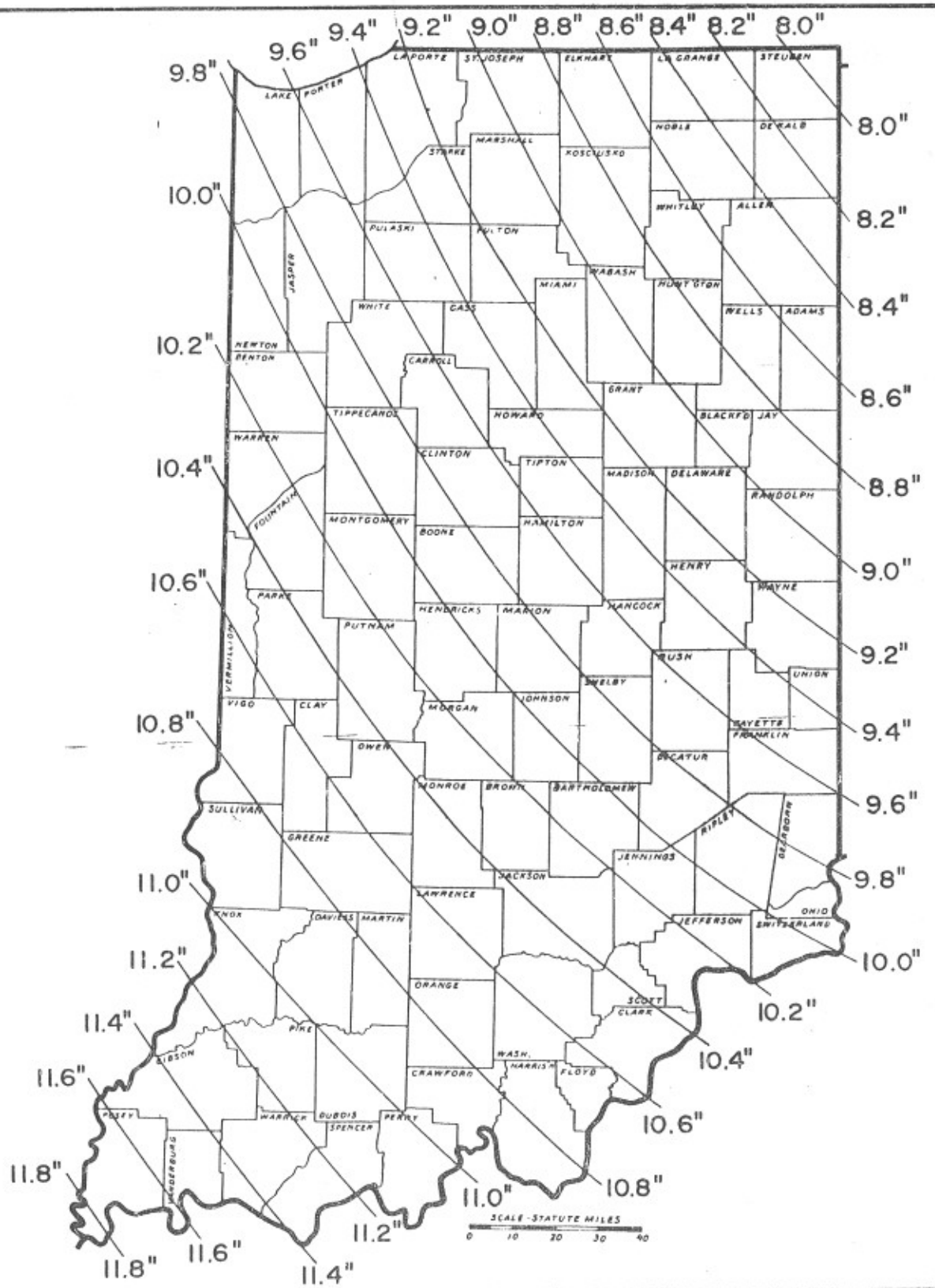
US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
INDIANA

Figure IN-2-2

Sheet 2 of 3

(EFM Notice IN-52, October 1989)

RAINFALL - 100 YEAR FREQUENCY - 10 DAY DURATION



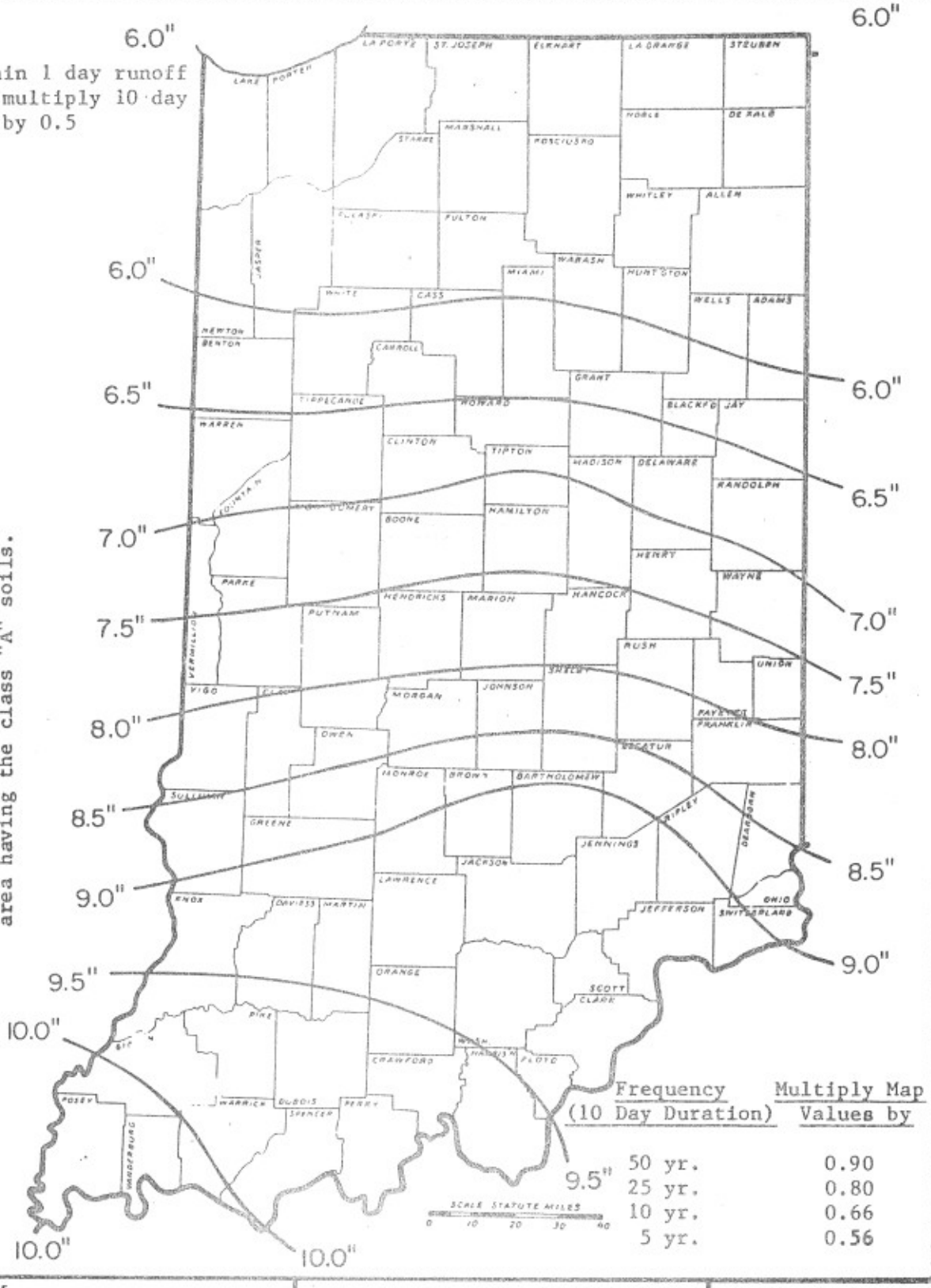
REFERENCE
Technical Paper No. 49
Weather Bureau
U.S. Dept. of Commerce

US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
INDIANA

Figure IN-2-2

Sheet 3 of 3

RUNOFF – 100 YEAR FREQUENCY – 10 DAY DURATION



To obtain 1 day runoff values multiply 10 day values by 0.5

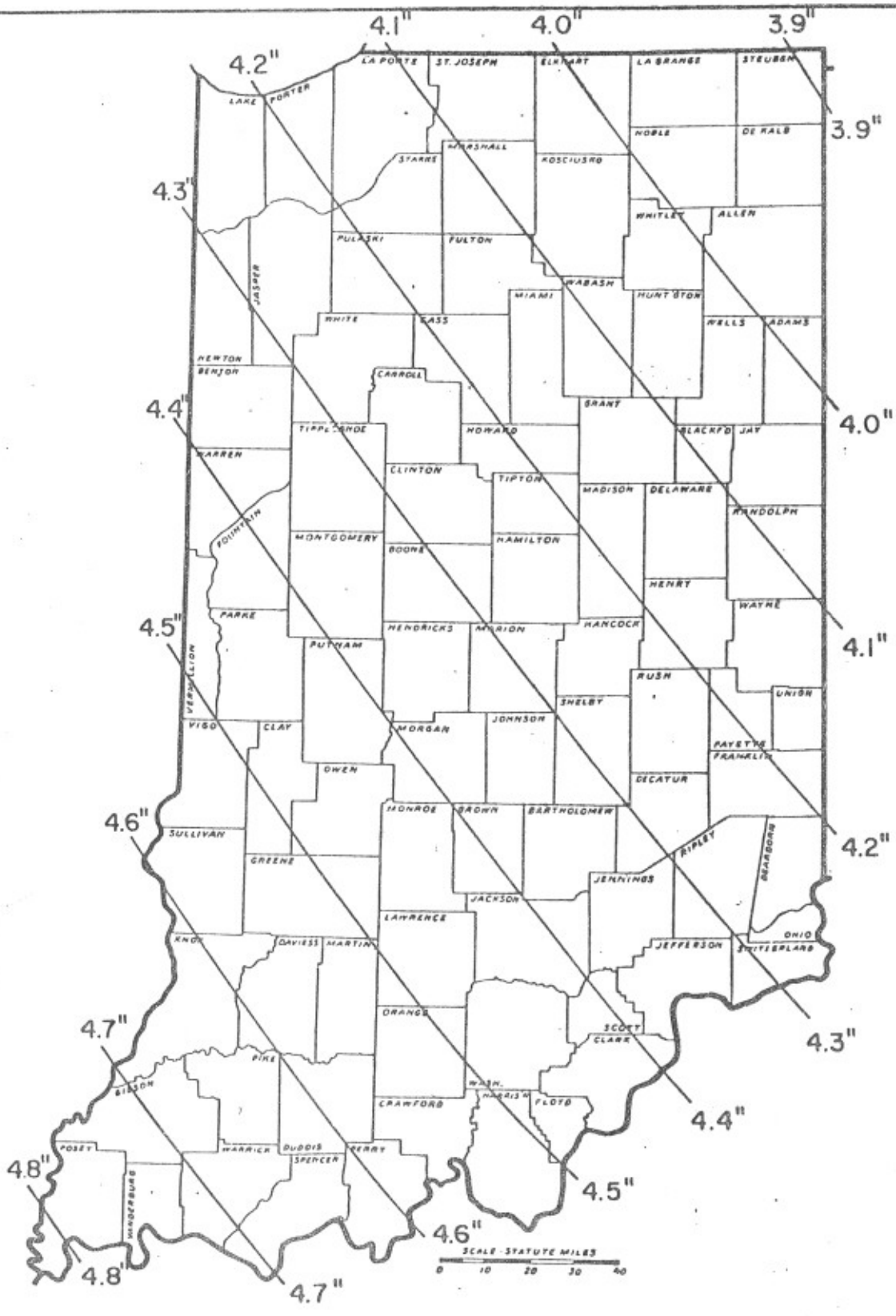
NOTE: Map values may be reduced 2.0 inches for drainage areas having deep, well drained soils (hydrologic class "A") in direct proportion to the percent of the drainage area having the class "A" soils.

Frequency (10 Day Duration)	Multiply Map Values by
50 yr.	0.90
25 yr.	0.80
10 yr.	0.66
5 yr.	0.56

REFERENCE		
Exhibits 21-1 and 21-2 SCS-NEH-4 January 1971	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE INDIANA	Figure IN-2-3 Sheet 1 of 1

(EFM Notice IN-52, October 1989)

RAINFALL- 100 YEAR FREQUENCY – 6 HOUR DURATION



REFERENCE
Technical Paper No. 40
Weather Bureau
U.S. Dep't. of Commerce

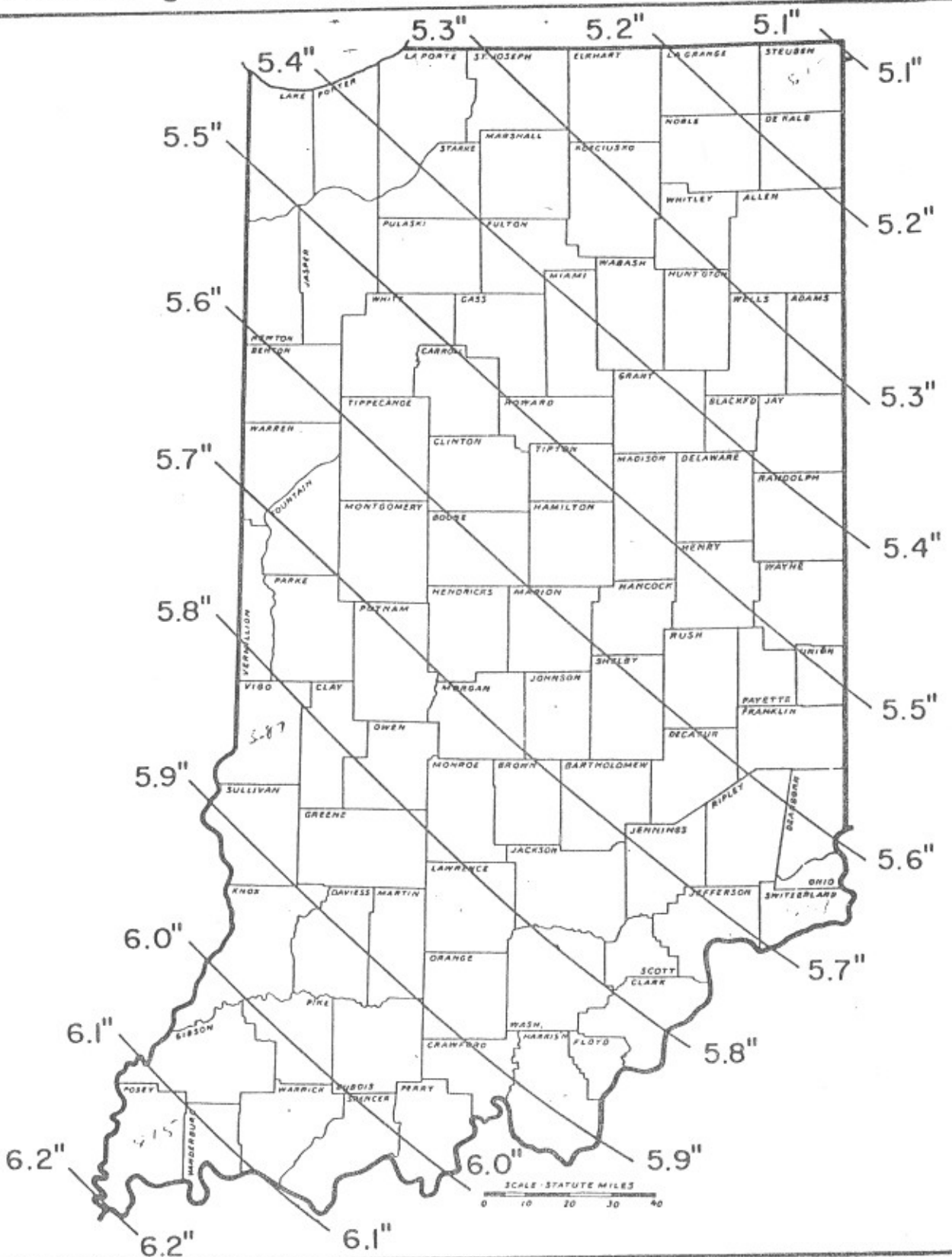
US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
INDIANA

Figure IN-2-4

Sheet 1 of 6

(EFM Notice IN-52, October 1989)

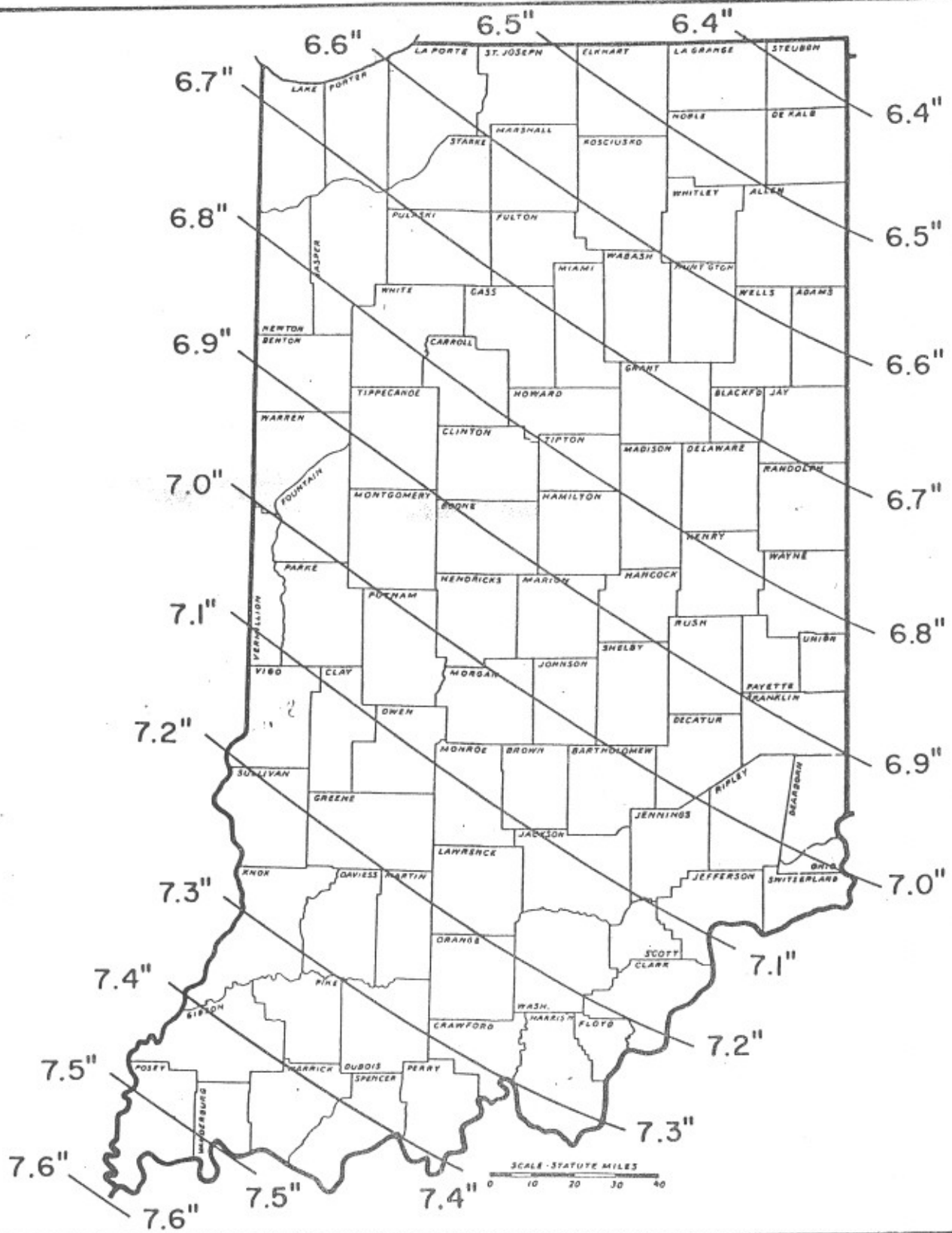
RAINFALL -- [P100 + 0.06(PMP - P100)] - 6 HOUR DURATION



REFERENCE		
SCS Technical Release No. 60, June 1976 Table 2-5	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE INDIANA	Figure IN-2-4 Sheet 2 of 6

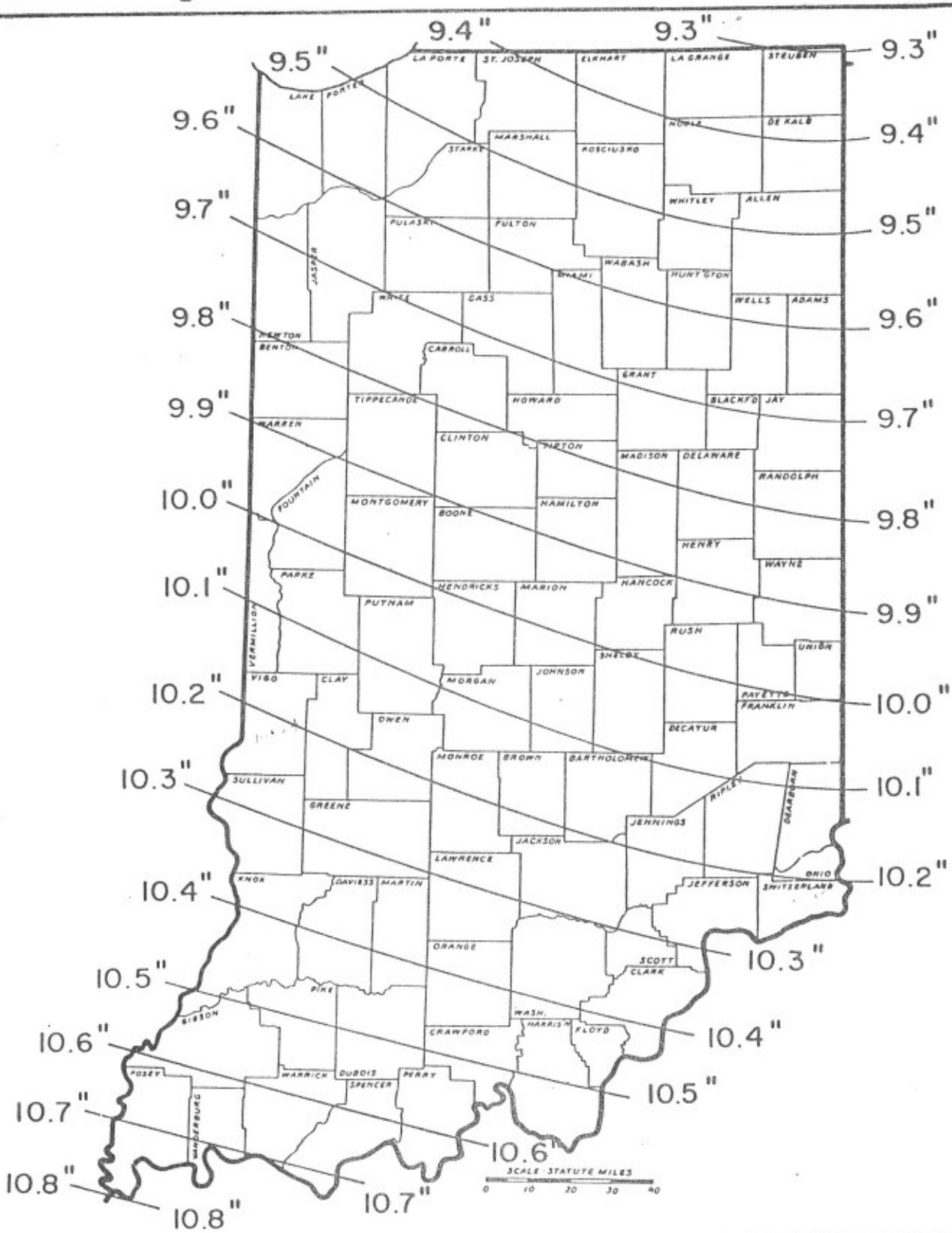
(EFM Notice IN-52, October 1989)

RAINFALL – [P100 + 0.12 (PMP – P100)] – 6 HOUR DURATION



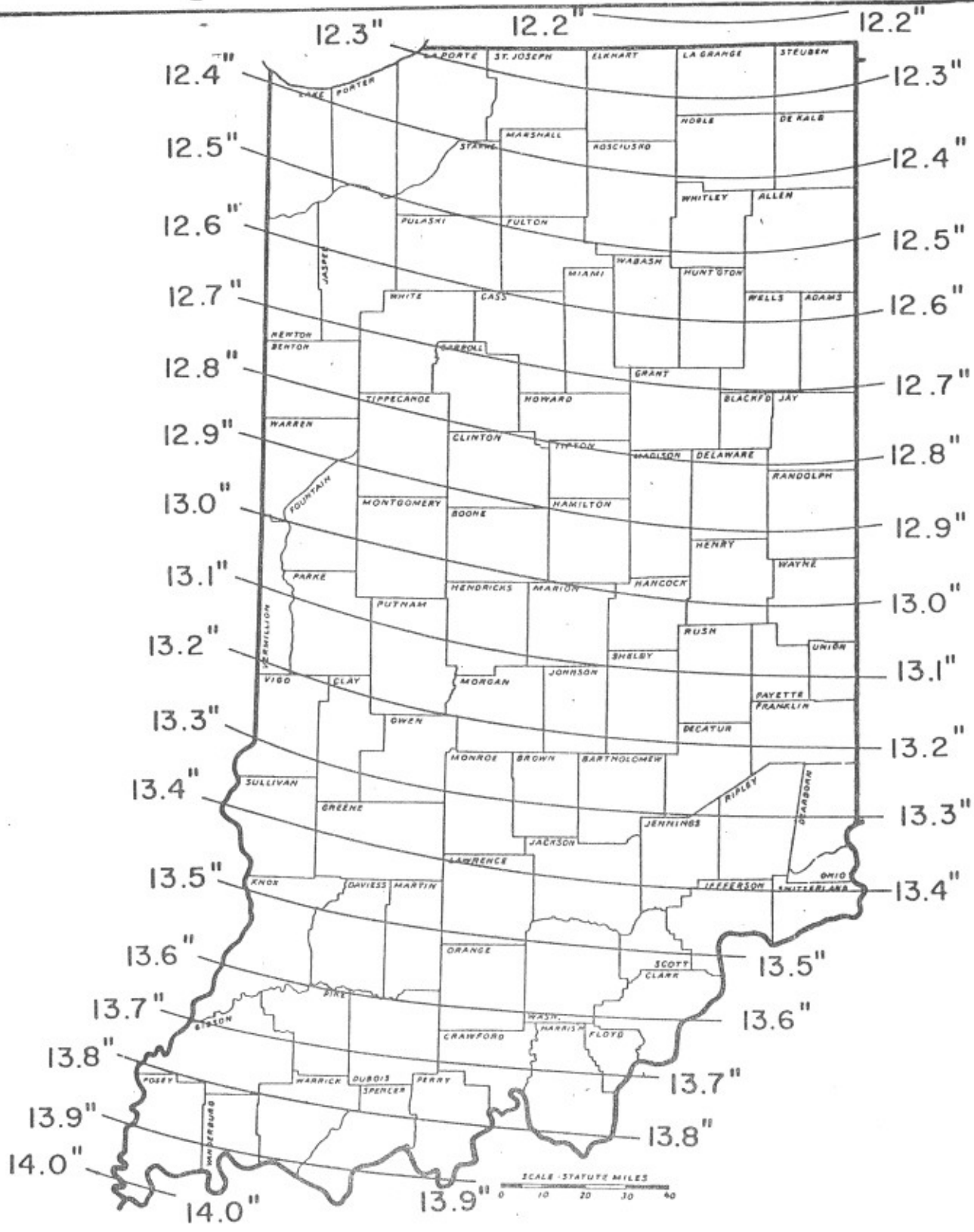
REFERENCE	US DEPARTMENT OF AGRICULTURE	Figure IN-2-4
SCS Technical Release No. 60, June 1976 Table 2-5	SOIL CONSERVATION SERVICE INDIANA	Sheet 3 of 6

RAINFALL – [P100 + 0.26 (PMP – P100)] – 6 HOUR DURATION



REFERENCE		
SCS Technical Release No. 60, June 1976 Table 2-5	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE INDIANA	Figure IN-2-4 Sheet 4 of 6

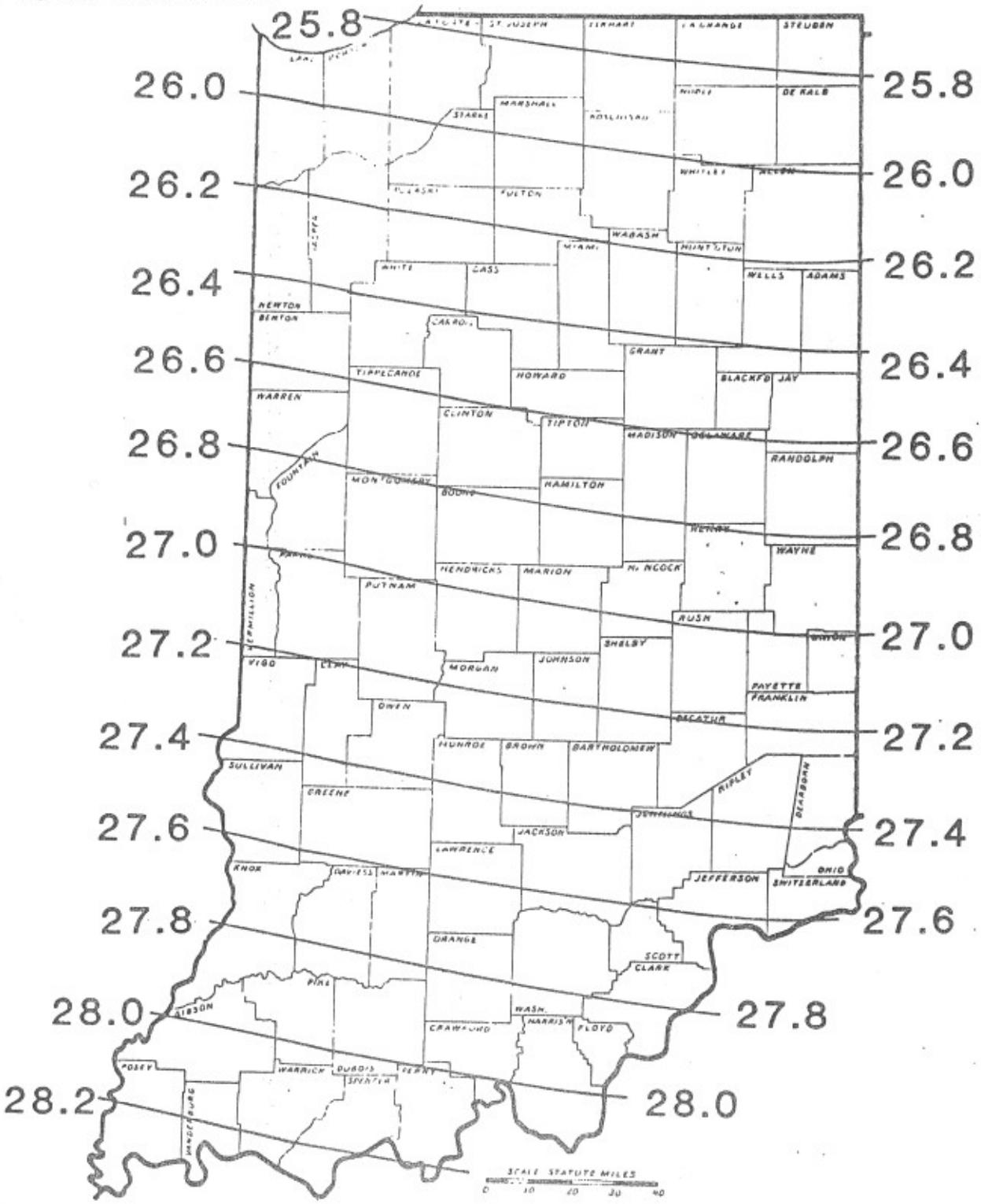
RAINFALL – [P100 + 0.40 (PMP – P100)] – 6 HOUR DURATION



REFERENCE	US DEPARTMENT OF AGRICULTURE	Figure IN-2-4
SCS Technical Release No. 60, June 1976 Table 2-5	SOIL CONSERVATION SERVICE INDIANA	Sheet 5 of 6

PROBABLE MAXIMUM PRECIPITATION-6 HOUR DURATION

10 square mile(inches)



December 1980

REFERENCE
Hydrometeorological Report #51
Technical Paper No. 40

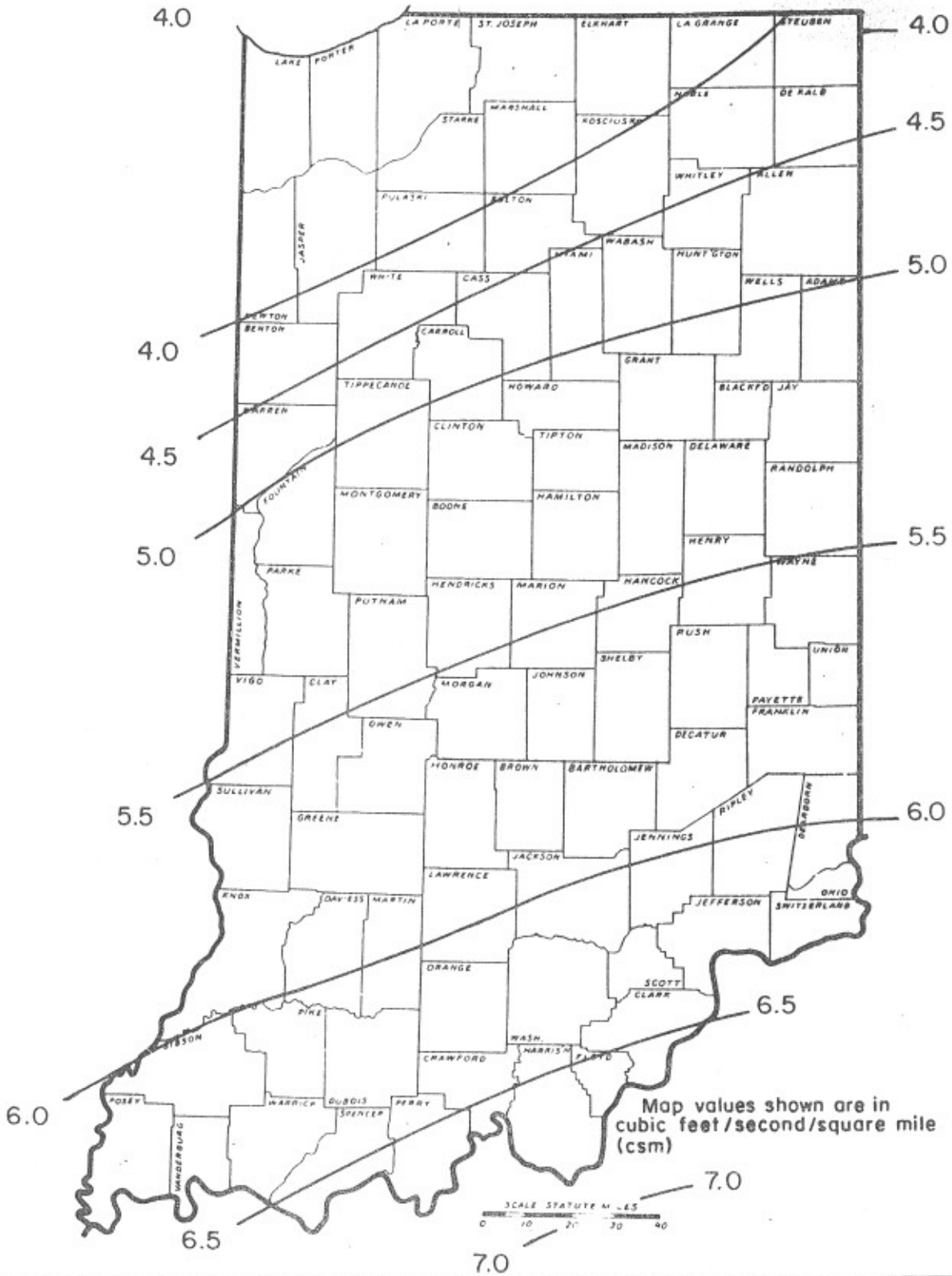
US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
INDIANA

Figure IN-2-4

Sheet 6 of 6

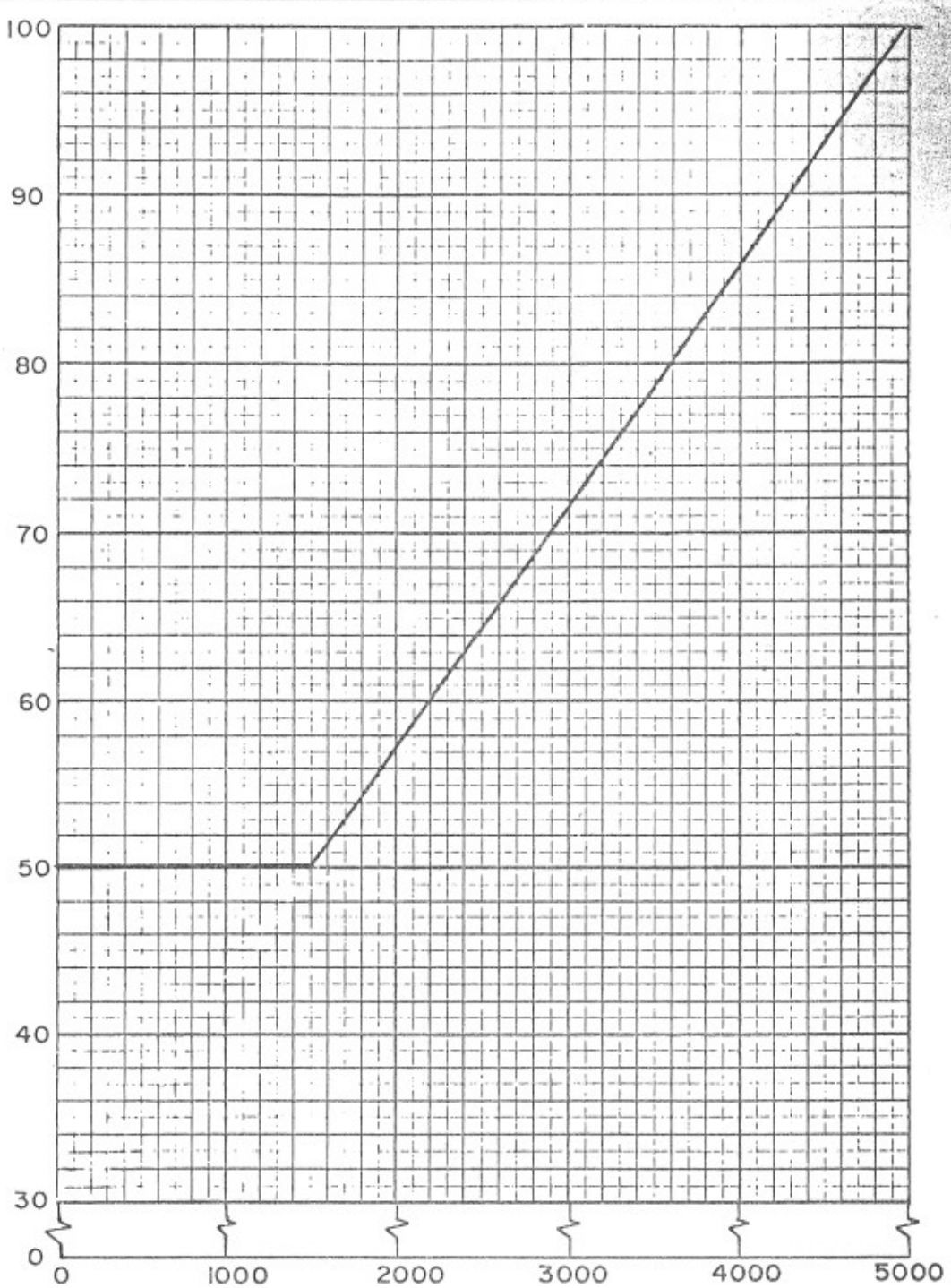
(EFM Notice IN-52, October 1989)

QUICK RETURN FLOW



REFERENCE	US DEPARTMENT OF AGRICULTURE	Figure IN-2-5
Exhibit 21-3 SCS-NEH-4 January 1971	SOIL CONSERVATION SERVICE INDIANA	Sheet 1 of 1

I.D.N.R. MINIMUM FREEBOARD RAINFALL



REFERENCE		
Indiana Department of Natural Resources (Revised)	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE INDIANA	Figure IN-2-6 Sheet 1 of 1

(EFM Notice IN-52, October 1989)

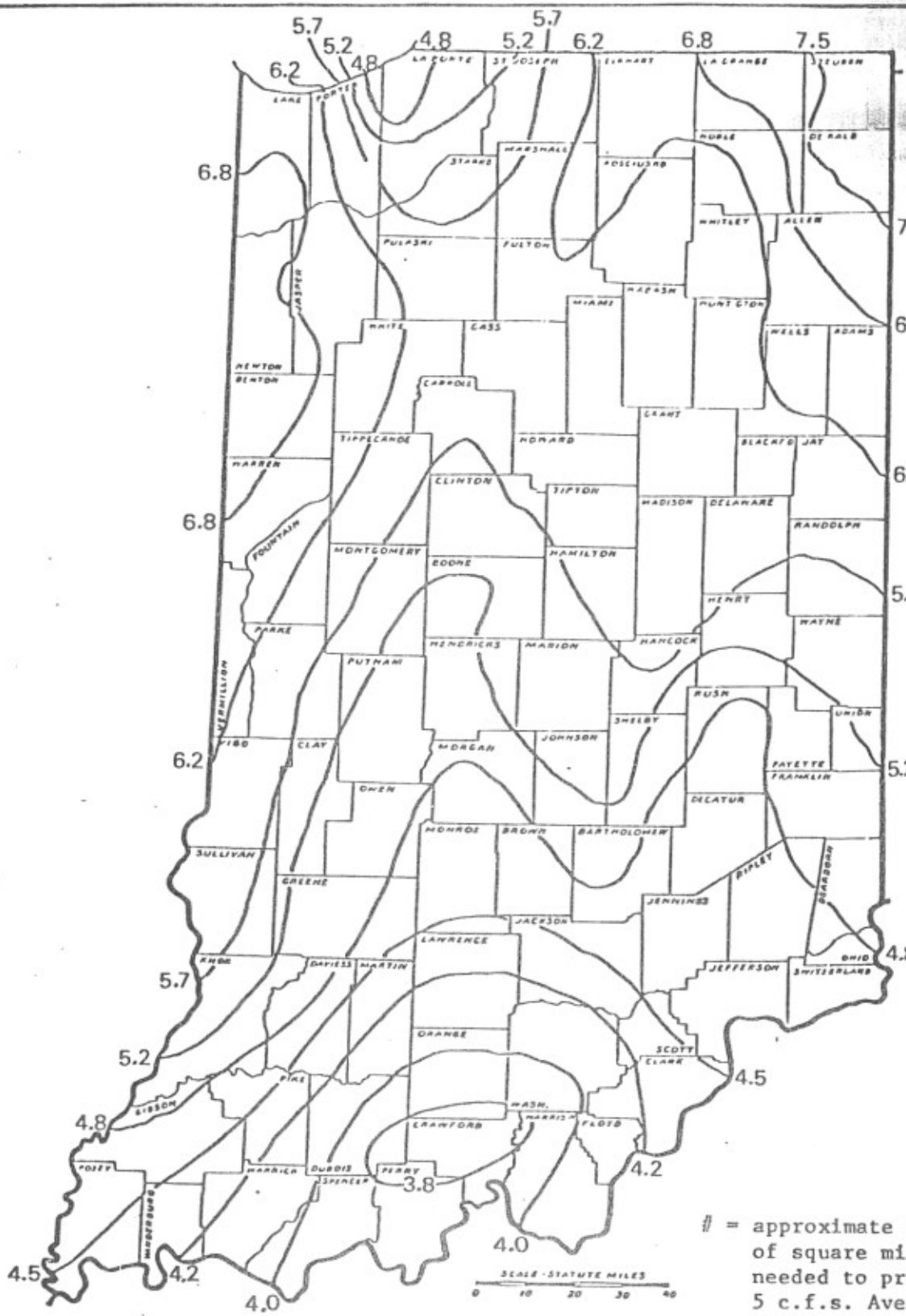
Guide to Requirements for a Section 404 Permit

Congress passed the Clean Water Act of 1977 with the announced purpose of restoring and maintaining the chemical, physical and biological integrity of the nation's waters. Under Section 404 of the Act, a permit program was established and is administered by the Secretary of the Army, acting through the Corps of Engineers, to regulate the discharges into the waters of the United States of dredged materials and of those pollutants that compose fill materials.

Work in the headwaters of streams, defined as waters where the average annual flow is less than 5 cubic feet per second (cfs) average annual flow, is covered under a national permit and do not require individual permits. Figure IN-2-7 gives an approximation of the square miles needed to produce 5 cfs average annual flow for locations in Indiana. For locations where the drainage area is close to what would provide an average annual flow of 5 cfs, a more accurate determination of discharge should be made based on the most appropriate gaging stations.

Possible variations may occur for urban areas. Also, there may be locations where topography is quite different from the normal topography for that portion of the state. In special cases such as these, actual computation of average annual flow is warranted.

AREA NEEDED TO PRODUCE 5c.f.s. AVERAGE ANNUAL FLOW



= approximate number of square miles needed to produce 5 c.f.s. Average Annual Flow

REFERENCE 404 Permits	US DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE INDIANA	Figure IN-2-7 Sheet 1 of 1

(EFM Notice IN-52, October 1989)

U.S. Department of Agriculture
Soil Conservation Service

IN-ENG-10
Rev. 10/89
File Code 210-11

WORKSHEET IN-1: RUNOFF CURVE NUMBER (CN)

Client _____ Practice and ID _____

_____ County Soil and Water Conservation District, Indiana

By _____ Date _____ Checked by _____ Date _____

COVER TYPE TREATMENT 1/	HYDROLOGIC CONDITION 2/	CURVE NUMBER (CN) Hydrologic Soil Group (EFM Table IN-2-2) A	B	C	D	AREA, ACRES	PRODUCT OF CN X ACRES
Row Crops - Straight Row	poor	72	81	88	91		
	good	67	78	85	89		
- Straight Row + CR	poor	71	80	87	90		
	good	64	75	82	85		
- Contoured + CR	poor	69	78	83	87		
	good	64	74	81	85		
Small Grain - Straight Row	poor	65	76	84	88		
- Straight Row + CR	good	63	75	83	87		
Pasture or Grassland	poor	68	79	86	89		
	good	39	61	74	80		
Meadow - Not Grazed	--	30	58	71	78		
Woods	poor	45	66	77	83		
	good	30	55	70	77		
Farmsteads	--	59	74	82	86		
Streets and - Paved w/ Curb	--	98	98	98	98		
Roads - Paved w/ Ditches	--	83	89	92	93		
Residential - 1/4 acre lots	--	61	75	83	87		
3/ - 1/2 acre lots	--	54	70	80	85		
- 1 acre lots	--	51	68	79	84		
Other (Specify)							
				TOTALS		ACRES	

1/ Crop residue cover (CR) applies if residue is on at least 5% of the surface throughout the year.
2/ See EFM Table 2-3 for definitions.
3/ Includes subdivision streets and driveways.

Weighted CN = $\frac{\text{Product Total}}{\text{Total Acres}}$ = _____; Use CN = _____

(Do not use less than CN 60 without approval of area engineer)

U.S. Department of Agriculture
Soil Conservation Service

IN-ENG-10A
Rev. 10/89
File Code 210-11

WORKSHEET IN-2: TIME OF CONCENTRATION AND PEAK DISCHARGE

Client _____ Practice and ID _____

_____ County Soil and Water Conservation District, Indiana

By _____ Date _____ Checked by _____ Date _____

Estimating Time of Concentration

1. Data:

   Rainfall Distribution Type ..... = II

   Drainage Area (IN-ENG-10) ..... A = _____ acres

   Runoff Curve Number (IN-ENG-10) ..... CN = _____

   Watershed Slope ..... Y = _____ %

   Flow Length ..... l = _____ feet

2. T_c using l, Y, CN and EFM Figure 2-27 (page 2-41) ..... T_c = _____ hours

   or using EFM Equation 2-5:

$$T_c = \frac{l^{0.8}(1000/CN - 9)^{0.7}}{1140\ Y^{0.5}} = \frac{(\quad)^{0.8}(\quad)^{0.7}}{1140\ (\quad)^{0.5}}$$ ..... T_c = _____ hours

Estimating Peak Discharge:

		Storm #1	Storm #2	Storm #3
1.	Frequency ..... year			
2.	Rainfall, 24-hour, inches (Figure IN-2-1) ..... P =			
3.	Initial Abstraction ..... I_a = (Use CN with EFM Table 2-4, page 2-89)			
4.	Compute I_a/P ratios ..... I_a/P =			
5.	Unit Peak Discharge, cfs/acre/inch ..... q_u = (Use T_c and I_a/P with EFM Exhibit IN-2-II)			
6.	Runoff, inches ..... Q = (Use P and CN with EFM Figure 2-26 or Table 2-2)			
7.	Ponding and Swampy Area Adjustment Factor ..... F_p = (Use percentage of area and EFM Table IN-2-1)			
8.	Peak Discharge, cfs ..... q_p = (Where $q_p = q_u A Q F_p$)			