# TECHNO-GRAM
# 007-2016

**SUBJECT:** Application of 24-hour rainfall intensity of 7.4 inches versus 8.5 inches in computing discharge for 100-year storm event

**PURPOSE:** To clarify when to utilize the 24-hour rainfall intensity of 7.4 inches versus 8.5 inches in computing discharges for 100-year storm event

**SCOPE:** Stormwater management requirements, as required per Prince George's County Code, Section, 32-180, and administered through the Prince George's County Department of Permitting, Inspections and Enforcement (DPIE)

The 24-hour rainfall intensity of 7.4 inches and Type II rainfall distribution constitutes the historic precipitation standard used in Natural Resources Conservation Service (NRCS) Soil Conservation Service (SCS) Methodology to compute the 100 year discharge in Prince George's County, Maryland. This rainfall intensity has been used historically in pond design, floodplain studies, bridge, culvert and storm drain sizing.

DPIE requires use of the 24-hour rainfall intensity of 7.4 inches and the Type II distribution in determining and delineating the 100-year floodplain, as well as in sizing structures such as bridges and major culverts. (Major culverts are defined on Page 2.) Similarly, the 24-hour rainfall intensity of 5.3 inches (10-year storm) and 3.3 inches (2-year storm) are to be utilized for these studies and structures.

The 24-hour rainfall intensity of 8.5 inches is the current NOAA Atlas 14 Precipitation Frequency Estimate for Central Prince Georges County, Maryland, which has been adopted by NRCS and the local Soil Conservation District. This rainfall intensity is to be utilized, along with the NOAA 'C' Distribution identified in NRCS – SCS Methodology, for computing 100-year discharge in the design of stormwater management ponds, dam safety and 100-year flood control attenuation. Similarly, stormwater management ponds shall be designed utilizing a 24-hour rainfall intensity of 4.93 inches (10-year storm) and 3.19 inches (2-year storm) as based on NOAA Atlas 14 and NOAA 'C' Distribution.

# TECHNO-GRAM
# 007-2016

For enclosed storm drain systems, minor culverts, and open channel storm drain systems, DPIE requires the use of the rainfall intensities identified in the Prince George's County Stormwater Design Manual Appendix 8-8. These are based on the NOAA Atlas 14 Rainfall intensities. The Design Manual requires sizing of culverts as follows:

- Drainage area less than 20 acres (minor culverts) – use Rational Equation and Rainfall intensities in Appendix 8-8
- Drainage area 20 to 50 acres (between minor and major culverts) – use Rational Equation and Rainfall intensities in Appendix 8-8 – OR – TR20. If TR20 is utilized, use historic rainfall rates (3.3 inches for 2-year storm, 5.3 inches for10-year storm, 7.4 inches for 100-year storm with Type II Distribution.
- Drainage area 50 acres and larger (major culverts) – use TR20 with historic rainfall rates as noted above.

The local Soil Conservation District will provide guidance related to Erosion and Sediment Control Design.

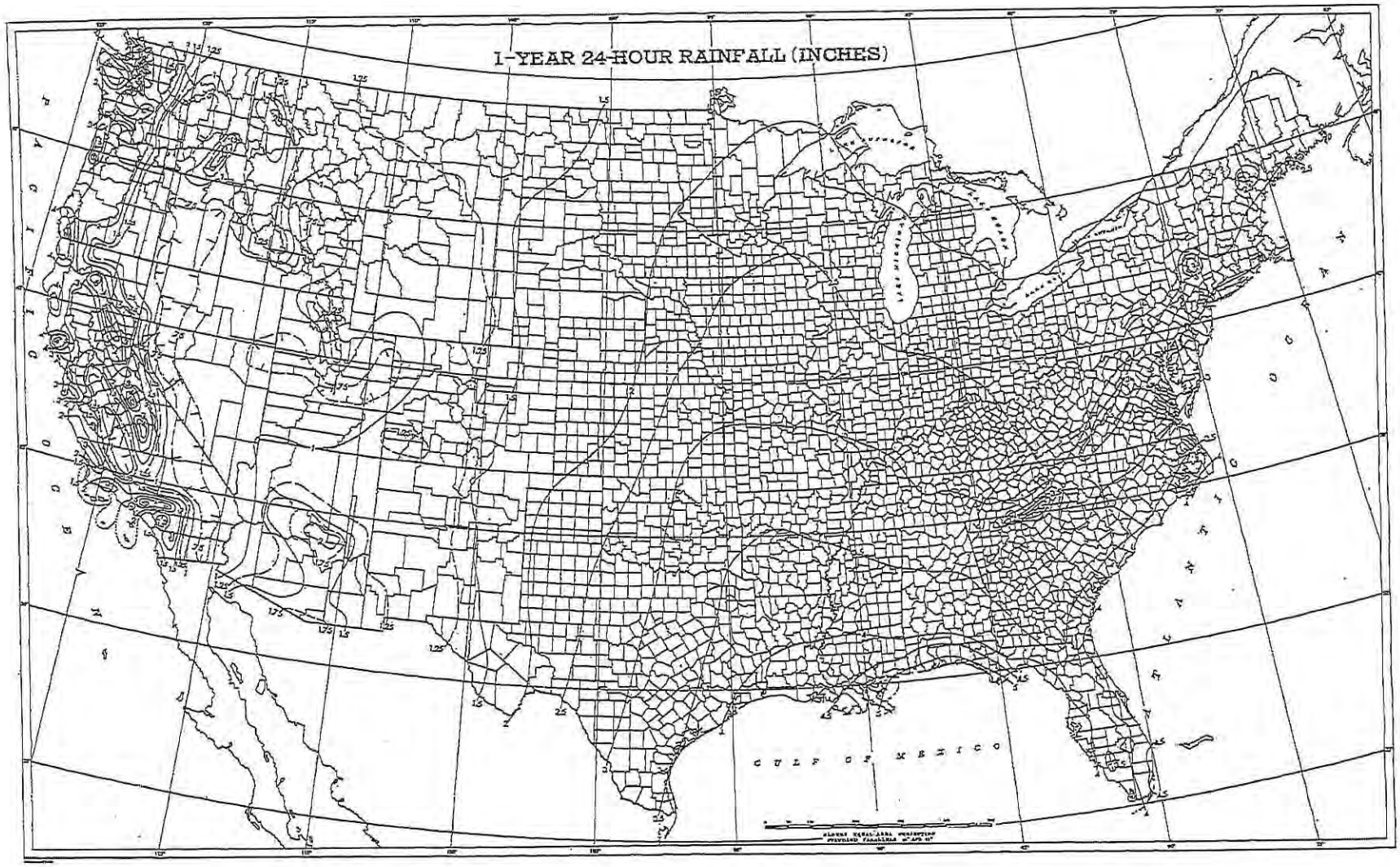
**APPROVED BY:**

**Haitham A. Hijazi, Director**

**June 23, 2016**
**Date**

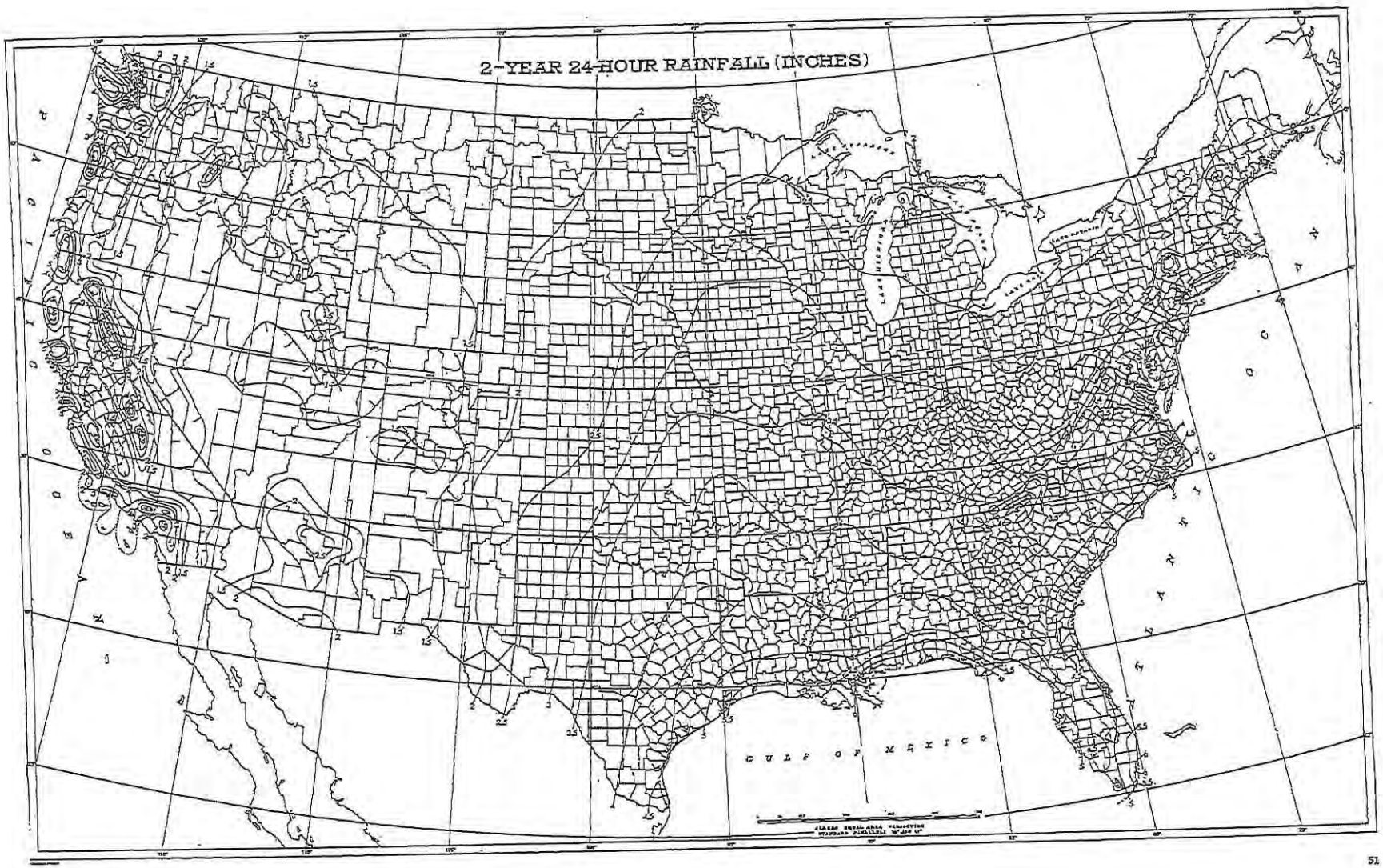
# TECHNO-GRAM
# 007-2016

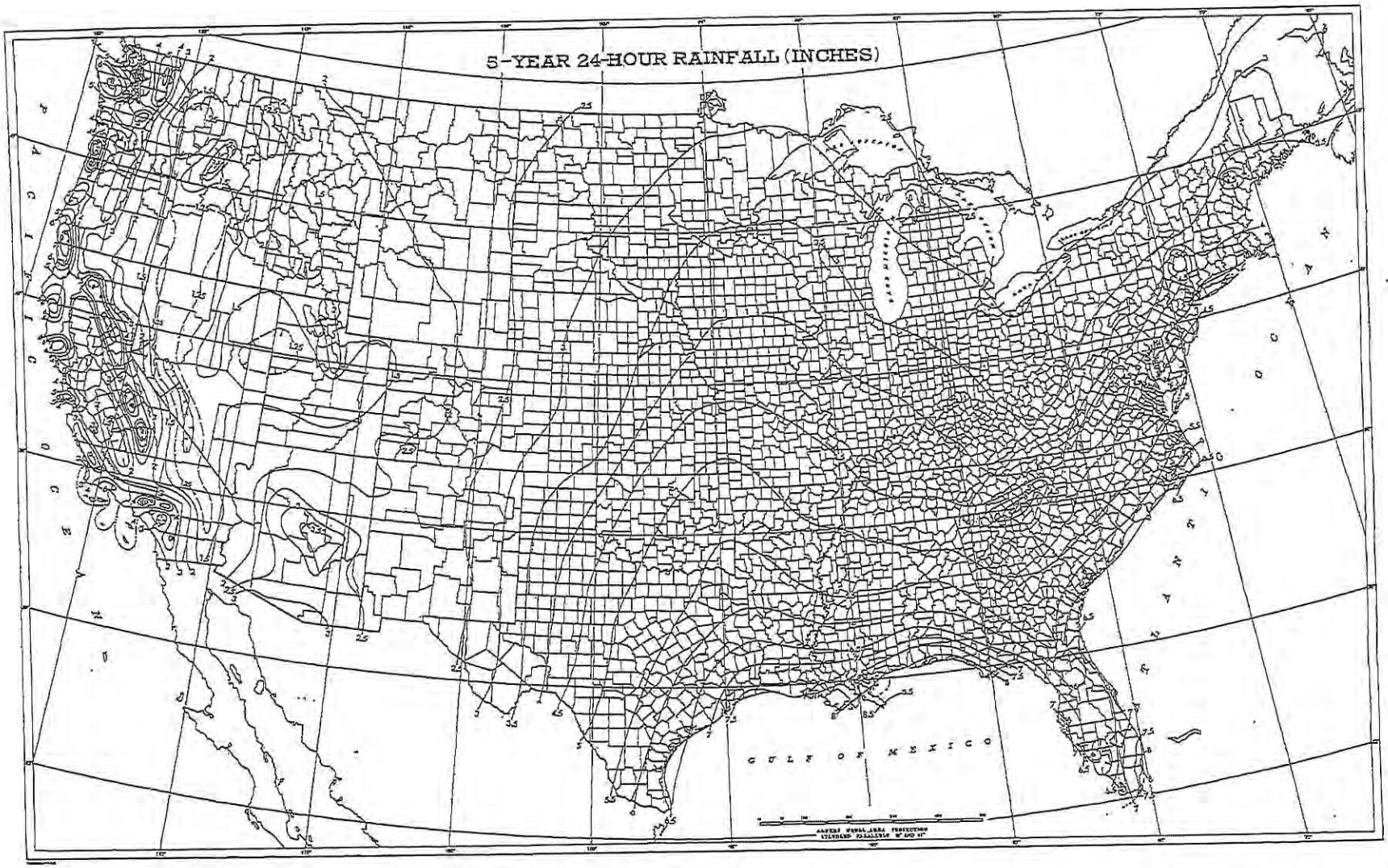
## HISTORIC RAINFALL RATES

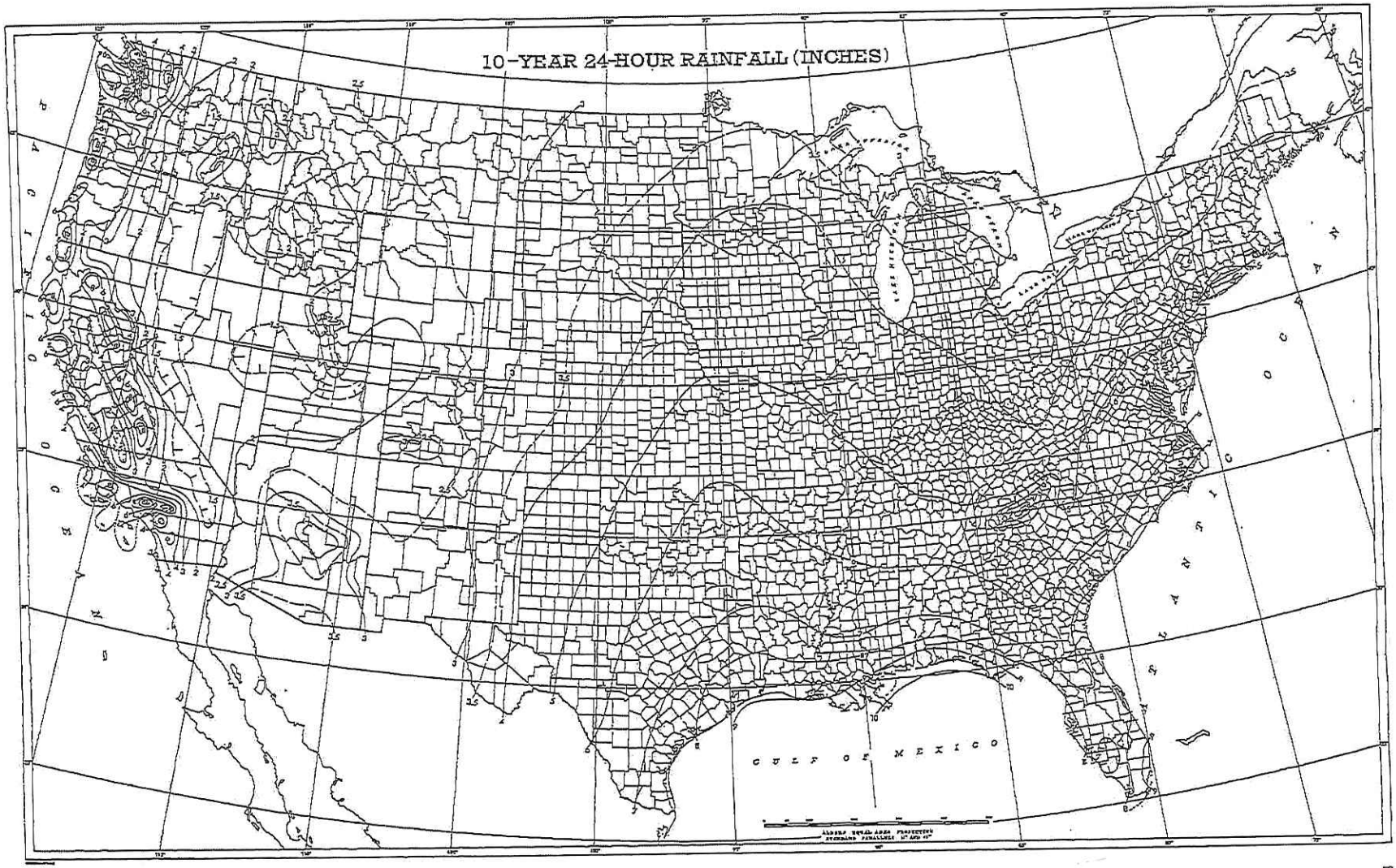


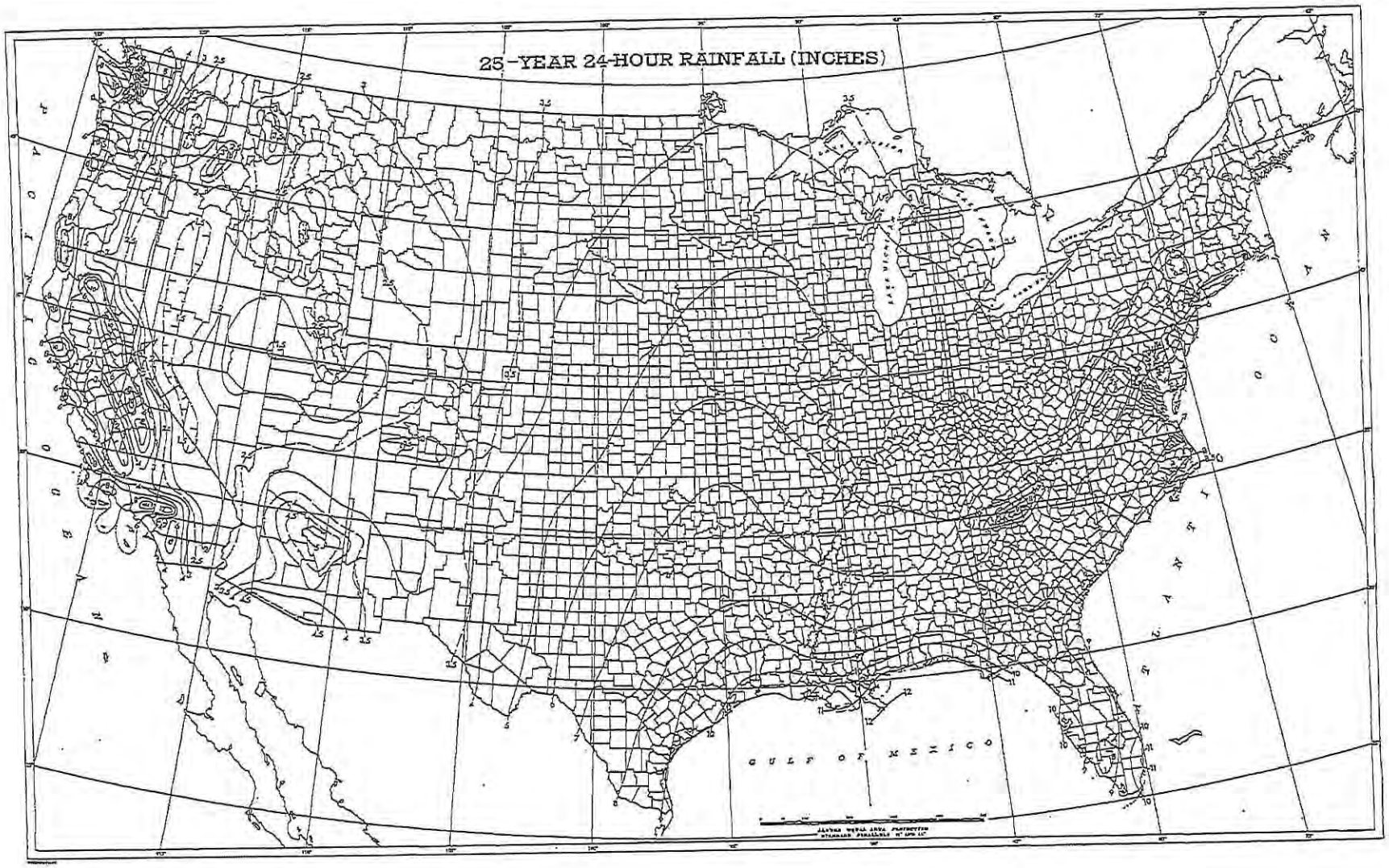


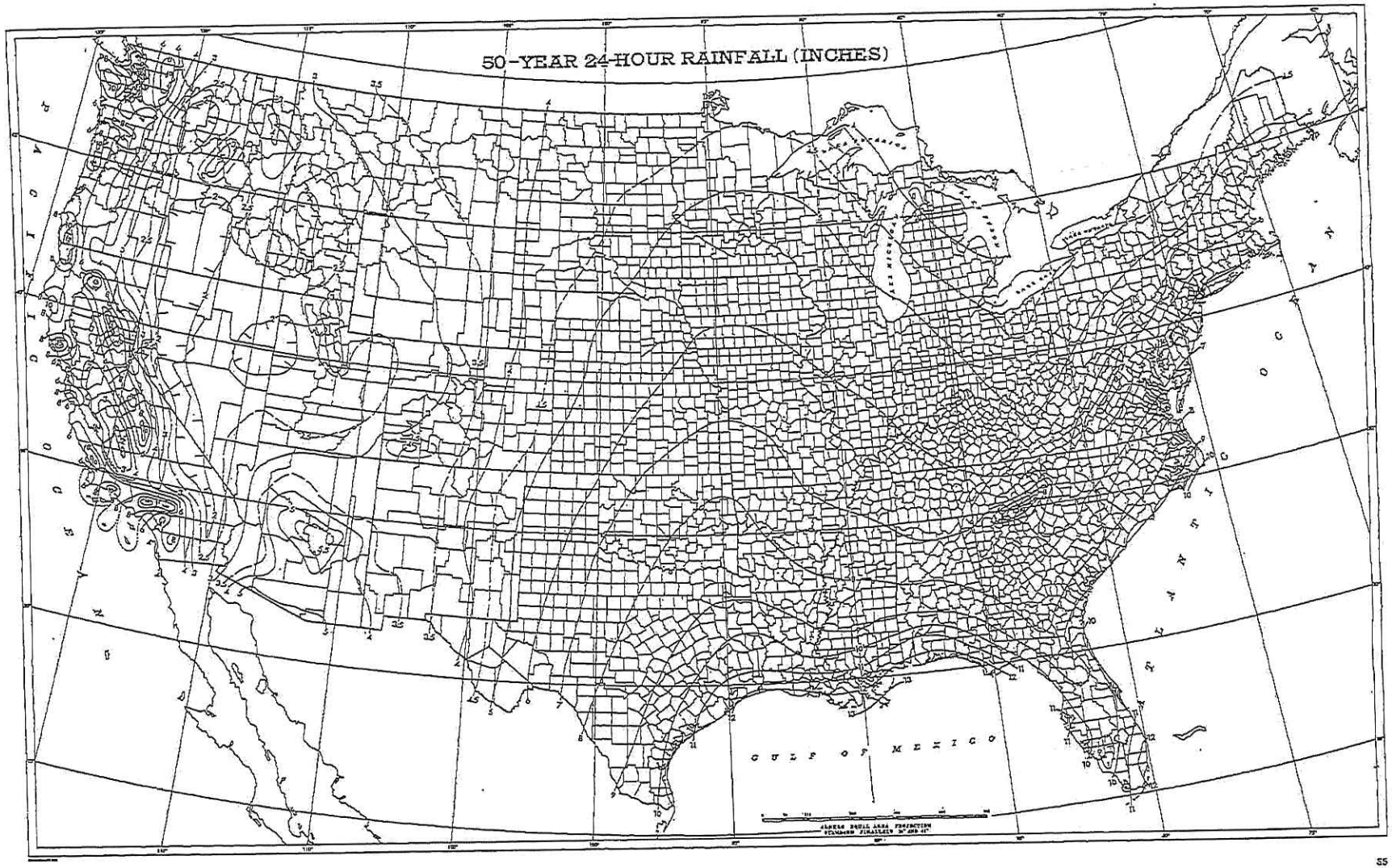

Excerpt USDA TR55

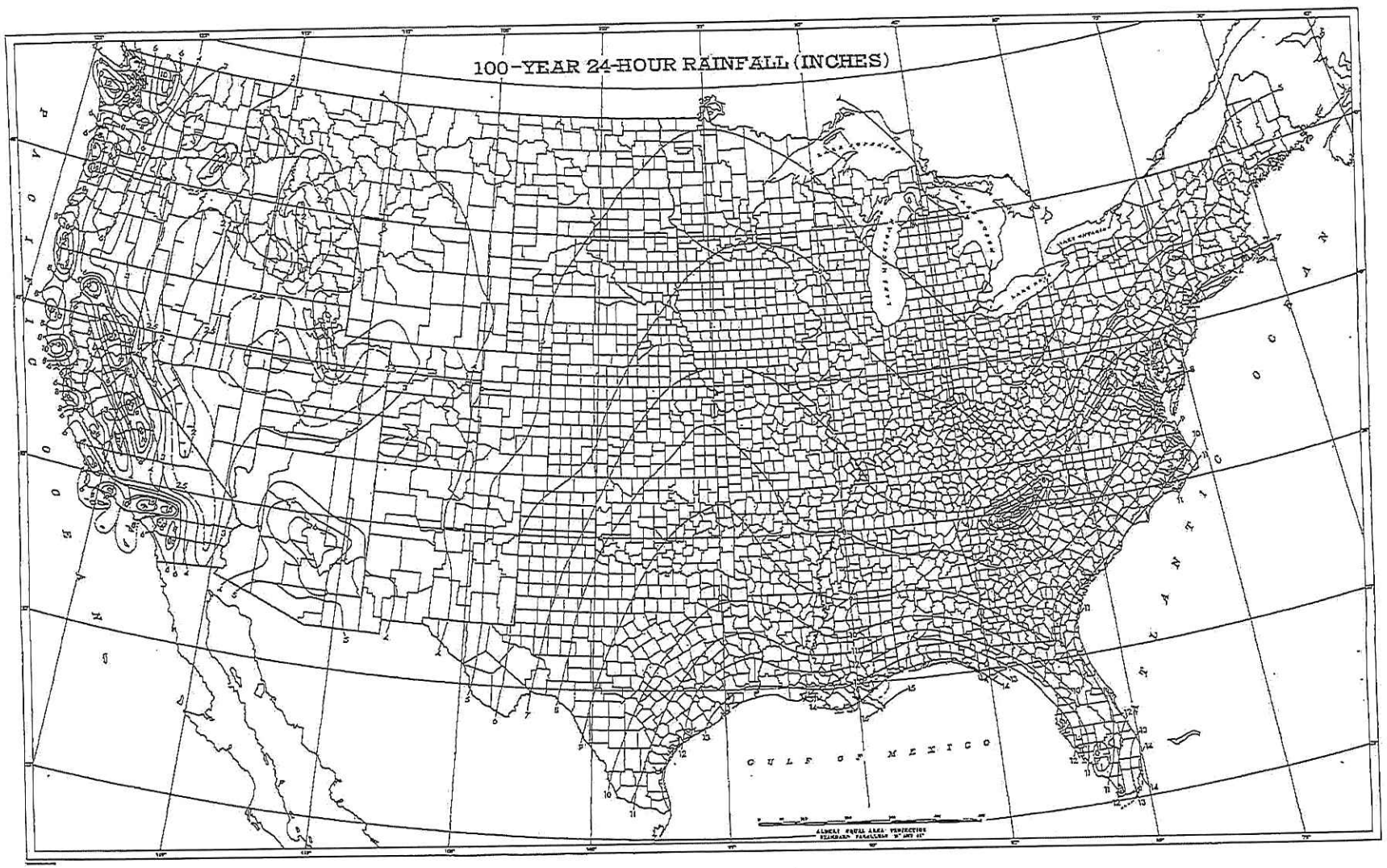

2-YEAR 24-HOUR RAINFALL (INCHES)
GULF OF MEXICO


5-YEAR 24-HOUR RAINFALL (INCHES)
GULF OF MEXICO


10-YEAR 24-HOUR RAINFALL (INCHES)
GULF OF MEXICO


25-YEAR 24-HOUR RAINFALL (INCHES)
GULF OF MEXICO


50-YEAR 24-HOUR RAINFALL (INCHES)
GULF OF MEXICO


100-YEAR 24-HOUR RAINFALL (INCHES)
PACIFIC OCEAN
GULF OF MEXICO
ATLANTIC OCEAN

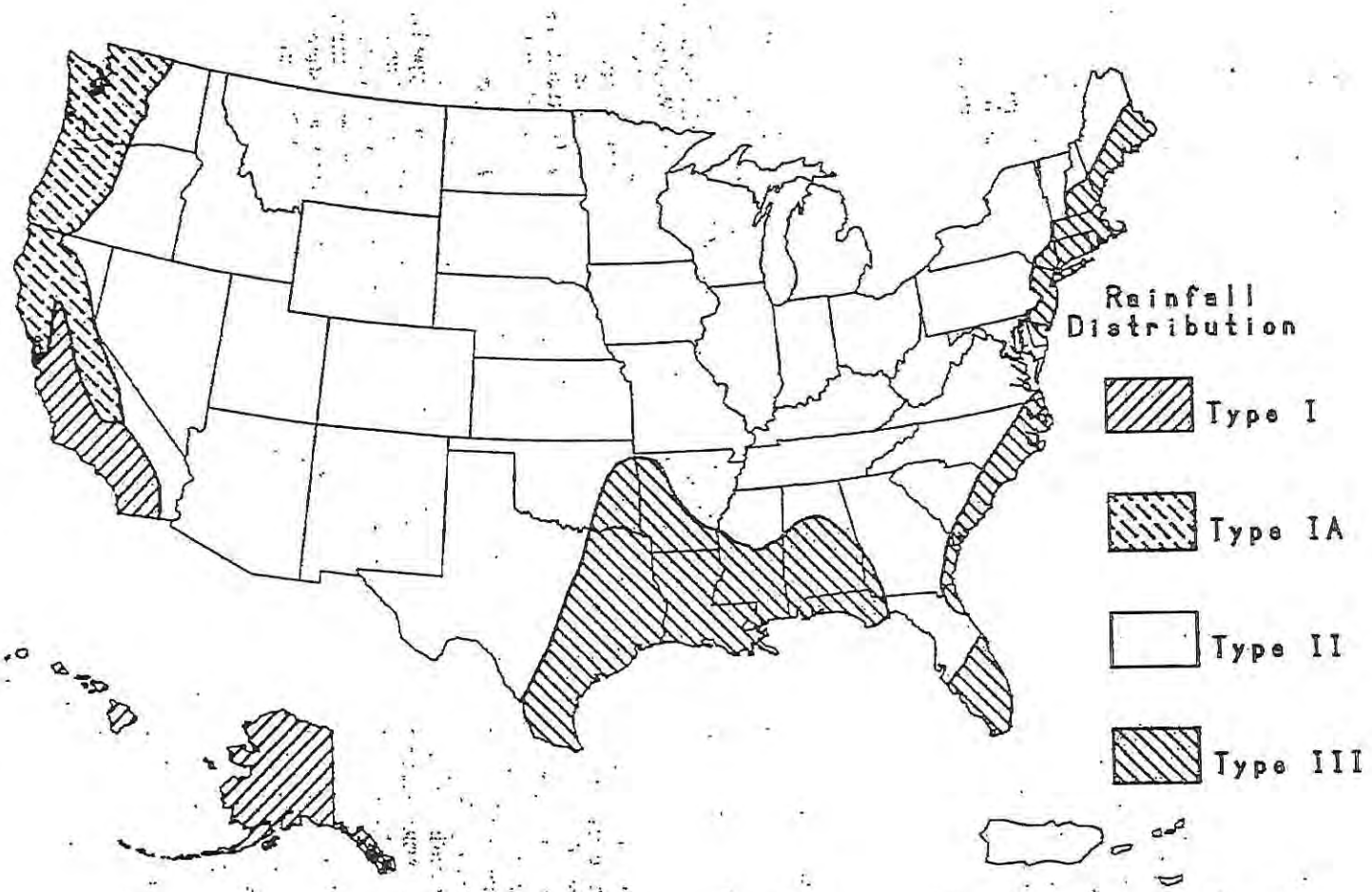



Figure B-2.—Approximate geographic boundaries for SCS rainfall distributions.



Excerpt USDA TR55

# TECHNO-GRAM
# 007-2016

## "NEW" NOAA ATLAS 14
## RAINFALL RATES

www.nws.noaa.gov

NOAA's National Weather Service
Hydrometeorological Design Studies Center
Precipitation Frequency Data Server (PFDS)





# NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: MD

## DATA DESCRIPTION

Data type: precipitation depth | Units: english | Time series type: partial duration

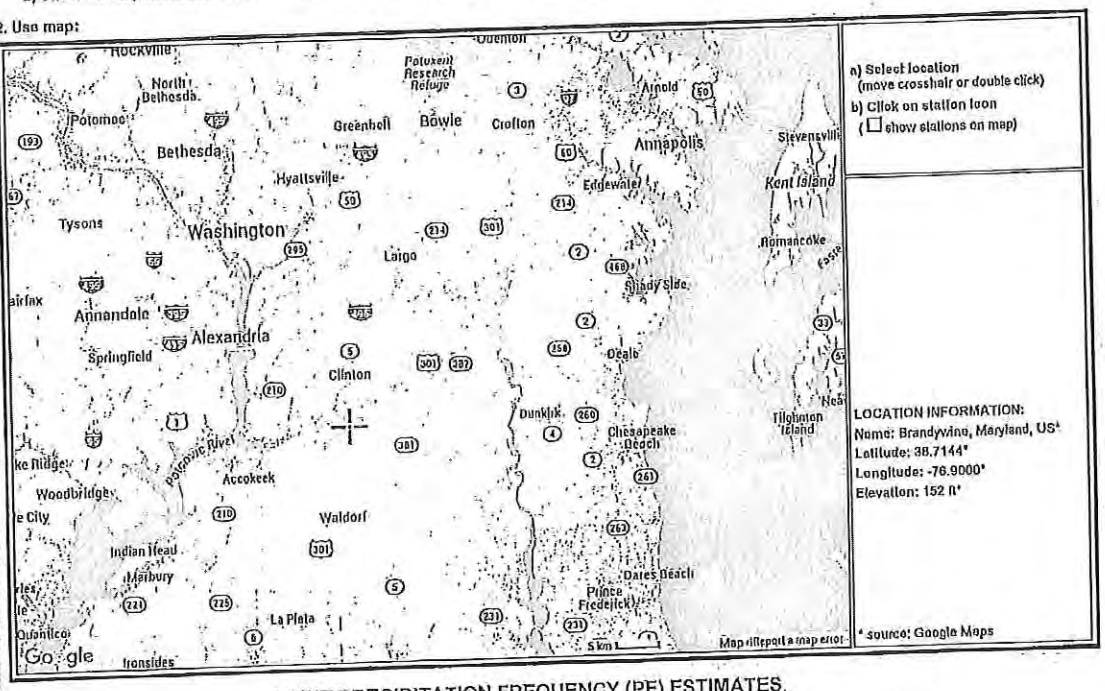
## SELECT LOCATION

1. Manually:

a) Enter location (decimal degrees, use "-" for S and W): latitude: longitude: submit

b) Select station (click here for a list of stations used in frequency analysis for MD): select station

2. Use map:




## POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 2, Version 3

PF tabular | PF graphical | Supplementary Information | Print Page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

| Duration | Average recurrence interval (years) 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|
| 5-min | 0.356 (0.323-0.392) | 0.428 (0.387-0.470) | 0.507 (0.460-0.559) | 0.566 (0.512-0.624) | 0.641 (0.578-0.707) | 0.697 (0.622-0.769) | 0.752 (0.668-0.832) | 0.808 (0.710-0.895) | 0.874 (0.762-0.977) | 0.928 (0.802-1.04) |
| 10-min | 0.569 (0.516-0.628) | 0.682 (0.619-0.751) | 0.812 (0.736-0.895) | 0.906 (0.818-0.998) | 1.02 (0.917-1.13) | 1.11 (0.991-1.23) | 1.20 (1.06-1.32) | 1.28 (1.13-1.42) | 1.38 (1.21-1.55) | 1.46 (1.26-1.64) |
| 15-min | 0.711 (0.645-0.782) | 0.857 (0.778-0.944) | 1.03 (0.931-1.13) | 1.15 (1.04-1.26) | 1.30 (1.16-1.43) | 1.41 (1.26-1.55) | 1.51 (1.34-1.67) | 1.61 (1.42-1.79) | 1.74 (1.52-1.95) | 1.83 (1.59-2.06) |
| 30-min | 0.974 (0.884-1.07) | 1.16 (1.07-1.30) | 1.46 (1.32-1.61) | 1.66 (1.50-1.83) | 1.92 (1.72-2.12) | 2.12 (1.89-2.34) | 2.31 (2.05-2.56) | 2.51 (2.21-2.79) | 2.77 (2.41-3.10) | 2.97 (2.57-3.34) |
| 60-min | 1.22 (1.10-1.34) | 1.49 (1.35-1.64) | 1.87 (1.70-2.06) | 2.16 (1.95-2.38) | 2.56 (2.29-2.82) | 2.87 (2.56-3.17) | 3.19 (2.83-3.53) | 3.52 (3.10-3.91) | 3.97 (3.46-4.44) | 4.34 (3.76-4.87) |
| 2-hr | 1.42 (1.29-1.57) | 1.73 (1.57-1.91) | 2.19 (1.99-2.42) | 2.55 (2.30-2.81) | 3.06 (2.74-3.37) | 3.47 (3.09-3.82) | 3.90 (3.45-4.31) | 4.36 (3.83-4.83) | 5.00 (4.34-5.58) | 5.53 (4.74-6.20) |
| 3-hr | 1.53 (1.39-1.70) | 1.86 (1.69-2.06) | 2.36 (2.13-2.61) | 2.76 (2.48-3.05) | 3.33 (2.98-3.67) | 3.79 (3.36-4.19) | 4.29 (3.77-4.75) | 4.81 (4.19-5.35) | 5.57 (4.79-6.22) | 6.19 (5.26-6.95) |
| 6-hr | 1.67 (1.70-2.06) | 2.27 (2.06-2.52) | 2.87 (2.60-3.18) | 3.36 (3.02-3.73) | 4.09 (3.64-4.53) | 4.71 (4.16-5.22) | 5.30 (4.70-5.88) | 6.11 (5.28-6.81) | 7.16 (6.10-8.06) | 8.08 (6.77-9.13) |
| 12-hr | 2.26 (2.03-2.64) | 2.73 (2.45-3.08) | 3.46 (3.10-3.89) | 4.10 (3.65-4.60) | 5.08 (4.46-5.67) | 5.91 (5.15-6.62) | 6.84 (5.90-7.69) | 7.89 (6.70-8.89) | 9.46 (7.99-10.6) | 10.9 (8.98-12.4) |
| 24-hr | 2.63 (2.38-2.94) | 3.19 (2.89-3.57) | 4.12 (3.73-4.61) | 4.93 (4.45-5.51) | 6.17 (5.53-6.85) | 7.27 (6.47-8.04) | 8.51 (7.50-9.37) | 9.91 (8.64-10.9) | 12.1 (10.4-13.2) | 13.9 (11.8-15.3) |
| 2-day | 3.04 (2.75-3.40) | 3.69 (3.34-4.13) | 4.76 (4.30-5.31) | 5.68 (5.11-6.33) | 7.05 (6.32-7.86) | 8.27 (7.36-9.18) | 9.62 (8.47-10.7) | 11.1 (9.72-12.3) | 13.4 (11.6-14.9) | 15.4 (13.1-17.1) |
| 3-day | 3.22 (2.92-3.59) | 3.90 (3.54-4.34) | 5.01 (4.54-5.57) | 5.96 (5.39-6.63) | 7.40 (6.64-8.20) | 8.65 (7.71-9.57) | 10.0 (8.87-11.1) | 11.6 (10.2-12.8) | 13.9 (12.0-15.4) | 15.9 (13.6-17.6) |
| 4-day | 3.39 (3.08-3.76) | 4.10 (3.73-4.56) | 5.26 (4.76-5.84) | 6.25 (5.66-6.92) | 7.74 (6.96-8.55) | 9.03 (8.07-9.95) | 10.5 (9.28-11.5) | 12.0 (10.6-13.2) | 14.4 (12.5-15.9) | 16.5 (14.2-18.1) |
| 7-day | 3.93 (3.60-4.32) | 4.73 (4.35-5.21) | 5.99 (5.49-6.58) | 7.08 (6.46-7.75) | 8.66 (7.87-9.48) | 10.0 (9.05-11.0) | 11.6 (10.3-12.6) | 13.2 (11.7-14.4) | 15.7 (13.8-17.1) | 17.8 (15.4-19.5) |

PFDS: Contiguous US

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 10-day | 4.48 (4.13-4.90) | 5.36 (4.95-5.88) | 6.71 (6.19-7.33) | 7.82 (7.18-8.54) | 9.44 (8.63-10.3) | 10.8 (9.92-11.7) | 12.2 (11.1-13.3) | 13.8 (12.4-15.0) | 16.1 (14.3-17.5) | 18.0 (15.9-19.6) |
| 20-day | 6.04 (5.64-6.50) | 7.18 (6.70-7.73) | 8.69 (8.09-9.35) | 9.91 (9.22-10.6) | 11.6 (10.8-12.5) | 13.0 (12.0-13.9) | 14.4 (13.2-15.4) | 15.9 (14.5-17.0) | 17.9 (16.3-19.2) | 19.6 (17.7-21.0) |
| 30-day | 7.45 (6.96-7.99) | 8.83 (8.25-9.46) | 10.5 (9.81-11.3) | 11.9 (11.0-12.7) | 13.7 (12.7-14.7) | 15.2 (14.1-16.2) | 16.7 (15.4-17.8) | 18.2 (16.7-19.4) | 20.3 (18.5-21.7) | 21.9 (19.9-23.4) |
| 45-day | 9.37 (8.83-9.94) | 11.1 (10.4-11.7) | 12.9 (12.2-13.7) | 14.4 (13.5-15.3) | 16.3 (15.3-17.3) | 17.7 (16.6-18.8) | 19.1 (17.9-20.3) | 20.5 (19.2-21.8) | 22.3 (20.7-23.7) | 23.7 (21.9-25.2) |
| 60-day | 11.1 (10.5-11.8) | 13.1 (12.4-13.9) | 15.2 (14.3-16.1) | 16.7 (15.8-17.7) | 18.7 (17.6-19.8) | 20.2 (18.9-21.3) | 21.5 (20.2-22.6) | 22.9 (21.4-24.2) | 24.6 (22.9-26.0) | 25.8 (24.0-27.4) |

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in csv format: precipitation frequency estimates | Submit

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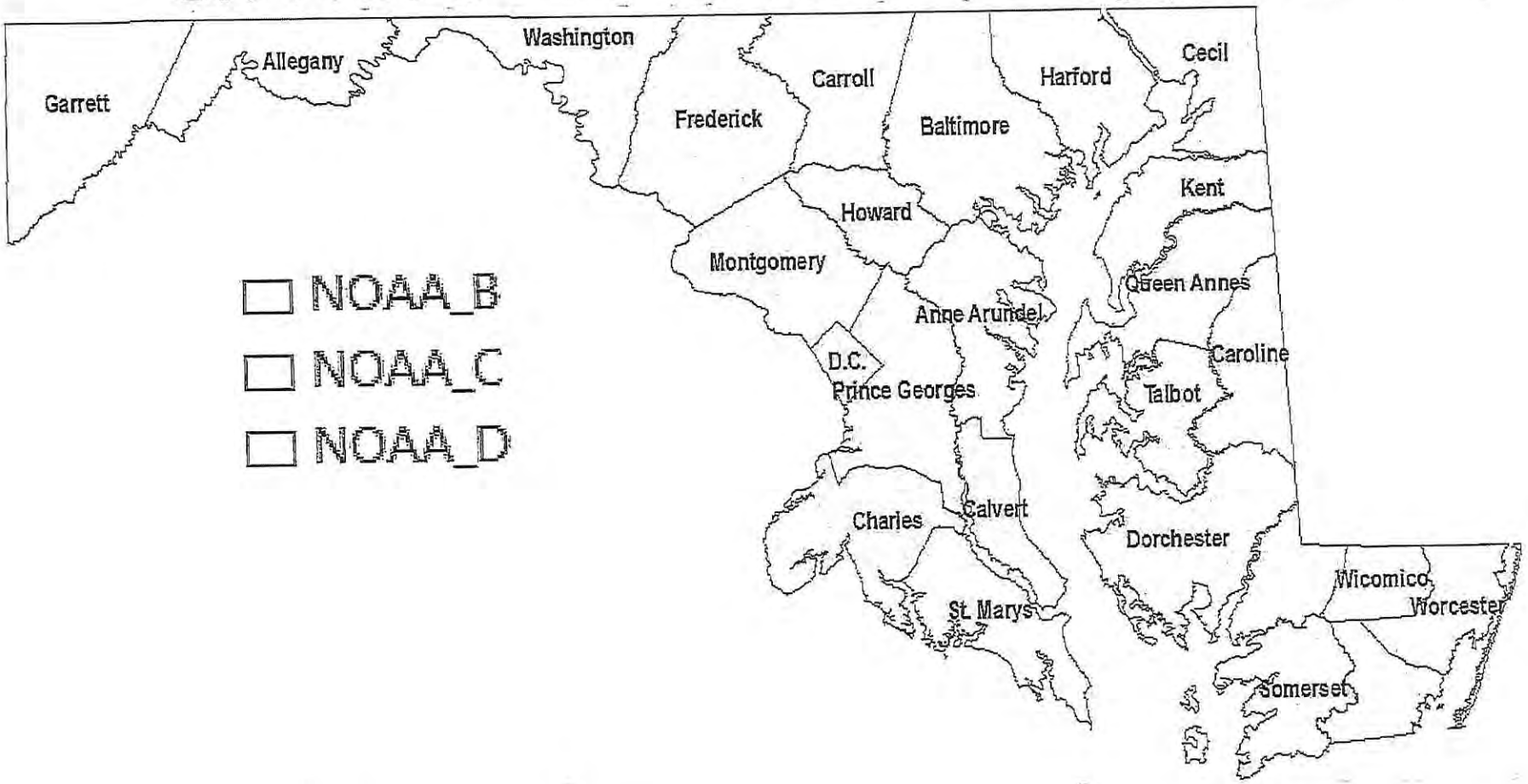
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: August 27, 2014

# New NRCS rainfall distributions based on NOAA 14 data for Maryland



# TECHNO-GRAM
# 007-2016

## RAINFALL INTENSITIES
## RATIONAL EQUATION

## (EXCERPT FROM PRINCE GEORGES COUNTY STORMWATER DESIGN MANUAL)

# RATIONAL METHOD RAINFALL INTENSITY TABLE

NOAA 14-2004: Intermediate Values from Interpolation
(Upper Marlboro 3 NNW: 18-9070)
PRINCE GEORGE'S COUNTY MARYLAND RAINFALL INTENSITY
(INCHES/HOUR)

| DURATION (MINUTES) | RETURN PERIOD (YEARS) 1 | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|---|
| 5.00 | 4.20 | 5.04 | 6.00 | 6.72 | 7.56 | 8.28 | 8.88 |
| 6.00 | 4.03 | 4.84 | 5.76 | 6.44 | 7.26 | 7.93 | 8.51 |
| 7.00 | 3.86 | 4.63 | 5.52 | 6.17 | 6.96 | 7.58 | 8.14 |
| 8.00 | 3.70 | 4.43 | 5.28 | 5.89 | 6.66 | 7.24 | 7.76 |
| 9.00 | 3.53 | 4.22 | 5.04 | 5.62 | 6.36 | 6.89 | 7.39 |
| 10.00 | 3.36 | 4.02 | 4.80 | 5.34 | 6.06 | 6.54 | 7.02 |
| 11.00 | 3.25 | 3.89 | 4.65 | 5.18 | 5.86 | 6.34 | 6.80 |
| 12.00 | 3.14 | 3.76 | 4.50 | 5.01 | 5.67 | 6.13 | 6.58 |
| 13.00 | 3.02 | 3.62 | 4.34 | 4.85 | 5.47 | 5.93 | 6.36 |
| 14.00 | 2.91 | 3.49 | 4.19 | 4.68 | 5.28 | 5.72 | 6.14 |
| 15.00 | 2.80 | 3.36 | 4.04 | 4.52 | 5.08 | 5.52 | 5.92 |
| 16.00 | 2.74 | 3.29 | 3.96 | 4.44 | 4.99 | 5.43 | 5.83 |
| 17.00 | 2.68 | 3.22 | 3.89 | 4.35 | 4.91 | 5.34 | 5.74 |
| 18.00 | 2.62 | 3.16 | 3.81 | 4.27 | 4.82 | 5.25 | 5.64 |
| 19.00 | 2.57 | 3.09 | 3.73 | 4.19 | 4.73 | 5.16 | 5.55 |
| 20.00 | 2.51 | 3.02 | 3.65 | 4.11 | 4.65 | 5.07 | 5.46 |
| 21.00 | 2.45 | 2.95 | 3.58 | 4.02 | 4.56 | 4.98 | 5.37 |
| 22.00 | 2.39 | 2.88 | 3.50 | 3.94 | 4.47 | 4.89 | 5.28 |
| 23.00 | 2.33 | 2.82 | 3.42 | 3.86 | 4.39 | 4.79 | 5.18 |
| 24.00 | 2.27 | 2.75 | 3.34 | 3.78 | 4.30 | 4.70 | 5.09 |
| 25.00 | 2.21 | 2.68 | 3.27 | 3.69 | 4.21 | 4.61 | 5.00 |
| 26.00 | 2.15 | 2.61 | 3.19 | 3.61 | 4.13 | 4.52 | 4.91 |
| 27.00 | 2.10 | 2.54 | 3.11 | 3.53 | 4.04 | 4.43 | 4.82 |
| 28.00 | 2.04 | 2.48 | 3.03 | 3.45 | 3.95 | 4.34 | 4.72 |
| 29.00 | 1.98 | 2.41 | 2.96 | 3.36 | 3.87 | 4.25 | 4.63 |
| 30.00 | 1.92 | 2.34 | 2.88 | 3.28 | 3.78 | 4.16 | 4.54 |
| 31.00 | 1.90 | 2.31 | 2.85 | 3.24 | 3.74 | 4.12 | 4.49 |
| 32.00 | 1.87 | 2.28 | 2.81 | 3.20 | 3.70 | 4.07 | 4.45 |
| 33.00 | 1.85 | 2.25 | 2.78 | 3.17 | 3.65 | 4.03 | 4.40 |
| 34.00 | 1.82 | 2.22 | 2.74 | 3.13 | 3.61 | 3.98 | 4.35 |
| 35.00 | 1.80 | 2.19 | 2.71 | 3.09 | 3.57 | 3.94 | 4.31 |
| 36.00 | 1.78 | 2.16 | 2.67 | 3.05 | 3.53 | 3.89 | 4.26 |
| 37.00 | 1.75 | 2.13 | 2.64 | 3.01 | 3.48 | 3.85 | 4.21 |
| 38.00 | 1.73 | 2.11 | 2.60 | 2.97 | 3.44 | 3.80 | 4.16 |
| 39.00 | 1.70 | 2.08 | 2.57 | 2.94 | 3.40 | 3.76 | 4.12 |
| 40.00 | 1.68 | 2.05 | 2.53 | 2.90 | 3.36 | 3.71 | 4.07 |
| 41.00 | 1.66 | 2.02 | 2.50 | 2.86 | 3.31 | 3.67 | 4.02 |
| 42.00 | 1.63 | 1.99 | 2.46 | 2.82 | 3.27 | 3.62 | 3.98 |
| 43.00 | 1.61 | 1.96 | 2.43 | 2.78 | 3.23 | 3.58 | 3.93 |
| 44.00 | 1.58 | 1.93 | 2.39 | 2.74 | 3.19 | 3.53 | 3.88 |
| 45.00 | 1.56 | 1.90 | 2.36 | 2.71 | 3.15 | 3.49 | 3.84 |
| 60.00 | 1.20 | 1.46 | 1.84 | 2.13 | 2.51 | 2.82 | 3.13 |