Rational Method

Area = 100 acres
Land Use = Open Space
Soils = Type B
Calculate Q100

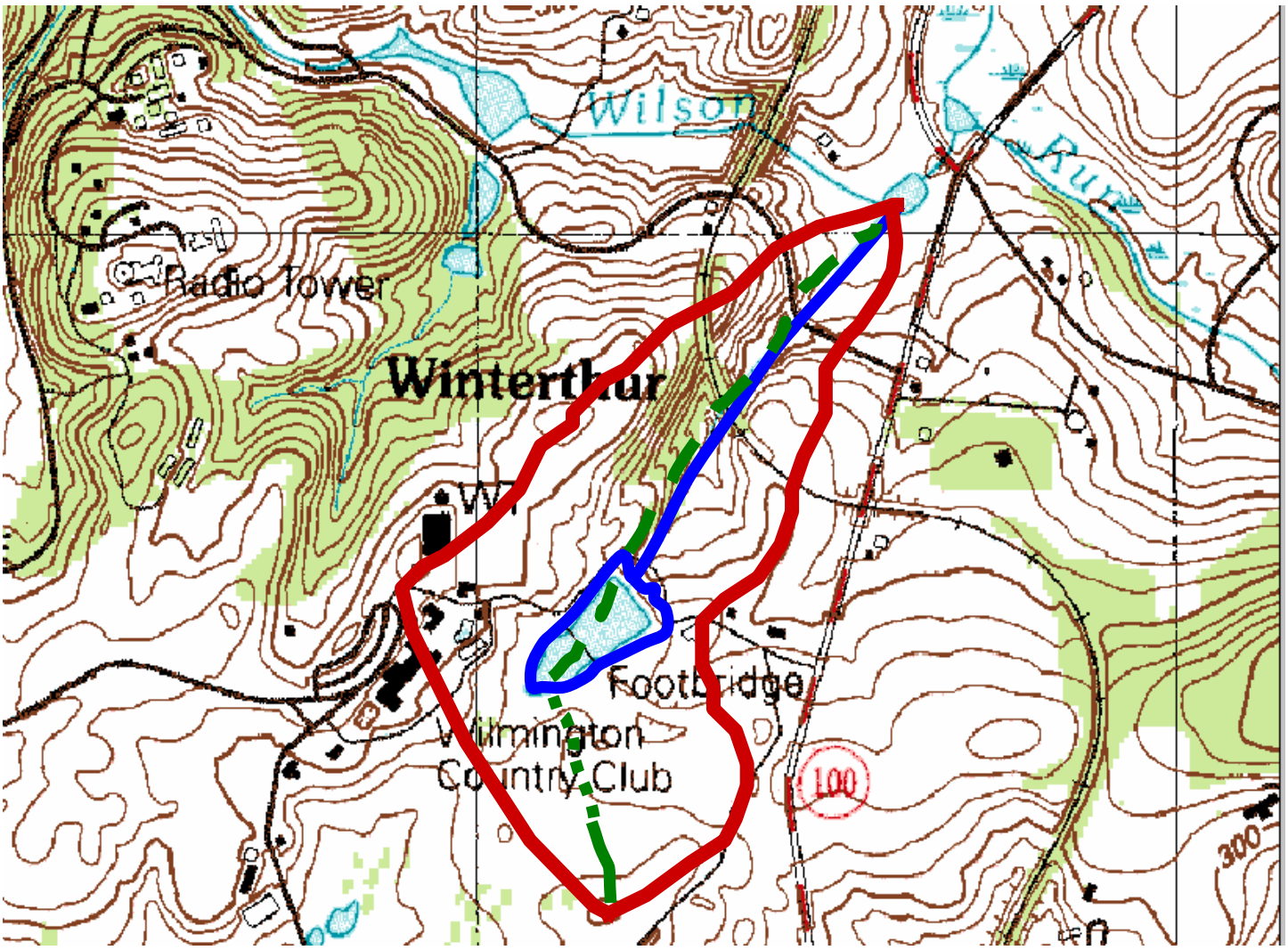
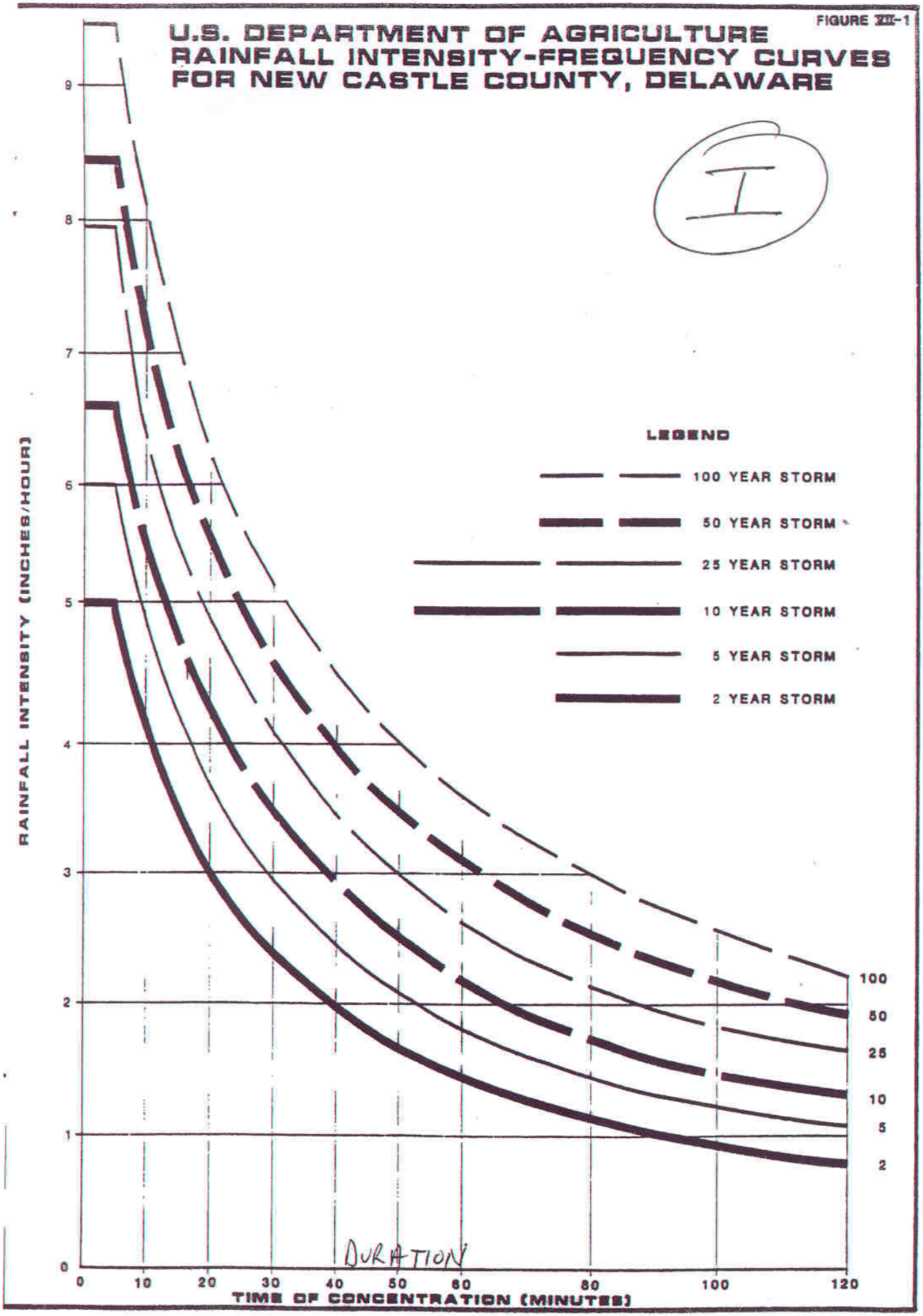


FIGURE XII-1

U.S. DEPARTMENT OF AGRICULTURE RAINFALL INTENSITY-FREQUENCY CURVES FOR NEW CASTLE COUNTY, DELAWARE



United States
Department of
Agriculture

**Natural
Resources
Conservation
Service**

**Conservation
Engineering
Division**

Technical
Release 55

June 1986

Urban Hydrology for Small Watersheds

TR-55

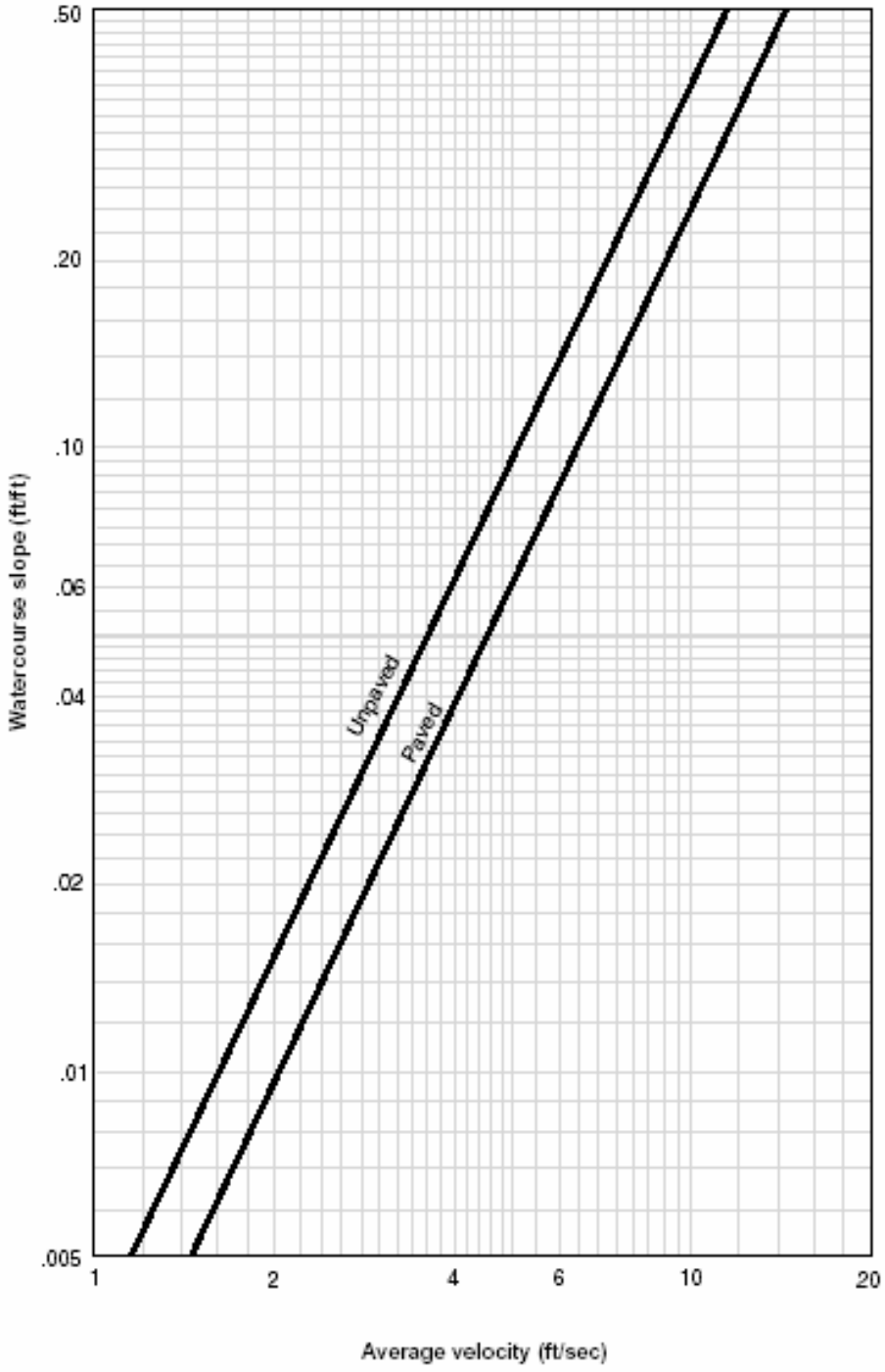
To show bookmarks which navigate through the document. Click the show/hide navigation pane button  , and then click the bookmarks tab. It will navigate you to the contents, chapters, rainfall maps, and printable forms.

Bookmark the TR-55 Manual from

www.wcc.nrcs.usda.gov/hydro/hydro-tools-models-tr55.html.

Print out Worksheet 3 Time of Concentration and Figure 3-1 Average Velocities.

Figure 3-1 Average velocities for estimating travel time for shallow concentrated flow



Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Location	Checked	Date

Check one: ☐ Present ☐ Developed

Check one: ☐ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID	
1. Surface description (table 3-1)		
2. Manning's roughness coefficient, n (table 3-1)		
3. Flow length, L (total L † 300 ft) ft		
4. Two-year 24-hour rainfall, P_2 in		
5. Land slope, s ft/ft		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr		+ =

Shallow concentrated flow

	Segment ID	
7. Surface description (paved or unpaved)		
8. Flow length, L ft		
9. Watercourse slope, s ft/ft		
10. Average velocity, V (figure 3-1) ft/s		
11. $T_t = \frac{L}{3600\ V}$ Compute Tt hr		+ =

Channel flow

	Segment ID	
12. Cross sectional flow area, a ft^2		
13. Wetted perimeter, p_w ft		
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft		
15 Channel slope, s ft/ft		
16. Manning's roughness coefficient, n		
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ft/s		
18. Flow length, L ft		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t hr		+ =

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr

Figure B-3 2-year, 24-hr rainfall

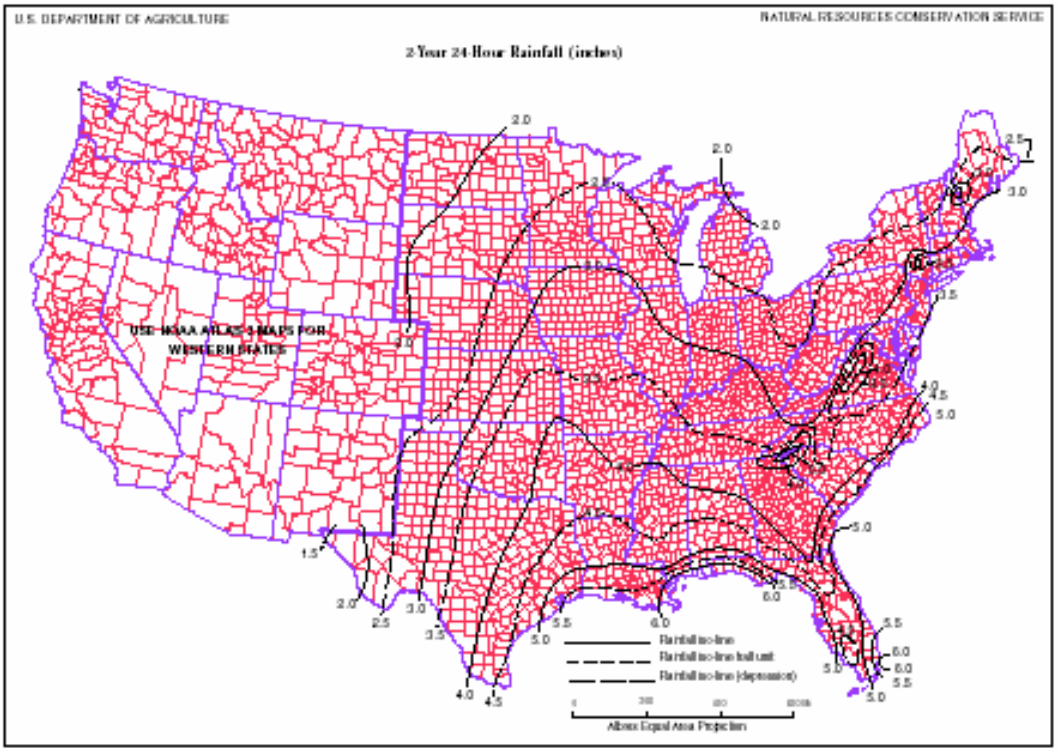
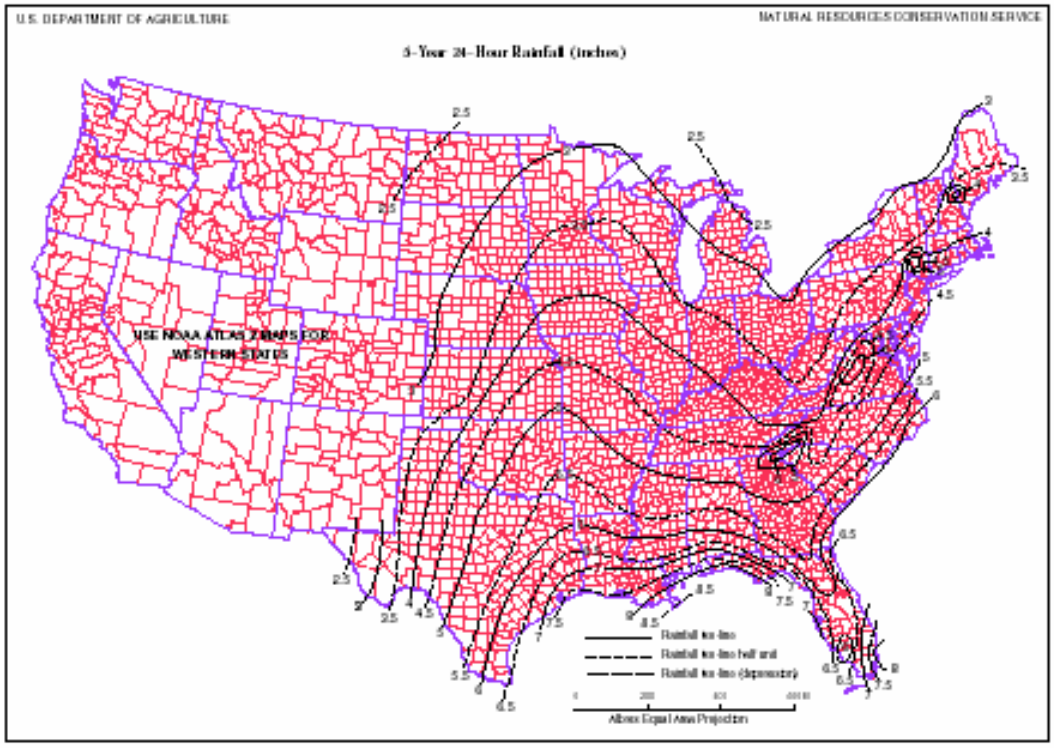


Figure B-4 5-year, 24-hour rainfall



Fairfield Run - Watershed Parameters

- Contour Interval = 10’
- D. A. = 120 acres
- Forest (green) = 45 acres
- Residential, 1/3 acre lots (yellow) = 50 acres
- Commercial/Institutional (orange) = 25 acres
- Tsf, L = 300 feet, n=0.24 (dense grass), s = 20’/300’ = 0.067 ft/ft
- Tsc, L = 1000 feet, unpaved, s = 100’/1000’ = 0.10 ft/ft
- Tch, L = 3100 ft, V = 8 fps