**0 Disclaimer [Form 0]**

**Disclaimer statement**

Although EFH2 has been tested by its developers, NO warranty, expressed or implied, is made as to the accuracy and functioning of this program and related program material. The fact of distribution shall not constitute any such warranty. NO responsibility is assumed by the developers in connection therewith.

**1 Introduction [Form 1]**

**Peak Discharge Estimation Method**

Peak discharge is determined by procedures contained in the SCS Engineering Field Handbook, Chapter 2. Data needed to use this procedure include the following watershed characteristics:

* Drainage area
* Curve number
* Watershed length
* Watershed slope

and rainfall amount and distribution.

If you are familiar with other Microsoft Windows applications, then learning to use EFH2 will be very straightforward. EFH2 uses common Windows conventions including tool bars, lists, and multiple windows. EFH2 uses many of the features of Windows.

This application supports the procedures for estimating surface runoff and peak discharge from small rural watersheds for use in designing soil and water conservation measures.

Surface runoff is the volume of excess water that runs off a drainage area. Peak discharge is the peak rate of runoff for a given rainfall

Computation procedures described in the Engineering Field Handbook, Chapter 2 (EFH2) for estimating runoff and peak discharge are included in this program.

This peak discharge determination method applies when the following conditions exist:

* Watershed is accurately represented by a single curve number between 40 and 98.
* Watershed area is between 1 and 2000 acres.
* Watershed hydraulic length is between 200 and 26000 feet.
* Average watershed slope is between 0.5 and 64 percent.
* No valley or reservoir routing is required.
* Urban land use within the watershed does not exceed 10%.

In addition to this Introduction screen, three data entry screens are included:

a. **Basic Data** screen to enter data describing the location of the drainage area and a description of the drainage area.

b. **Rainfall/Discharge Data** screen to enter rainfall data including Rainfall Type and Storm Data (Frequency and 24-HR Rain for each storm). Determination can be made for up to 7 storms per run.

c. **RCN (Runoff Curve Number)** – Optional CN Calculator

RCN data can be entered for 5 different types of Cover Description including:

* Urban Area - Fully Developed Urban Areas (Vegetation Established)
* Developing Urban - Developing Urban Area (No Vegetation)
* Cultivated Agriculture – Cultivated Agricultural Lands
* Other Agriculture – Other Agricultural Lands
* Arid Rangeland – Arid and Semiarid Rangelands.

**2 Basic Data - Data Entry Screen 1**

Data entry for Basic Data is not case sensitive. This screen is for entering data that describes the location of the drainage area including the following data fields:

a. **Client** (30 characters) - Identifies property owner

b. **State** (2 characters) - Two letter postal abbreviation

c. **County** (choice list) - Project county or parish – used to retrieve rainfall frequency data for project location

d. **Practice** (65 characters) - Description of associated conservation measure

e. **By** (4 characters) - Initials of data entry person

f. **Date** (8 characters) - Today’s date - Format MM/DD/YY

Fields included in the description of the drainage area include the following:

a **Drainage Area** (6) - Watershed area in acres; data can be entered by user (Limits 1 to 2000) or by the CN Calculator

b. **Curve Number** (2 ) - Weighted NRCS watershed curve number; data can be entered by the user (Limits 40-98) or by the CN Calculator

c. **Watershed Length** (5) - Length in feet along the flow path from the hydraulically most distant point to point of interest (Limits 200 to 26000)

d. **Watershed Slope** (4) - Average watershed slope percent (limits 0.5 to 64)

e. **Time of Concentration** - Time of Concentration in hours, is calculated hours calculated from above data, but may be overridden by user entry (Limits 0.1 to 10)

**Time of Concentration Calculation**

TIME OF CONCENTRATION (Tc) is the time in hours required for runoff to travel from the hydraulically most distant point to the point of interest. This value is program generated using the following equation:

Tc =

where Tc = Time of concentration in hours

L = Flow length in feet

CN = Runoff curve number

Y = Average watershed slope in percent

Acceptable values are from 0.1 to 10 hours. For values less than 1 hour, the program will use 0.1. Tc may not be greater than 10.0.

The computed Tc is displayed at the bottom of the Basic Data input screen. This procedure is recommended.

The Tc may also be entered by the user when some other method of computing has been used. When the user enters Tc from an outside source, an '\*' will appear beside the number on the input data screen and in the printed output.

**3 Rainfall/Discharge Data - Data Entry Screen 2**

Rainfall-frequency data is loaded from the Rainfall\_Data.xlsx file for each state for which Peak Flow and Runoff data are wanted.

This screen is used for entering numeric rainfall data including the following:

a. **Rainfall – Type** (choice list) - Rainfall distribution select from drop down choice list

Click on the down arrow on the right side of the data entry box to display the choice list of possible rainfall types. Click on the selected rainfall type to highlight the chosen response.

b. **Frequency -** Rainfall frequency in years for the 24-hour rainfall amount for storm #n

c. **24-HR Rain** - Depth of the 24-hour rainfall in inches for the storm #n event frequency

Maximum number of storms for each run = 7 storms

Results of the calculations for this screen are displayed to the right of each pair of input data entered for a storm. Output displayed for each storm entered include:

a. **Peak Flow (cfs)**

b. **Runoff (in)**

**4 RCN (Runoff Curve Numbers) - Data Entry Screen 3**

This optional CN Calculator can be used to enter data in Cover Description Pages on the RCN screen to produce Weighted Curve Number (Curve Number on Basic Data) and Accumulated Area (Drainage Area on Basic Data):

1. Click on one of the following buttons to select Cover Type and Hydrologic Condition:

* Urban Area - Fully Developed Urban Areas (Vegetation Established)
* Developing Urban - Developing Urban Area (No Vegetation)
* Cultivated Agriculture – Cultivated Agricultural Lands
* Other Agriculture – Other Agricultural Lands
* Arid Rangeland – Arid and Semiarid Rangelands.

2. After one of the buttons has been selected, the RCN data entry table will be positioned so that the data entry input area for that specific Cover Type will be displayed at the top of the current screen.

Cover Description - Enter acres or percent of each land use/cover by hydraulic soil group A, B, C or D

3. At the bottom left corner of the screen click on either Acres or Percentage to select the appropriate drainage area for the cover description. Complete cover descriptions are contained in Table 2-3 of EFH2, Chapter 2.

Acres button - Sets up table for data in acres (data conversions options available)

Percentage button - Sets up table in percent (data conversions options available)

4. After the land use and Area have been selected, enter acres or percent of each land/cover by hydraulic soil groups A, B, C or D. The applicable cover description can be selected by changing the screen using the up or down arrows on the scroll bar on the right side of the screen.

To correct or remove existing data, perform the following actions:

* Position the cursor to the desired data field.
* Use the backspace or delete key to remove unwanted characters.
* Type the new value.
* Press the Return Key when changes are complete.
* Press the ESC key to exit Curve Number (CN) and return to the previous process. The weighted CN and drainage area (if appropriate) will be returned unless urban land use exceeds 10%. When urban land use exceeds 10%, no values are returned.

Press the ESC key to return to Basic Data (CN data) screen.

5. After all data have been added for this Cover Type and Hydrologic Condition, click on the Accept button or the Clear button in the lower right corner of the screen.

6. The output will appear as:

* Weighted Curve Number =
* Accumulated Area (ac) =

These output numbers will appear at the bottom of the page next to the Accept and Clear buttons for the selected Cover Type and Hydrologic Condition.

Accept button - Copies calculated weighted CN (and area) to basic data

Clear button - Removes all data from entire table

7. To print the Results from this run, on any data entry page either click on the typewriter icon on the tool bar at the top of the screen or click on File on the Windows menu and click on Print.