SCS
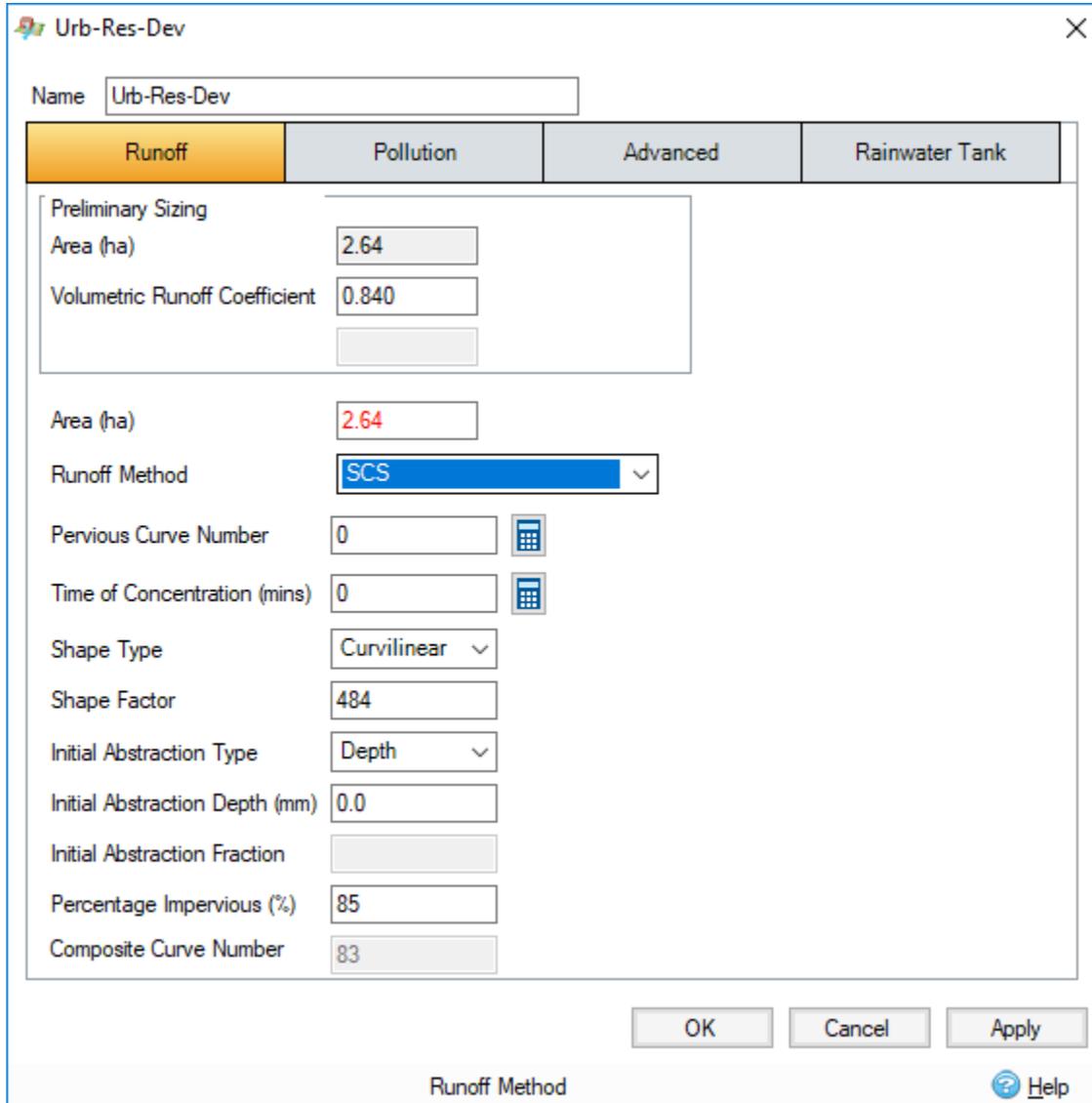
The SCS Runoff Method is described in the SCS National Engineering Handbook - Section 4 (NEH-4), with the input attributes described below.

> ⚠ This method may not be available for your region. For more information, refer to the Regionalisation topic.

Pervious Curve Number - The runoff curve number for the pervious fraction of the Catchment, as described in NEH-4 Chapter 9. Typical values vary from 20 for regions with high infiltration and interception capacities to 98 for impervious areas. It is a dimensionless number depending on hydrologic soil group, cover type, treatment, hydrological condition, and antecedent moisture conditions. This number has a valid range from 0 to 100 with typical values from 60 to 90 and 98 for impervious surfaces.

> ⓘ **Pervious and Impervious Curve Number**
>
> The Pervious CN characterises the fraction of the Catchment that is not impervious (area derived from the Percentage Impervious value). The impervious fraction of the Catchment is assigned a default CN of 98.

For ease of use the Curve Number Calculator can be accessed using the button to the right of the field. This provides a quick and easy way to select the appropriate curve number.

Time of Concentration - The time of concentration as described in NEH-4 Chapter 15 (in mins) is defined in two ways; the time for runoff to travel from the furthermost point of the watershed to the point in question, and the time from the end of excess rainfall to the point of inflection on the trailing limb of the unit hydrograph. Tc can be estimated from several formula such as Kinematic-wave. For a constant excess rainfall can be described as:

$$Tc = C(n^{0.6} L^{0.6}/i^{0.4} S^{0.3})$$

in which **L** is the distance from the upper end of the plane to the point of interest (usually the inlet) **n** is the Manning resistance coefficient, **i** is the excess rainfall rate, **S** is the dimensionless slope of the surface, and **C** is a constant that depends on units of the other variables. For **tc** in minutes, **i** in inches/hr and **L** in feet **C** equals 0.938. For **tc** in minutes **i** in mm/hr and **L** in meters **C** equals 6.99.

Another formula for determining tc is the lag equation

Tc = L/0.6 where **L= I^0.8(S+1)^0.7/1900Y^0.5**

> **Tc** = time of concentration in hours

> **L** = lag time in hours

> **I** = hydraulic length of the watershed in feet

> **Y** = Average land slope in percent

> **S** = Potential maximum retention in inches

> **CN** = weighted Curve Number

For ease the Time Of Concentration Calculator can be accessed using the button to the right of the field. This allows a set of popular methods to be sued to determine the Time of Concentration.

Shape Type - Select from the available shape types from the drop-down list.

Shape Factor - The shape factor or peak rate factor as defined in NEH-4 Chapter 16. The typical value is 484 for a hydrograph where the volume under the falling side of the triangular unit hydrograph is equal to 1.67 times the volume under the rising limb of the curvilinear unit hydrograph. Actual values may vary from 100 in very flat swampy country to 800 in steep rocky terrain.

The Soil Conservation Service has been determined the hydrograph shape factor to be 484 for most watersheds. This was the result of analyzing many watersheds of various size and geographic location. It is used in the formulation of peak discharge and the peak of the unit hydrograph:

Qp=484A/tp

in which **Qp** is the peak discharge in cfs, **A** is the drainage area mi^2 and **tp** is the time to peak in hr. Several other values have been used for shape factor within Florida and other areas of the country for wetlands, sandy soils and steep terrain. Typical values in Florida include 323 or 256 and values as low as 100. Effectively, the hydrograph shape factor will lengthen the time base of the unit hydrograph and lower the peak. If you are using real rainfall data this parameter can be used for calibration. For example the falling limb time base of the hydrograph will be double when using a shape factor of 300 instead of 484.

A curvilinear or triangular shape may be chosen by selecting the appropriate button. Both shapes are supported for the entire range of hydrograph shape factors.

Initial Abstraction - The initial abstraction from the precipitation may be represented as an absolute number, that is the total depth of precipitation that is less (in mm or inches) or as a fraction of the amount of precipitation (between 0 to 1).

Initial Abstraction, Ia, contains all the loss terms prior to beginning of runoff. All though it was found to be highly variable for many small agricultural watersheds it was found that

Ia = 0.2 × S

Where **S = (1000/CN)-10**

S is the potential maximum abstraction.

Percent Impervious - Pervious portion of the Inflow area.

Composite Curve Number - The weighted CN used by the simulation. It is calculated as follows:

CN = (PIMP / 100 * 98) + ((1 – (PIMP / 100)) * PACN)

where:

PIMP = Percent Impervious

PACN = Pervious Area Curve Number

⚠ This method may not be available for your region. For more information, refer to the Regionalisation topic.

References for more information:

James 1998, Editor "Modeling the Management of Stormwater Impacts" Volume 6 Chapter 23 Author Ashok Pandit and Joanie Regan What is the Impervious Area Curve Number. Publisher CHI Guelph Ontario Canada.

Viessman W. et al 1977, "Introduction to Hydrology", Harper&Row Publishers New York

USDA National Resources Conservation Service, 1986, Urban Hydrology for Small Watersheds, Technical Release 55.

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