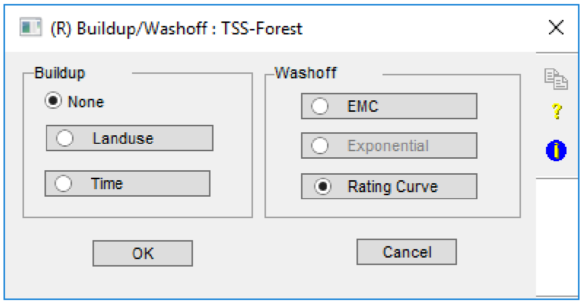
Buildup and Washoff Data

This database is for global pollutant buildup and washoff data, and is referenced from the 'Pollutant-Landuse Data' dialog under the Runoff Pollutant Global Database. Buildup/washoff characteristics are defined for each combination of Landuse and Pollutant.



Note that Runoff Water Quality in Job Control must be ON.

Several methods constitute the genesis of stormwater quality, most notably Buildup and Washoff. In an impervious urban area, it is usually assumed that a supply of constituents is built up on the land surface during dry weather preceding a storm. With the storm the material is then washed off into the drainage system.

As an alternative to the use of a buildup-washoff formulation, quality loads may be generated by a rating curve or EMC approach.

Washoff is the process of eroding or dissolving of constituents from a subcatchment surface during a period of runoff.

Buildup Method

Several methods of Pollutant buildup are available. The pollutant buildup can be directly related to the buildup of dust and dirt, or may build up using a similar formulation with independent parameters for each pollutant/landuse combination. Buildup need not be specified at all; washoff can be defined directly. Some Buildup and Washoff methods are mutually exclusive. Where this is the case invalid combinations are greyed out.

No Buildup

No buildup required (KALC = 4). In this case, washoff is generated by a rating curve approach, with no upper limit.

Buildup/Landuse

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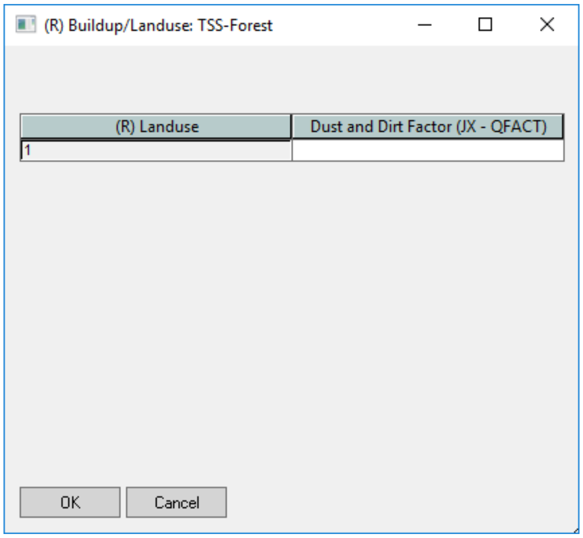


Buildup of pollutants (JX - KALC = 0) may be specified as a fraction of the dust and dirt for each landuse. The land use names are those entered in the Landuse Global Database. If Buildup by Landuse is being used the Landuse types must first be defined in the **Landuse Global Database** . The following table indicates the quantity of pollutant per gram of dust and dirt for four Chicago land uses (*American Public Works Association, 1969*).

Land Use Type	BOD5 (mg/g)	COD (mg/g)	Coliforms (mg/g)	N (MPN/g)	PO4 (mg/g)
Single-Family Residential	5.0	40.0	1.3E6	0.48	0.05
Multi-Family Residential	3.6	40.0	2.7E6	0.61	0.05
Commercial	7.7	39.0	1.7E6	0.41	0.07
Industrial	3.0	40.0	1.0E6	0.43	0.03

Landuse

Further details on this parameter can be found in the Landuse global data section

Dust and Dirt Fraction (QFACT)

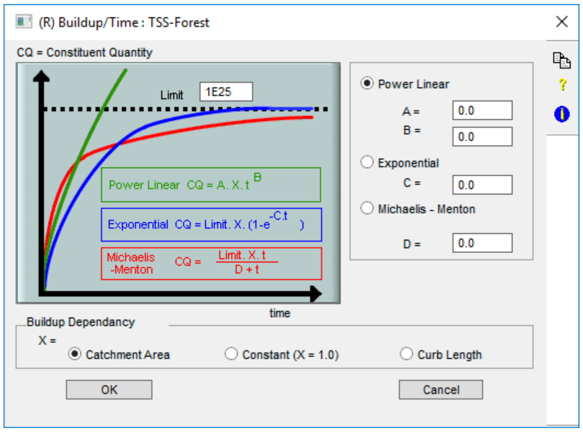
The Dust and Dirt Fraction is the quantity of pollutant in the Dust and Dirt. The units of this factor depend on the pollutant units as shown in the following table:

Pollutant Unit	*Dust and Dirt Factor Units*
mg/liter	pound/gram [kg/gram]
'other'/liter	10^6/gram [10^6/gram]
other ft^3	[m^3]

If the pollutant has units of 'other'/l (e.g. MPN/l), the Dust and Dirt factor entered is in millions in order to facilitate the entry of large numbers. If the pollutant units are 'other,' then "buildup" of such parameters is rarely referred to; instead a much more viable option is the use of a rating curve that gives load directly as a function of flow.

Time

Cumulative pollutant buildup specified as a function of time (JX - KALC = 1-3). This formulation is similar to the dust and dirt buildup equations, except that units for pollutant buildup parameters depend on the units for the pollutant. If the pollutant units are in mg/l, then buildup units are given as mass units. If the pollutant has units of 'other'/l (eg. MPN/l) the Dust and Dirt parameters are in millions, to facilitate the entry of large numbers. If the pollutant units are 'other', then "buildup" of such parameters is rarely referred to; instead a much more viable option is the use of a rating curve that gives load directly as a function of flow.



Limit (QFACT1)

Upper limit for the pollutant buildup. The units for this parameter depend on the Buildup Dependency variable, as follows:

Buildup Dependency	Unit for Pollutant Buildup Limit
Catchment Area	Q1/acre [Q1/hectare]
Constant	Q1
Curb Length	Q1/(100 ft curb) [Q1/(km curb)]

where:

Q1 = Pollutant quantity, that depends on the pollutant units as follows:

Pollutant Unit	Unit for Q1
mg/litre	lb [kg]
'other'/litre	10^6 [10^6]
other	ft^3 [m^3]

For the Exponential or Michaelis-Menton formulations, this value becomes the asymptote; this limit is imposed for the Power-Linear form.

Buildup Dependency

This parameter defines the dependent variable 'X' in the buildup equations formulated in this dialog. Pollutant buildup can depend on the subcatchment area, curb length, or neither (the value of 'X' is always 1.0 in this case).

Buildup by Catchment Area (JX - KACGUT = 1)

Pollutant buildup is calculated using the landuse area (subcatchment area or part thereof).

Constant Buildup (JX - KACGUT = 2)

Pollutant builds up at the same rate regardless of the size of the subcatchment.

Buildup by Curb (Kerb) Length (JX - KACGUT = 0)

Pollutant buildup is calculated using the curb (kerb) length entered for the subcatchment, in units of 100 ft [km].

Buildup Function

Power Linear Function (JX - KALC = 1)

Calculate the pollutant buildup using the power linear function to the right of this item. Linear buildup is simply a subset of a power function buildup.

Power Linear Factor (JX - QFACT3)

The multiplication factor in the power-linear form. The unit of this parameter depends on the Buildup Dependency option, as follows:

Buildup Dependency	Unit of Factor in power-linear form
Area	Q1/acre/day^{POW} [Q1/hectare/day^{POW}]
Curb Length	Q1/(100 ft curb/day^{POW}) [Q1/(km curb)/day^{POW}]
Constant	Q1/day^{POW} Q1/day^{POW}

where:

POW = Power in the power-linear form

Q1 = Pollutant quantity, that depends on the pollutant units as follows:

Pollutant Unit	Unit for Q1
mg/liter	lb [kg]
'other'/liter	10^6 [10^6]
other	ft^3 [m^3]

Power (JX - QFACT2)

The power in the power-linear formulation. This parameter has no units. Linear buildup can be simulated by setting this parameter to 1.0.

Exponential Function (JX - KALC = 2)

Calculate the pollutant buildup using the exponential function to the right of this item. This form of buildup has an asymptotic trend.

Exponent (JX - QFACT2)

This parameter is the familiar exponential decay constant. This type of relation will be evident by a semi-log plot of buildup versus time indicating a linear relationship. Thus the unit of this parameter is 1/day.

Michaelis Menton Function (JX - KALC = 3)

Calculate the pollutant buildup using the Michaelis Menton function to the right of this item. This form of buildup has an asymptotic trend. Generally, this formulation rises steeply (in fact linearly for small values of time) and then approaches the asymptote slowly.

Michaelis Menton Factor (JX - QFACT3)

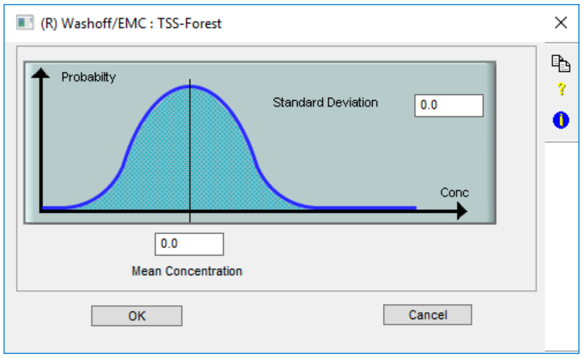
This parameter has the interpretation of the half-time constant, ie. the time at which buildup is half of the maximum (asymptotic) value. Thus, the unit of this parameter is days.

Washoff Method

Washoff is the process of erosion and/or solution of constituents from a subcatchment surface during a period of runoff.

EMC

Event Mean Concentration (KWASH\=3) . The amount of pollutant being washed off is proportional to the amount of runoff, although the concentration varies from the mean using a given standard deviation. The EMC approach is a special case of the 'Rating Curve' approach, with a power of 1.0 and a coefficient which has a probability distribution with a given mean and standard deviation. The EMC is assumed to vary with a log probability distribution.



This option is only available when 'None' is specified for the 'Buildup Method'.

Standard Deviation

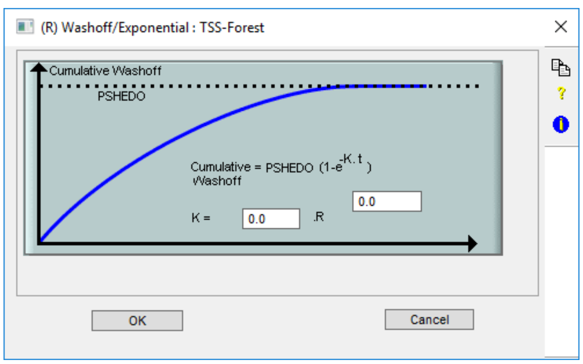
Statistical standard deviation from the mean pollutant concentration (RCOEF), in the units for the current pollutant.

Mean Concentration (WASHPO)

Mean concentration of pollutant in the runoff water, in the units defined for the current pollutant.

Exponential

Cumulative pollutant washoff is specified as an exponential function of time (KWASH\=0). This method requires some buildup of pollutant to occur during dry periods prior to a storm. With rainfall, the pollutant is washed off with an exponential relationship, ie. approaching the amount built up asymptotically. The quantity PSHED0 is the quantity of pollutant built up, and thus available for washoff.



This option is available only when a buildup method other than 'None' is selected.

The variation from the simple exponential relation is that the exponential coefficient varies with the runoff in a power form.

Initial Buildup Quantity (PSHEDO)

The quantity of pollutant built up, and thus available for washoff.

Coefficient (RCOEFF)

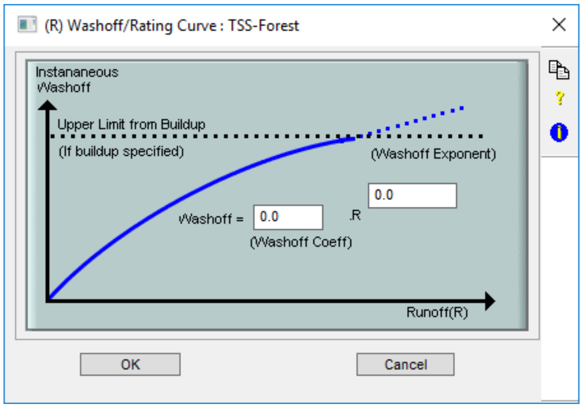
The coefficient in the power equation for the exponent, in units of (in/hr)^-POW [(mm/hr)^-POW], where POW is the power used in this equation. Note that the runoff rate is spread over the subcatchment in units of in/hr [mm/hr].

Power (WASHPO)

The power in the equation for the exponential coefficient.

Rating Curve

The rating curve (KWASH=1 or 2) is a function of instantaneous washoff against instantaneous runoff. This method is generally easiest to use when only total runoff volumes and pollutant loads are available for calibration.



The cumulative pollutant washoff will always be limited to the amount of pollutant built up if buildup has been specified (ie. if the buildup criteria is other than 'None'). The maximum amount that can be removed is the amount built up prior to the storm. Once the limit is reached, concentrations drop to zero, until dry weather allows buildup.

Coefficient (RCOEF)

The coefficient in the rating curve equation, with units of Q1/(cfs^POW) [Q1/cumec^POW],

where

POW = power in the power rating curve

Q1 = Pollutant quantity, that depends on the pollutant units as follows:

Pollutant Unit	Unit for Q1
mg/liter	lb [kg]
'other'/liter	10^6 [10^6]
other	ft^3 [m^3]

Power (WASHPO)

The exponent in the rating curve equation, non-dimensional. If this value is more than one the concentration of pollutant in the runoff will increase as the runoff increases. Otherwise the concentration of the pollutant will decrease as the runoff increases.