From: Randall Fedors
Sent: Tuesday, August 07, 2007 7:29 AM
To: Chandrika Manepally
Subject: Re: Fmult question
Attachments: image001.gif; image002.gif; image003.gif

Chandrika,

What Hakan put in the seepage report is a form that is most transparent with the scientific notebook and Mathematica fitting notebook, both of which I had provided to him. Note that in the Seepage report, the log (base 10) of Q is correct. In the TPA user guide, equation 10-2 has this switched to ln (natural log), which is incorrect.

For the seepage report, more transparency can be gained by adding a sentence that the fitting algorithm used flux in units of mm/yr. I expect that the seepage report already describes this as an empirical fit; if not, add that notion. The coefficients are correct for fluxes in mm/yr. I did the fitting without looking at what the TPA code would be passing to the Fmult subroutine/algorithm. So actually, the flux in the log term should be in units of mm/yr (otherwise the coefficients would be different); i.e., the coefficient values are units-dependent. The TPA code glosses over this issue. The seepage report looks like it tries to create transparency. I remember Osvaldo and I talking about re-doing my old calculations to make things cleaner, but decided the conversion was easier.

Summary: the equation looks fine, but TPA user guide needs to have the ln changed to log.

--Randy

>>> Chandrika Manepally <cmanepally@cnwra.swri.edu> 08/06/2007 4:17 PM >>>
Randy
Here's what is there in Seepage workshop report

F_{mult} is defined as a function of time-variant reflux rate during the therm
percolation rate above the drift ceiling in the postthermal period. F_{mult} i
empirical three-parameter sigmoidal relation described in Scientific No

$$F_{mult} = \begin{cases} \dfrac{a}{1 + e^{-\frac{\log[Q] - x_o}{b}}} & \text{if } t < t_B \\ 1 & \text{if } t > t_B \end{cases}$$

$$Q = q_r \times c \times F / L_{WP} / D_{WP}$$

where

a	—	shape parameter [dimensionless] (AfmultCoeffic
b	—	scale parameter [dimensionless] (BfmultCoeffici
x_o	—	shift parameter [dimensionless] (X0FmultCoeffic
Q	—	linear flux [mm/yr]
q_r	—	reflux rate in the thermal period or deep percola period [m^3/yr] (Figure 2-2)
c	—	conversion parameter [yr/m]
F	—	flow focusing factor, F_{ow} × WastePackageFlowM [dimensionless]
L_{WP}	—	waste package length [m] (WPLength in *tpa.inp*)
D_{WP}	—	waste package diameter [m] (WPDiameter in *tpa*
t_B	—	initial time at which rubble starts accumulating o

Check the dimensions of Equation 3-1b. First, Q should be unitless and not mm/yr.
I'm going to rewrite eqn 3-1 b as follows:

$$Q = \frac{q_r \times c \times F}{L_{wp} \times L_{wp}}$$

OR

We could also say that

$$Q = \frac{q_r \times F}{L_w \times D_w}$$

And then in equation 3-1a, introduce Q x c before the ln so that there are no units for the term.

Let me know what works for you..

I personally think that it will best to have Equation 10-2 given in TPA User's guide here too.so there is no confusion!

Thank you for your help!
Chandrika

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image001.gif	77146	
image002.gif	383	
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F_{mult} is defined as a function of time-variant reflux rate during the thermal period or deep percolation rate above the drift ceiling in the postthermal period. F_{mult} is constructed using an empirical three-parameter sigmoidal relation described in Scientific Notebook 432, Volume XII as

$$F_{mult} = \begin{cases} \dfrac{a}{1 + e^{-\frac{\log[Q]-x_o}{b}}} & \text{if } t < t_B \\ 1 & \text{if } t > t_B \end{cases} \tag{3-1a}$$

$$Q = q_r \times c \times F / L_{WP} / D_{WP} \tag{3-1b}$$

where

a	—	shape parameter [dimensionless] (AfmultCoefficient in *tpa.inp*)
b	—	scale parameter [dimensionless] (BfmultCoefficient in *tpa.inp*)
x_o	—	shift parameter [dimensionless] (X0FmultCoefficient in *tpa.inp*)
Q	—	linear flux [mm/yr]
q_r	—	reflux rate in the thermal period or deep percolation rate in post thermal period [m^3/yr] (Figure 2-2)
c	—	conversion parameter [yr/m]
F	—	flow focusing factor, F_{ow} × WastePackageFlowMultiplicationFactor [dimensionless]
L_{WP}	—	waste package length [m] (WPLength in *tpa.inp*)
D_{WP}	—	waste package diameter [m] (WPDiameter in *tpa.inp*)
t_B	—	initial time at which rubble starts accumulating on top of the drip shield [yr]

$$Q = \frac{q_r \times c \times F}{L_{wp} \times D_{wp}}$$

$$Q = \frac{q_r \times F}{L_{wp} \times D_{wp}}$$