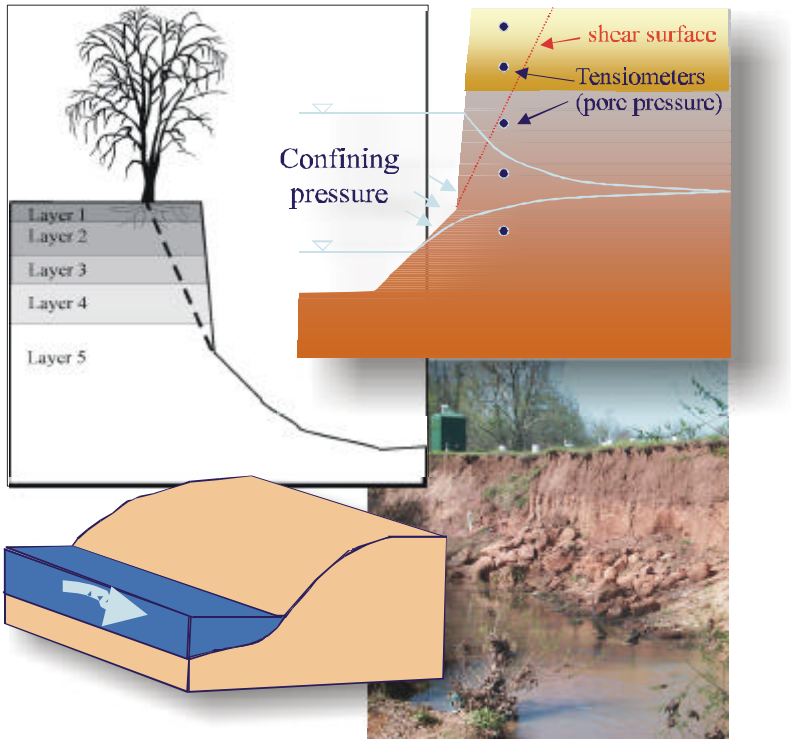
Bank-Stability and Toe Erosion Model

Version 3.4



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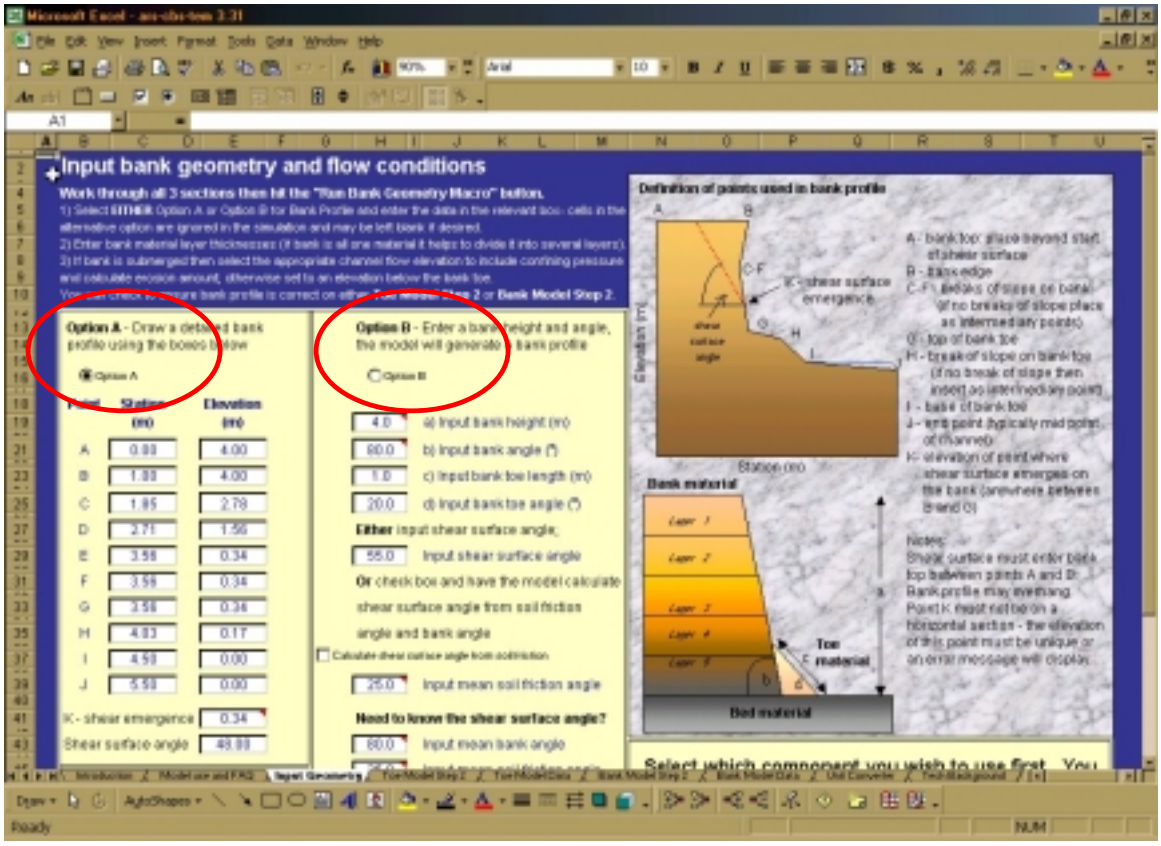
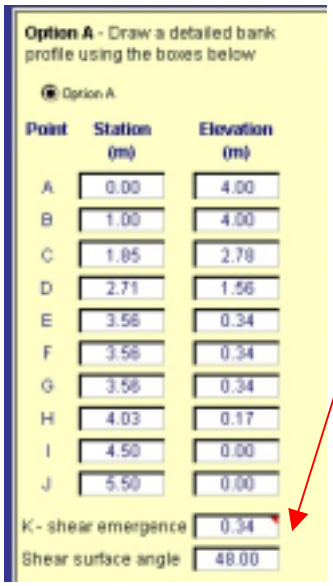
Note: Additional information on model usage is available on each of the model worksheets.

1. Input Geometry Sheet



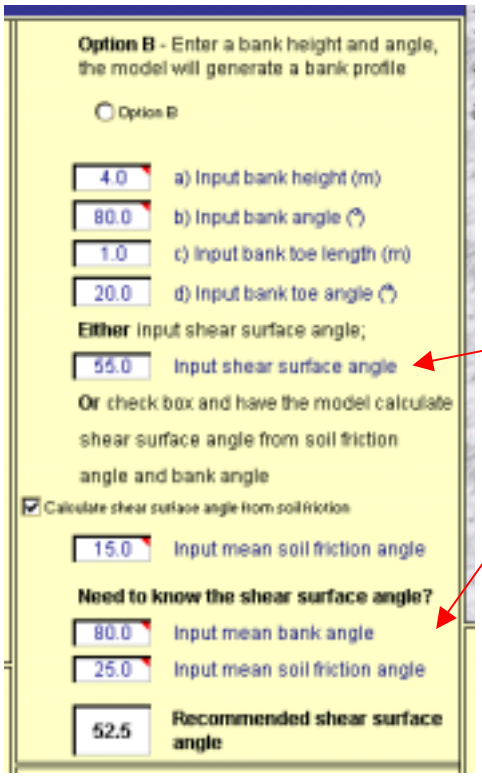
- Select EITHER Option A or Option B for Bank Profile and enter the data in the relevant box - cells in the alternative option are ignored in the simulation and may be left blank if desired.



If Option A is selected remember to enter a K value and a shear surface angle.

The K value is the elevation of the point where the shear surface emerges on the bank. Point K must not be on a horizontal section - the elevation of this point must be unique or an error message will be displayed

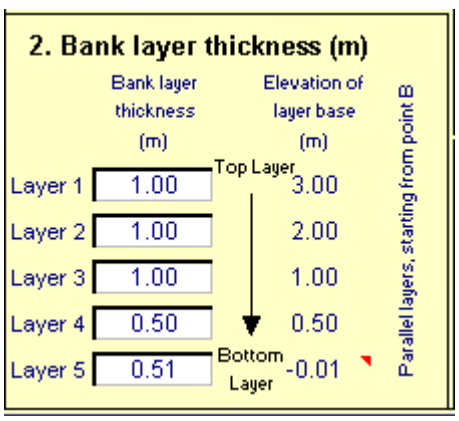
Note the shear surface must enter bank top between points A and B.



If Option B is selected remember to enter a shear surface angle.

The shear surface angle may be determined from mean bank angle and a soil friction angle.

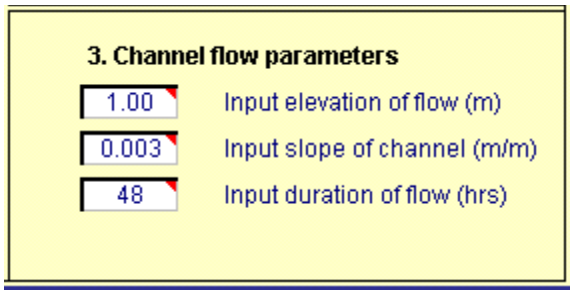
- Enter bank layer thickness



If the bank is all one material it helps to divide it into several layers.

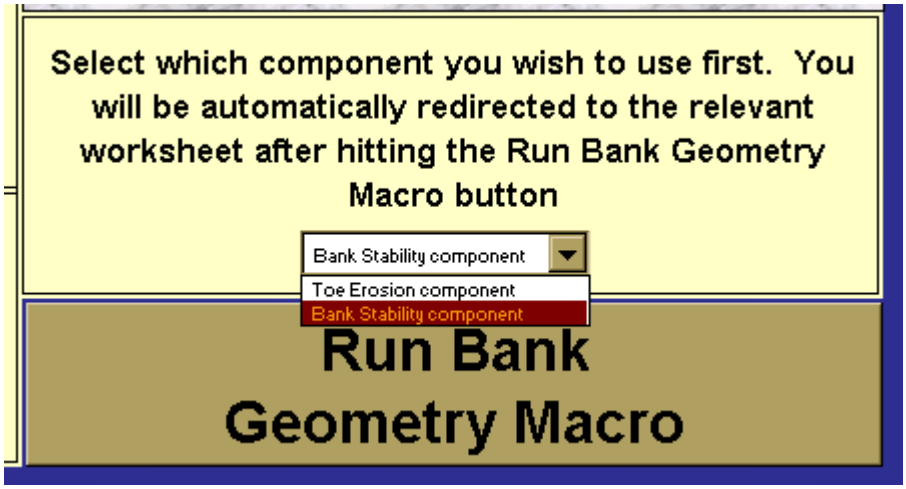
Layer 5 must end at or below the base of the bank toe. Therefore the basal elevation of layer 5 should be equal to or less than the elevation of point I (base of bank toe) if option A is selected, or 0 (zero) if option B is selected.

- Enter channel flow parameters

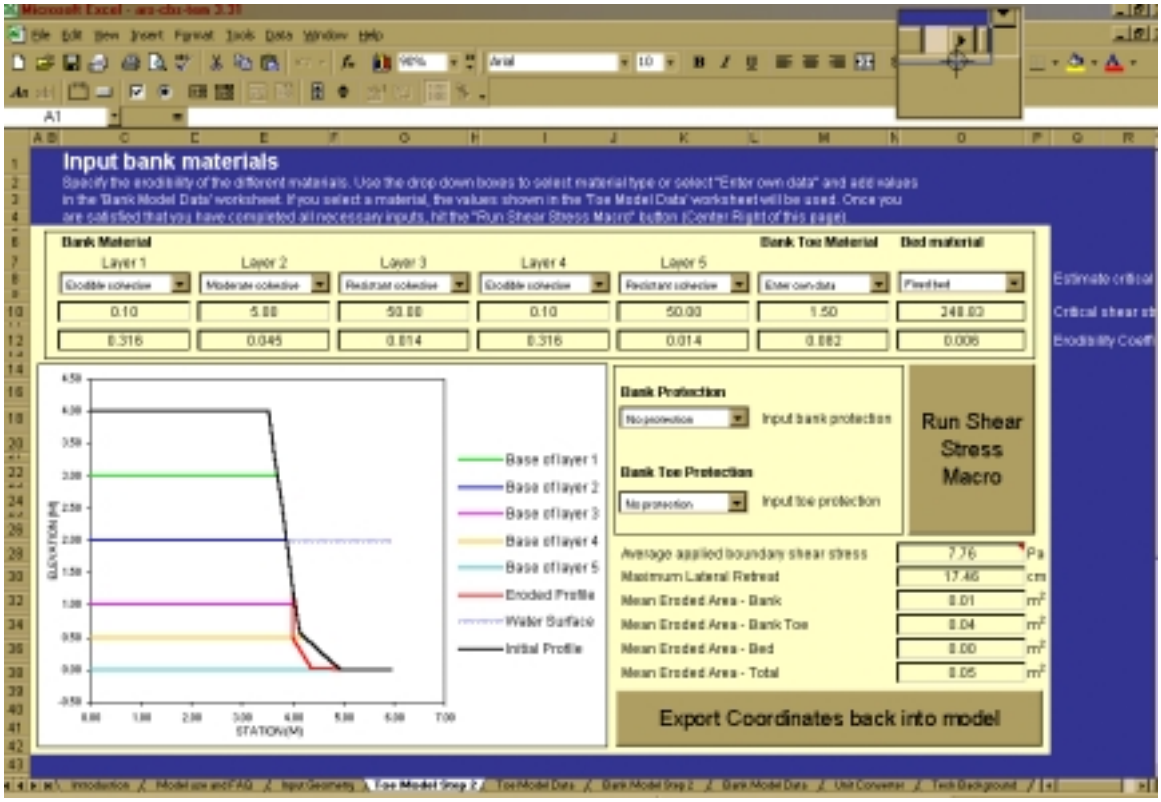


If bank is partially submerged then select the appropriate channel-flow elevation to provide a calculation of confining pressure and erosion amount; otherwise set to an elevation below the bank toe.

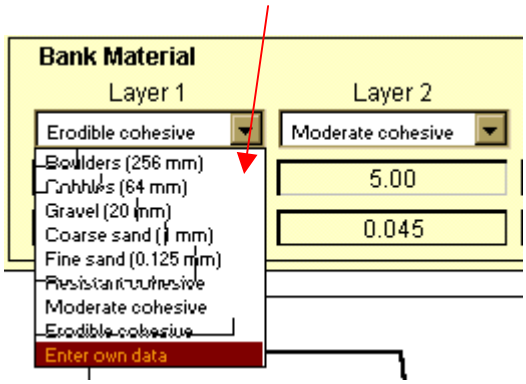
- Select which model (Bank toe or Bank stability) you wish to use first. You will be automatically redirected to the relevant worksheet after hitting the "Run Bank Geometry Macro" button



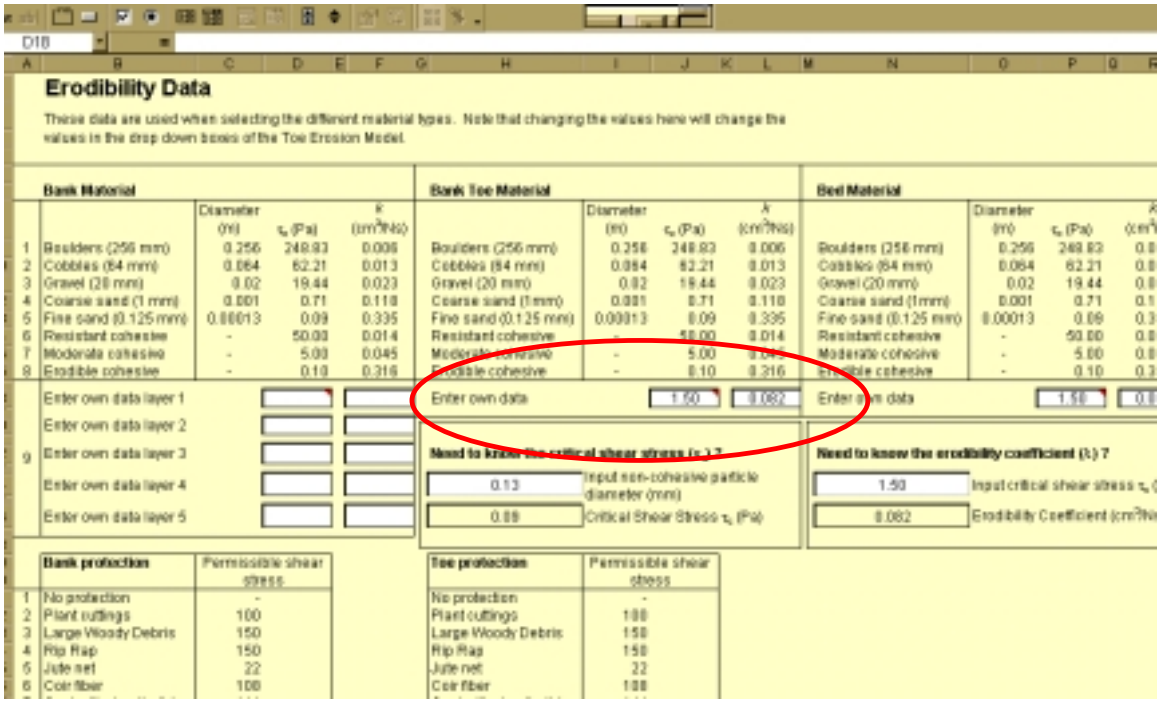
2. Input Bank Materials



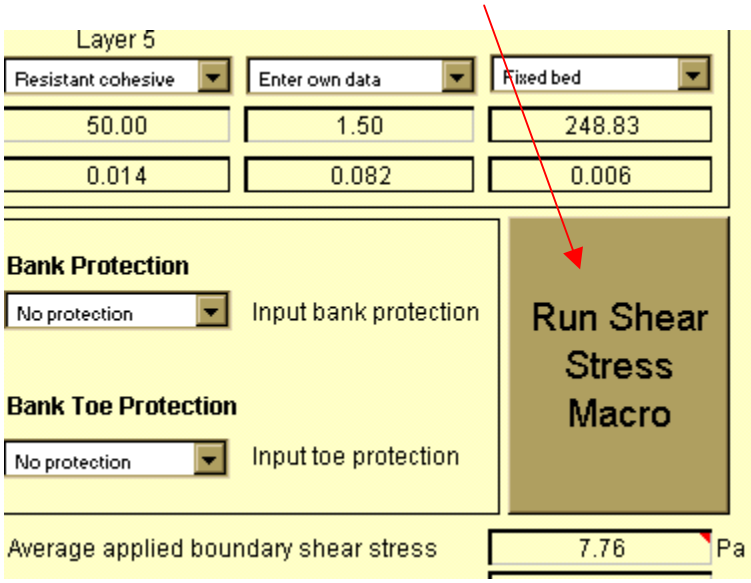
- Specify the erodibility of the different materials. Use the drop down boxes to select material



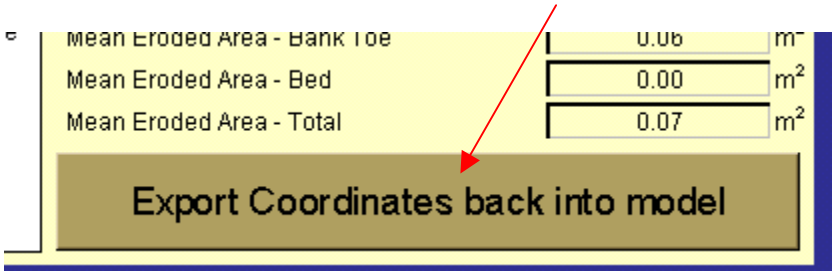
- If "Enter own data" is selected add values in the “Toe model data” sheet



- Once you are satisfied that you have completed all necessary inputs, hit the "Run Shear Stress Macro" button.



- To continue transfer the coordinates into the “Input geometry” sheet by clicking the “Export Coordinates back into model” button.

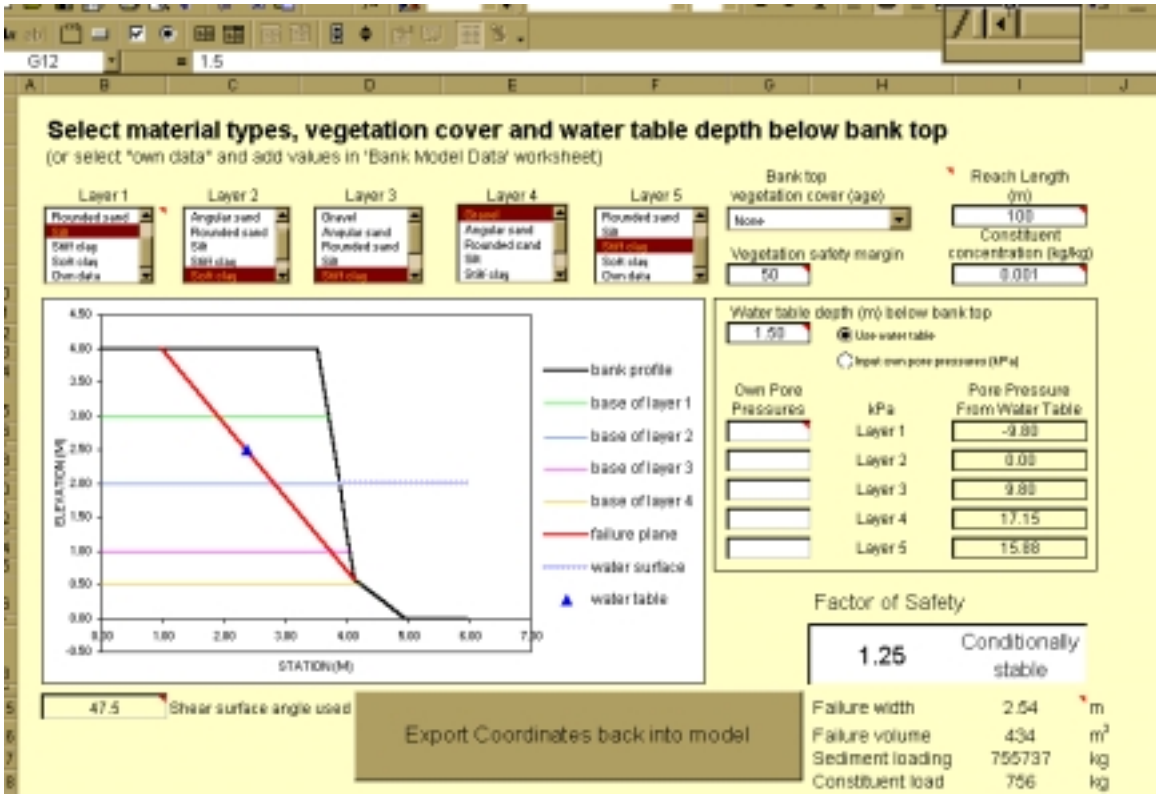


This will export coordinates into the “Option A” box on the “Input geometry” sheet.

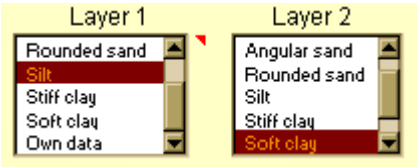
Once the coordinates have been transferred two options are available. One may determine the stability of the new eroded bank profile or one may run another flow event. To run another flow event alter the relevant details in section 3 and hit the “Run bank geometry macro” button making sure the toe model component is selected.

To determine bank stability after a flow event select the bank stability model component and click the “Run bank geometry macro” button.

3. Bank Stability model



- Select material type from the menus



- If “own data” is selected enter values in the “Bank Model data” sheet

Bank material type	Description	Friction angle ϕ'	Cohesion c' (kPa)	Saturated unit weight (kN/m^3)	ϕb (degrees)
1	Gravel	36	0	20	5
2	Angular sand	36	0	18	15
3	Rounded sand	27.0	0.0	18	15
4	Silt	25.0	5.0	18	15
5	Stiff clay	10.0	15.0	18	15
6	Soft clay	30	10	16	15
7	Own data layer 1	27.0	0.4	21.4	15.0
	Own data layer 2	0.0	79.0	21.6	15.0
	Own data layer 3	35.0	0.0	21.6	15.0
	Own data layer 4	15.0	10.0	16.0	12.0
	Own data layer 5	15.0	10.0	16.0	12.0

- Select pore water pressures to determine stability

Water table depth (m) below bank top

1.50

(●) Use water table

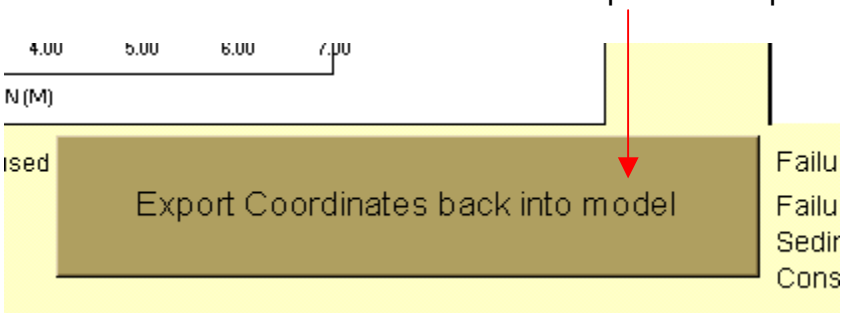
( ) Input own pore pressures (kPa)

Own Pore Pressures	kPa	Pore Pressure From Water Table
	Layer 1	-9.80
	Layer 2	0.00
	Layer 3	9.80
	Layer 4	17.15
	Layer 5	15.88

Stability is given as a factor of safety

Factor of Safety

1.25 Conditionally stable

Failure width	2.54	m
Failure volume	434	m^3
Sediment loading	755737	kg
Constituent load	756	kg

- Once stability has been determined the coordinates may be exported back into the model ("Initial Geometry" sheet) **IF** the modeler deems that the bank has failed. This is done by clicking the "Export Coordinates back into model" button. **IF** the bank remains stable, return to the "Initial Geometry" sheet to simulate another flow event or another pore-water pressure condition.