Spring'14 Soil Mechanics Homework-7

The cross section of a small earth dam resting on an impermeable base layer is shown in the figure below. Soil 2 is a granular layer placed at the slope surface which has 16 kN/m^3 dry unit weight and $c' = 0$ and $\phi' = 39°$. Soil 1 constitutes the main body of the dam. It has dry and saturated unit weights 18 and 20 kN/m^3, respectively, and the following shear strength parameters: $c' = 8$ kN/m^2, $\phi' = 30°$, $c_u = 50$ kN/m^2, and $\phi_u = 0$.

Ignore tension cracks and calculate factor of safety:
1) of a shallow landslide of soil 2 only; using infinite slope analysis.
2) of the given circular failure surface in terms of total stresses; using driving and resisting moments (in this calculation, you may assume that all of the length of the circular arc passes through soil 1).
3) of the given circular failure surface in terms of effective stresses; using method of slices. Do not use less than 5, or more than 10 slices. Obtain pore pressures using the flow net given on the figure (not $h_w.\gamma_w.\cos^2\alpha$) On one of your slices on the figure, show the dimensions you measured.

O

soil 2

soil 1   soil 1

Top flow line

Figure is drawn to scale. 1 cm = 1 m

granular drain

impervious