EPA On-line Tools for Site Assessment Calculation

Module Home Objectives Table of Contents Previous < Next >

Vertical Gradient Calculator
Vertical Gradient

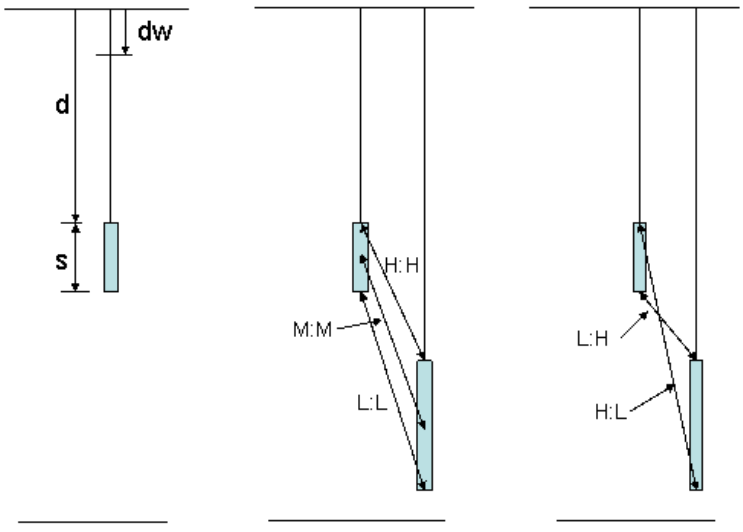
Water levels in nested well clusters (wells located closely together) indicate upward or downward flow in aquifers or flow between adjacent geologic units. Flow is governed by Darcy's Law:

$$q = -K \frac{change\ of\ head}{distance}$$

where q is the Darcy flux (volume of water per unit area per unit time) and K is the hydraulic conductivity. The change of head (roughly water level) divided by the distance determines the gradient and direction of flow.

Different assumptions about the distances are used in the calculator and are illustrated below.

The vertical gradient calculator determines vertical gradients between adjacent wells. (They are assumed to be located very close together; for wells far apart use one of the horizontal gradient calculators.) It illustrates the effects of screen length on gradient calculations. These differences come about because the gradients are theoretically determined from piezometers that are only open at the bottom and thus have an effective screen length of zero. In practice, wells with screens of various lengths are used to calculate the gradients and the screen lengths may have an influence on the calculated gradients. For reference, the gradients are also calculated assuming that the screen lengths are zero, as if the wells were true piezometers. More information ...



Definition of inputs for each well (piezometer):

- dw = depth to water
- d = depth to top of screen
- s = screen length

Assumptions concerning screen lengths:

- Distance is from top of screen to top of screen (H:H)
- Distance is from mid-point of screen to mid-point of screen (M:M)
- Distance is from bottom of screen to bottom of screen (L:L)

- Distance is from top of screen to bottom of screen (H:L)
- Distance is from bottom of screen to top of screen (L:H)

Example Data | Calculate | Clear
Save Data | Recall Data | Go Back

Input Parameters

	Surface Elevation	Depth to Well Screen	Screen Length	Depth to Water
Shallow Well	36.62	5	10	6.89
Deep Well	37.22	58.5	5	7.72

Results

	Magnitude	Flow Direction	
Low to high value (L:H)	0.004106	down	
High to high value (H:H)	0.004509	down	
Mid-point value (M:M)	0.004651	down	Concise version
Low to low value (L:L)	0.004802	down	
Low to high value (H:L)	0.005361	down	

Flow directions can be determined. Shallow well is a water table well. Only submerged length used in calculations.

Gradient Estimate Between Piezometers (screen lengths equal to zero)

Piezoemeters	0.004348	down

Previous Top ^ Next

Home | Glossary | Notation | Links | References | Calculators