

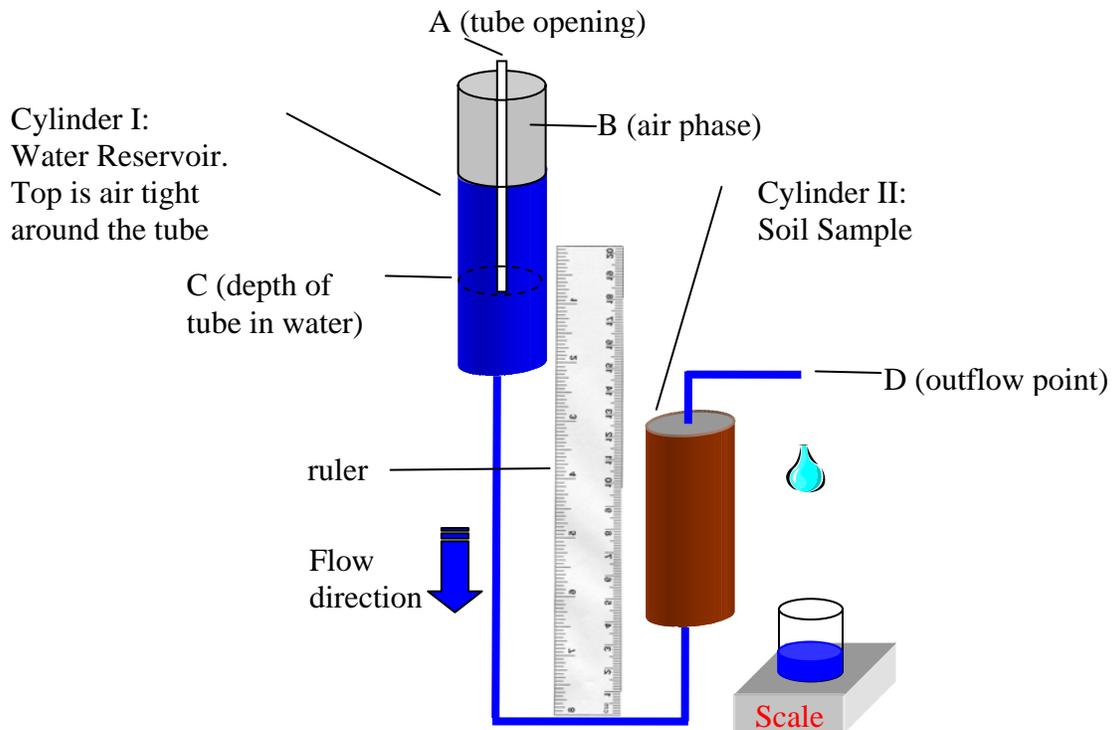
Assignment

The purpose of this assignment is to familiarize you with the field equipment you will use at Waquoit Bay (WB) on the field trip Sunday. At WB, you will attempt to demonstrate Darcy's Law:

$$q = K \frac{dh}{dz} \quad (1)$$

by independently measure its three components: K , the hydraulic conductivity of the bay sediment; q , the Darcy flux of water moving from the subsurface into the bay ; and $\frac{dh}{dz}$, the hydraulic gradient between the subsurface and the bay. You will measure each component by the following means: hydraulic conductivity with a permeameter; the Darcy flux with a seepage meter, and the hydraulic gradient with a differential head sampler. The purpose of this exercise is to get familiar with and understand the equipment you will use. Please study the figures and reason through the following questions.

Hydraulic Conductivity: The Permeameter



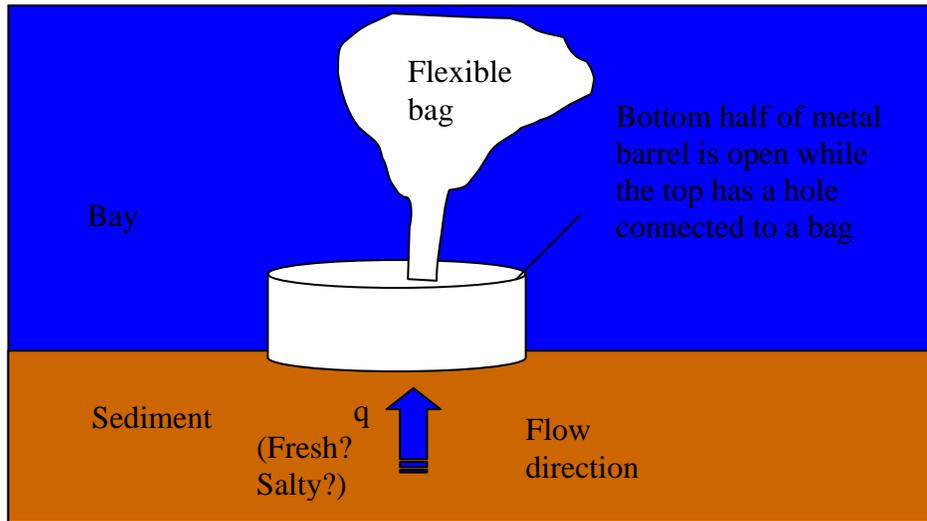
The purpose of Cylinder I is to maintain a constant head. In Cylinder I, what happens in part **B** as water starts to flow?

How does this cause part **A** and **C** to respond?

How does this affect the hydraulic head level at part **C** as water continues to flow?

Knowing that fresh water is 1 g/ml and having a stop watch handy to record the weight of water accumulation from the scale with time, what other easy measurement(s) are required to apply Darcy's Law in order to determine the hydraulic conductivity of the soil sample in cylinder II? How can the permeameter measure the hydraulic conductivity of a soil sample?

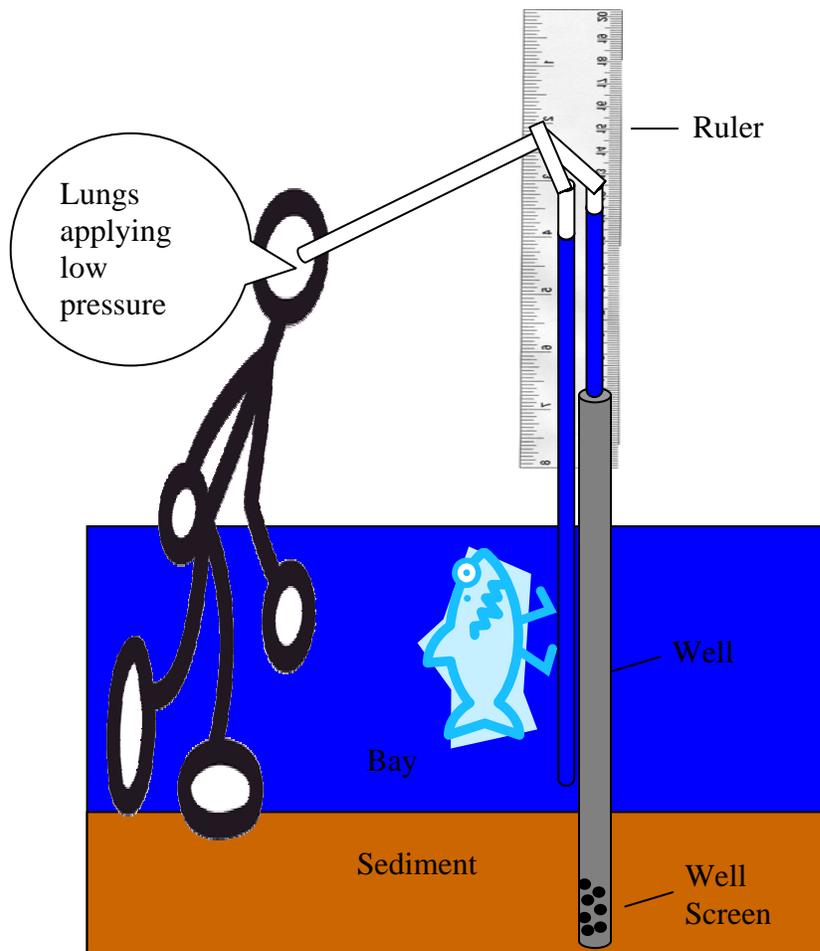
Darcy flux: The Seepage Meter



Using a scale to weigh the bag after a recorded amount of time what other measurements are needed to measure the Darcy flux? Do you think it would be important to fill the bag with some water first? Why?

Why doesn't the Bay squeeze all the water out of the bag? How is this device used to directly measure the Darcy flux?

Hydraulic Gradient: The Differential Head Sampler



Aside from drowning, why don't we care how deep the bay is (which is why the ruler stays above water)? Do we care how deep the well goes into the sediment? How can this device be used to calculate the hydraulic gradient?

Lets say the bay water is saltier than the sediment water, how does this affect the gradient? Can we correct for it?

Bonus: Waqiout Bay is very shallow and has a very small opening? Are you worried about sharks in Waqiout Bay? Is this reasonable?