Water Cycle

Water flows from areas of high potential energy to those with low potential energy.
DARCY’s LAW

Discharge (i.e. Volumetric Flow Rate) is directly proportional to AREA and HEAD DIFFERENCE inversely proportional to distance between heads constant of proportionality is hydraulic conductivity, $K : LT^{-1}$

$$Q = K \frac{\text{Head Difference}}{\text{Area}} = K \frac{\text{Head Difference}}{i \cdot \text{Area}}$$

Q=volumetric discharge : $L^3T^{-1}$ $i=$gradient : $LL^{-1}$ $A=$Area : $L^2$

If the sand is uniform the head will decline linearly
Standpipes open in the sand would show this

We could contour the lines of equal head

More on DARCY’s LAW later
We will talk more about this later, but let's make a simple estimate now.

\[ Q = K \frac{\text{Head Difference}}{\text{Area}} = K \frac{i}{A} \]

Distance between Heads

\[ Q = \text{volumetric discharge} : L^3 T^{-1} \quad i = \text{gradient} : L L^{-1} \]

constant of proportionality is hydraulic conductivity, \( K : L T^{-1} \)

A simple formula but often misused.


\[ Q = K \frac{\text{Head Difference}}{\text{Area}} \]

Distance between Heads

\[ \text{constant head} \]

\[ 0.4 \text{ m} \]

\[ 0.21 \text{ m} \]

\[ 6 \text{ cm} \]

\[ 0.63 \text{ m} \]

\[ 0.75 \text{ cm} \]

FINE SAND

\[ \approx 0.14 \text{ cm}^3/\text{sec} \text{? how about liters? days? significant figures? Might vary up and down and order of magnitude} \]