Unit 2: How Does Groundwater Travel?

Humans may control how quickly groundwater is pumped out, but what controls how quickly groundwater moves INTO an area?

It's not just a matter of how much recharge (rainfall, snowmelt) the area gets, although that's important. It's also a question of how quickly the recharge water can move into and through the ground and that depends on what type of soils and rocks the water is moving through. If you dug up soil samples from different kinds of places - like a creek bank, a garden plot, the woods - you'd notice that the soils don't look alike. They don't act alike, either.

If you poured water through different soil types - such as sand, clay, gravel and garden soil - you'd discover that water moves at different rates through different kinds of earth materials: quickly through the gravel and sand; more slowly through the garden soil; and most slowly of all through the clay.

Here's something else you ought to know: WATER CAN MOVE THROUGH ROCKS at different rates. Think back to the cup of gravel we used for the water table demonstration. Imagine the gravel as a close-up view of a single rock. The spaces between the chunks of gravel are like a rock's PORES. Pores are the spaces that water occupies when the rock (or a soil) is part of the saturated zone. If the POROSITY is formed at the same time as the rock or with the sediments, it is called PRIMARY porosity.

Porous/porosity

Rocks with large pore spaces are called POROUS; that means that they can hold a great deal of water. How easily the water can travel through a rock depends on whether the pores are connected to each other.

Demonstration 1: porosity

PURPOSE: To gain an understanding of porosity

MATERIALS:
- 3 clear, hard plastic cups
- marbles
- sand
- graduated cylinders
- water

PROCEDURE: Fill one cup (to rim) with marbles, one cup (to rim) with sand, and a third cup (to rim) with a mixture of sand and marbles (pour in the marbles first, then add sand slowly while agitating the cup, to make sure sand filters down through the marbles). Measure and pour water into each cup until the water line reaches the rim of the cup. Record the amount of water used for each cup.

marbles:_____cc water

sand:_____cc water

marbles + sand:_____cc water

CONCLUSION: The closer the fit of each particle to another, the smaller the space between them. As the spaces between the particles (the "pores") become smaller, the amount of water that can occupy that space is reduced. Both size and shape of a particle help to determine POROSITY, with mixed sizes having the smallest amount of pore space.

QUESTIONS:

1. What could the marbles represent?
2. How is the sand different from the marbles?
3. Which takes up more space in the cup, marbles or sand?
4. Which takes up more space, a marble or a grain of sand?
5. How do marbles and sand represent real ground or earth?
6. How are they different from real situations?