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HOW FAST DOES GROUND WATER MOVE?

In most cases, the speed of ground water movement in the Earth's rocks and sediments is very slow and may only be a few feet per year. But there are exceptions, especially if the rocks have interconnected fracture systems. Ground water flow may even change direction rapidly if provoked, such as in the case of a geyser sending water up into the air.

Basics:

1. In almost all cases, ground water flows down-gradient under the influence of gravity.
2. The velocity of ground water flow is influenced by the permeability of the rock or sediments through which it is passing.
3. The greater the amount of recharge, the greater the chance of higher rates of ground water movement.
4. Ground water may be moving at different rates at different depths in the same place.

Permeability is a measure of how well the void spaces are connected within the rock or soil. The greater the permeability, the faster ground water is likely to flow. Sometimes sub-surface permeability's vary because of faults, fractures or changes in rock type. These sub-surface changes in geology explain how two wells drilled to the same depth just a few feet apart may have very different well yields.

Scientists use the term hydraulic conductivity (HC) rather than permeability. Ground water flow speeds in unconsolidated sedimentary deposits such as gravel may be about 600 feet per year, whereas clay formations may have ground water flow speeds of 2 inches per year! In rocks with extensive fractures or in some limestone formations that have caves, ground water can move at rates of several hundreds of feet per day. Crystalline bedrock, such as igneous basalt and granite, and metamorphic schist and gneiss (pronounced "nice") generally has low HC values. HC in crystalline rocks is dependent on the number and spacing of fractures and the amount of weathering that has occurred. You can't get "water from a stone" unless it has voids, fractures or cracks for the water to pass through. The higher the number of fractures in the bedrock and the closer the cracks are to each other, the higher the HC of the bedrock.

When considering the water supply for your well, it is important to remember that low geologic HC values usually correspond to slow well recharge rates. Some solutions to increase the water supply from a well in low HC rocks may be to:

1. "Hydrofrack" the well to increase the number and size of fractures in the bedrock
2. Drill deeper to increase the storage volume of ground water in the well, and / or
3. Set-up a holding tank to maintain an available supply of water outside the well.

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