OKLAHOMA ROCKS!
GROUNDWATER

Lesson 1: What is an aquifer?

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The term aquifer is derived from the Latin roots aqua meaning "water" and ferre meaning "to bear." To be called an aquifer the geologic material must not only "bear water," but be saturated and have sufficient porosity and permeability to be a usable source of water for wells. Sedimentary rocks (such as sandstone and limestone) or unconsolidated materials (such as sand and gravel alluvium) most often form aquifers because they are porous and permeable enough to transmit water.

The Latin root tard means "slow," so the term aquitard refers to geologic material that transmits water slowly. Shale is an example of a sedimentary rock that normally is classified as an aquitard because although it has a high porosity it has a very low permeability. When an aquitard is present between two aquifers it will restrict the migration of fluids between the two aquifers.

Geologists and engineers try to understand the distribution of geologic materials in the subsurface and the corresponding variability in porosity and permeability. A basic understanding of these characteristics are needed for installing productive water wells, designing liners for landfills out of clay, or planning to extract oil and gas from the subsurface.

A sample of the Garber sandstone, which is one of the geologic units forming the Central Oklahoma Aquifer. Photo from: Murray, K. E. (2012), Geologic controls on groundwater recharge to the Central Oklahoma Aquifer, Oklahoma Geology Notes, 72(2), 1-8.

Questions:

1. The Garber Sandstone and Wellington Formation extend beyond the northern and southern borders of Oklahoma. So, why are they only classified as an "aquifer" in central Oklahoma?

   http://www.ogs.ou.edu/pubsscanned/NOTES/GNV72N2.pdf

2. Why is clay used to line a landfill? Why is it compacted during installation?

3. Why is gravel used in the leachfield of a septic system?