

Groundwater Lab

Name _____ Block _____

Guiding Question: What happens to the water table when a pumping well removes water from the zone of saturation?

Concept: A pumping well causes a cone of depression in the zone of saturation and also lowers the water table. An injection well introduces contaminants to the zone of saturation. If an injection well is near enough to a pumping well, a pumping well could remove the contaminants and people would be drinking and using poisoned well water.

Materials: a two-liter clear plastic bottle, two transparent straws, syringe gravel, sand, limestone rocks, topsoil.

Procedure:

1. Cut the top off a two-liter bottle
2. Place at least two inches of gravel in the bottom of the bottle.
3. Position two straws in the container and layer three-six inches of sand on top of the gravel. Make sure you hold the straws in place as you pour in the sand.
4. Add a layer of Cole County rocks on top of the sand.
5. Add one inch of topsoil on top of the rocks.

Procedure:

1. **SLOWLY** add water to the model to saturate the sand and gravel layers **only**.
2. Predict what will happen if the water is drawn off (using a syringe) through one of the straws. **PREDICTION:**

3. A. Insert a syringe into one of the straws (**a pumping well**) and withdraw some water.
B. Move the syringe to the other straw (**a pumping well**) and remove water through it.

SKETCH: (Label each area.)



Pumping Wells

OBSERVATIONS:

A.

B.

4. Inject food coloring into one of the straws (**an injection well**) to represent a contaminant. Observe how the contaminant enters the groundwater.

5. Move the syringe to the other straw (**a pumping well**) and remove water through it.
How does pumping near an injection well affect the movement of the contaminant?

SKETCH: (Sketch the changes.)



OBSERVATIONS:

Pumping Well near an Injection Well

6. Simulate a landfill with a liner by placing a two-inch square plastic near the edge of the bottle on the surface and covering it with a thin layer of dirt. Carefully add one or two drops of food coloring to the center. Then prepare another landfill without the state-required liner by making a small depression in the dirt. Carefully add two drops of food coloring.

SKETCH: (Sketch the changes.)



OBSERVATIONS:

Lined and Unlined Landfill

Analysis Questions:

1. What happens to the zone of saturation when a pumping well removes water from the zone of saturation?
2. What happens when an injection well introduces a contaminant to the zone of saturation?
3. What might happen when a pumping well is near an injection well?
4. Do you think an industry has a right to inject industrial wastes without regulation? ____