

Groundwater and Wells:

*An Introductory Discussion with Application
to Northeastern Illinois*

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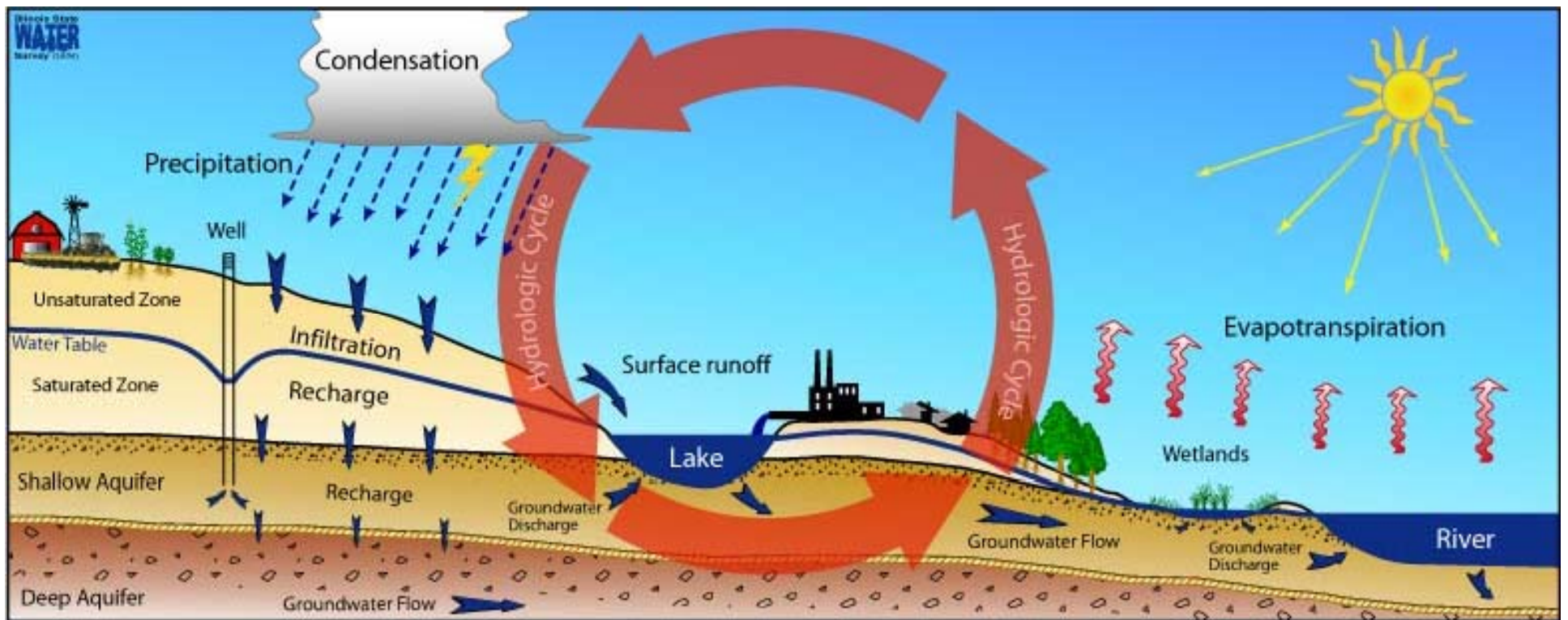
Topical Presentation Outline

Basic Concepts and Definition

- The Hydrologic Cycle
 - What Is Groundwater?
- Concepts and Definitions
 - Porous Flow vs. Fractured Flow
 - Aquifers vs. Aquitards
 - Artesian vs. Water Table Conditions
- Regional Groundwater Flow Systems
- Well and Aquifer Hydraulics

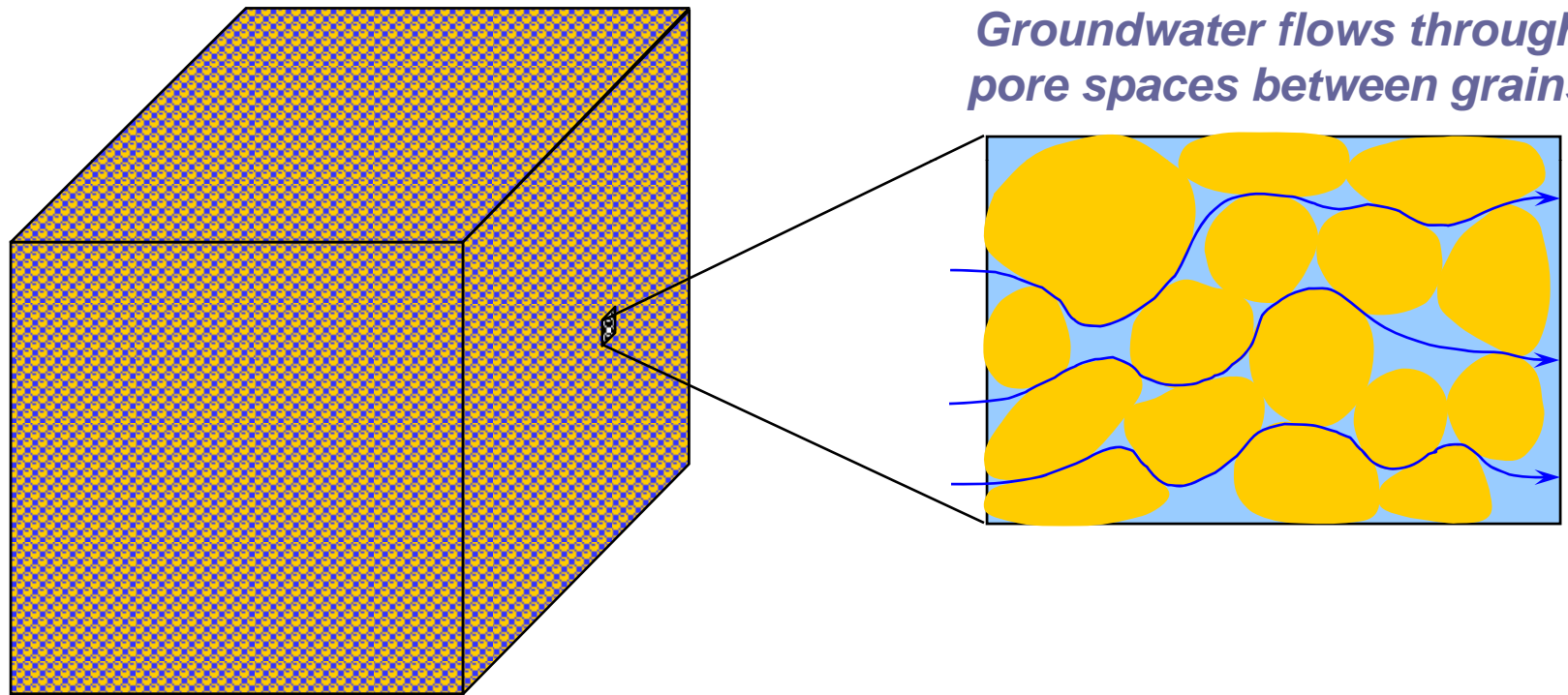
The Water Cycle

Climate, surface water, and groundwater are linked



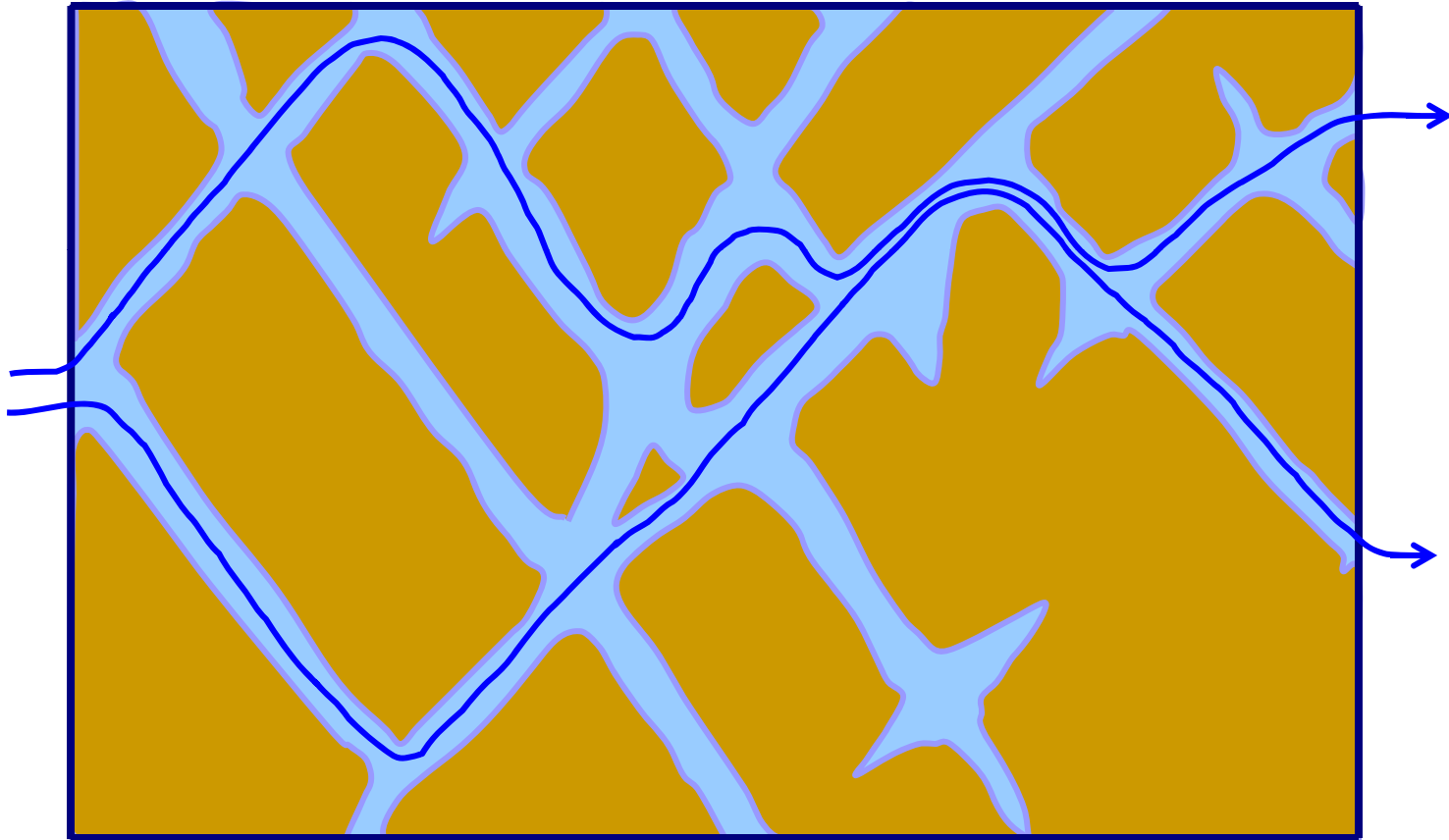


Porous Systems





Fractured Systems



Fractured Limestone or Dolomite





Aquifers vs. Aquitards

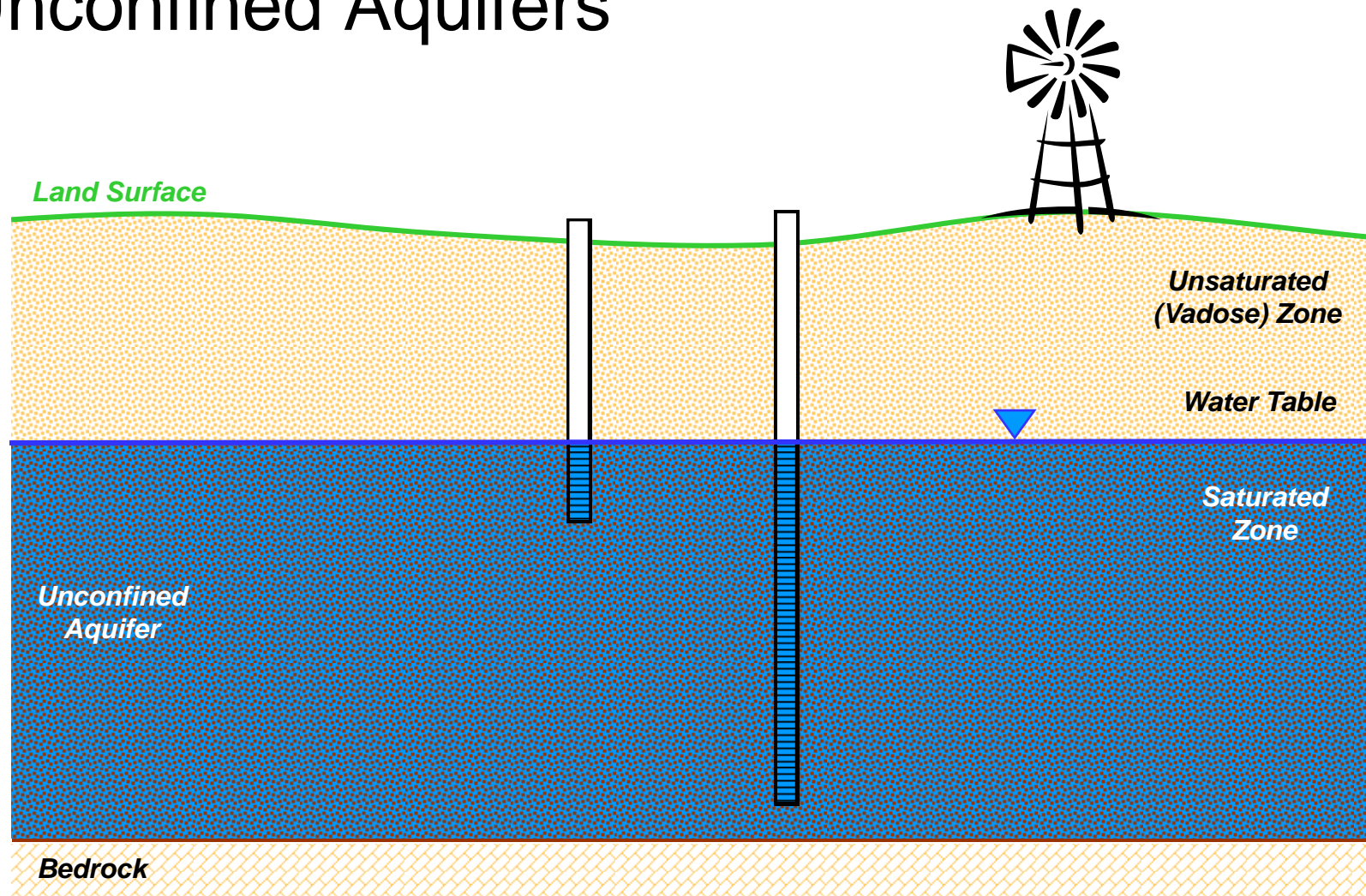
- An ***aquifer*** is a saturated bed, formation, or group of formations that yields water in sufficient quantity to be of consequence as a source of supply.
- An ***aquitard*** yields *inappreciable* quantities of water, but *leakage* of water through the aquitard is possible. Aquitards often act as confining beds.



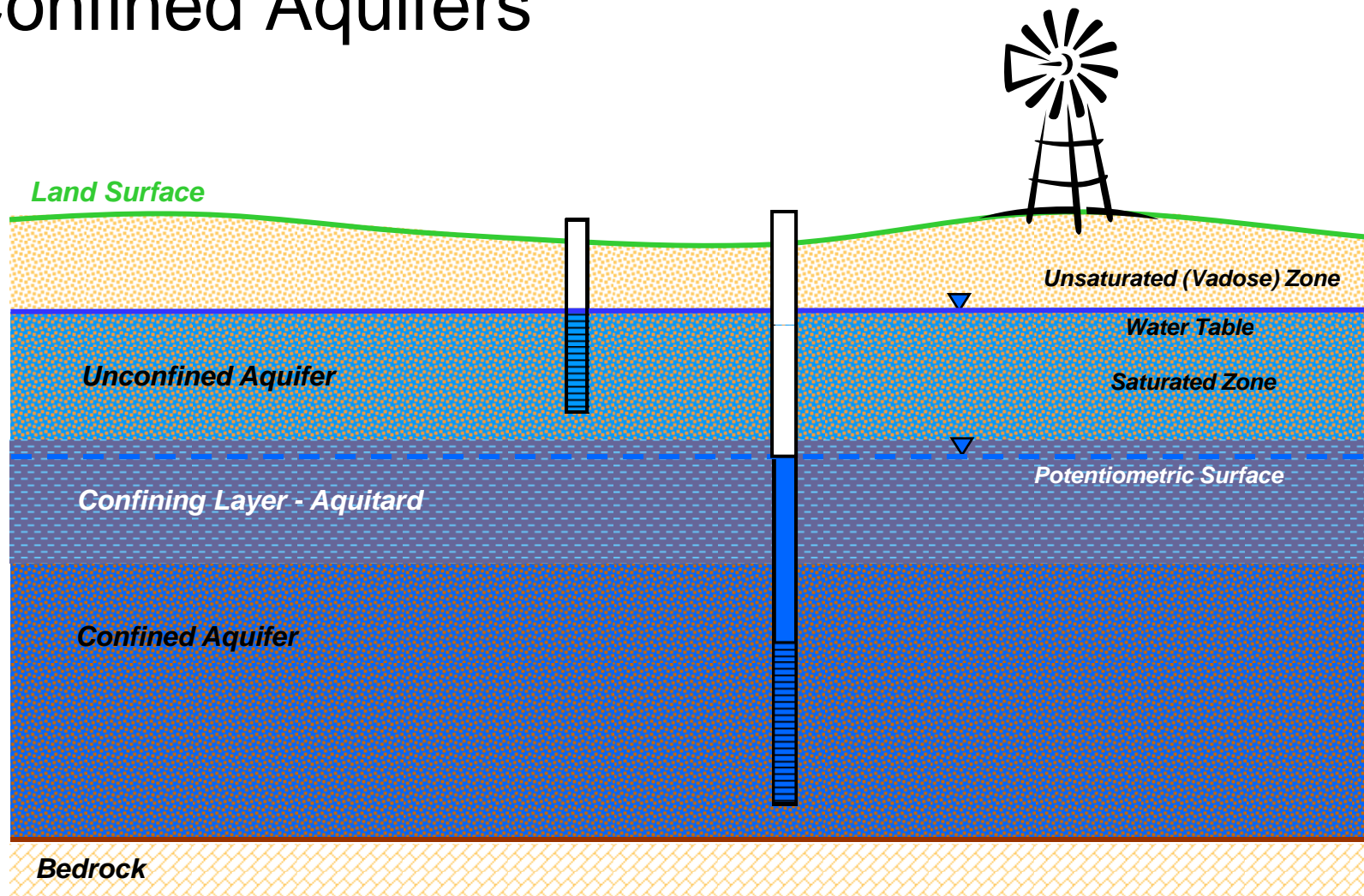
Unconfined vs. Confined Groundwater

- An ***unconfined aquifer*** is one in which groundwater possesses a free surface open to the atmosphere. The upper surface of the zone of saturation is called the ***water table***.
- A ***confined aquifer*** is one in which groundwater is confined under pressure by overlying and underlying aquitards or aquicludes, and water levels in wells rise above the top of the aquifer. A confined aquifer is also called an ***artesian aquifer***.

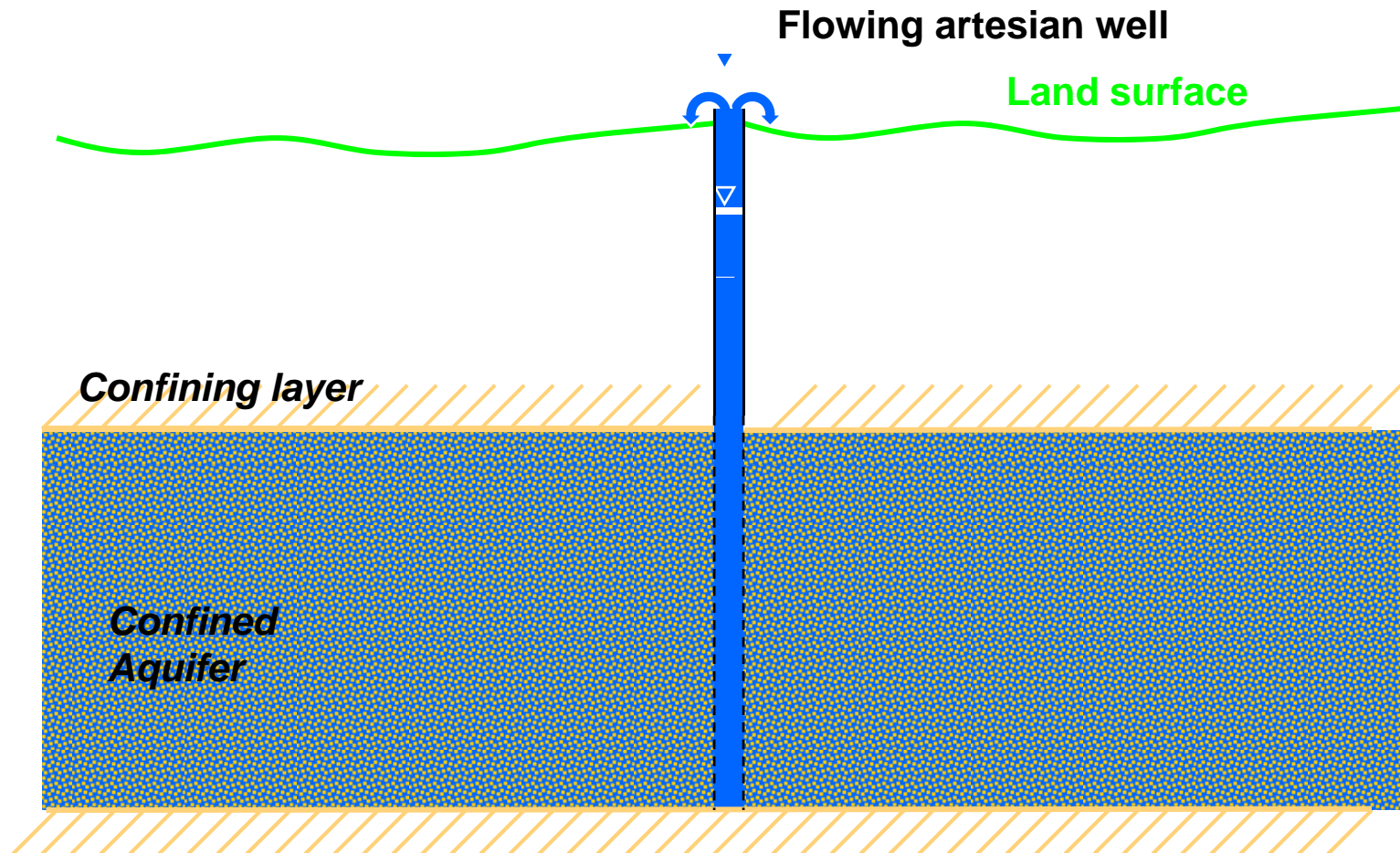
Unconfined Aquifers



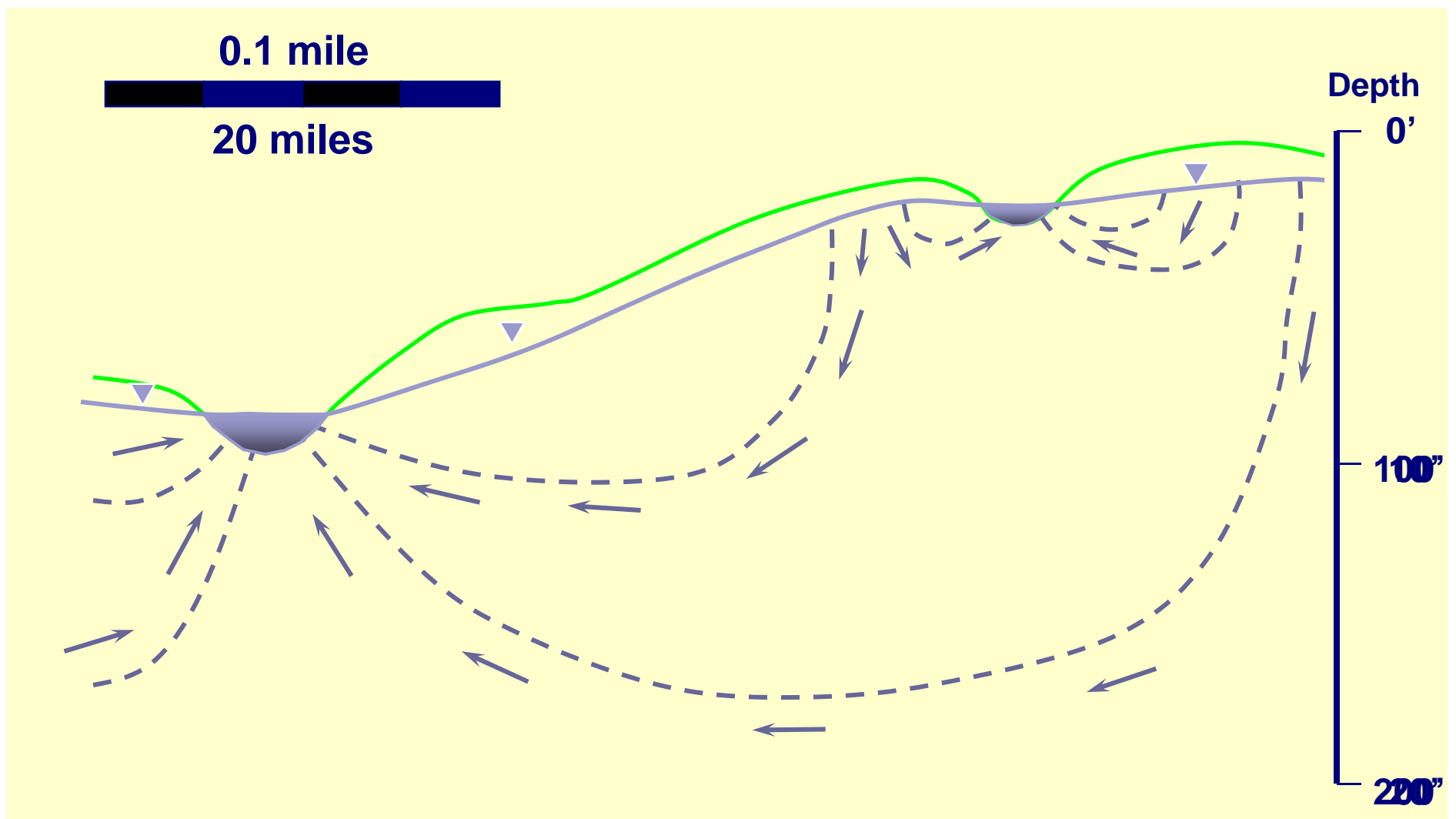
Confined Aquifers



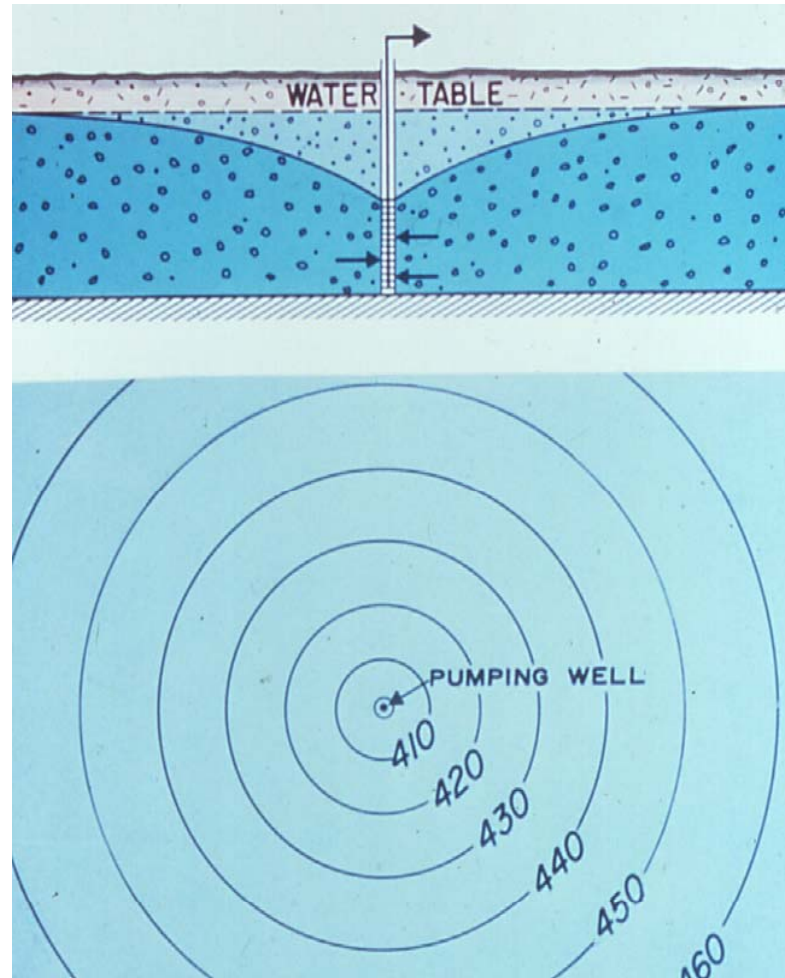
Confined Aquifers and Artesian Wells



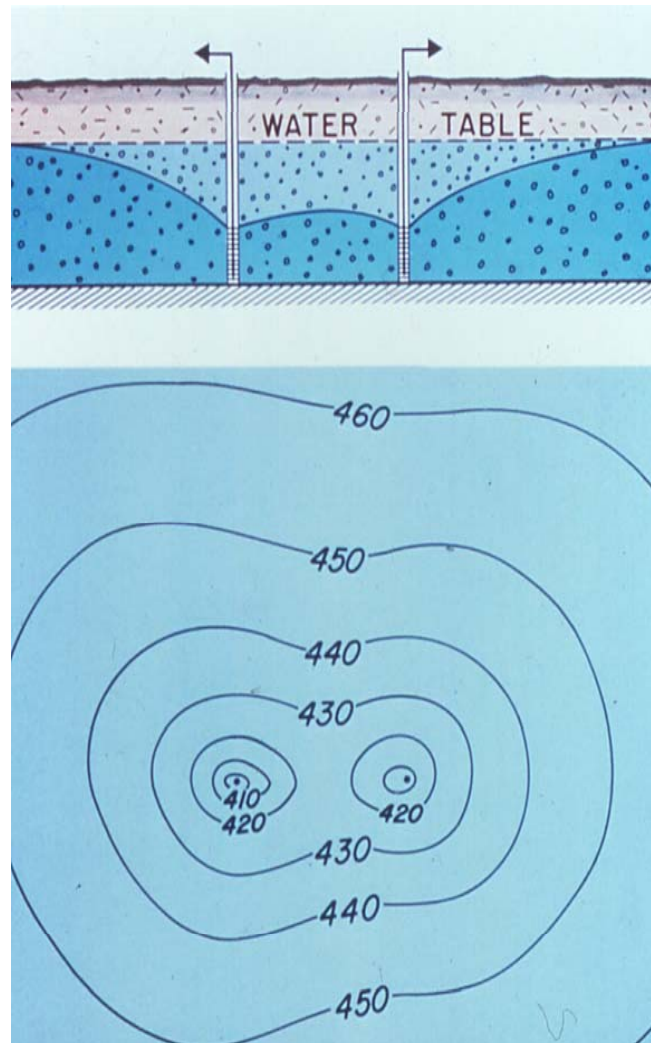
Regional Groundwater Flow Systems



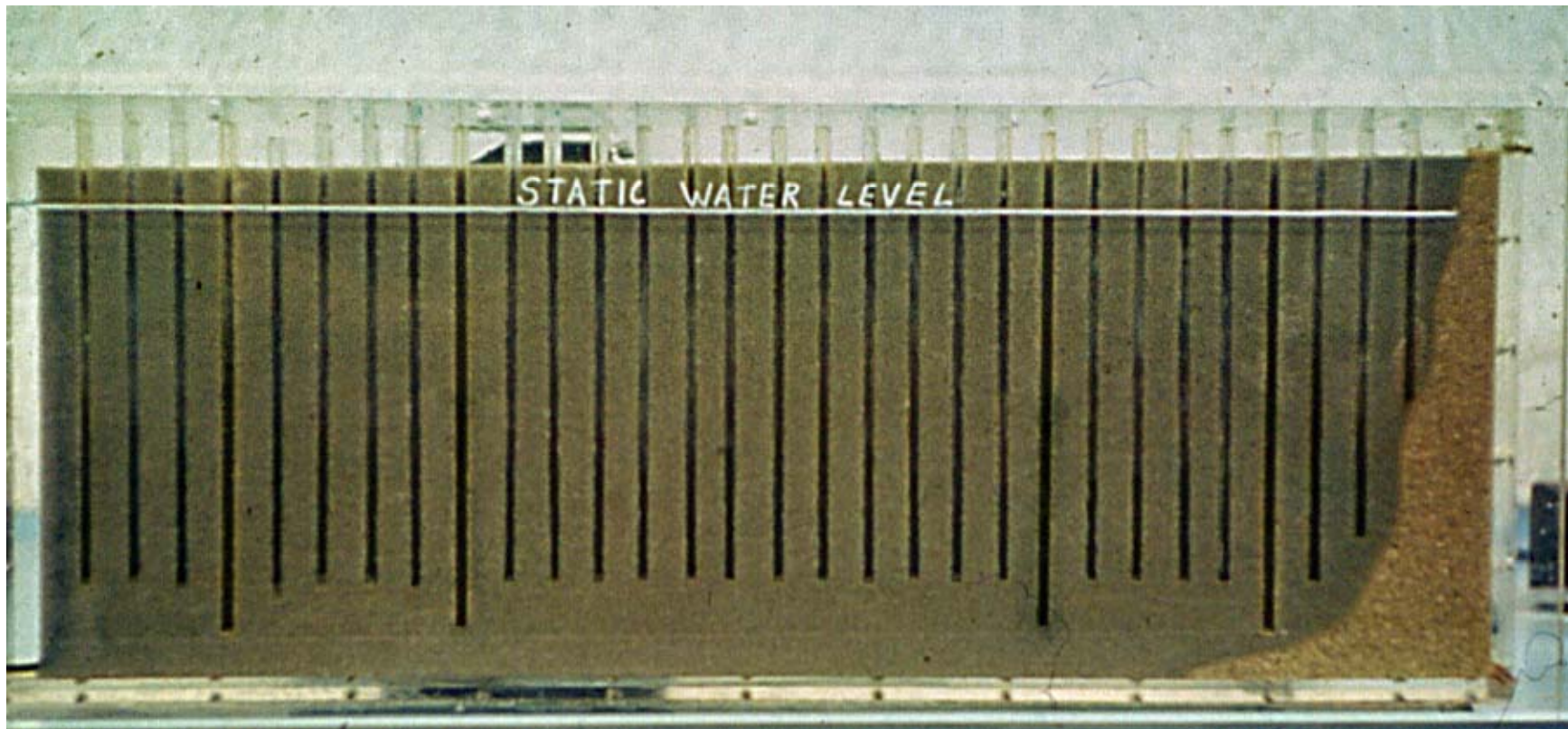
Cone of Depression



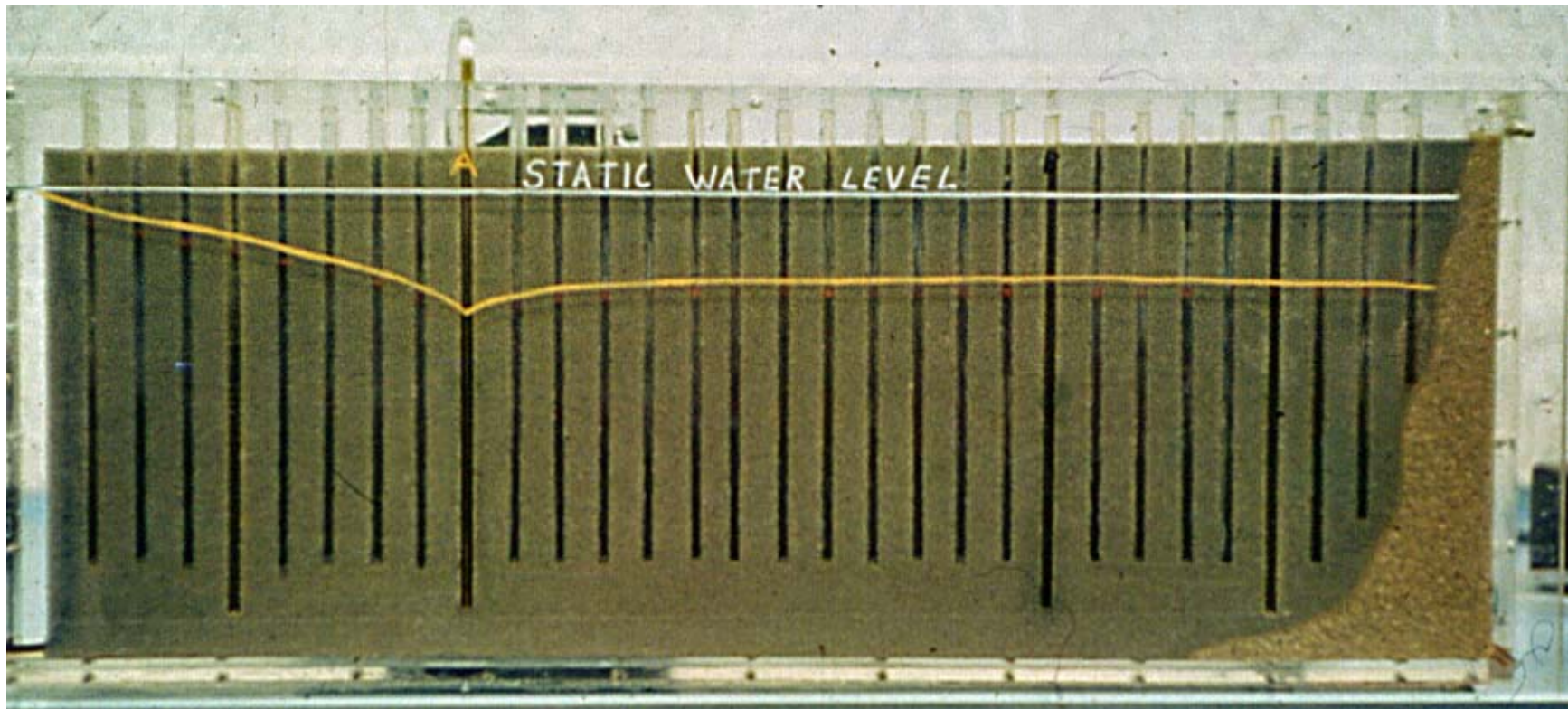
Overlapping Cones of Depression



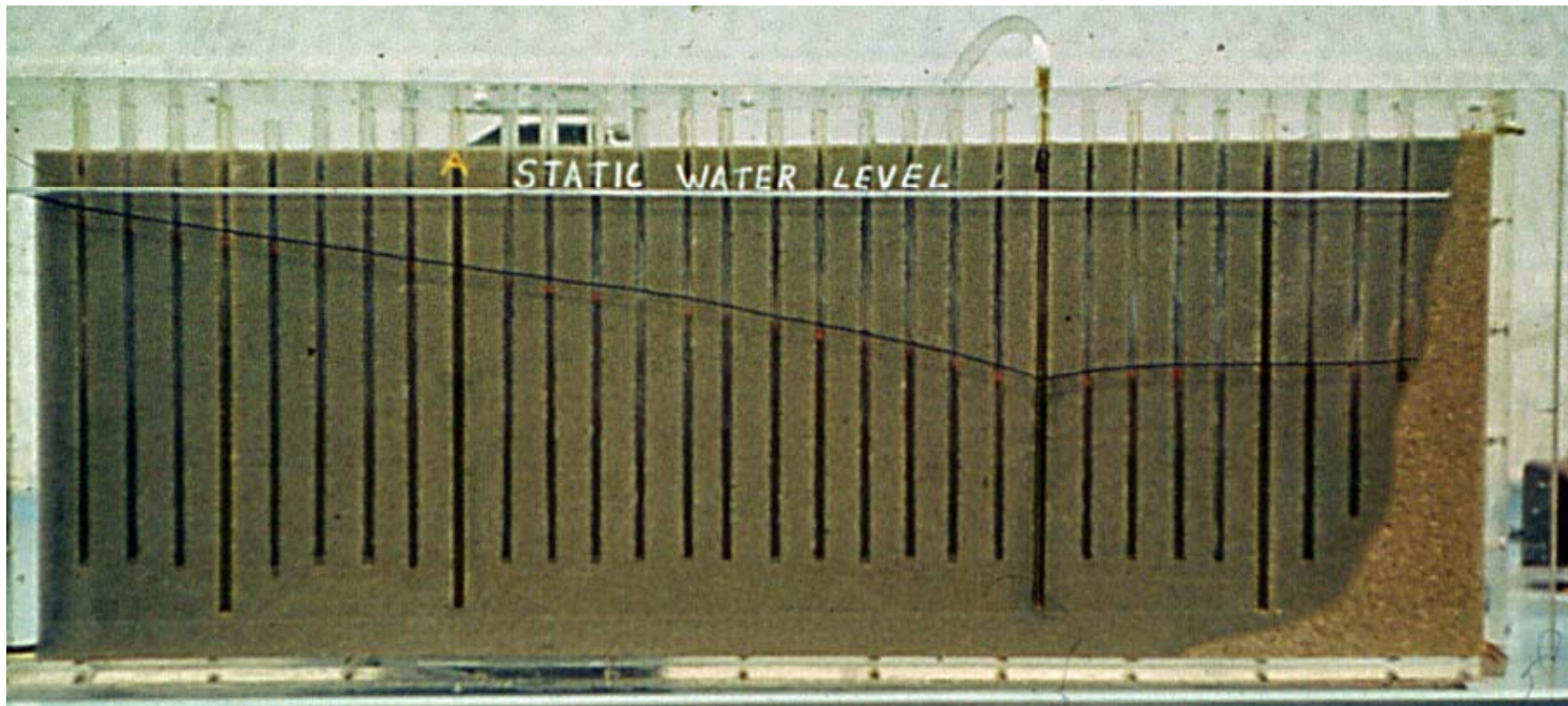
Overlapping Cones of Depression: Well Interference



Overlapping Cones of Depression: Well Interference



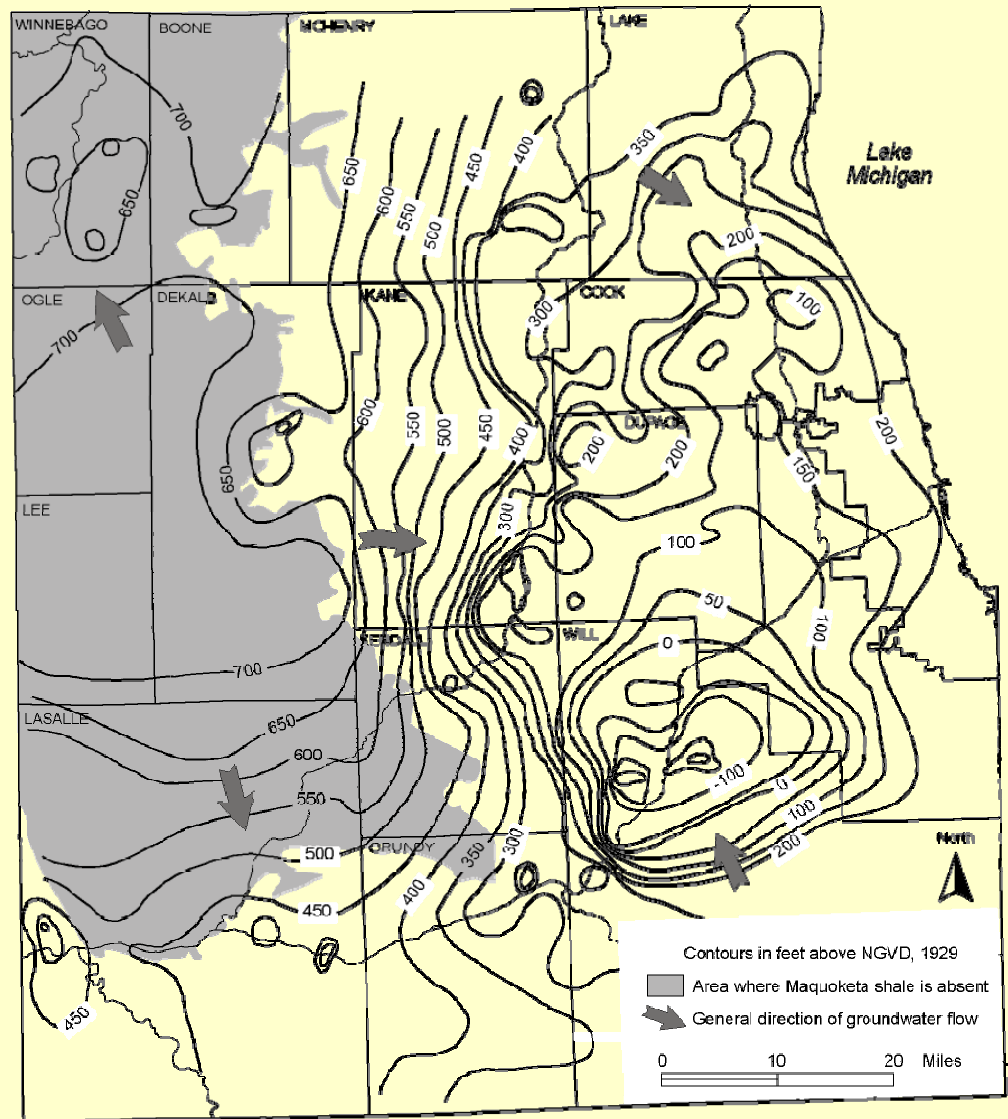
Overlapping Cones of Depression: Well Interference



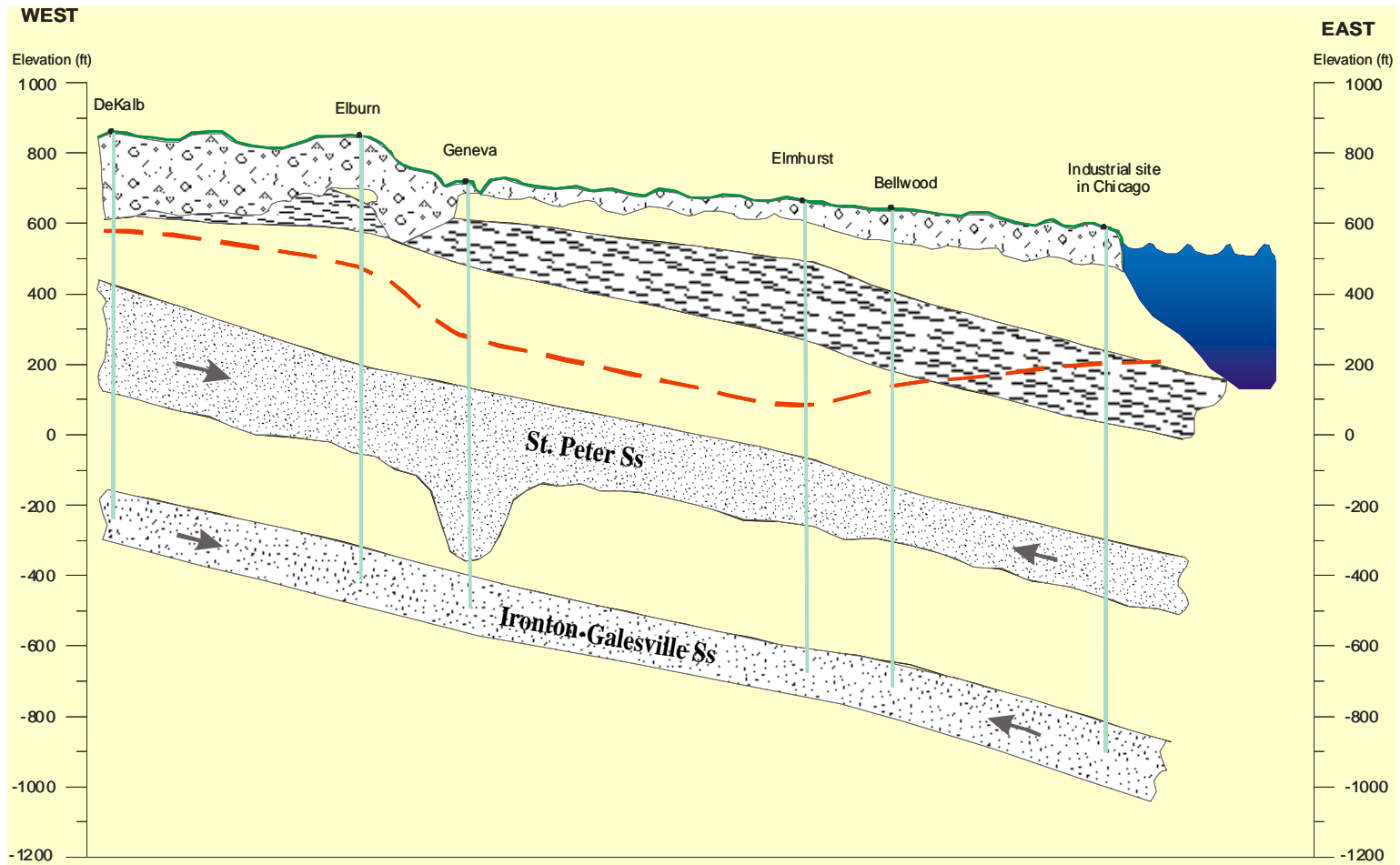
Overlapping Cones of Depression: Well Interference



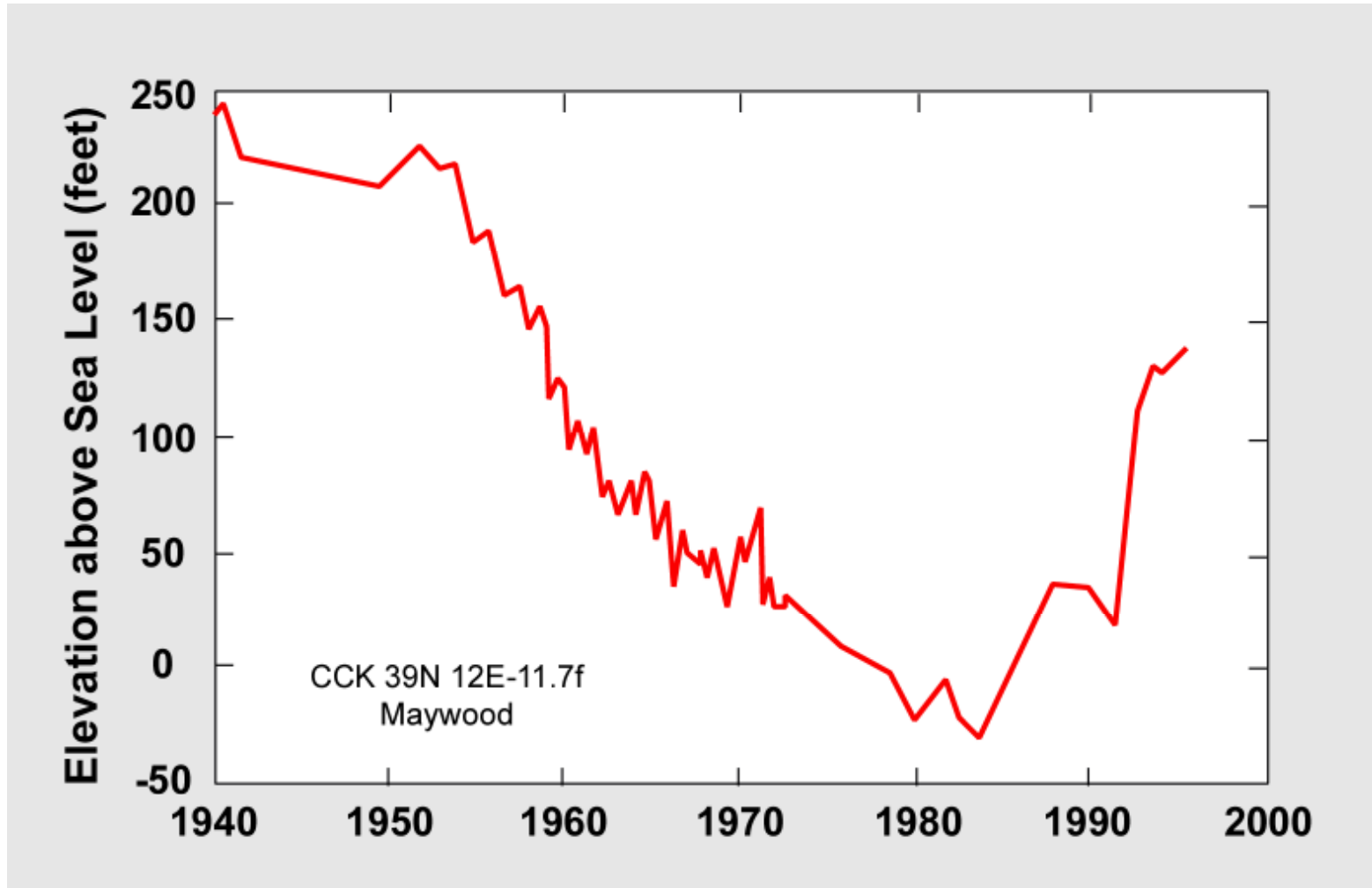
Potentiometric Surface of the Deep Bedrock Aquifer System, Fall 2000



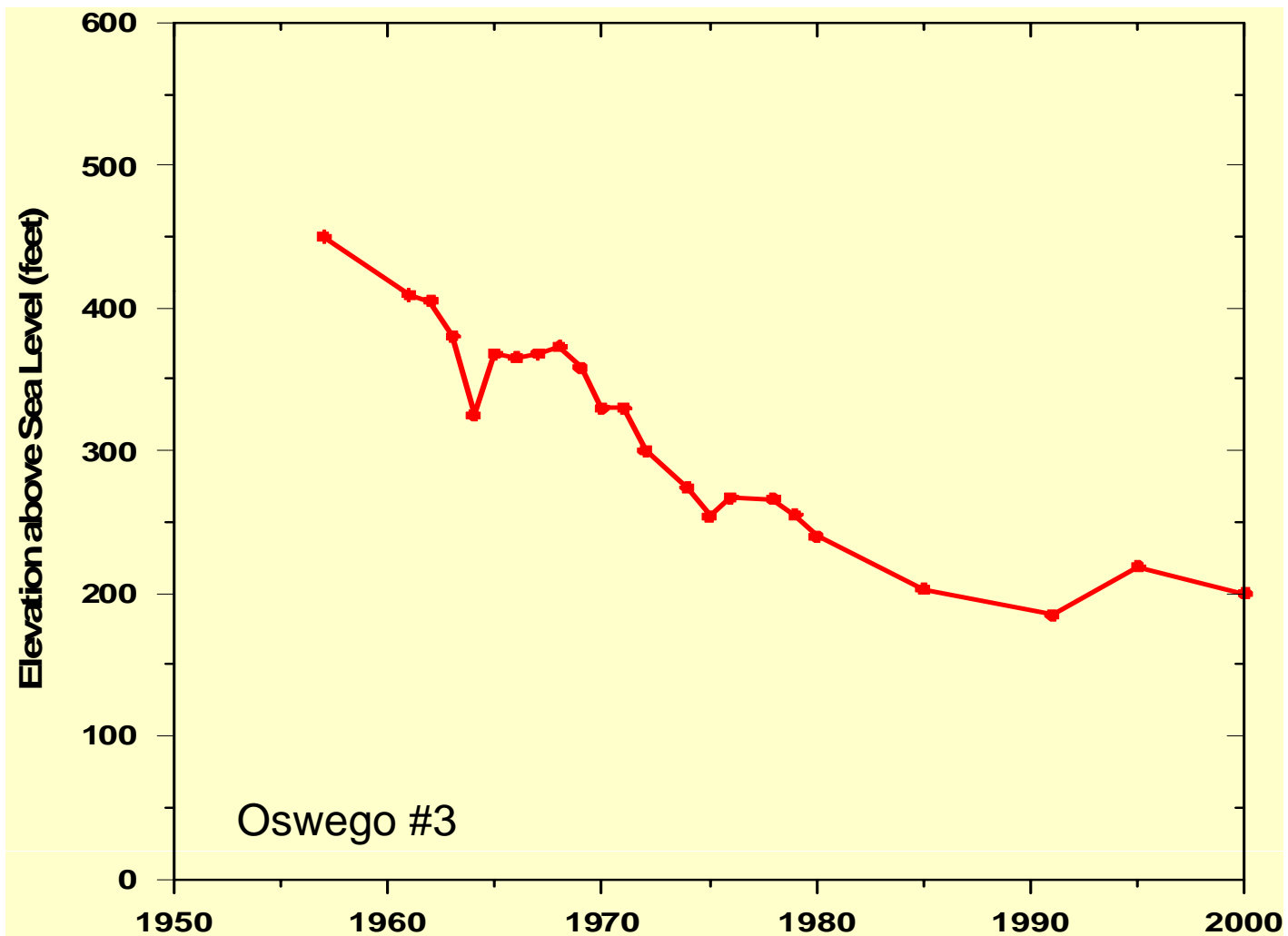
Potentiometric Surface across NE Illinois



Deep Well Water Levels, Cook County



Deep Well Water Levels, Kendall County



Water Sources for Public Supply in Northeast Illinois

