In cooperation with Llano Estacado Underground Water Conservation District, Sandy Land Underground Water Conservation District, and South Plains Underground Water Conservation District

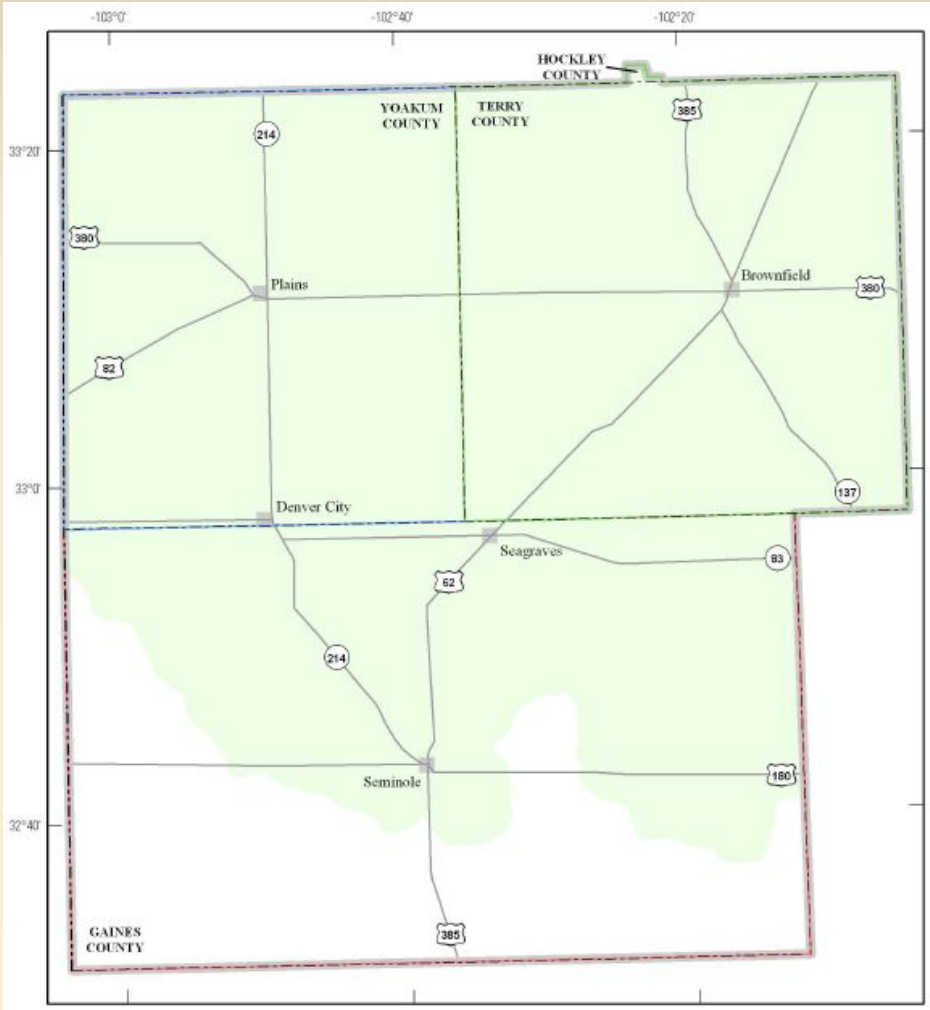
Geophysics Used for the Hydrogeologic Framework of the Ogallala and Edwards-Trinity (High Plains) Aquifers in Gaines, Yoakum, and Terry Counties, Texas.

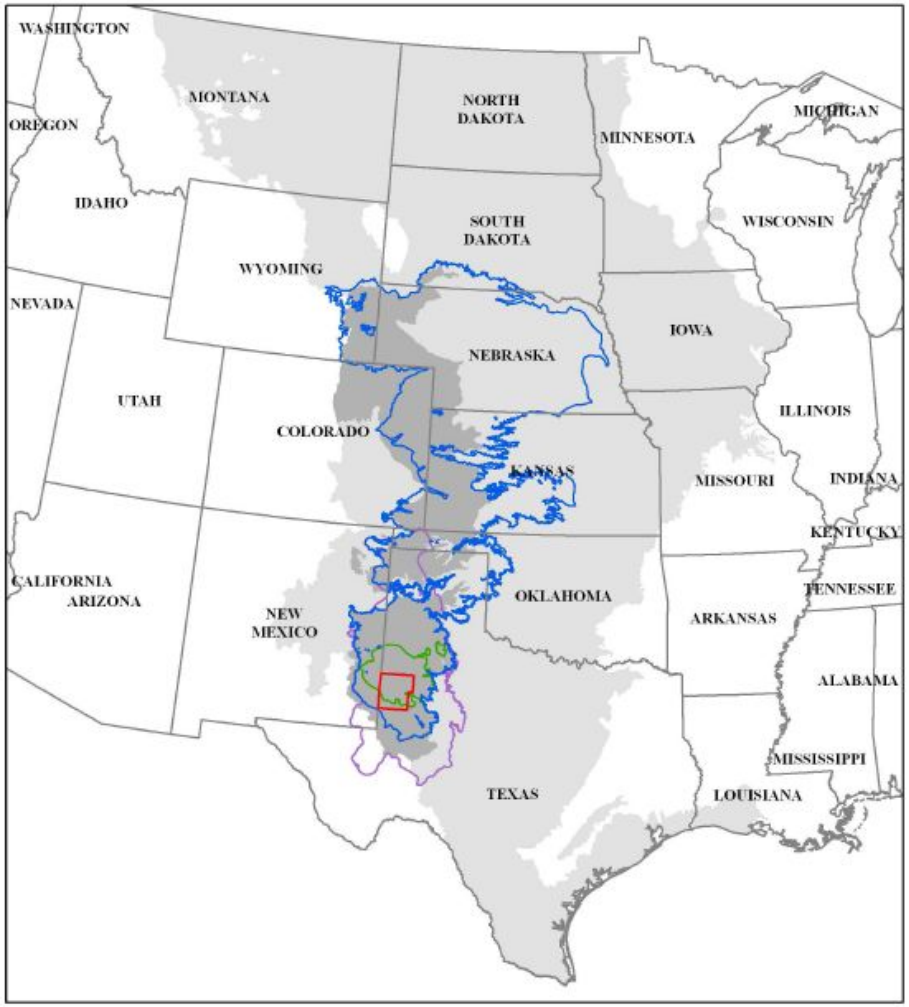
Andrew P. Teeple
Layne Marlow

USGS science for a changing world

South Plains UWCD

Location Maps



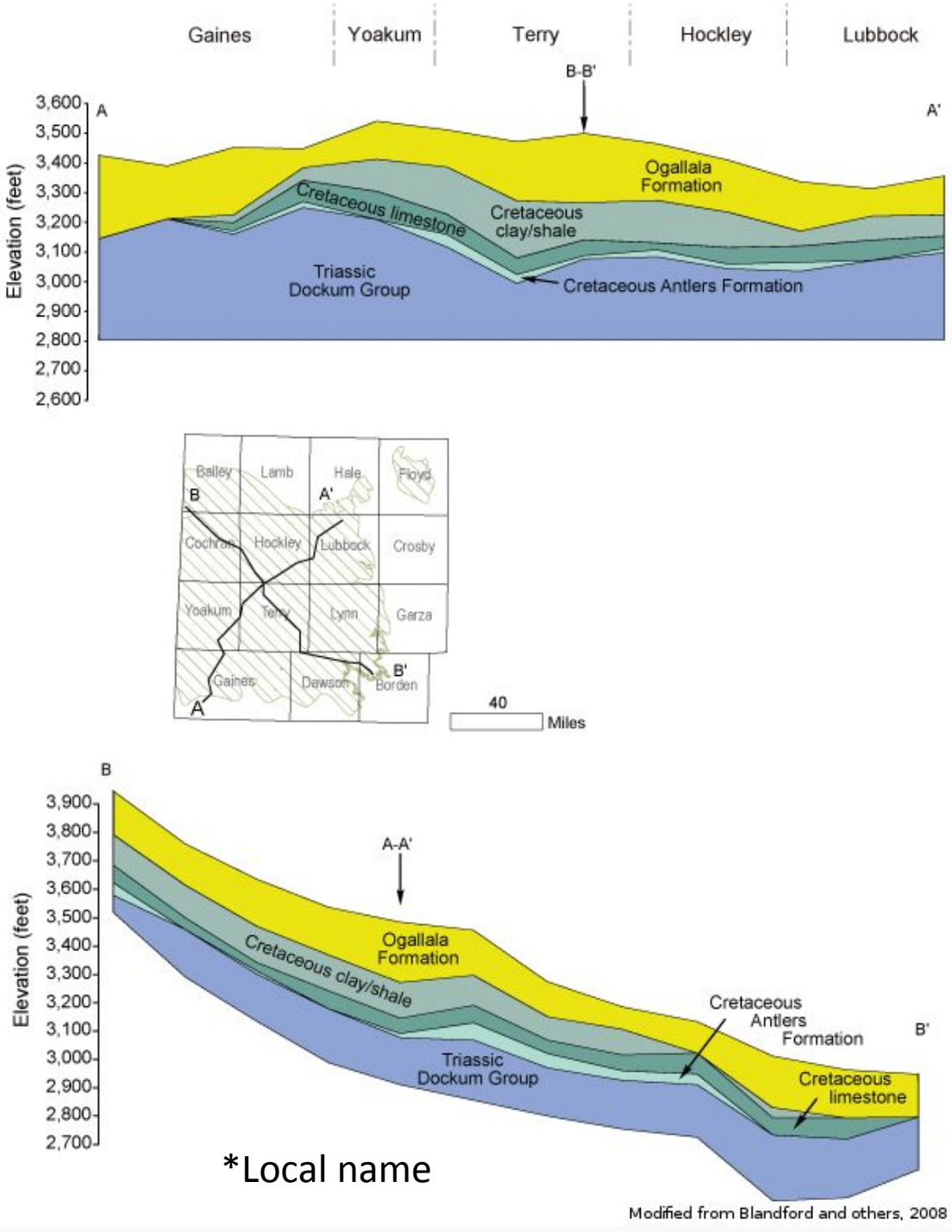


USGS science for a changing world

South Plains UWCD

Hydrogeologic Setting

- Ogallala Formation
  - Quaternary- to Tertiary-age unit
- Edwards-Trinity (High Plains)
  - Cretaceous-age unit
    - Fredericksburg Group (upper part)
      - Clay and shale
      - Limestone
    - Trinity Group (lower part)
      - Antlers Formation
- Dockum Group
  - Triassic-age unit



USGS science for a changing world

Requests from Cooperators

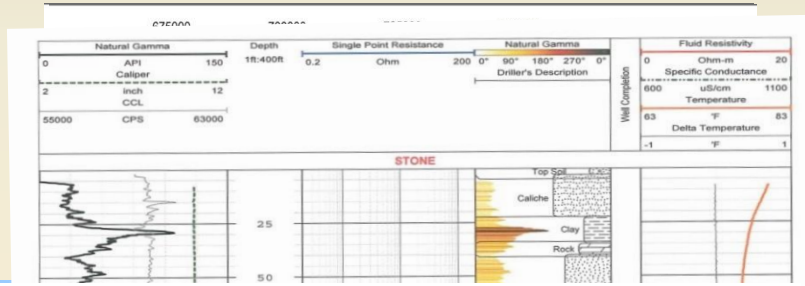
- Request 1
  - Determine total formation thickness and estimate saturated thickness of the Ogallala and Edwards-Trinity (High Plains) aquifer system.
- Request 2
  - Develop values of specific yield for the aquifers on results of Request 1.
- Request 3
  - Collect and analyze geochemical samples from selected wells of the Ogallala and Edwards-Trinity (High Plains) aquifer system.
- Provide associated databases, geographic information system (GIS) layers, and report.

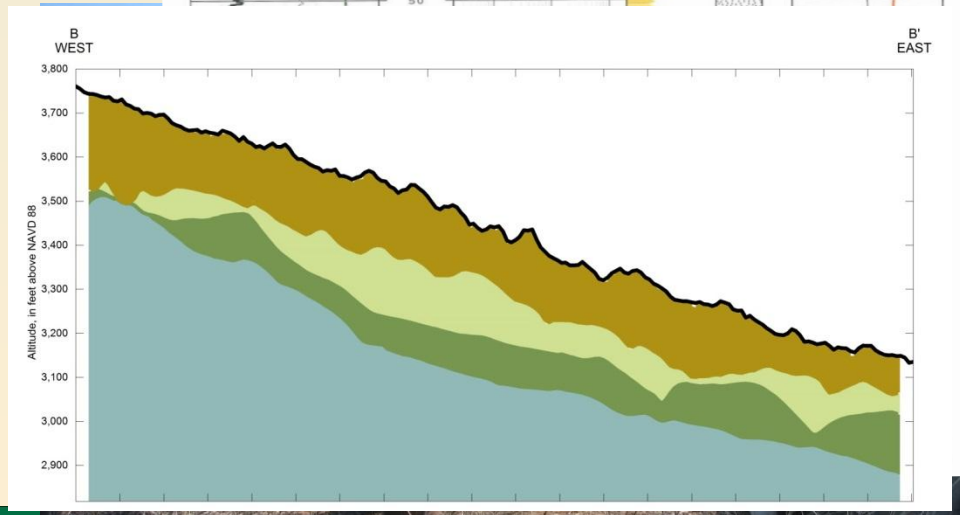
Components of the Hydrogeologic Framework

- Hydrogeology
  - Geophysical and lithologic logs
  - Determine tops and bases of aquifer units (“picks”)

- Structure
  - Delineate geologic structure
  - Interpolate picks to create surfaces of the tops and bases
  - Calculate unit thicknesses

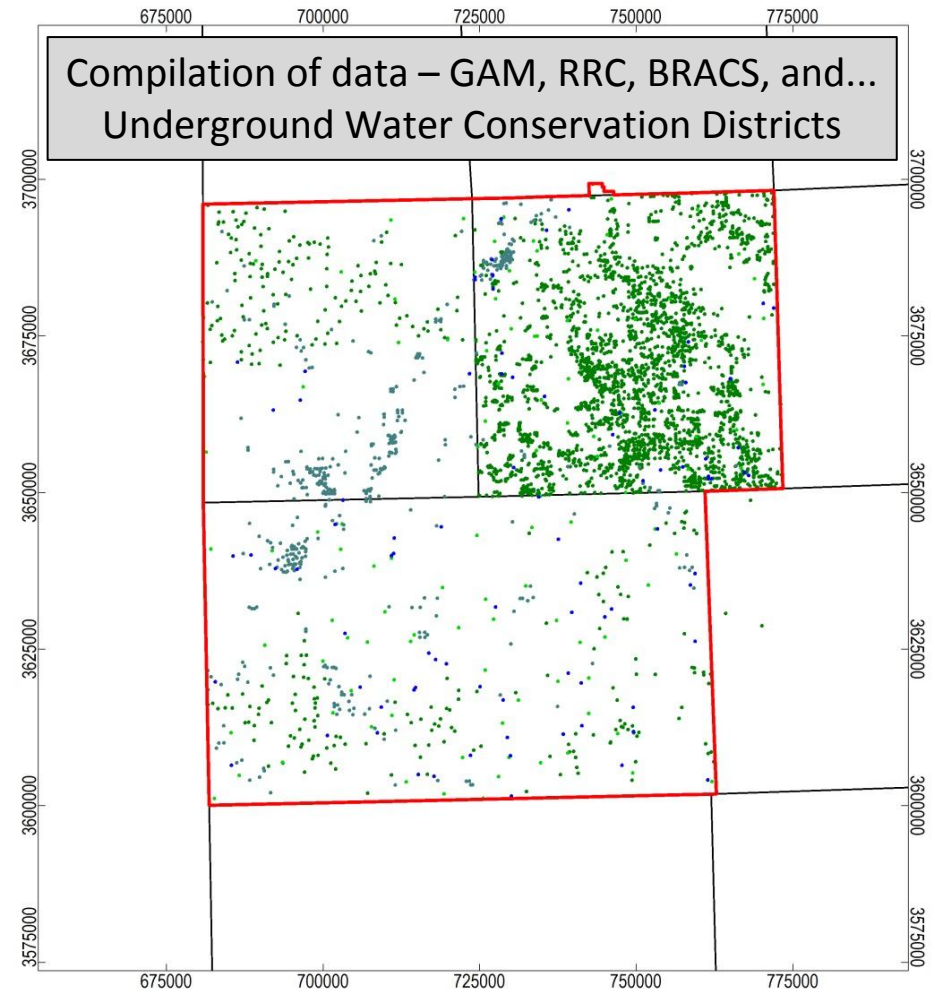
- Aquifer properties
  - Update historical pump-test data
  - Aquifer specific yield and/or transmissivity

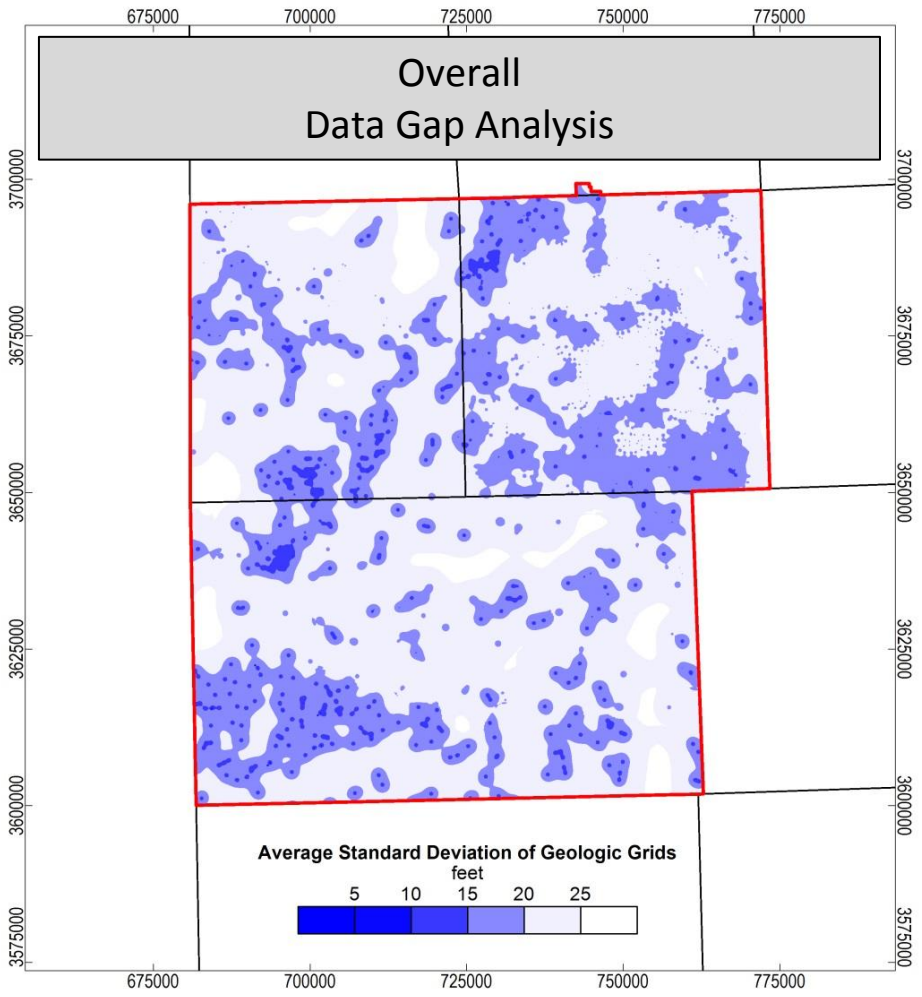




USGS
science for a changing world

Early Framework Analysis





USGS science for a changing world

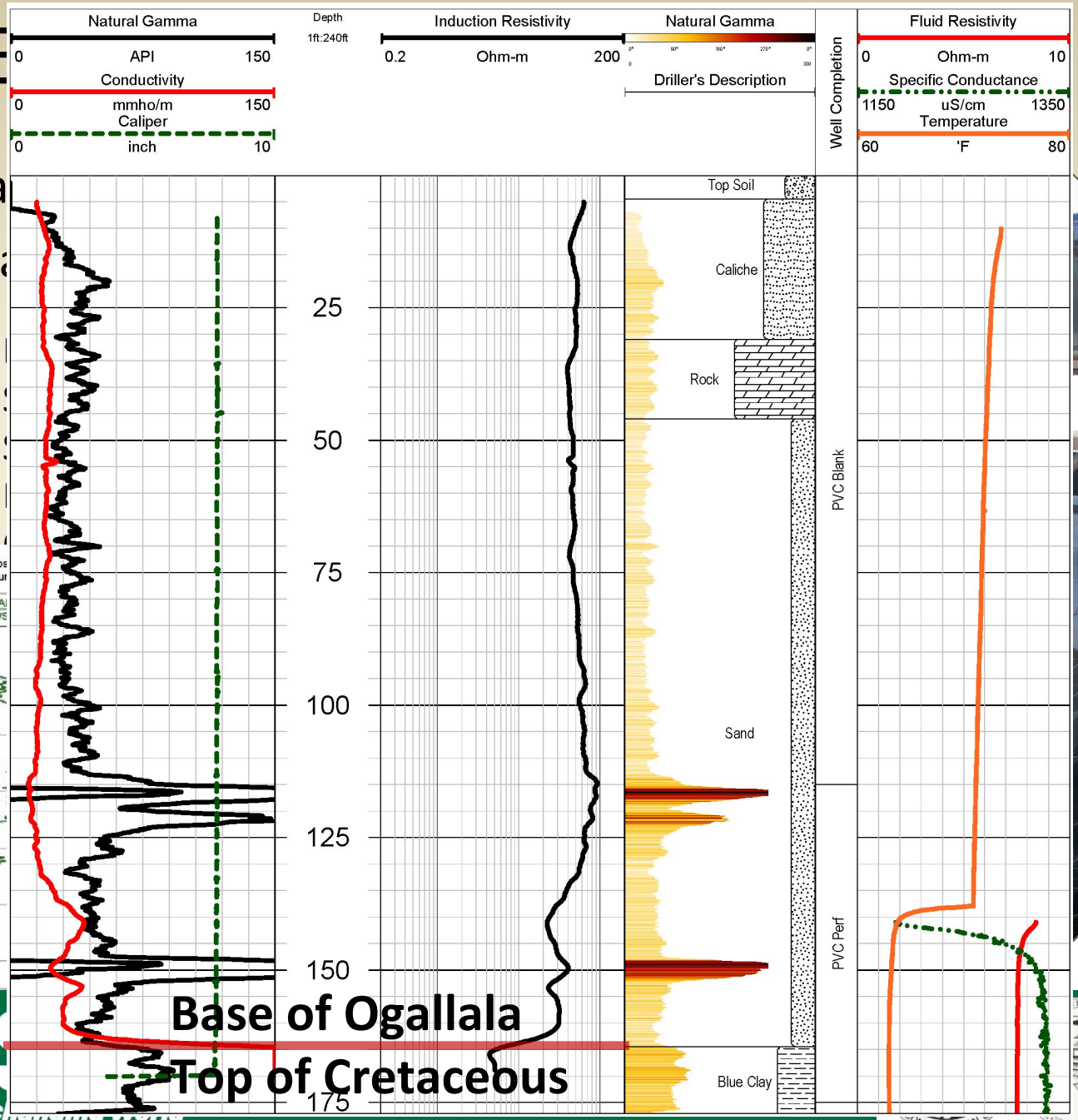
LLANO ESTACADO UNDERGROUND WATER CONSERVATION DISTRICT

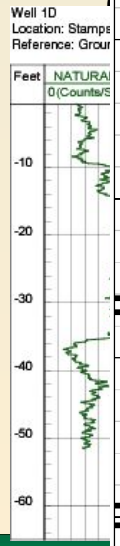
SANDY LAND UNDERGROUND WATER CONSERVATION DISTRICT

South Plains UWCD

E ue

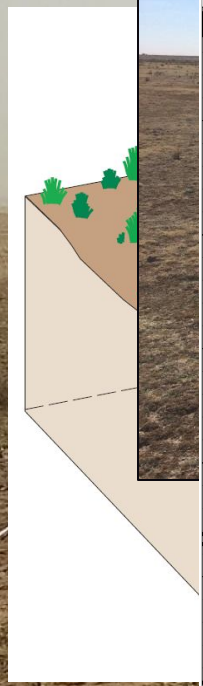
- Stra
- Data :

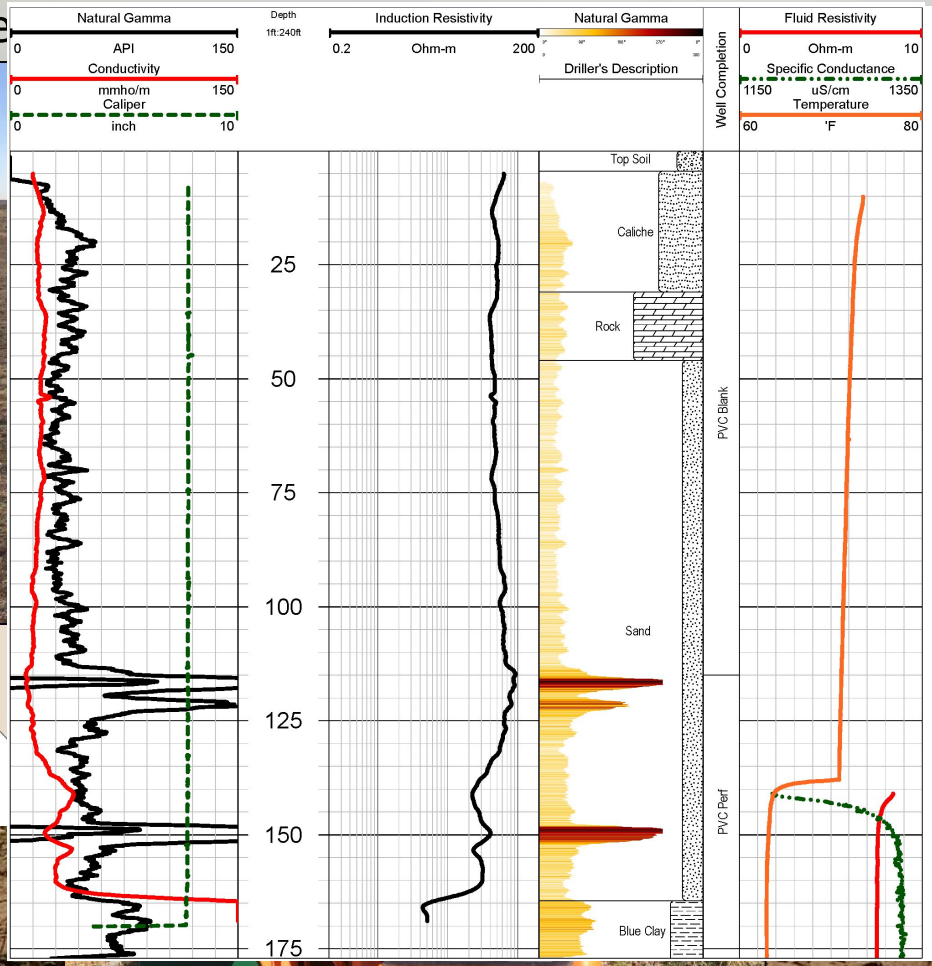


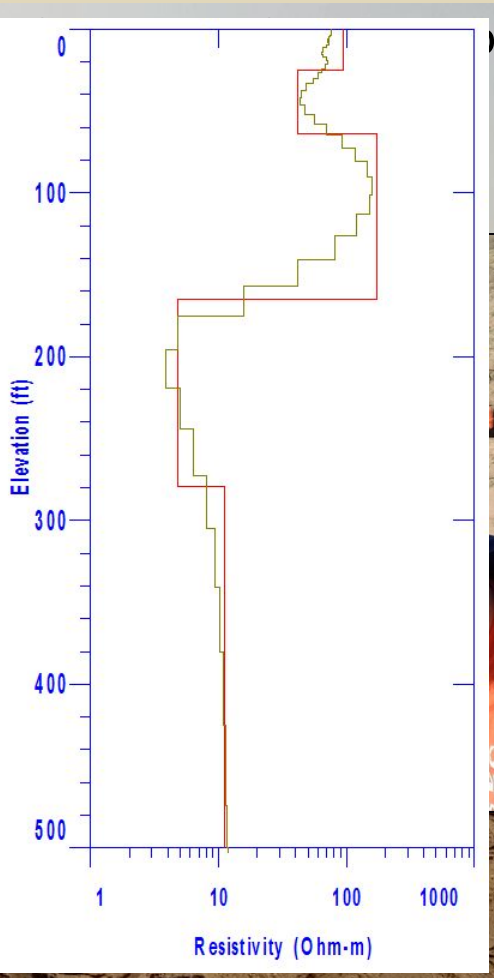


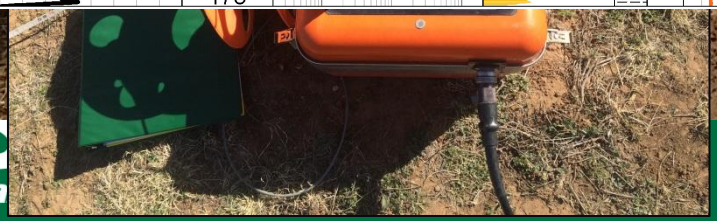
Time-Domain Electromagnetic Technique

- Me… …of





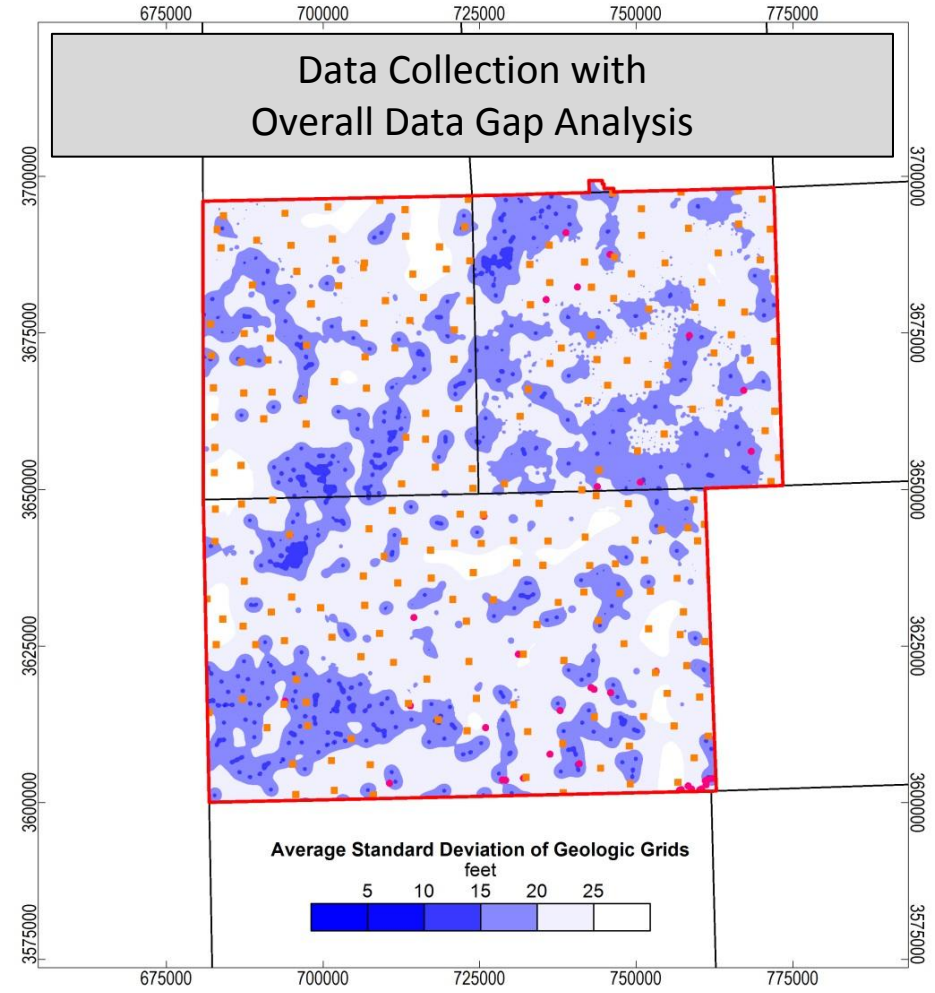


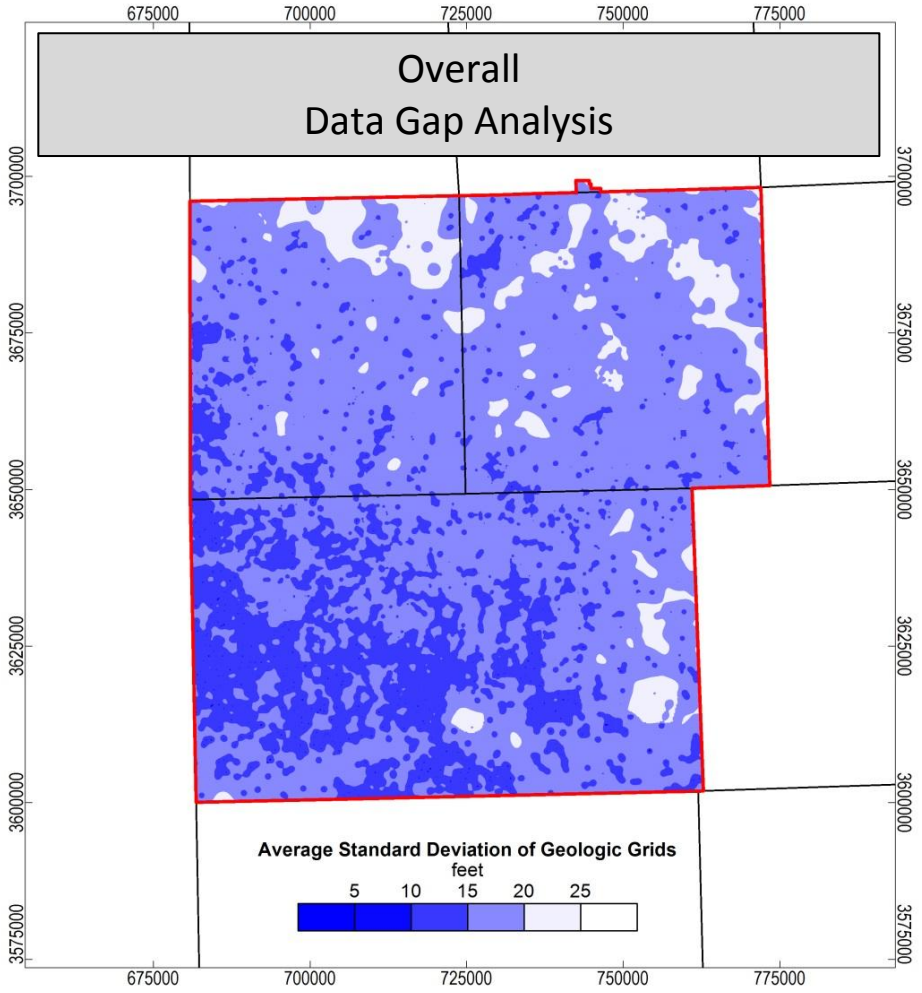


science for a cha

South Plains UWCD

Geophysical Data Collection





USGS science for a changing world

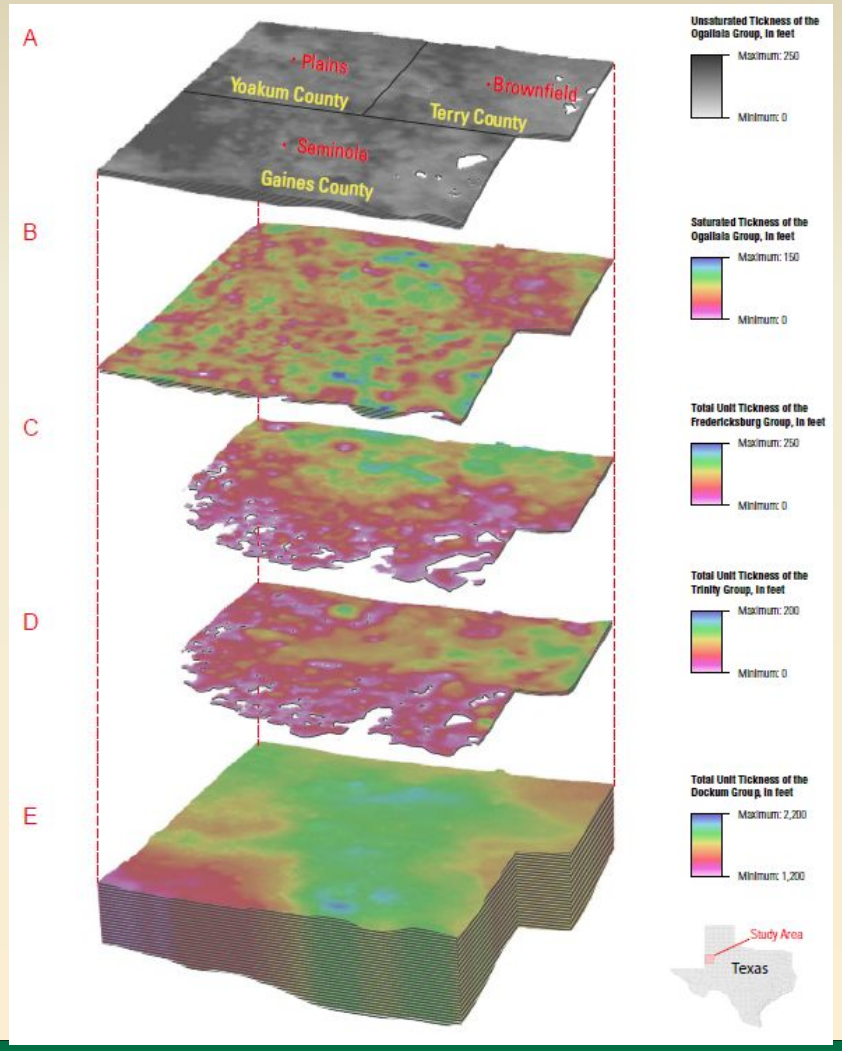
Llano Estacado Underground Water Conservation District

Sandy Land Underground Water Conservation District

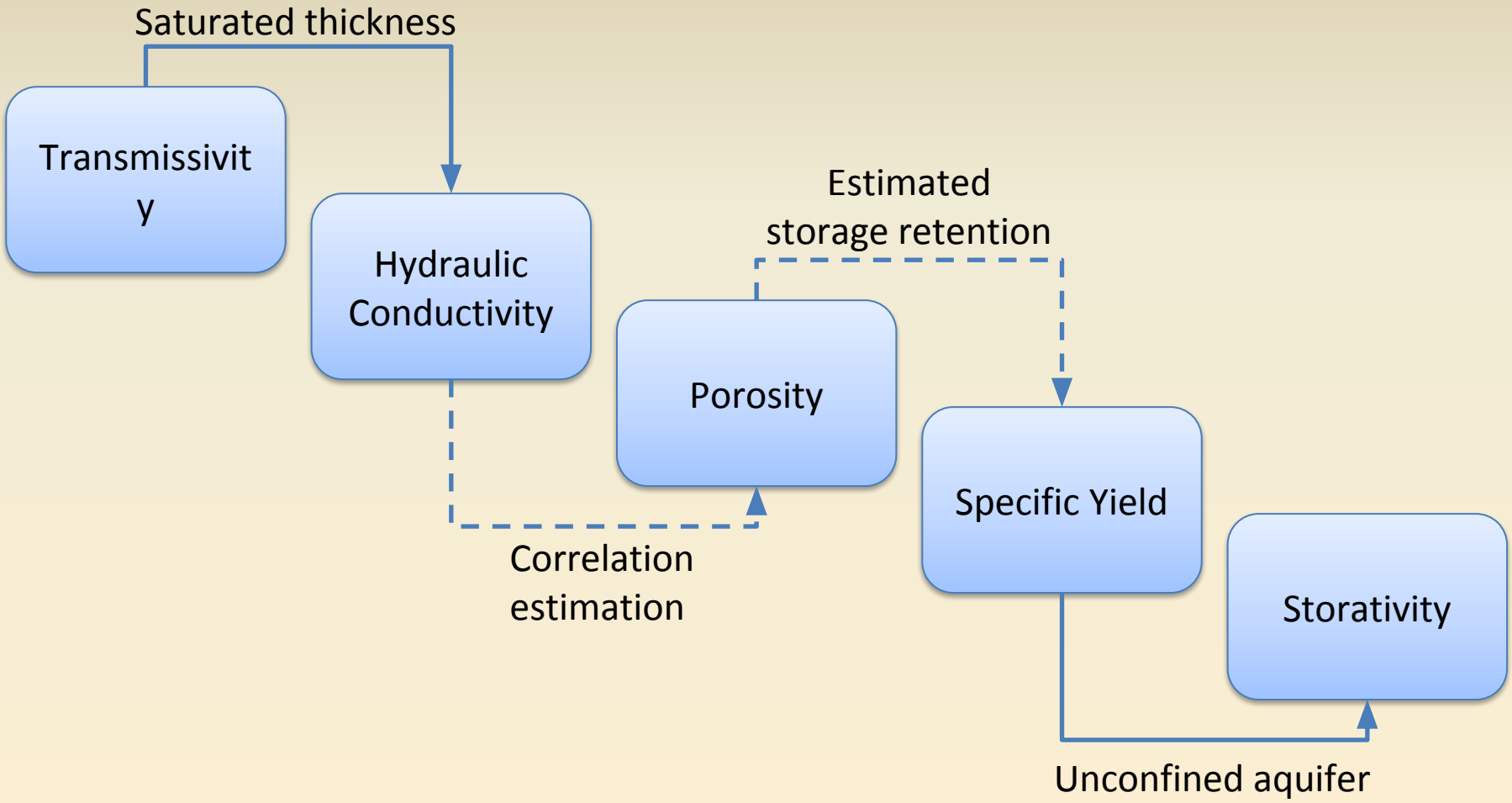
South Plains UWCD

Hydrogeologic Framework

- Developed contact layers
  - Compiled geophysical logs and driller's descriptions
  - Collected surface and borehole geophysics to develop contact layers
- Estimated thickness based on contact layers
- Saturated thickness estimated from most recent water table and the base of Ogallala.

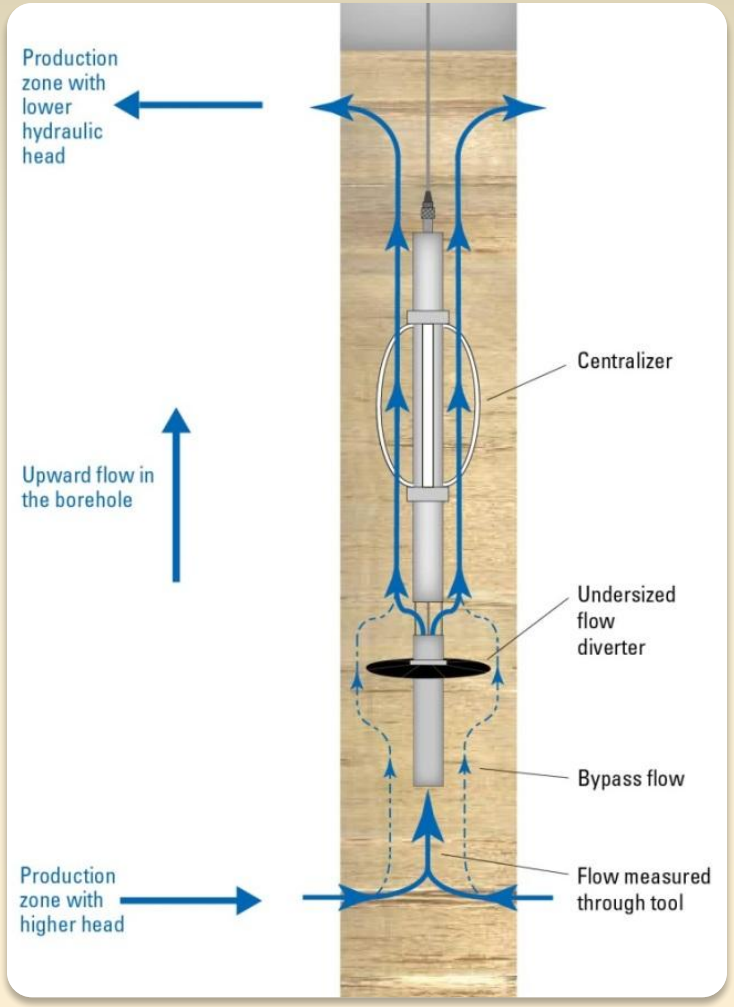


Aquifer Hydraulic Properties

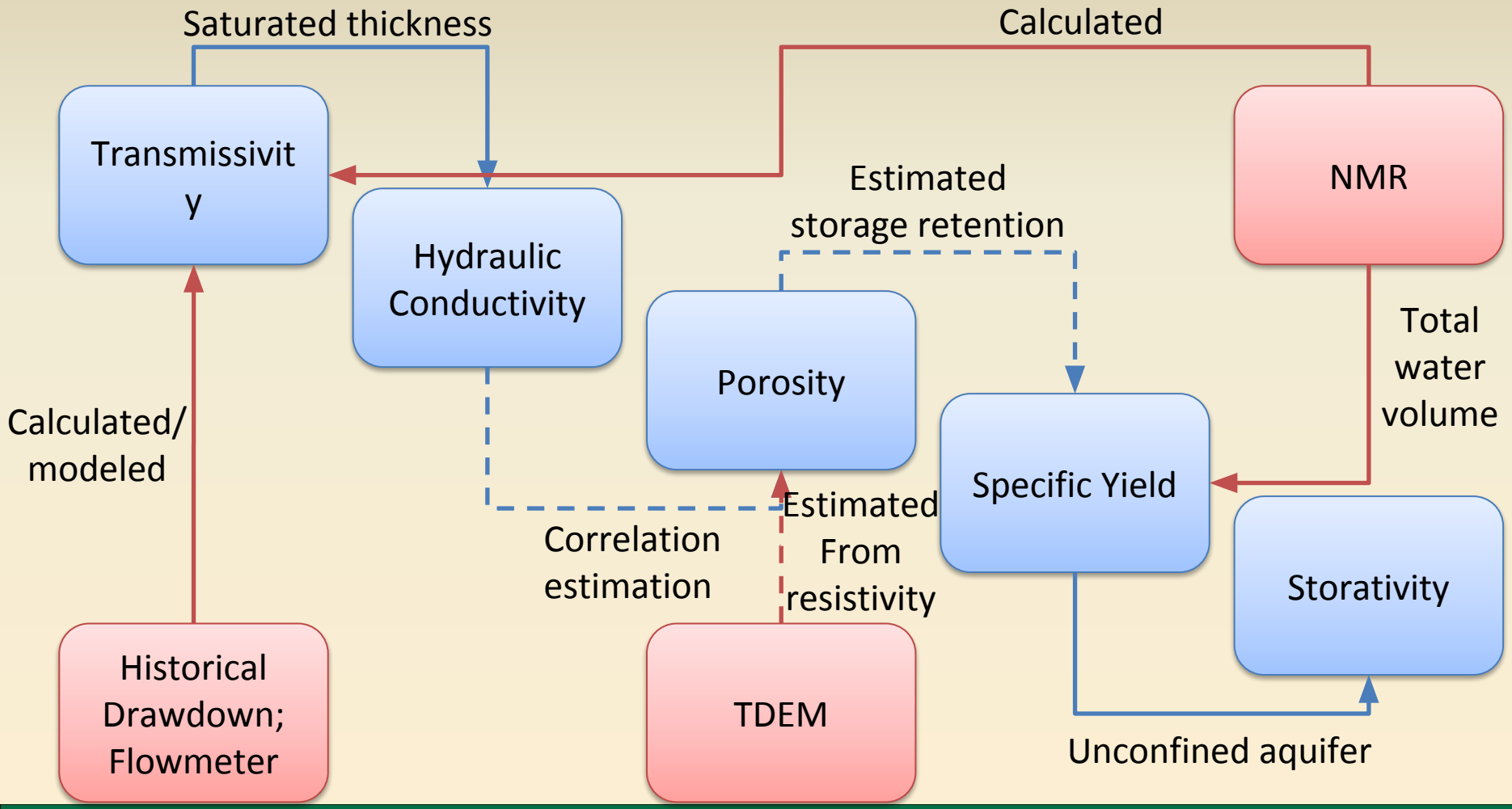


Aquifer Hydraulic Properties Testing

- Historical pump-test data
- Aquifer specific yield and/or transmissivity
- Flowmeter surveys can be used to evaluate the hydraulic conductivity and transmissivity of the aquifer
- Nuclear magnetic resonance

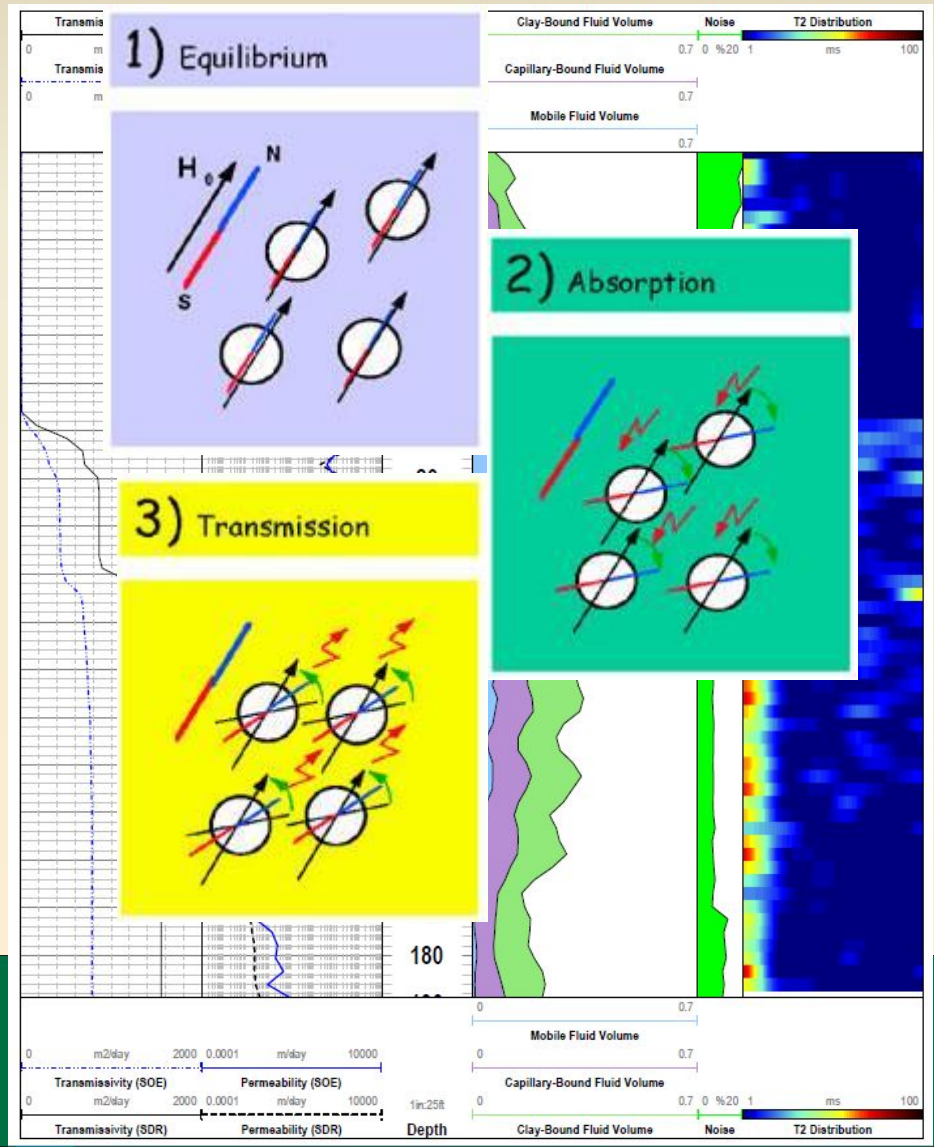


Aquifer Hydraulic Properties



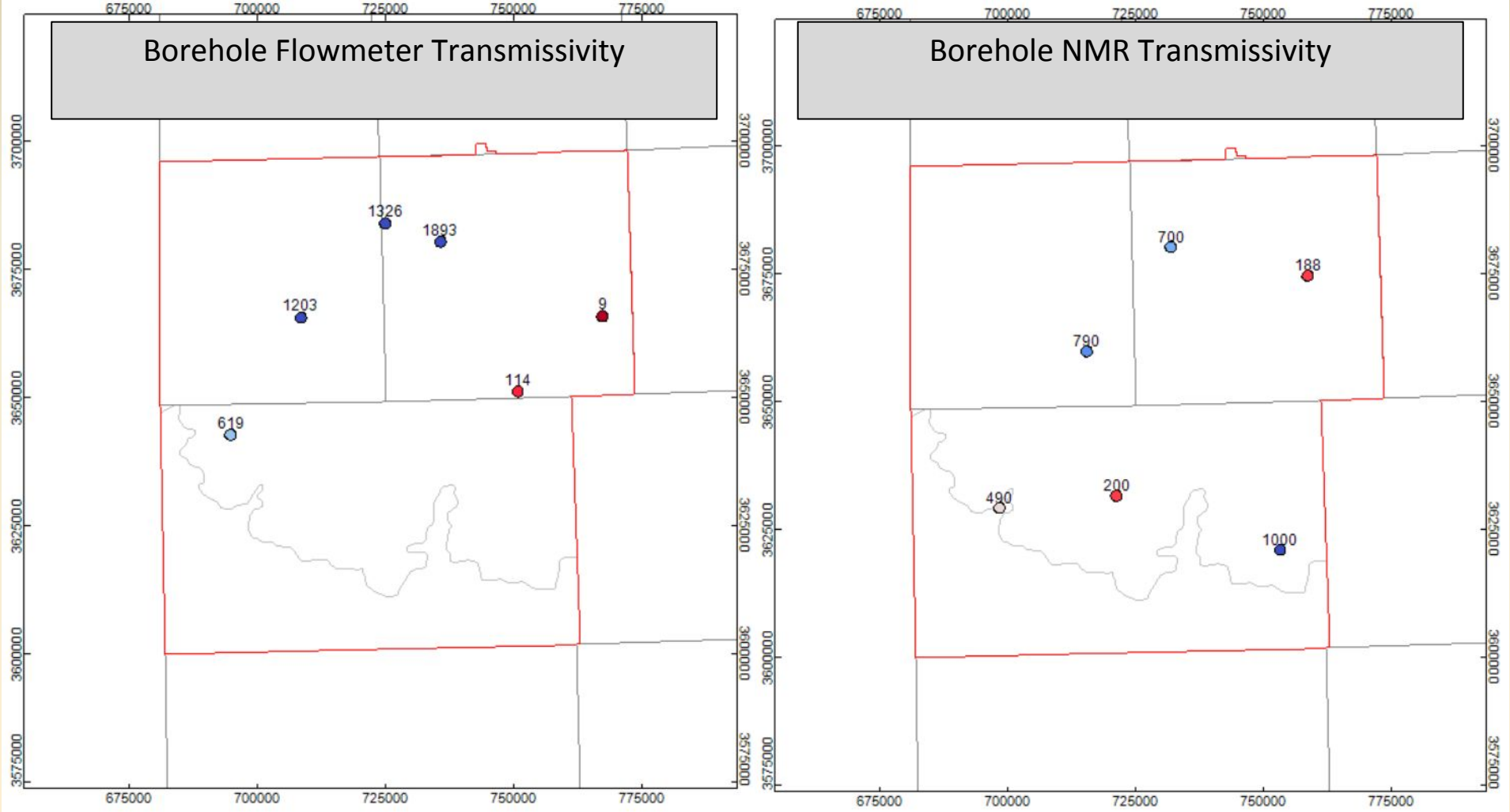
Nuclear Magnetic Resonance

- Magnetic resonance directly measures the response from hydrogen atoms
- Great tool to measure direct response from water molecule



USGS
science for a changing world

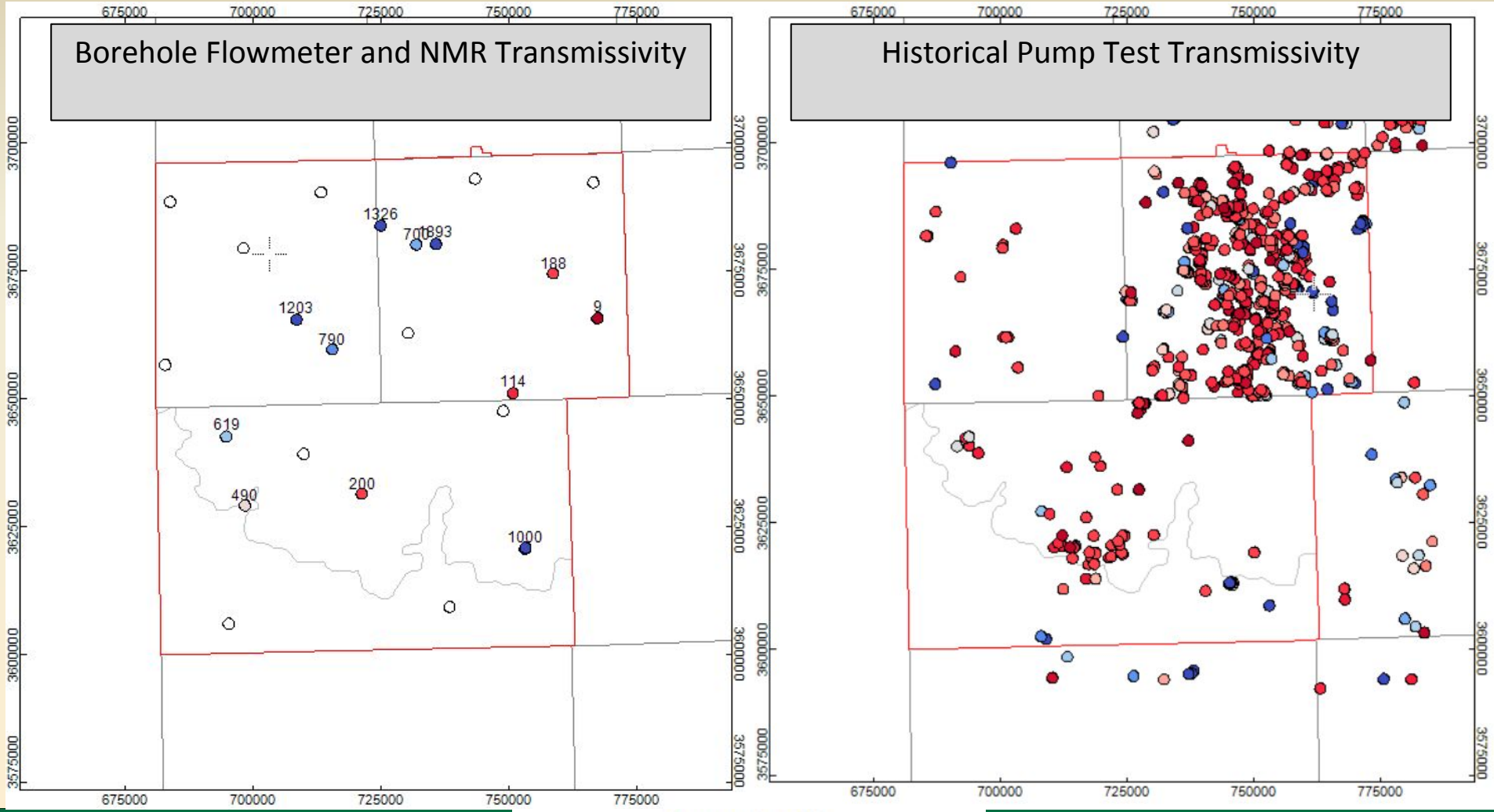
Collected Aquifer Hydraulic Properties



USGS science for a changing world

South Plains UWCD

All Aquifer Hydraulic Properties



USGS
science for a changing world

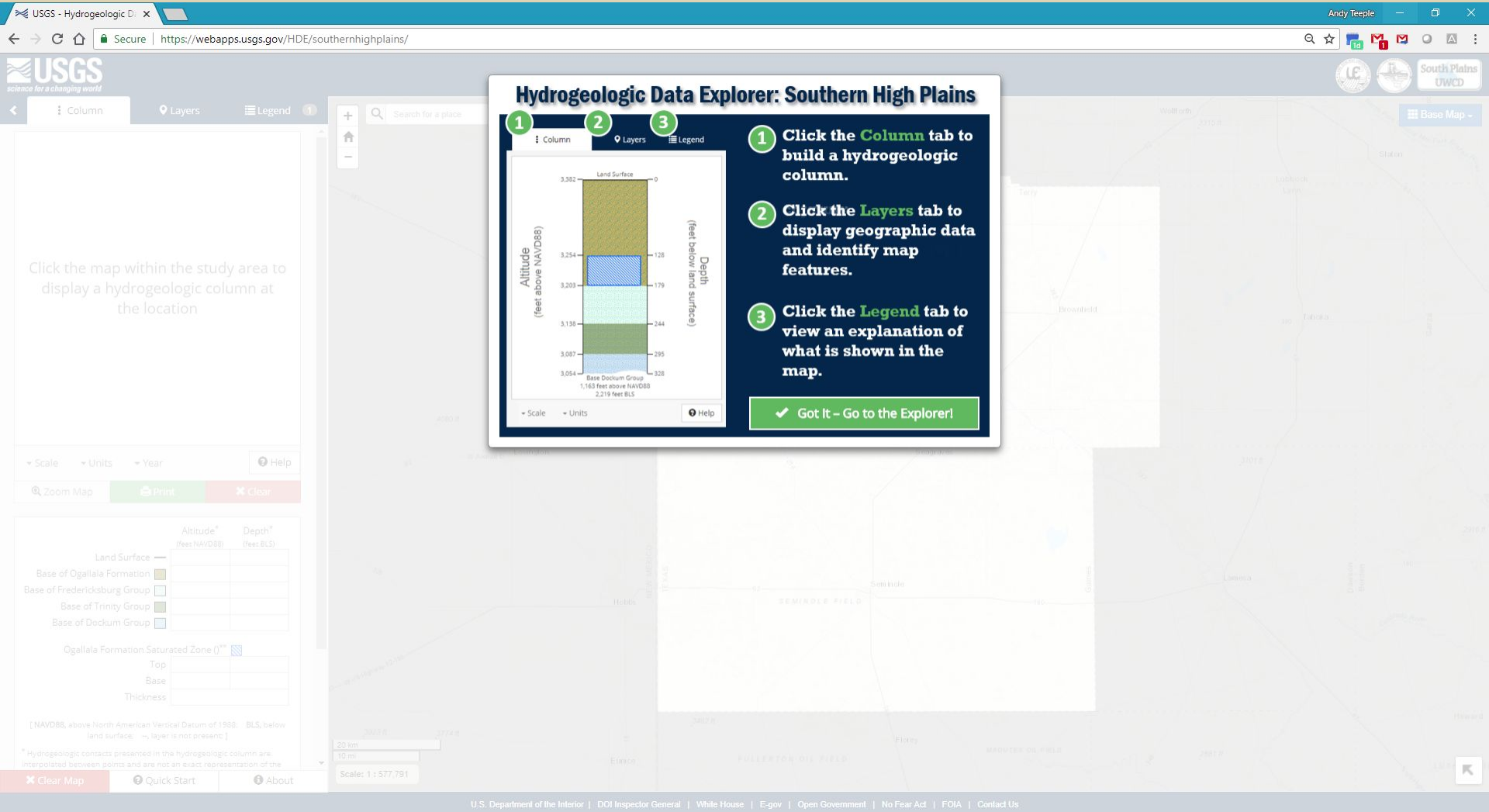
LLANO ESTACADO UNDERGROUND WATER CONSERVATION DISTRICT

SANDY LAND UNDERGROUND WATER CONSERVATION DISTRICT

South Plains UWCD

https://webapps.usgs.gov/HDE/southernhighplains/

Web Application



USGS science for a changing world

South Plains UWCD

District Representative

Layne Marlow
South Plains Underground
Water Conservation District
802 Tahoka Road
PO Box 986
Brownfield, TX 79316

(806) 637-7467
spuwcd@spuwcd.org

Gregory P. Stanton, Supv.
Hydrologist Deputy Director - Studies
USGS Texas Water Science Center
gstanton@usgs.gov
Office: (512)927-3558
Cell: (512)963-3558

QUESTIONS?