Railroad Commission of Texas
Drilling Insight & Casing Estimator GIS Site

DICE

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Geologic Advisory (Unit GAU)

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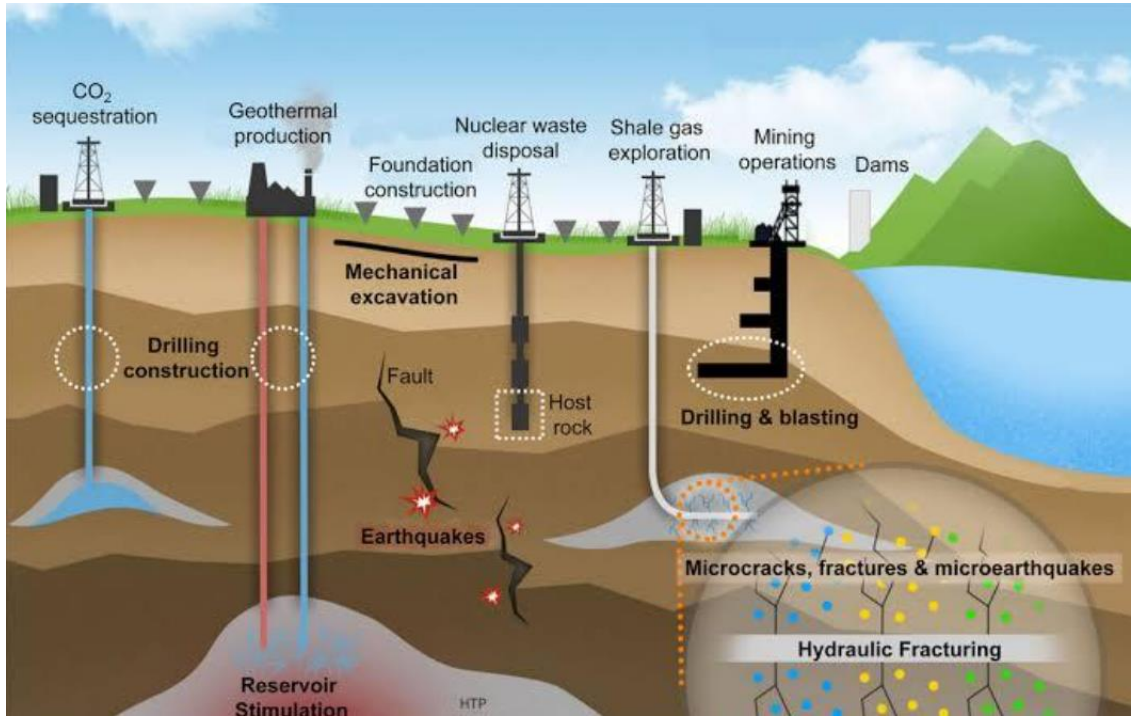
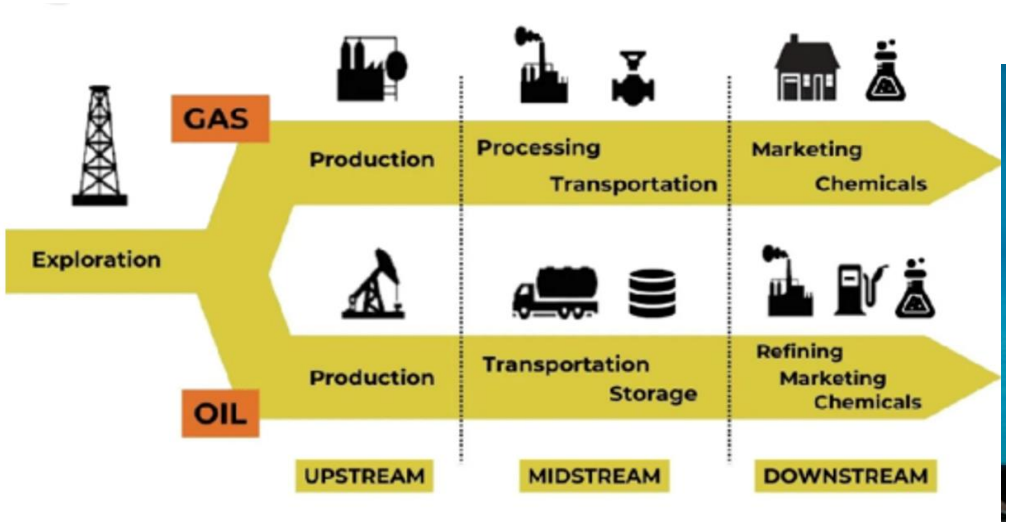
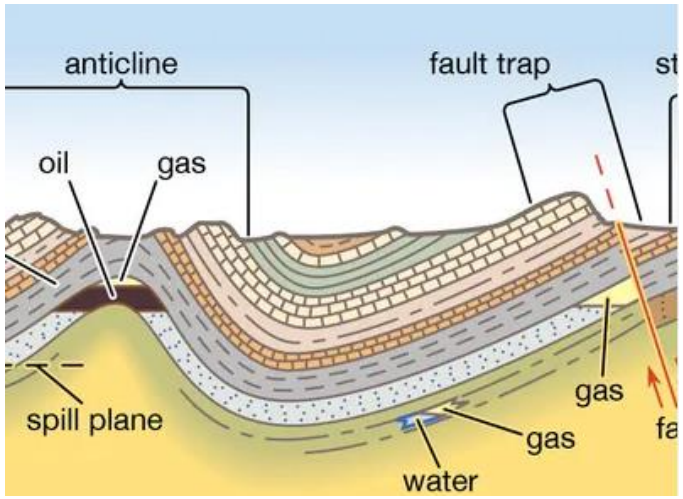
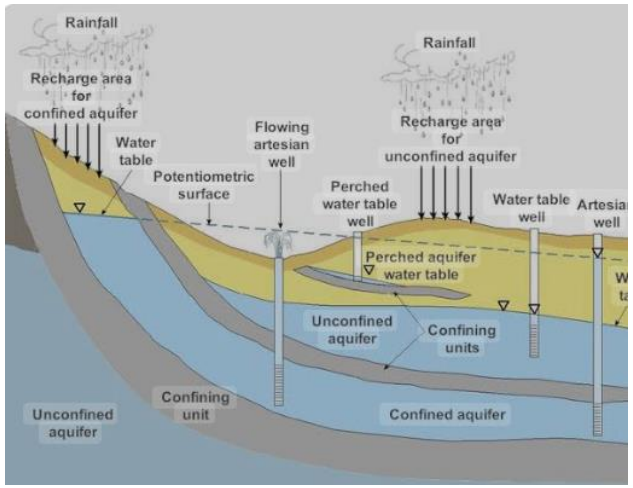


Engineering Vs. Geologic GIS Information

- Engineering - the branch of science and technology concerned with the design, building, and use of engines, machines, & structures (Wells, Pipes)
- Production - processes involving extracting, processing, quantifying, and transporting oil and natural gas from the earth



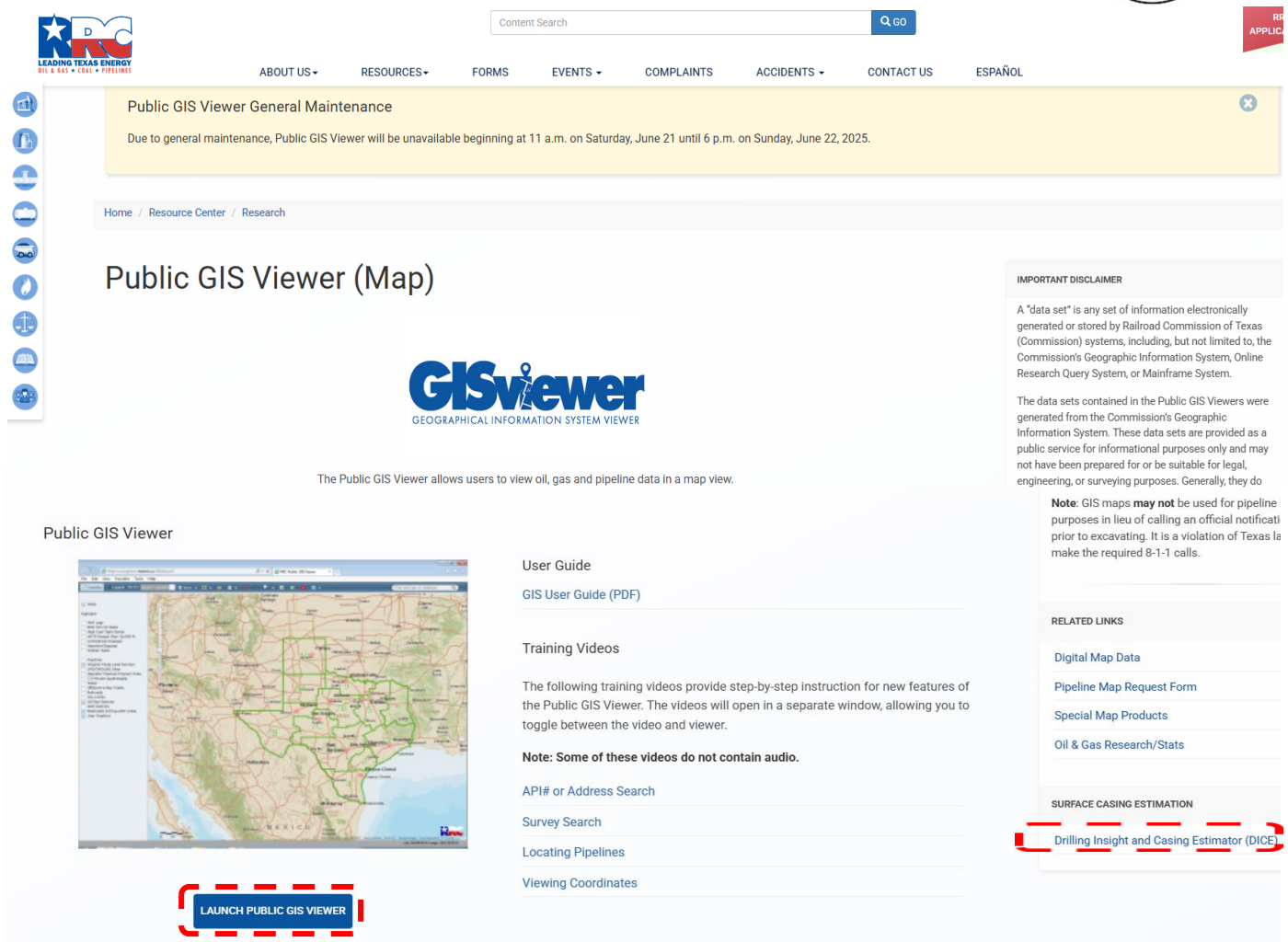




- Geology - the science that deals with the earth's physical structure and substance, its history, and the processes that act on it

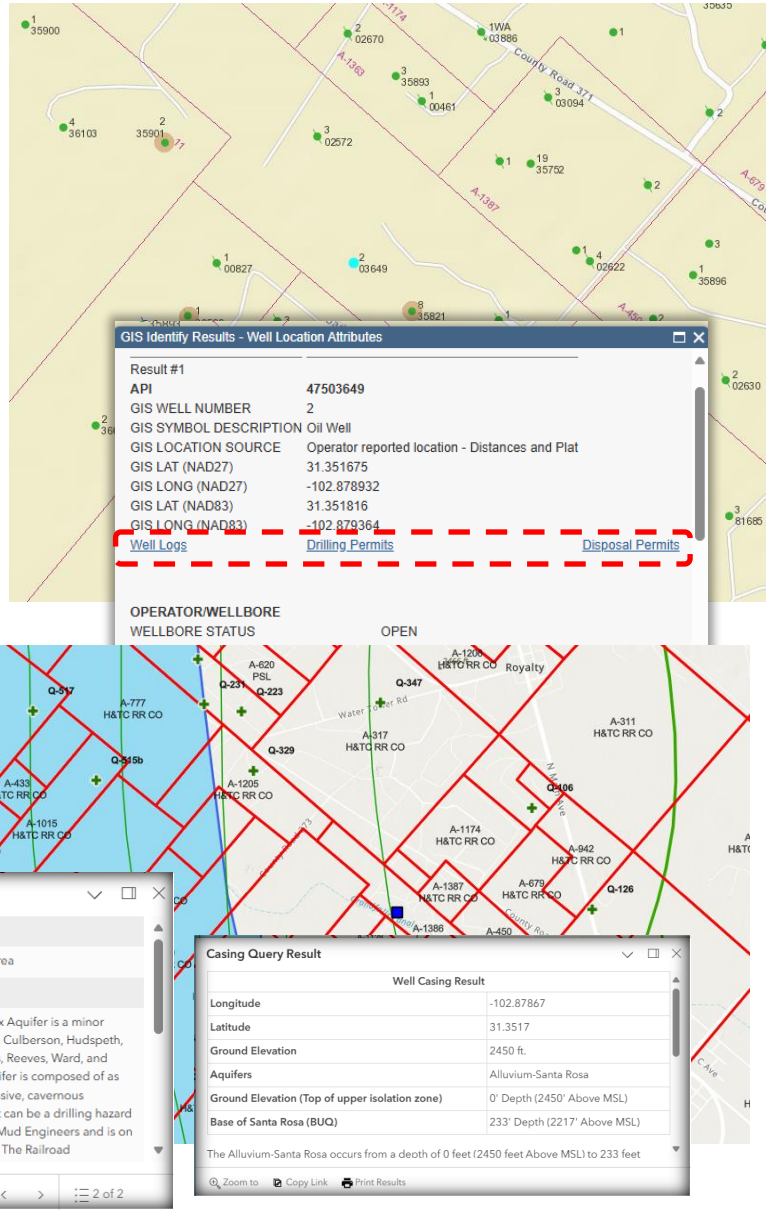
Navigation to Public GIS & DICE Sites

- RRC Home Page
  - Link to GIS Resources
  - Two GIS Resources
  - Public GIS & DICE
- Why are there Two?
  - How are they different?
- Search by Browser
  - RRC Public GIS Viewer
  - Drilling and Insight Casing Estimator



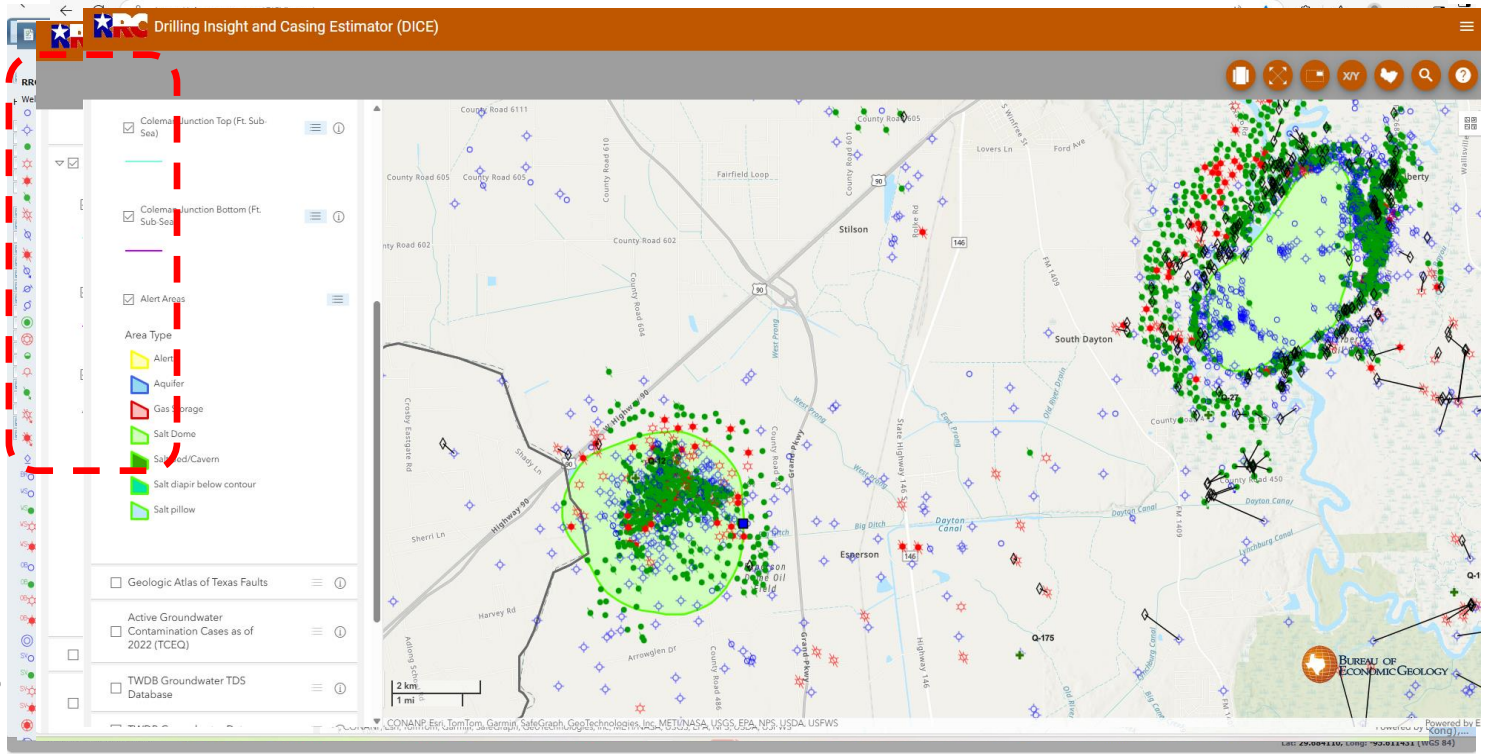
DICE vs. Public GIS Layers

- Public GIS Viewer
  - Regulated RRC Asset Engineering Information
  - Production & Permitting Information
  - Spatial inventory regulated assets
  - RRC Data Only
  - 95% of all RRC Engineering and Production Information
- Drilling Insight and Casing Estimator (DICE)
  - Geologic and Hydrogeologic Data
  - Groundwater Depth Interpretations (Peer Reviewed)
  - Known Casing Area (no Waterboard letter needed)
  - Geologic & Natural Drilling Alerts
  - District Office ID'ed Casing and Pluggi
  - Published Peer Reviewed Geologic Ha
  - Data from Multiple agencies and Publis



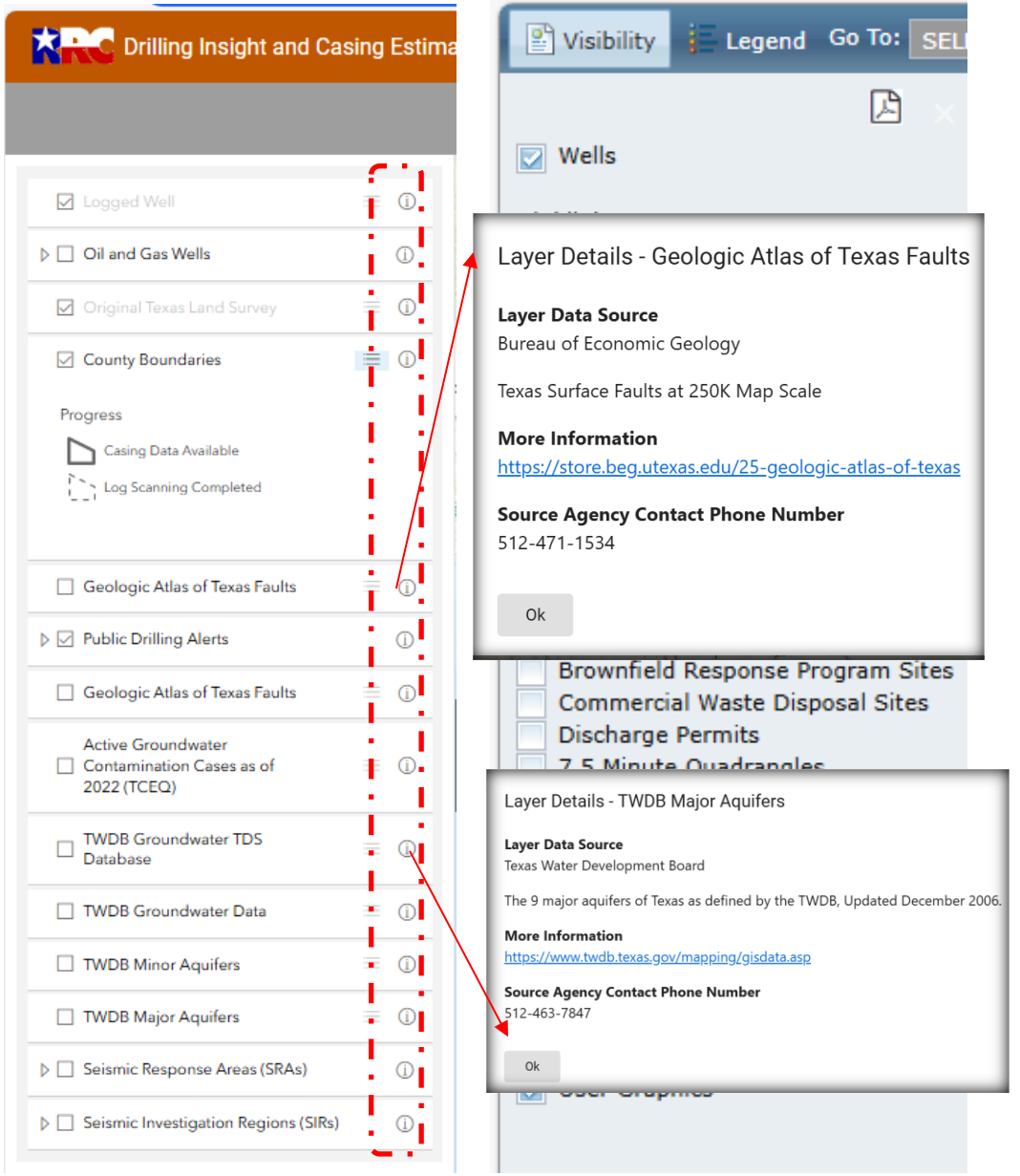
Public GIS Viewer

- Inventory of regulated oil field assets
  - Spatial representation of Texas RRC regulated assets
  - Access to 95% of all electronic asset database information at RRC
  - Hyperlinks to business and production information
  - Multiple Layers
- GIS Data Opportunity
  - Hydrogeology, Drilling Hazards
- Drilling Insight & Casing Est.
  - Groundwater Data
  - Structural Geology
  - Drilling Hazards & Alerts
  - Many Published Data Sources



DICE vs. Public GIS Layers Continued

- Public GIS Viewer Data Set Key or Layers
  - Regulated engineering assets
  - Wells
  - Pipelines
  - Clean up sites
  - RRC data only (RRC is responsible)
- DICE (Drilling Insight Casing Estimator) Key
  - Geology
  - Groundwater Depths
  - Aquifers
  - Drilling Alerts
    - Faults
    - Seismic Response & Investigation areas
    - Salt structures
  - Multiple Agency & Published Data
  - Citing, Update Frequency, Accuracy
  - (RRC is NOT Responsible)

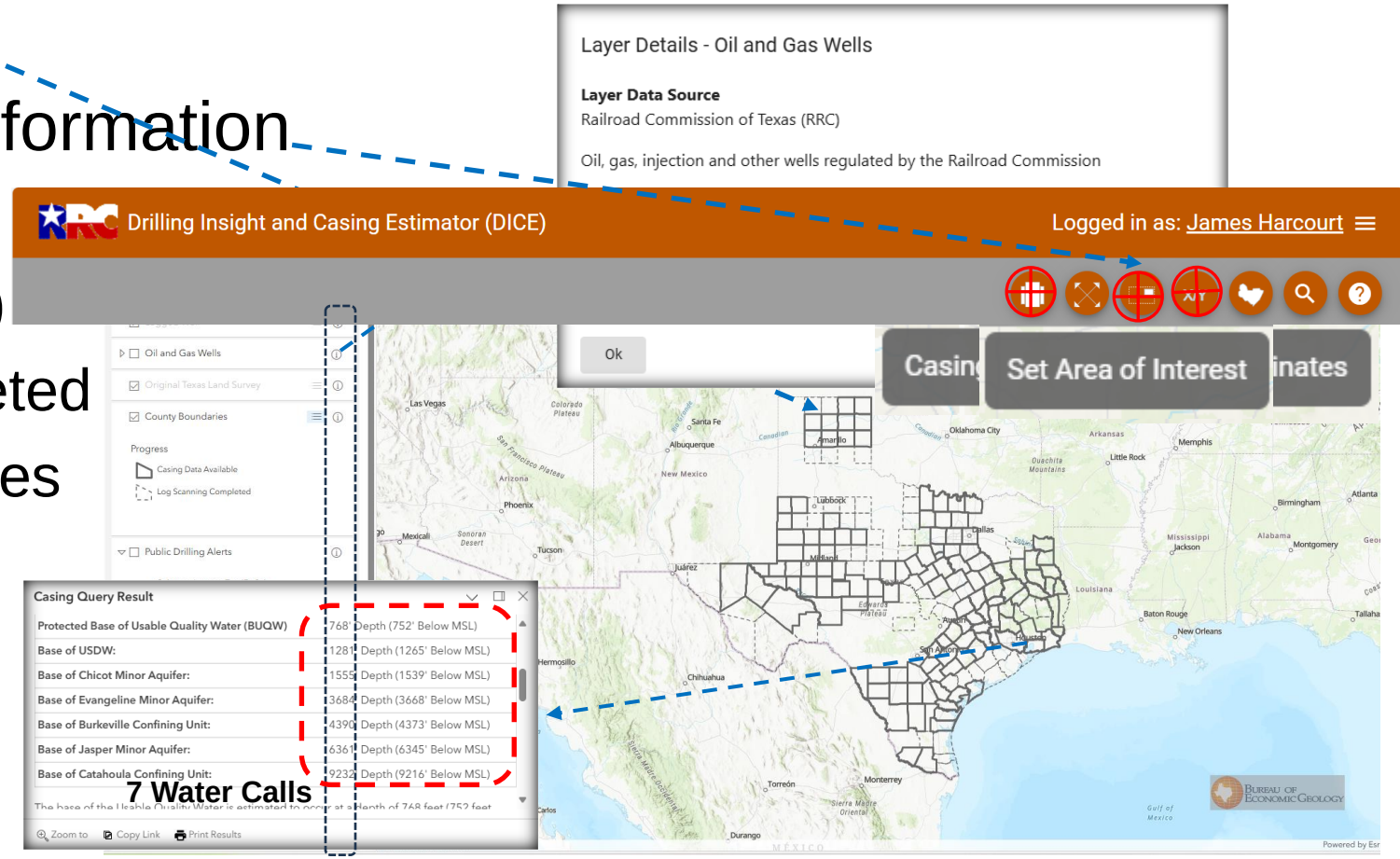


Joint Venture between UT BEG & RRC & GAU

- Data Sets provided by State & Federal Agencies & Peer Reviewed Data Sets
  - RRC
  - UT BEG
  - TCEQ
  - TWDB
  - EPA
- UT Bureau of Economic Geology (BEG)
  - Hosts Site, Maintains, Updates, and Contributes Content
- RRC provides most of the Funding, Creative Direction, some of the content
  - TCEQ funded site 2004 – 2011 (1M)
  - RRC is not liable for the accuracy of Non-RRC data sets
  - 225K/Year, 5 Million invested to date by State Agencies
- UT BEG can add most any geologic or hazard information requested
  - What do you want to see?
  - What will help you?

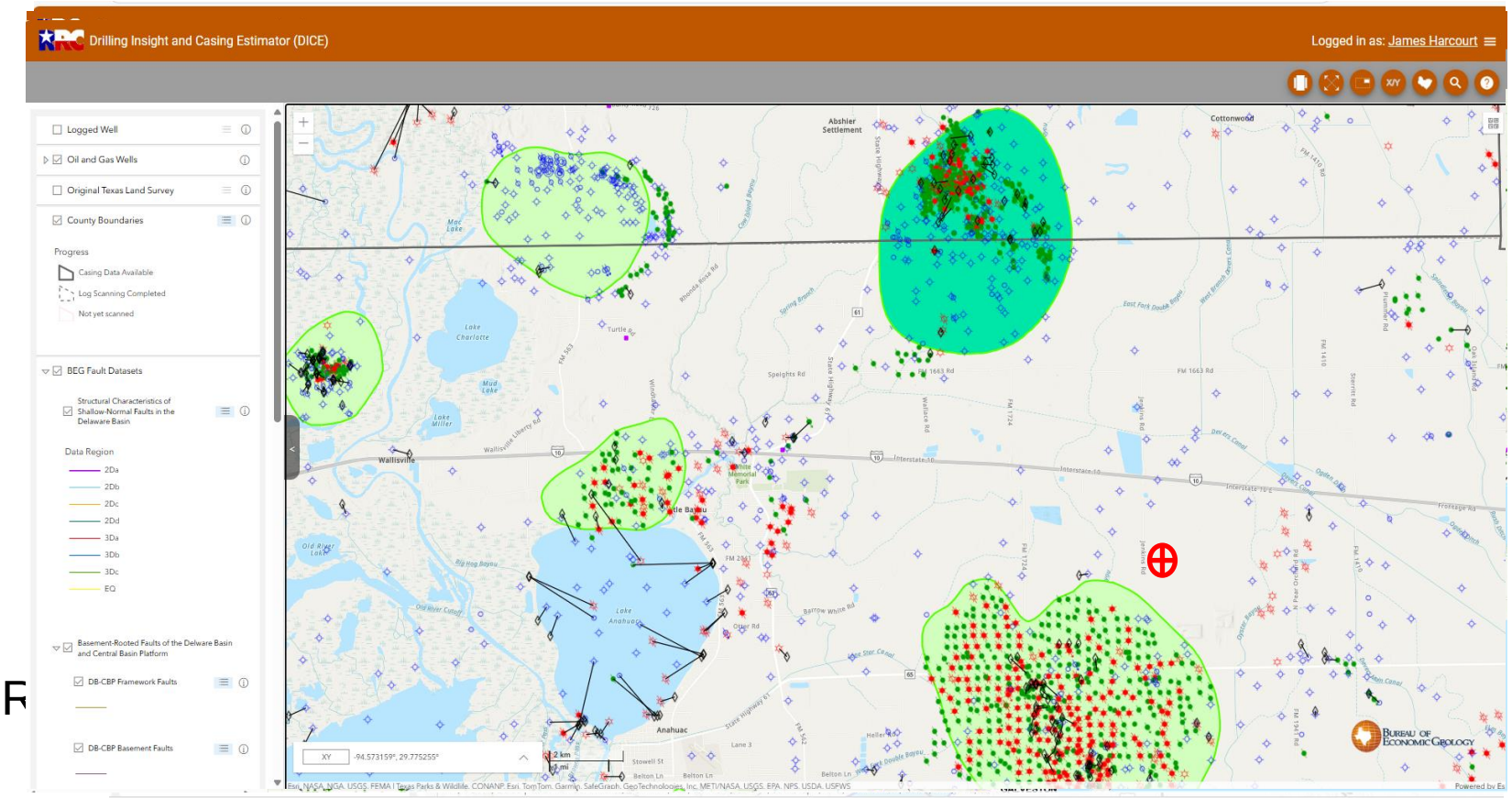
Drilling Insight and Casing Estimator

- Geologic, Hydrogeologic, Drilling Alerts & Hazards Information
  - Salt Piercement Structures
  - Known Casing Depth Area
- Groundwater Protection Information
  - Interpreted Counties (dark)
  - Scanned Counties (dashed)
  - 90% O&G Counties Interpreted
  - Priority is Gulf Coast Counties
- Data Source Identification
- Query Tools
  - Roll Curser for Descriptions



Drop Down and Look Around

- Setting Surface Casing or Plugging
  - Location of Groundwater
  - 1 Mile Away
- Plugging SWR 14
  - Location of Groundwater
  - Caustic formations (Salt)
  - Disposal formations
  - Overpressure formations
- Class II Injection Info
  - USDW
  - Confinement
  - Artificial Penetrations AOR
  - Seismicity and Faults
- Class VI (CCS)
  - Most Comprehensive and Subordinate Review



Finding Groundwater in non-interpreted Counties

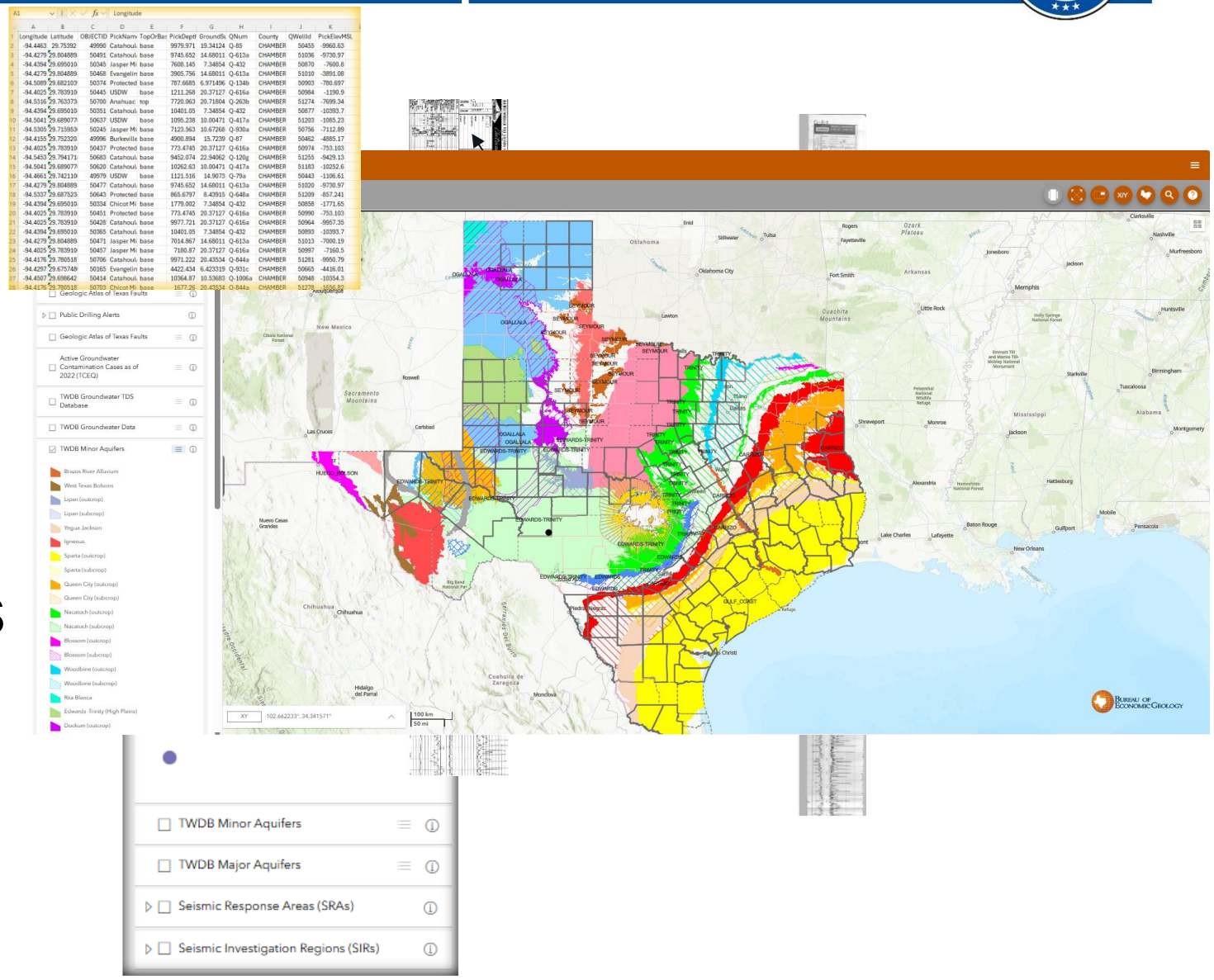
- Uninterpreted County's
  - No casing depths listed

A. Find Groundwater info
  - Turn on TWDB layers
  - Zoom in
  - 380' and 403', 259 mg/L

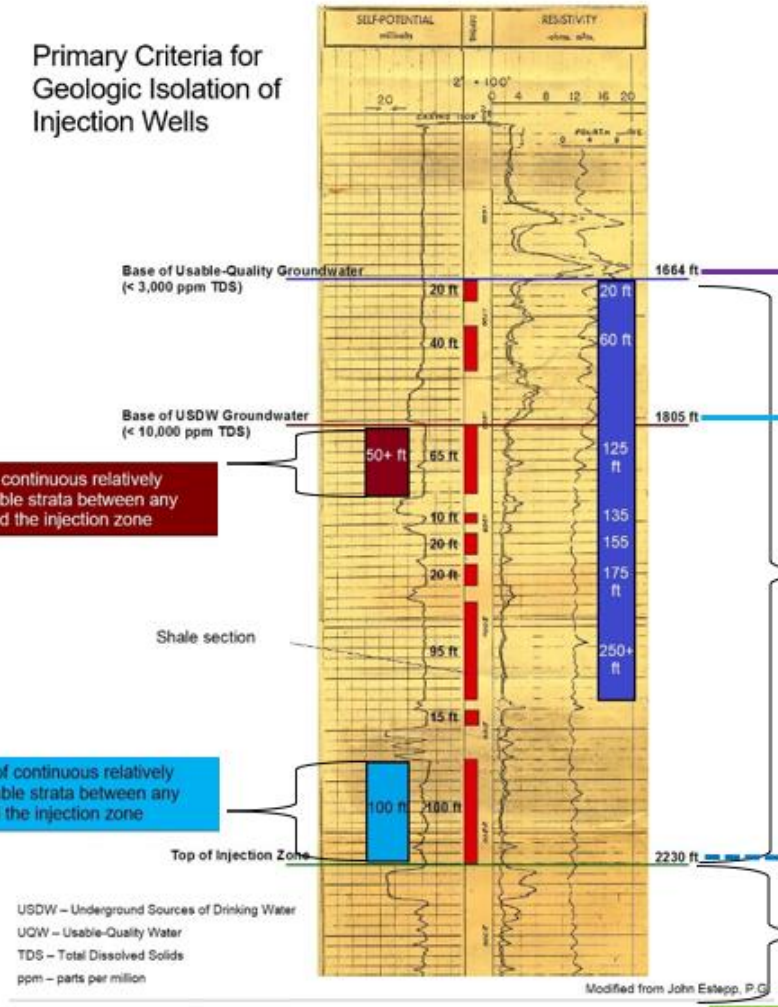
B. Find/review type Well Logs
  - Deep Groundwater
  - 750', 849'

C. View Major Aquifers

C. View Minor Aquifers



From Well Log to Groundwater Letter



GROUNDWATER PROTECTION DETERMINATION — Form GW-2

Groundwater Advisory Unit

Date Issued:	10 March 2021	GAU Number:	296480
Attention:	STATE OF TEXAS 123 Sam View Dr. Canada, TX 12345	API Number:	12345678
		County:	Martin
		Lease Name:	Bodacious SWD
Operator No.:	012345	Lease Number:	
		Well Number:	1
		Total Vertical	2300
		Latitude:	32.164950
		Longitude:	-101.981790
		Datum:	NAD27
Purpose:	Injection into Non-producing Zone (W14)		
Location:	Survey-T&P RRC Co. Survey; Abstract-A-0000; Block-22; Section-1		

To protect usable-quality groundwater at this location, the Groundwater Advisory Unit of the Railroad Commission of Texas recommends:

The Base of Usable-Quality Water-bearing (BUQW) strata is estimated to occur at a depth of 1,664 feet at the site of referenced well.

The BASE OF UNDERGROUND SOURCES OF DRINKING WATER (USDW) is estimated to occur at a depth of 1,805 feet at the site of the referenced well. (For UIC Purposes Only)

Geologic Isolation occurs at 2,230 feet measured depth at the site of the referenced well. (For UIC Purposes Only)

Injection into the subsurface interval 2,235 - 4,100 feet, as listed on the W14 application dated March 10, 2021, WILL NOT ENDANGER the freshwater strata in this area. For questions, see contact information below. (For UIC Purposes Only)

This recommendation is applicable to all wells within a radius of 200 feet of this location.

Note: Unless stated otherwise, this recommendation is intended to apply to wells drilled within 200 feet of the subject well. Unless stated otherwise, this recommendation is for normal drilling, production, and plugging operations only.

This determination is based on information provided when the application was submitted on 03/10/2021. If the location information has changed, you must contact the Groundwater Advisory Unit, and submit a new application if necessary. If you have questions, please contact us at 512-463-2741 or gau@rrc.texas.gov.

Groundwater Advisory Unit, Oil and Gas Division

Form GW-2 Rev. 02/2014 P.O. Box 12967 Austin, Texas 78771-2967 512-463-2741 Internet address: www.rrc.texas.gov

Endangerment language regarding proposed injection zone risk to protected groundwater given geologic isolation and minerology:

Will Not Endanger – Suitable for Injection
Will Endanger – Not Suitable for Injection
May Endanger – Inconclusive, more evidence is needed, do not inject
Is Endangering – Currently in violation of EPA requirements

What GIS Layers Do You Need?

Questions?