

Brackish Resources Aquifer Characterization System (BRACS)

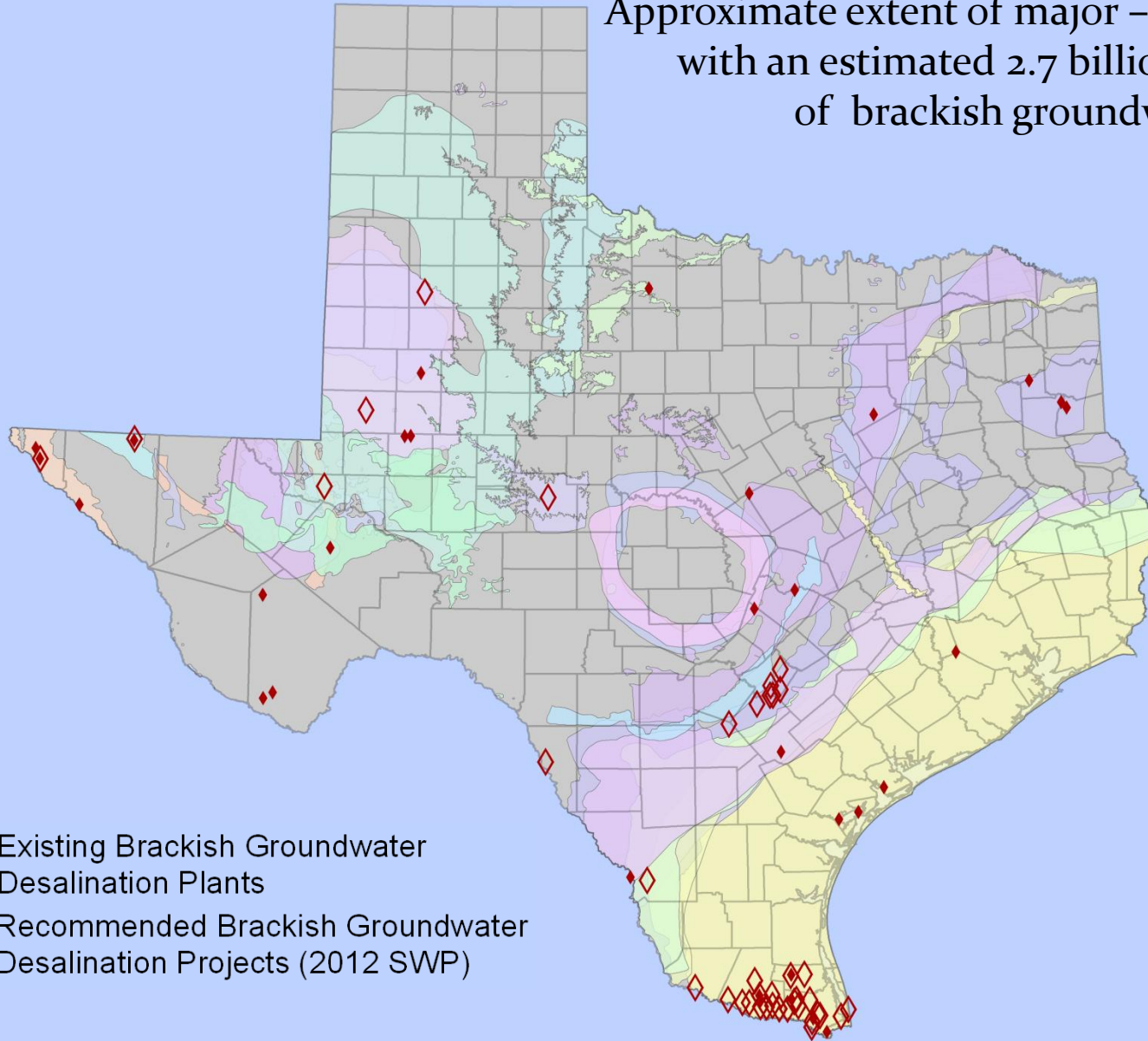
December 13, 2011



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Texas Water Development Board
Water Science and Conservation
Innovative Water Technologies

Approximate extent of major – minor aquifers
with an estimated 2.7 billion acre-feet
of brackish groundwater



- ◆ Existing Brackish Groundwater Desalination Plants
- ◇ Recommended Brackish Groundwater Desalination Projects (2012 SWP)

State and regional water planning

Water for Texas 2007

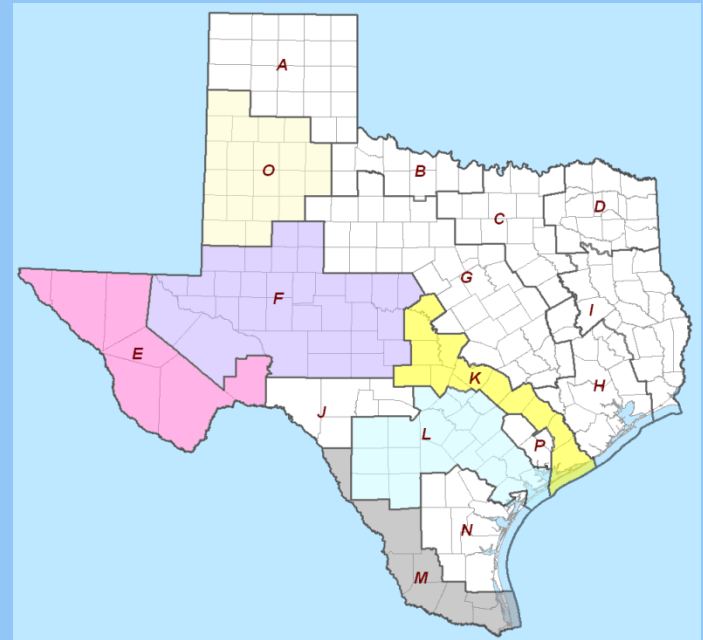
Water for Texas 2007

Texas Water Development Board



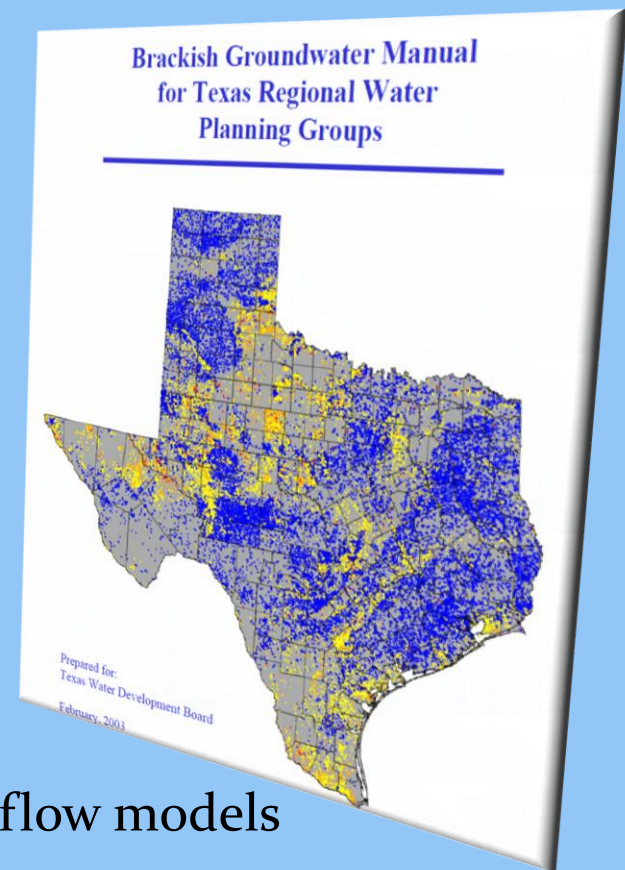
Texas Water Development Board

- Consider and evaluate all potentially feasible water management strategies
- Brackish groundwater desalination
 - Develop 175,000 acre-feet/year by 2060
 - 6 regions recommended strategy



BRACS Goals:

- Extend the TWDB statewide brackish groundwater study (2003):
 - map aquifers to 10,000 mg/L TDS
 - map key desalination parameters
 - estimate aquifer properties
 - estimate volumes of water
 - prepare data for numerical groundwater flow models
 - collect well logs (water, oil/gas) for interpretation
 - build datasets (database, GIS) of project information
- Assist regional water planning groups
- Collect and disseminate information to be used for site-specific brackish groundwater projects



- Convene a Technical Resource Panel
- Pilot Study: Pecos Valley Aquifer, West Texas
- Six-month studies:
 - Queen City – Sparta Aquifer, Atascosa and McMullen Counties
 - Corpus Christi ASR District: Evaluate Evangeline Aquifer for ASR
- Contracts to support brackish groundwater analysis include:
 - Digital Geological Bibliography of Texas to focus on brackish portions of aquifers in Texas
 - Compile digital geophysical well logs across Texas for resistivity / stratigraphic analysis (goal: 1 log per 2.5 minute grid cell)
 - Assessment of Groundwater Modeling Approaches to Brackish Aquifers, using Variable Density Modeling

TWDB Relational Database Primary Tables

TWDB Groundwater Database

Well Data

Remarks

Water Levels

Water Chemistry (2 tables)

Casing

TWDB BRACS Database

Well Data (location, depth, owner, ...)

Water Levels

Water Chemistry (2 tables)

Casing

New
Tables

Foreign Keys (well ids)

Well Geology (lithology\stratigraphy)

Net Sand and Sand Percent

Interpreted TDS from Geophysical W.L.

Aquifer Determination Analysis

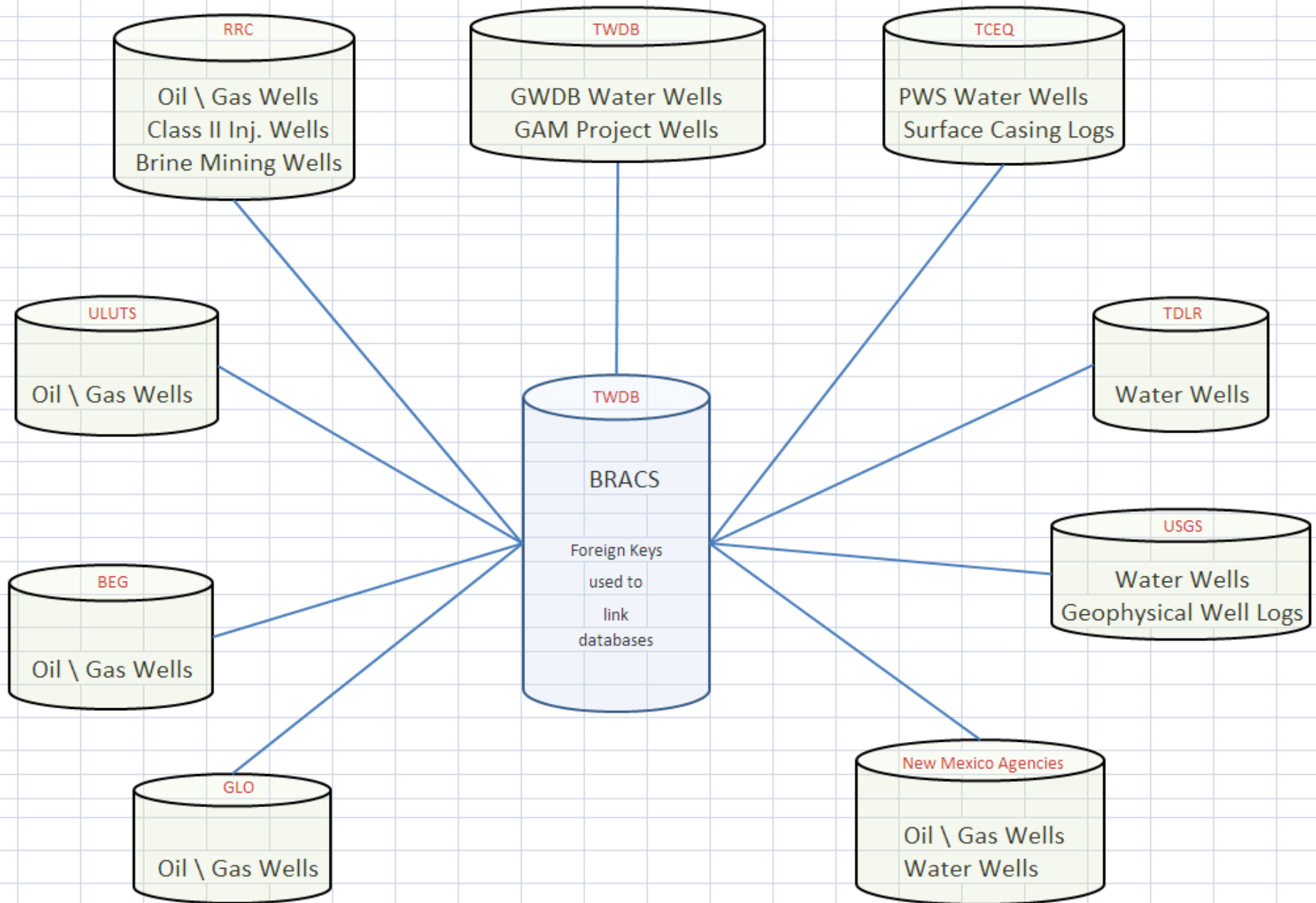
Digital Water Well Reports

Digital Geophysical Well Logs

Geophysical Well Log Suites

Aquifer Test Information

BRACS Supporting Well Databases



Well Attributes: location, source, log types, ...

TWDB WSC IWT BRACS Geophysical Log Search Task

State Name: Source of Well Data: Remarks: Initials:

County Name:

Depth Total: Latitude: Elevation: (RRC, ULUTS, NMEMN, TDLR, TCEQ, TWDB, NMOSE)

Depth Well: Longitude:

Drill Date: Horizontal Datum: Vertical Datum:

Kelly Bushing Height: Location Method: Elevation Method:

Well Type: Agency: Elevation Agency:

2.5' Grid Cell: Location Date: Elevation Date:

Owner:

Log File Type: GL folder: Remarks:

File Name:

JEM: GL Hyperlink: [G:\BRACS\Geophysical\Welllogs\42_495\424953](#) MRW: GL Hyperlink: [F:\BRACS\Geophysical\Welllogs\42_495\424953](#)

Geophysical Log	GL Code	Top Depth	Bottom Depth	Remarks
<input type="text" value="CALIPER"/>	<input type="text" value="CAL"/>	<input type="text" value="4900"/>	<input type="text" value="7750"/>	<input type="text" value="N/A"/>
<input type="text" value="DENSITY"/>	<input type="text" value="DEN"/>	<input type="text" value="4900"/>	<input type="text" value="7750"/>	<input type="text" value="N/A"/>
<input type="text" value="GAMMA RAY OR GAMMA"/>	<input type="text" value="GR"/>	<input type="text" value="180"/>	<input type="text" value="7750"/>	<input type="text" value="180-4900' appears attenuated"/>
<input type="text" value="NEUTRON"/>	<input type="text" value="NEU"/>	<input type="text" value="180"/>	<input type="text" value="7750"/>	<input type="text" value="N/A"/>
<input type="text" value="TENSION"/>	<input type="text" value="TEN"/>	<input type="text" value="180"/>	<input type="text" value="7750"/>	<input type="text" value="N/A"/>
<input type="text" value="*"/>	<input type="text" value=""/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="N/A"/>

Record:

(New) Log File Type: WW folder: Remarks:

File Name:

JEM: WW Hyperlink: MRW: WW Hyperlink:

Record:

ID Name	ID Agency	Foreign Key Id (Text)	Foreign Key Id (Numeric)	Remarks
<input type="text" value="INT_RUSTLER_PROJ"/>	<input type="text" value="1561"/>	<input type="text" value="1561"/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="text" value="API_NUMBER"/>	<input type="text" value="4249532997"/>	<input type="text" value="4249532997"/>	<input type="text" value=""/>	<input type="text" value=""/>
<input type="text" value="WELL_NUMBER"/>	<input type="text" value="TUBB 9 UNIT 2"/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

Num Lock

Digital Lithology from TDLR Submitted Driller Reports

Extract Well Lithology using Digital Parser

Close Form

Select Water Well | Modify Lithology for Extraction | **Final Data Edits and Append Data**

Step 1

Review the final extracted data. Use the Data Modification tools below, if necessary. If data is correct, proceed to step 2. If the data was extracted incorrectly, proceed to page "Modify Lithology for Extraction and do those steps over.

129982	1	0	loose surface	JEM	7/25/2011	Remarks:
		10				
		10				
129982	2	10	caliche	JEM	7/25/2011	Remarks:
		15				
		5				
129982	3	15	tan sand	JEM	7/25/2011	Remarks:
		51				
		36				
129982	4	51	tan sand stone	JEM	7/25/2011	Remarks:
		111				
		60				
129982	5	111	brown clay	JEM	7/25/2011	Remarks:
		158				
		47				

Data Modification Tools

Remove Leading Spaces in Lithology in Geologic Description Field

Substructure Record Removal and Lithology Depth Modification

1
2
3

Append these records to the tblWellLithology table

This tool will remove the first record in the lithology table, re-number the records, and adjust the depths based on the substructure (rig floor) height.

Step 2

Geology Table

frmWell_Lithology_DE

2509 API Number 4249532576 State Well Number 0 Owner ENERGEN RESOURCES CORPORATION Drill Date 10/20/1996
 Track Number 0 Water Source Well Number UNIVERSITY 47-21 3 Depth Total 7300

Lithologic Description

Q Number
 Source of Well Data ULUTS Digital Geophysical Logs

Stratigraphic Description

Record Number	Geologic Pick	Top Depth Bottom Depth Thickness	Lithologic Description Source of Data Initials Last Change
5	Lithologic	0 80 80	No Record GEOPHYSICAL WELL LOG JEM 3/7/2011
6	Lithologic	80 170 90	Sand GEOPHYSICAL WELL LOG JEM 3/7/2011
7	Lithologic	170 297 127	Clay GEOPHYSICAL WELL LOG JEM 3/7/2011
8	Lithologic	297 532 235	Sand GEOPHYSICAL WELL LOG JEM 3/7/2011
9	Lithologic	532 752 220	Sand and Clay GEOPHYSICAL WELL LOG JEM 3/7/2011
10	Lithologic	752 810 58	SAND GEOPHYSICAL WELL LOG JEM 3/7/2011
11	Lithologic	810	

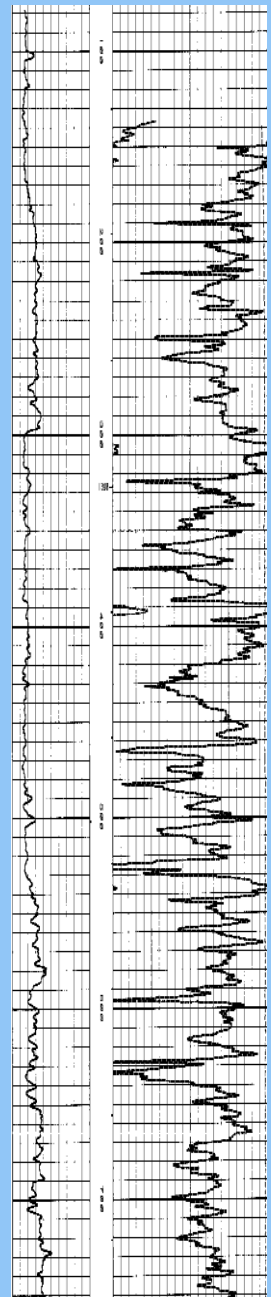
Record Number	Geologic Pick	Top Depth Bottom Depth Thickness	Stratigraphic Description Source of Data Initials Last Change
1	Stratigraphic	0 1330 1330	Pecos Valley Alluvium GEOPHYSICAL WELL LOG JEM 3/7/2011
2	Stratigraphic	1330	Dockum Group GEOPHYSICAL WELL LOG JEM 3/7/2011
3	Stratigraphic	1792	Dewey Lake Redbeds GEOPHYSICAL WELL LOG JEM 10/22/2010
4	Stratigraphic	1792	Rustler Formation GEOPHYSICAL WELL LOG JEM 8/30/2010
*			

Add First Record Add Next Record Complete Last Record

Add First Record Add Next Record Complete Last Record Add BLANK Record

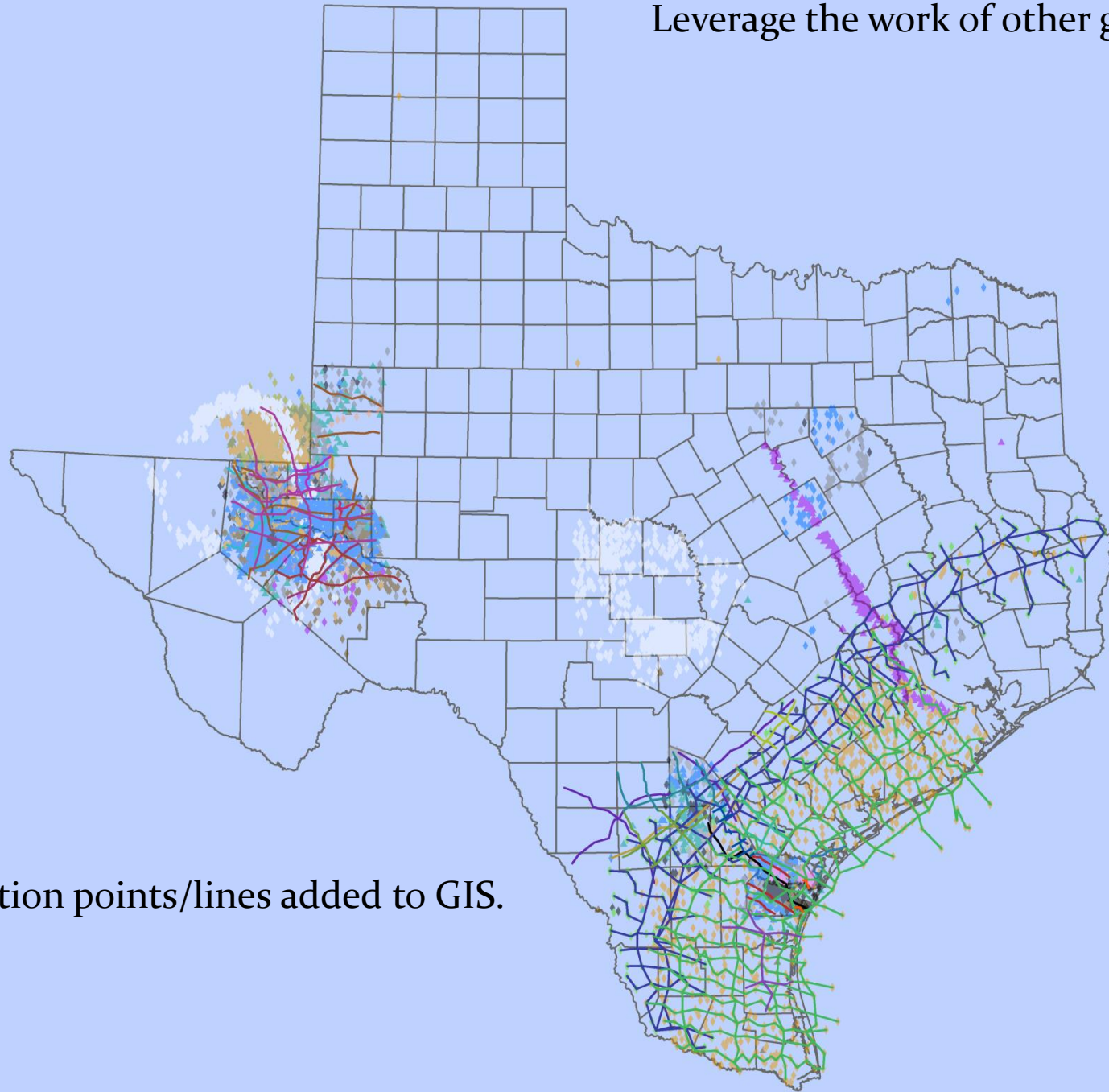
Geophysical Well Log Hyperlinks

JEM <G:\BRACS\GeophysicalLogs\4249532576.tif>
 MRW <F:\BRACS\GeophysicalLogs\4249532576.tif>



NMOSE POD HYP

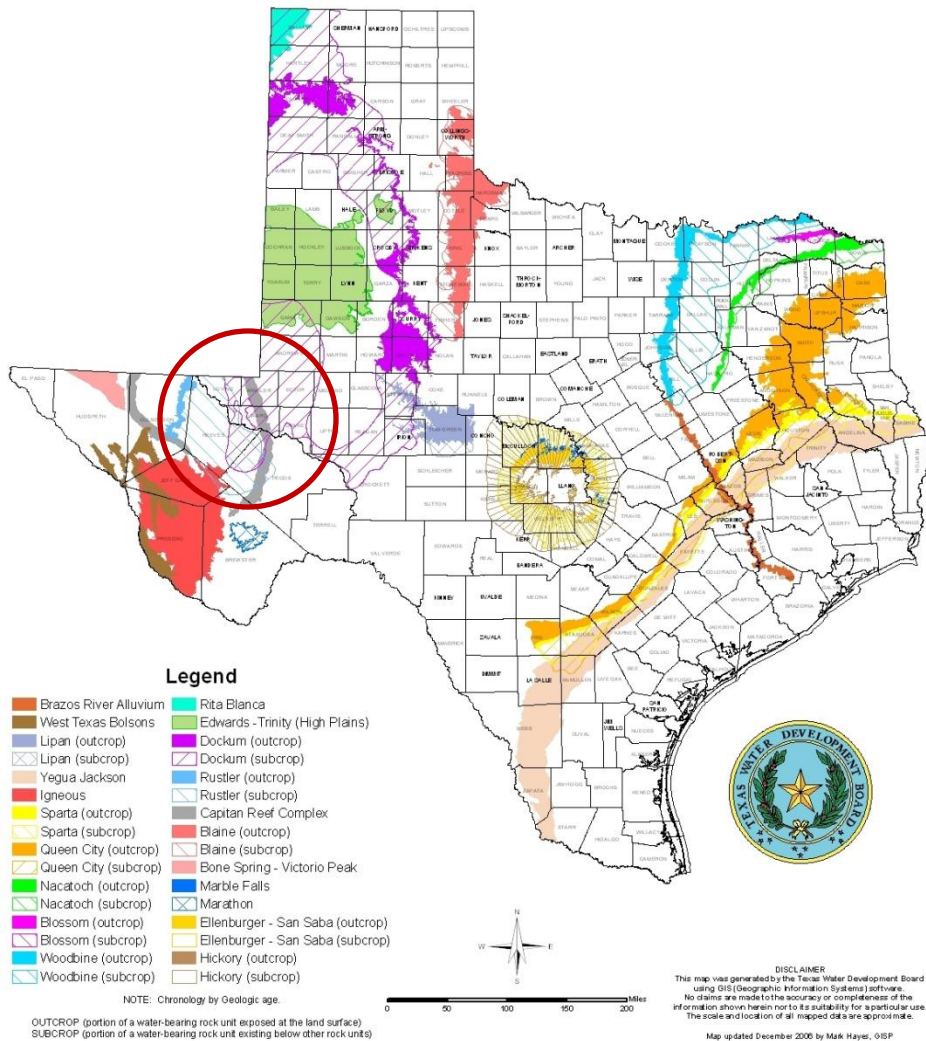
Leverage the work of other geologists



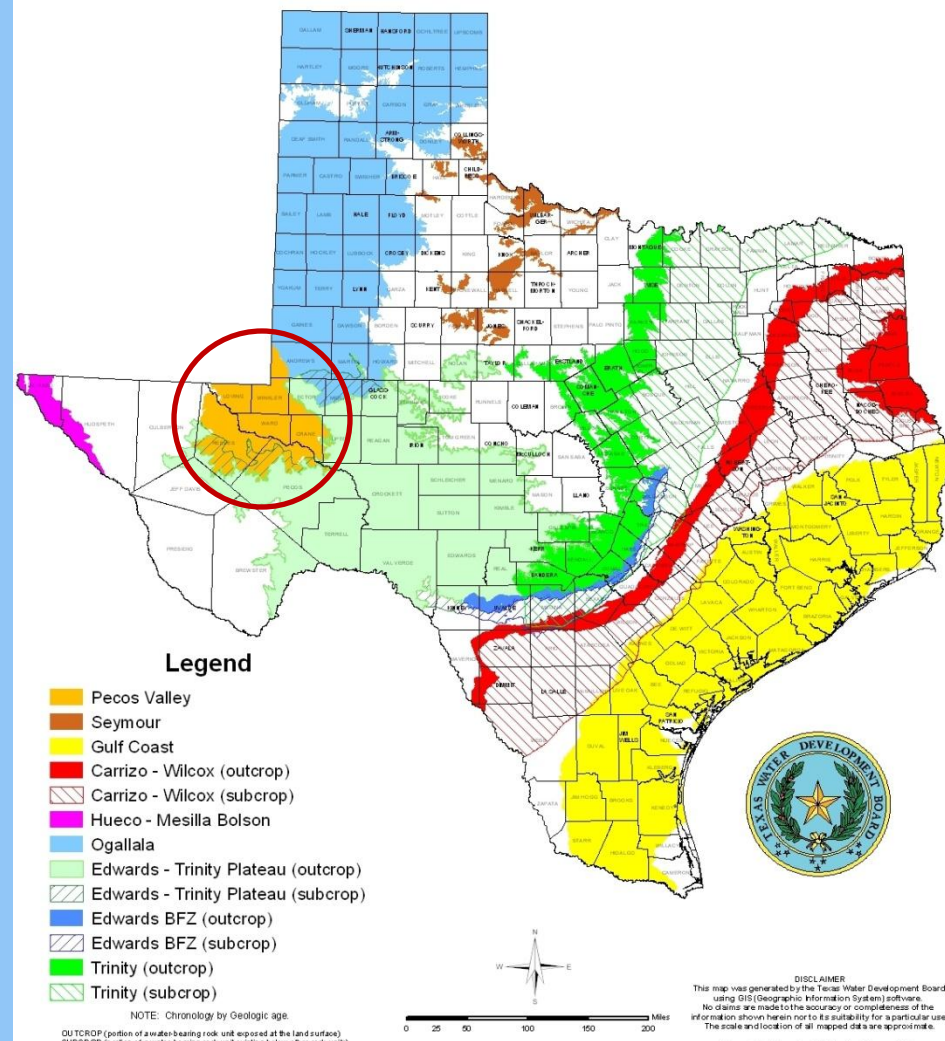
Cross-section points/lines added to GIS.

Pecos Valley Aquifer Pilot Study Area

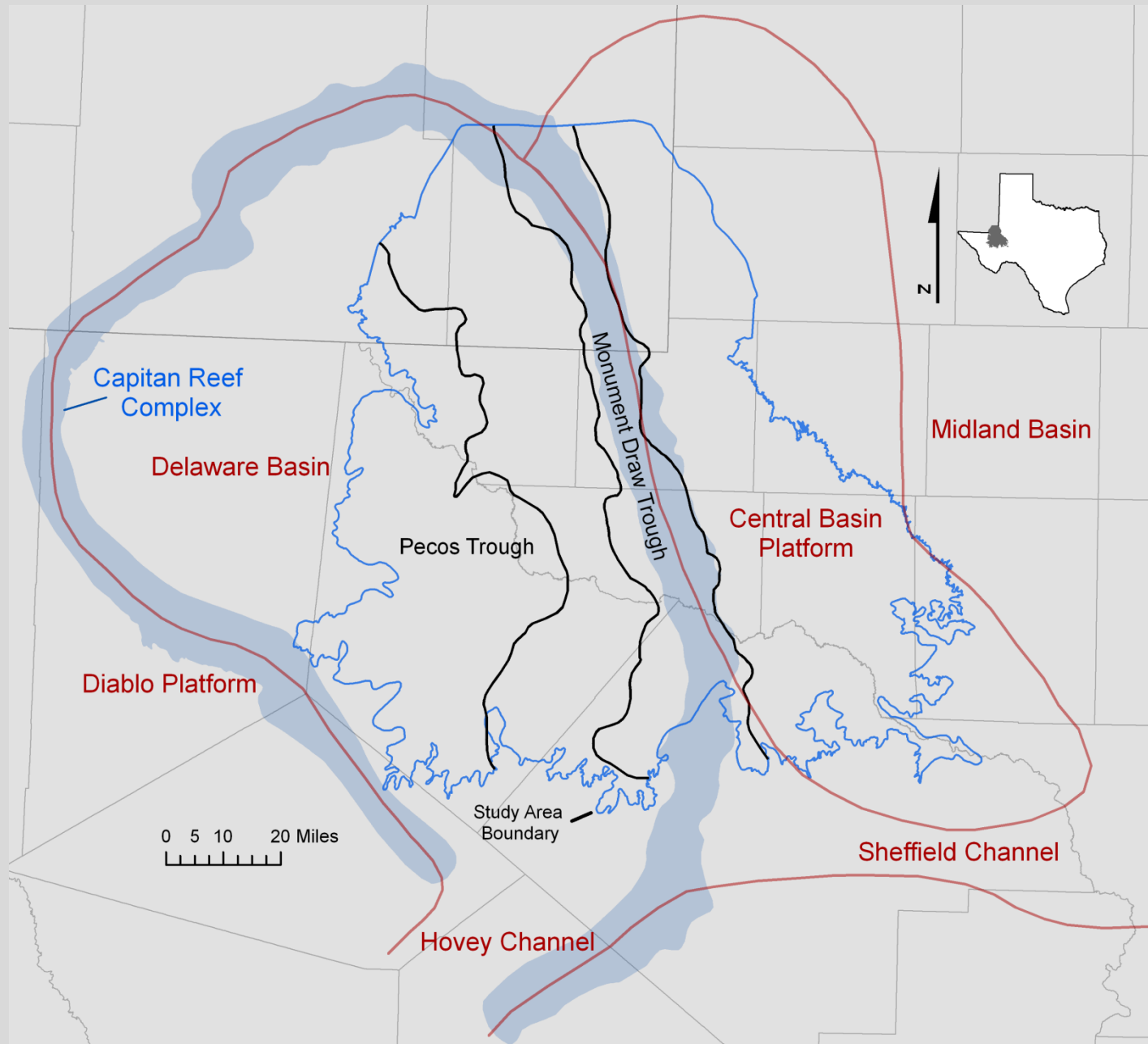
Minor Aquifers of Texas



Major Aquifers of Texas

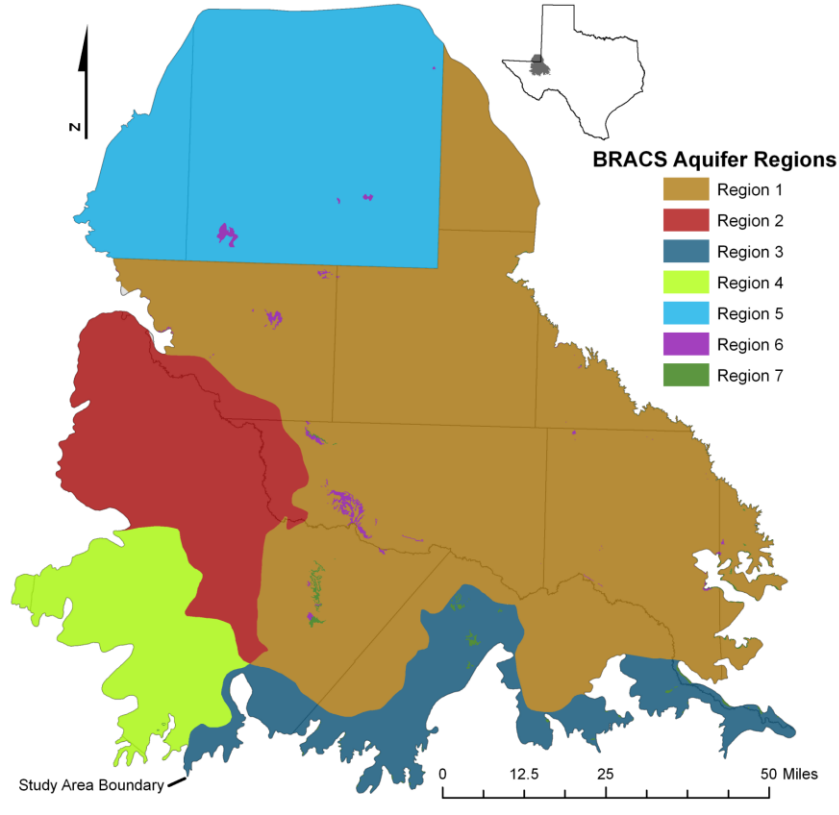


Pecos Valley Aquifer Pilot Study Area and Permian Structural Elements

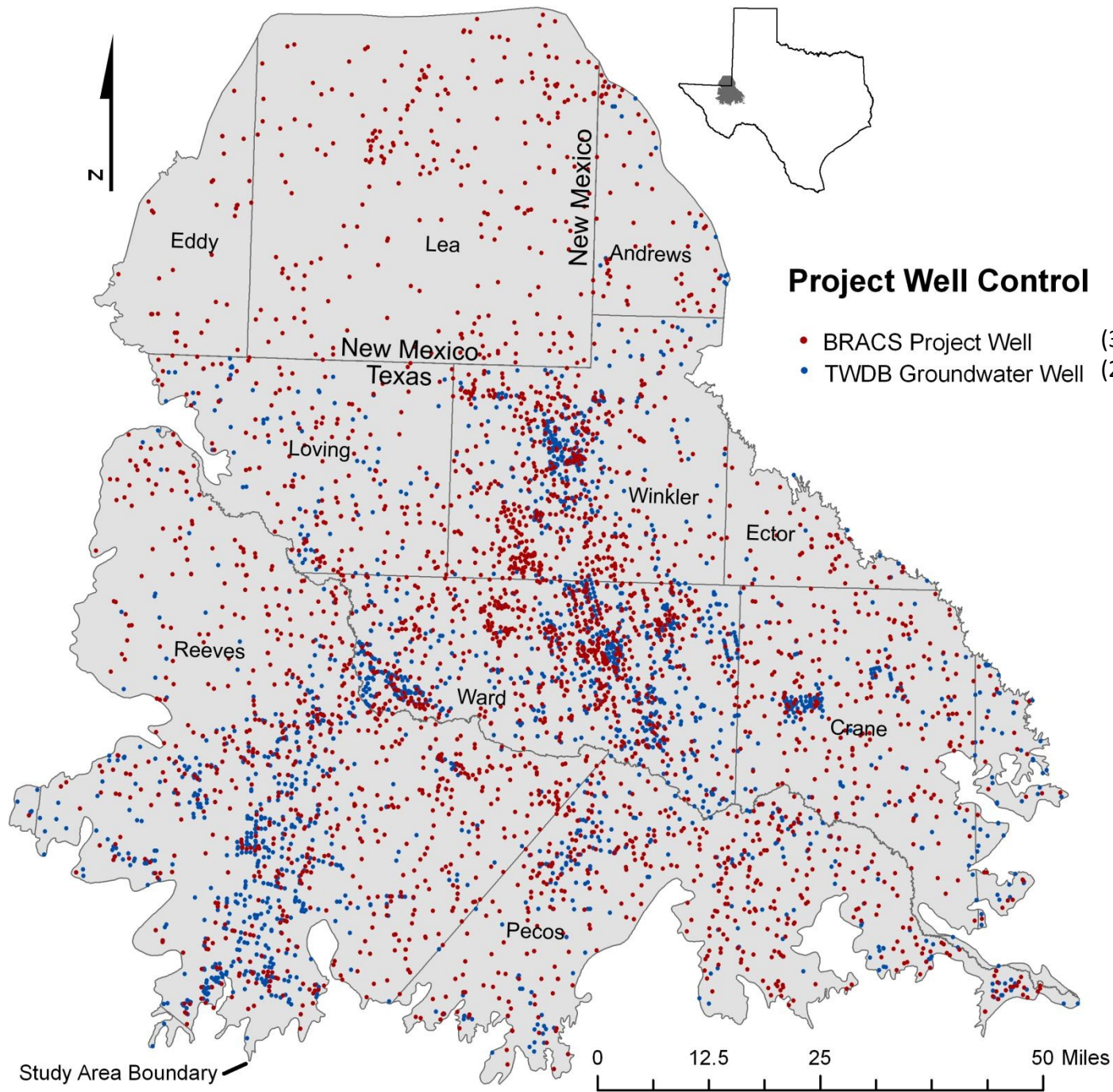


Each “region” within the project area has a different stratigraphic relationship.

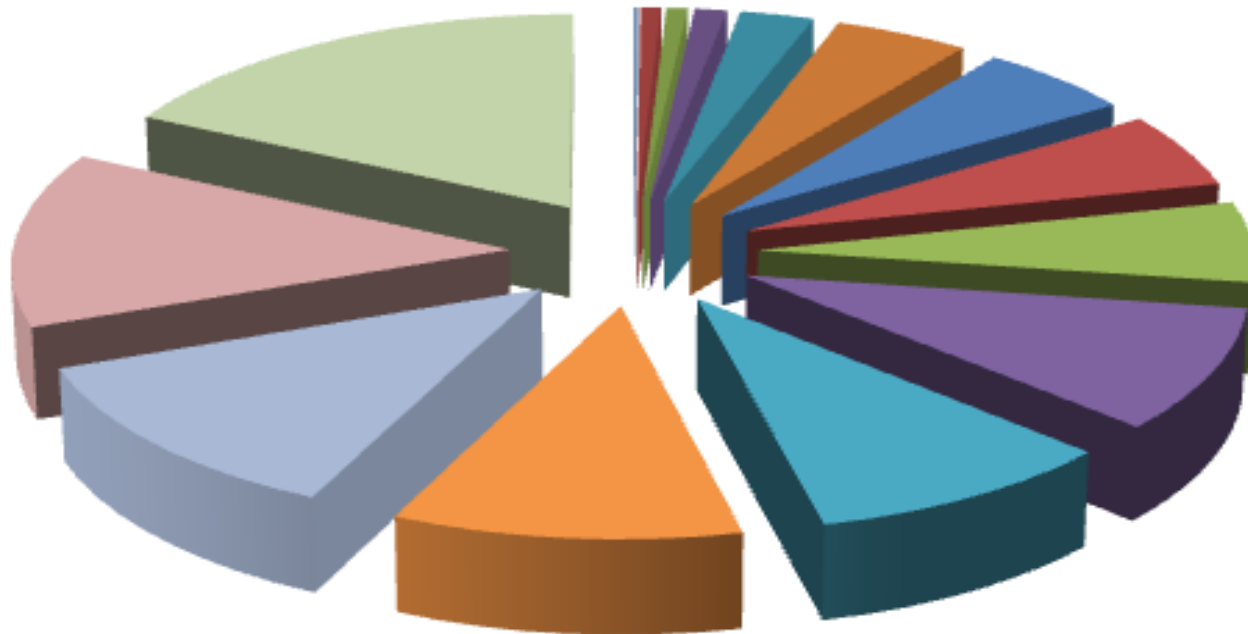
Mapping the Pecos Valley Alluvium and underlying formations in greater detail than what has been done in previous studies was imperative.



System	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7
Quaternary	Pecos Valley Alluvium	Pecos Valley Alluvium	Pecos Valley Alluvium	Pecos Valley Alluvium	Ogallala Formation		
Tertiary							
Cretaceous			Cretaceous Undivided	Cretaceous Undivided			Cretaceous Undivided
Jurassic							
Triassic	Dockum Group		Dockum Group		Dockum Group	Dockum Group	Dockum Group
Permian	Dewey Lake Formation	Dewey Lake Formation	Dewey Lake Formation	Dewey Lake Formation	Dewey Lake Formation	Dewey Lake Formation	Dewey Lake Formation
	Rustler Formation	Rustler Formation	Rustler Formation	Rustler Formation	Rustler Formation	Rustler Formation	Rustler Formation
	Salado Formation	Salado Formation	Salado Formation	Salado Formation	Salado Formation	Salado Formation	Salado Formation
	Castile Capitan Reef Complex	Castile	Castile Capitan Reef Complex	Castile	Castile Capitan Reef Complex	Castile Capitan Reef Complex	Castile Capitan Reef Complex



Sources of Data for the Pecos Valley Study



- NM OSE Aquifer Test Information
- NM OSE Digital Water Well Reports
- TCEQ PWS Water Wells
- TWDB Geophysical Logs
- NM OSE Paper Water Well Reports
- DBSA Capitan Reef Study
- NM EMNRD Geophysical Logs
- ULUTS Digital Geophysical Logs
- TCEQ SC Q Paper/Digital Geophysical Logs
- RRC Digital Geophysical Logs
- TWDB Groundwater Database
- TCEQ Water Well Images
- TDLR Digital Water Well Reports
- BEG Paper/Digital Geophysical Logs
- TWDB Published Reports

3,131 wells in project

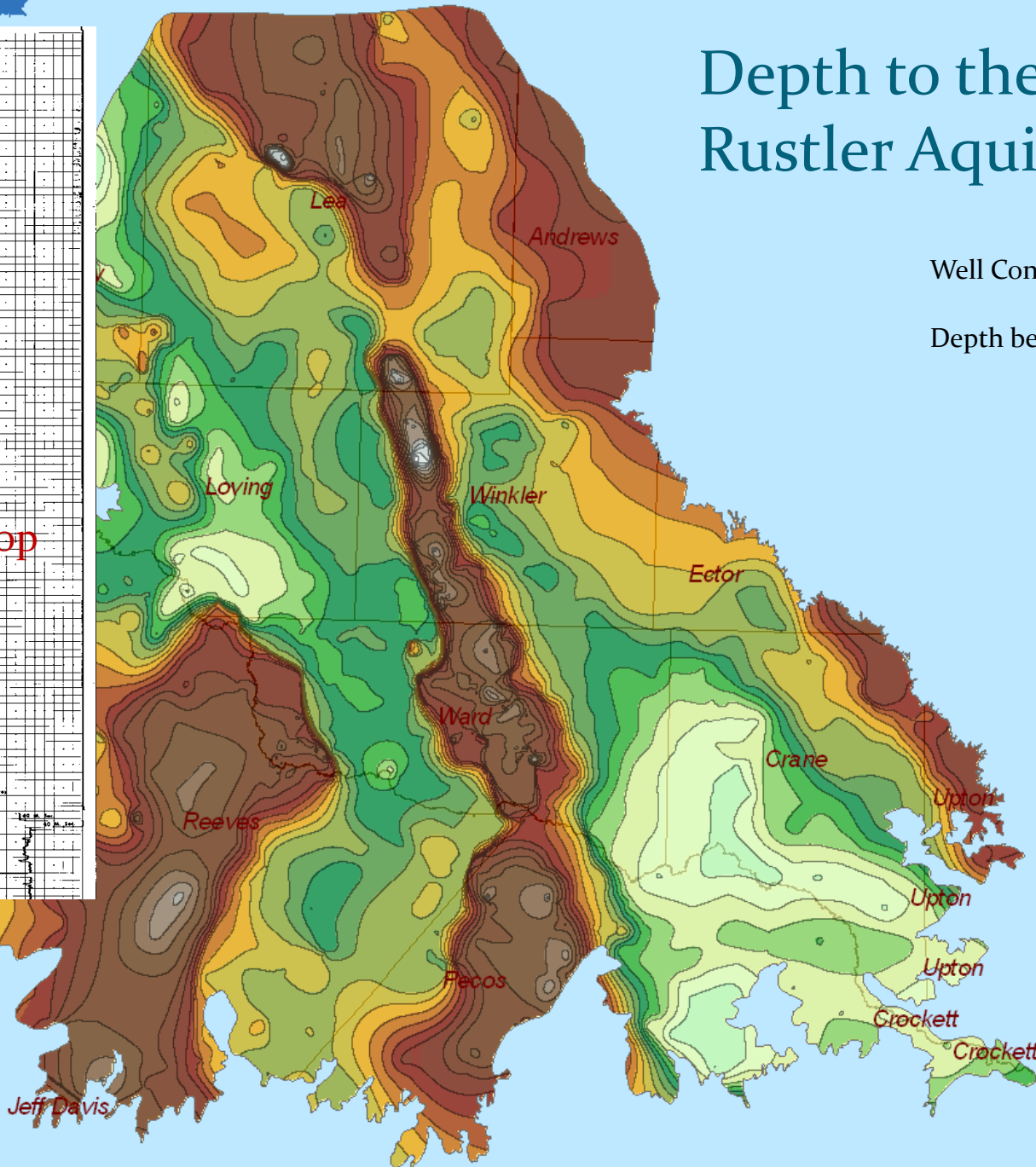
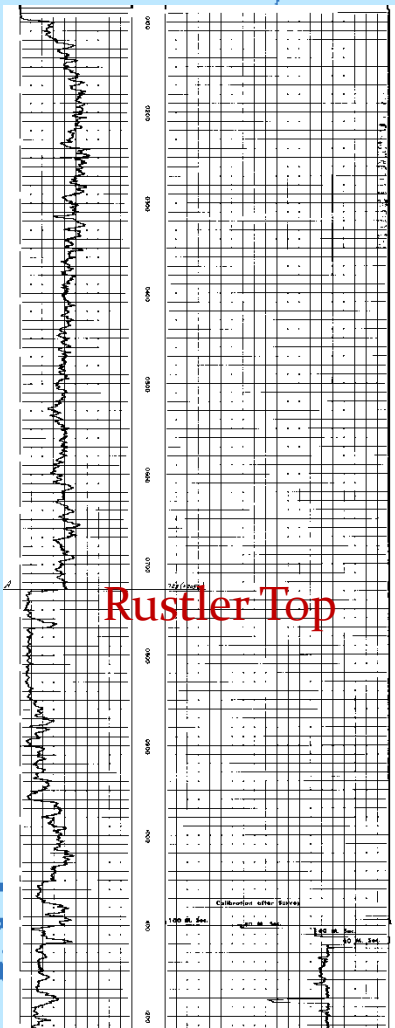
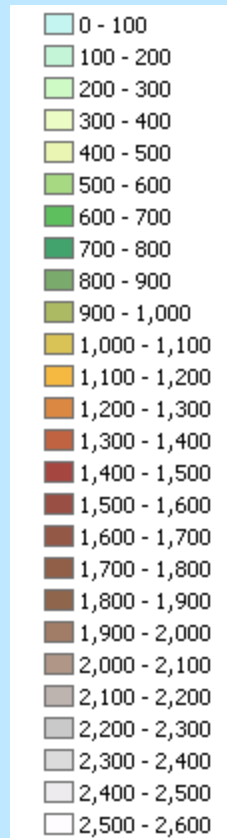
85% new data to TWDB

Depth to the Rustler Aquifer Top

Well Control: 1,479 wells

Depth below ground surface

Units = feet

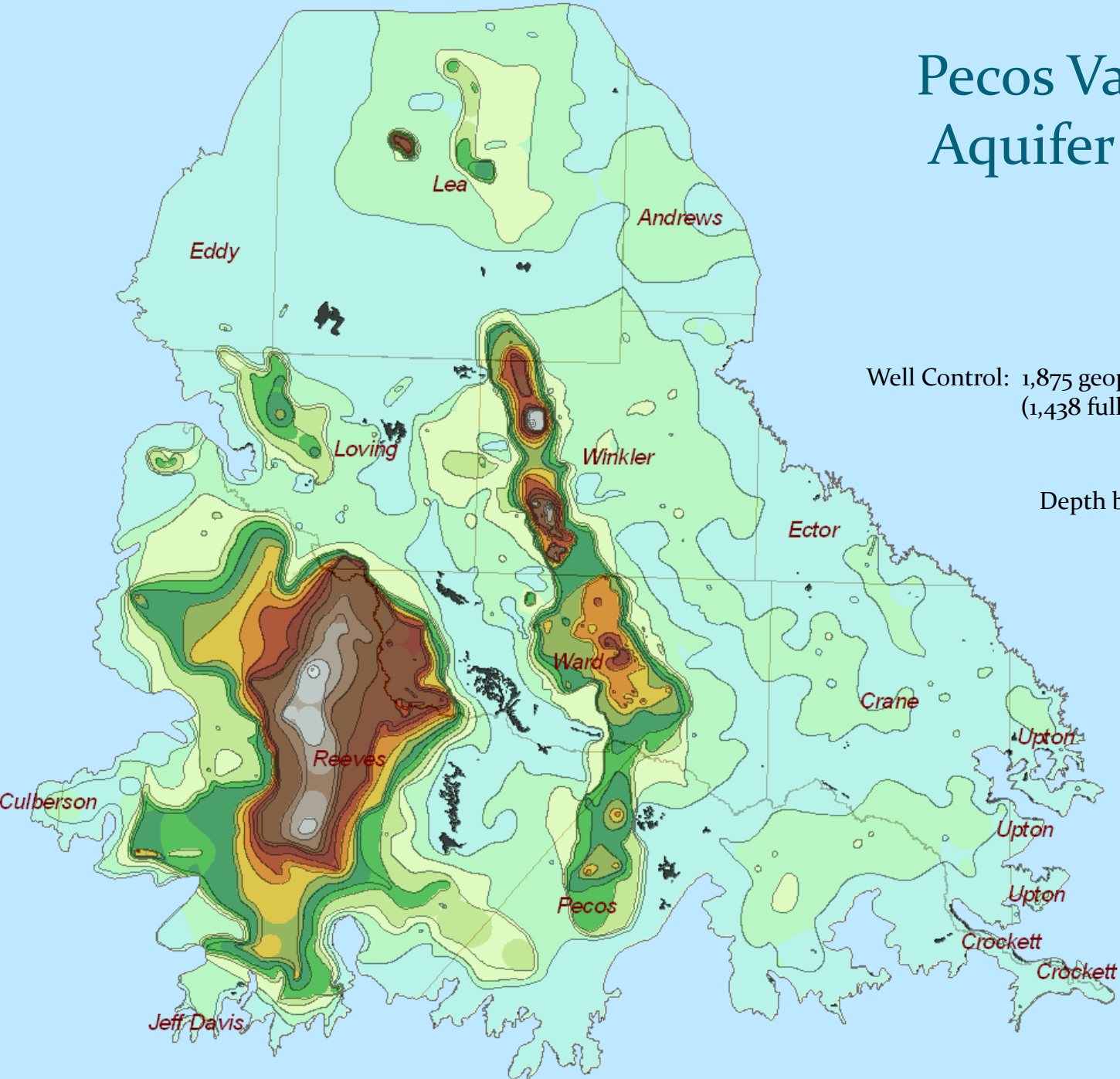
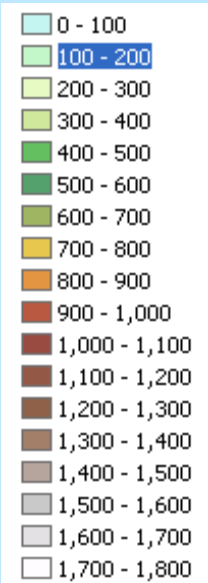


Pecos Valley Aquifer Thickness

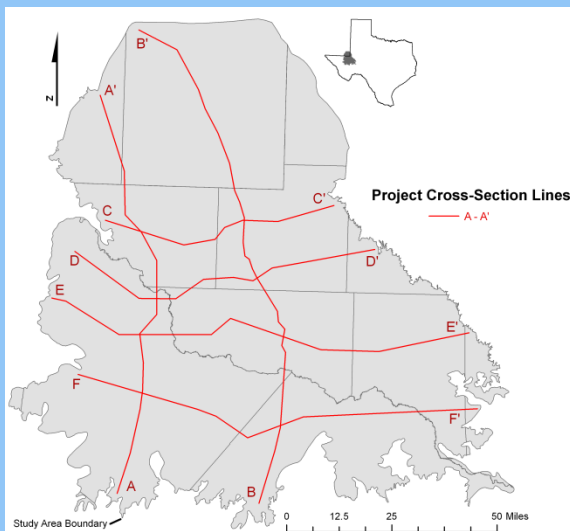
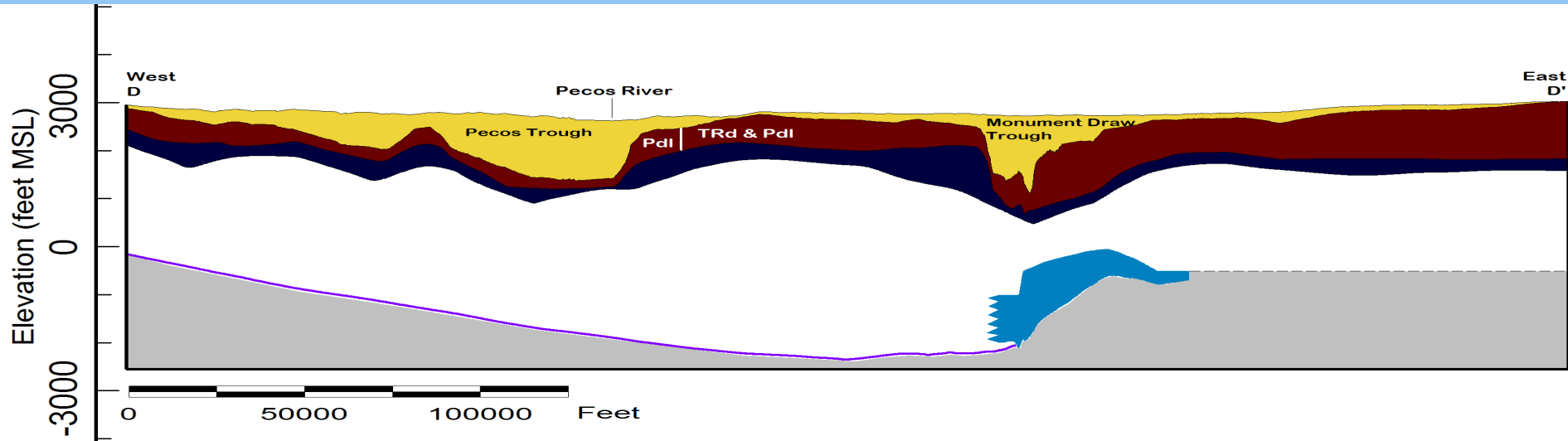
Well Control: 1,875 geophysical logs and water wells
(1,438 fully penetrate aquifer)

Depth below ground surface

Units = feet



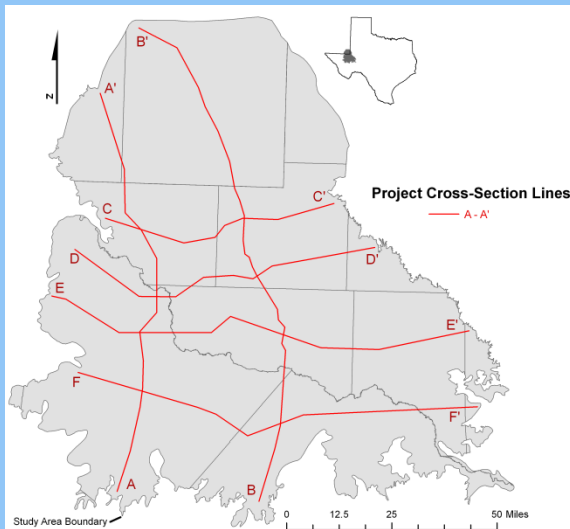
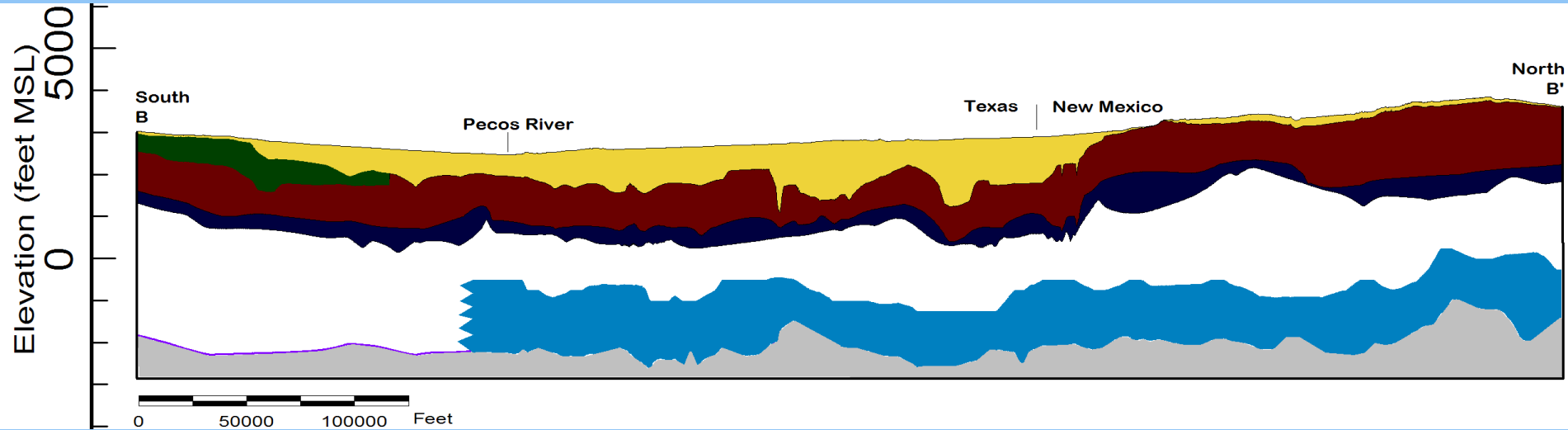
West to east cross-section D - D' across both troughs



- Pecos Valley Alluvium
 - Cretaceous Undivided
 - Dockum Group (TRd) & Dewey Lake Formation (PdI)
 - Rustler Formation
 - Salado and Castile Formations
 - Capitan Reef Complex
 - Pre-Castile beds west of Capitan Reef Complex & Pre-Salado beds east of Capitan Reef Complex
- Vertical exaggeration = x20

South to north cross-section B – B'





Monument Draw Trough

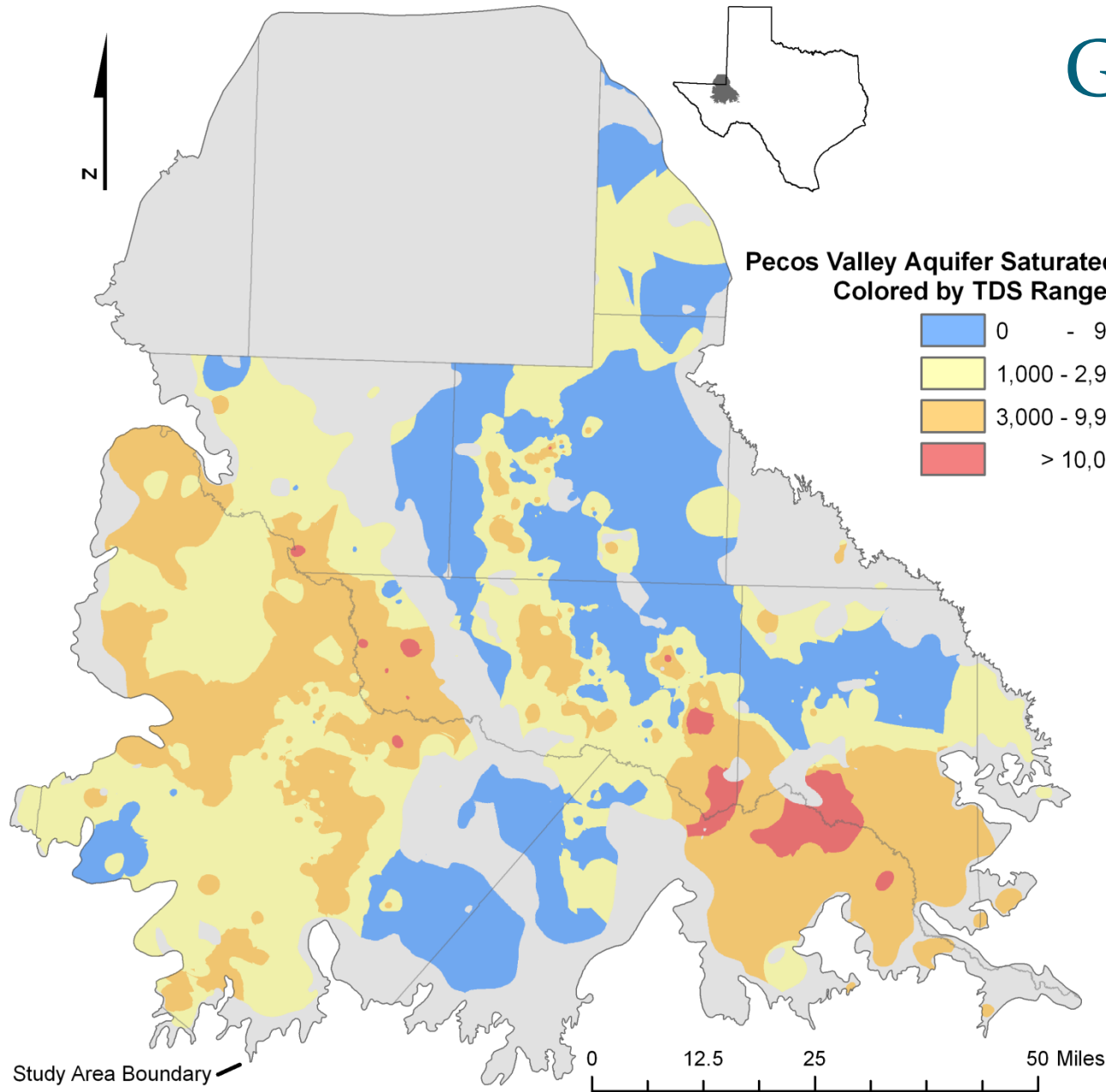


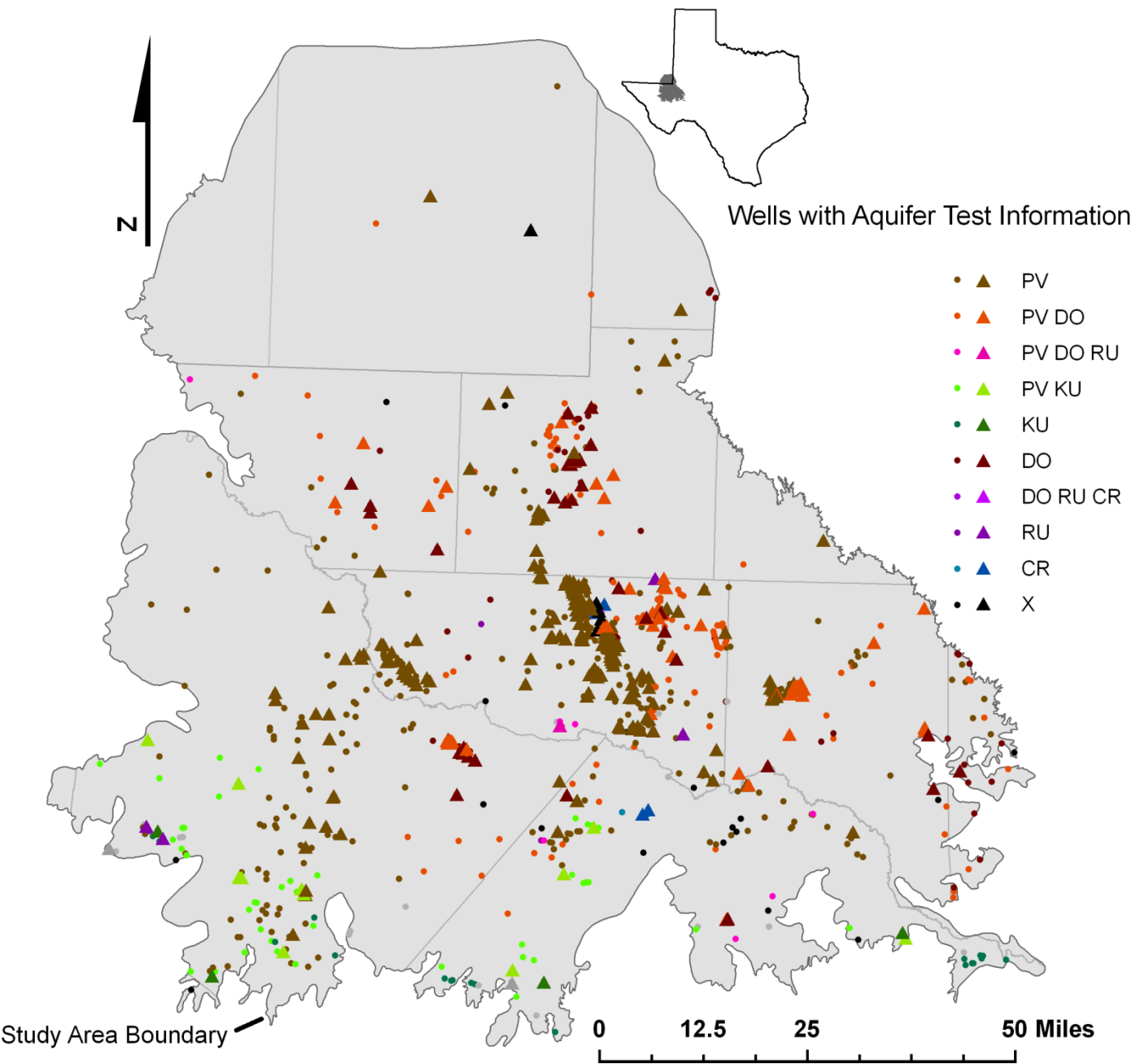
- Pecos Valley Alluvium
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- Vertical exaggeration = x20

Groundwater Volumes

**Pecos Valley Aquifer Saturated Region
Colored by TDS Ranges**

	0 - 999 mg/L	14.7 million acre-feet
	1,000 - 2,999 mg/L	46.2 million acre-feet
	3,000 - 9,999 mg/L	38.9 million acre-feet
	> 10,000 mg/L	.9 million acre-feet





- ▲ PV
- ▲ PV DO
- ▲ PV DO RU
- ▲ PV KU
- ▲ KU
- ▲ DO
- ▲ DO RU CR
- ▲ RU
- ▲ CR
- ▲ X

Triangle = Aquifer Test Results

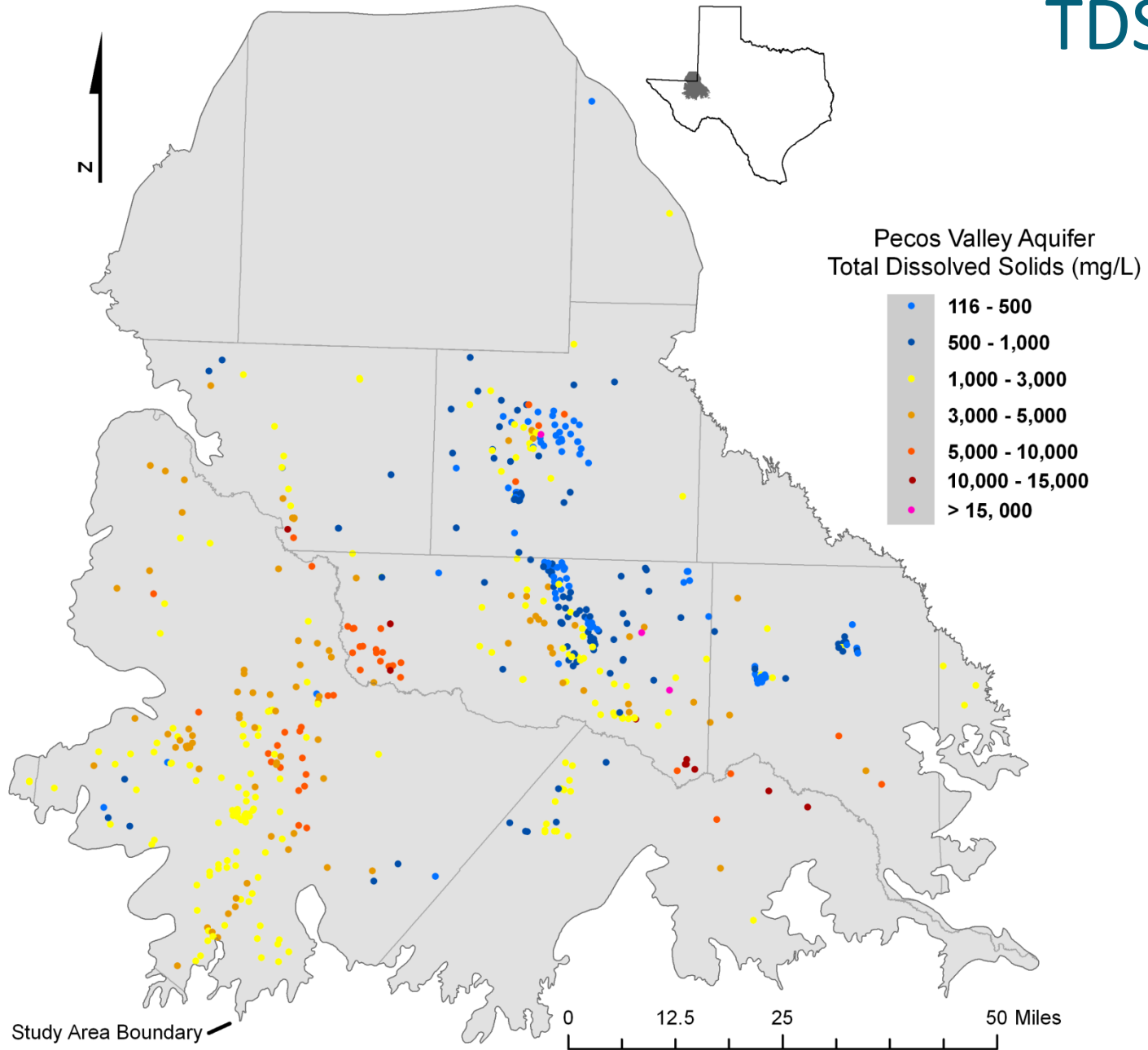
Dot = Well Yield Data

- PV: Pecos Valley
- KU: Cretaceous
- DO: Dockum
- RU: Rustler
- CR: Capitan Reef
- X: not applicable

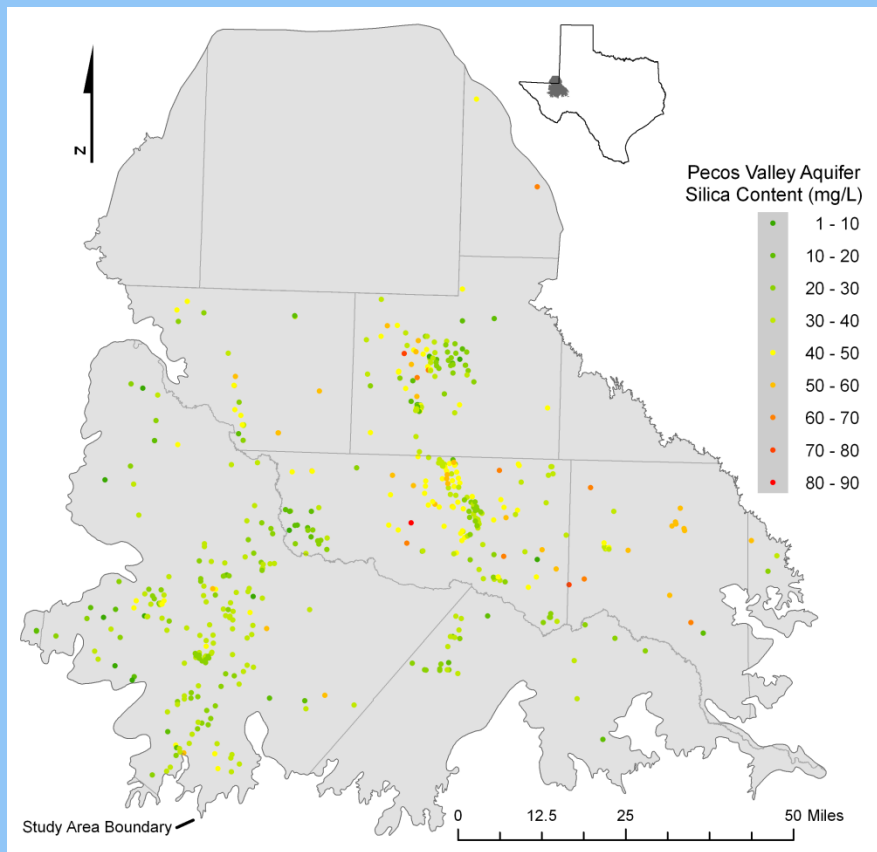
Desalination parameters of interest

Physical Parameters	Chemical Parameters		
	Cations (mg/L)	Anions (mg/L)	Other Chemical Parameters
Conductivity (mS/cm)	As ³⁺	Cl ⁻	Alkalinity (mg/L as CaCO ₃)
pH	As ⁵⁺	F ⁻	Boron (mg/L)
Silt density index	Ba ²⁺	HCO ₃ ⁻	Dissolved oxygen concentration (mg/L)
Temperature (°C)	Ca ²⁺	NO ₂ ⁻ -N	H ₂ S (mg/L)
Turbidity (NTU)	Cu ²⁺	NO ₃ ⁻ -N	Hardness (mg/L as CaCO ₃)
	Fe ₃ ⁺	SO ₄ ²⁻	Pesticides(mg/L)
	K ⁺		Radionuclides (pCi/L) Uranium (µg/L)
	Mg ²⁺		Silica (mg/L)
	Mn ²⁺		TDS (mg/L)
	Na ⁺		
	NH ₄ ⁺ -N		
	Ni ²⁺		
	Zn ²⁺		

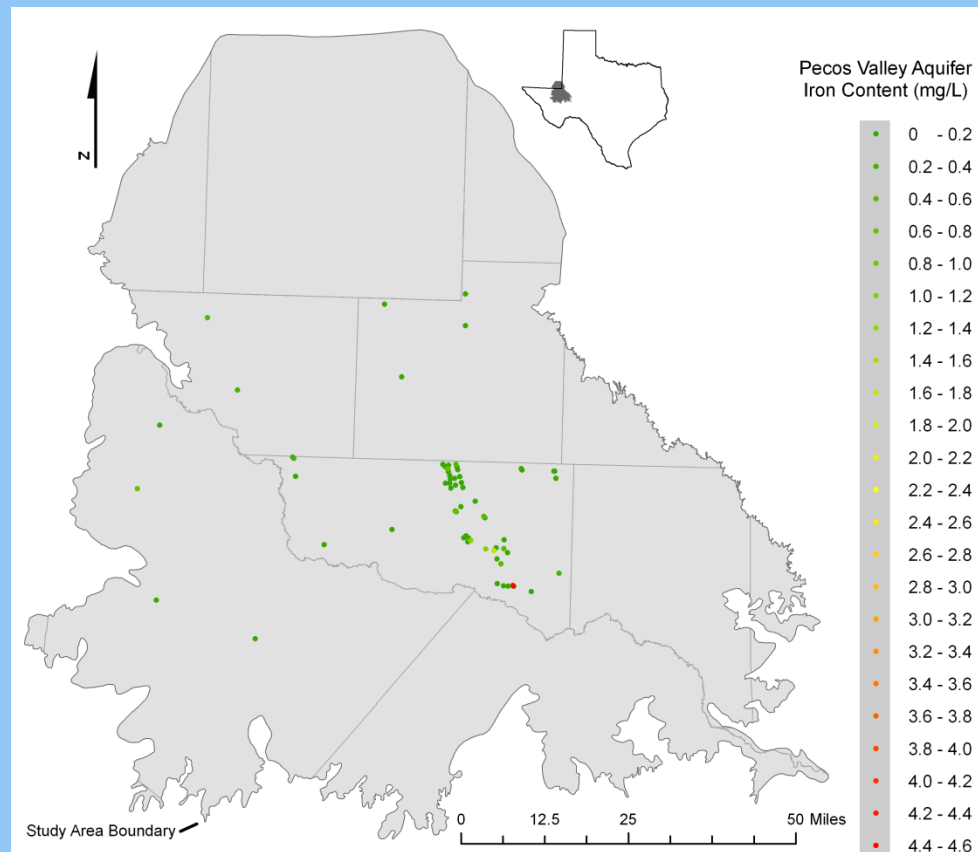
TDS



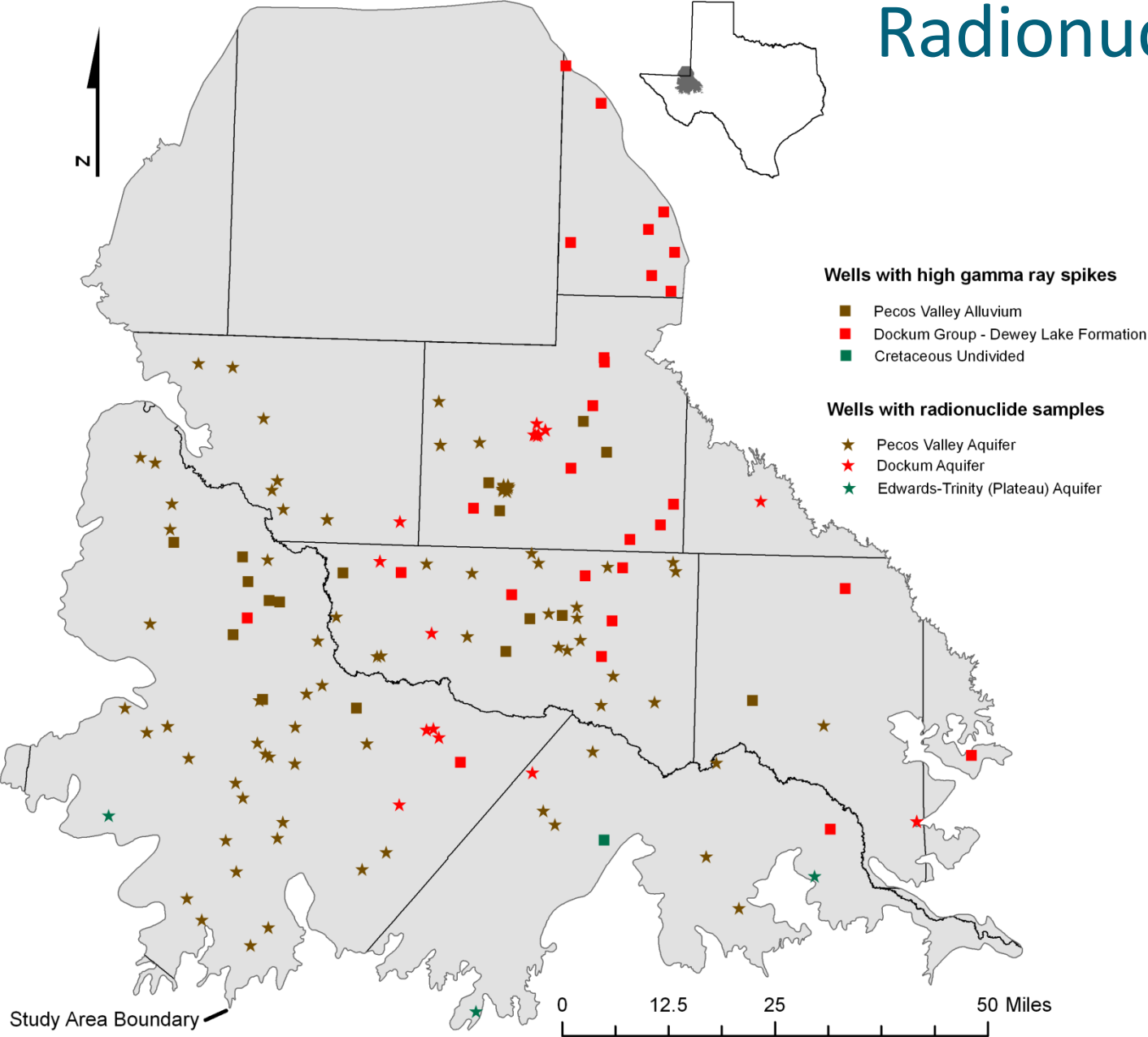
Silica



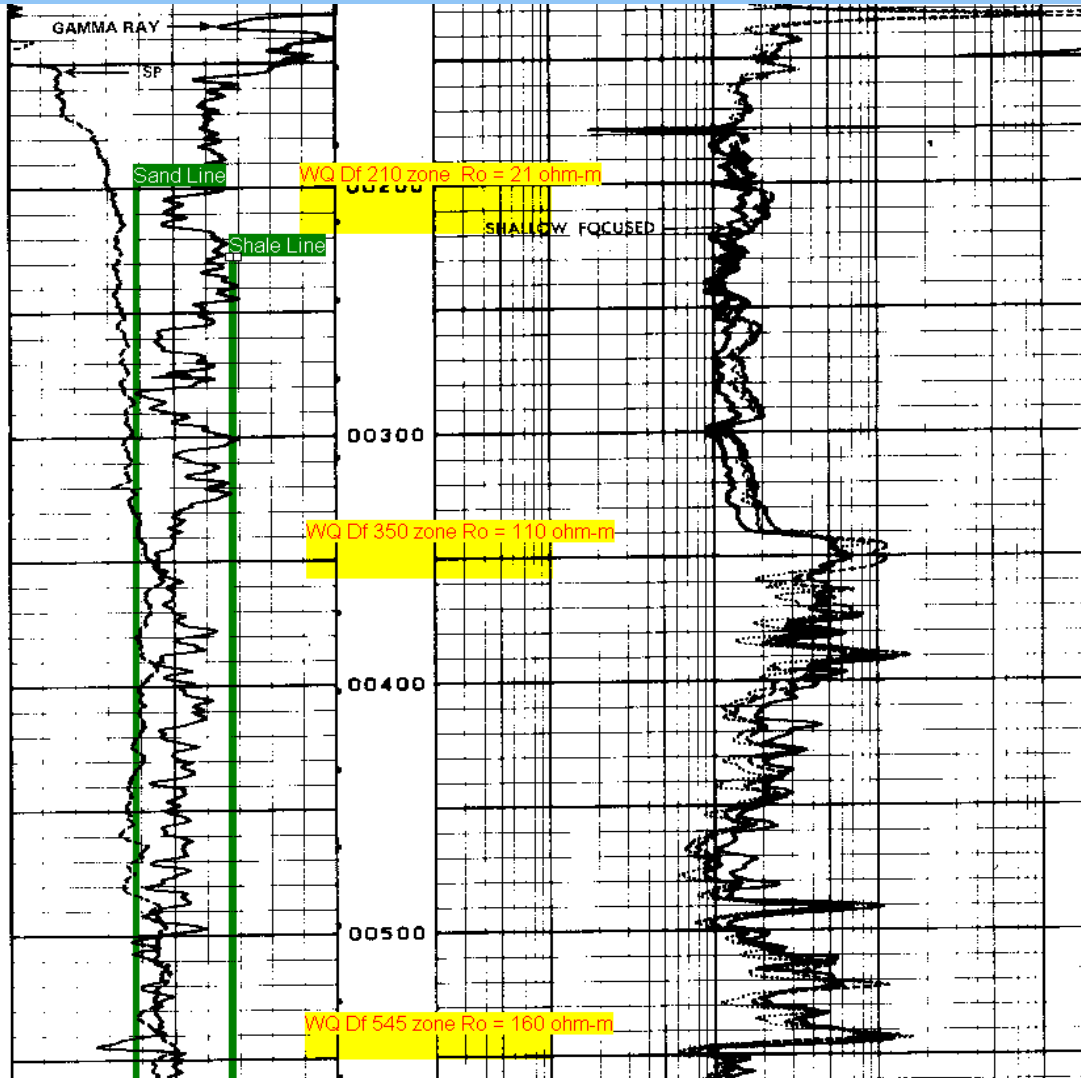
Iron



Radionuclides



Determining resistivity values for calculating TDS



Can use:

SP Log
(Spontaneous Potential)

Resistivity Tools

Induction

Laterolog

Resistivity

Electric

Lateral

Calculation of TDS from geophysical well logs

Staff load method-specific log values and correction factors

and the analysis is performed by the software

BRACS Geophysical Log Analysis for TDS Calculations

Well Id: 1376
GL Number: 844
Depth Formation (Df): 530
Thickness Lithologic Unit: 30

TDS Interpreted: 3428
Consensus TDS Method: SP Method

Ts: 63 Dt: 1015
Tf: 69.2660 Rmf: 1.7
Tbh: 75 Rmf Tf: 1.546213

Remarks: High sulfate water in the Pecos Valley Aquifer, Reeves County, Tx

TDS Method: SP Method
Geophysical Log Used: SPONTANEOUS POTENTIAL

Correction Factors

SP: 8
Rxo: 0
Ro: 0
Rxo / Ro: []
m: 0
Source m: N/A
Porosity: .0
Source Porosity: N/A

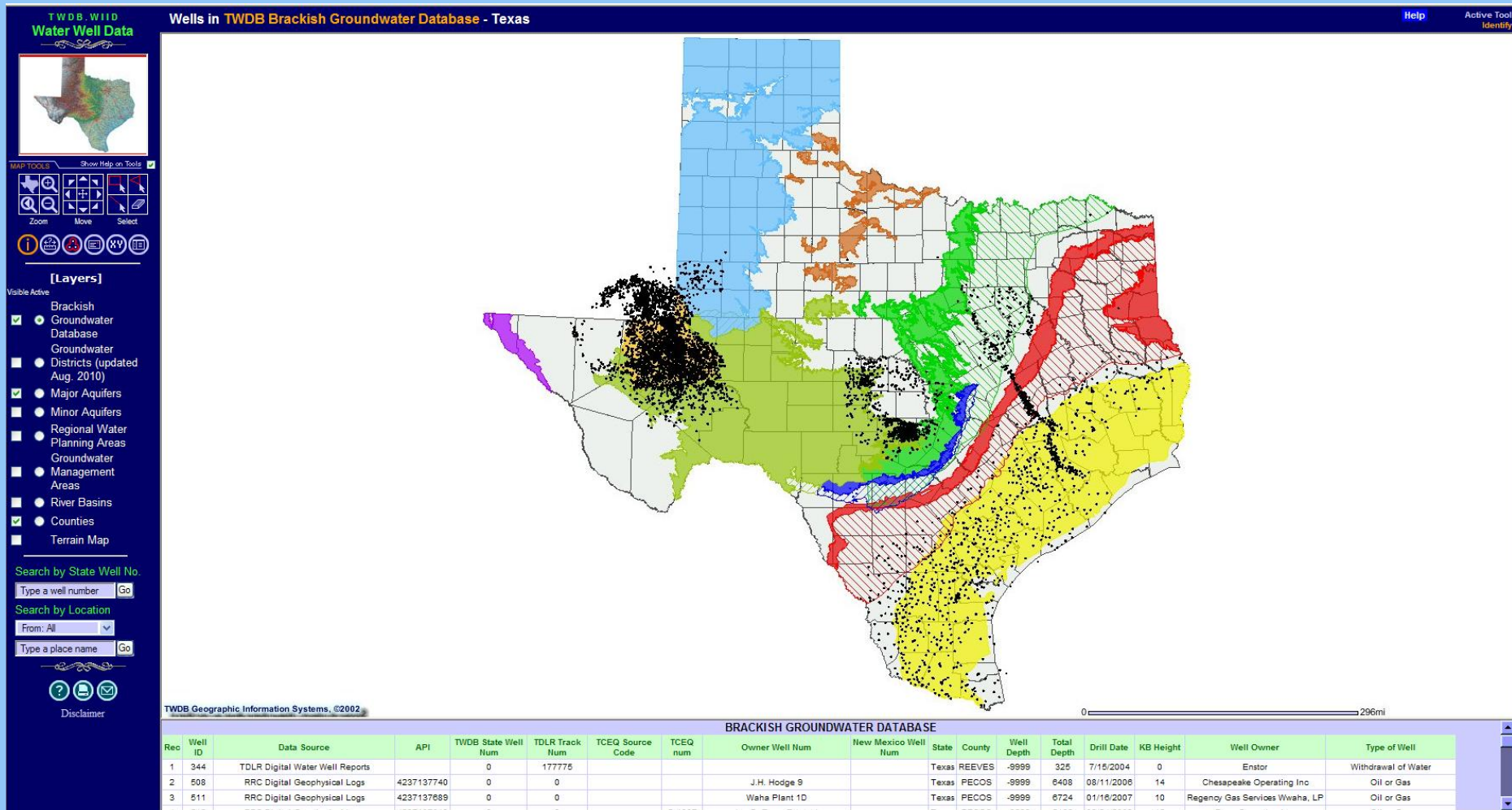
70.21238 K (Temperature): SP Method
1.1 Rwe Rw: Sp, Alger Harrison, and Rwa Minimum Methods
1 Rmf: SP and Alger Harrison Methods
0.7 ct: Many Methods
99 Invasion Zone: Alger Harrison Method
1 m correction factor: Estepp Method high anion waters
1 Ro: Mean Ro Method

Rwe: 2.010062 Rw: 2.211068 Rw75: 2.042024 Cw: 4897.101 TDS: 3428

Initials: JEM

Record: 1 of 1

BRACS Database well locations in WIID



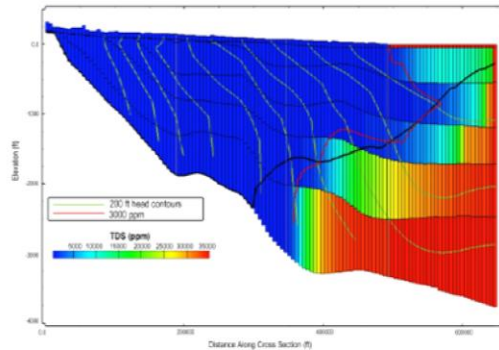
Assessment of Groundwater Modeling Approaches for Brackish Aquifers

Final Report

Prepared by

Neil E. Deeds, Ph.D., P.E.

Toya L. Jones, P.G.



Prepared for:

Texas Water Development Board
P.O. Box 13231, Capitol Station
Austin, Texas 78711-3231



November 2011

Guidance on selecting appropriate groundwater modeling codes for simulating brackish groundwater, including variable density effects.

Excel Software Selection Matrix

Decision_Matrix_Prototype_v06.xlsm - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Developer

Normal Page Layout Page Break Preview Custom Views Full Screen

Workbook Views Show/Hide

Ruler Formula Bar Gridlines Headings Message Bar

Zoom 100% Zoom to Selection

New Window Arrange All Freeze Panes Unhide

Split Hide View Side by Side Synchronous Scrolling Reset Window Position

Save Workspace Switch Windows

Macros

A24

	A	B	C	D	E	F	G	H	I	J	K	L
1	Code-->	MODHMS	SEAWAT	SWIFT-2002	CFEST	CODESA-3D	FEFLOW	FEMWATER	HydroGeoSphere	SUTRA	SWI package for MODFLOW	TOUGH2
2	GUI Available	0	0	0	0	0	0	0	0	0	0	0
3	Preferred GUI	0	0	0	0	0	0	0	0	0	0	0
4	Source Code Available	0	0	0	0	0	0	0	0	0	0	0
5	Programming Language	0	0	0	0	0	0	0	0	0	0	0
6	Licensing	0	0	0	0	0	0	0	0	0	0	0
7	Cost	0	0	0	0	0	0	0	0	0	0	0
8	MODFLOW Compatible	0	0	0	0	0	0	0	0	0	0	0
9	Grid Type	2	2	2	-2	-2	-2	-2	-2	-2	2	-2
10	Direct Solver	0	0	0	0	0	0	0	0	0	0	0
11	Iterative Solver	0	0	0	0	0	0	0	0	0	0	0
12	Non-Linear Method	0	0	0	0	0	0	0	0	0	0	0
13	Aquifer Type	2	2	2	2	2	2	2	2	2	2	2
14	Media Type	2	2	2	2	2	2	2	2	2	2	2
15	Boundary Conditions	4	4	4	4	4	4	4	4	4	4	4
16	Heterogeneity	2	2	2	2	2	2	2	2	2	2	2
17	Structural Features	0	0	0	0	0	0	0	0	0	0	0
18	Saturation	2	2	2	2	2	2	2	2	2	2	2
19	GW SW Interaction	0	0	0	0	0	0	0	0	0	0	0
20	Solute Transport	2	2	2	2	2	2	2	2	2	-2	2
21	Density Distribution	6	6	6	6	6	6	6	6	6	6	6
22	Simulation Scenarios	0	0	0	0	0	0	0	0	0	0	0
23	Total	22	22	22	18	18	18	18	18	18	18	18
24												
25												
26												
27												
28												

Ready

Characteristic Selection Code Ranking Basic Characteristics Physical Processes

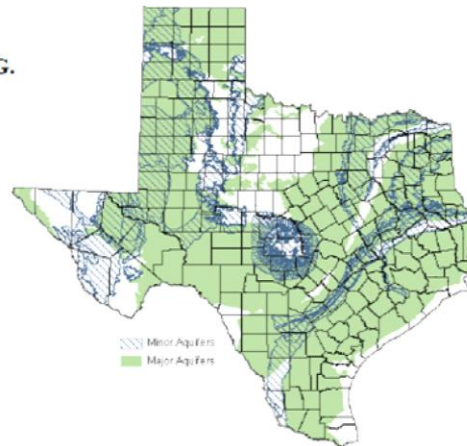
107%

Aquifers of Texas Bibliography to Support the Brackish Resources Aquifer Characterization System (BRACS) Program

Final Report

Prepared by

Steven C. Young, Ph.D., P.E., P.G.
Bridget Ronayne



Prepared for:

Texas Water Development Board
P.O. Box 13231, Capitol Station
Austin, Texas 78711-3231



November 2011

Over 7,800 references compiled from:

TWDB GAM program

Theses

Dissertations

Journals

Reports

Abstracts

Conference proceedings


Scientific magazines

Government reports

Information provided in MS Access.

VBA code provided for export in Endnote format.

References - Entry Form

 **Bibliography Entry Form** **Report** Thursday, December 08, 2011 12:59:21 PM

Title:

Subtitle:

Author(s):

Priority	Last Name	First Name	M Initial	Suffix	Company
1	Garza	Sergio			
2	Wesselman	J	B		
*					

Additional Reference Data


Year Published:

Report Type and Number:

Date Published:


Publishing Agency:


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Notes:


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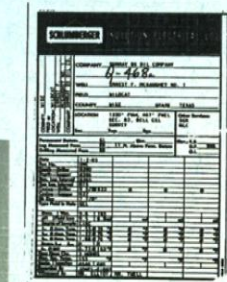
Additional Information

Close

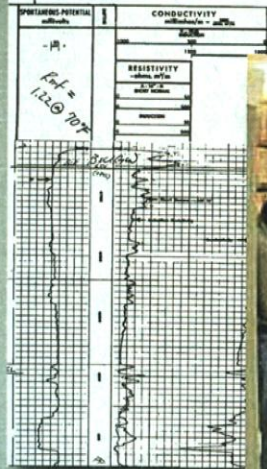
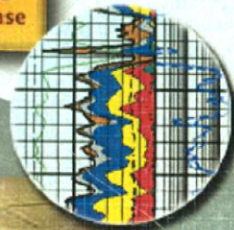
DB Provider: Twodb

Locate and Acquire Digital Geophysical Well Logs and Conduct Data Entry of Attributes

TRD-201003975



SCHEDULE	
Well No.	4-465
Well Name	WELL 4-465
County	...
Operator	...
...	...



2010 SEP 17 AM 11:32

Prepared for:



Texas Water Development Board

September 2010

Prepared by:

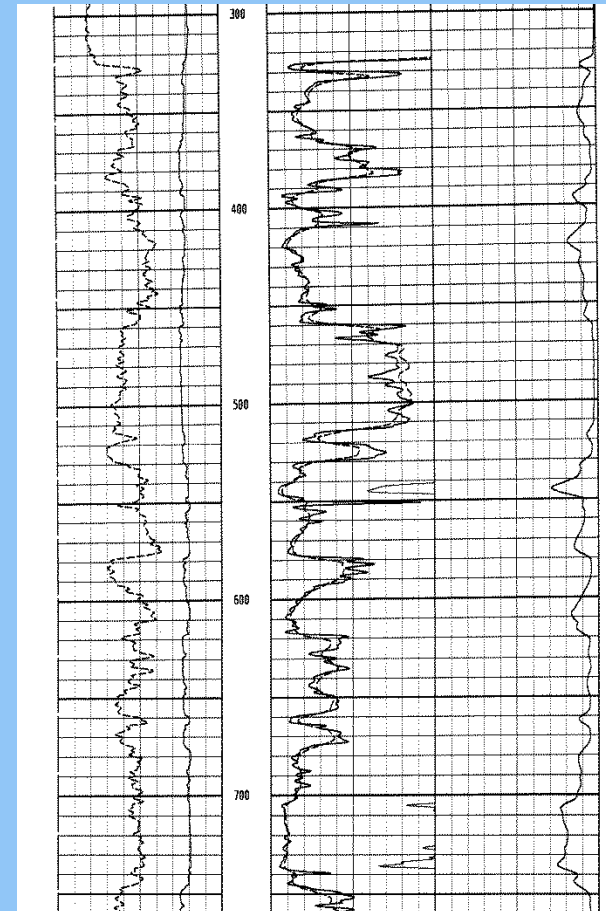


BUREAU OF
ECONOMIC
GEOLOGY

Bureau of Economic Geology
The University of Texas at Austin

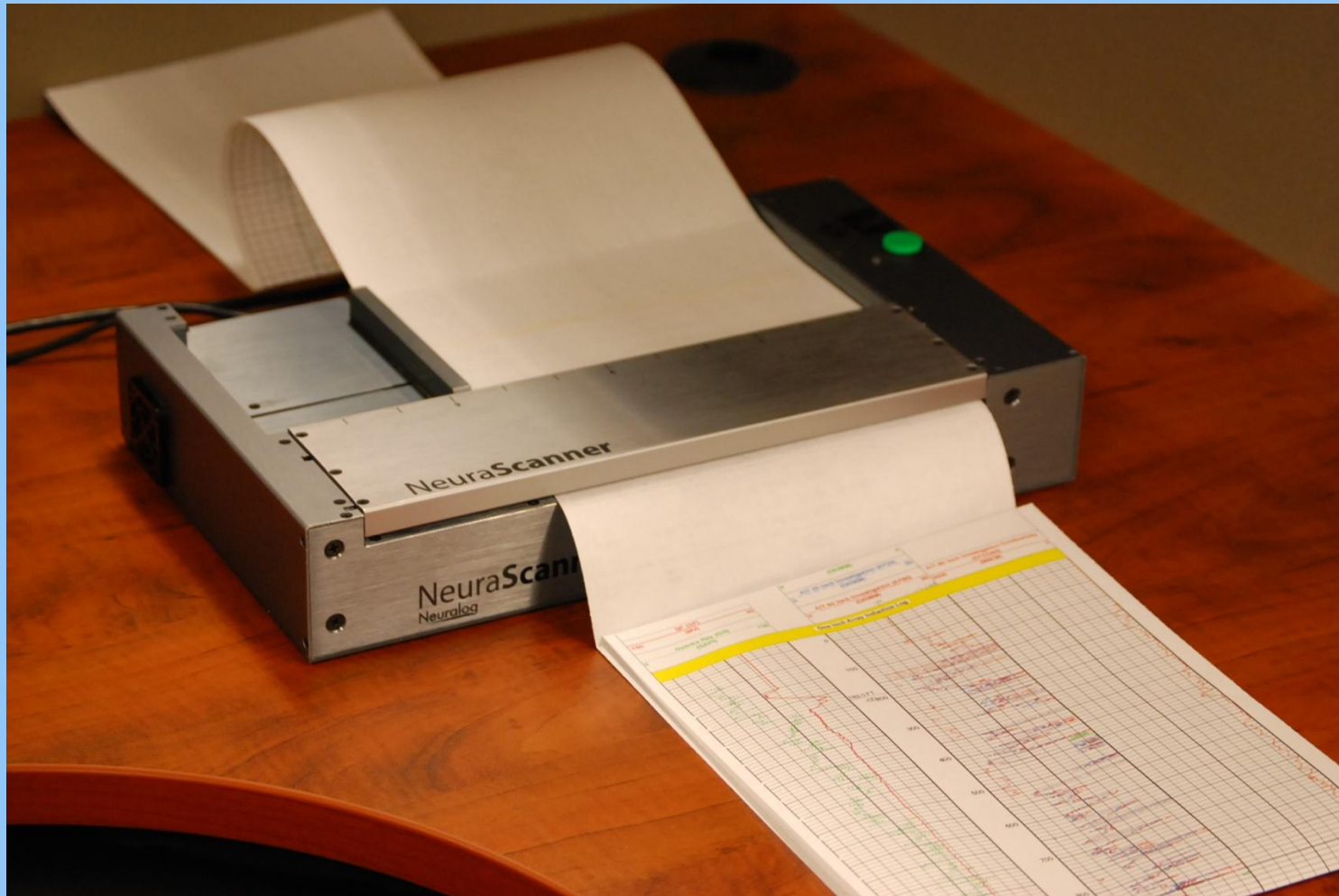
BEG will provide over 27,000 digital geophysical well logs.

Logs represent over 12,000 2.5 minute grid cells across the state.



TWDB staff are using NeuraScanner equipment acquired through the BEG contract to scan paper geophysical well logs.

The TWDB has hundreds of paper logs in its files and the Railroad Commission of Texas has over 300,000 paper geophysical well logs in the Groundwater Advisory Unit collection.



Corpus Christi Aquifer Storage and Recovery Conservation District

Project objective is to:

Collect Data

Develop Database

Characterize Evangeline Aquifer within ASR District :

- sand and clay sequences

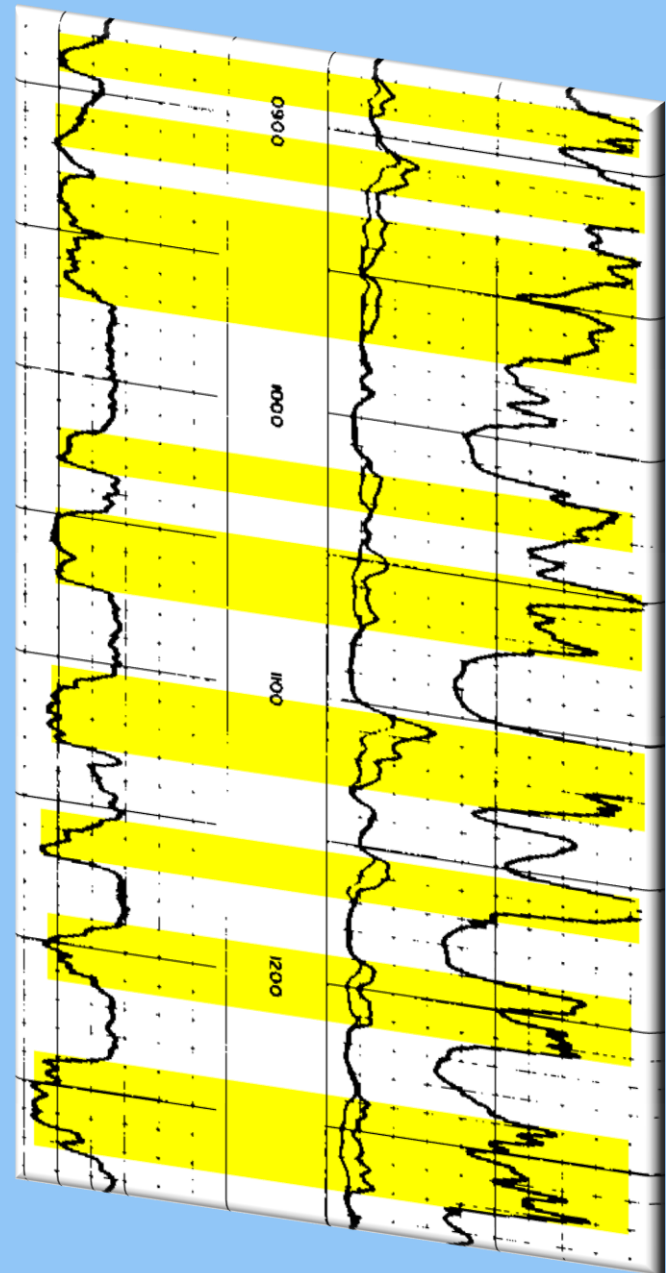
- chemistry

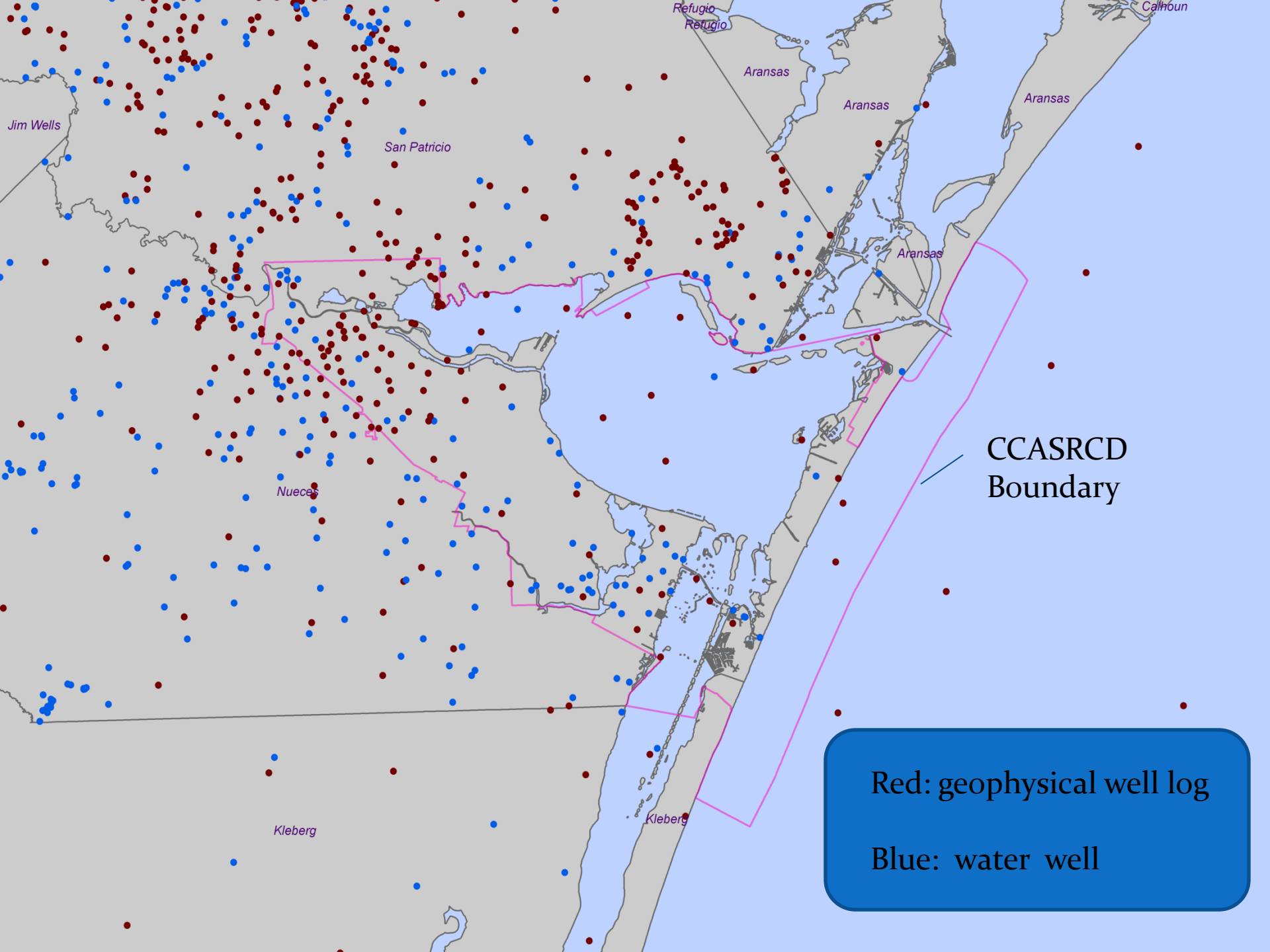
- aquifer tests

- potential problems:

 - hydrocarbons

 - high gamma ray spikes





CCASRCD
Boundary

Red: geophysical well log
Blue: water well

		Series	North Texas	Central Texas	South Texas	
Tertiary	U	Eocene	Jackson Group			
			Yegua Fm.			
	M	Eocene	Claiborne Group	Cook Mtn Fm.		Laredo Fm.
				Sparta Sand		
				Weches Fm.		
				Queen City Sand		El Pico Clay
				Reklaw Fm.		Bigford Fm.
				Carrizo Sand		
				Upper Wilcox	Calvert Bluff Fm.	Upper Wilcox
	L	Eocene	Wilcox Group	Middle Wilcox	Simsboro Fm.	Middle Wilcox
	U			Lower Wilcox	Hooper Fm.	Lower Wilcox
	L			Midway Fm.		
	U	Paleocene				

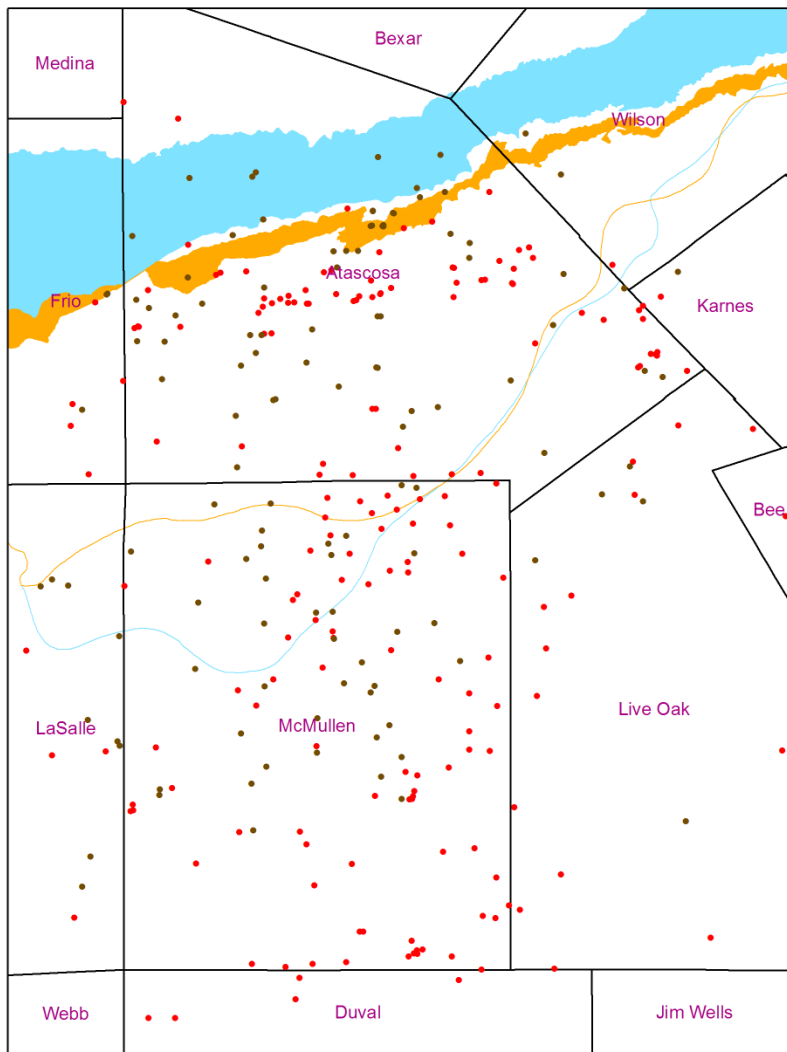
File: Geologic Stratigraphy.fh8

Generalized stratigraphic section for the Wilcox and Claiborne groups in Texas (after Ayers and Lewis, 1985; Hamlin, 1988; Kaiser, 1978; Ricoy and Brown, 1977; Guevara and Garcia, 1972; and Payne, 1968).

BRACS Sparta & Queen City Study Area

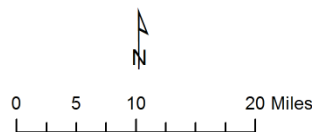
Project Objectives

- Delineate areas with brackish groundwater (1,000 – 9,999 mg/L TDS) within the Sparta and Queen City aquifers in the project area
- Estimate volume of brackish groundwater in sandy portions of the Sparta and Queen City aquifers in the project area
- Characterize groundwater chemistry within the Sparta and Queen City aquifers in the project area by showing spatial distribution of chloride, iron, silica, and sulfate concentrations.



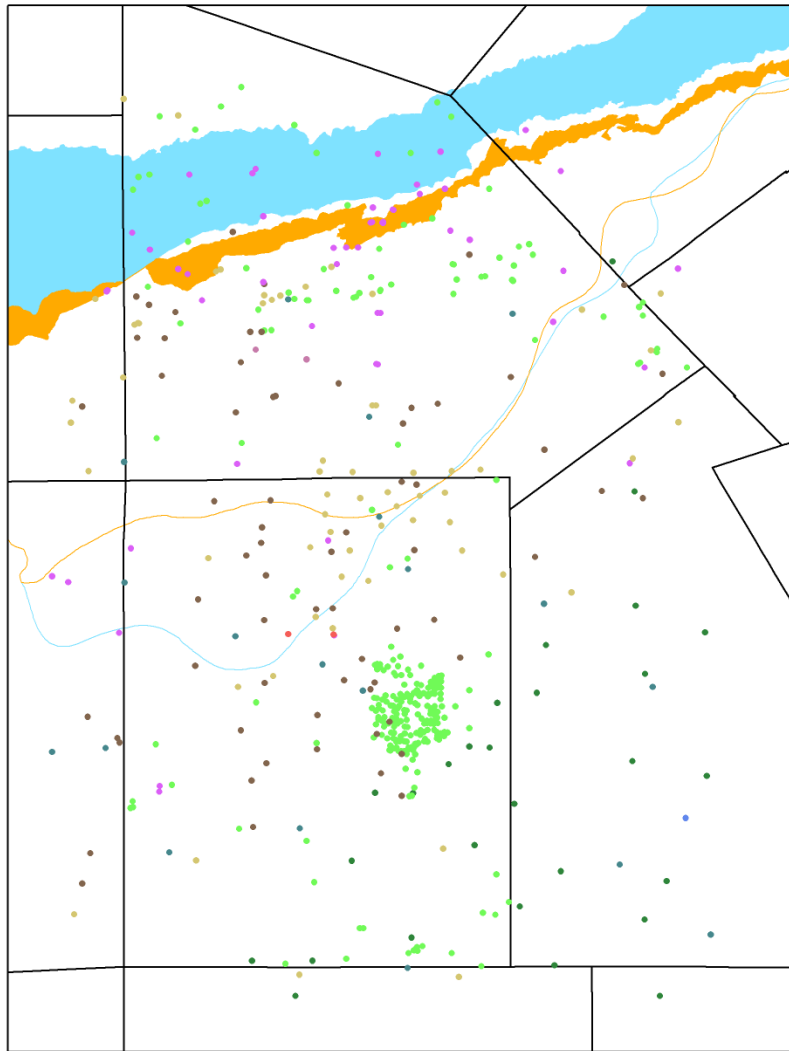
Project Well Control

- Water Well
- Geophysical Log
- Sparta Aquifer Outcrop
- Approximate 3,000 mg/L TDS extent
- Queen City Aquifer Outcrop
- Approximate 3,000 mg/L TDS extent



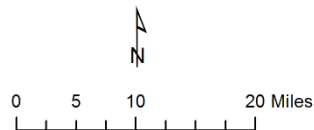
BRACS Sparta & Queen City Potential Data Sources

Consolidate and integrate
multiple data sets to obtain
best possible well control and
expand BRACS database



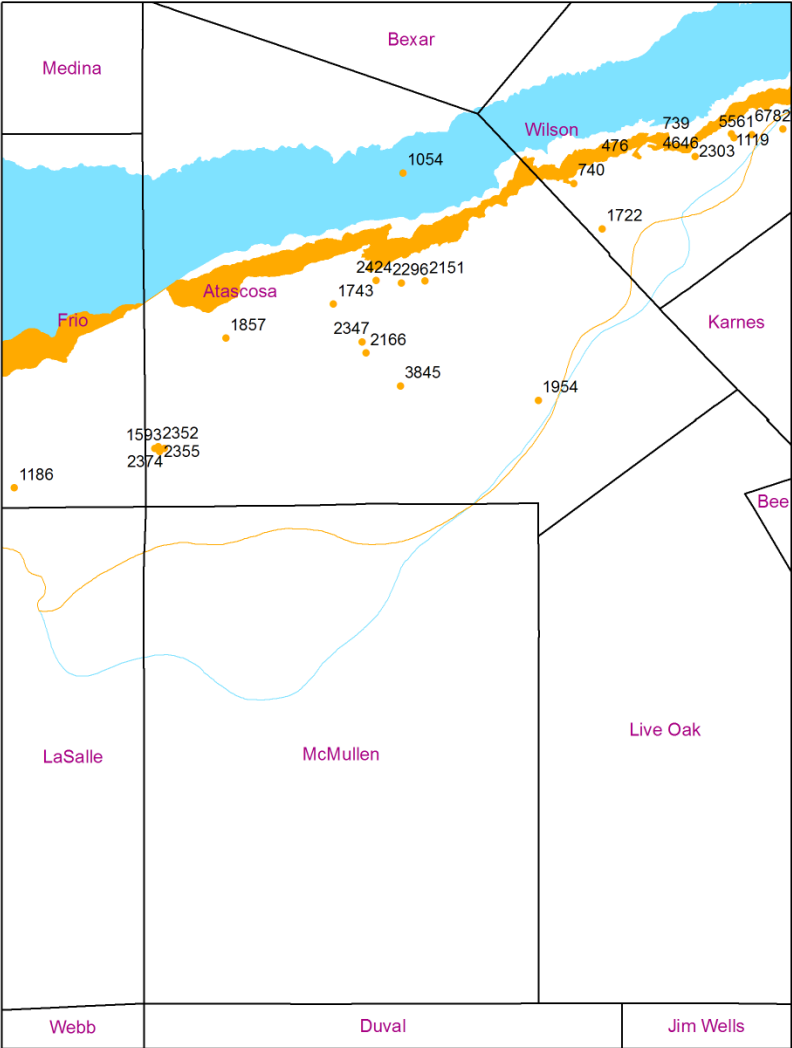
SOURCE

- BAER Yegua Jackson Study
- BEG Digital Geophysical Well Logs
- Intera Gulf Coast Aquifer Study
- RRC Digital Geophysical Logs
- TCEQ Water Well Images
- TDLR Digital Water Well Reports
- TWDB Aquifer Test Information
- TWDB Geophysical Logs
- TWDB Groundwater Database

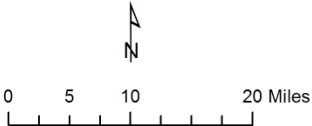


TWDB Groundwater Database Total Dissolved Solids Values from Wells with Sparta Aquifer Code

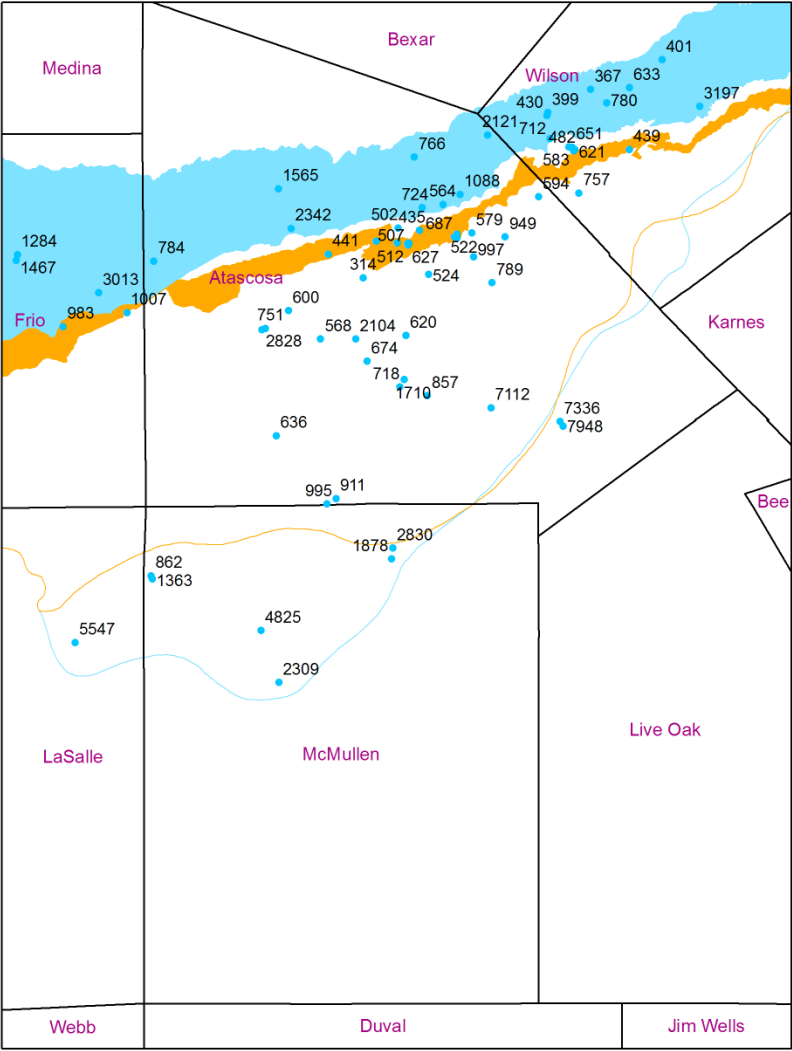
- Wide range of sample ages
- Limited sample depth information
- Incorrect aquifer assignments



1857 GWDB TDS value
 • Wells with Sparta Aquifer Code



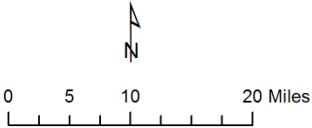
TWDB Groundwater Database Total Dissolved Solids Values for Wells with Queen City Aquifer Code



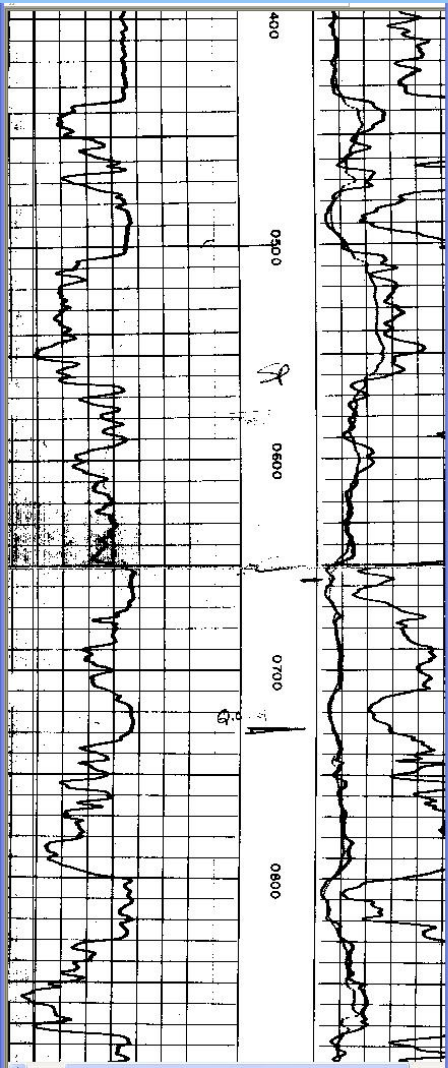
- Wide range of sample ages
- Limited sample depth information
- Incorrect aquifer assignments

1710 GWDB TDS value

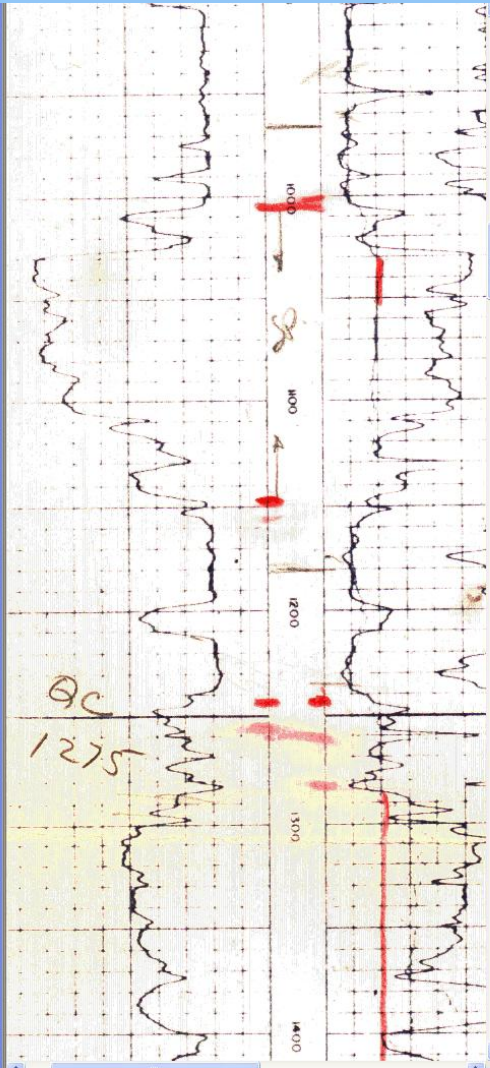
• Wells with Queen City Aquifer Code



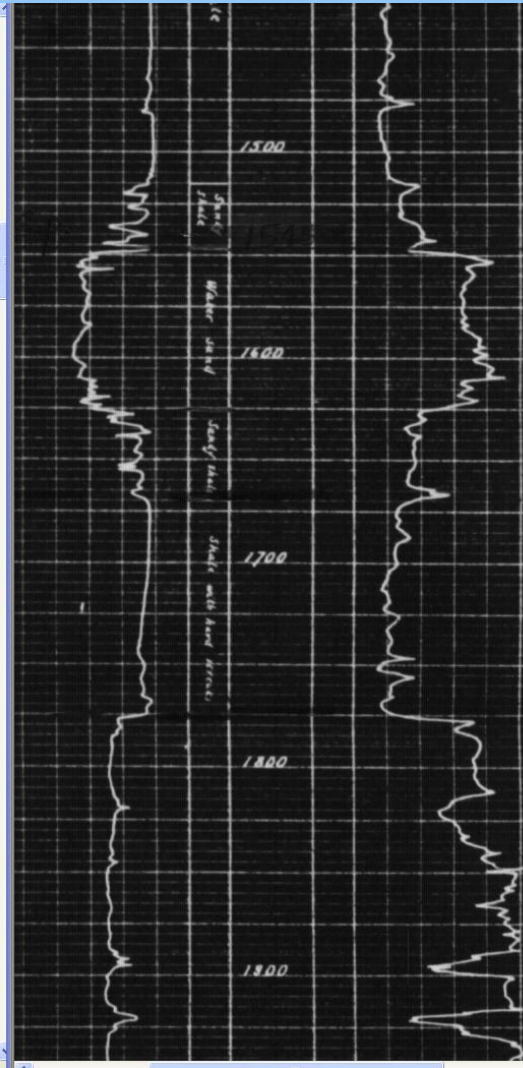
Sparta and Queen City Stratigraphic Correlation Example Across Southern Atascosa County



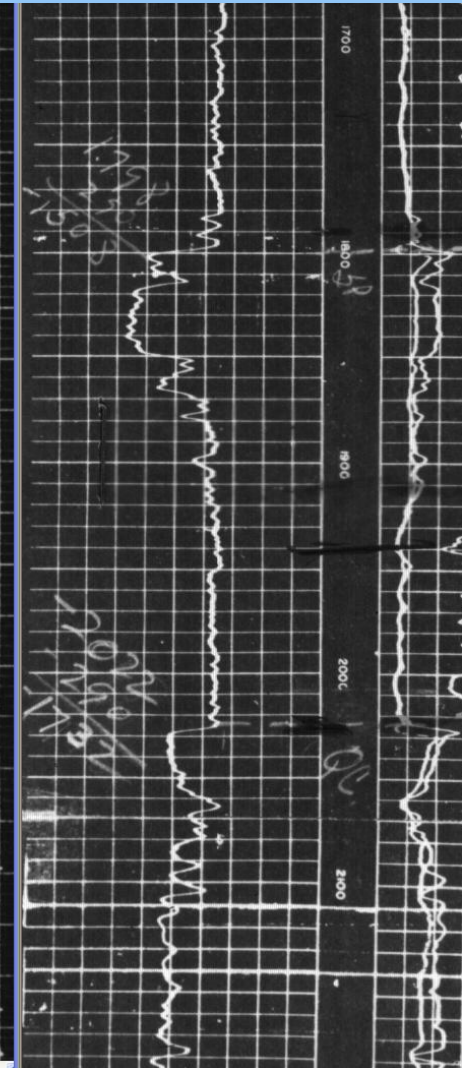
Q-280
1964



Q-142
1959



Q-6
1935



Q-209
1948

Summary

- The 2003 Brackish Groundwater Manual indicated the estimated total volume of brackish groundwater in: Texas : > 2.7 billion acre-feet.
- Pecos Valley Aquifer: > 85 million acre-feet.
- 44 water treatment plants in Texas use Reverse Osmosis to treat brackish water.
- The Texas Innovative Water 2010 Seminar held in San Antonio in October, 2010, showed a tremendous interest in brackish groundwater resources.
- The TWDB, through the BRACS project and external contracts, is well-poised to provide the information Texas needs to continue development of this resource.
- Each aquifer is different and techniques of analysis will need to fit data available.
- The BRACS data is an intermediate data set between the statewide approaches used in the past and site-specific resource development drilling and evaluation.

**2010
Seawater
Desalination
Biennial
Report**

**Texas Innovative Water
2010**

Report

**An Assessment
of Aquifer Storage
and Recovery
in Texas**

February 2011

Malcolm Pirnie, Inc.
ASR Systems, LLC
Jackson, Sjoberg, McCarthy & Wilson, LLP

Innovative Water Technologies

- ★ [Aquifer Storage and Recovery](#)
- ★ [BRACS](#)
- ★ [Desalination](#)
- ★ [Rainwater Harvesting](#)
- ★ [Water Reuse](#)

Questions?

TWDB: (512) 463-7847

<http://www.twdb.state.tx.us>

Innovative Water Technologies

The mission of the Innovative Water Technologies is to educate the water community on the use of nontraditional water supplies. This mission is accomplished by participating in research needed to advance technology demonstration projects; developing publications and educational materials; making presentations to the public; and, actively participating in key water organizations.

To promote and advance the use of non-traditional water supply development and management technologies such as desalination; rainwater and stormwater harvesting; water reuse; and aquifer storage and recovery in Texas, Innovative Water Technologies:

- funds and participates in research and demonstration projects; and,
- disseminates information through outreach activities.

Innovative Water Technologies (IWT) is primarily involved in the areas of nontraditional water supply and management activities including: desalination, rainwater and stormwater harvesting, water reuse, and aquifer storage recovery.

Through our desalination program, we administer grants for brackish groundwater desalination projects and seawater desalination pilot studies. To date, TWDB has funded eight brackish groundwater desalination demonstration projects worth a total of about \$2.2 million, and two seawater desalination pilot plant studies worth approximately \$3.13 million.

We promote rainwater and stormwater harvesting and water reuse through grants for research and demonstration projects and outreach activities.

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sanjeev.kalaswad@twdb.state.tx.us