Brackish Resources Aquifer Characterization System

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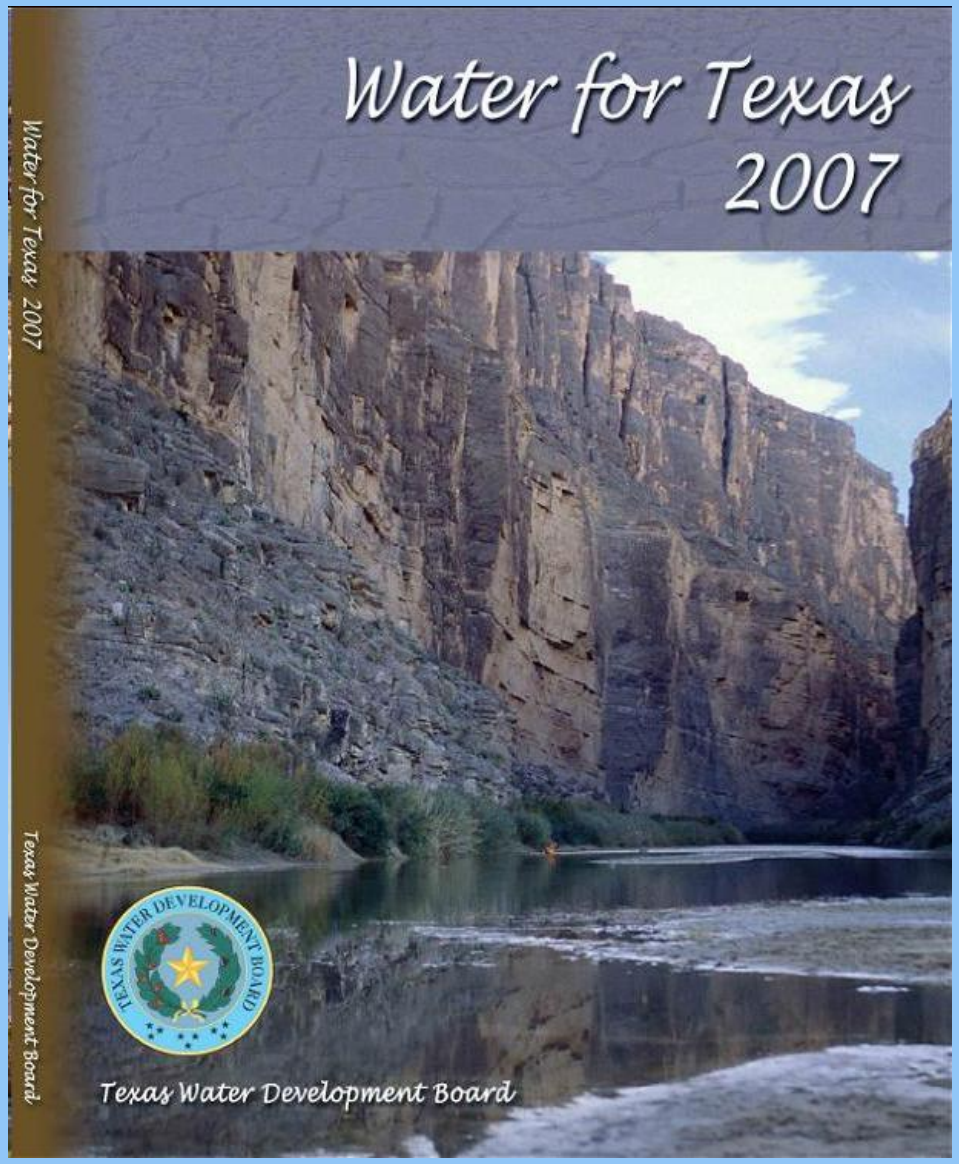
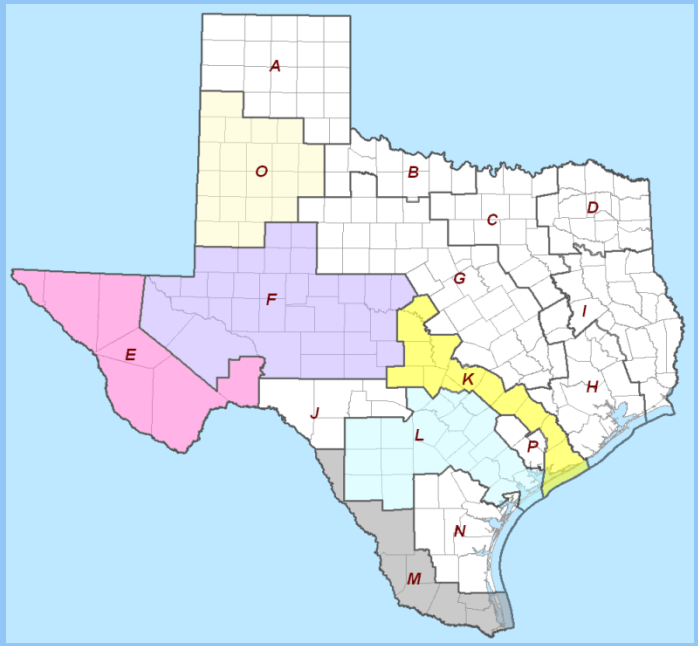
Texas Water Development Board
Water Science and Conservation
Innovative Water Technologies

State and regional water planning



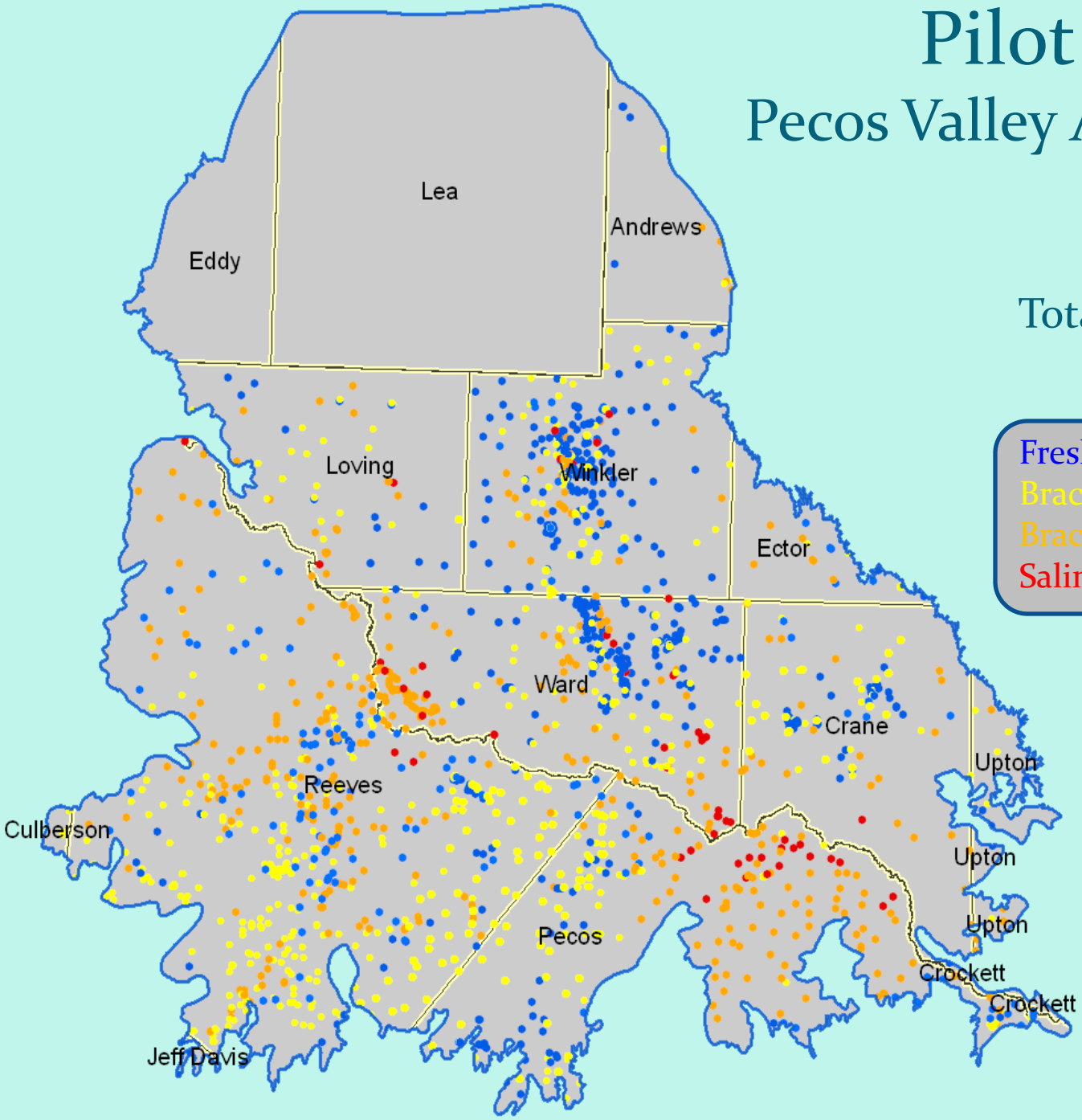
- Consider and evaluate all potentially feasible water management strategies
- Brackish groundwater desalination
  - Develop 175,000 acre-feet/year by 2060
  - 6 regions recommended strategy



BRACS Goals

- Map aquifers to 10,000 mg/L total dissolved solids
- Map key desalination parameters (for example: silica, iron, …)
- Estimate aquifer properties
- Estimate volumes of brackish groundwater
- Build replicable numerical groundwater flow models
- Collect well logs (water, oil/gas) for interpretation
- Build datasets (database, GIS) of project information
- Implement techniques to assess brackish groundwater
- Disseminate information

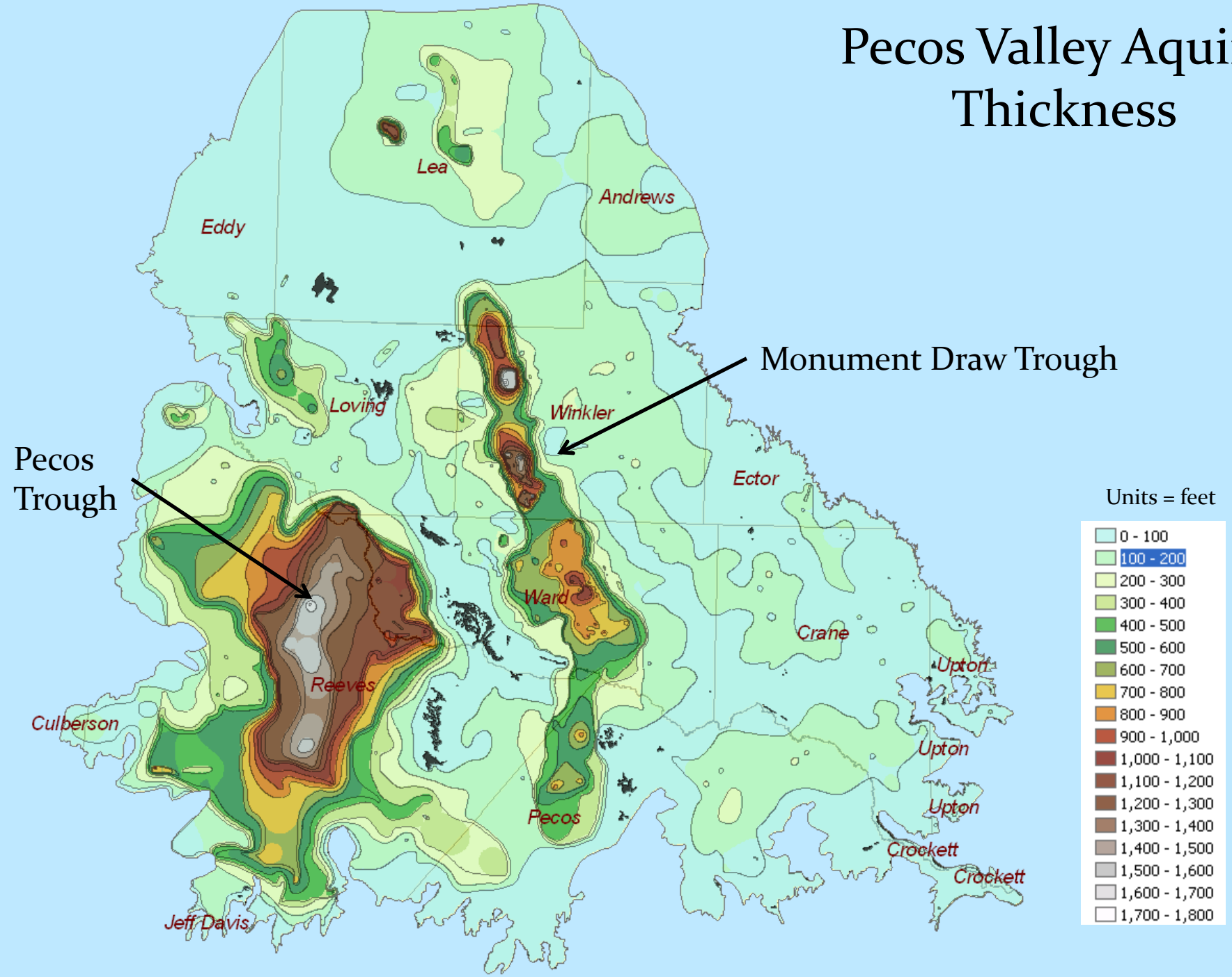
Pilot Study
Pecos Valley Aquifer Region

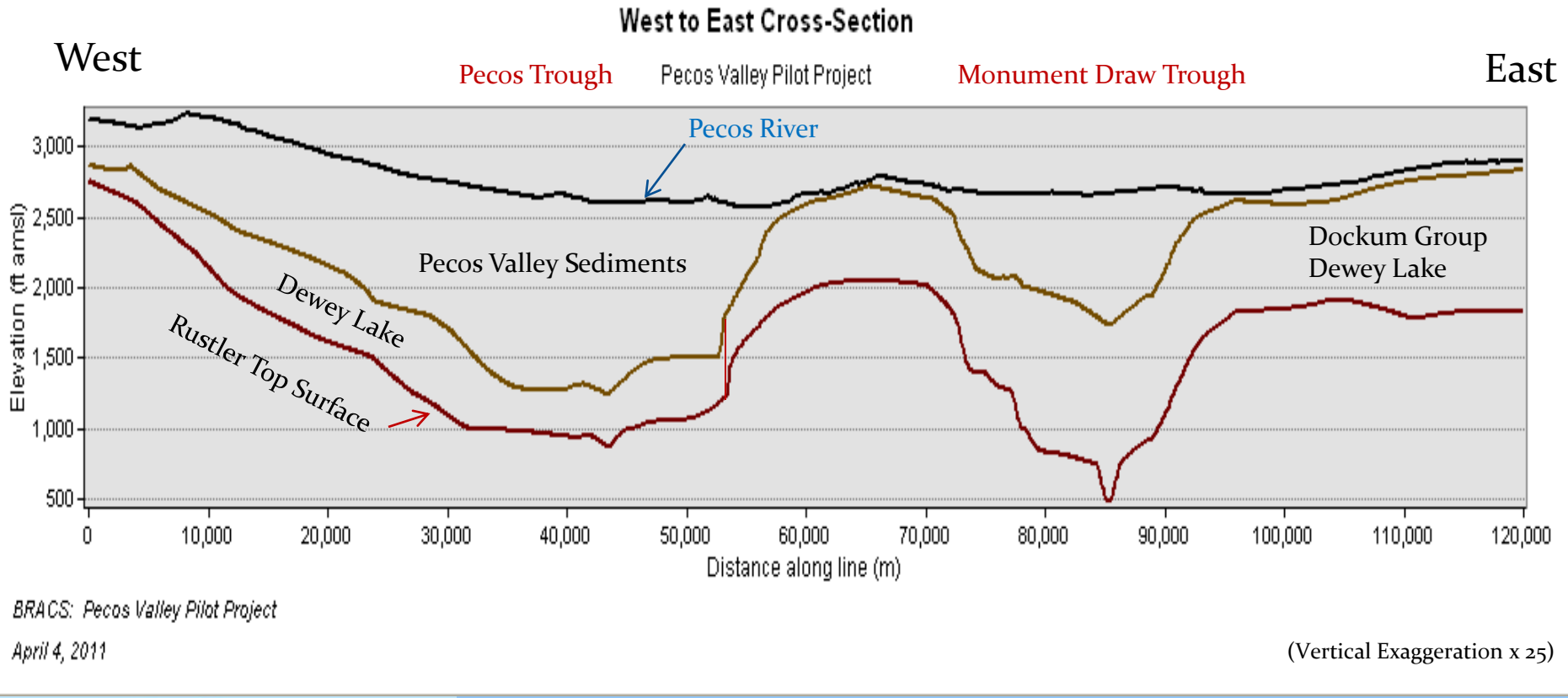


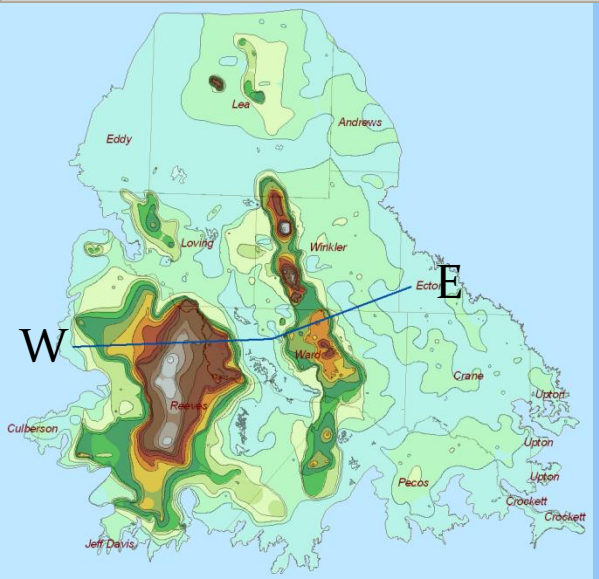
Wells with
Total Dissolved Solids
(mg/L)

Fresh	0 – 1,000
Brackish	1,000 – 3,000
Brackish	3,000 – 10,000
Saline	> 10,000

Pecos Valley Aquifer Thickness



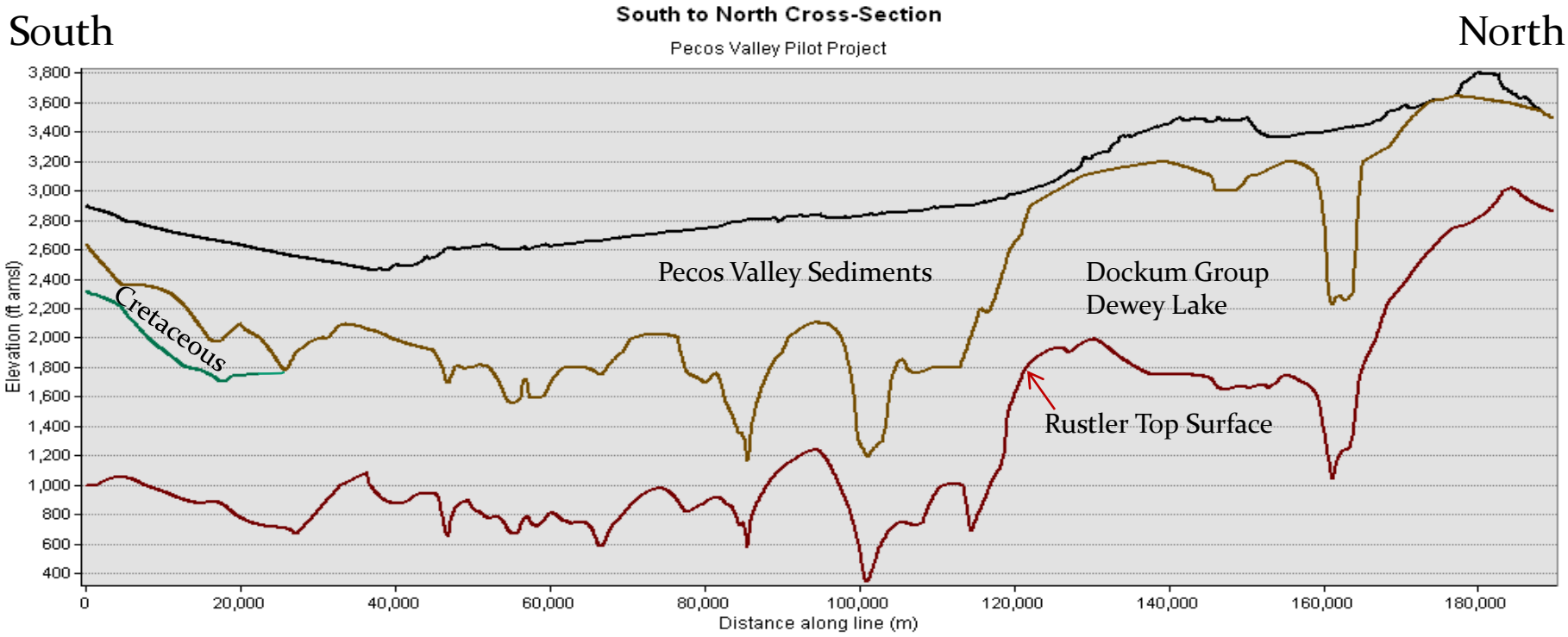




Cross-section across both troughs

South

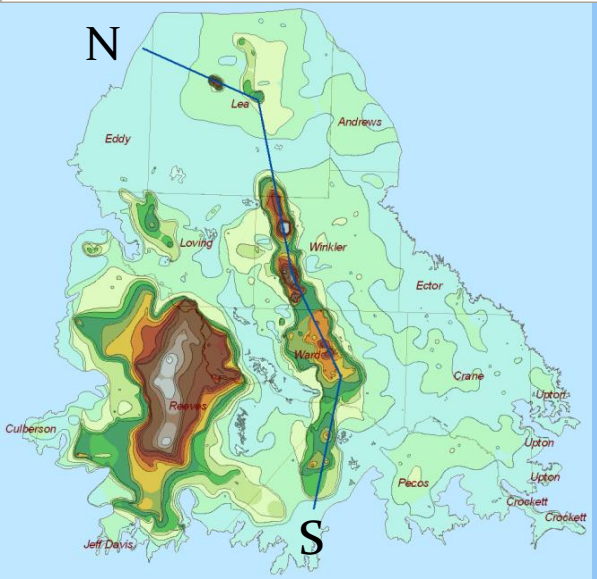
North



BRACS: Pecos Valley Pilot Project

April 4, 2011

(Vertical Exaggeration x 50)



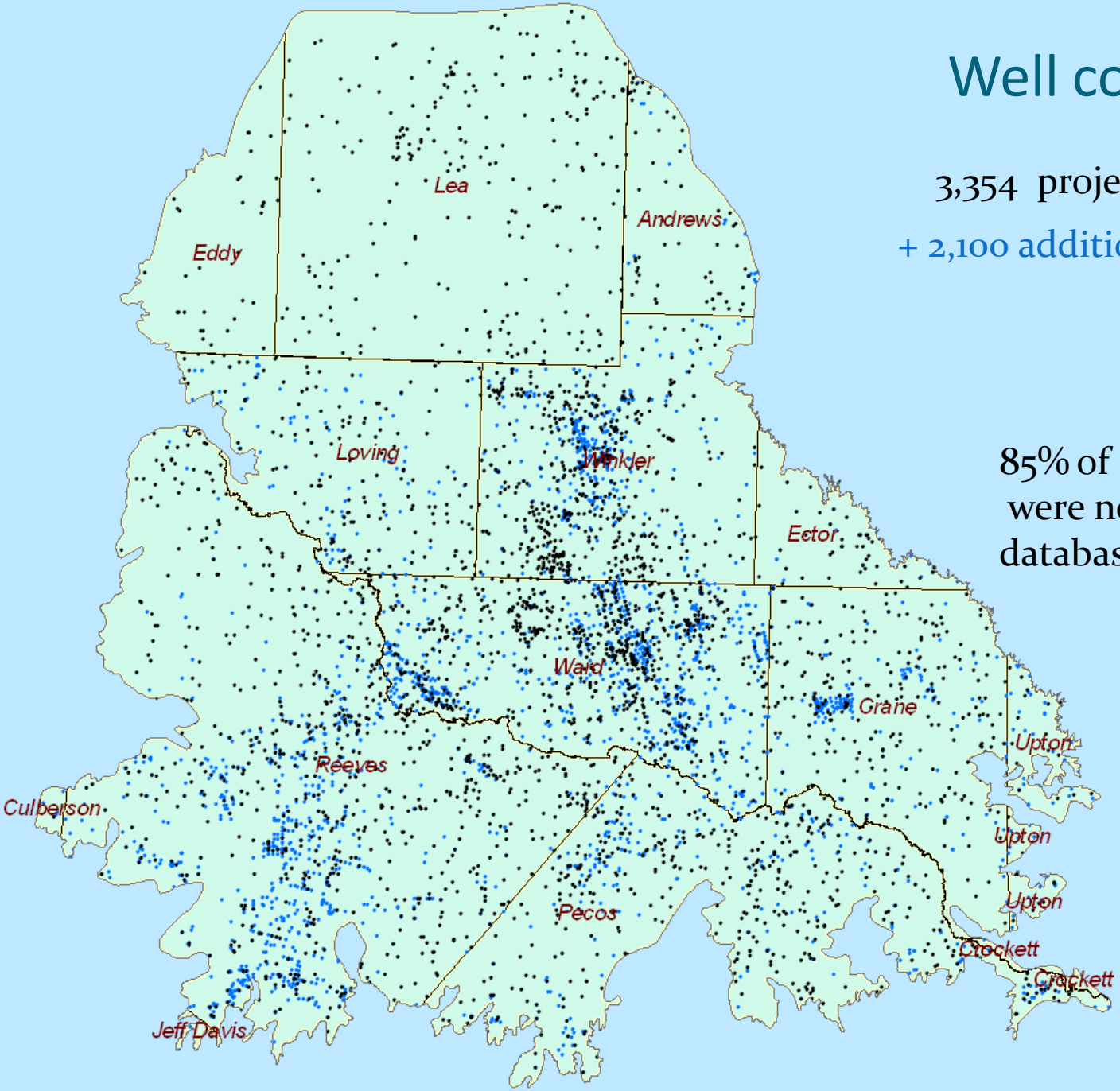
Cross-section along length of Monument Draw Trough

Well control

3,354 project wells

+ 2,100 additional TWDB wells

85% of the project wells were not in the TWDB database.



Geophysical Well Logs and Water Well Reports Provide:

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
Q Number
Source of Well Data ULUTS Digital Geophysical Logs

Lithologic Description

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

Add First Record | Add Next Record | Complete Last Record

Stratigraphic Description

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
*						

Unit > Well Depth ?

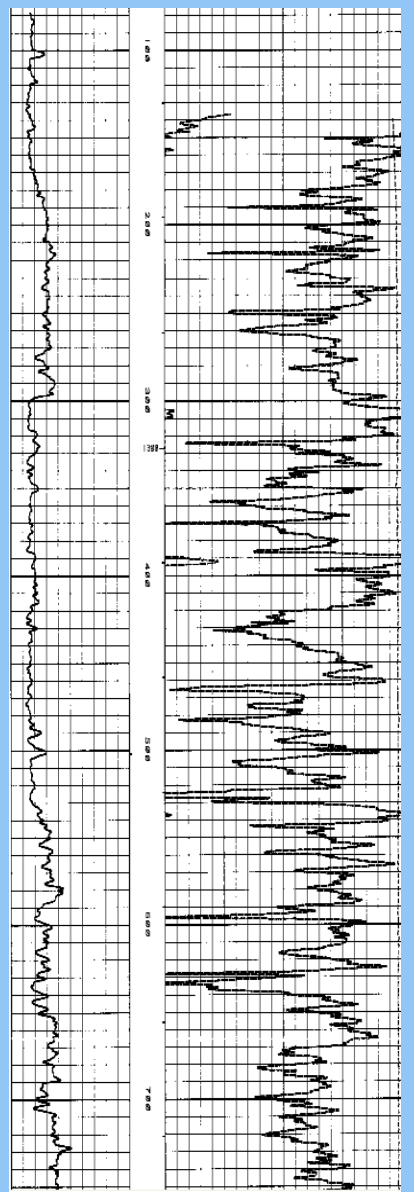
Add First Record | Add Next Record | Complete Last Record | Add BLANK Record

NMOSE POD HYP

Geophysical Well Log Hyperlinks

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

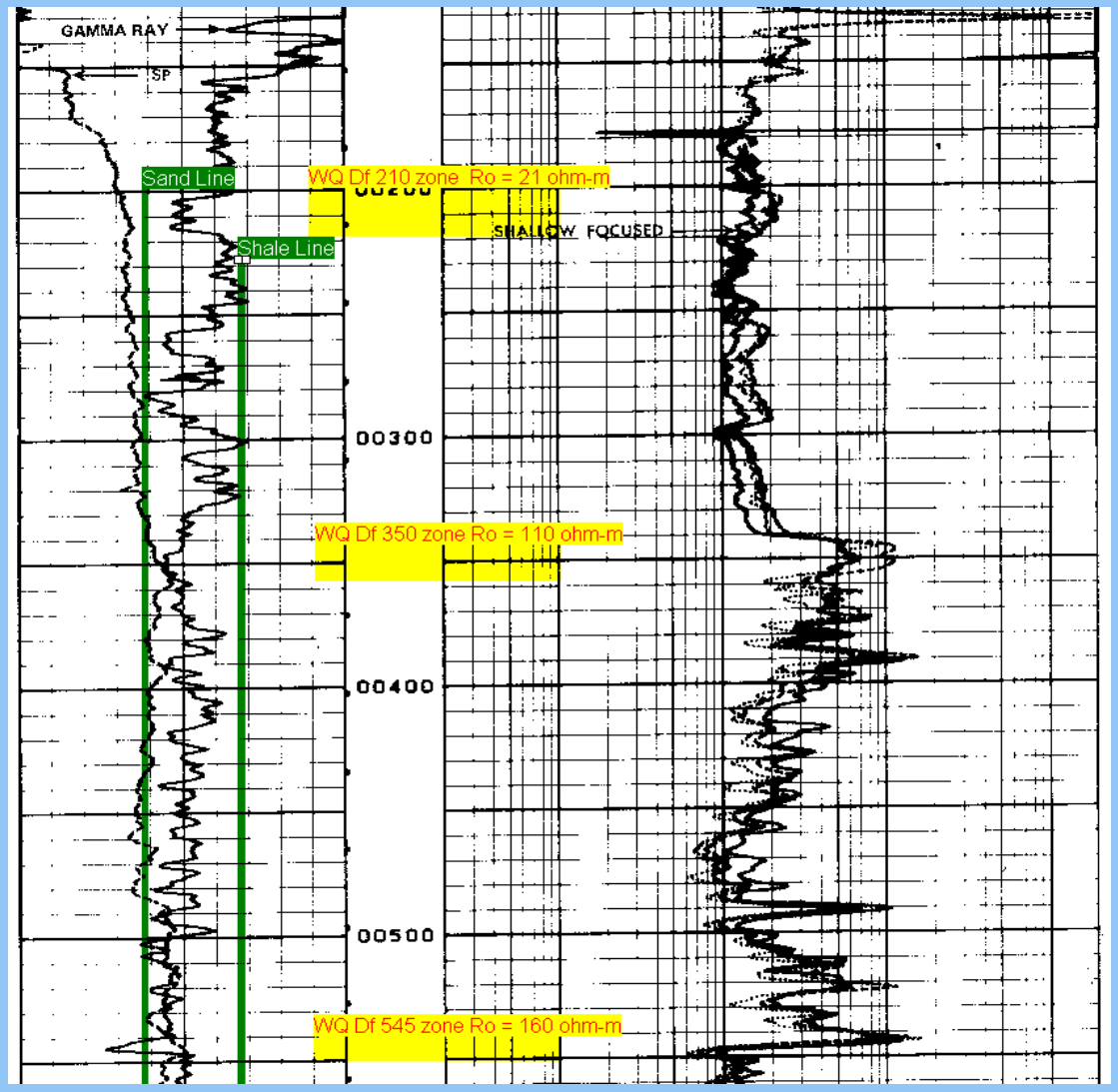
Record: 1 of 1 | No Filter | Search



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_2S (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+}		

Determining resistivity values for calculating TDS



Can use:

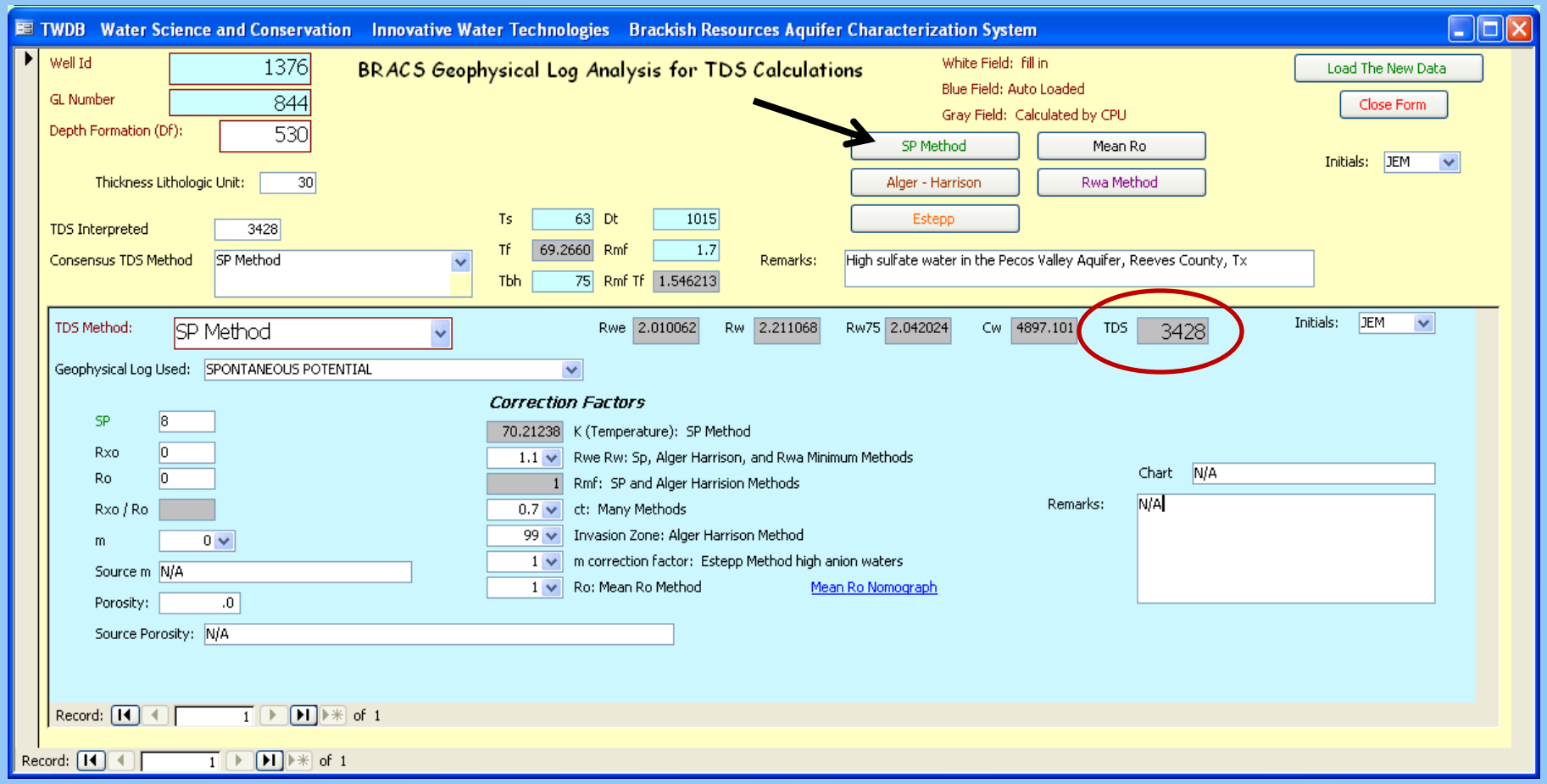
Spontaneous Potential (SP)

Resistivity Tools:

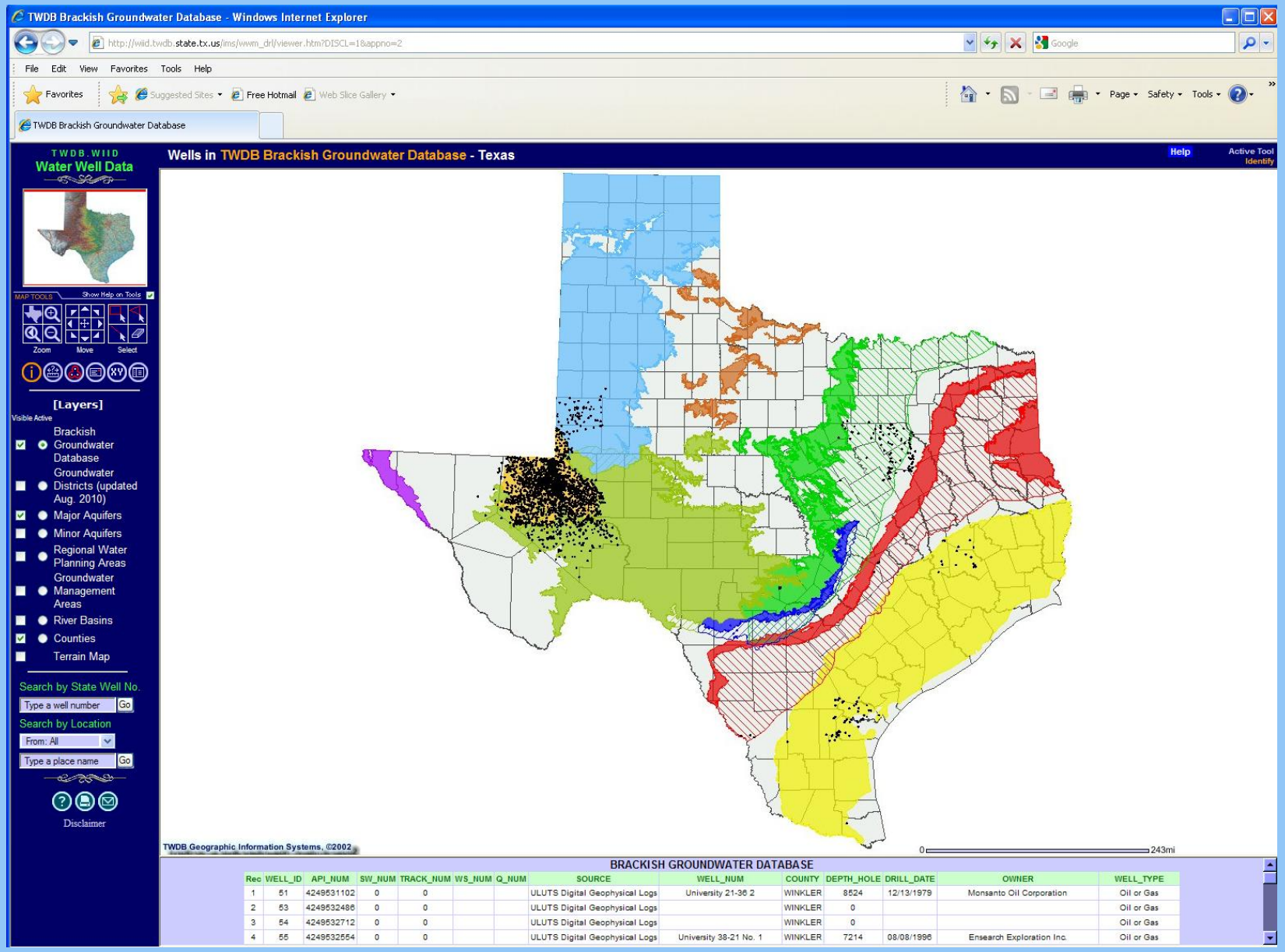
- Induction
- Laterolog
- Resistivity
- Electric
- Lateral

Calculation of TDS from geophysical well logs

Load method-specific log values and correction factors; automate the analysis



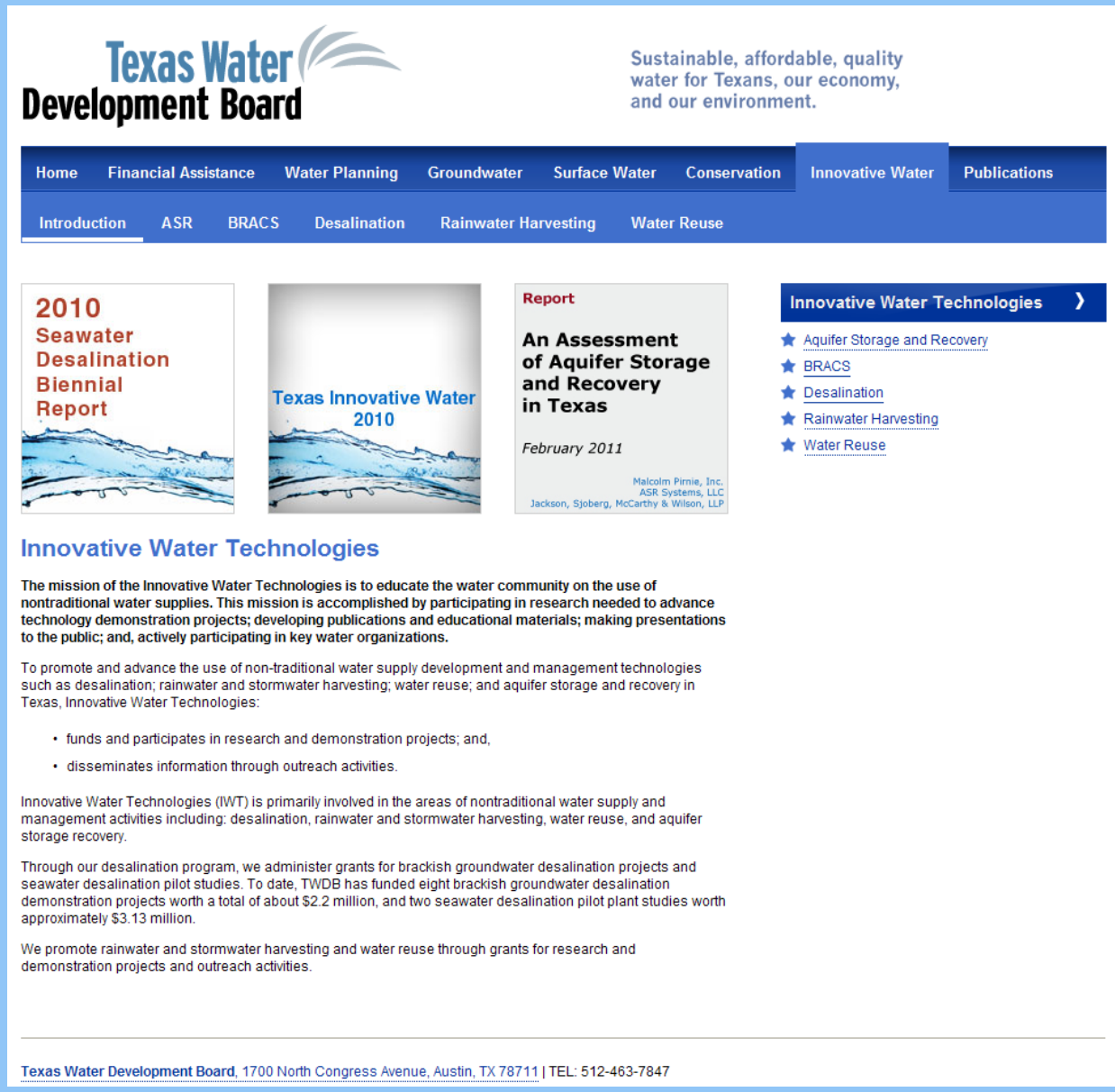
Brackish groundwater database well locations in WIID



WIID: Water Information Integration & Dissemination

Summary

- The 2003 Brackish Groundwater Manual indicated the estimated total volume of brackish groundwater in: Texas : > 2.7 billion acre-feet.
  Pecos Valley Aquifer: > 116 million acre-feet.
- 32 Texas water treatment plants use reverse osmosis to treat brackish groundwater.
- Each aquifer is different and techniques of analysis will need to fit data available.
- August 31, 2011 is the deadline for:
  - the Pecos Valley Aquifer pilot study;
  - statewide digital geophysical well log collection;
  - digital geological bibliography of Texas;
  - report on the applicability of variable density modeling to brackish aquifers.
- Future plans: Evaluate all aquifers in Texas with potential for brackish resource



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

Questions?

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