

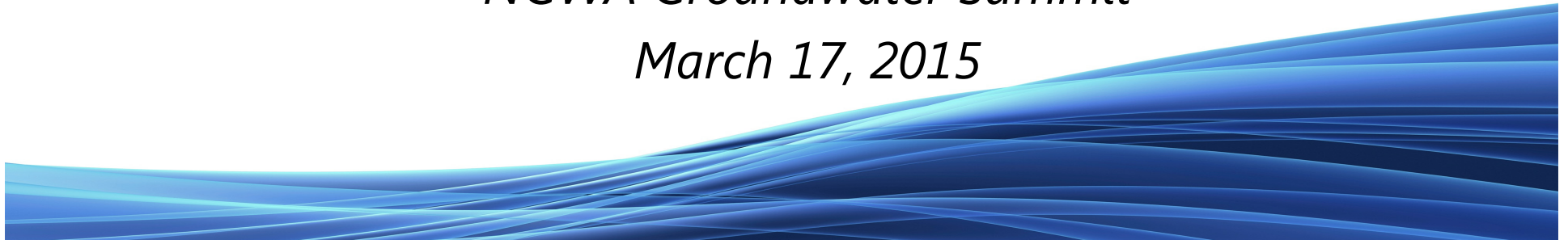


“Techniques for Mapping and Characterizing Brackish Aquifers through the Mining of Existing Geophysical Data”

Brackish Groundwater Characterization System (BRACS)

by
Andrea Croskrey

*NGWA Groundwater Summit
March 17, 2015*





The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board's statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.

Source: TWDB General Counsel

A decorative graphic at the bottom of the slide consisting of multiple overlapping, wavy lines in various shades of blue, creating a sense of movement and depth.

Who are we?
**Why do we study brackish
aquifers?**
**How do we study brackish
aquifers?**

Innovative Water Technologies Team



Sanjeev Kalaswad, Ph.D., P.G.
Director



Erika Mancha, EIT, Team Lead



John Meyer, P.G.



Matthew Webb



Andrea Croskrey



Nathaniel van Oort

Groundwater Desalination Plants

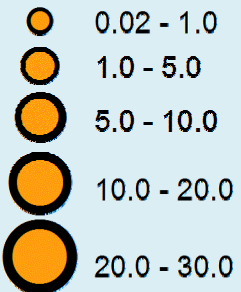
Existing and Recommended Strategies 2012 State Water Plan

Projects from the 2012 State Water Plan are conceptual and may or may not represent a precise site being considered for a plant.

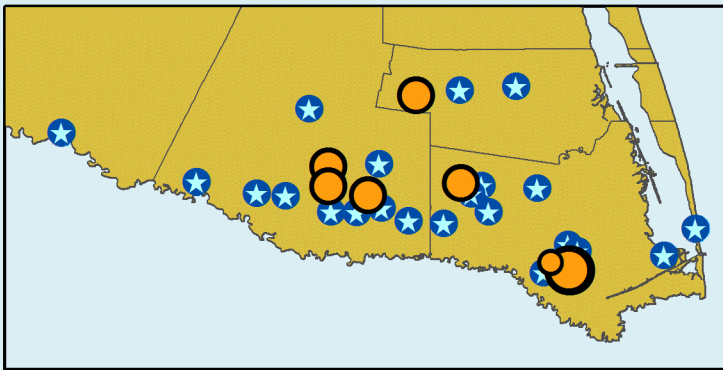
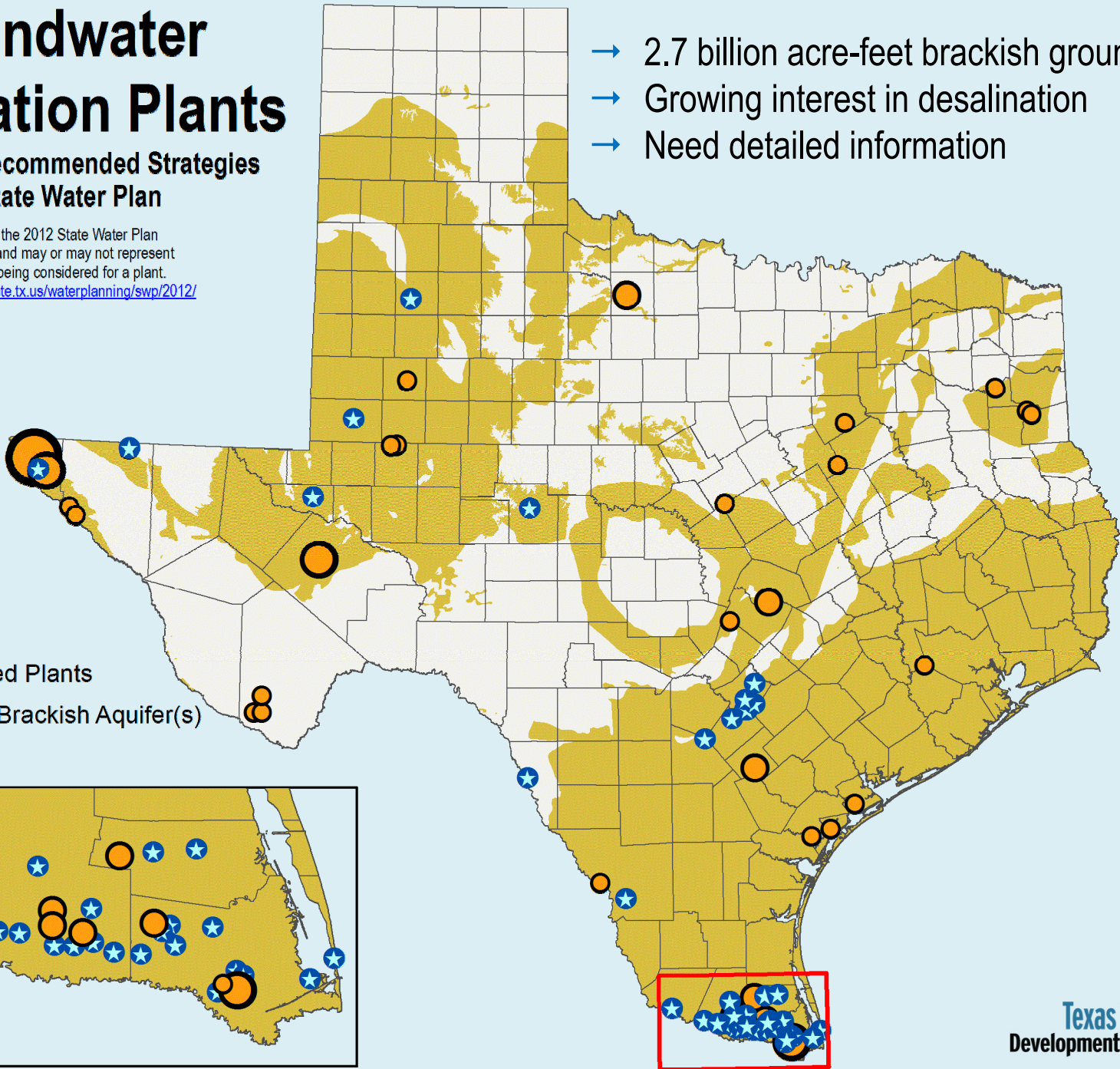
<http://www.twdb.state.tx.us/waterplanning/swp/2012/>

- 2.7 billion acre-feet brackish groundwater
- Growing interest in desalination
- Need detailed information

Existing Plants (MGD)



- ★ Recommended Plants
- Underlain by Brackish Aquifer(s)



Groundwater Salinity Classification

Groundwater Salinity Classification	Salinity Zone Code	Total Dissolved Solids Concentration (units: milligrams per liter)
Fresh	FR	0 to 1,000
Slightly Saline	SS	1,000 to 3,000
Moderately Saline	MS	3,000 to 10,000
Very Saline	VS	10,000 to 35,000
Brine	BR	Greater than 35,000

← Drinking Water Limit

← Major/Minor Aquifer Mapped Limit

← Seawater

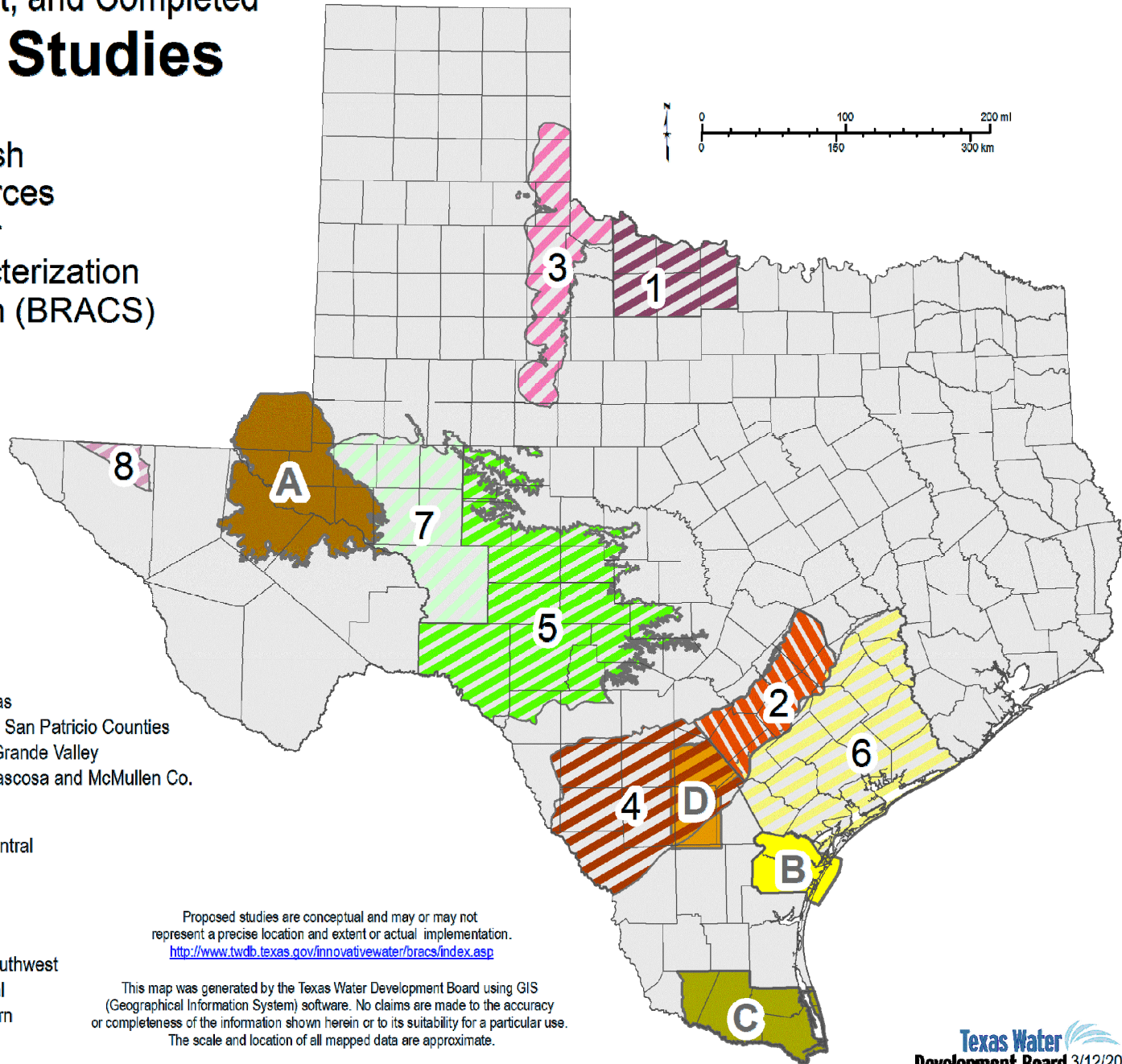
Source: modified from Winslow and Kister, 1956

BRACS: Brackish Resources Aquifer Characterization System

- collect well logs
 - build geologic datasets
 - compile aquifer properties
 - map aquifer extent
 - map key desalination water quality parameters
 - estimate volumes of water
 - provide all data to stakeholders
- ★ *each aquifer will require unique analysis based on data availability and local hydrogeology*

Proposed, Current, and Completed BRACS Studies

**Brackish
Resources
Aquifer
Characterization
System (BRACS)**



2014 Study Area Status COMPLETE

- A - Pecos Valley Aquifer, West Texas
- B - Gulf Coast Aquifer, Nueces and San Patricio Counties
- C - Gulf Coast Aquifer, Lower Rio Grande Valley
- D - Queen City-Sparta Aquifers, Atascosa and McMullen Co.

2014 Study Area Status CURRENT

- 2 - Upper Coastal Plain Aquifer, Central

2014 Study Area Status PROPOSED

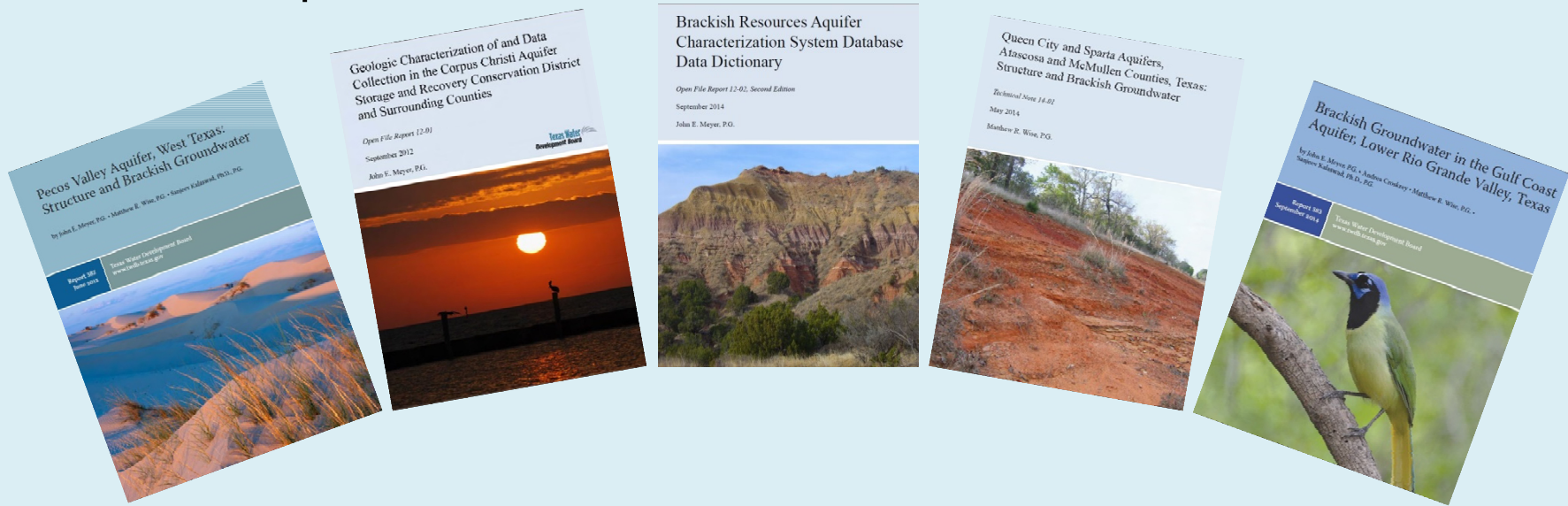
- 1 - Paleozoics, Wichita Falls Area
- 3 - Blaine Aquifer
- 4 - Upper Coastal Plain Aquifer, Southwest
- 5 - Edwards-Trinity Plateau, Central
- 7 - Edwards-Trinity Plateau, Western
- 6 - Gulf Coast Aquifer, Central
- 8 - Bone Spring - Victorio Peak

Proposed studies are conceptual and may or may not represent a precise location and extent or actual implementation.
<http://www.twdb.texas.gov/innovativewater/bracs/index.asp>

This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein or to its suitability for a particular use. The scale and location of all mapped data are approximate.

Study Deliverables

- Published reports



- GIS Datasets
- BRACS Database
- Well logs



The real value is in the data:

Stakeholders can use this to evaluate potential groundwater exploration areas.

Brackish Resources Aquifer Characterization System (BRACS)



Estimated at more than 2.7 billion acre-feet, brackish groundwater constitutes an important desalination water supply option in Texas.

One challenging issue - and a potential roadblock to the more widespread development of brackish groundwater - is the lack of detailed information (especially on parameters relevant to desalination) on brackish aquifers. A 2003 TWDB-funded study laid the foundation for estimating brackish groundwater volumes. However, the study was by design regional in scope, limited in areal extent, and narrow in its assessment of groundwater quality. To remedy this situation, TWDB requested and received funding from the 81st Texas Legislature in 2009 to implement the Brackish Resources Aquifers Characterization System (BRACS) to more thoroughly characterize the brackish aquifers.

Goals of Brackish Resources Aquifer Characterization System:

- Map and characterize the brackish aquifers of the state in greater detail using existing geophysical well logs and available aquifer data;
- Build replicable numerical groundwater flow models to estimate aquifer productivity; and
- Develop parameter-screening tools to help communities assess the viability of their brackish groundwater supplies.

Aquifer Storage and Recovery

Brackish Resource Aquifer Characterization System

- FAQs
- Studies
- Projects
- BRACS Database
- BRACS GIS Data
- BRACS Well Logs
- TWDB Documents
- Useful Links
- BRACS Projects

Desalination

Rainwater Harvesting

Water Reuse

State Water Implementation Fund for Texas (SWIFT)

Texas Innovative Water

TWDB Databases: wiid.twdb.texas.gov

The screenshot shows a web browser window with the address bar displaying wiid.twdb.texas.gov. The page header features the Texas Water Development Board logo and the text "WIID SYSTEM Water Information Integration & Dissemination". Navigation links for "Applications", "Links", and "Help" are visible in the top right. A horizontal menu contains four items: "First time here? quick tutorial" (with a traffic light icon), "Individual WIID applications" (with a water drop icon), "Questions or Comments? contact us" (with an envelope icon), and "TWDB home Sign up to TWDB E-Newsletter" (with a globe icon).

The main content area is titled "Welcome to the WIID Portal" and includes the following sections:

- WIID Mission**

Efficiently managing and distributing critical data and information will be vital to ensuring long-term, drought-resistant water supplies. The Water Information Integration & Dissemination (WIID) initiative utilizes internet-based mapping technology to significantly improve internal and external access to water-related data in order to facilitate providing TWDB customers with a much needed tool to locate and access agency water-related data.
- Overview of WIID System**

The WIID currently consists of 3 applications:

 1. [Groundwater Database](#)
 2. [Submitted Driller's Report](#)
 3. [Brackish Groundwater Database](#)
 4. Click [here](#) to go the USGS National Water Information System
 5. Click [here](#) to go the TCEQ Water Well Report Viewer

Click [here](#) to go the a detailed description of the applications.

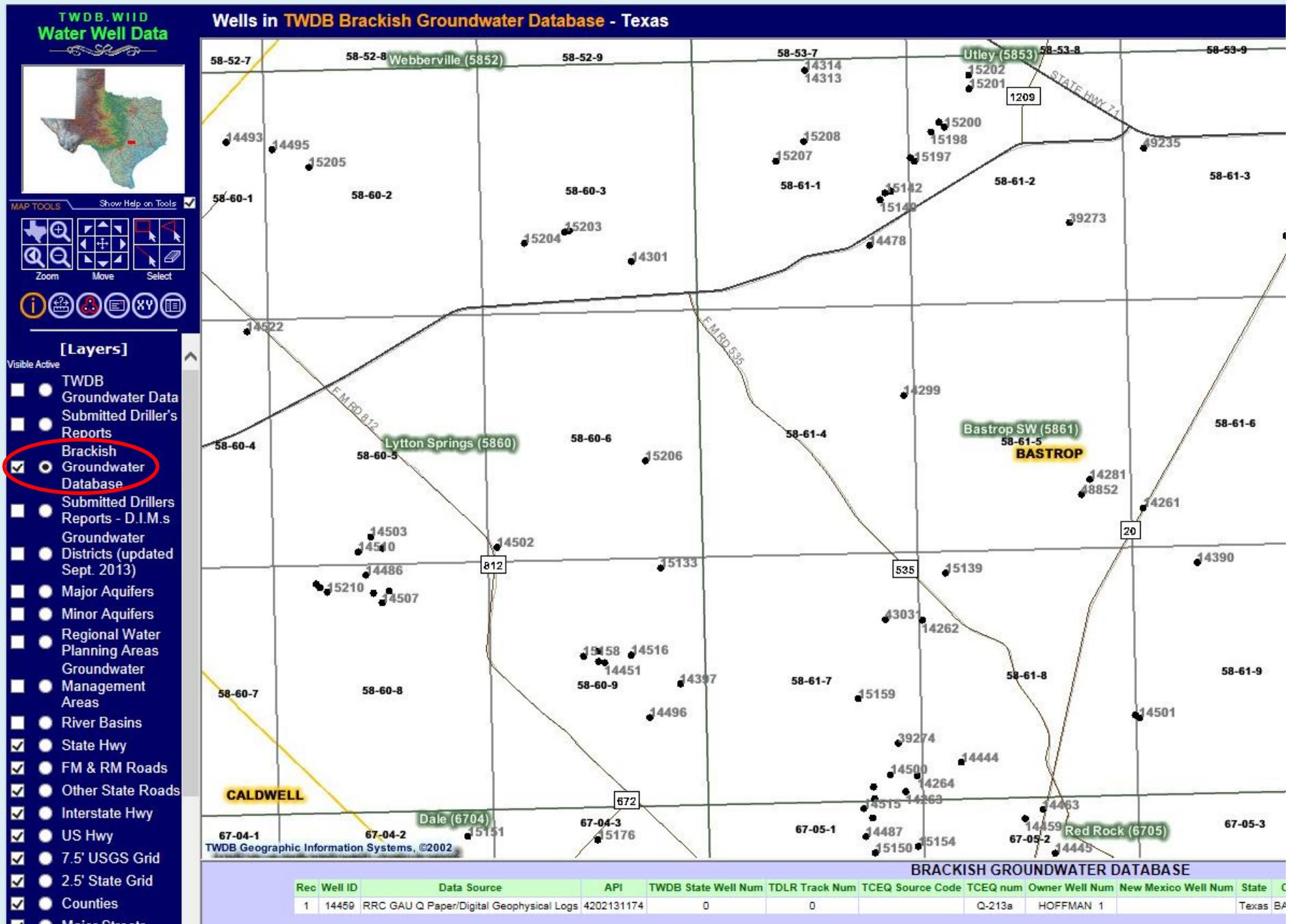
Please be sure to **turn Pop-up Blocker OFF** for *.state.tx.us

For more help with navigating through this system, please review the "quick tutorial" above or the WIID "Help" file.

At the present time this site works Only with [Internet Explorer 5.5](#) or higher.
For more information: [Accessibility](#), [Privacy & Security](#), and [Link Policies](#).

The footer contains links for "Home", "Disclaimer", and "Help".

TWDB WIID: Water Information Integration and Dissemination



BRACS Public Database: <http://www.twdb.texas.gov/innovativewater/bracs/database.asp>

frmSelection_PU

BRACS Database, Navigation to Forms

Close Form

1: Select a form to display

BRACS Database Master Well Form

TWDB Report 382, 2012, Pecos Valley Aquifer, West Texas: Structure and Brackish Groundwater

- Pecos Valley Aquifer Study: Aquifer Determination Form
- Pecos Valley Aquifer Study: Net Sand Form

TWDB Technical Note 14-01, 2014, Queen City and Sparta Aquifers, Atascosa and McMullen Counties, Texas: Structure and Brackish Groundwater

- Queen City and Sparta Aquifer Study: Aquifer Determination Form
- Queen City and Sparta Aquifer Study: Net Sand Form

TWDB Open-file Report 12-01, 2012, Geologic Characterization of and Data Collection in the Corpus Christi Aquifer Storage and Recovery Conservation District and Surrounding Counties

- Gulf Coast CCASRCD Study: Aquifer Determination Form
- Gulf Coast CCASRCD Study: Net Sand Form

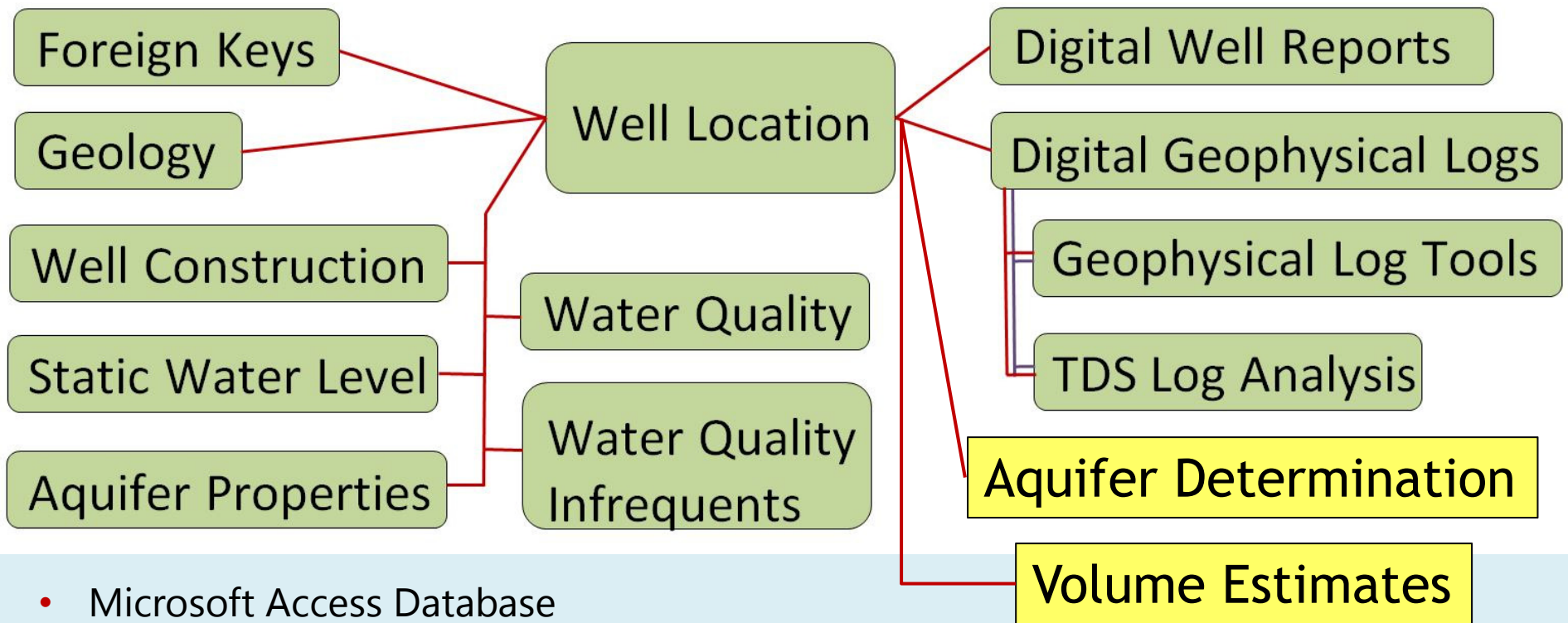
TWDB Report 383, 2014, Brackish Groundwater in the Gulf Coast Aquifer, Lower Rio Grande Valley, Texas

- Gulf Coast Lower Rio Grande Valley Study: Aquifer Determination Form
- Gulf Coast Lower Rio Grande Valley Study: Net Sand Form
- Gulf Coast Lower Rio Grande Valley Study: Salinity Zone Form

2: Press Button

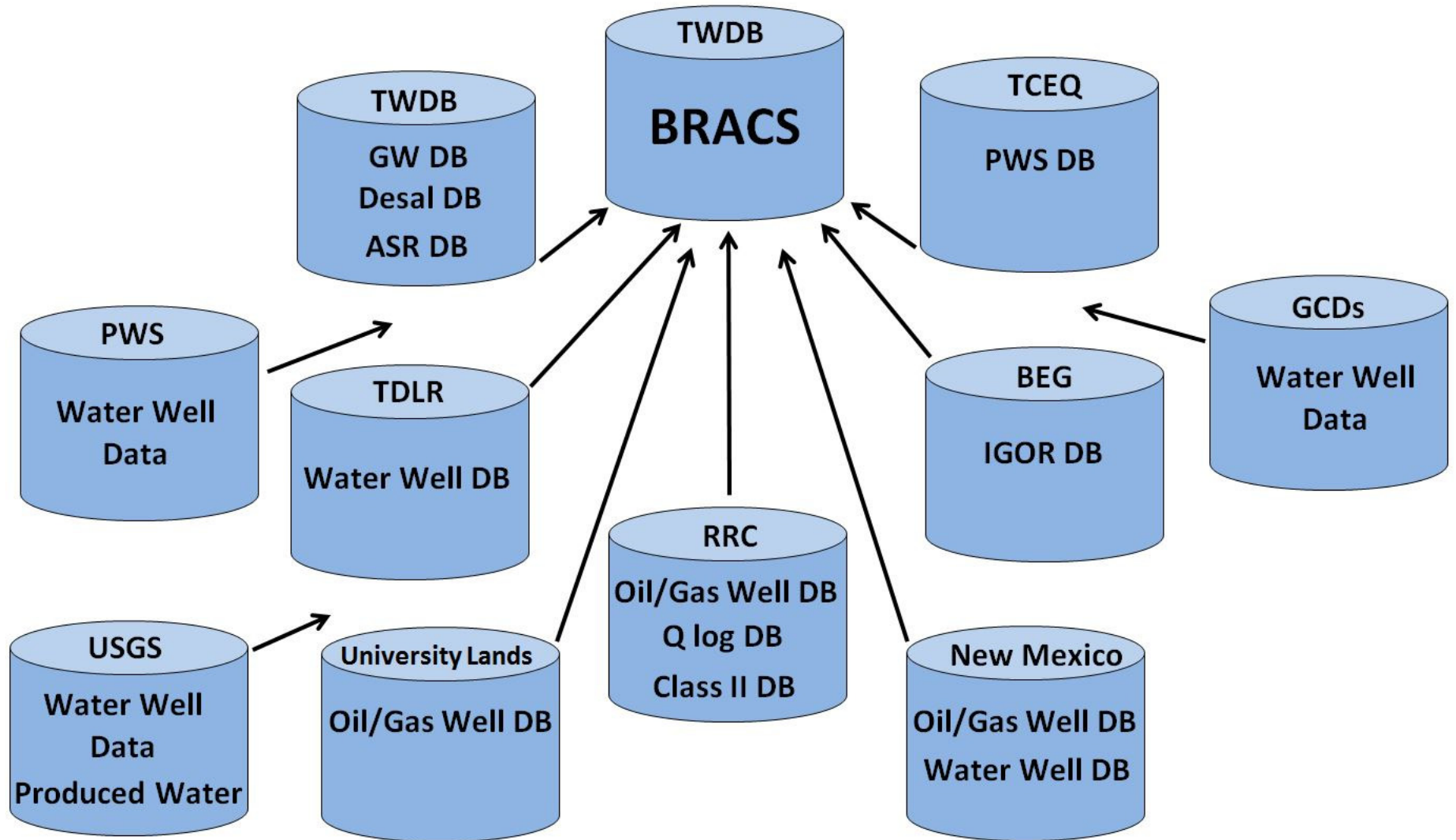
Open Form

BRACS Database Tables



- Microsoft Access Database
- Available on the TWDB web site (with data dictionary)
- Relational table design
- All wells are assigned a unique well id, linking (red line) records together

BRACS Supporting Databases



BRACS Database: Water quality tables

TWDB WSC IWT BRACS Geophysical Log Search Task

1737 Close Form

BRACS Well ID

Location and Well IDs | Lithology and Stratigraphy | Digital Well Logs | TDS Analysis using Geophysical Well Logs | Aquifer Test Information | **Water Quality** | Static Water Level | Well Construction

BRACS Water Quality

State Well Number	8850305			Sample Date	Sample Number		Date Entered					5/7/2012
				Month	Day	Year						
Source Data	Driller/Engineer Well Development Sample			9	16	2005	1					
Silica	Calcium	Magnesium	Sodium	Potassium	Bicarbonate	Sulfate	Chloride	Nitrate	TDS	Spec. C.	pH	
13.7	155	81	1070	17.9	250	1120	1230	0.05	3818	6000	7.3	

Record: 1 of 1 No Filter Search

BRACS Infrequent Constituents

State Well Number	8850305			Sample Date	Sample Number		
				Month	Day	Year	
Source Data	Driller/Engineer Well Development Sample			9	16	2005	1
Storet Code	00405	Iron = 01045					
flag							
Value	245						
plus / minus							

Record: 1 of 32 No Filter Search

BRACS Database: Static water level table

TWDB WSC IWT BRACS Geophysical Log Search Task

1737 Close Form

BRACS Well ID

Location and Well IDs | Lithology and Stratigraphy | Digital Well Logs | TDS Analysis using Geophysical Well Logs | Aquifer Test Information | Water Quality | **Static Water Level** | Well Construction

Static Water Level	Date Measured	Method	Agency	Remarks	State Well Number	Track Number	Water Source
-22.85	9/1/2005	07	DRILL		8850305	0	
*						0	

BRACS Database: Well construction table

TWDB WSC IWT BRACS Geophysical Log Search Task

1737 Close Form

BRACS Well ID

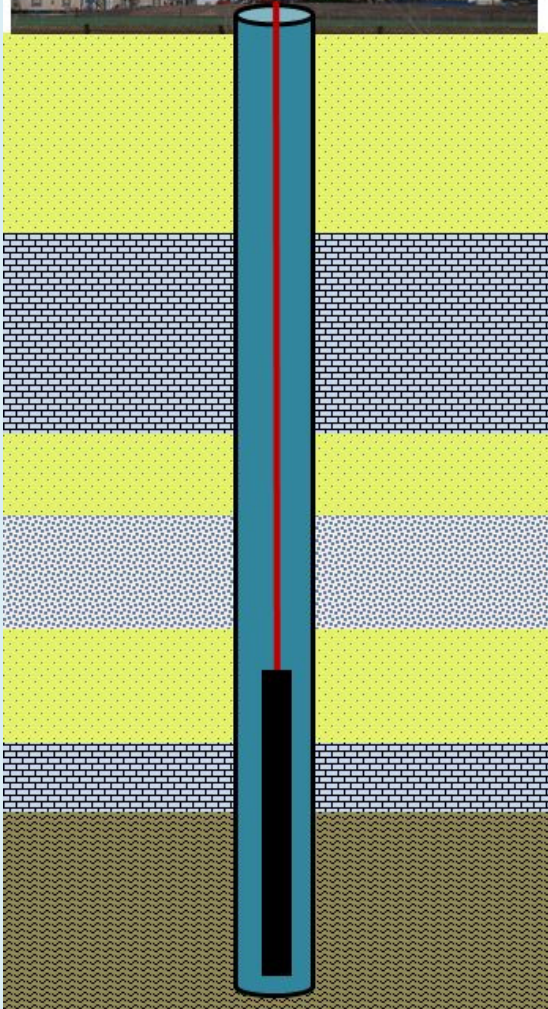
Location and Well IDs | Lithology and Stratigraphy | Digital Well Logs | TDS Analysis using Geophysical Well Logs | Aquifer Test Information | Water Quality | Static Water Level | Well Construction

Group	CSO	Diam	Top Depth	Bottom Depth
1	C	24	0	56
2	C	16	0	285
3	C	11	250	290
4	S	11	290	301
5	c	11	301	385
6	s	11	385	439
7	c	11	439	478
8	s	11	478	531
9	c	11	531	601

Note:

C = casing

S = screen



What is a Geophysical Well Log?

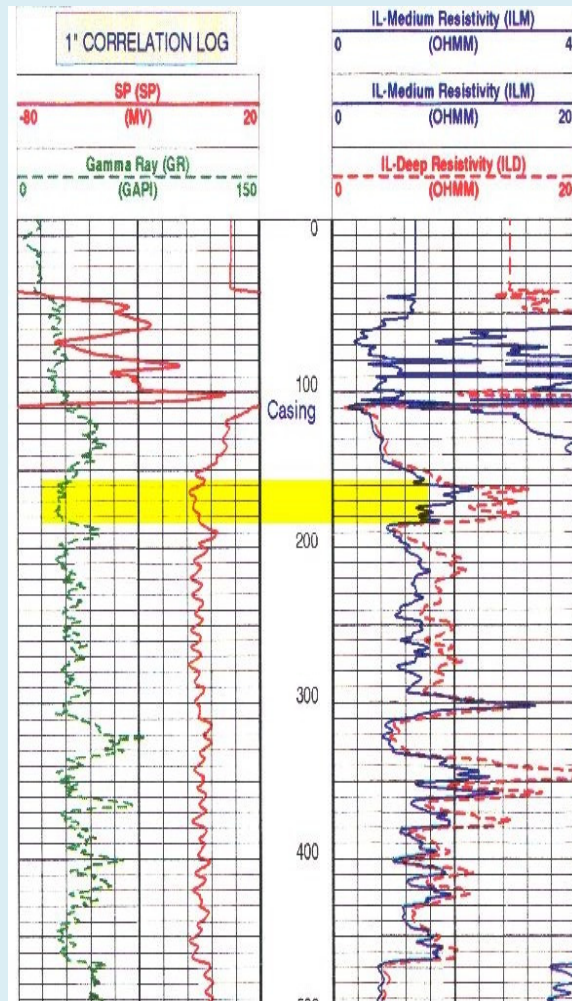
A tool or combination of tools lowered into a borehole on a wireline and retrieved to the surface.

Tools are designed to record specific parameters.

Also known as: electrical logging; wireline logging.

Logs must be corrected for a number of parameters.

Tool response recorded in left and right tracks.



BRACS Database: Location and Foreign Key tables

TWDB WSC IWT BRACS Geophysical Log Search Task

1737 Close Form

BRACS Well ID

Location and Well IDs | **Lithology and Stratigraphy** | Digital Well Logs | TDS Analysis using Geophysical Well Logs | Aquifer Test Information | Water Quality | Static Water Level | Well Construction

Location Attributes

Source of Well Data: TCEQ PWS Water Wells

Owner: NORTH CAMERON REGIONAL WATER TREATMENT FACILITY

State Name: Texas | Latitude: 26.24930796
 County Name: CAMERON | Longitude: -97.7818281
 Depth Total: 600 | Horizontal Datum: 83
 Depth Well: 601 | Location Method: GPS-S
 Drill Date: 07/19/2005 | Agency: TCEQ | Location Date: 6/12/2008

Kelly Bushing: 5 | Elevation: 43
 Well Type: Withdrawal of Water | Vertical Datum: 29
 2.5' Grid Cell: 88-50-3 | Elevation Method: D
 Elevation Agency: TWDB | Elevation Date: 5/7/2012

Remarks: pumping tests plotted in BRACS pdf files. Driller's lithology replaced by geophysical log simplified lithology. Driller's log available in PDF file.

Foreign Keys

ID Name	Foreign Key Id (Text)	Remarks
ID Agency	Foreign Key Id (Numeric)	
WELL_NUMBER	1	
OWNER		
TRACK_NUMBER	180500	
TDLR	180500	
STATE_WELL_NUMBER	8850305	
TWDB	8850305	
WATER_SOURCE	G0310152A	
TCEQ		
*		

Refer to Brackish Resources Aquifer Characterization System Data Dictionary for Table Definitions
 Refer to Brackish Groundwater Resources of the Pecos Valley Aquifer, West Texas for Pilot Project Description

BRACS Database: Geology table

TWDB WSC IWT BRACS Geophysical Log Search Task

1737 Close Form

BRACS Well ID

Location and Well IDs | **Lithology and Stratigraphy** | Digital Well Logs | TDS Analysis using Geophysical Well Logs | Aquifer Test Information | Water Quality | Static Water Level | Well Construction

Lithologic Description

Record Number	Geologic Pick	Top Depth Bottom Depth Thickness	Lithologic Description Simplified Lithologic Description Source of Data Remarks	Last Change
22	Lithologic	70 70	No Record GEOPHYSICAL WELL LOG	12/20/2013
23	Lithologic	70 110 40	Sand with Clay GEOPHYSICAL WELL LOG	12/20/2013
24	Lithologic	110 130 20	Clay GEOPHYSICAL WELL LOG	12/20/2013
25	Lithologic	130 180 50	Sand with Clay GEOPHYSICAL WELL LOG	12/20/2013
26	Lithologic	180 196 16	Clay GEOPHYSICAL WELL LOG	12/20/2013
27	Lithologic	196 210 14	Sand with Clay GEOPHYSICAL WELL LOG	12/20/2013
28	Lithologic	210		

Stratigraphic Description

Record Number	Geologic Pick	Top Depth Bottom Depth GT Flag Thickness	Stratigraphic Description Source of Data	Last Change
17	STRATIGRAPHIC	0 406 406	Beaumont Formation PUBLISHED REPORT	5/7/2012
18	STRATIGRAPHIC	406 732 326	Lissie Formation PUBLISHED REPORT	5/7/2012
*				

Simplified Lithologic Description

Lithologic Description

Record Number	Geologic Pick	Top Depth Bottom Depth Thickness	Lithologic Description Simplified Lithologic Description Source of Data Remarks	Last Change
1	LITHOLOGIC	0 3	SAND Sand	3/23/2012
2	LITHOLOGIC	3 8	RED CLAY Clay	3/23/2012
3	LITHOLOGIC	8 12	RED CLAY AND SAND MIX Sand and Clay	3/23/2012
4	LITHOLOGIC	12 15	YELLOW CLAY Clay	3/23/2012
5	LITHOLOGIC	15 36	RED SAND Sand	3/23/2012
6	LITHOLOGIC	36 40	YELLOW SAND Sand	3/23/2012
7	LITHOLOGIC	40	CHOPPY TAN SAND WITH OCC. CLAY STREAK	

Description from well report

Simplified description from well report or geophysical log interpretation

Stratigraphic Picks: *Link map to log to database*

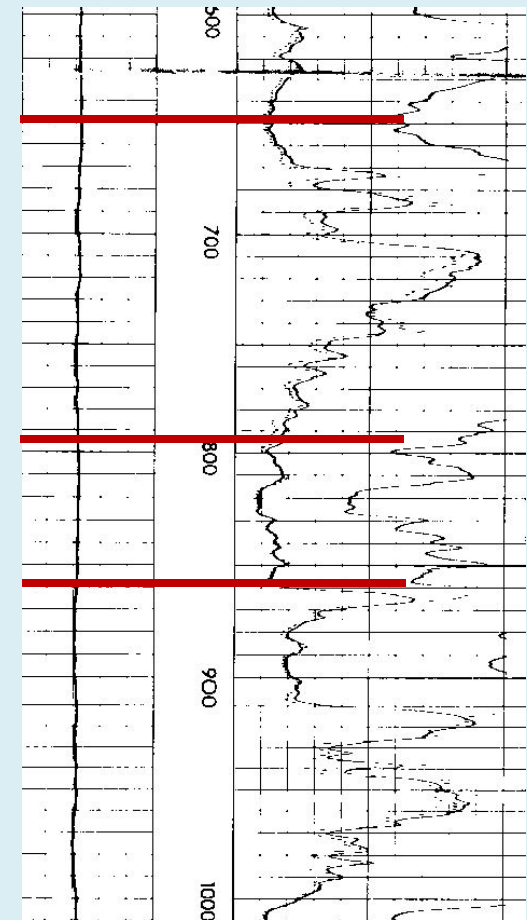
Stratigraphic Description

Record Number	Geologic Pick	Top Depth Bottom Depth Thickness	Stratigraphic Description Source of Data Initials Last Change
1	Stratigraphic	0	Yegua Formation Geophysical Well Log #####
2	Stratigraphic	650	Cook Mountain Formation Geophysical Well Log #####
3	Stratigraphic	650 797 147	Sparta Formation Geophysical Well Log 3/18/2013
4	Stratigraphic	797 860 63	Weches Formation Geophysical Well Log 3/18/2013
5	Stratigraphic	860 1450 590	Queen City Formation Geophysical Well Log 3/18/2013
6	Stratigraphic	1450 1740 290	Reklaw Formation Geophysical Well Log 3/18/2013
7	Stratigraphic	1740 2460 720	Carrizo Formation Geophysical Well Log #####
8	Stratigraphic	2460 4790 2330	Wilcox Group Geophysical Well Log #####
9	Stratigraphic	4790	Midway Formation Geophysical Well Log #####
*			

Sparta

Weches

Queen City



BRACS Database: Digital log tables

TWDB WSC IWT BRACS Geophysical Log Search Task

1737 Close Form

BRACS Well ID

Location and Well IDs | Lithology and Stratigraphy | Digital Well Logs | TDS Analysis using Geophysical Well Logs | Aquifer Test Information | Water Quality | Static Water Level | Well Construction

Digital Geophysical Well Logs

1014 Log File Type: TIF IMAGE GL Folder Name: 42_061 REMARKS: no BHT on GL header; use Gg from BRACS 3999. Ts from Larkin, LP-192 avg annual temp 73-74 F.

File Name: G0310152A_

GL_HYPERLINK: B:\GeophysicalWellLogs\42_061\G0310152A .tif

Geophysical Log	Top Depth	Bottom Depth	Remarks
GAMMA RAY OR GAMMA	0	552	N/A
INDUCTION	70	600	N/A
SPONTANEOUS POTENTIAL	70	576	N/A
*	0	0	N/A

Record: 1 of 1 No Filter Search

Digital Water Well Logs

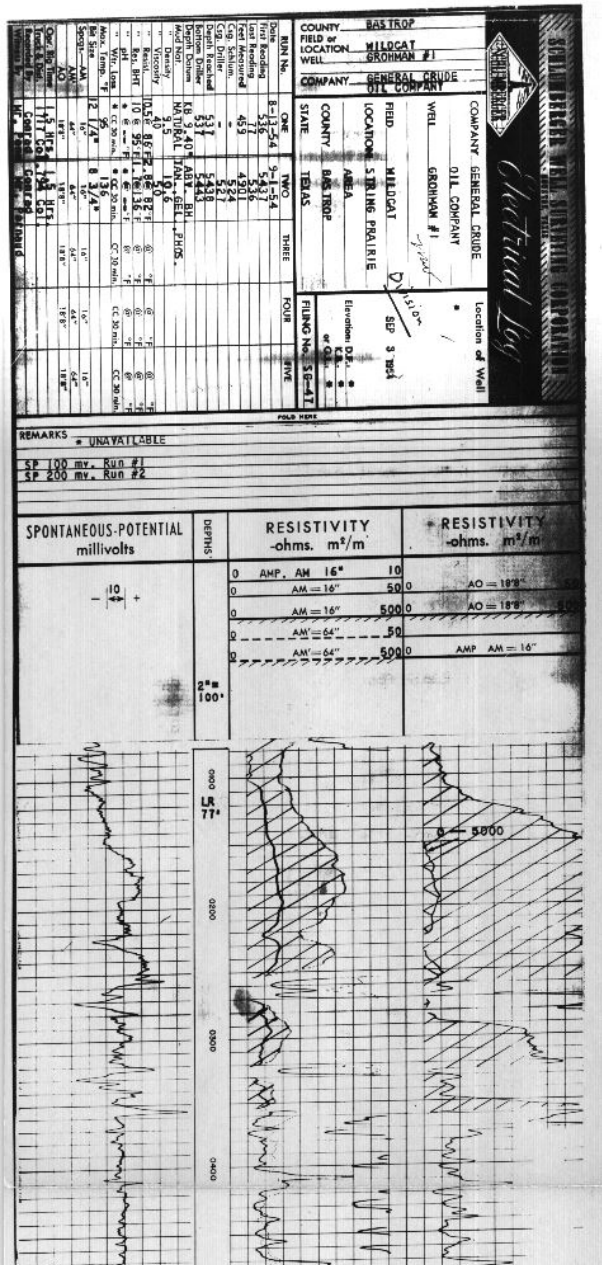
756 Log File Type: PDF Image WW folder: 42_061 Remarks:

File Name: G0310152A

WW Hyperlink: B:\DrillerWellLogs\42_061\G0310152A.pdf

Record: 1 of 1 No Filter Search

Digital geophysical and water well logs



4089006D

State of Texas
WELL REPORT

ATTENTION OWNER: Confidentiality
Privilege Notice on Reverse Side
Gonzales County Water Supply Corp.

OWNER: Gonzales County Water Supply Corp ADDRESS: 1903 Sarah DeWitt Dr., Gonzales, Texas 78629
(Name) (Street or RFD) (City) (State) (Zip)

ADDRESS OF WELL: 8 miles N. of Gonzales (F.M. 794 well) GRID # 67-20-9
(Street, RFD or other) (City) (State) (Zip)

TYPE OF WORK (Check):
 New Well Deepening Reconditioning Plugging

PROPOSED USE (Check):
 Monitor Industrial Irrigation Injection Public Supply Domestic Environmental Soil Boring De-watering Testwell
 If Public Supply well, were plans submitted to the TNRCC? Yes No

WELL LOG:
 Date Drilling: 10-24-1996
 Completed: 11-10-1996

From (ft.)	To (ft.)	DIAMETER OF HOLE	
		Dia. (in.)	From (ft.) To (ft.)
18	1/2	Surface	748
11	1/2	748	830

DRILLING METHOD (Check):
 Air Rotary Mud Rotary Bored
 Air Hammer Cable Tool Jetted
 Other

From (ft.)	To (ft.)	Description and color of formation material
0	5	Top Soil
5	68	Clay (Yellow)
68	150	Sand & Shale
150	184	Sand
184	266	Shale
266	270	Sand
270	296	Shale
296	302	Sand
302	306	Sand & Shale
306	353	Sand
353	386	Shale
386	513	Sand & Shale
513	672	Sand
672	675	Shale
675	700	Sand

Borehole Completion (Check):
 Open Hole Straight Wall
 Underreamed Gravel Packed Other
 If Gravel Packed give Interval - from _____ ft. to _____ ft.

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Cage Casting Screen
			From	To	
12 1/2	New	Steel	4	748	
8 5/8	New	Steel	702	750	
8 5/8	New	Screen Mfg.	750	820	

CEMENTING DATA [Rule 338.44(1)]
 Cemented from 0 ft. to 748 ft. No. of sacks used 420
 Method used Pressure
 Cemented by International Services, Inc.
 Distance to septic system field lines or other concentrated contamination 200 ft.
 Method of verification of above distance measured

TYPE PUMP: N/A
 Turbine Jet Submersible Cylinder
 Other _____
 Depth to pump bowl, cylinder, jet, etc. _____ ft.

WELL TESTS:
 Type test: Pump Bailer Jetted Estimated
 Yield: 1471 gpm with 252 ft. drawdown after 36 hrs.

WATER QUALITY:
 Did you knowingly penetrate any strata which contained undesirable constituents?
 Yes No If yes, submit 'REPORT OF UNDESIRABLE WATER'
 Type of water? Good Depth of strata 750-820
 Was a chemical analysis made? Yes No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Cude Drilling, Inc. WELL DRILLER'S LICENSE NO. 2738W
(Type or print)

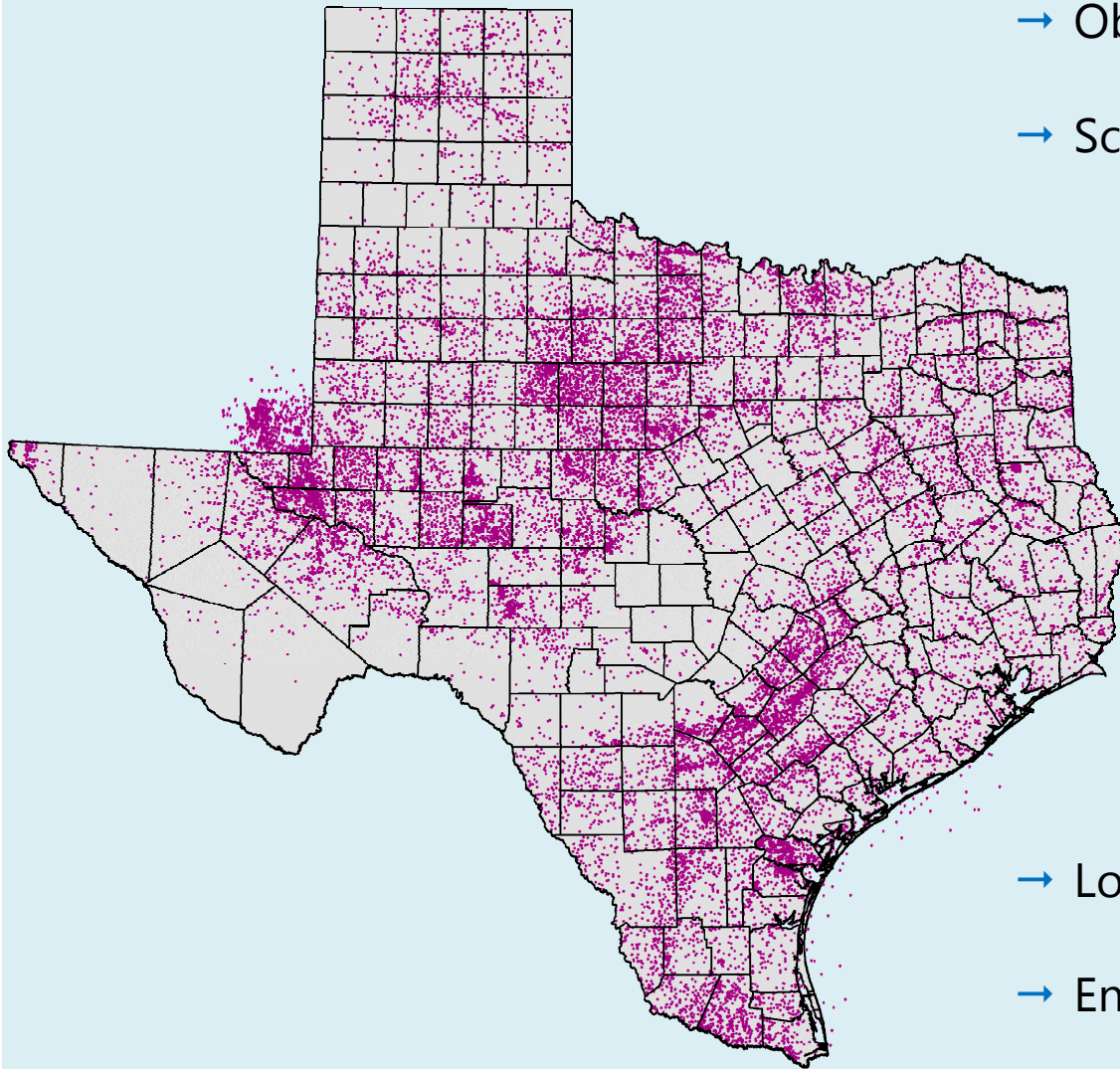
ADDRESS P. O. Box 8 Pleasanton Texas 78064
(Street or RFD) (City) (State) (Zip)

(Signed) Richard R. Banton (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC 0199 (Rev. 11-01-94)

BRACS Geophysical Well Log Collection



- Obtain oil, gas, and water well logs
- Scan into digital TIFF image files



- Logs must be non-confidential
- Entire collection available to the public

Total BRACS well control > 47,000 wells

BRACS Database: Log analysis to interpret Total Dissolved Solids

TWDB WSC IWT BRACS Geophysical Log Search Task

1737 Close Form

BRACS Well ID

Location and Well IDs | Lithology and Stratigraphy | Digital Well Logs | TDS Analysis using Geophysical Well Logs | Aquifer Test Information | Water Quality | Static Water Level | Well Construction

GL NUMBER: 1014 GL FILE TYPE: TIF IMAGE GL Co: Baker Hughes
 GL FILE NAME: G0310152A_ Remarks: no BHT on GL header; use Gg from BRACS 3999. Ts from Larkin, LP-192 avg annual temp 73-74 F.

Depth Total: 603 Rmf: 0.7
 Temperature Surface: 74 Rmf Temperature: 75
 Temperature Bottom Hole: 81 Rm: 0.9
 Rm Temperature: 75 Mud Type: water base

Depth Formation (DF): 296 TDS Interpreted: 0 TF: 77
 Thickness Lithologic Unit: 12 Consensus TDS Method: N/A Rmf TF: 0 Remarks: N/A

TDS Method: Rwa Method Rwe: 1.08 Rw: 0.92 Rw75: 0.94 Cw: 10638.3 TDS: 5638
 Geophysical Log Used: INDUCTION

Correction Factors

SP: 0 K (Temperature): SP Method
 Rxo: 0 Rwe Rw: Sp, Alger Harrison, and Rwa Minimum Methods
 Ro: 6 Rmf: SP and Alger Harrison Methods
 Rxo/Ro: 0 ct: Many Methods
 m: 1.6296 Invasion Zone: Alger Harrison Method
 Source m: Eq. 1.18 (Esteepp, 1998) m correction factor: Esteepp Method high anion waters
 Porosity: 0.35 Ro: Mean Ro Method
 Source Porosity: N/A

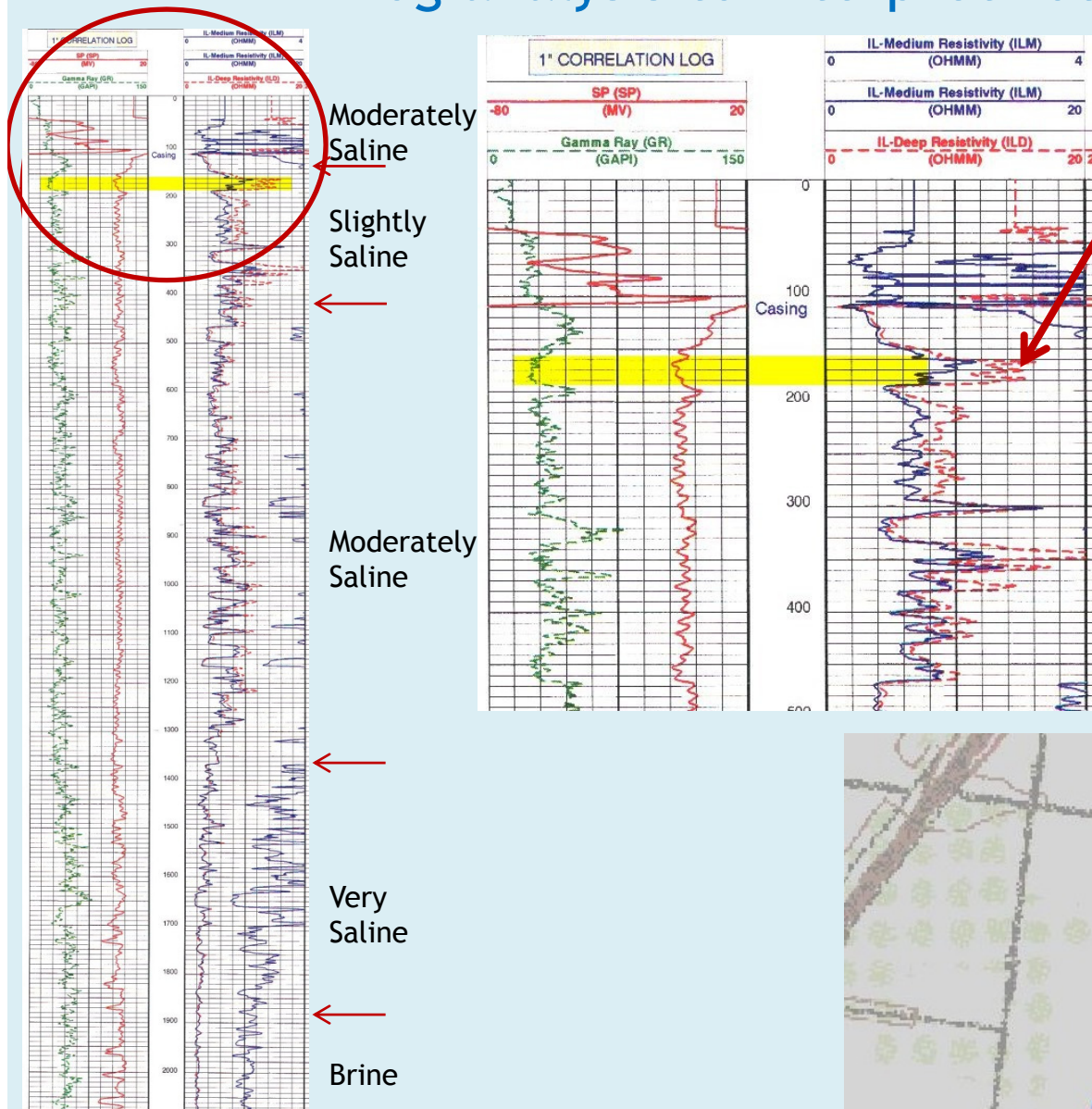
Chart: N/A
 Remarks: WQ: 8850305 (2005) TDS: 3817 ct: 0.53
 HCO3/TDS: 0.04 SO4/TDS: 0.35 Rwe NaCl cf: 1.17

Record: 1 of 1 | No Filter | Search

Record: 1 of 3 | No Filter | Search

Record: 1 of 1 | No Filter | Search

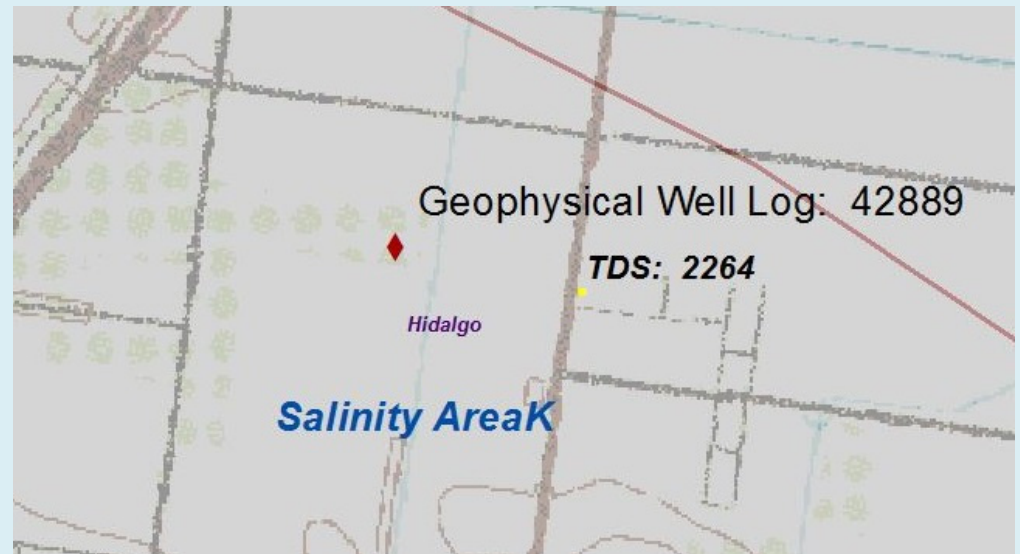
Log analysis to interpret Total Dissolved Solids



At 160 ft = 15 ohm-meter

Rwa Minimum Method interpreted TDS = 2,500 mg/L

Water Well
TDS concentration = 2,264 mg/L
(well screen 170-349 ft)



BRACS Well ID 42889

Source: Lower Rio Grande Valley BRACS Study

BRACS Database: Aquifer properties table

TWDB WSC IWT BRACS Geophysical Log Search Task

1737 Close Form

BRACS Well ID

Location and Well IDs | Lithology and Stratigraphy | Digital Well Logs | TDS Analysis using Geophysical Well Logs | **Aquifer Test Information** | Water Quality | Static Water Level | Well Construction

Record Number: 0 State Well Number: 8850305 Source AT Data: TWDB Groundwater Database

Date Test	09/01/2005	Test Length	36	Depth Well	541
Pumping Rate	1476	Static Water Level	-22.85	Screen Top	364
Well Yield Method	Pumped	Pumping Water Level	-168.15	Screen Bottom	541
		Drawdown	145	D/R	D

Transmissivity: -99999 Units: [v] * If T is expressed as a range of values, then place larger value in [Transmissivity] field and smaller value in [Transmissivity 2] field

Transmissivity 2*: -99999

Hydraulic Conductivity: -99999 Units: [v]

Storage Coefficient: -99999

Specific Yield: -99999

Specific Capacity: 10.17 Units: gpm/ft

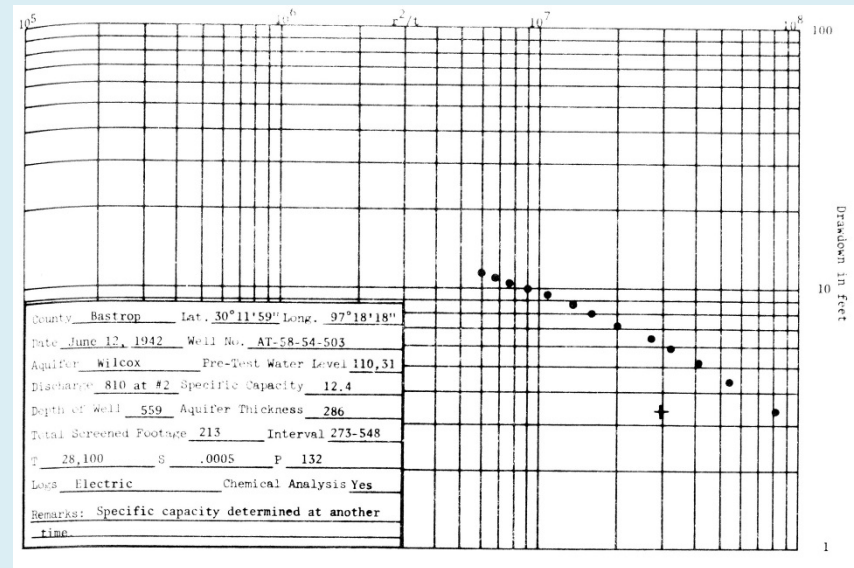
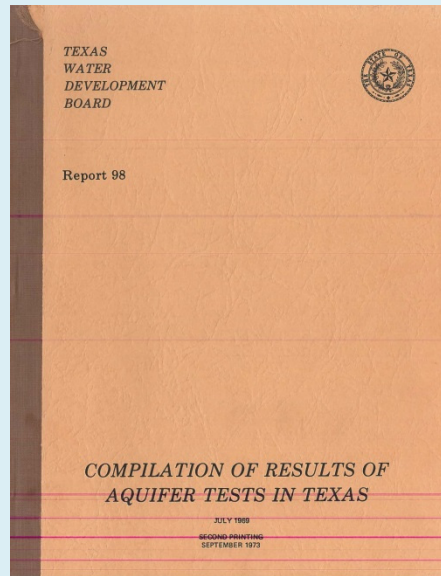
Remarks: [Empty Text Area]

Analysis Remarks: [Empty Text Area]

Report 98 Page No: [Empty Text Area]

Record: 14 1 of 2 No Filter Search

Link
aquifer
properties
to
the
source
of
information



frmBracsAT_DE

Well ID: 39245 | Owner: Univ. of Texas Cancer

BRACS Aquifer Test Data Entry

Record Number: 0 | State Well Number: 5854503 | Source AT Data: TWDB Published Reports

Date Test	06/12/1942	Test Length	0	Depth Well	559
Pumping Rate	810	Static Water Level	-110.31	Screen Top	273
Well Yield Method		Drawdown	-99999	D/R	
		Pumping Water Level		Screen Bottom	548

Transmissivity: 28100 (gpd/ft) | Transmissivity 2*: -99999 (Units)

Hydraulic Conductivity: 132 (gpd/ft2) | Units

Storage Coefficient: 0.0005

Specific Yield: -99999

Specific Capacity: -99999 (Units)

Remarks: [Empty]

Analysis Remarks: Test results only in TWDB files. Also R 109, Table 6, p. 30

Report 98 Page No: 63

Specific Capacity [Button]

* If T is expressed as a range of values, then place larger value in [Transmissivity] field and smaller value in [Transmissivity 2] field

BRACS Database: Project aquifer determination table

TWDB WSC IWT BRACS Aquifer Determination CCASR

State Well Number: BRACS Well ID: Well Owner: NORTH CAMERON REGIONAL WATER TREATMENT FACILITY

BRACS Aquifer Determination Code: Lower Rio Grande Valley BRACS Study

Aquifer: Aquifer (New): Remarks:

Depth Well: Depth Hole: Screen Top: Screen Bottom: Multiple Screens: ELEVATION:

<i>Chicot Aquifer</i> <input type="text" value="Yes"/>	<i>Beaumont Fm.</i>	B_T_D: <input type="text" value="0"/>	Caq_T_D: <input type="text" value="0"/>
		B_B_D: <input type="text" value="406"/>	
	<i>Lissie Fm.</i>	L_T_D: <input type="text" value="406"/>	
		L_B_D: <input type="text" value="732"/>	
	<i>Willis Fm.</i>	W_T_D: <input type="text" value="732"/>	
		W_B_D: <input type="text" value="1137"/>	Caq_B_D: <input type="text" value="1137"/>
<i>EvangelineA quifer</i> <input type="text" value="No"/>	<i>Upper Goliad Fm.</i>	UG_T_D: <input type="text" value="1137"/>	Eaq_T_D: <input type="text" value="1137"/>
		UG_B_D: <input type="text" value="2251"/>	
	<i>Lower Goliad Fm.</i>	LG_T_D: <input type="text" value="2251"/>	
		LG_B_D: <input type="text" value="3270"/>	
	<i>Upper Lagarto Fm.</i>	UL_T_D: <input type="text" value="3270"/>	
		UL_B_D: <input type="text" value="4080"/>	Eaq_B_D: <input type="text" value="4080"/>
<i>Burkeville Confining Unit</i> <input type="text" value="#####"/>	<i>Middle Lagarto Fm.</i>	ML_T_D: <input type="text" value="4080"/>	
		ML_B_D: <input type="text" value="4936"/>	
<i>Jasper Aquifer</i> <input type="text" value="No"/>	<i>Lower Lagarto Fm.</i>	LL_T_D: <input type="text" value="4936"/>	Jaq_T_D: <input type="text" value="4936"/>
		LL_B_D: <input type="text" value="5660"/>	
	<i>Oakville Fm.</i>	OK_T_D: <input type="text" value="5660"/>	
		OK_B_D: <input type="text" value="6906"/>	Jaq_B_D: <input type="text" value="6906"/>

- Compare wells completed in same aquifer
- Consistent evaluation of aquifer water quality and properties
- Many new wells do not have TWDB aquifer code
- Some wells have incorrect TWDB aquifer code

BRACS Database: Project net sand determination tables

TWDB WSC IWT BRACS Net Sand Determination

BRACS Well ID

Lower Rio Grande Valley BRACS Study Net Sand Gulf Coast Aquifer

Close Form

Net Sand Processing Table

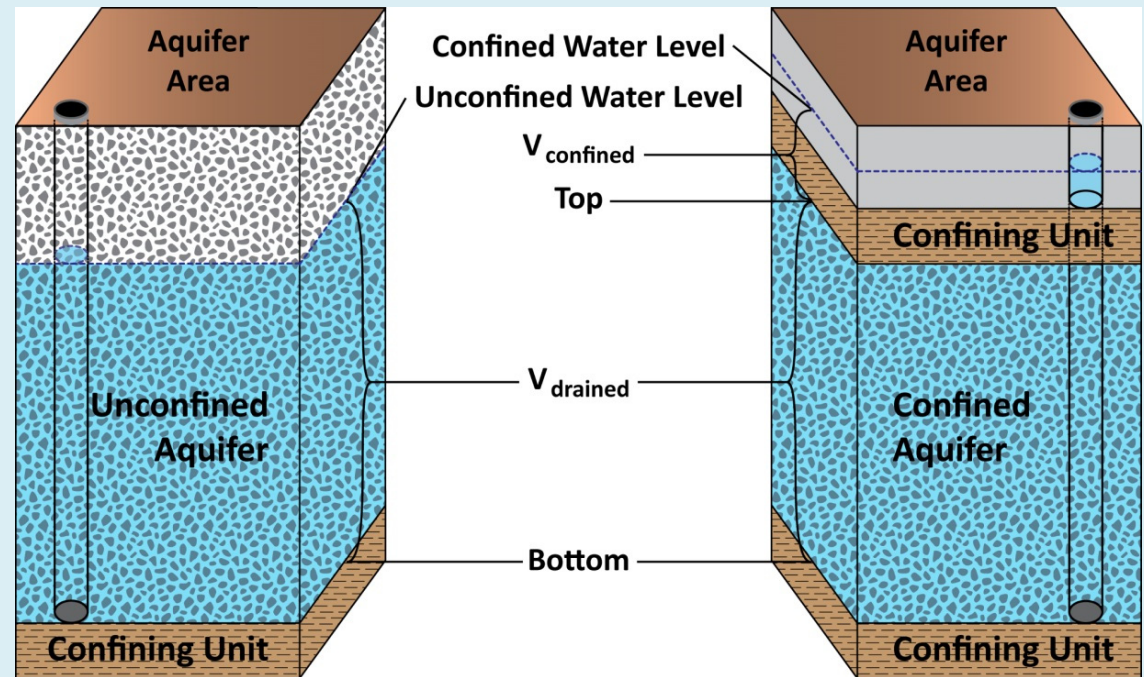
Record Number	Simplified Lithologic Description	Top Bottom Thickness	Sand %
23	Sand with Clay	65 105 40	0.65
25	Sand with Clay	125 175 50	0.65
27	Sand with Clay	191 205 14	0.65
28	Sand	205 215 10	1
29	Clay with Sand	215 285 70	0.35
30	Sand	285 349 64	1

Formation Net Sand	Formation Present Well Partial Penetration	Partial Geology Desc	Aquifer Net Sand Sand %	Aquifer Present Well Partial Penetration	Aquifer Determination Table
Chicot Aquifer					Depth Well <input type="text" value="601"/> B_T_D: <input type="text" value="0"/> Depth Hole <input type="text" value="600"/> B_B_D: <input type="text" value="406"/> Screen Top <input type="text" value="290"/> L_T_D: <input type="text" value="406"/> Screen Bottom <input type="text" value="531"/> L_B_D: <input type="text" value="732"/> W_T_D: <input type="text" value="732"/> W_B_D: <input type="text" value="1137"/>
Beaumont Fm	<input type="text" value="200"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="No"/>	<input type="text" value="Yes"/>	<input type="text" value="300"/> <input type="text" value="26"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>
Lissie Fm	<input type="text" value="100"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>	<input type="text" value="No"/>	<input type="text" value="0"/> <input type="text" value="0"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>
Willis Fm	<input type="text" value="0"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>	<input type="text" value="No"/>		
Evangeline Aquifer					UG_T_D: <input type="text" value="1137"/> UG_B_D: <input type="text" value="2251"/> LG_T_D: <input type="text" value="2251"/> LG_B_D: <input type="text" value="3270"/> UL_T_D: <input type="text" value="3270"/> UL_B_D: <input type="text" value="4080"/>
Upper Goliad Fm	<input type="text" value="0"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>	<input type="text" value="No"/>	<input type="text" value="0"/> <input type="text" value="0"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>
Lower Goliad Fm	<input type="text" value="0"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>	<input type="text" value="No"/>		
Upper Lagarto Fm	<input type="text" value="0"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>	<input type="text" value="No"/>		
Burkeville Confining Unit					ML_T_D: <input type="text" value="4080"/> ML_B_D: <input type="text" value="4936"/>
Middle Lagarto Fm	<input type="text" value="0"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>	<input type="text" value="No"/>		
Jasper Aquifer					LL_T_D: <input type="text" value="4936"/> LL_B_D: <input type="text" value="5660"/> OK_T_D: <input type="text" value="5660"/> OK_B_D: <input type="text" value="6906"/>
Lower Lagarto Fm	<input type="text" value="0"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>	<input type="text" value="No"/>	<input type="text" value="0"/> <input type="text" value="0"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>
Oakville Fm	<input type="text" value="0"/> <input type="text" value="-99999"/>	<input type="text" value="Yes"/> <input type="text" value="Yes"/>	<input type="text" value="No"/>		

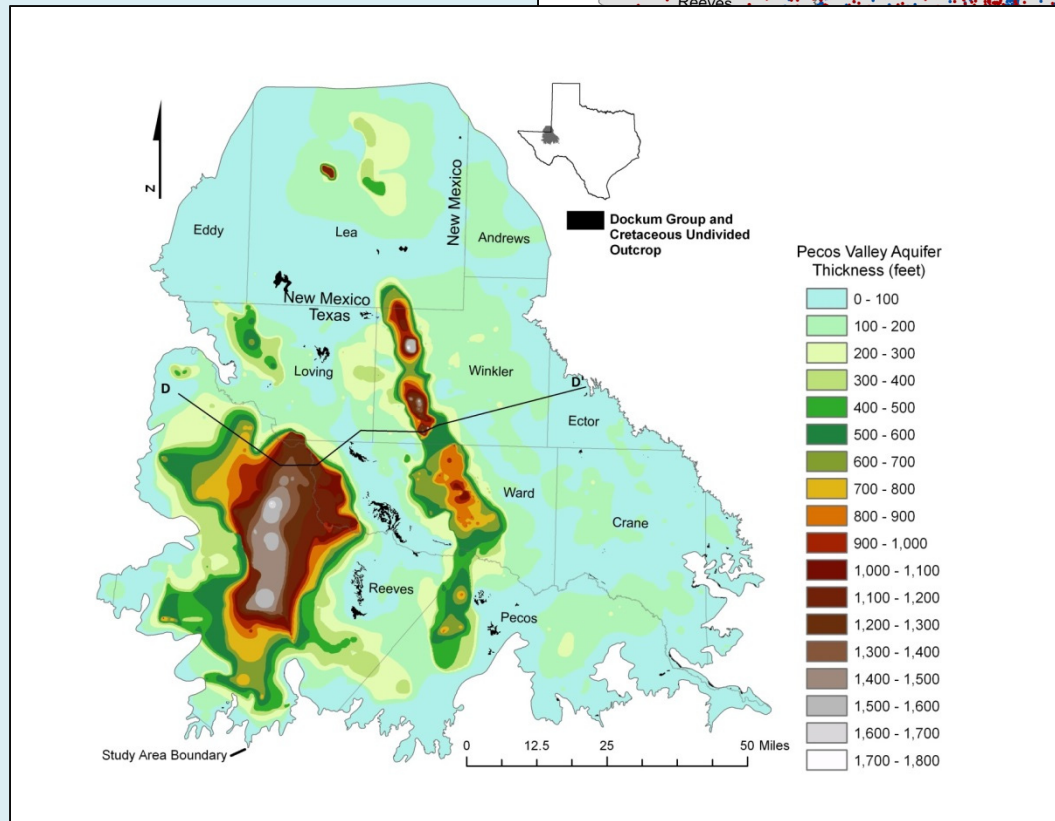
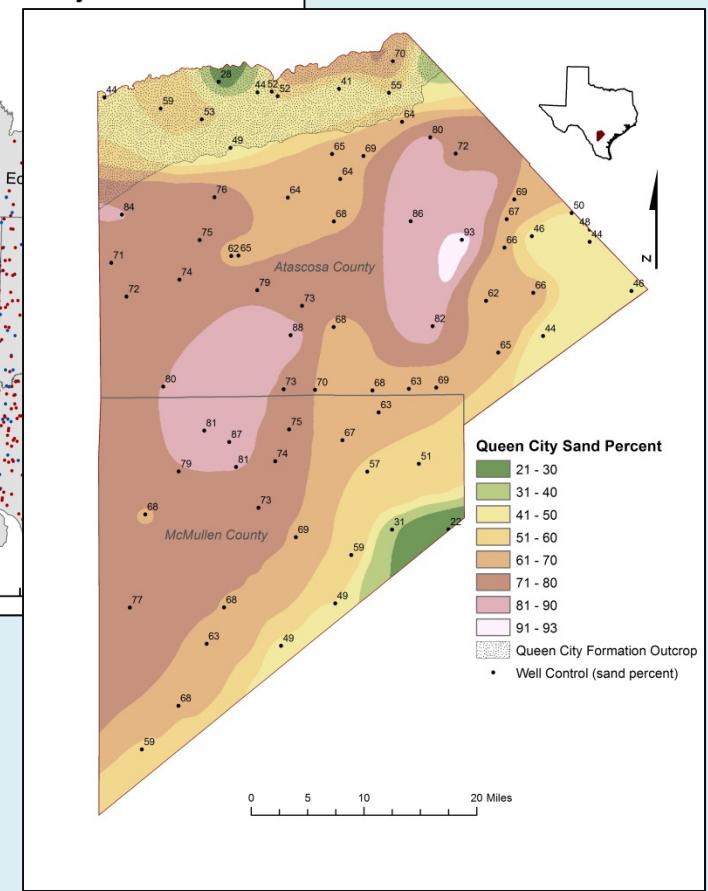
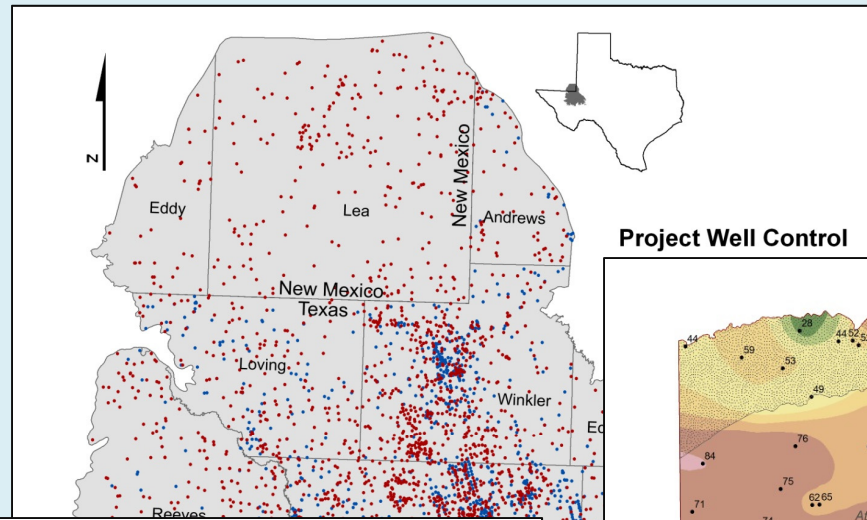
Estimated Groundwater Volumes

Five TDS Ranges (mg/L):

- Fresh 0-999
- Slightly Saline 1,000 -2,999
- Moderately Saline 3,000 – 9,999
- Very Saline 10,000 – 35,000
- Brine > 35,000



BRACS GIS



Who are we?

Texas Water Development Board

Why do we study brackish aquifers?

**Groundwater Desalination is part of the
Texas Water Plan**

How do we study brackish aquifers?

Well Logs, Databases, Geospatial Data

www.twdb.texas.gov

Conservation and Innovative Water Technologies Division

www.twdb.texas.gov

Sanjeev Kalaswad, Ph.D., P.G. Director

sanjeev.kalaswad@twdb.texas.gov

(512) 936-0838

Erika Mancha, EIT, Team Lead

erika.mancha@twdb.texas.gov

(512) 463-7932

Andrea Croskrey

andrea.croskrey@twdb.texas.gov

(512) 463-2865

John E. Meyer, P.G.

john.meyer@twdb.texas.gov

(512) 463-8010

Nathaniel van Oort

nathaniel.vanoort@twdb.texas.gov

(512) 463-3870

Matthew Webb

matthew.webb@twdb.texas.gov

(512) 463-6929