

# Status of the TWDB's Brackish Aquifer Mapping Program

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Texas Groundwater Protection Committee

April 20, 2016

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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.

## Primary Responsibilities:

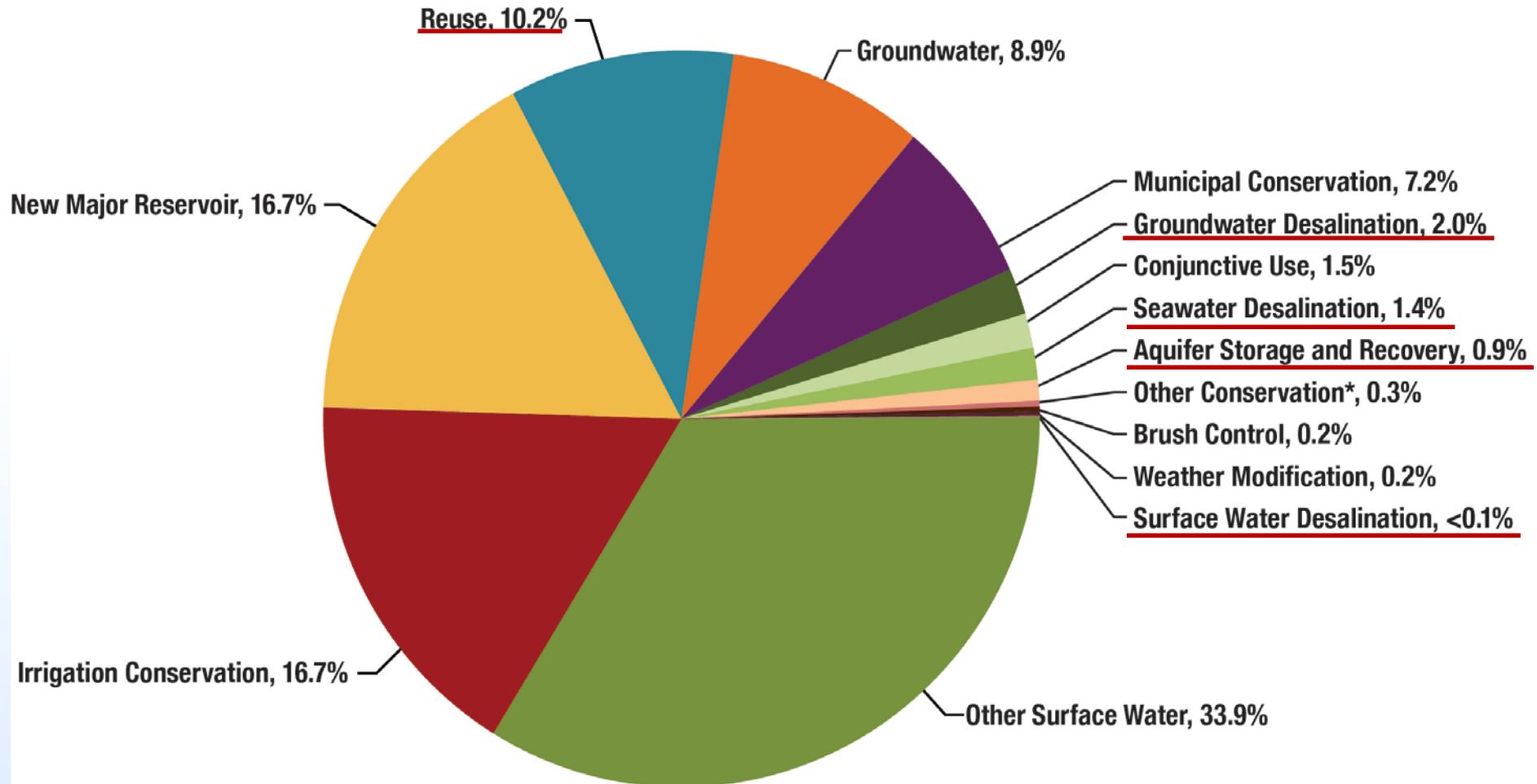
- State Water Plan
- Water Funds
- Water Resource Data
- Outreach



# Innovative Water Technologies

- 💧 Aquifer Storage & Recovery
- 💧 BRACS
- 💧 Desalination
- 💧 Rainwater Harvesting
- 💧 Water Reuse

# Recommended Water Management Strategies by 2060



# BRACS

## Brackish Resources Aquifer Characterization System

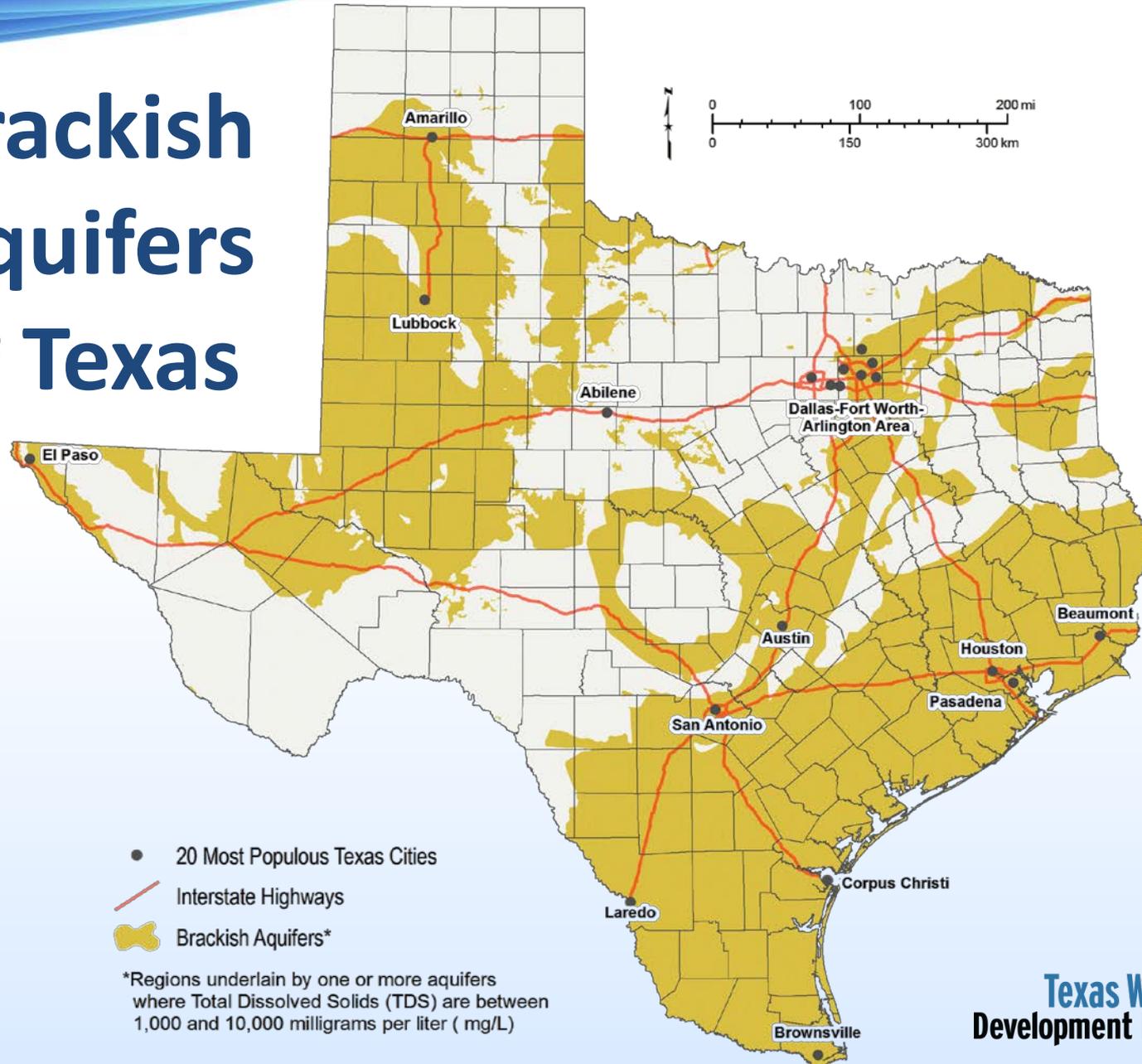
- Collect data
- Map and characterize existing brackish aquifers
- Map key water quality parameters
- Estimate saturated zones using net sand analysis
- Chemical parameters important to desalination
- Provide data to stakeholders

# Brackish Groundwater

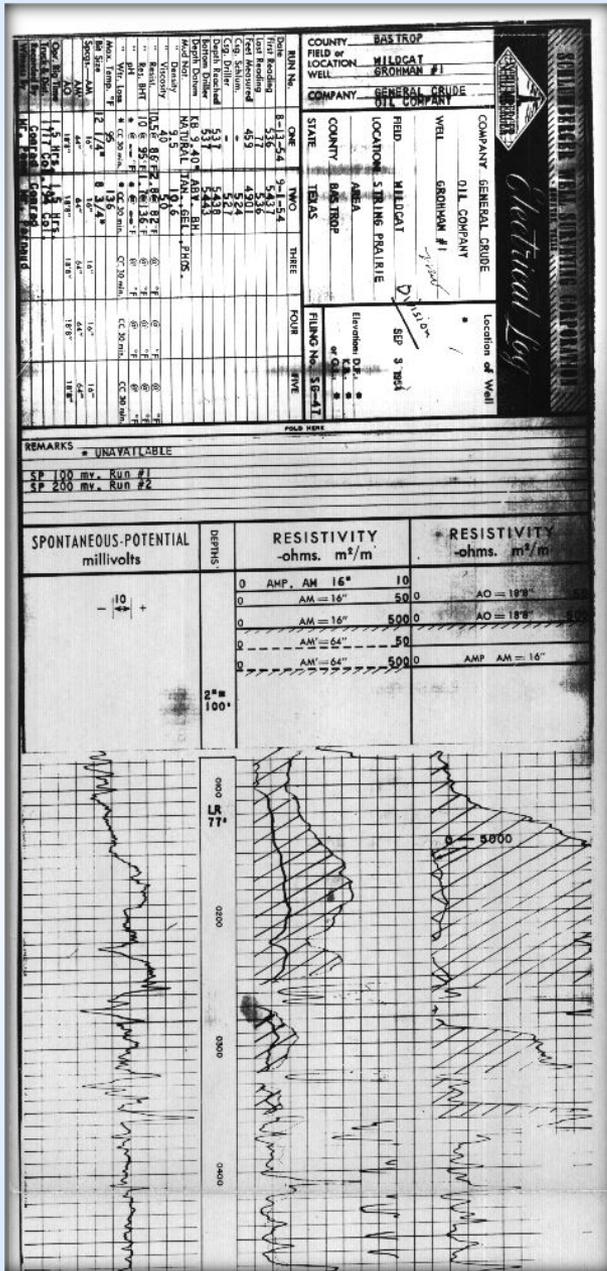
Saltier than fresh water, less salty than seawater

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	← Drinking Water Limit
Moderately Saline	MS	3,000 to 10,000	← Major/Minor Aquifer (Texas) Mapped Limit
Very Saline	VS	10,000 to 35,000	
Brine	BR	Greater than 35,000	← Seawater

# Brackish Aquifers of Texas



# Digital geophysical and water well logs



4089006D

Please use black ink.

Attention Owner: Confidentiality  
 Privilege Notice on Reverse Side  
 Gonzales County Water Supply Corp.

State of Texas  
**WELL REPORT**  
 Texas Water Well Drillers Advisory Council  
 P.O. Box 13087  
 Austin, TX 78711-3087  
 512-239-0530

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

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

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

4) PROPOSED USE (Check):  
 Industrial  Irrigation  Injection  Public Supply  De-watering  Testwell  
 If Public Supply well, were plans submitted to the TNFCC?  Yes  No

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

6) WELL LOG:  
 Date Drilling: Started 10-24-1996 Completed 11-10-1996

From (ft.)	To (ft.)	DIAMETER OF HOLE	
		Dia. (in.)	From (ft.) To (ft.)
0	5	18 1/2	Surface 748
5	68	11 1/2	748 830

7) DRILLING METHOD (Check):  
 Open Hole  Straight Wall  
 Underreamed  Gravel Packed  Other

8) Borehole Completion (Check):  
 Underreamed  Gravel Packed  Other

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
12 7/8	New	Steel	4	748	
8 5/8	New	Steel	702	750	
8 5/8	New	Screen Mfg.	750	820	

9) 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

10) SURFACE COMPLETION  
 Specified Surface Slab installed [Rule 338.44(2)(A)]  
 Specified Steel Sleeve installed [Rule 338.44(3)(A)]  
 Pile Adapter Used [Rule 338.44(3)(B)]  
 Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:  
 Static level 65 ft. below land surface Date 12-23-96  
 Artesian flow \_\_\_\_\_ gpm. Date \_\_\_\_\_

12) PACKERS:  
 N/A

13) TYPE PUMP: N/A  
 Turbine  Jet  Submersible  Cylinder  
 Other

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

15) 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  
 (City) (State) (Zip)

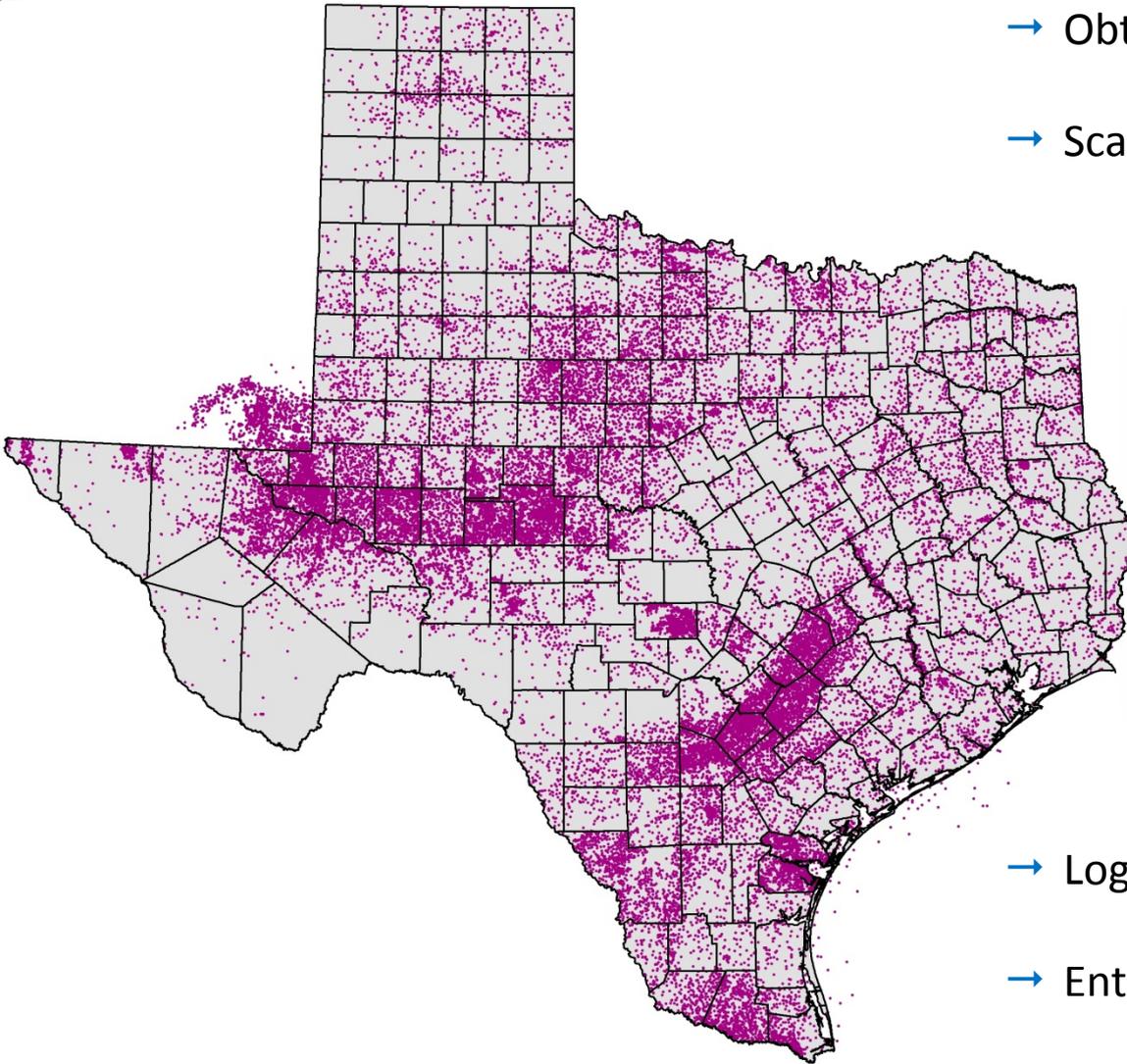
(Signed) Richard R. Banters (Licensed Well Driller) (Signed) \_\_\_\_\_ (Registered Driller Trainee)

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

IRCC-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 > 53,000 wells*

# TWDB Water Data Interactive website, showing BRACS wells and geophysical well log

<http://www2.twdb.texas.gov/apps/waterdatainteractive/groundwaterdataviewer#>

The screenshot displays the TWDB Water Data Interactive website interface. The top navigation bar includes "Groundwater", "Layers", "Base Maps", "Help", "Disclaimer", and the "Texas Water Development Board" logo. A search bar is located in the top left. The main map area shows a distribution of wells, with well 386 highlighted. A pop-up window titled "Brackish Groundwater" provides details for well 386:

**Well Id:** 386 - Logs

**Geophysical Well Logs for Well Id: 386**

Log Id	File Type	File Size
165	tif	18.6 MB

**Data Source:** ULUTS Digital Geophysical Logs

**API Number:** 4249510699

**County:** WINKLER

**Well Depth (ft):** 3335

**Total Depth (ft):** 3335

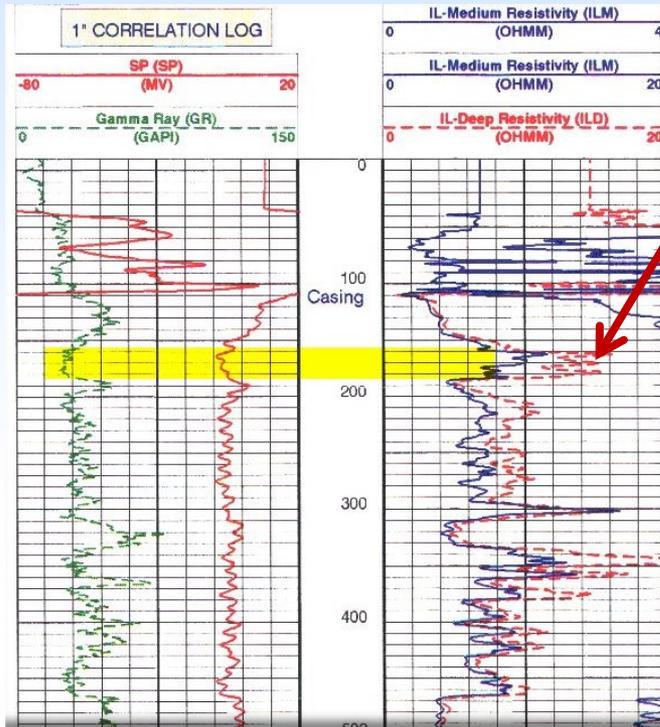
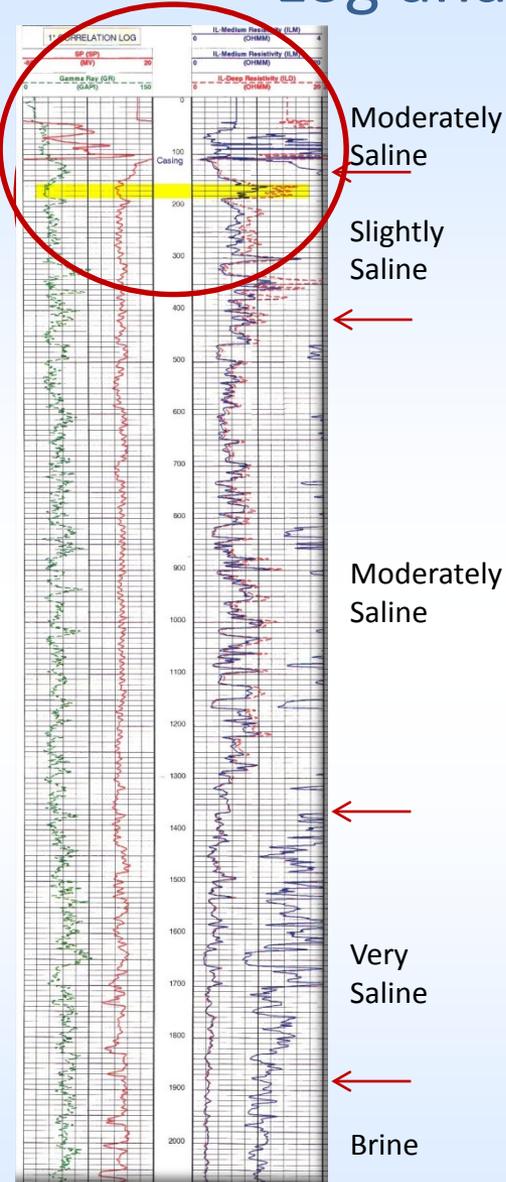
**Drill Date:** 12/20/1965

For Geophysical Well Log assistance contact: [BRACS@twdb.texas.gov](mailto:BRACS@twdb.texas.gov)

The right side of the image shows a geophysical well log for well 386, titled "Schlumberger BlueView". The log displays two curves: "GAMMA RAY" and "NEUTRON", both in API UNITS. The vertical axis represents depth in feet, ranging from 0 to 3000. The log shows a "CR Zone" at the top, a "Neutron Zero" line, and a "Field Level" indicated by a horizontal line at approximately 1120 API units. The log is displayed in a window titled "Schlumberger BlueView" with a file path of "C:\Users\jmeyer\Downloads\4249510699.tif".

Image Properties: 9.02 W x 191.76 H (in) : 2705 W x 57528 H (dots) : 300 DPI : 1 bit color : X=0, Y=1008

# Log analysis to interpret Total Dissolved Solids



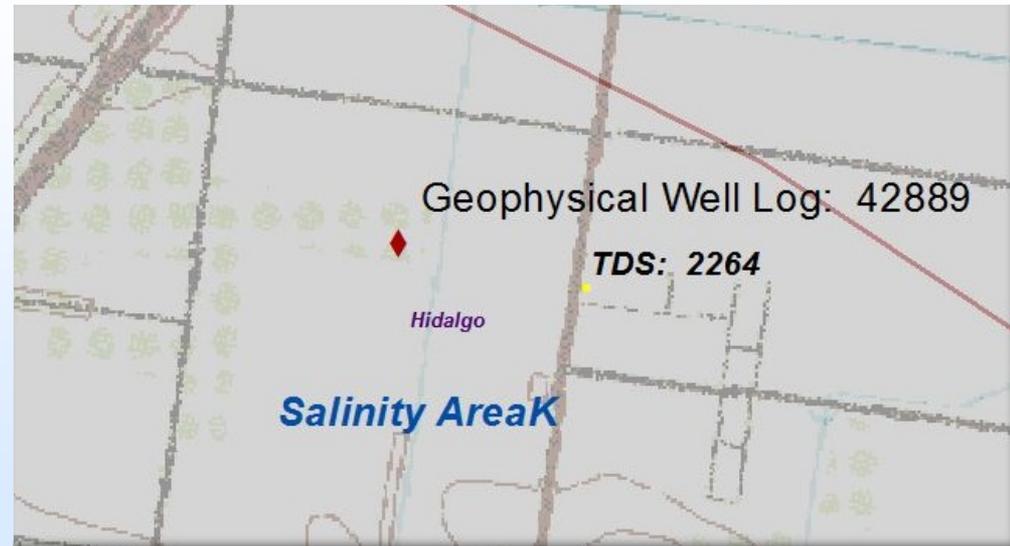
At 160 ft = 15 ohm-meter

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 Public Database

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**

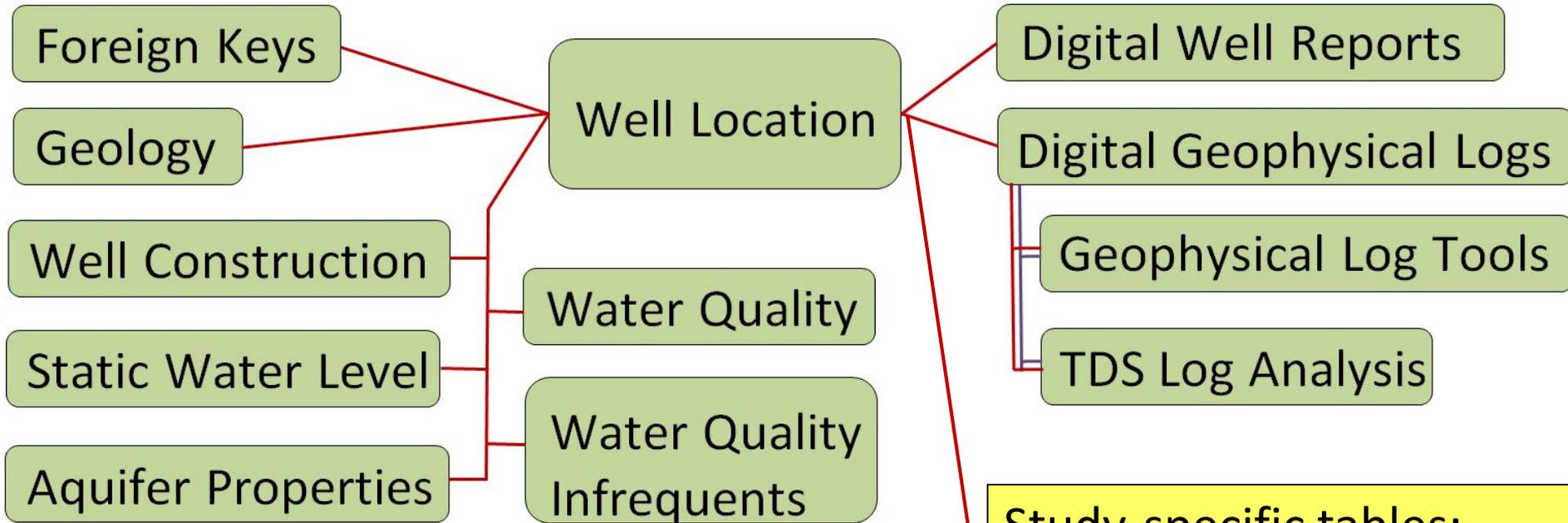
- Gulf Coast Lower Rio Grande Valley Study: Aquifer Determination Form
- Gulf Coast Lower Rio Grande Valley Study: Net Sand Form
- Gulf Coast Lower Rio Grande Valley Study: Salinity Zone Form

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

### 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

## Study-specific tables:

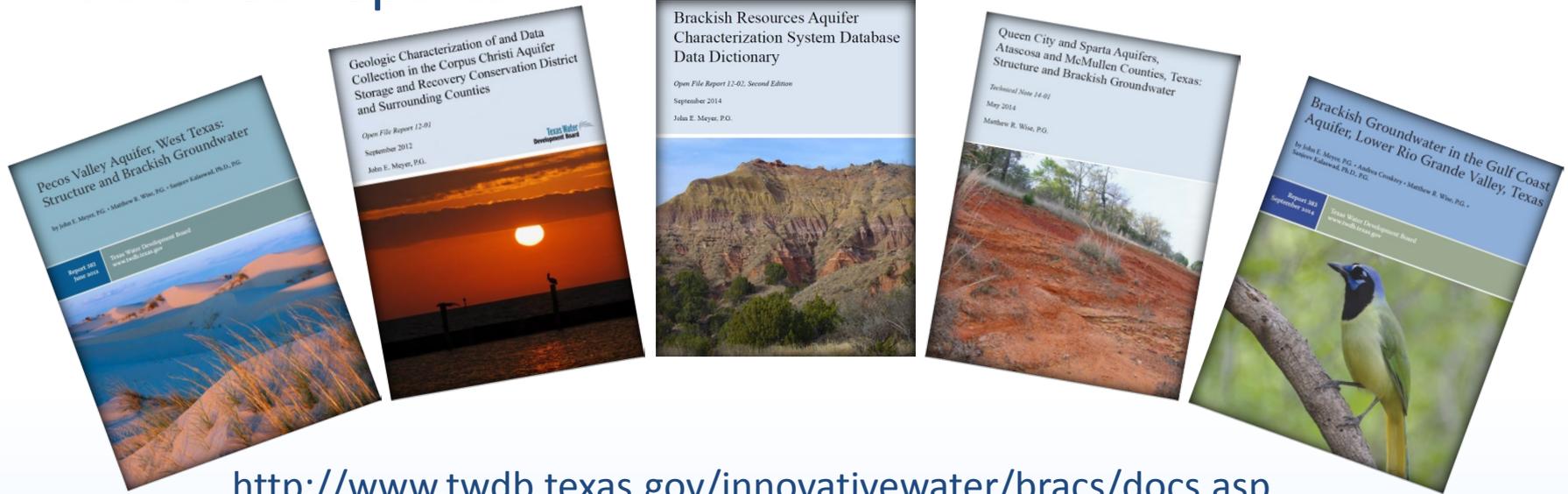
Stratigraphic picks  
Aquifer determination  
Net sand analysis  
Master water quality

# BRACS Data

- GIS data
  - Locate geophysical logs
  - Lateral extent of brackish aquifers
    - Lithology
    - Water quality parameters
    - Salinity Zones
  - Rasters and shapefiles
- Published Reports

# BRACS Studies

- Published reports



<http://www.twdb.texas.gov/innovativewater/bracs/docs.asp>

- GIS Datasets
- BRACS Database
- Well logs

The real value is in the data:

Stakeholders can use this to evaluate potential groundwater exploration areas.

# House Bill 30 (84<sup>th</sup> Texas Legislature, 2015)

- Map brackish groundwater production zones (BGPZ) separated by hydrogeologic barriers from fresh water aquifers
- Estimate 30- and 50-year production without causing significant impact to water quality or water quantity in fresh water aquifers
- Four aquifers must be completed by December 1, 2016 – contracted work
- Three other contracted studies - must be completed by August 31, 2017
- Remaining aquifers in the state will be mapped by December 1, 2022
- Stakeholder involvement; BGPZ approved by TWDB Board
- TWDB staff increased to 7.5 FTE to map aquifers and manage contracts
- \$2,000,000 appropriated to TWDB from General Revenue Fund
- Include status report in every biennial desalination report to Texas Legislature (next report due December 1, 2016)



# TWDB Website for HB 30 activities

<http://www.twdb.texas.gov/innovativewater/bracs/HB30.asp>

- History of HB 30 implementation
- Copy of HB 30 Legislation
- Stakeholder meeting video
- Copies of written stakeholder comments
- Contract documents
- Notice of future stakeholder meetings
- Links to current and completed contracted studies

# BRACS Studies

Brackish  
Resources  
Aquifer  
Characterization  
System

## House Bill 30 Excluded Aquifers

Edwards BFZ

## House Bill 30 Excluded GCDs

- Barton Springs/Edwards Aquifer CD
- Edwards Aquifer Authority
- Fort Bend Subsidence District
- Harris-Galveston Coastal Subsidence District

## Current

- 1. Aquifers of the upper coastal plain - Central
- 2. Lipan Aquifer

## Completed

- A. Pecos Valley Aquifer (Report 382)
- B. Gulf Coast Aquifer (Corpus Christi) (Report 12-01)
- C. Gulf Coast Aquifer (Lower Rio Grande Valley) (Report 383)
- D. Queen City-Sparta aquifers (Report 14-01)

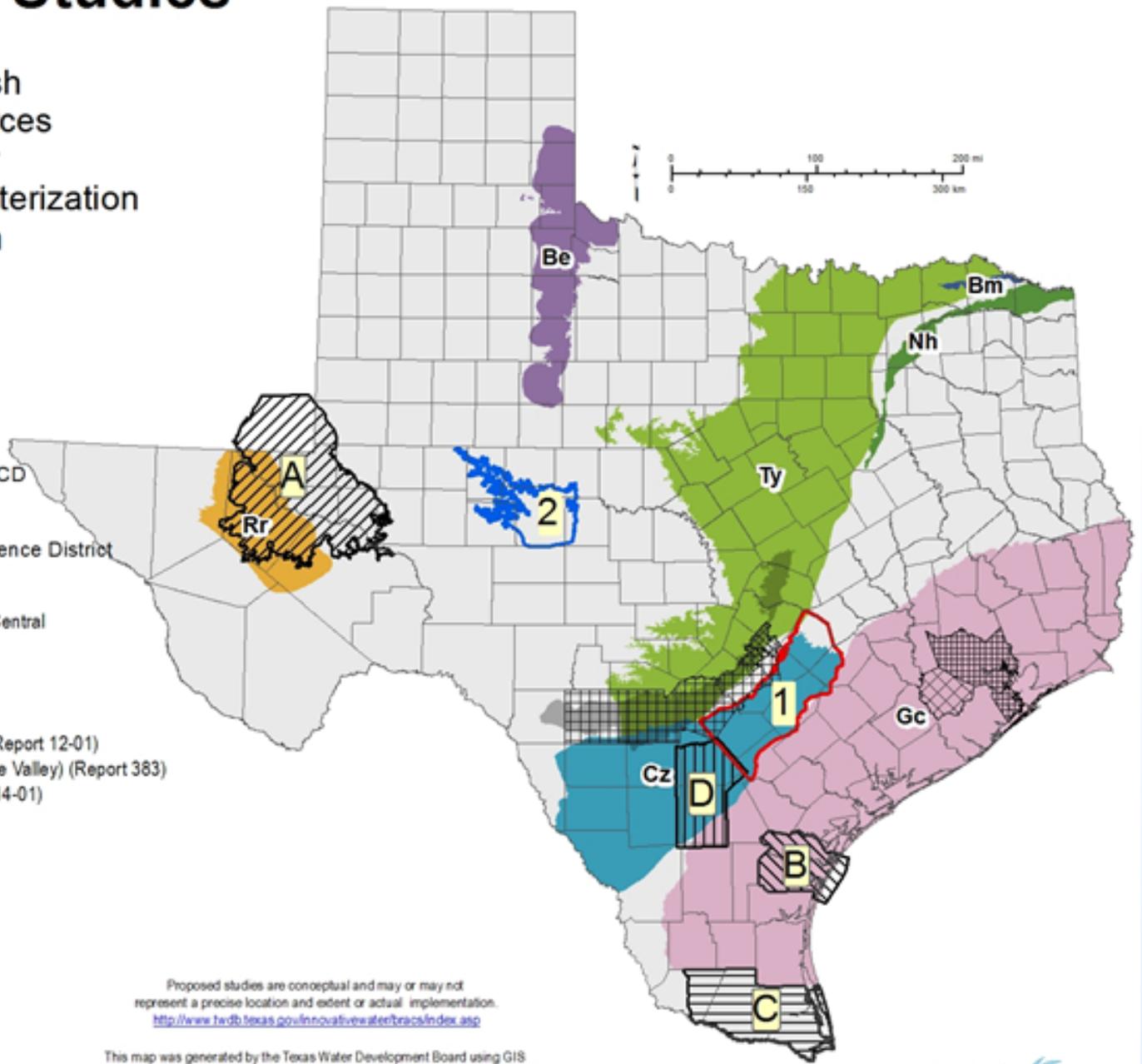
## House Bill 30

### 2016

- Be. Blaine
- Cz. Carrizo
- Gc. Gulf Coast
- Rr. Rustler

### 2017

- Bm. Blossom
- Nh. Nacatoch
- Ty. Trinity



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.

# Questions

## John Meyer

Geologist

Innovative Water Technologies

Texas Water Development Board

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(512) 463-8010

<http://www.twdb.texas.gov/innovativewater/index.asp>