Structural Cross-section of Strike Line A

Salinity class and lithology interpretations for the Yegua, Sparta, Queen City, Carrizo, and Wilcox aquifers, Central Texas

Texas Water Development Board
Report 385
Plate 1

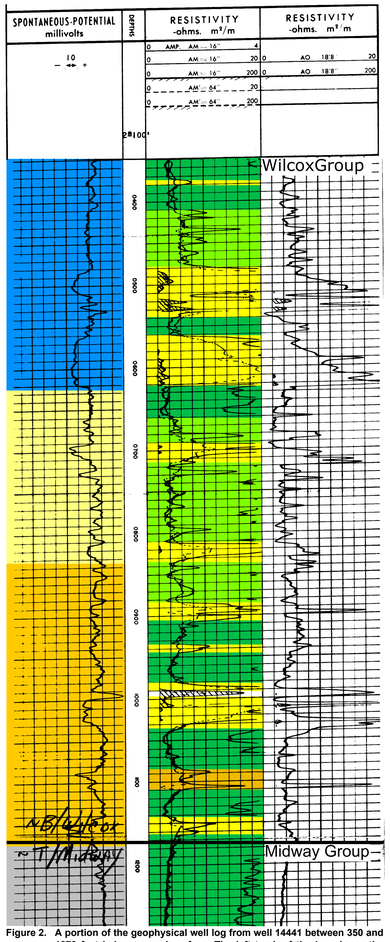

Figure 2. A portion of the geophysical well log from well 14441 between 350 and 1270 feet below ground surface. The left track of the log shows the Spontaneous Potential curve with superimposed estimated salinity class. The center track shows depth below ground surface in units of feet. The right track shows the shallow and deep resistivity curves (solid and dashed lines, respectively) with superimposed lithology interpretations. The far right track shows the very deep resistivity curve.

Explanation of Figures 1 and 2

Example well label
Well Owner or Well Number
State Well Number (SWN ##-##-###) or BRACS ID (######)

Approximate ground surface
Formation top between adjacent wells
Formation top between non-adjacent wells or estimated surface

Interpreted salinity class
- Fresh (0-999 mg/L TDS)
- Slightly saline (1,000-2,999 mg/L TDS)
- Moderately saline (3,000-9,999 mg/L TDS)
- TDS analysis not performed

Measured water quality
- Fresh (0-999 mg/L TDS); screened interval known
- Slightly saline (1,000-2,999 mg/L TDS); screened interval known
- Moderately saline (3,000-9,999 mg/L TDS); screened interval unknown

Lithology interpretation
- Sand
- Sand with clay
- Clay with sand
- Clay
- Coal
- Unknown
- Log interpretation not conducted
- No log available for interpretation

Total Dissolved Solids (TDS) are measured in milligrams per liter (mg/L)

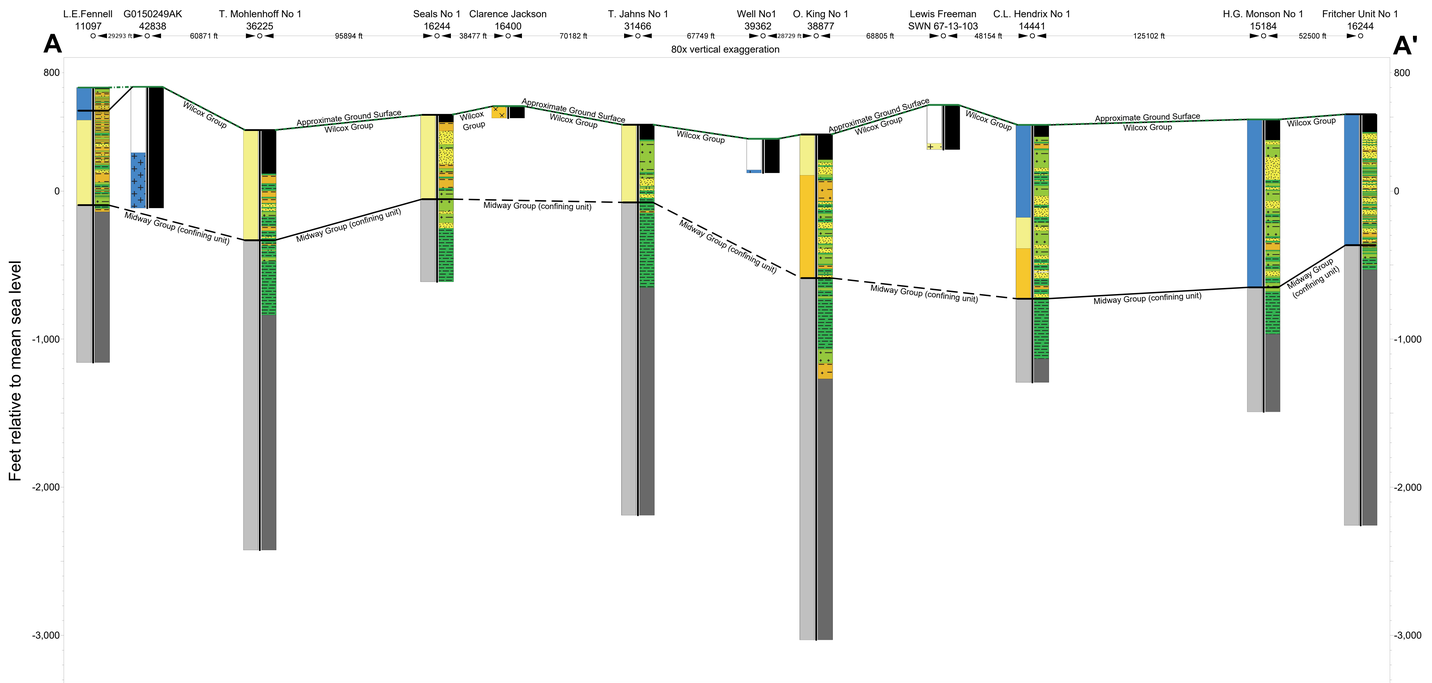

Figure 1. Strike-oriented cross-section A to A' shows estimated salinity class, lithologic interpretations, and stratigraphic correlations.

The aquifers mapped by the Brackish Resources Aquifer Characterization System (BRACS) team at the Texas Water Development Board (TWDB) in *Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas* (Meyer and others 2020), are the Wilcox, Carrizo, Queen City, Sparta, and Yegua aquifers (listed oldest to youngest). The team mapped these aquifers in all or parts of 14 counties (Atascosa, Bastrop, Bexar, Caldwell, Dewitt, Fayette, Gonzales, Guadalupe, Karnes, Lavaca, Lee, Live Oak, Williamson, and Wilson counties), five regional water planning areas (G, K, L, P, and N), and nine groundwater conservation districts.

BRACS studies provide Texans with an estimate of the location and quantity of brackish groundwater, asgroundwater salinity is an important parameter for desalination. Groundwater salinity classes are mapped as fresh (0-999 mg/L TDS), slightly saline (1,000-2,999 mg/L TDS), moderately saline (3,000-9,999 mg/L TDS), very saline (10,000-34,999 mg/L TDS), brine (greater than or equal to 35,000 mg/L TDS), or some combination of these classes (Winslow and Kister, 1956). The BRACS team accomplishes this goal by:

- mapping a stratigraphic framework from geophysical well logs,
- estimating saturated pore space using lithology interpreted from geophysical well logs and static water level,
- calculating total dissolved solids from geophysical well logs where no measured water quality samples exist,
- delineating the extent of salinity classes based on the measured and calculated total dissolved solids, and
- calculating an estimate of in place groundwater volume per aquifer salinity class.

For *Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas*, geophysical well logs were used to make 4,652 stratigraphic picks and 5,139 groundwater salinity calculations. More than 2,000 wells with geophysical well logs or driller's descriptions assigned lithologic intervals (Figure 2). Data mining and aquifer determination yielded 3,862 measured water qualitysamples. All this data is interrelated and provided the foundation to map and characterize the groundwater of the study area.

GIS datasets from this study, for example formation surface elevation rasters and net sand point value shapefiles, can be downloaded from the Texas Water Development Board's website: http://www.twdb.texas.gov/innovativewater/bracs/studies/UCP/index.asp.

In addition to the study report and GIS datasets, stratigraphic, lithologic, and salinity interpretations are saved in the BRACS Database. It may be downloaded with an accompanying data dictionary: http://www.twdb.texas.gov/innovativewater/bracs/database.asp.

We constructed nine regional cross-sections, six strike-oriented and three dip-oriented (Figure 3), to illustrate the stratigraphy, lithology, and salinity interpretations for selected wells in the project. S*tructural cross-section of Strike Line A* (Figure 1) was constructed from *Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas* data and interpretations stored in the BRACS Database. Each well on the line is labeled withthe owner's name and either the BRACS Database well ID (5 digit, auto-assigned number) or the Groundwater Database State Well Number (SWN ##-##-###). Well intervals are displayed in feet relative to mean sea level with a vertical exaggeration of 80x. An approximate ground surface is shown for illustrative purposes.

This strike-oriented line was selected to display the complexity of groundwater salinity class mapping in the Wilcox Aquifer outcrop. Starting at A and going to A', the first well (11097) displays a shallow and short interval of fresh groundwater on top of mostly slightly saline groundwater. This interpretation is based on total dissolved solid estimates calculated from geophysical log values. The next well in the cross-section (42838) did not have a geophysical well log but did have a measured water quality sample. Based on the total dissolved solids of that measured groundwater quality sample, the salinity class interval was assigned as fresh. However, the screen interval of the well characterizes less than half of the vertical extent of the Wilcox Aquifer. Therefore, the fresh salinity class assigned to this screen interval represents the mixture of groundwater in this segment of the aquifer and leaves the salinity class of the remaining cased segment of the aquifer unknown. As you progress northeast along the line towards A', notice how salinity class intervals assigned to the screen interval of measured water quality samples differ from the salinity class intervals interpreted from geophysical well logs. The measured water quality samples only represent mixed waters from a discrete section of the aquifer whereas stacked salinity classes can be interpreted from geophysical well logs. Also note how the salinity profile of the Wilcox Aquifer changes vertically across the cross-section. Some wells have multiple stacked salinity classes while others are represented by one class. Finally, the Wilcox Aquifer outcrop is freshest in the northeastern portion of the cross-section. The Simsboro Formation, a regionally limited subset of the Wilcox Group with high transmissivity, is present in this area.

Additional information and cross-sections from *Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas* (Meyer and others, 2020) are available to download from the study's webpage.

References

Meyer, J.E., Croskrey, A.D., Suydam, A.K., and van Oort, N., 2020, Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas: Texas Water Development Board Report No 385, 278 p. and 9 plates.

TWDB (Texas Water Development Board), 2019a, BRACS Database: Texas Water Development Board.

TWDB (Texas Water Development Board), 2019b, Groundwater Database: Texas Water Development Board.

Winslow, A.G., and Kister, L.R., 1956, Saline-water resources of Texas: U.S. Geological Survey Water-Supply Paper 1365, 105 p.

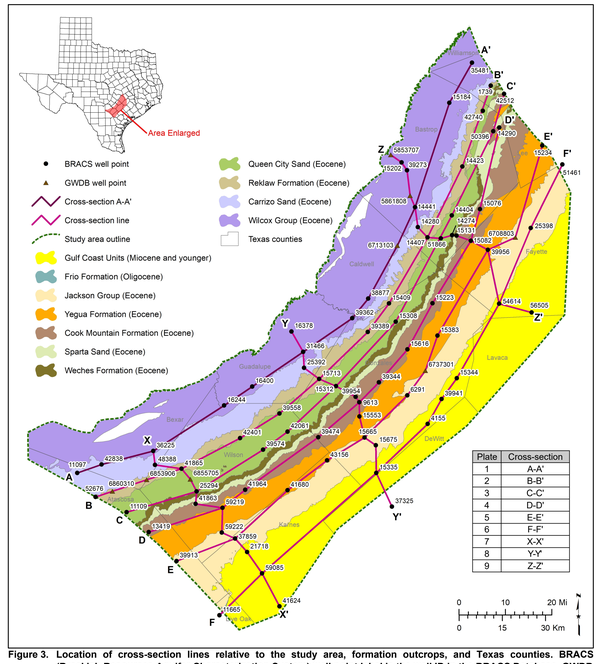

Figure 3. Location of cross-section lines relative to the study area, formation outcrops, and Texas counties. BRACS (Brackish Resources Aquifer Characterization System) well point label is the well ID in the BRACS Database. GWDB (Groundwater Database) well point label is the state well number in the GWDB Database.

Geoscientist Seal

The following contents of this report (including figures, tables, and plates) document the work of the following licensed Texas geoscientists:

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Ms. Suydam interpreted stratigraphy, lithology, andtotal dissolved solids from geophysical well logs, interpolated net sand GIS rasters, delineated salinity classes, calculated groundwater volumes, created report figures, and prepared cross-sections. Ms. Suydam completed this work as a G.I.T. under the direct supervision of Mr. Meyer and Ms. Croskrey. The seal appearing on this document was authorized on December 28, 2020.

Alysa Suydam

Nathanial van Oort under the direct supervision of Mr. Meyer and Ms. Croskrey, collected well information, interpreted stratigraphy and lithology from geophysical well logs, prepared stratigraphic surface GIS rasters, and prepared report figures.