

Structural Cross-section of Strike Line D

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

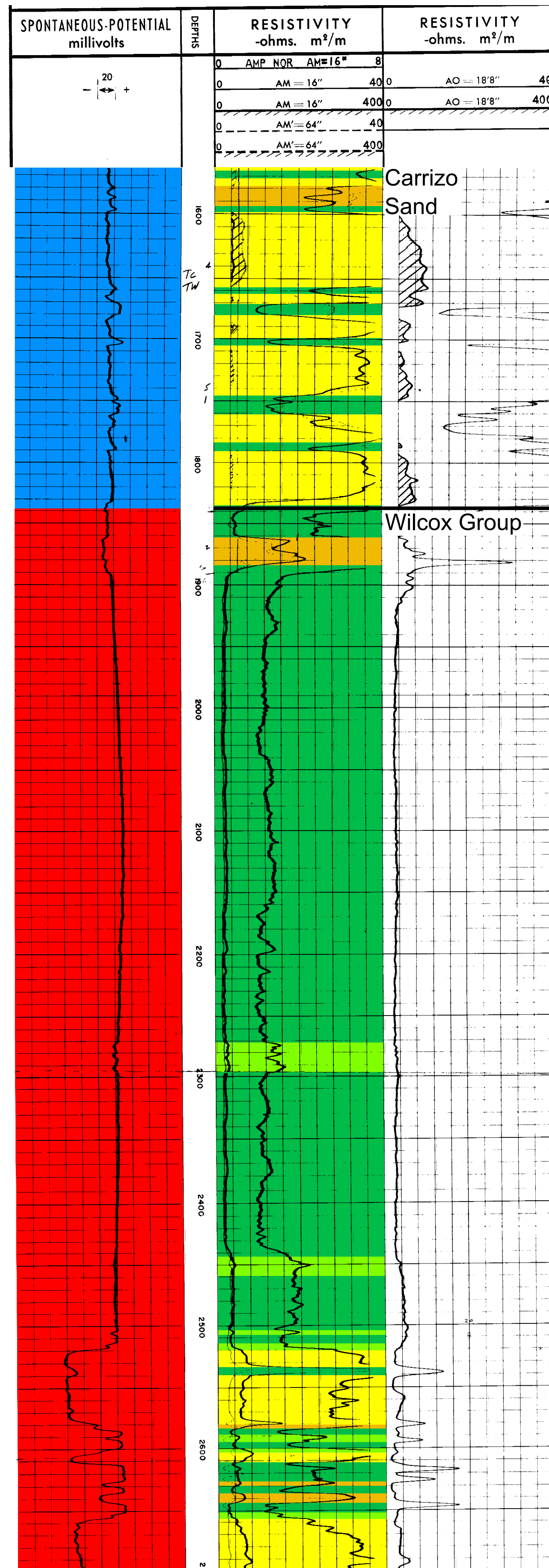


Figure 2. A portion of the geophysical well log from well 15223 between 1570 and 2700 feet below ground surface. The left track of the log shows the Spontaneous Potential curve with superimposed estimated salinity class. The center track shows depth below ground surface in units of feet. The right track 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)
 Very saline (10,000-34,999 mg/L TDS)
 TDS analysis not performed

Measured water quality
 Fresh (0-999 mg/L TDS); screened interval known

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)

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, as groundwater 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 quality samples. 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>.

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.

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. *Structural cross-section of Strike Line D* (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 with the 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 highlight groundwater salinity class mapping in the Sparta Aquifer, which is mostly brackish even near outcrop. We did not observe any vertical groundwater salinity class variations within the Sparta Aquifer, likely due to its lithologic nature. The Sparta Formation in the study area is primarily composed of one sand body, rather than multiple sand packages, which is apparent in Strike Line D.

Some highlights of the older aquifers on this strike line include the variable groundwater class mapping of the Queen City Aquifer, even downdip. Starting at D, the Queen City Formation displays a single interval of brackish groundwater, but well 9613 display three intervals of brackish groundwater. As you progress to D', mapped fresh Queen City Aquifer groundwater is introduced, and vertical variations in groundwater classifications persist.

The Carrizo Aquifer is mapped as mostly fresh and slightly

slightly saline, except in well 15616, where it is adjacent to the Yoakum Canyon. The presence of the Yoakum Canyon appears to be affecting water quality in the Wilcox Aquifer as well. The Yoakum Canyon is a shale dominant feature in the upper third to half of the Wilcox Group from Bastrop to Lavaca counties. Since it is a clay rich feature, it can act as a hydrologic barrier. Groundwater salinity class is mapped as mostly brackish in the Wilcox Aquifer, except in wells 15223 and 15616. Well 15223 is located within the Yoakum Canyon and is interpreted to have very saline groundwater. Well 15616 is adjacent to the Yoakum Canyon and is interpreted to have both moderately and very saline groundwater.

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.

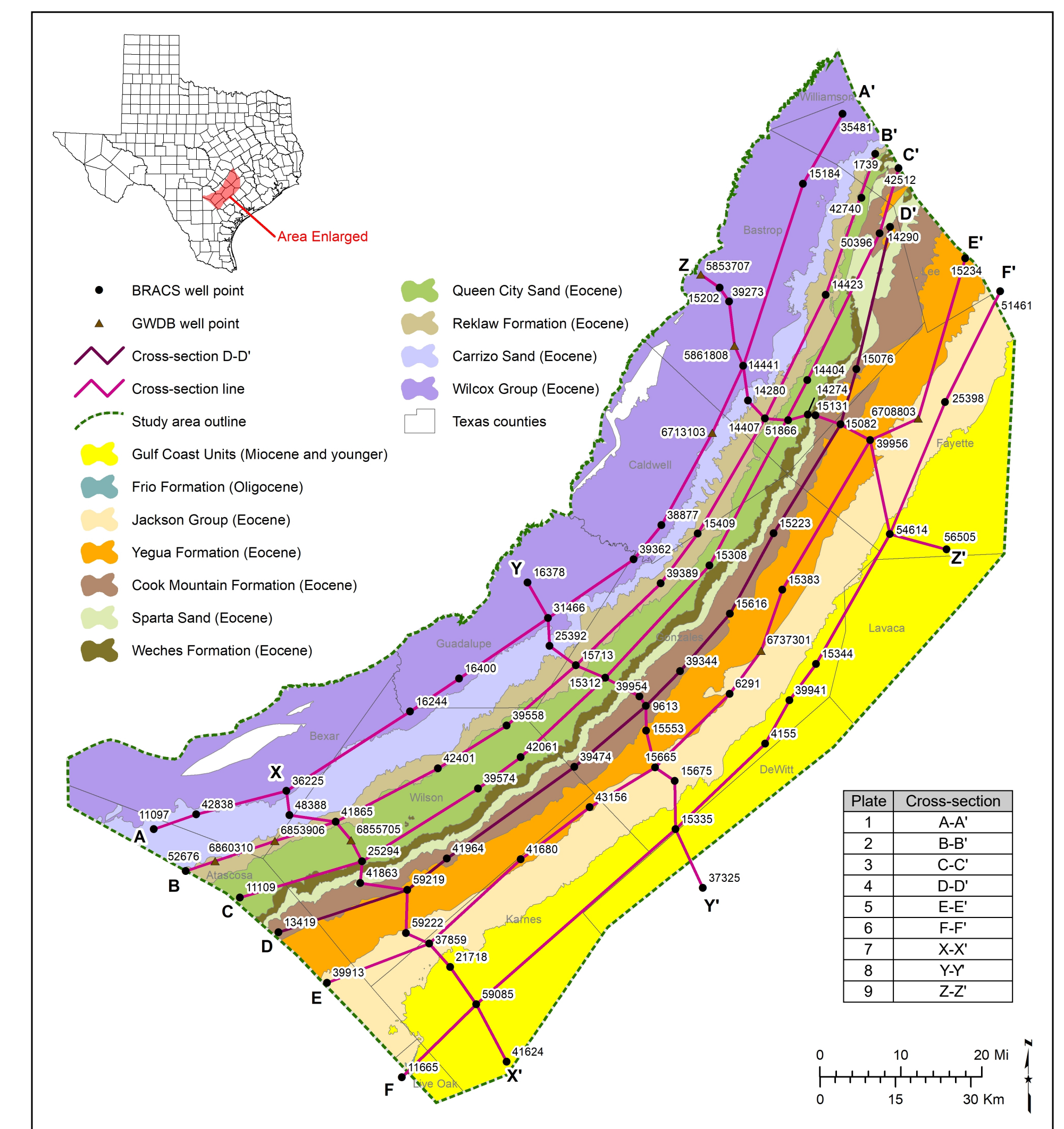
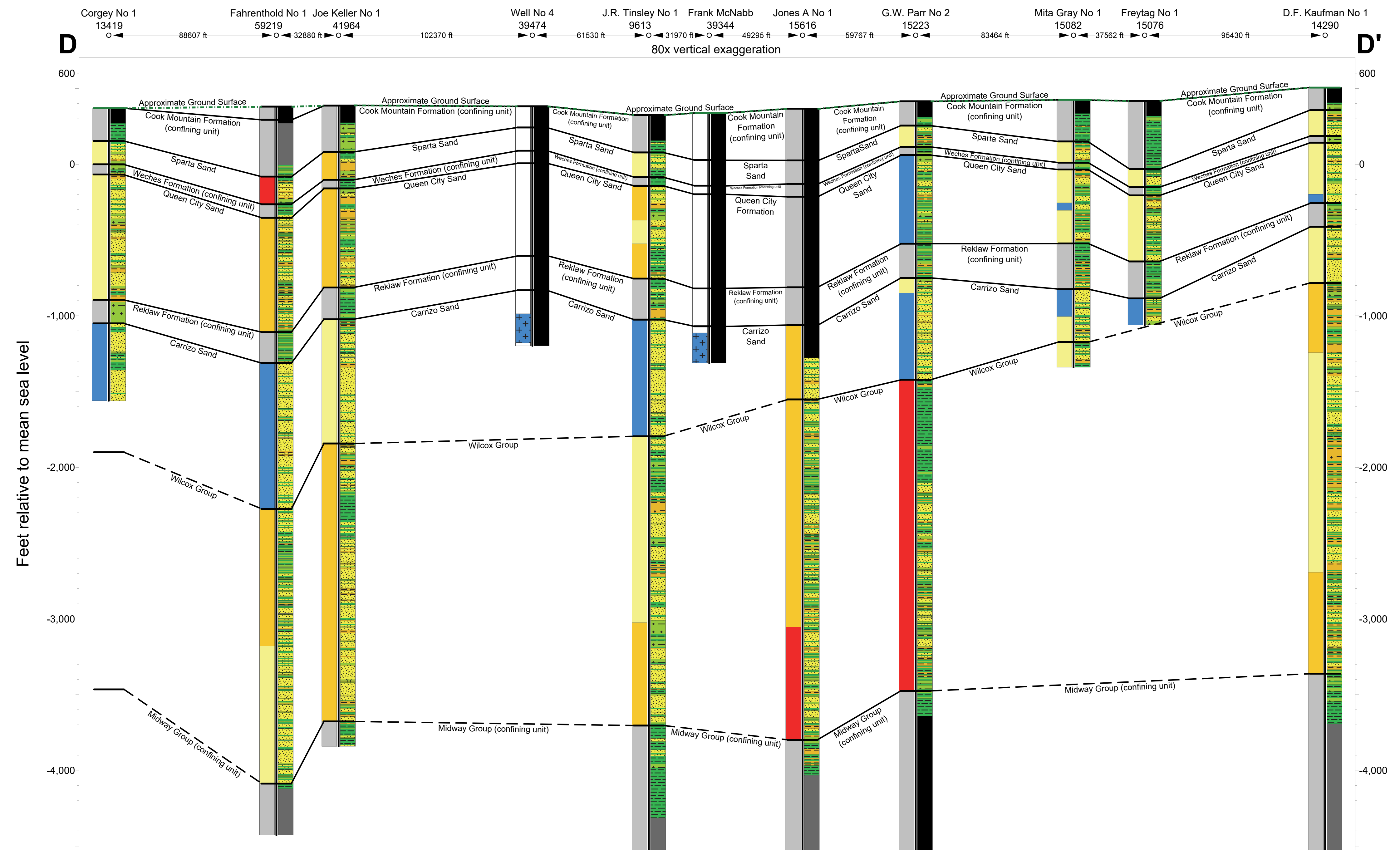


Figure 3. Location of cross-section lines relative to the study area, formation outcrops, and Texas counties. BRACS (Brackish Resources Aquifer Characterization System) well point label is the well ID in the BRACS Database. GWDB (Groundwater Database) well point label is the state well number in the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

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

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