UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SCHLUMBERGER SOUNDINGS IN THE LOWER
MESILLA VALLEY OF THE RIO GRANDE,
TEXAS AND NEW MEXICO

By

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This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.
In 1973, the U. S. Geological Survey, in cooperation with the Texas Water Development Board, made sixty five Schlumberger resistivity soundings in the lower Mesilla Valley of the Rio Grande River. The survey area includes the westernmost edge of Texas in El Paso County and part of Dona Ana County, New Mexico. The survey was made to estimate and delineate the volume of fill containing fresh ground water.

Figure 1 shows the index map for the location, number, and azimuth of the 65 Schlumberger sounding stations. All the sounding curves were automatically processed and interpreted (Zohdy, 1973 and 1975) as shown in the graphs given in the appendix.

Each graph shows the following:

1. Field data designated by a segmented solid-line curve with diamond symbols for observed data.

2. A continuous-dashed curve which represents:
   (a) The continuous "field" curve which is generally obtained by maintaining the position of the last segment and
shifting each of the previous segments up or down so that the last point on each segment coincides with the corresponding point on the following segment (Zohdy and others, 1973).

(b) The digitized curve at the rate of six points per logarithmic cycle. Although the individual digitized points are not depicted on the dashed curve (to avoid cluttering the graphs) they were computed using a subroutine in a computer program for bicubic spline functions (Anderson, 1971). The digitized data from the continuous dashed curve were then fed into the automatic interpretation program (Zohdy, 1973) to obtain the best fitting theoretical sounding curve for a horizontally layered medium. The automatic interpretation program used here was slightly modified from the one referred to in the above reference. The modifications are identical to those used in another program recently written for inverting Wenner sounding curves (Zohdy and Bisdorf, 1975).

(3) The theoretical best fitting sounding curve plotted as (+) signs.

(4) The detailed layering for which the theoretical curve is calculated.

(5) The D.Z. (Dar Zarrouk) curve for the detailed layering. The ordinate values for the D.Z. curves are shifted upward or downward by one logarithmic cycle or they are plotted on a separate sheet of graph paper (as for Mesilla 21, Mesilla 22,
Mesilla 24, Mesilla 37, Messila 57, and Mesilla 58) to avoid cluttering the graphs. The D-Z curves can be used to obtain equivalent and simpler solutions containing fewer number of layers. In addition, they can be used to impose certain constraints on the layer thicknesses and resistivities (Zohdy, 1974).

All these graphs were generated on a graphic plotter. The plotter-driving subroutines were developed by G. I. Evenden of the U. S. Geological Survey.
References


MESILLA VALLEY: NEW MEXICO-TEXAS.
SCHLUMBERGER SOUNDINGS.
STATION LOCATION, NUMBER, AND AZIMUTH.
Curve is strongly distorted by fence, buried cables, or pipeline.

RESISTIVITIES IN OHM-METRES

1000 100 10 1

AB/2, DEPTH, DZ-DEPTH, IN METRES
RESISTIVITIES IN OHM-METRES

AB/2, DEPTH, DZ-DEPTH, IN METRES
RESISTIVITIES IN OHM-METRES

AB/2, DEPTH, DZ-DEPTH, IN METRES
RESISTIVITIES IN OHM-METRES

MESILLA 47

AB/2, DEPTH, DZ-DEPTH, IN METRES

RESISTIVITIES IN OHM-METRES
RESISTIVITIES IN OHM-METRES

Dar Zarrouk curve for MESILLA 57

AB/2, DEPTH, DZ-DEPTH, IN METRES

RESISTIVITIES IN OHM-METRES