



Figure 1. Map showing approximate water-level altitudes in the Chicot aquifer, Houston-Galveston region, Texas, January-March 2003.

WATER-LEVEL ALTITUDES 2003 AND WATER-LEVEL CHANGES IN THE CHICOT, EVANGELINE, AND JASPER AQUIFERS AND COMPACTION 1973-2002 IN THE CHICOT AND EVANGELINE AQUIFERS, HOUSTON-GALVESTON REGION, TEXAS

By
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2003

Base from U.S. Geological Survey
Digital data, 1:100,000
Universal Transverse Mercator projection
Zone 15

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INTRODUCTION

This report is one in an annual series of reports that depicts water-level altitudes and water-level changes in the Chicot, Evangeline, and Jasper aquifers, and compaction in the Chicot and Evangeline aquifers in the Houston-Galveston region. The Houston-Galveston region comprises Harris, Galveston, Fort Bend, Waller, and Montgomery Counties and adjacent parts of Brazoria, Grimes, Walker, San Jacinto, Liberty, and Chambers Counties. The report was prepared in cooperation with the Harris-Galveston Coastal Subsidence District, the City of Houston, and the Fort Bend Subsidence District. For the Chicot and Evangeline aquifers, maps show approximate water-level altitudes in 2003, water-level changes from 2002 to 2003, approximate water-level changes from 1990 to 2003, approximate water-level changes from 1977 to 2003, and lines of zero water-level change for selected intervals beginning with 1977-82 (figs. 1-10). For the Jasper aquifer, maps show approximate water-level altitudes in 2003 and water-level changes from 2002 to 2003 and 2000 to 2003 (figs. 11-13). The report also contains a map showing borehole extensometer (well equipped with compaction monitor) site locations (fig. 14) and graphs showing measured compaction of subsurface material at these sites from 1973 or later to 2002 (fig. 15). The U.S. Geological Survey (USGS) has published annual reports of water-level altitudes and water-level changes for the Chicot and Evangeline aquifers in the Houston-Galveston region since 1979; and annual reports of same for the Fort Bend subregion (Fort Bend County and adjacent areas) since 1990. The USGS published its first water-level-altitude map for the Jasper aquifer in the greater Houston area (primarily Montgomery County) in 2001. The 2003 altitude and change maps for the three aquifers are included in this report.

GEOHYDROLOGY

The Chicot aquifer (in Holocene- and Pleistocene-age sediments), Evangeline aquifer (in Pliocene- and Miocene-age sediments), and Jasper aquifer (in Miocene-age sediments) are the three primary aquifers in the Gulf Coast aquifer system. The lowermost Jasper aquifer is separated from the Evangeline aquifer by the Burkeville confining unit. The hydrogeologic units are laterally discontinuous fluvial-deltaic deposits of gravel, sand, silt, and clay that dip and thicken from northwest to southeast. The aquifers thus crop out in bands inland from and approximately parallel to the coast and become progressively more deeply buried and confined toward the coast. The Chicot outcrop, which comprises the youngest sediments, is the closest of the aquifer outcrops to the coast, followed farther inland by the Evangeline outcrop and then farthest inland by the Jasper outcrop.

The Chicot aquifer can be differentiated from the geologically similar Evangeline aquifer on the basis of hydraulic conductivity (Carr and others, 1985, p. 10). The Jasper aquifer can be differentiated from the Evangeline aquifer in the outcrops on the basis of water levels (higher in the Jasper than the Evangeline) and in the down-dip parts of the aquifers on the basis of position relative to the Burkeville confining unit.

The water in the aquifers is fresh (less than 1,000 milligrams per liter dissolved solids concentration) in the region but becomes more saline in the down-dip and deeply buried parts of the aquifers near the coast. In the natural ground-water-flow system, water recharges the aquifers in the unconfined outcrop areas, moves downward and eastward, and discharges upward as diffuse upward leakage in the confined down-dip areas.

WATER-LEVEL MEASUREMENTS

Water-level measurements used to prepare these maps were obtained by steel tape, airborne, and from reports of well operators. Most wells are pumped once daily, but some are pumped more frequently. Multiple measurements were made when wells were not being pumped; however, antecedent conditions and pumping status of nearby wells were not always known. Most measurements were made in January and February, the months when water levels usually are highest. For this year's maps, 230 water-level measurements were used for the Chicot aquifer, 305 for the Evangeline aquifer, and 61 for the Jasper aquifer.

MEASURED COMPACTION

Compaction of subsurface material is measured continuously by 13 borehole extensometers at 11 sites (fig. 14). Compaction measured by the shallower of two extensometers at the Clear Lake site is not shown because it is similar to that measured by the deeper extensometer at the site. Graphs of long-term compaction for 12 extensometers are shown in figure 15.

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EXPLANATION

- -50 --- Water-level contour—Shows altitude at which water level would have stood in tightly cased well. Contour intervals 50 and 100 feet. Datum is NGVD of 1929
- Boundary of study area
- Updip limit of Chicot aquifer (Baker, 1979; University of Texas, Bureau of Economic Geology, 1968)
- -58 Data point—Well in which water-level measurement was made. Number is water-level altitude (shown where data too sparse for contours). One point can represent more than one well

VERTICAL DATUM

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD of 1929).