PREPARED IN COOPERATION WITH THE
HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT
AND THE
CITY OF HOUSTON

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT 91-94
SHEET 1 OF 7

INTRODUCTION

This report is one in a series of reports that depict water-level changes and compaction of subsurface material in the Houston-Galveston region. The report was prepared in cooperation with the Harris-Galveston Coastal Subsidence District and the City of Houston. The maps present approximate water-level changes in wells in the Chicot and Evangeline aquifers, 1977-91 and 1990-91 (figs. 1-4). The location of borehole extensometers is shown in figure 5, and graphs present measured compaction for 1973-90 (fig. 6).

GEOHYDROLOGY

The Chicot aquifer and the underlying Evangeline aquifer are composed of discontinuous sedimentary deposits of sand, silt, and clay, which thicken to the southeast (Williams and Ranzau, 1987). In most of the region, the water in the aquifers is fresh (contains less than 1,000 milligrams per liter dissolved solids). The primary basis for separating the Chicot aquifer from the underlying Evangeline aquifer is a difference in hydraulic conductivity. The hydraulic conductivity is larger in the Chicot aquifer than in the Evangeline aquifer and, in part, causes the difference in the altitude of the water levels in wells completed in the two aquifers (Meyer and Carr, 1979). Water levels in wells in the Chicot aquifer are higher than those in wells in the Evangeline aquifer. In the western and northern parts of the region, the aquifers crop out and are under water-table conditions. In the southern and eastern parts of the region, the aquifers are under artesian conditions. Because there is a slight hydraulic connection between the aquifers and between the Chicot aquifer and the land surface, the system is termed "leaky" (Carr and others, 1985). The Chicot and Evangeline aquifers are confined beneath Galveston Bay and Lake Houston by the Beaumont Formation, which consists mainly of clay. The water levels in the Houston-Galveston region, in effect, may be considered a system of intersecting cones of depression created by the withdrawal of water from numerous wells throughout the area.

WATER-LEVEL MEASUREMENTS

Water levels used in preparation of this report were obtained by steel tape and air-line measurements, by electronic sensors, or from reports by well operators. Sixty percent of the observation wells are pumped frequently, and some are pumped daily. Multiple measurements were made when wells were not being pumped. However, antecedent pumping conditions often were not known. The data for wells having comparable depths and screened intervals were selected for construction of the maps. Additional wells in the southern and southwestern parts of the Houston-Galveston region were added to the monitoring network in 1990. Water-level measurements from these wells help better define water-level changes in those parts of the region. The maps were prepared using measurements from 304 wells.

MEASURED COMPACTION

Compaction of subsurface material is being measured by 13 borehole extensometers (wells equipped with compaction monitors) at 11 sites (fig. 5). Historical measurements from 12 extensometers are presented in figure 6. At the Clear Lake site, measurements from a second extensometer of less depth (1,740 feet) are not shown because they duplicate the record of the Clear Lake extensometer presented in figure 6.

REFERENCES CITED

Carr, J.E., Meyer, W.R., Sandeen, W.M., and McLane, L.R., 1985, Digital models for simulation of ground-water hydrology of the Chicot and Evangeline aquifers along the Gulf Coast of Texas: Texas Department of Water Resources Report 289, 101 p.

Meyer, W.R., and Carr, J.E., 1979, A digital model for simulation of ground-water hydrology in the Houston area, Texas: Texas Department of Water Resources Report LP-103, 27 p., 3 app.

Williams, J.F. III, and Ranzau, C.E., Jr., 1987, Ground-water withdrawals and changes in ground-water levels, ground-water quality, and land-surface subsidence in the Houston District, Texas, 1980-84: U.S. Geological Survey Water-Resources Investigations Report 87-4153, 56 p.

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
foot	0.3048	meter
mile	1.609	kilometer

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

4 0 4 8 12 MILES

4 0 4 8 12 KILOMETERS

EXPLANATION

—— 20 —— LINE OF EQUAL WATER-LEVEL CHANGE--Dashed where approximately located. Hachures indicate depression. Interval 20 feet

AREAS WHERE WATER LEVELS DECLINED

Figure 1.--Map showing approximate change in water levels in wells completed in the Chicot aquifer, 1977-91.

Base from Texas Department of Highways and Public Transportation

APPROXIMATE WATER-LEVEL CHANGES IN WELLS COMPLETED IN THE CHICOT AND EVANGELINE AQUIFERS, 1977-91 AND 1990-91, AND MEASURED COMPACTION, 1973-90, IN THE HOUSTON-GALVESTON REGION, TEXAS

By

DANA L. BARBIE, MARK C. KASMAREK, AND AL CAMPODONICO

1991