

LAND SUBSIDENCE CAUSED BY WITHDRAWAL OF OIL AND GAS IN THE GULF COASTAL PLAIN—THE HOUSTON, TEXAS, CASE HISTORY

Thomas L. Holzer¹

Abstract

The extensive network of geodetic leveling lines in the Houston-Galveston, Texas area, where at least 110 oil and gas fields have been developed, provides the most comprehensive opportunity in the Gulf Coast to search for the occurrence of land subsidence caused by withdrawal of oil and gas. Although the evaluation is complicated by regional subsidence caused by a decline of ground-water level in aquifers beneath the area, subsidence caused by oil and gas withdrawal can be examined by searching for local increases of subsidence at oil and gas fields crossed by leveling lines. Twenty nine field are crossed by lines with repeated leveling surveys. Subsidence profiles across these fields indicate local increases of subsidence at six fields—Alco-Mag, Chocolate Bayou, Goose Creek, Hastings, Mykawa, and South Houston. Although ground-water withdrawal is undoubtedly the most important factor contributing to the local subsidence at each field, oil and gas withdrawal may be partly responsible for the local increases. Except for Chocolate Bayou, the volume of petroleum production at each field was sufficient to account for the increase. The volume of petroleum production, however, in general is not a reliable index for predicting the local increase because land within many fields with significant production did not show local increases of subsidence. With the exception of the 1-m subsidence caused by petroleum withdrawal at Goose Creek (1917-1925), local increases of subsidence were less than 0.3 m.

¹ U.S. Geological Survey, 345 Middlefield Road, MS 977, Menlo Park, CA 94025