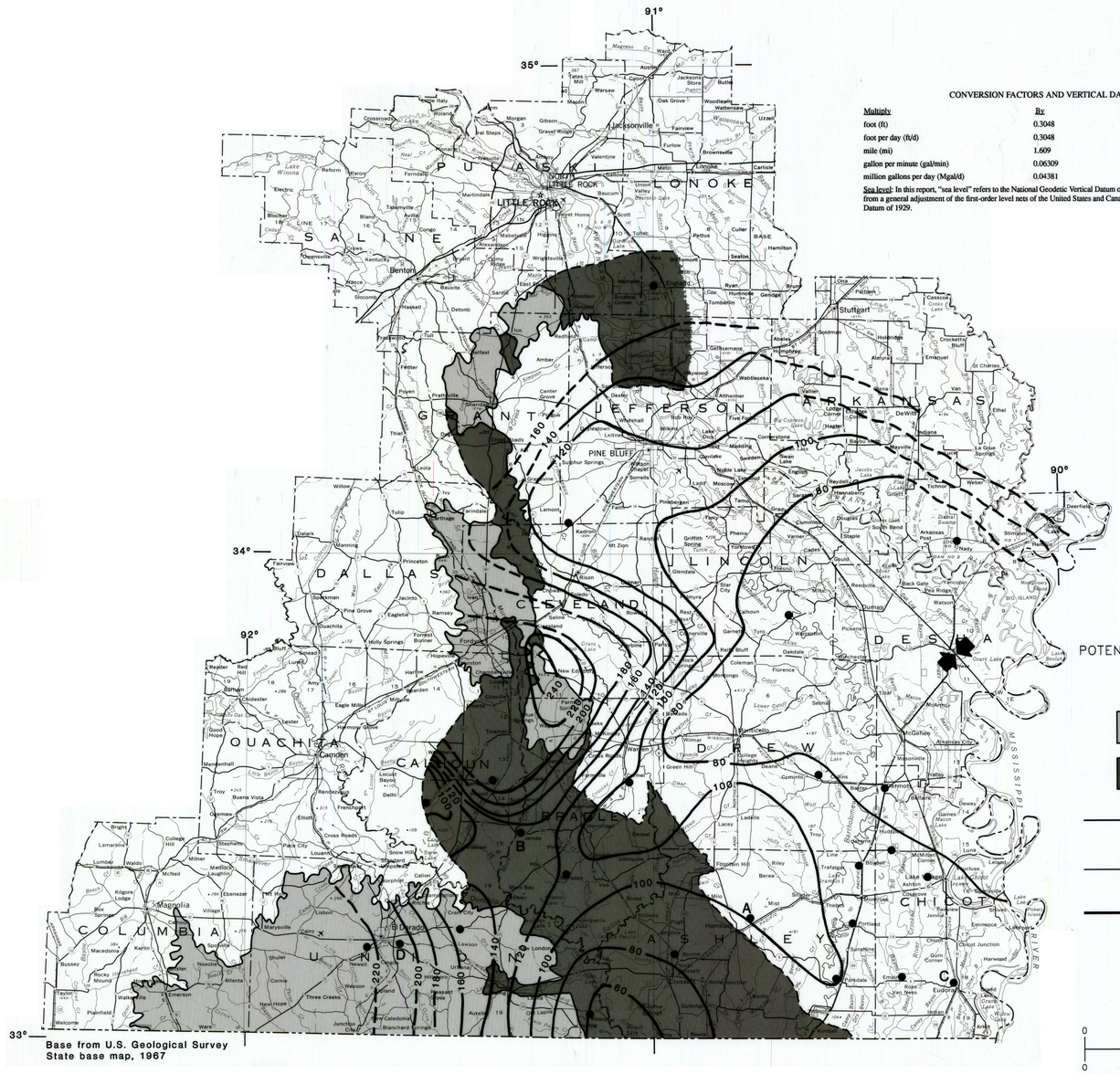
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
ARKANSAS GEOLOGICAL COMMISSION

WATER-RESOURCES INVESTIGATIONS REPORT 93-4134
SHEET 1 of 2
Westerfield, P.W., 1994, Potentiometric-surface maps of the Cockfield and Lower Wilcox aquifers, in Arkansas, 1991




CONVERSION FACTORS AND VERTICAL DATUM

| Multiply | By | To obtain |
|---|---|---|
| foot (ft) | 0.3048 | meter |
| foot per day (ft/d) | 0.3048 | meter per day |
| mile (mi) | 1.609 | kilometer |
| gallon per minute (gal/min) | 0.06309 | liter per second |
| million gallons per day (Mgal/d) | 0.04381 | cubic meter per second |

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum 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.

## INTRODUCTION

This map report is one of a series of reports that depict water levels or potentiometric surfaces for major aquifers in Arkansas. This report, which was prepared as part of a cooperative program between the U.S. Geological Survey and the Arkansas Geological Commission, depicts the potentiometric surface of two important aquifers, the Cockfield aquifer in the southeastern part of the State and the lower Wilcox aquifer in the northeastern part of the State. The Cockfield aquifer consists of sand beds in the Cockfield Formation of Eocene age and is an important source of water for public supply systems in southeastern Arkansas. The lower Wilcox aquifer consists of a thick sand bed in sediments of the Wilcox Group of Eocene age. The lower Wilcox aquifer is an important source of water for public and some industrial supply systems in northeastern Arkansas. Water-level measurements were made in 27 wells completed in the Cockfield aquifer and in 29 wells completed in the lower Wilcox aquifer during the spring and summer of 1991 by personnel of the U.S. Geological Survey. These water-level measurements and other water-level data for wells in Arkansas, Louisiana, Mississippi, and Tennessee were used to construct the potentiometric-surface maps and hydrographs presented in this report. All of these water-level data are stored in the U.S. Geological Survey's Ground-Water Site Inventory (GWSI) data storage system.

## COCKFIELD AQUIFER

### Hydrogeologic Setting

Sand beds in the Cockfield Formation of Eocene age consist of fine-to medium-grained sand interbedded with silt, clay, and lignite. The total thickness of the Cockfield Formation ranges from 100 to 400 ft near the area of outcrop but is as much as 625 ft in northeastern Chicot County (Ackerman, 1987). The lower part of the formation consists of well-developed beds of sand approximately 15 to 45 ft thick; the middle part (approximately 30 to 100 ft thick) consists of lignitic clay interbedded with thin beds of lignitic sand; and the upper part consists of alternating beds of sand and clay. In the western part of the study area, the Cockfield Formation crops out in the upland areas or subcrops beneath terrace and alluvial deposits of Quaternary age and is underlain by the Eocene Cook Mountain Formation. In the eastern part of the study area, the Cockfield aquifer is confined by the overlying Jackson Group of Eocene age and the underlying Cook Mountain Formation. In the northern part of the study area, the sand beds become thinner and the Cockfield Formation is not used as an aquifer.

Recharge to the Cockfield aquifer occurs by infiltration of rainfall in the outcrop areas and by inflow from the overlying terrace and alluvial deposits where the aquifer subcrops beneath these units. Discharge occurs as flow to streams in the outcrop areas, outflow to other formations in the areas where the aquifer is confined, and to wells (Ackerman, 1987).

Withdrawals from the Cockfield aquifer totaled 8.09 Mgal/d in 1990 (T.W. Holland, U.S. Geological Survey, written commun., 1992). The largest withdrawals were in Chicot (5.00 Mgal/d) and Ashley (2.44 Mgal/d) Counties. Water from the aquifer is used for public supplies and to a lesser degree for domestic and commercial uses. Most well yields are small, less than 30 gal/min, but wells screened through the full thickness of the aquifer commonly produce 100 to 500 gal/min.

### Potentiometric-Surface Map

The potentiometric-surface map of the Cockfield aquifer shows the altitude to which water levels would rise in tightly cased wells that penetrate the aquifer. The potentiometric surface of the Cockfield aquifer generally is highest in the outcrop and subcrop areas in the western part of the study area. The general direction of ground-water flow in the aquifer is perpendicular to the potentiometric-surface contours and in the direction of hydraulic gradient. Lateral ground-water flow in the aquifer generally is from the outcrop and subcrop areas in the western part of the study area toward areas of lower potentiometric surface along the axis of the syncline of the Desha Basin or toward areas of relatively large withdrawals (or upward leakage) in southwestern Ashley and southeastern Union Counties.

### Hydrographs of Selected Wells

Water levels in selected wells completed in the Cockfield aquifer are shown for the period of 1971 to 1991. The well in Bradley County is located where the Cockfield Formation underlies terrace and alluvial deposits. The well in Union County is located where deposits of the Cockfield Formation are exposed at land surface. These wells do not show a systematic change in water levels during the period of record. The wells in Ashley and Chicot Counties are located in areas where the aquifer is confined and ground-water withdrawals are relatively large. During the period 1971-91, the water level in the well in Ashley County declined 8.70 ft (average decline of 0.4 ft/yr) and the water level in the well in Chicot County declined 21.62 ft (average decline of 1.1 ft/yr).

POTENTIOMETRIC SURFACE OF THE COCKFIELD AQUIFER, 1991

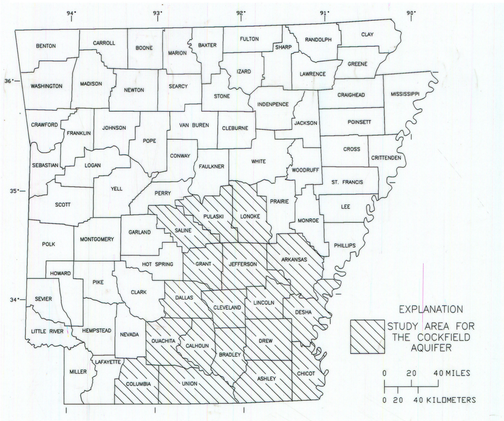
EXPLANATION

- OUTCROP OF THE COCKFIELD FORMATION
- SUBCROP OF THE COCKFIELD FORMATION--Area in which Cockfield Formation is overlain by terrace and alluvial deposits of Quaternary age
- GEOLOGIC CONTACT--Dashed where approximately located
- AXIS OF SYNCLINE FORMING THE DESHA BASIN
- 140 POTENTIOMETRIC CONTOUR--Shows altitude at which water level would have stood in tightly cased wells. Dashed where approximately located. Contour interval 20 feet. Datum is sea level
- A OBSERVATION WELL COMPLETED IN THE COCKFIELD AQUIFER--Letter, when present corresponds to hydrograph

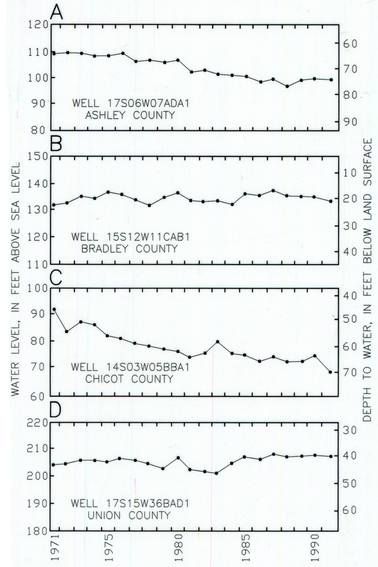
0 10 20 30 40 MILES
0 10 20 30 40 KILOMETERS

*Water-level measurements for wells completed in the Cockfield aquifer, 1991*

| Well number | County | Altitude of land surface (feet above sea level) | Depth to water below land surface Date | Depth to water below land surface Feet | Altitude of water level (feet above sea level) |
|---|---|---|---|---|---|
| 08S02W04ACA1 | Arkansas | 165 | 3-20 | 91.03 | 74 |
| 15S04W26CBC1 | Ashley | 128 | 6-21 | 32.66 | 95 |
| 15S08W32CBA2 | Ashley | 188 | 7-11 | 81.62 | 106 |
| 17S04W10BCD2 | Ashley | 125 | 6-20 | 28.07 | 97 |
| 17S06W07ADA1 | Ashley | 174 | 7-11 | 73.71 | 100 |
| 18S04W19DAA2 | Ashley | 116 | 6-20 | 15.78 | 100 |
| 18S08W04BBC1 | Ashley | 149 | 7-11 | 68.32 | 81 |
| 14S09W04ADA1 | Bradley | 148 | 6-06 | 49.65 | 98 |
| 14S10W31DBA1 | Bradley | 193 | 7-12 | 90.48 | 103 |
| 15S12W11CAB1 | Bradley | 155 | 7-12 | 20.70 | 134 |
| 16S11W11ACA1 | Bradley | 141 | 7-11 | 26.14 | 115 |
| 14S13W01AAA1 | Calhoun | 212 | 6-07 | 8.45 | 204 |
| 14S14W21ACB1 | Calhoun | 132 | 6-07 | 35.10 | 97 |
| 14S03W05BBA1 | Chicot | 139 | 7-10 | 68.65 | 70 |
| 15S03W21ABA1 | Chicot | 122 | 7-10 | 32.87 | 89 |
| 16S02W04BAC1 | Chicot | 125 | 6-20 | 38.12 | 87 |
| 18S02W25ABB3 | Chicot | 135 | 6-21 | 42.98 | 92 |
| 18S03W14CCC1 | Chicot | 98 | 6-21 | 11.14 | 87 |
| 08S11W02BCB1 | Cleveland | 245 | 6-19 | 138.63 | 106 |
| 11S11W23BBD1 | Cleveland | 275 | 6-19 | 39.04 | 236 |
| 13S05W35ABB1 | Drew | 170 | 7-23 | 86.20 | 84 |
| 10S05W06CAC1 | Lincoln | 170 | 6-07 | 106.60 | 63 |
| 02S09W15BBB2 | Lonoke | 226 | 4-23 | 56.44 | 170 |
| 17S13W17DDC1 | Union | 193 | 7-11 | 39.36 | 154 |
| 17S15W31DCA2 | Union | 269 | 7-11 | 46.79 | 222 |
| 17S15W36BAD1 | Union | 248 | 7-11 | 39.69 | 208 |
| 19S10W16CBC2 | Union | 82 | 7-11 | 22.34 | 60 |




LOCATION OF STUDY AREA




HYDROGRAPHS OF WATER LEVELS IN SELECTED WELLS COMPLETED IN THE COCKFIELD AQUIFER, 1971-1991

# POTENTIOMETRIC-SURFACE MAPS OF THE COCKFIELD AND LOWER WILCOX AQUIFERS, IN ARKANSAS, 1991

Paul W. Westerfield
1994