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

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MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF LAND AND WATER RESOURCES

WATER-RESOURCES INVESTIGATIONS REPORT 94-4049
Oakley, W.T. and Burt, Jr., D.E., 1994, Potentiometric-surface map of the Winona-Tallahatta aquifer in Northwestern Mississippi, November through December 1988

INTRODUCTION

As part of a program to document the potentiometric surface (ground-water level) of the major aquifers in Mississippi, the U.S. Geological Survey, in cooperation with the Mississippi Department of Environmental Quality, Office of Land and Water Resources, measured water levels at about 5-year intervals in wells completed in the Winona-Tallahatta aquifer. This report, the third in the series for the Winona-Tallahatta aquifer, includes a potentiometric-surface map (fig. 1) based on water-level data collected in 28 wells during November through December 1988, and hydrographs of water levels in selected observation wells completed in the aquifer (fig. 2). The study area for the Winona-Tallahatta aquifer includes 19 counties -- 9 counties where wells were accessible for water-level measurements and 10 additional counties included to show the areas of the outcrop and the downdip limit of freshwater. Previously published potentiometric-surface maps of the Winona-Tallahatta aquifer were based on water-level measurements made in 35 wells in fall 1979 (Wasson, 1980) and fall 1983 (Darden, 1986).

HYDROGEOLOGY

The Winona-Tallahatta aquifer consists of beds of sand in the Winona Sand and in the underlying Neshoba Sand and Basic City Shale Members of the Tallahatta Formation at the base of the Claiborne Group. The Winona Sand is a marine sand that is about 40 feet thick and commonly is known as the "greensand" in Mississippi. The Neshoba Sand Member typically is a fine quartz sand that thickens from southeast to northwest across the study area. The Basic City Shale Member commonly is composed of many thin beds of sand and shale with increasing sand content from southeast to northwest across the area.

The Winona-Tallahatta aquifer is overlain by the Zilpha Clay and underlain by the Meridian-upper Wilcox aquifer. Thick beds of shale commonly occur in the basal part of the Basic City Shale Member of the Tallahatta Formation that separate the Winona-Tallahatta and the Meridian-upper Wilcox aquifers. The beds of clay that commonly occur above and below the Winona-Tallahatta aquifer act as confining units for water in the aquifer, except in the western part of the study area, where the beds of clay in the confining unit below the Winona-Tallahatta are not as thick, and greater vertical hydraulic connection exists between the Winona-Tallahatta aquifer and the underlying Meridian-upper Wilcox aquifer.

The base of the Winona-Tallahatta aquifer dips about 25 to 50 feet per mile to the southwest away from the outcrop area. [Refer to adjacent outcrop area and to Spiers (1977) for structure contour map and more geologic information.] Aquifer thickness increases from about 100 feet in the southeastern part of the outcrop area to about 400 feet across most of northwestern Mississippi. The sand beds of the aquifer extend into Tennessee and becomes part of the Memphis aquifer. In Arkansas and Louisiana, the aquifer is equivalent to the Cane River Formation.

WATER USE

The Winona-Tallahatta aquifer in northwestern and central Mississippi is a source of freshwater for several public supplies, a few rural water associations, several small industrial wells, and many farm and domestic supplies. The Winona-Tallahatta aquifer commonly yields less than 300 gallons per minute to wells for public and industrial supplies, and no large pumping centers are present in the study area. Yields to most rural domestic wells are small (commonly less than 30 gallons per minute). Water-use data for the aquifer were reported for 1985 as part of the Mississippi Water Use Information Program of the U.S. Geological Survey. Total withdrawal of freshwater from the aquifer in Mississippi during 1985 was about 1.4 million gallons per day (P.M. Johnson, U.S. Geological Survey, oral commun, 1993).

The largest use (and the only use in much of the study area) of the Winona-Tallahatta aquifer is for rural domestic supplies. The major public-supply withdrawals from the Winona-Tallahatta aquifer occur at or near the towns of Shaw in Bolivar County, Minter City in Leflore County, and Sumner and Webb in Tallahatchie County.

WATER LEVELS

The potentiometric surface of the Winona-Tallahatta aquifer is shown on the accompanying map (fig. 1). The altitude of the potentiometric surface slopes downward generally to the west and southwest away from the outcrop area. The depression in the potentiometric surface in the area of Indianola and across parts of Bolivar, Humphreys, Leflore, Sunflower, Tallahatchie, and Washington Counties is the result of ground-water withdrawals from the Winona-Tallahatta and Meridian-upper Wilcox aquifers. In these counties, the configuration of the potentiometric surface in the Winona-Tallahatta aquifer is similar to that in the underlying Meridian-upper Wilcox aquifer.

In the areas of outcrop, water-table conditions commonly prevail at shallow depths, and the potentiometric surface is affected primarily by topography, the discharge of ground water from the aquifer to streams, and recharge from precipitation. Outside the outcrop area, confined ground-water conditions prevail, and water levels fluctuate seasonally in response to natural variations in recharge and discharge and to pumping from nearby wells. Ground-water levels in or near the outcrop areas generally fluctuate less than 5 feet and show little change over the period 1975-88 (fig. 2, well K22). Water levels in wells outside the outcrop area declined as a result of long-term regional withdrawals (fig. 2, well Q150).

In 1988, water levels in the outcrop of the Winona-Tallahatta aquifer ranged from about 8 feet above to 9 feet below water levels measured in 1979. Withdrawals in the confined part of the aquifer have resulted in a water-level increase of 1 foot in one well, no change in one well, and water-level declines of about 1 to 16 feet in the other wells since 1979 (table 1). For example, long-term water-level records for well Q150 (fig. 2) indicate declines of about 1 foot per year. Measured water-level changes during 1979-88 in 17 wells are listed in table 1.

REFERENCES

Belt, W.E., and others, 1945, Geologic map of Mississippi: Mississippi Geological Society, Jackson, Mississippi, 1 sheet.

Darden, Daphne, 1986, Potentiometric- surface map of the Winona-Tallahatta aquifer in northwestern Mississippi, fall 1983: U.S. Geological Survey Water-Resources Investigations Report 86-4146, 1 sheet.

Spiers, C.A., 1977, The Winona-Tallahatta aquifer in Mississippi: U.S. Geological Survey Water-Resources Investigations Report 77-125, 2 sheets.

Wasson, B.E., 1980, Potentiometric map of the Winona-Tallahatta aquifer in northwestern Mississippi, fall 1979: U.S. Geological Survey Water- Resources Investigations Report 80-598, 1 sheet.

Data describing the individual wells used in this study may be obtained from the following:

Director
Mississippi Department of Environmental Quality
Office of Land and Water Resources
P.O. Box 10631
Jackson, Mississippi 39209

District Chief
U.S. Geological Survey
Water Resources Division
100 West Capitol Street, Suite 710
Jackson, Mississippi 39269

Copies of this report can be purchased from:

U.S. Geological Survey
Earth Science Information Center
Open-File Reports Section
Box 25286, MS 517, Federal Center
Denver, Colorado 80225

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
foot	0.3048	meter
mile	1.609	kilometer
million gallons per day	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.

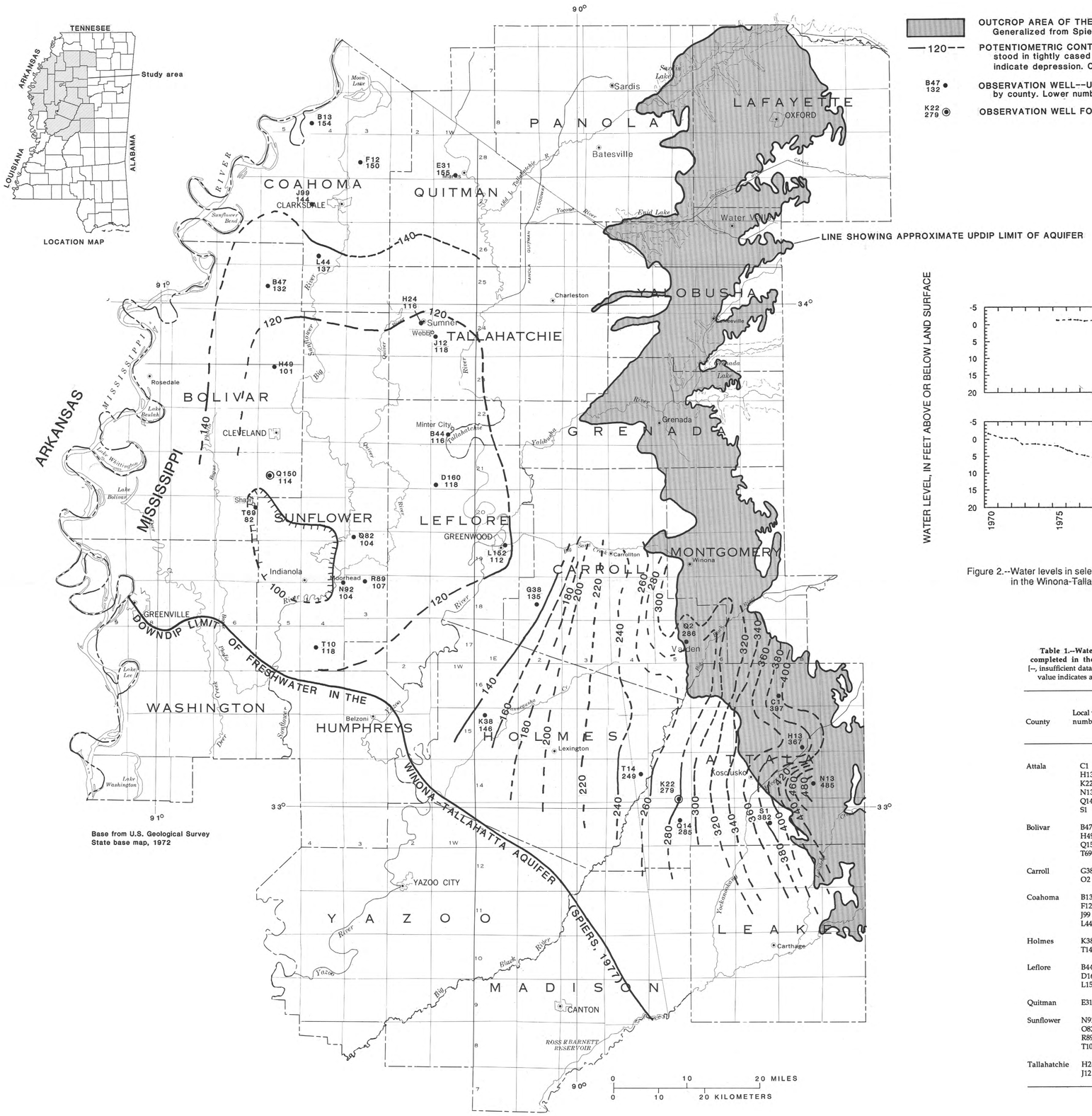

Figure 1.--Potentiometric surface of the Winona-Tallahatta aquifer, November through December 1988.

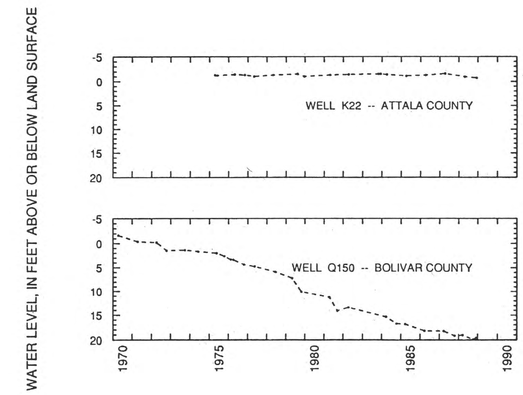

Figure 2.--Water levels in selected observation wells completed in the Winona-Tallahatta aquifer, 1970-88.

Table 1.--Water-level changes for wells completed in the Winona-Tallahatta aquifer
[--, insufficient data to compute value; negative value indicates a decrease in water level]

County	Local well number	Measured water-level change from 1979 to 1988 (in feet)
Attala	C1	--
	H13	8
	K22	0
	N13	-1
	Q14	-1
	S1	-11
Bolivar	B47	-10
	H49	-10
	Q150	-9
	T69	-7
Carroll	G38	-16
	O2	-9
Coahoma	B13	--
	F12	-7
	J99	--
	L44	--
Holmes	K38	-12
	T14	-4
Leflore	B44	--
	D160	-7
	L152	--
Quitman	E31	1
Sunflower	N92	--
	O82	--
	R89	--
	T10	-5
Tallahatchie	H24	--
	J12	--

POTENTIOMETRIC-SURFACE MAP OF THE WINONA-TALLAHATTA AQUIFER IN NORTHWESTERN MISSISSIPPI, NOVEMBER THROUGH DECEMBER 1988

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1994