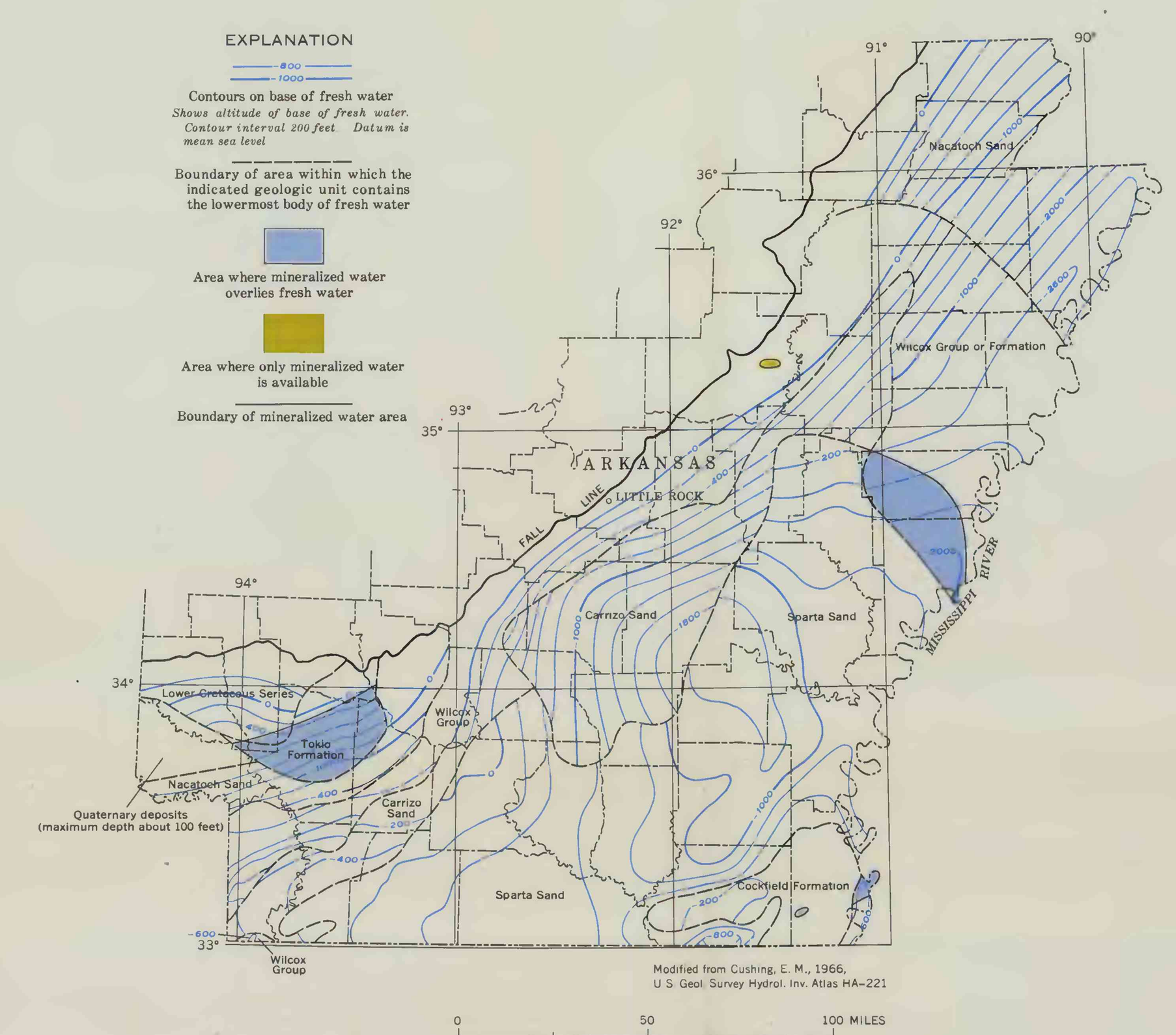
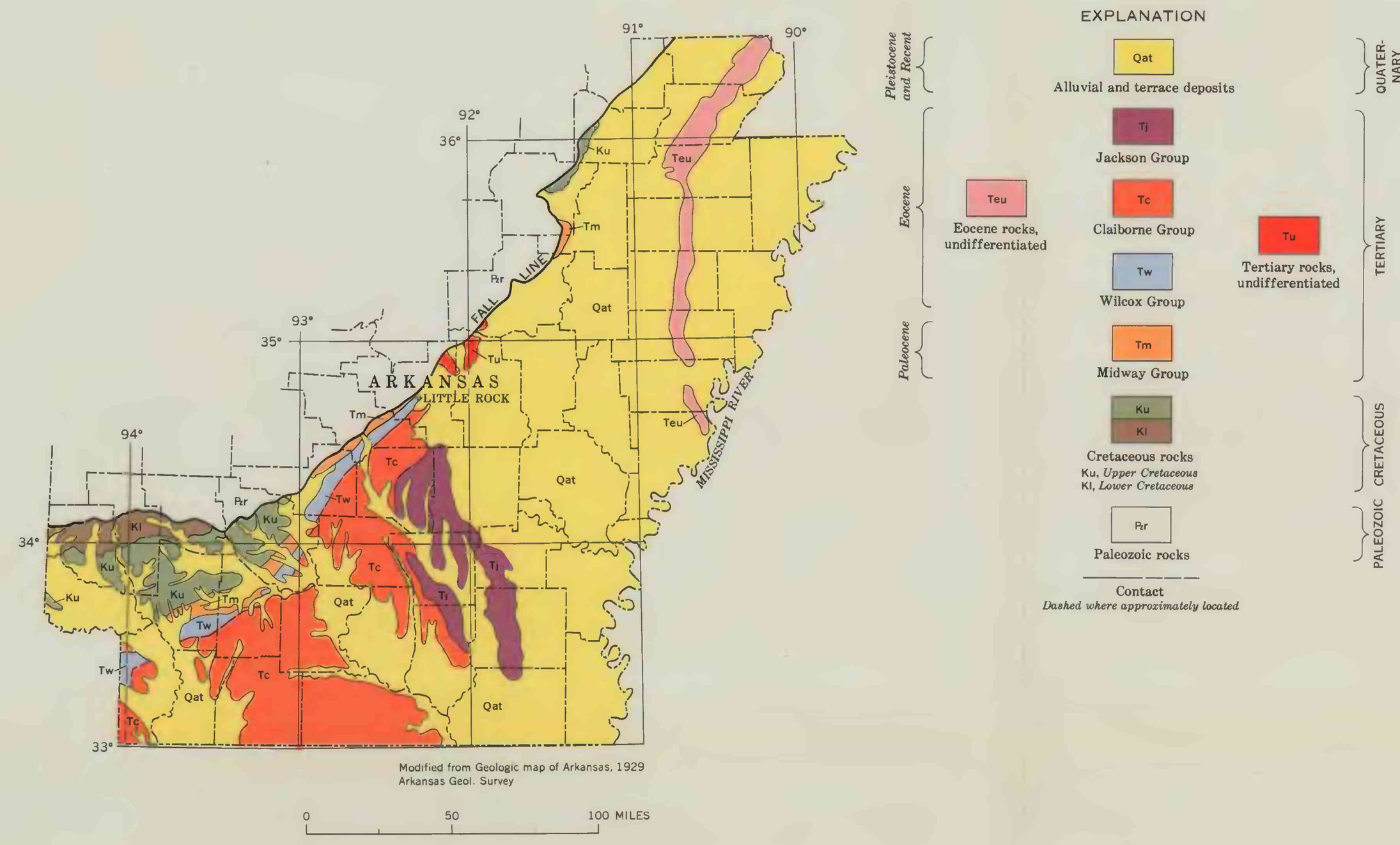


MAP SHOWING ALTITUDE OF THE BASE OF FRESH WATER

GENERALIZED GEOLOGIC COLUMN

SYSTEM	SERIES	GROUP	SUBDIVISION	
QUATERNARY	Recent		Alluvial and terrace deposits	
	Pleistocene			
TERTIARY	Pliocene(?)		Terrace deposits	
	Eocene	Jackson	Undifferentiated	
		Claiborne	Cockfield Formation Cook Mountain Formation	
			Sparta Sand Cane River Formation Carrizo Sand	Memphis aquifers
		Wilcox	Undifferentiated (contains lower Wilcox aquifer)	
	Paleocene	Midway	Porters Creek Clay Clayton Formation	
CRETACEOUS	Upper Cretaceous		Arkadelphia Marl Nacatoch Sand Saratoga Clay Marlbrook Marl Annona Chalk Ozan Formation Brownstown Marl Tokio Formation Woodbine Formation	
	Lower Cretaceous	Trinity	Paluxy Sand De Queen Limestone Holly Creek Formation Ultima Thule Gravel Member Dierks Limestone Delight Sand Pike Gravel	



GENERALIZED GEOLOGIC MAP

The Coastal Plain of Arkansas is underlain by vast artesian aquifer systems, and most of the surface is blanketed by alluvial sands and gravels, which contain water under both water-table and artesian conditions. This atlas is a generalized regional presentation of the various aspects of the principal aquifers.

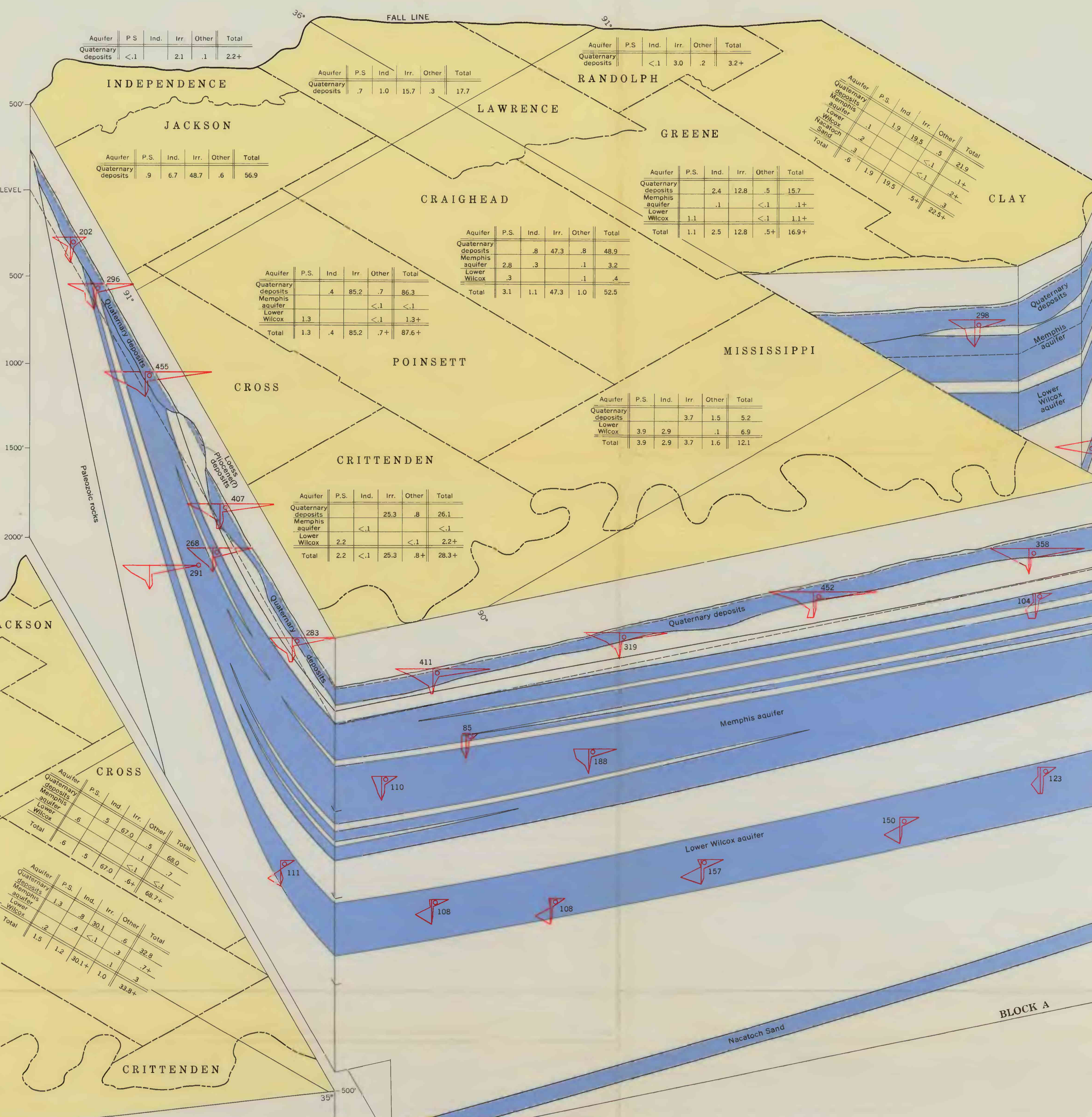
The diagrammatic representations of the clays in the Sparta Sand and Cockfield Formation and of the irregular sands in the Wilcox Group and Cane River Formation in southwestern Arkansas do not necessarily show the exact position and thickness of the individual layers. Clays and sands too thin or discontinuous for presentation at this scale were disregarded. Nonessential stratigraphy is omitted on the blocks, but the complete section is given in the geologic column.

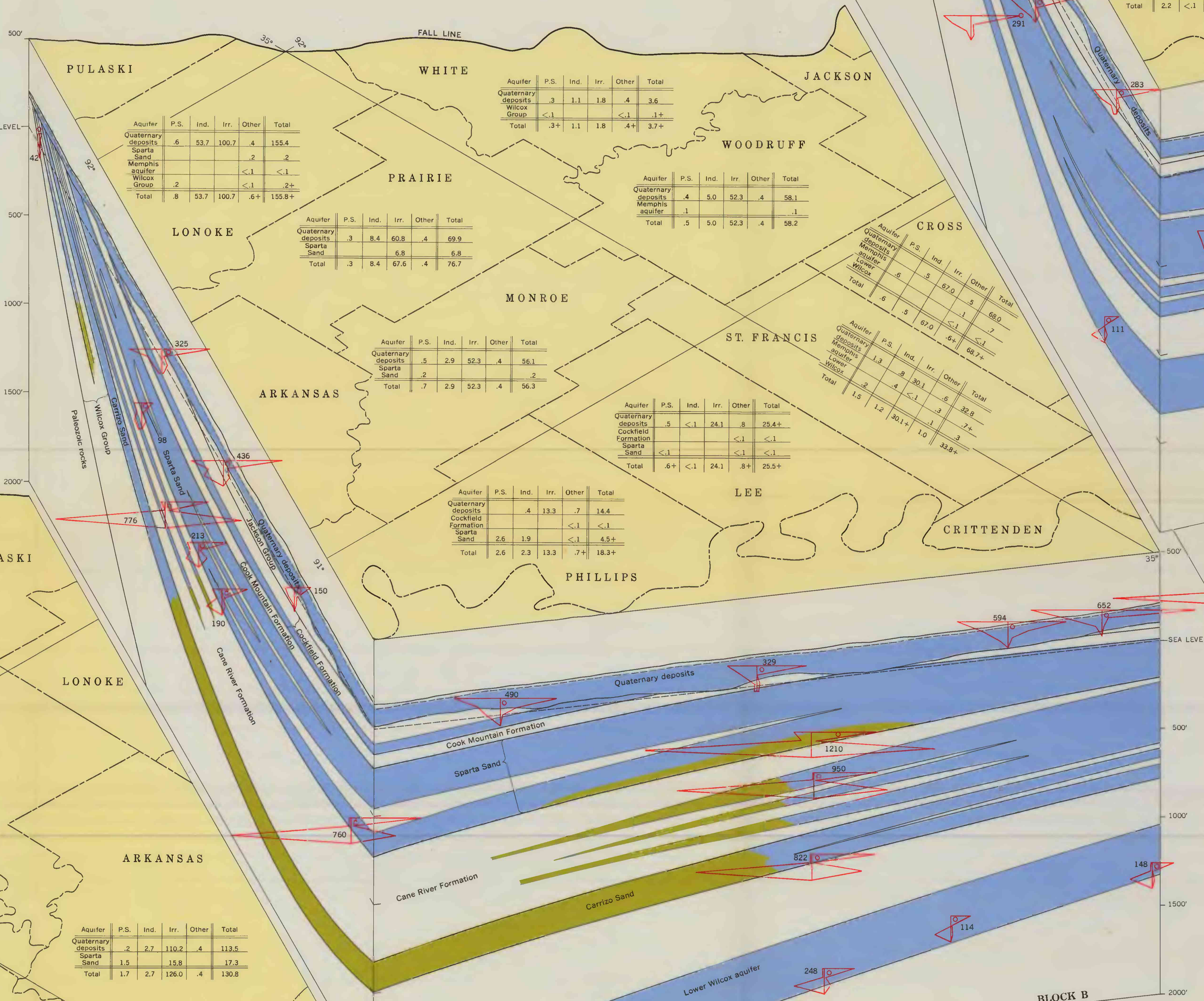
Conditions depicted on the sides of the blocks adjacent to the Mississippi River are representative of the area in Arkansas west of the river rather than east of the river as the blocks might indicate.

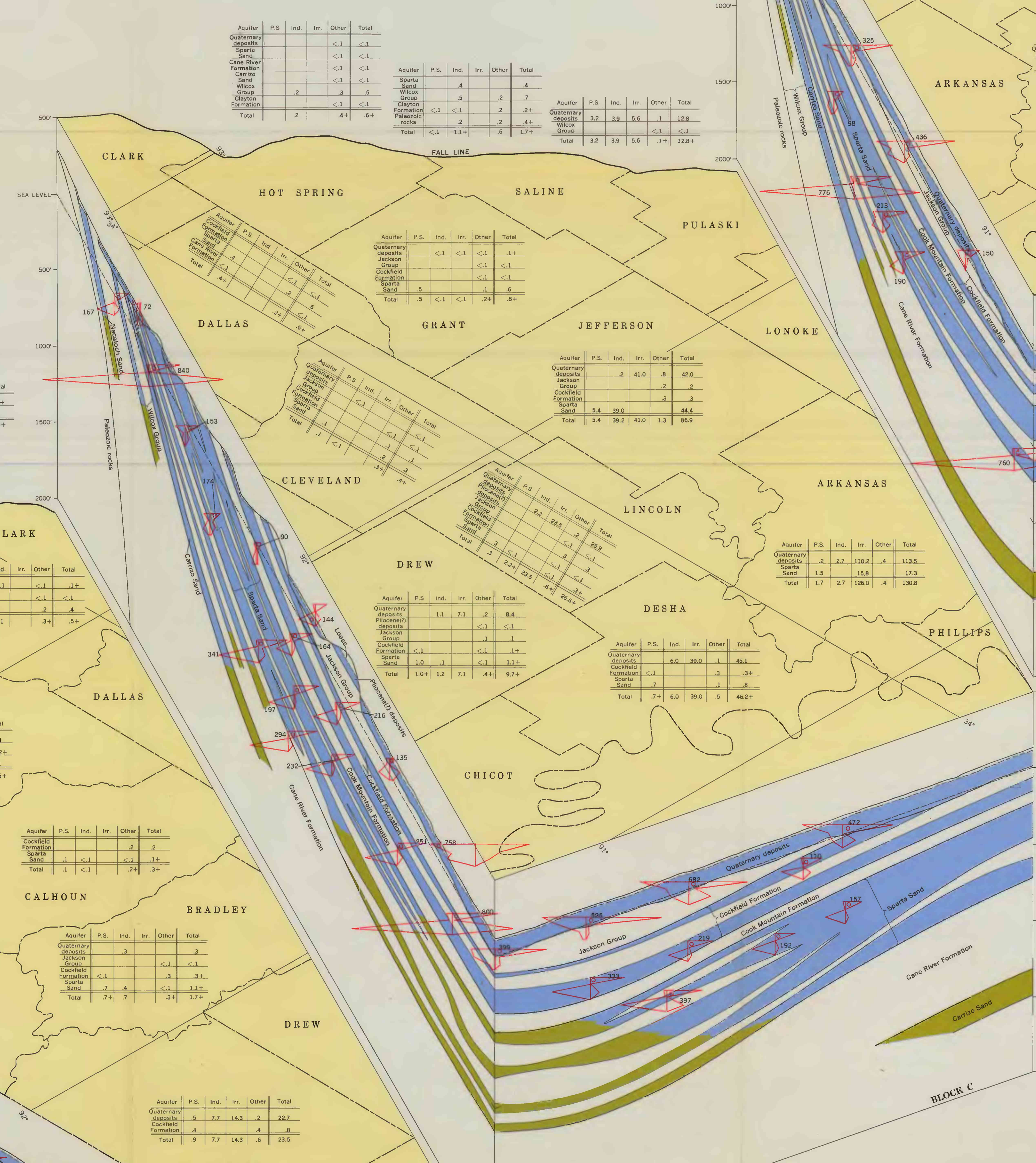
Chemical-quality diagrams are shown on the block diagrams at the approximate location from which the samples they represent were taken. In some areas where data were not available in the immediate vicinity of the side of the block, the diagrams were projected short distances to the block; some were projected from adjacent States.

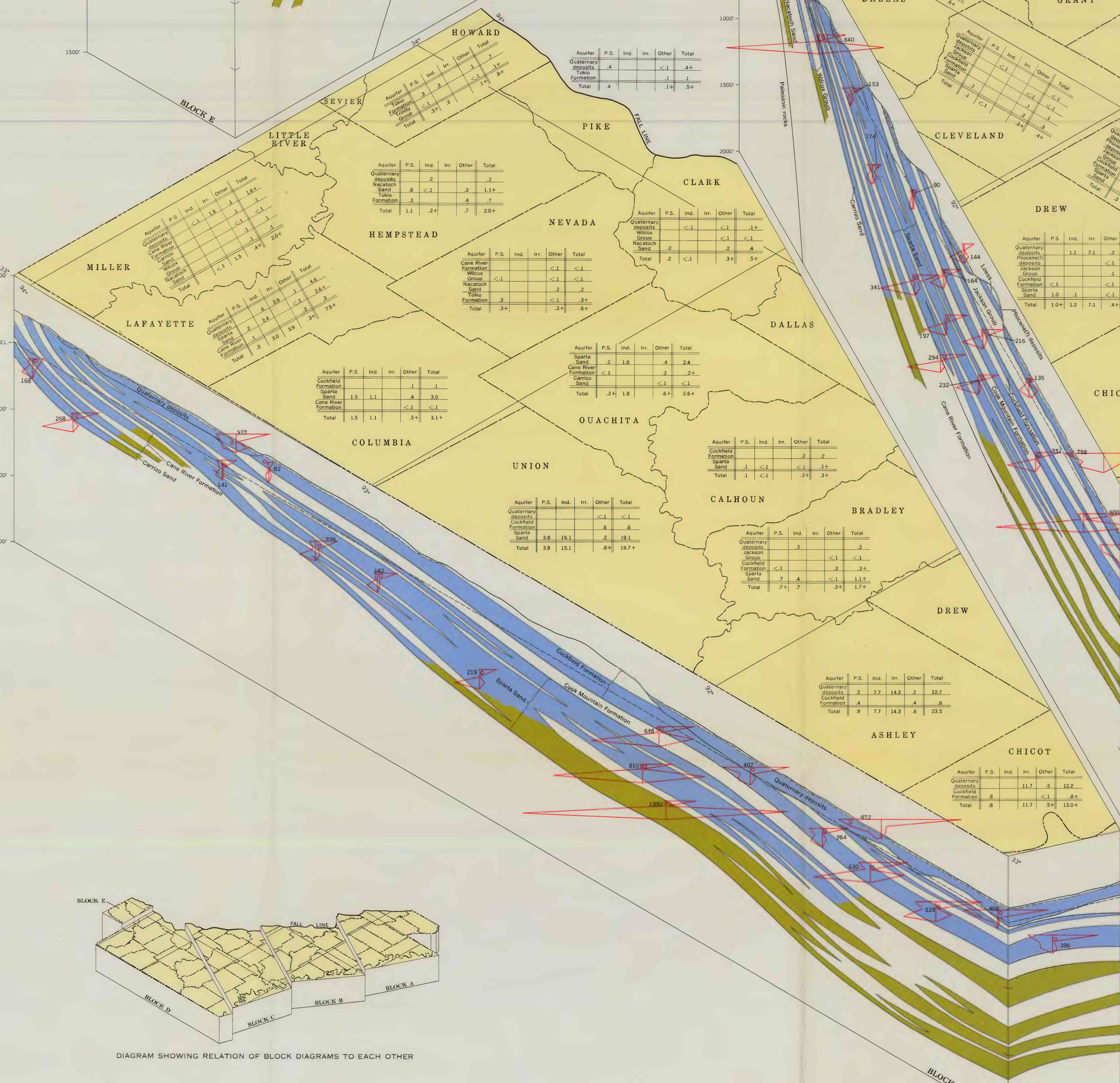
Aquifers or units containing aquifers of insufficient thickness or extent to be shown are the Pike Gravel, the Ultima Thule Gravel Member of the Holly Creek Formation, the Woodbine Formation, the Brownstown Marl, the Ozan Formation, the Clayton Formation, local sands of the Cook Mountain Formation, and sands of the Jackson Group.

This atlas was prepared from data used in the investigation of the water resources of the Mississippi embayment. The author appreciates the assistance of his project colleagues and the staff of the U.S. Geological Survey, Little Rock, Ark.









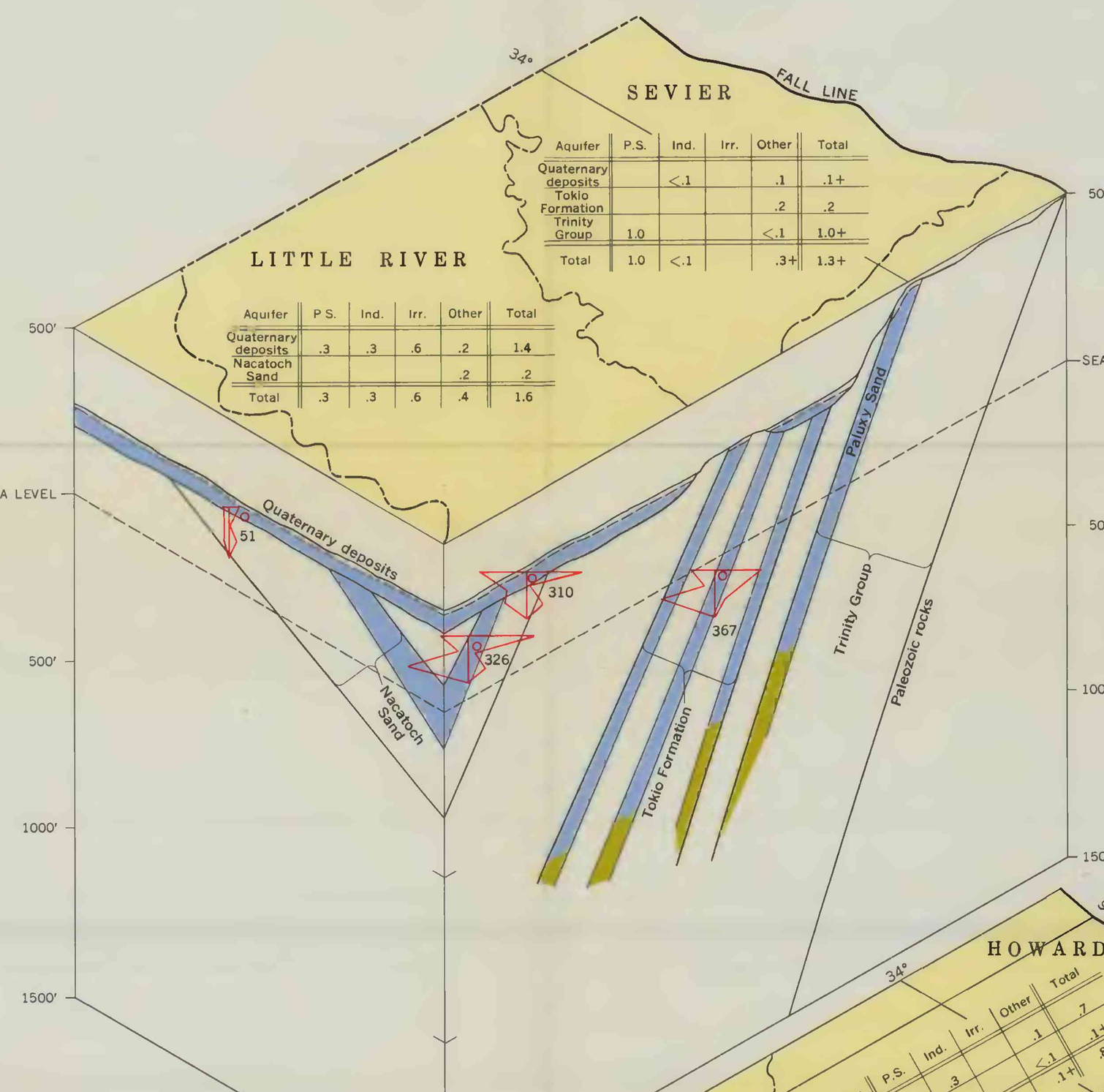


DIAGRAM SHOWING RELATION OF BLOCK DIAGRAMS TO EACH OTHER

EXPLANATION

Aquifer	P.S	Ind.	Irr	Other	Total
Quaternary deposits		<.1	3.0	.2	3.2+

Water-use table

Showing water use in million gallons per day in county indicated

Abbreviations: <, *less than;* P. S., *public supply;* Ind., *industrial;* Irr., *irrigation*

Modified from data in *Halberg, H. N., and Stephens, J. W., 1966. Estimated use of water in Arkansas, 1965. Arkansas Geol. Comm. Water Resources Summary 5*

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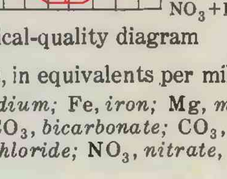
Approximate location where quality of water sample was taken

Number is dissolved solids in parts per million



Chemical-quality diagram

Constituents, in equivalents per million

Ca, *calcium;* Na, *sodium;* Fe, *iron;* Mg, *magnesium;* K, *potassium;* HCO_3, *bicarbonate;* CO_3, *carbonate;* SO_4, *sulfate;* Cl, *chloride;* NO_3, *nitrate,* F, *flouride*

Aquifer

Blue; water containing less than 1000 parts per million dissolved solids

Green; water containing more than 1000 parts per million dissolved solids

AQUIFER AND PUMPING TEST RESULTS AVERAGED BY COUNTY

(Number in parenthesis denotes number of tests used to compute average)

Aquifer or unit containing aquifer	County	Coefficient of: Transmissibility (gpd per ft.)	Storage	Permeability (gpd per sq. ft.)	Specific capacity (gpm per ft. of drawdown)
Quaternary deposits	Arkansas	(8) 120,000	(2) 0.0016	(6) 1,900	(1) 33
Do	Ashley	(1) 200,000	(1) .08	--------	------
Do	Chicot	(1) 110,000	(1) .0003	--------	------
Do	Crittenden	(1) 140,000	(1) .0005	(1) 1,250	------
Do	Desha	(4) 130,000	(4) .002	(3) 1,660	------
Do	Drew	(1) 65,000	----------	(1) 930	------
Do	Jackson	(2) 70,000	(1) .07	(2) 425	------
Do	Jefferson	(4) 290,000	(2) .004	--------	------
Do	Lincoln	(3) 190,000	(3) .002	(3) 2,100	------
Do	Little River	(3) 13,000	(3) .021	(3) 460	(1) 13
Do	Lonoke	(5) 120,000	(2) .021	(5) 1,600	------
Do	Mississippi	(4) 190,000	(4) .0007	(4) 1,950	(3) 70
Do	Prairie	(2) 90,000	----------	(2) 1,700	------
Do	Pulaski	(1) 260,000	----------	--------	------
Do	St. Francis	(2) 300,000	(2) .02	(1) 2,500	------
Do	White	(4) 99,000	(4) .10	(3) 700	------
Cockfield Formation	Chicot	(1) 51,000	(1) .0008	(1) 850	------
Memphis aquifer	St. Francis	(1) 55,000	(1) .0009	(1) 1,050	------
Sparta Sand	Arkansas	(2) 130,000	----------	--------	------
Do	Columbia	(8) 28,000	(3) .0008	(1) 830	(7) 9
Do	Dallas	(1) 24,000	(1) .0003	--------	------
Do	Desha	(1) 20,000	(1) .0024	--------	------
Do	Drew	(1) 13,500	----------	(1) 135	------
Do	Grant	(2) 38,000	----------	--------	(1) 12
Do	Jefferson	(5) 100,000	(5) .00025	--------	------
Do	Lafayette	(1) 49,000	(1) .00054	--------	------
Do	Ouachita	(1) 29,000	(1) .00019	(1) 660	(1) 7
Do	Prairie	(1) 55,000	(1) .0002	--------	------
Do	Union	(6) 32,000	(2) .00037	(6) 80	(3) 14
Carrizo Sand	Hot Spring	(1) 4,000	----------	(1) 103	(1) 2
Wilcox Group undiff.	do	(1) 18,000	(1) .000016	(1) 448	------
Lower Wilcox aquifer	Mississippi	(1) 160,000	(1) .0002	(1) 1,300	(3) 30
Nacatoch Sand	Hempstead	(1) 3,500	----------	(1) 36	------
Tokio Formation	do	(1) 4,500	----------	(1) 90	------
Do	Howard	(1) 1,300	(1) .000044	(1) 62	------
Pike Gravel	Pike	(1) 10,000	(1) .00004	--------	(1) 4

SUMMARY OF HYDROLOGIC CHARACTERISTICS OF PRINCIPAL AQUIFERS

Aquifer or unit containing aquifer	Remarks
Quaternary deposits	Occur as terrace and alluvium, generally grading finer upward from gravel or coarse sand at the base to fine sand or silt at the surface. Some older higher level terrace gravels are present as scattered remnants. Except where lowered by withdrawals, water levels are generally within 20 feet of land surface. The largest use of water from Quaternary aquifers is for irrigation; lesser amounts are used by industry, chiefly fish farms. Treatment requirements, mostly for iron removal, may be prohibitive for some industrial uses. Quaternary aquifers are the most widely used source for rural domestic and stock water supplies. Well yields range from a few gallons per minute to about 6,000 gpm (gallons per minute); most irrigation wells are in the 500-2,000 gpm range.
Cockfield Formation	Contains irregular beds of fine to medium sand, generally in the lower part. Used mostly for rural domestic and stock water supplies. Well yields range from a few gallons per minute to about 600 gpm, but most yields are less than 400 gpm.
Sparta Sand	Most widely used Tertiary aquifer. Varies from massive extensive beds of fine to medium sand to irregular or lenticular sands. In places, especially in the southern part of the State, the thickness and continuity of the sands change drastically over short distances, transmissibilities are low, and only small to medium well yields are possible; deep and steep depressions in the piezometric surface in the Sparta have resulted in a few areas from large withdrawals of water for municipal and industrial uses. However, over most of the area the Sparta contains thick extensive sands, and wells yield as much as 3,000 gpm. Industry makes the heaviest demands on the Sparta, but large amounts of water are also withdrawn for municipalities and irrigation. In east-central Arkansas a large elliptical depression in the piezometric surface has resulted from the coalescence of a cone produced by large industrial and municipal withdrawals with one produced by irrigation usage. Anomalous to the generally excellent quality of water in the Sparta are occurrences of mineralized water at relatively shallow depths in the vicinity of latitude 35°N.
Cane River Formation	Contains beds of fine sand, which are utilized as aquifers primarily in updip areas near the outcrop where the sands are thickest. Most wells are for rural domestic and stock use.
Carrizo Sand	Extensive, practically unused aquifer. Composed of fine to medium sand generally ranging in thickness from about 100 feet to about 300 feet. Contains fresh water at depths exceeding 2,000 feet. However, most wells screened in it are for domestic water supplies in updip areas. Owing to sparse development because of the availability of water from the shallower Sparta Sand, little is known about potential yields. In east-central Arkansas, where the Carrizo is thickest and deep pumping levels are possible, large yields should be available.
Memphis aquifer	The Carrizo Sand, the sandy facies of the Cane River Formation, and the Sparta Sand comprise the Memphis aquifer, a massive fine to medium sand extending northeastward from approximately latitude 35°N. The aquifer is tapped by only a few wells in Arkansas and represents a tremendous reserve. Known yields range from 100 to 1,000 gpm, but larger yields are possible.
Wilcox Group	Contains highly irregular beds of fine to medium sand in southwestern Arkansas, and the water commonly is high in iron content. Most wells are small-capacity domestic water supplies. In northeastern Arkansas the lower Wilcox aquifer a persistent sandy zone in the lower part of the Wilcox, is as much as 300 feet thick. Although this aquifer is widely used, the total withdrawal is small. Well yields range from about 100 to 2,000 gpm. Most of the usage is for municipal water supplies.
Nacatoch Sand	The upper part of the formation is a massive fine sand; in southwestern Arkansas it is thickest, about 150 feet, updip near the outcrop. Most wells tapping it are for rural domestic and stock use, but the largest withdrawal is for public supply. Well yields are 300 gpm or less. Water levels are declining, due in large part to the widepread practice of not capping flowing wells. In northeastern Arkansas the massive fine sand of the Nacatoch is 50 to 150 feet thick. The only withdrawals in this area are for public supplies for a few small towns just west of the "bootheel" of Missouri.
Tokio Formation	Contains three sands which converge eastward to become a massive sand. The lower sand grades into a basal gravel in places. Most withdrawals from the Tokio are for public and rural domestic water supplies. Well yields are small; only a few yield as much as 300 gpm. Flowing wells, generally 20 gpm or less, may be obtained in many areas.
Trinity Group	The principal aquifer in the Trinity Group is the Paluxy Sand, which is the uppermost unit. It is a fine sand, and well yields are small. The largest withdrawal is for public water supplies. Flowing wells of small yield may be obtained in low-lying areas. Two lower aquifers in the Trinity, the Ultima Thule Gravel Member of the Holly Creek Formation and the basal Pike Gravel, are not widely used as sources of water, owing to their limited areal extent.

SCALE 1:500 000

10 0 10 20 30 40 50 MILES

10 0 10 20 30 40 50 KILOMETERS

GEOHYDROLOGY OF THE COASTAL PLAIN AQUIFERS OF ARKANSAS

By
R. L. Hosman

1969

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