Rankin County Geology and Mineral Resources

WILBUR T. BAUGHMAN

THOMAS E. McCUTCHEON

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BULLETIN 115

MISSISSIPPI GEOLOGICAL, ECONOMIC AND TOPOGRAPHICAL SURVEY

WILLIAM HALSELL MOORE
Director and State Geologist

JACKSON, MISSISSIPPI
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STATE OF MISSISSIPPI

Hon. John Bell Williams	Governor

MISSISSIPPI GEOLOGICAL, ECONOMIC AND TOPOGRAPHICAL SURVEY

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LETTER OF TRANSMITTAL

Office of the Mississippi Geological, Economic and
Topographical Survey
Jackson, Mississippi

July 15, 1971

Mr. Gordon W. Gulmon, Chairman, and
Members of the Board
Mississippi Geological, Economic and Topographical Survey

Gentlemen:

I am pleased to transmit to you Bulletin 115 of Mississippi Geological Survey, "Rankin County Geology and Mineral Resources," by Wilbur T. Baughman and others.

Rankin County has a varied suite of both surface and subsurface minerals. This Bulletin will add immeasurably to the geological knowledge of the County and will be helpful in the development of the mineral resources. This Bulletin utilizes several members of the Survey staff plus outside consultants to present a complete picture of the County's geology and mineral resources.

Respectfully submitted,
William H. Moore
Director and State Geologist

RANKIN COUNTY GEOLOGY AND MINERAL RESOURCES

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RANKIN COUNTY GEOLOGY

Wilbur T. Baughman

ABSTRACT

Rankin County, located just south-southwest of the center of the State, lies within the parallels of 32° 00' and 32° 40' north latitude and the meridians 89° 40' and 90° 20'. It is located in the Gulf Coastal Plain physiographic province. It ranks sixth in size within the State and contains within its boundaries a total of 800 square miles. The County was formed in 1828 and named for Christopher Rankin, a former representative in Congress. Brandon is the County seat.

Bedrock exposed on the surface in the County is part of the Eocene, Oligocene and Miocene series of the Tertiary system and the Pliestocene and Recent series of the Quarternary system. The oldest unit exposed in the County is the Yazoo formation of the Jackson group. The younger units in ascending order are the Forest Hill formation and the Vicksburg group of Oligocene age and the Catahoula formation of Miocene age. The Yazoo, Forest Hill and Vicksburg formations are overlain locally by deposits of pre-loess terrace sands and gravels. The Catahoula is overlain locally by deposits of Citronelle sands and gravels and pre-loess sands and gravels. These deposits, which are present locally, are Pleistocene in age. Alluvium of Recent age covers bedrock that would otherwise be exposed in the alluvial plains of creeks and rivers in the County.

The major structural feature in the County is the Jackson Dome, which is located on the western fringe of the County in the Flowood-Jackson vicinity. Strata exhibiting a higher than normal position, indicating smaller structural features, are present in other localities. These may be noted on the structural map constructed on the top of the Moodys Branch formation. Generally the near surface strata show a southwest dip. There are no shallow piercement salt domes located within the County.

Surface rocks and minerals of economic importance include clay and natural clay mixtures, sand and gravel, and limestone and marl. Clays found in the County have potential uses in the manufacture of lightweight aggregate, brick, tile, fireproofing and related products, garden pottery and flower pots, and flux clay. Limestone and marl are utilized in the County in the manufacture of Portland cement. Other potential uses of limestone and marl are in the production of rock wool and agricultural lime.

INTRODUCTION

This report includes the results from a geological and hydrological investigation of Rankin County which are combined in this report. The geological investigation involved an interpretation of the geology of the County and an appraisal of its mineral resources. The hydrological investigation provides detailed data on the ground-water resources and includes available information on surface water.

The field work for the present investigation was begun on a part-time basis in late October 1968 and was concluded in August 1970. The investigation included a study of the various geological units with regard to character, thickness, distribution on the surface, and possible surface expressions of subsurface structures that affected these units. Special attention was given a search for materials of possible economic importance. In a study of Rankin County that was discontinued, a total of 14 holes were drilled in 1964 and 1965. In that program a total of 2880 feet were drilled and cored. A total of 34 holes were drilled and cored during the present investigation in order to obtain stratigraphic, structural and hydrologic information and to obtain clay samples for various laboratory analyses and for paleontological studies. The total footage amounted to 7164 feet. All the holes drilled under the program in 1964 and 1965 were drilled by the Survey's Failing 750 rig and electrical logs were run on all of them using the Survey's Widco electrical logger. All holes drilled as a result of the present investigation were drilled with the Survey's Failing 1500 Holemaster rig and electrical logs were run on 15 of them with either the Survey's Neltronic electrical logger or its Widco electrical logger.

Additional data used in the investigation of the geology and mineral resources of Rankin County included electrical logs of core holes supplied to the Survey by oil companies and operators. Other data was obtained from the Water Resources Division of the U. S. Geological Survey in Jackson, which included bore hole cuttings from water wells and electrical logs. These bore hole cuttings and electrical logs are on file in the Mississippi Geological Survey offices. The cuttings and electrical logs were made possible by the coordinated electrical logging program of the two agencies in cooperation with the water well industry in Mississippi. This information has enormous value in a study of this type.

PREVIOUS INVESTIGATIONS

No comprehensive report on the geology of Rankin County has been prepared previously, although certain portions of the

County and particular formations, fossil suites and mineral resources have been subjects of several previous investigations.

Wailes[1] in 1854 in his report on the geology and agriculture of Mississippi mentioned slabs of sandstone noted in Rankin County which he assigned to the Grand Gulf Series. He noted the presence of limestone in a railroad cut between Jackson and Brandon and suggested that the angular, disjointed blocks would be well adapted for burning into lime. Harper[2] in 1857 made mention of strata found in Rankin County. These early reports of the Mississippi Geological Survey were followed in 1860 by the classic report on the geology and agriculture of Mississippi by E. W. Hilgard[3] in 1860. Hilgard discussed strata found in Rankin County and recognized structural anomaly at Jackson. This anomaly is now widely known as the Jackson Dome.

Crider[4] in 1906 described a section of the Vicksburg formation southeast of Brandon and gave additional data on the Vicksburg limestone and marl in his work on cement and Portland cement materials in Mississippi in 1907[5]. It was in this writing that he suggested locations in Rankin County as being advantageous for cement plant locations.

Logan[6] in 1907 described brick clays in the Brandon area.

Lowe[7] in 1915 summarized the geology of Mississippi, proposed new names for some strata that appear in the County and suggested that the Jackson anomaly was a favorable area to prospect for oil and gas. Writings in 1919[8] and 1925[9] by Lowe offered minor corrections in his 1915 writing.

Hopkins[10] in 1916 mentioned thicknesses of the Vicksburg limestone just east of Brandon and along the Pearl River south of Jackson. He also noted evidence of faulting in Rankin County. He recommended the Jackson structure be drilled for oil and gas. Drilling in earnest began after the release of his report. Two unsuccessful wildcats were drilled and in 1919 Lowe[11] was able to demonstrate that the wells had been drilled too low on the structure.

In 1928 Grim[12] in his report on oil and gas prospecting in Mississippi, concluded that the Jackson anticline was formed by faulting which was the result of crustal movement.

Monroe[13] in 1932, after the discovery of the Jackson Gas Field in 1930, described the strata down to and including the producing horizon, the Jackson "Gas Rock". Monroe[14] described the rocks below the "Gas Rock" in 1933. Monroe and Toler[15] wrote about the history of the Jackson Gas Field in 1937.

Mellen[16] in 1942 described Vicksburg limestones and marls near Brandon.

In 1954 Monroe [17] published a report on the geology of the Jackson area, which included portions in Rankin County covered by the Jackson quadrangle, the Pelahatchie quadrangle and the northern third of the Florence quadrangle. His report gave an excellent geologic map on the area covered by the report and the most complete geologic report available on the area.

Several reports have been published by the United States Geological Survey on ground-water resources of the Jackson area and Rankin County. Discussion of these reports will be made in the section on ground-water in the County.

Discussions of various aspects of formations found in the County have been the subject of previous writings. The portions of the County not covered by Monroe's[18] report were the subject of a master's thesis by Echols[19] in 1961.

DESCRIPTION OF THE AREA

Location and Size

Rankin County is located just southwest of the center of the State. The northeast corner of the County is in close proximity to the center of the State. It lies within the parallels 32°00' and 32°40' north latitude and the meridians 89°40' and 90°20' west longitude. The southern boundary of the County is straight with the exception of a slight offset from north to south along the range line between Rs. 3 and 4 E. This offset extends Rs. 4 and 5 E., approximately 500 feet farther south than the ranges west of this line. The western boundary of the County is the Pearl River. The eastern boundary is north-south from the southeastern corner of T. 3 N., R. 5 E., to near the mid-point of T. 6 N., R. 5 E., and is common with the eastern township lines of those townships. From approximately the mid-point of T. 6 N., the eastern boundary turns in a northwesterly direction to a point of intersection with the Pearl River in Sec. 28, T. 9 N., R. 5 E. Rankin County has a maximum east-west extent of almost 31 miles and a maximum north-south extent of almost 38 miles. Rankin County contains 800 square miles or 512,000 acres within its boundaries, which places it sixth in size among the 82 counties in the State. Rankin County is bounded on the west by Hinds and Madison Counties, on the south by Simpson County and on the east by Smith and Scott Counties (Figure 1).

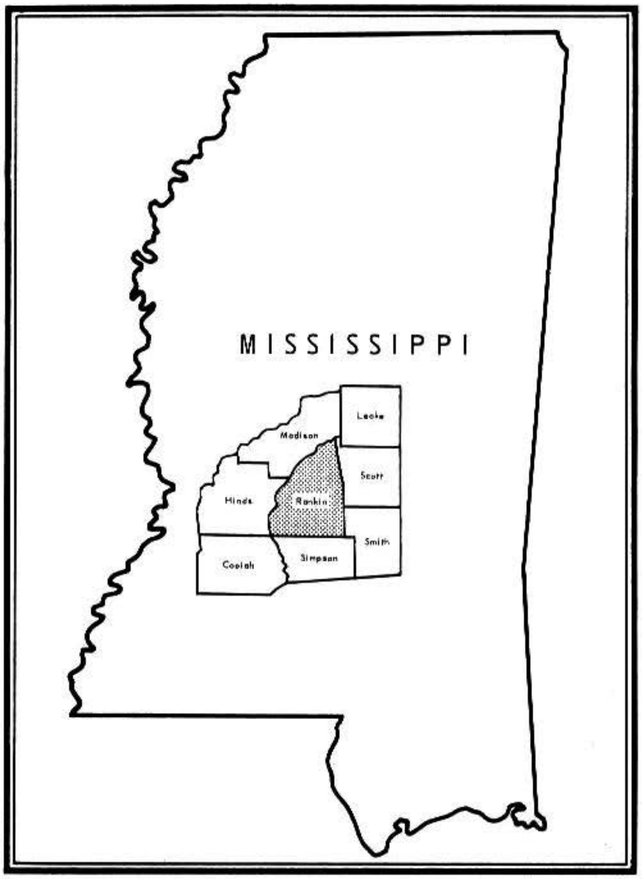

Figure 1.—Location of Rankin County.

Accessibility

Rankin County is favorably located near the center of the state with Jackson, the State's capitol, bordering the County to the west. The County is served by 2 Interstate Highways, 2 U. S. Highways, 9 State Highways and numerous County roads, some asphalt and other surfaced with gravel or sand.

Interstate 20 crosses the County in an east-west direction at approximately the mid-section of the County. It extends from south Jackson on the west and traverses the County in an eastern direction just south of the Flowood-Pearl area, crosses the northern part of the town of Brandon and passes Pelahatchie less than a mile south of town. This is one of the most important arteries in the Highway system of the state.

Interstate 55 skirts east around Jackson into the west central edge of the County and even though it only passes through the County in its by-pass of downtown Jackson, it is easily accessible to residents in the heavily populated sections of central and west central Rankin County. It too, is one of the most important Highways in the State. Both interstates are concrete surfaced and built to interstate standards.

U. S. Highway 80 parallels Interstate 20 in an east-west direction. It passes along the south boundary of Flowood, through Pearl, under Interstate 20 on the western edge of Brandon, through Brandon, under Interstate 20 just east of Brandon and on east through Pelahatchie. U. S. 80 is concrete and asphalt surfaced and is a four-lane highway from Jackson to a point half-way between Pearl and Brandon.

U. S. Highway 49 intersects Interstate 20 and U. S. 80 just east of the Pearl River in western Rankin County. It is a four-lane highway from those points south to the Mississippi Gulf Coast. It passes through Plain, Florence, Star and Piney Woods in Rankin County. It is concrete and asphalt surfaced and is a main artery of travel in the State.

State Highway 18 extends southeasterly from Brandon through Puckett, where it crosses State Highway 13 and continues easterly through Raleigh in Smith County. State Highway 13 connects Mendenhall in Simpson County to the southwest with Puckett and then continues into Smith County through Polkville to the northeast. State Highway 541 exits off 18 south of Puckett for easy access in a southerly direction to Magee in Simpson County. State Highway 43 intersects 18 just northwest of Puckett and spans the County near the east side from that point north through Rufus, Cross Roads, Pelahatchie, Leesburg, Sand Hill, into Madison County near the north end of the Barnett Reservoir, and on through Canton in Madison County. State Highway 481 connects to 43 in the Leesburg community and extends southeast into Morton in Scott County. State Highway 471 extends from Brandon in central Rankin County north through Langford, Fannin and Goshen Springs to a point of intersection with 43 just east of the Barnett Reservoir. State Highway 25 is a four-lane highway which connects north Jackson and Interstate 55 with State Highway 468 just north of the north corporate line of the town of Flowood. Highway 468 extends south from that point through Flowood, west Pearl, Pearson, then east through Whitfield and into Brandon. State Highway 469 extends south from 468 approximately 2.5 miles east of Whitfield, through Florence and continues in a southern direction through Harrisville in Simpson County.

State Highway 475 connects State Highway 25 east of the Pearl River in Rankin County to the Jackson Municipal Airport, U. S. Highway 80 and Interstate 20 just south of the airport. Contracts have been let and completion on the extension of 25 east to 471 just south of the Pelahatchie Creek is scheduled for the end of September, 1971. This highway is planned to continue ultimately to Carthage where it will provide a connection with State Highway 25 presenlty in use from just north of Carthage to Starkville.

Approximately 600 miles of asphalt surfaced county maintained roads are in use within the County at the time of this writing. These provide good access to rural areas of the County. An additional 200 miles of gravel and sand roads are maintained by the County and are passable at all times of the year except during extreme wet weather conditions or rare bridge washouts.

Three rail lines cross the County. One Illinois Central line passes through the southwestern portion of the County connecting Jackson with Hattiesburg and the Mississippi Gulf Coast to the South. Another Illinois Central line passes through the central part of the County from Jackson on the west to Meridian in the eastern part of the State. These lines connect to the main Illinois Central Railroad in Jackson. The Gulf Mobile and Ohio Railroad passes from Jackson on the west through northwestern and northern Rankin County on its route to Meridian. Several other rail lines serve the Metropolitan City of Jackson which is adjacent to the heavily populated area on the west central fringe of the County.

Three commercial air lines serve Rankin County and the Jackson Metropolitan Area through the Jackson Municipal Airport located in west central Rankin County just east of the City of Jackson. This airport is owned by the City of Jackson and is one of the most modern in the United States today.

Climate

Climatological data for Rankin County was compiled from United States Weather Bureau reports for the 10-year period from June 1, 1960 through May 30, 1970. Measurements used were taken at the recording station in Pelahatchie, except for a small number of months at random during this period of time. Measurements taken at the recording station at the Jackson Municipal Airport in Rankin County were used for these months. Climatological data is shown on Table 1. Rankin County enjoys a temporate climate with long, humid summers and short, mild winters. The average winter temperature for the 10-year period compiled was 46.5 degrees, average summer temperature was 79.1 degrees and the average annual temperature was 63.8 degrees. Absolute maximum temperature recorded at the recording station was 103 degrees in June 1963 and the lowest temperature recorded was 3 degrees below zero in January 1962. The average annual precipitation for the 10-year period was fairly well distributed with the spring months, particularly March, having the heaviest rainfall and the fall months, particularly October, having the lightest rainfall. Figure 2 shows Rankin County had an average annual rainfall of approximately 52 inches in the 25-year period from 1931 through 1955. Precipitation extremes ranged from none in October 1961 to 13.49 inches in April 1964. Time loss due to adverse weather conditions is extremely low. Below freezing temperature and snowfall is uncommon. Temperatures approaching 100 degrees are common in summer and early fall.

Table 1.

Normal, Monthly, Seasonal, and Annual Temperature and Precipitation in Rankin County, Mississippi*

Month	Temperature			Precipitation		
	Average	Absolute maximum	Absolute minimum	Average	Absolute maximum	Absolute minimum
	F°	F°	F°	Inches	Inches	Inches
December	47.3	81	4	6.28	9.76	3.37
January	44.4	79	-3	4.98	9.53	1.35
February	47.9	83	11	4.92	10.04	2.60
Winter	46.5	83	-3	16.18	22.27	11.47
March	55.9	88	20	5.41	11.50	1.07
April	66.4	91	30	4.96	13.49	1.05
May	72.0	95	38	3.57	9.61	.20
Spring	64.8	95	20	13.94	23.61	6.13
June	77.5	103	46	3.18	8.75	.72
July	80.4	102	52	4.88	6.42	2.35
August	79.5	100	53	4.02	9.71	1.41
Summer	79.1	103	46	12.08	14.29	8.28
September	74.2	101	35	3.14	5.31	1.66
October	64.7	98	24	2.04	6.37	0.00
November	55.7	85	17	3.90	10.08	.98
Fall	64.9	101	17	9.08	16.10	6.45
Year	63.8	103	-3	51.28	67.37	37.16

*Average temperature and precipitation based on a 10 year record; compiled from available recordings in U. S. Department of Commerce, Weather Bureau, "Climatological Data," June, 1960, through May, 1970.

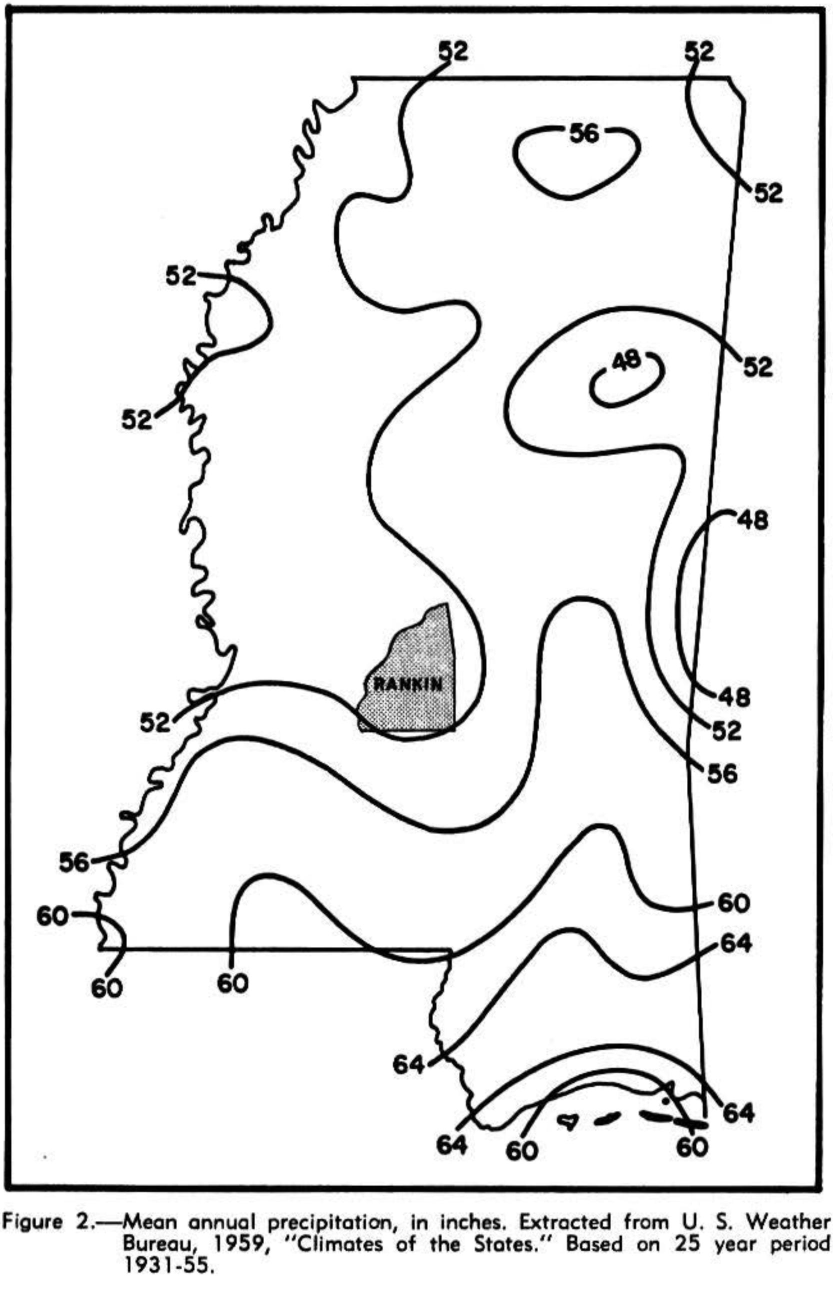

Figure 2.—Mean annual precipitation, in inches. Extracted from U. S. Weather Bureau, 1959, "Climates of the States." Based on 25 year period 1931-55.

Population

The 1960 census listed a population of 34,322 for Rankin County. Of this total 10,784 were white males, 10,720 were white females, 6286 were non-white males and 6532 were non-white females. The 1970 preliminary census report lists a population of 43,200, which is an increase of 8878 or 25.9% over the 1960 census. The 1920 census listed 20,153 or slightly less than half the 1970 preliminary figure. Population density for Rankin County, using the 1970 preliminary data, is 54 per square mile.

At the time of this writing Brandon, the County seat, and Pelahatchie are the only incorporated towns having a total population of 1000 inhabitants or more within its corporate limits. The 1970 preliminary census report lists Brandon (pop. 2677) and Pelahatchie (pop. 1259). No data has been released by the U. S. Census on the other 3 incorporated towns in the County, however, the Rankin County Chamber of Commerce reports their population at the time of this writing to be as follows: Florence (pop. 397), Flowood (pop. 344) and Puckett (pop. 321). The densely populated Pearl-McLaurin area has an incorporation petition in court. The Chamber of Commerce reports the population of this area to be approximately 21,000. Plain, another densely populated area between Jackson and Florence, has a population of approximately 4900 as reported by the Chamber of Commerce. Small communities and villages include Cato, Clarksburg, Cleary, Crossgates, Cross Roads, Fannin, Goshen Springs, Greenfield, Gulde, Johns, Lakeland, Langford, Leesburg, Luckney, Monterey, Pearson, Piney Woods, Pisgah, Rankin, Rock Hill, Rufus, Sand Hill, Sherwood Forest, Shiloh, Star, Thomasville, Value, Whites and Whitfield.

Culture and Industry

The 1960 census listed 10,935 as the total work force in Rankin County. This total included 7087 employed males, 259 unemployed males, 3435 employed females and 146 unemployed females.

Rankin County is divided into two primary cultural patterns, industrial and agricultural. Agricultural areas include all rural areas. Industrial areas are primarily those in close proximity to the metropolitan area of the City of Jackson, which include Flowood, Pearl-McLaurin and Plain. A considerable number of the residents of these areas are employed in and around the City of Jackson in adjoining Hinds County. A number of non-farming rural residents in Rankin County are also employed in Jackson. Other industry is located in Brandon, Florence and Pelahatchie.

The 1960 census listed a total of 1597 farms in Rankin County. Nearly 302,000 acres or 58.9% of the total acreage was in farms in 1960. A preliminary census in 1964 showed this figure had declined to 52.9% or a little less than 270,000 acres. The principal sources of farm income are livestock (beef cattle and hogs), timber, poultry, cotton, soy beans, grain crops and dairying.

At the time of this writing, the Rankin County Chamber of Commerce lists a total of 53 manufacturing plants in Rankin County with a total employment of 2350. Major industries include glass container manufacturing, corrugated paper box fabrication, poultry processing, ceramic tile manufacturing, steel fabrication, textile manufacturing, lumber products, battery manufacturing, molded concrete products, woodworking, wire drawing and knitting, and glass bead manufacturing for industry and reflective traffic products. Industries utilizing or producing minerals or mineral products will be discussed in the section titled Rankin County Mineral Industries.

GEOMORPHOLOGY

Physiography

Mississippi lies within the Gulf Coastal Plain province of North America. It can be divided into 12 physiographic units as shown in Figure 3. Three of these units are represented in Rankin County as shown by Priddy[20].

The major portion of the County is located in the Jackson Prairie Belt. This belt is developed on the outcrop area of the massive Yazoo clay which extends from south of Plain in west Rankin County north through the County and from south of Pelahatchie in east Rankin County north to the northern tip of the County. It is characterized by gently rolling terrain with deposit of terrace sands capping the higher hills.

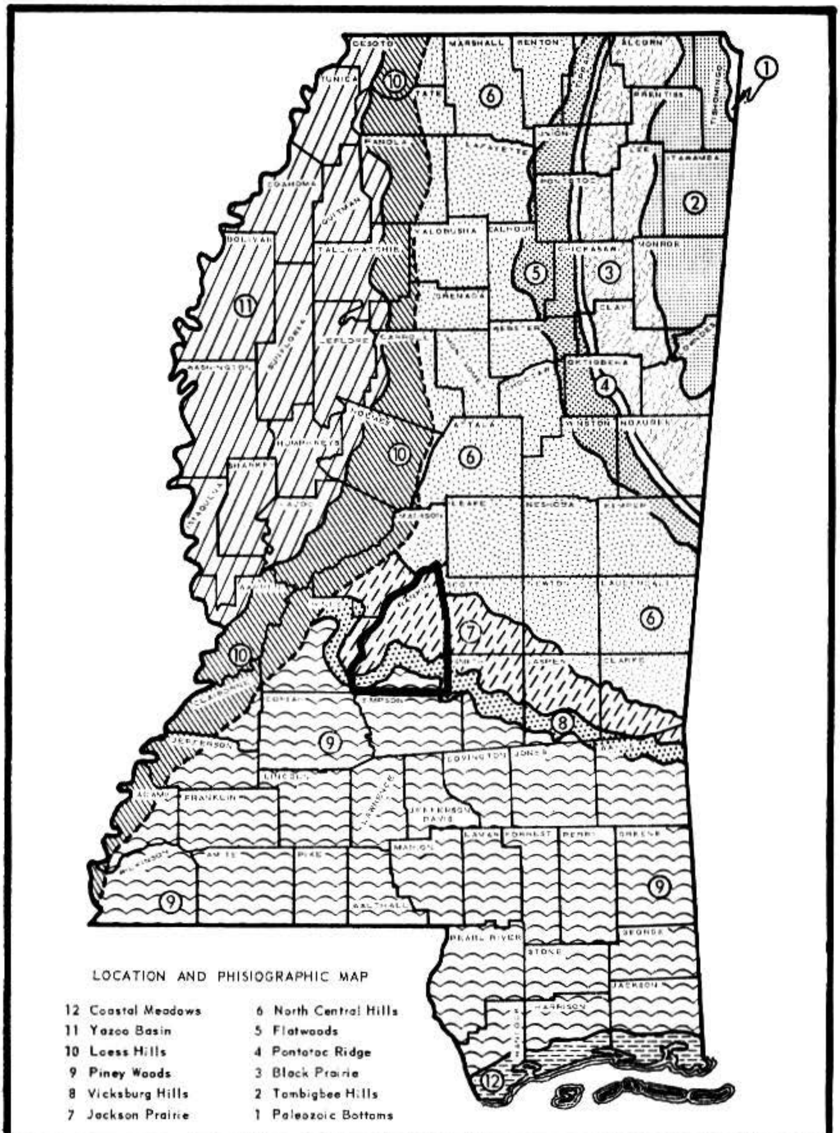

Figure 3.—Physiographic provinces of Mississippi. After R. R. Priddy.

Lowe[21] included the whole southern half of Mississippi south of the Jackson Prairie belt in a unit he designated the Long Leaf Pine Hills. This unit is now commonly known as the Southern Pine Hills. Priddy[22] further divided this unit into 3 dis-

tinct belts as shown in Figure 3. The Vicksburg Hills belt shares the same northern boundary as that of the Southern Pine Hills. It is characterized by a steep slope near the contact of the Yazoo clay and the Forest Hill formation on the northern edge of the belt and includes also that portion underlain by the Vicksburg group. Monroe[23] described the topography of the Vicksburg Hills as follows:

> The northern edge of the province (Southern Pine Hills) is the abrupt scarp of the Forest Hill cuesta, which is characterized by a steep slope near the outcrop of the contact of the Yazoo clay and the Forest Hill sand and by a more gentle back slope over the outcropping edges of the Forest Hill sand and limestones of the Vicksburg group.

Priddy[24] places the Piney Woods physiographic unit immediately south of the Vicksburg Hills belt as shown in Figure 3. It is underlain by the Catahoula formation of the Miocene Series in Rankin County. Some of the higher hills are capped by preloess terrace deposits and in some cases by Citronelle deposits.

The Jackson Dome exhibits a very pronounced effect on the physiographic units in the western portion of the County, particularly in the area immediately surrounding the Dome. If geologic conditions were normal, and regional dip prevailed in this area, the southern limit of the Jackson Prairie belt would probably have been about as far north of Jackson as it is presently south of the City. This is to say that Jackson in Hinds County to the west and Flowood in Rankin County east of Jackson for example, would have been in another physiographic belt without the influence of the Jackson Dome. Flowood and Jackson in their present geographic location would have been in Lowe's[25] Long Leaf Pine Hills and Priddy's[26] Piney Woods Unit.

General Topography

Surface mapping in Rankin County was aided tremendously by complete topographic map coverage as shown in Figure 4. Older 15 minute quadrangles were used in areas where newer 7.5 minute quadrangle maps were not available. These older maps have a scale of 1 to 62,500 and a contour interval

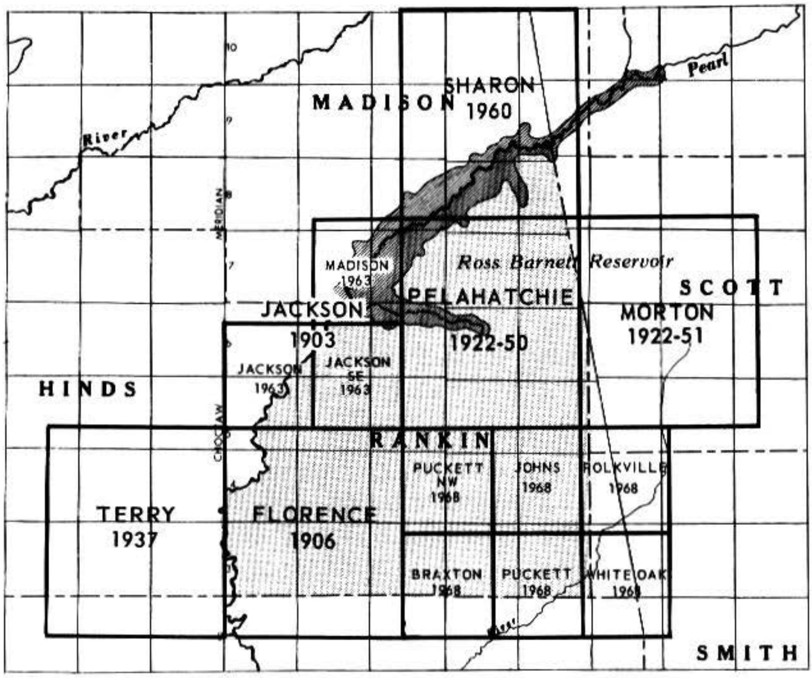

Figure 4.—Topographic map coverage of Rankin County.

of 20 feet on all but the Sharon quadrangle, which has a 10-foot interval on contours. The 15 minute maps used included the Terry quadrangle, mapped in 1937; the Florence quadrangle, 1906; Pelahatchie, 1950; Morton, 1951 and Sharon, 1960. 7.5 minute maps used included the Jackson quadrangle, mapped in 1963; the Jackson SE, 1963; Madison, 1963; Braxton, 1968; Puckett, 1968; White Oak, 1968; Puckett NW, 1968; Johns, 1968 and Polkville, 1968. All the 7.5 minute maps are on a scale of 1 to 24,000 and have a 10-foot contour interval except Jackson, Jackson SE and Madison. These have a 5-foot contour interval in the flat alluvial plain of the Pearl River and a 10-foot interval on the remainder of the map. Topographic maps enable the geologist to locate the various outcrops and physical features of a given area and thereby more readily determine the relationship of one situation to another. The 7.5 minute maps used in the study of Rankin County are a vast improvement over the previously published 15 minute quadrangles in facilitating more specific determinations.

The Mississippi Geological Survey stocks available topographic maps of Mississippi as a public service. The topographic maps of Rankin County and any other previously mapped area in the State are available at the offices of the Mississippi Geological Survey or may be ordered by mail from the Survey.

The topography of Rankin County varies from broad, gently rounded hills and broad flat alluvial plains to high narrow hills and ridges with steep slopes and narrow valleys. In the northern one-third of the County and in the area influenced by the Jackson Dome, broad rounded hills and broad, flat plains are common while in the remainder of the County a more rugged terrain is common with some areas having high narrow ridges and deep narrow valleys.

A prominent ridge crosses the southeastern one-fourth of the County in a southwest-northeast direction. It runs from southeast of Star and north-northwest of Piney Woods in the southern portion of the County northeasterly through Shiloh and into Scott County on the east about 4 miles southeast of Pelahatchie. This ridge forms a divide between the Pearl and Strong River drainage basins. Some branches of this ridge run off it in a southern direction. One, just east of the Shiloh Lookout Tower runs south to Indian Mound Hill where it forks. The east fork continues in a southern direction to the Puckett area and the west fork continues south passing just east of Johns and into Simpson County near the Strong River. Another short ridge branches off the main ridge at the Shiloh Lookout Tower. It is along this ridge just south of the Tower in Sec. 36, T. 5 N., R. 4 E., that the highest elevation in Rankin County is found. The elevation at this point is 612 feet. A ridge runs west from the main ridge in Sec. 34, T. 5 N., R. 4 E., to the Sherwood Forest area. Elevations in excess of 450 feet up to 550 feet are quite numerous along each of these ridges. The lowest elevations in the County are found in the southwestern corner where it is less than 220 feet along the Pearl River.

DRAINAGE

Rankin County lies within the Pearl and Strong River drainage basins. Strong River is actually a tributary of the Pearl. It flows into the Pearl in southwest Simpson County. The divide separating these two drainage basins runs southwest-northeast as previously stated. The Pearl River receives water from four primary creeks and their tributaries in Rankin County. The Strong River also receives water from four primary creeks and their tributaries in the County.

Fannegusha Creek in north Rankin County flows north-northwest from the vicinity of Leesburg to the Pearl River. Its tributaries include Deer Creek, Hurricane Creek, Red Cane Creek, Rollison Creek and Purnell Creek.

Pelahatchie Creek in north-central Rankin County flows west-northwest from the vicinity of Pelahatchie and flows into the south end of the Ross Barnett Reservoir (on the Pearl River). Its tributaries include Mulberry Creek, Ashlog Creek, Pierce Creek, Eutacutachee Creek, Snake Creek, Clear Creek, Riley Creek, Brush Creek and Clark Creek.

Richland Creek flows west-northwest from east of Brandon across west-central Rankin County to the Pearl River. Richland Creek tributaries include Tumbaloo Creek, Dry Creek and Terrapin Skin Creek.

Steen Creek in southwest Rankin County flows from north of Star westward to the Pearl River. Hominy Creek, Mountain Creek, Butler Creek and Indian Creek are tributaries of Steen Creek.

Dobbs Creek in south Rankin County flows south from the vicinity of Rock Hill to the Strong River in Simpson County. Thompson Creek is its main tributary in Rankin County.

Campbell Creek flows south from just south of Shiloh to the Strong River in Simpson County.

Brushy Creek flows south-southeast from southeast of Johns through Puckett and into the Strong River near the southeast corner of Rankin County. Its main tributary is Clear Creek.

Purvis Creek flows south-southeast from just east of Shiloh to the Strong River in Smith County. Its main tributary in Rankin County is Billy Walker Creek.

SURFACE STRATIGRAPHY

General Statement

The bedrock exposed in Rankin County are of the Eocene, Oligocene and Miocene series of the Teritary System. Bedrock exposed in the County includes sediments deposited in marine and non-marine environments. Surface strata in Rankin County include an array of lithologies such as: clay, sand, silt, siltstone, sandstone, marl and limestone. Generally the strata dip south-southwest, however, due to the influence of the Jackson Dome, dip has been altered around it so that the strata dip in all directions off the dome. The aggregate thickness of exposed strata in the County is in excess of 1200 feet. The youngest strata are exposed in southern Rankin County at higher elevations. The oldest strata crop out under the alluvium of the Pearl River on the Jackson Dome and will be discussed in the subsurface stratigraphy section.

In a considerable part of Rankin County, bedrock is covered by surficial materials of alluvium, colluvium, terraces and soils. These materials are of the Pleistocene and Recent Series of the Quarternary System.

Figure 5 is a generalized section of strata exposed on the surface in Rankin County. The areal extent of these strata is shown on the Geologic Map, Plate 1. Locations of test holes drilled and cored relative to the study for this report are shown in Figure 6.

SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	THICKNESS (feet)	LITHOLOGIC CHARACTER
QUATERNARY	RECENT		Alluvium	0-45	Sand, fine-to very coarse-grained; gravel, silt and clay with some organic material.
	PLEISTOCENE		Pre-loess Terrace deposits	0-156	Sand, fine-to coarse-grained. Scattered gravel locally, mostly pebble size. Occasional clay lenses. Sands weather to orange-red. Some silicified wood at or near base in some localities.
			Citronelle formation	0-110	Sand, fine-to coarse-grained, with abundant chert and quartz gravel. Ferruginous sandstone and siltstone present at base in some localities.
TERTIARY	MIOCENE		Catahoula formation	Up to 420	Clay, gray, buff, purple and green, silty to very silty. Silt, light-gray to white and buff, locally indurated to form siltstones, kaolinitic. Sand, gray to white, kaolinitic, very fine-to coarse-grained, locally indurated, particularly on or near surface, forming sandstone ledges.
	OLIGOCENE	VICKSBURG	Bucatunna clay	20-70	Dark-gray, finely carbonaceous, occasionally pyritiferous clay and finely micaceous clay with thin silt and sand laminae. Rare fossil fragments and glauconite near base. Weathers to chocolate brown.
			Byram marl	8-22	Gray-green, glauconitic, fossiliferous, clayey, silty to occasionally slightly sandy marl.
			Glendon limestone	15-50	Light-gray to gray, fossiliferous, glauconitic limestone. Occasionally slightly sandy. Alternating beds of gray-green, fossiliferous, glauconitic marl. Limestone beds vary from less than 1 foot thick to 4 feet thick.
			Mint Spring marl	6-30	Gray-green, fine-to coarse-grained, glauconitic, fossiliferous sand and sandy marl. Occasionally clayey.
			Forest Hill formation	65-210	Very fine-to fine-grained, silty sand. Silty, carbonaceous clay. Thin beds of lignite. Thinly laminated on outcrop.
	EOCENE	JACKSON	Yazoo formation	340-460	Blue-green, fossiliferous, calcareous clay. Weathers to greenish-yellow-tan. Very limy near base. Upper few feet occasionally non-calcareous.

Figure 5.—Generalized section of exposed strata in Rankin County.

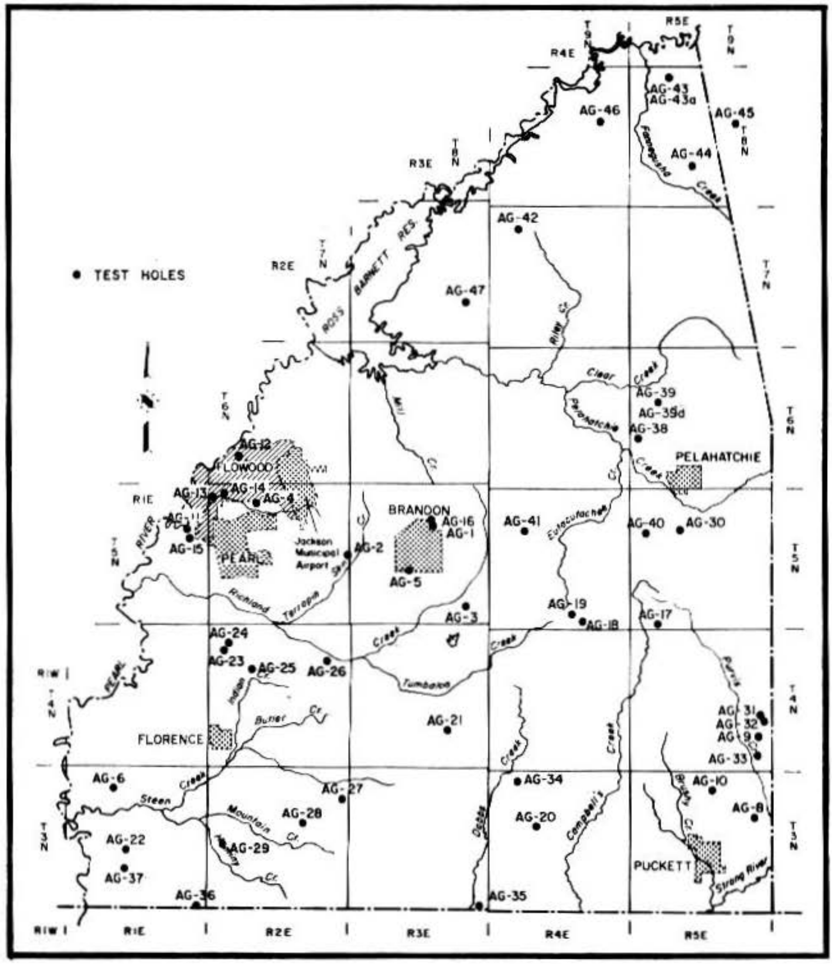

Figure 6.—Locations of test holes in Rankin County.

Yazoo Formation

In 1915, Lowe[27] described the upper part of the Jackson group in a bluff of the Yazoo River at Yazoo City, Mississippi and named it the Yazoo clay marl.

Cooke[28] in 1918 shortened the name to the Yazoo clay member of the Jackson formation. Murray [29] divided the Yazoo into four members in Jasper and Clarke Counties. In 1965, Moore[30] stated that the Yazoo is now considered by many geologists to be a formation. Evidence to divide the Yazoo into recognizable and correlative units is not considered by the writer to be present in Rankin County and for the purpose of this report, it will be considered an undifferentiated formation.

The unweathered Yazoo clay is a more or less homogeneous unit of blue-green, blue-gray and gray calcareous clay with occasional pyrite, many thin soft fossils and fossiliferous zones, foraminifera, occesionally slightly sandy and usually limy near the base. Some thin beds of soft marly limestone are often present in the upper portion of the formation as shown in Figure 7.

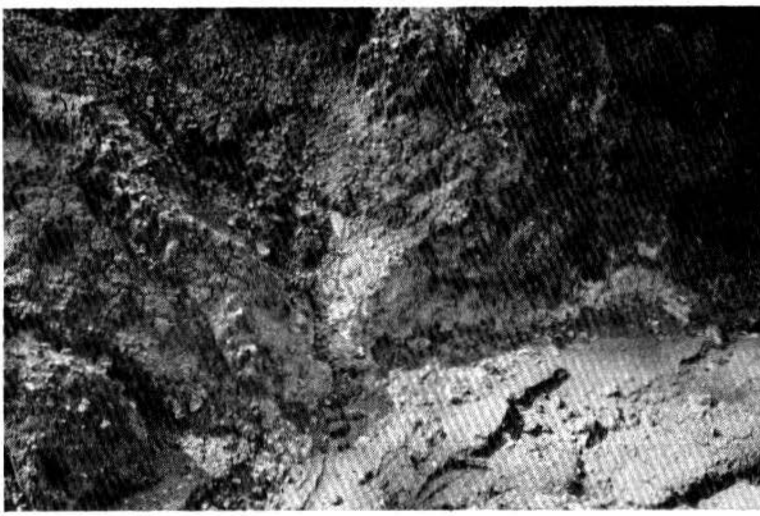

Figure 7.—Soft, marly limestone and calcareous nodules in outcrop of Yazoo clay along roadcut to General Crude No. 1 Spann in SE/4, NE/4, Sec. 19, T. 6 N., R. 5 E. May 1, 1971.

Yazoo clay is greenish-yellow-tan. On the surface it is usually blocky and crumbly when dry with much black staining which is due to the presence of manganese. Calcareous nodules on weathered surfaces of the clay are common in some areas as shown in Figure 7. Pyrite is not found in weathered Yazoo. Gypsum is present in the weathered zone in the form of selenite crystals. These crystals often exhibit limonite and manganese staining. The crystals are a weathering phenomenon and do not appear below the weathered zone, which is normally 27 to 31 feet. Wet Yazoo is a sticky mud in the weathered and unweathered state and is commonly called "gumbo". It is very incompetent and in its outcrop belt tends to cause serious foundation and roadbed problems. As the moisture content in it increases, it expands, creating tension in foundations and road surfaces causing them to crack and pull apart. Many homes built on Yazoo are cracked in numerous places and in some cases have actually fallen off conventional foundations. Strong "floating" slabs are suggested as a solution to the problem in the building of homes and other such structures in the outcrop belt of the Yazoo clay.

The Yazoo clay crops out in a broad belt in Rankin County. Its outcrop covers almost all of the County north of the south line of T. 5 N., except the south part of the center three townships and that part overlain by terraces and alluvium. It also occupies the area immediately surrounding the Jackson Dome, being overlain only by alluvium and terrace deposits in this area. The outcrop of the Yazoo exhibits varying degrees of weathering throughout.

The Yazoo clay varies from approximately 340 to 460 feet thick in Rankin County. The average thickness of the Yazoo in Rankin County is approximately 375 feet. It is generally thicker downdip and the thicker sections are found in the southwestern part of the County. AG-2 located in Sec. 18, T. 5 N., R. 3 E., penetrated 407 feet of Yazoo clay overlain by the Forest Hill formation. AG-4 penetrated 89 feet beneath the Pearl River alluvium. Only 10 feet of Yazoo was present in AG-15, Sec. 13, T. 5 N., R. 1 E., overlain by 26 feet of alluvium. Plate 4 indicates the stratigraphic position of the Yazoo on the east flank the Jackson Dome. The varying thickness of the Yazoo may be noted on Plate 4. Thick deposits of the Forest Hill formation are present at the expense of the Yazoo as may be noted on Plate 4, well number 5 on the strike section. In holes having thinner than normal Yazoo sections, a somewhat massive thick basal Forest Hill sand is usually present, but as in this case, this condition does not always exist.

The contact of the Yazoo with the underlying Moodys Branch marl is placed at the upper limit of the sand sequence of the Moodys Branch formation. It is quickly recognized on a sub-surface electrical log by characteristic SP and Resistivity kicks. The contact of the Yazoo-Moodys Branch in Rankin County is gradational and conformable.

The contact of the Forest Hill with the Yazoo is placed at the first occurrence of blue or blue-green clay underlying sand, finely laminated sand or sandy clay. The uppermost Yazoo is sometimes non-calcareous. The contact is often impossible to place definitely within a few feet on the surface due to lack of exposures at the contact and in other cases because non-marine Forest Hill clays overlie non-calcareous Yazoo clays. The contact is usually fairly simple to determine on electrical logs in Rankin County. The Yazoo-Forest Hill contact in Rankin County is generally unconformable.

Fresh outcrops of Yazoo clay are rare in Rankin County. Outcrops in the form of roadcuts were perhaps plentiful during early construction of Interstate 20 across Rankin County, however sodding of roadcuts had been completed when the writer began field work in the County. Outcrops of Yazoo clay were reported by Monroe[31] at a bend in the Pearl River in NE/4, Sec. 22, T. 5 N., R. 1 E., Rankin County, where he described "3

Figure 8.—Limestone bed in upper Yazoo clay in east bank of Pearl River in NE/4, Sec. 22, T. 5 N., R. 1 E. Perry Nations photo. September 22, 1954.

Figure 9.—Non-calcareous upper Yazoo clay in east bank of Pearl River in Sec. 10, T. 4 N., R. 1 E. Perry Nations photo. September 22, 1964.

feet of slightly sandy, slightly pyritiferous and very calcareous clay overlain by alluvium" and at another bend in the Pearl River, "in NW/, SE/4, NW/, Sec. 33, T. 5 N., R. 1 E., Rankin County, about 2 feet of blue-gray calcareous fossiliferous clay that is not sandy and is characteristic of the Yazoo is exposed." He also suspected faulting in the Yazoo in SE/4, SE/4, NW/4, Sec. 3, T. 4 N., R. 1 E. Other outcrops along the Pearl River were observed by Moore [32] on a boat trip down the Pearl where he described "two beds of white, soft, argillaceous limestone each about 1 foot thick in the east bank of the River in NE/4, Sec. 22, T. 5 N., R. 1 E., Rankin County." Figure 8 shows this limestone. Figure 9 shows an outcrop of non-calcareous Yazoo also observed on that boat trip. Priddy[33] noted bentonite inches in thickness about 35 feet below the top of the Yazoo in NW/4, NE/4, Sec. 35, T. 6 N., R. 5 E.

Numerous outcrops were observed by the writer. Approximately 10 feet of olive-brown calcareous clay is exposed in

SW/4, SE/4, SW/4, Sec. 9, T. 5 N., R. 2 E., in the east wall of a planned construction site. In the north roadcut of State Highway 471 near intersection of east-west gravel road in SW/4, SE/4, SE/4, Sec. 15, T. 6 N., R. 3 E., approximately 4 feet of yellow-tan calcareous clay with many small calcareous nodules is exposed. Olive-tan upper Yazoo is exposed in washes in an old board road in SW/4, SE/4, SE/4, Sec. 7, T. 5 N., R. 5 E., and also in the east road ditch along north-south gravel road in NW/4, NW/4, NE/4, Sec. 30, T. 6 N., R. 4 E.

Near the base of the Yazoo clay in Sec. 14, T. 8 N., R. 4 E., on the G. B. Denson property, several large *Ostrea trigonalis* were collected (Figure 10). According to the land owner these fossils were quite abundant at this location many years ago

Figure 10.—**Ostrea trigonalis** in pasture on G. B. Denson property in NE/4, NE/4, NE/4, Sec. 14, T. 8 N., R. 4 E.

and were called "mule's feet." The best known fossil from the Yazoo clay is the Zeuglodon, *Basilosaurus cetoides*, a large whale-like mammal whose remains have been found in numerous localities in the upper part of the formation. Many species of *Pecten*, small *Gastropods* and *Pelecypods* are represented in the Yazoo clay in Rankin County. An abundance of microfossils are also present in the Yazoo. Huff[34] described 107 species of ostracods in samples examined along the strike of the outcrop of the Jackson group in Mississippi. He described twenty-one species and one genus as new.

The Yazoo clay outcrop is expressed physiographically as the Jackson Prairie, a low relief belt of gently rounded slopes between the North Central Hills to the northeast and the Vicksburg Hills to the southwest.

Forest Hill Formation

"Madison Sands" was suggested by Lowe[35] as the name for beds between the Jackson marine beds and the marine marls of the overlying Vicksburg group. Cooke[36] proposed that the name be changed to the Forest Hill Sand. Mellen[37] observed that the Yazoo-Forest Hill contact was not only conformable, but gradational as well. Moore [38] placed the Forest Hill in the Oligocene as a formation, and for the purpose of this report, the writer places the Forest Hill in the Oligocene as a formation.

The Forest Hill in the subsurface generally consists of thinly bedded, silty, micaceous, gray sands, usually very fine- to fine-grained and silty, carbonaceous to lignitic clays. Clays are gray to gray-brown. Several beds of lignite, usually only inches thick are often present in the Forest Hill. Thick massive sands in the Forest Hill are the exception rather than the rule in Rankin County.

Forest Hill sands weather to light-gray, yellow, buff or pink, are micaceous and usually very fine-grained and thin bedded. Clays are usually silty, thinly bedded, often separated by equally thin lenses of very fine-grained sand. The clays are usually gray, buff, pink and yellow. Thin lignite beds can be observed in some outcrops. Very thin partings of limonite can be observed along some bedding planes. Selenite crystals were observed on some outcrops. Petrified wood scattered over the surface of many Forest Hill outcrops was observed. A petrified tree stump found in an outcrop in Sec. 31, T. 6 N., R. 4 E., had within it thousands of poorly cemented quartz crystals (Figure 11).

The Forest Hill formation is exposed between the Yazoo clay and the Mint Spring marl member of the Vicksburg group. It occupies an arcuate band across the central part of the County from less than 1 mile to more than 4 miles wide.

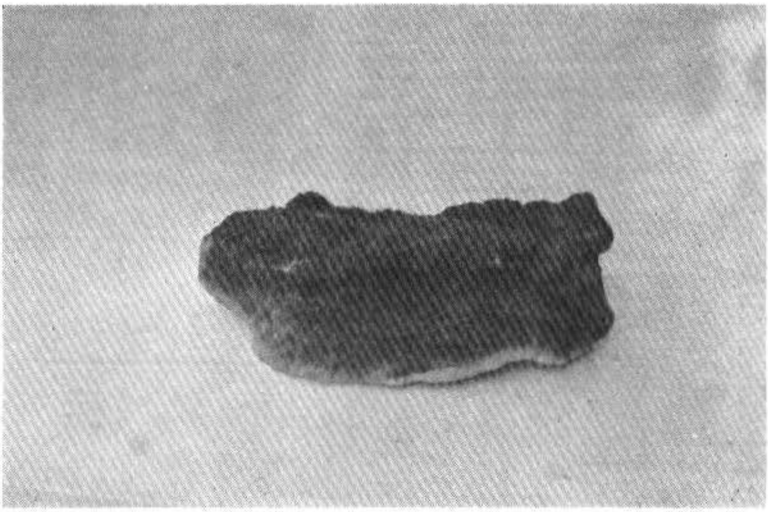

Figure 11.—Quartz crystals in portion of petrified stump from Forest Hill outcrop. May 5, 1971.

The Forest Hill formation ranges in thickness from 65 to 210 feet. Test hole AG-41 penetrated 202 feet of Forest Hill but did not reach the underlying Yazoo clay. AG-37, located in SW/4, NW/4, NE/4, Sec. 28, T. 3 N., R. 1 E., penetrated 69 feet of Forest Hill. AG-34 penetrated 122 feet of Forest Hill. An electrical log on AG-34 is shown in Figure 12. The Forest Hill penetrated in this hole is typical for the formation in Rankin County. The average thickness of the Forest Hill in Rankin County is about 100 to 110 feet. Thick Forest Hill deposits in Rankin County almost always overlie thin Yazoo deposits and conversely thin Forest Hill deposits generally overlie thick Yazoo deposits.

The contact of the Mint Spring-Forest Hill in Rankin County is disconformable and is placed at the point where silty, sandy, sometimes lignitic or carbonaceous clays of the Forest Hill are overlain by limy, marly, fossiliferous sands of the Mint Spring. Surface contacts of the Mint Spring-Forest Hill are usually noted by rusty-brown limonitic nodules covering the surface of fine-grained, clayey, brown to red sand overlying thin-bedded fine-grained sands and silty clays. A notable contact was observed along the east roadcut on State Highway 43 just south of Cross Roads intersection in Sec. 27, T. 5 N., R. 5 E. This contact is shown in Figure 13.

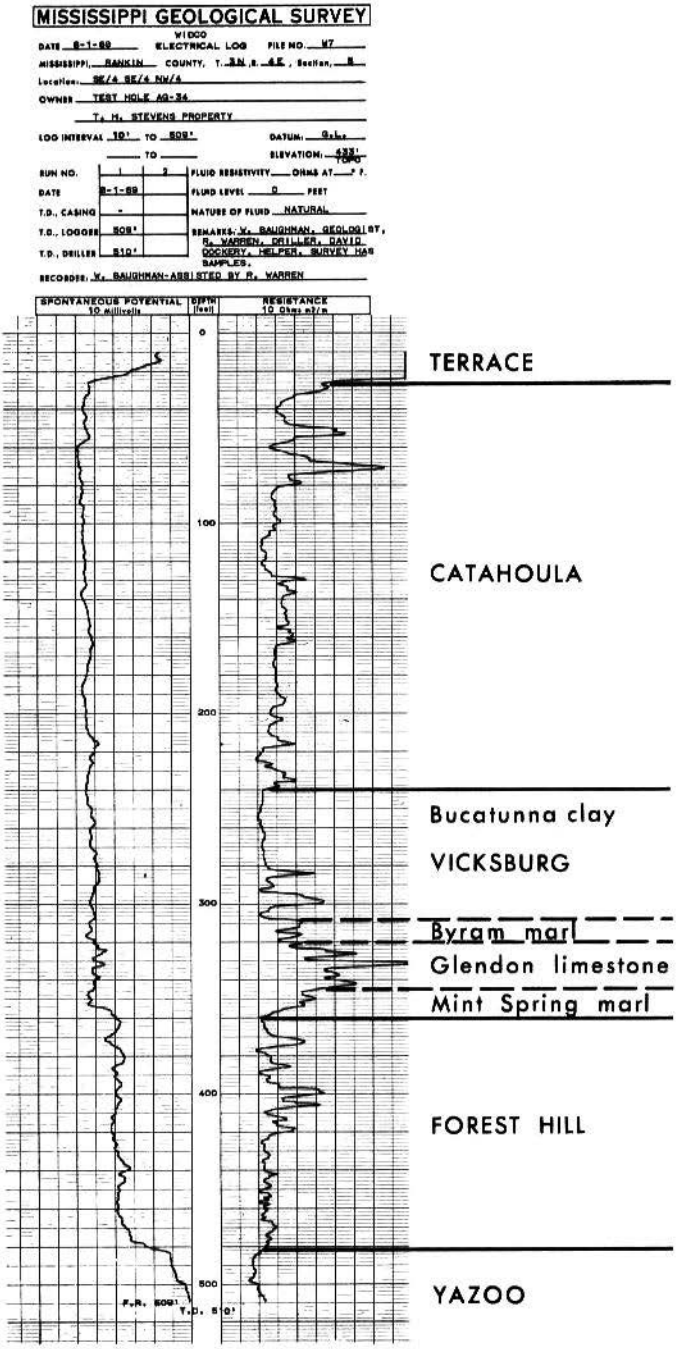

Figure 12.—Electrical log of test hole AG-34.

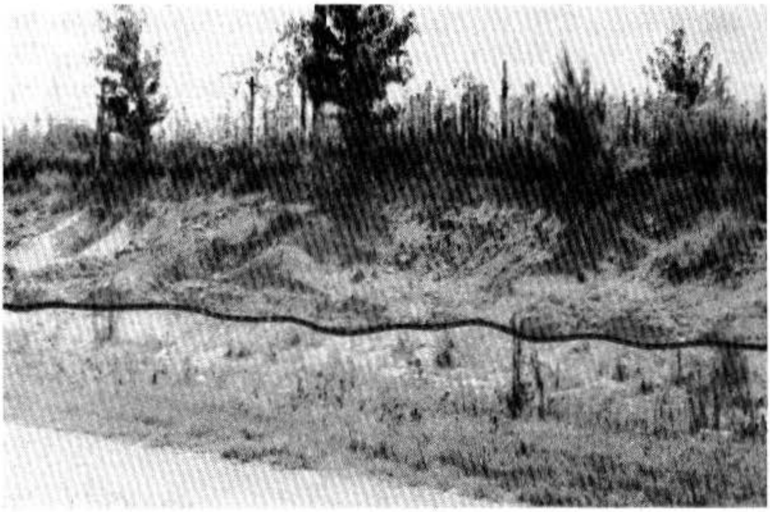

Figure 13.—Forest Hill-Mint Spring contact in east roadcut of State Highway 43 near Cross Roads in Sec. 27, T. 5 N., R. 5 E. Dark line indicates contact. May 5, 1971.

Numerous outcrops of Forest Hill are present in Rankin County along County road ditches and roadcuts. Extreme weathering, however, makes it difficult to identify in some parts of the County. Monroe[39] mapped deposits in T. 7 N., R. 3 E., T. 8 N., R. 3 E., and T. 8 N., R. 4 E., as questionable Forest Hill. AG-42 and AG-47 were drilled to try and solve this problem. Neither of these holes penetrated any bedded Forest Hill deposits. AG-47 located in NW/4, SW/4, NW/4, Sec. 25, T. 7 N., R. 3 E., in the community of Fannin, did however, penetrate 157 feet of terrace materials. AG-38 was drilled near the center of S/2, Sec. 19, T. 6 N., R. 5 E., on Ware Hill northwest of Pelahatchie. This hole penetrated 92 feet of terrace sand. Based on the information gained from this test hole and observations made in the field by the writer, all those deposits north of Pelahatchie in T. 6 N., R. 5 E., formerly mapped by Monroe[40] as Forest Hill deposits, are considered to be terrace deposits.

Numerous excellent outcrops of Forest Hill are available in the area southwest, south and southeast of Pelahatchie. Light-gray, cream and yellow, thinly laminated and thinly bedded very fine-grained sands separated by thin beds of sandy clay were observed along north and south roadcuts in SE/4, Sec. 7, T. 5 N., R. 5 E., and east and west roadcuts along north-south road in

Sec. 18, T. 5 N., R. 5 E. Figure 14 shows a carbonaceous layer observed in NW/4, NW/4, Sec. 23, T. 5 N., R. 4 E. Thinly laminated and thinly bedded Forest Hill is shown in Figure 15 and thin limonitic sand lenses separating silty, clayey lower Forest Hill sands and silty, sandy clays are shown in Figure 16.

Figure 14.—Carbonaceous bed in Forest Hill in south roadcut of gravel road in NW/4, NW/4, Sec. 23, T. 5 N., R. 4 E.

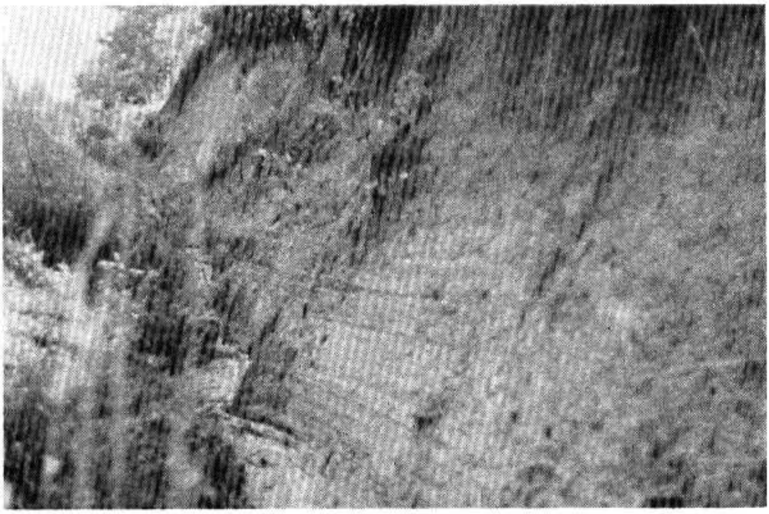

Figure 15.—Thin-bedded Forest Hill in west roadcut of north-south gravel road north of Thorn Hill Church in NE/4, NW/4, NE/4, Sec. 23, T. 5 N., R. 5 E. May 1, 1971.

Figure 16.—Forest Hill sand separated by thin limonitic lenses in north roadcut of east-west gravel road in SW/4, SW/4, Sec. 1, T. 5 N., R. 5 E. May 1, 1971.

Petrified wood preserved by silicification was noted at several Forest Hill outcrops. Notable locations were: NW/4, Sec. 19, T. 6 N., R. 3 E., at intersection of gravel roads, SW/4, Sec. 7, T. 5 N., R. 5 E., (along north roadcut, NE/4, Sec. 31, T. 6 N., R. 4 E., (where stump with quartz crystals shown in Figure 11 was found) and along west roadcut in Sec. 18, T. 5 N., R. 5 E.

The physiographic expression of the Forest Hill is noted by an abrupt scarp near the contact of the Forest Hill with the Yazoo. Much more rugged topography is present in the Forest Hill outcrop belt than is developed in the outcrop belt of the Yazoo clay. The Forest Hill outcrop belt forms the northern portion of the Vicksburg Hills province, which is characterized by steep slopes.

VICKSBURG GROUP

General Statement

The Vicksburg group is divisible lithologically and electrically into four distinct stratigraphic units in Rankin County. The units in ascending order are the Mint Spring marl, the

Glendon limestone, the Byram marl and the Bucatunna clay. These are all associated marine units and are shown on the Geologic map as one unit.

The Vicksburg group crops out across Rankin County in an arcuate band from east-northeast of Puckett in the southeastern corner of the County in a northwesterly direction to the community of Shiloh and westerly to the Brandon area. In this area it comes under the influence of the Jackson Dome and the outcrop turns in a southwesterly direction to just south of Plain in T. 4 N., R. 1 E. The Brandon area exhibits the most areal coverage of Vicksburg outcrops from the updip limit to the downdip limit whereas the Shiloh area exhibits the least areal coverage from the updip limit to the downdip limit. The Vicksburg is overlain in parts of its outcrop area by alluvium, terrace deposits and other surficial materials. In the Brandon area it is overlain by a Catahoula outlier and terrace materials. Southwest of Brandon in the Greenfield area it is partially overlain by Catahoula outliers. Deposits of alluvium cover it in the alluvial plains of creeks and rivers.

Test hole AG-1 penetrated the entire Vicksburg group, which was 79 feet thick. An electrical log of AG-1 is shown in Figure 17. The entire group is not exposed in any single outcrop in the County. The thickest exposures are in the walls of the Marquette Cement Company quarries in Secs. 17 and 19, T. 5 N., R. 3 E., west and southwest of Brandon. Test hole AG-35 in Sec. 36, T. 3 N., R. 3 E., penetrated 65 feet of Vicksburg and was the thinnest section having all members present, whereas AG-34, located in Sec. 5, T. 3 N., R. 4 E., penetrated 120 feet of Vicksburg sediments, the thickest section encountered. The average thickness of Vicksburg in test holes drilled having all four members present was 90 feet.

In a water well in Sec. 11, T. 3 N., R. 5 E., the entire Vicksburg interval has been replaced by a sand, believed by the writer to be a channel deposit of Catahoula age. Several electrical logs at the writer's disposal in the general area indicate sands occupying the position of portions of the Glendon and upper Vicksburg members. Test hole AG-8 in Sec. 12, T. 3 N., R. 5 E., penetrated Catahoula sediments directly overlying the lower Glendon limestone as did AG-9 in Sec. 25, T. 4 N., R. 5 E. AG-10 in Sec. 3, T. 3 N., R. 5 E., also had no Byram or Bucatunna with

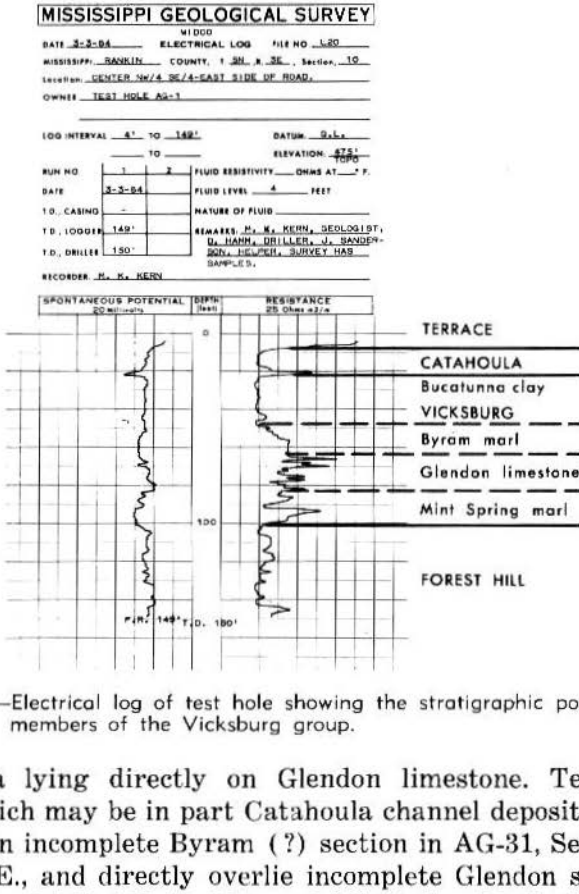

Figure 17.—Electrical log of test hole showing the stratigraphic position of the members of the Vicksburg group.

Catahoula lying directly on Glendon limestone. Terrace deposits which may be in part Catahoula channel deposits, directly overlies an incomplete Byram (?) section in AG-31, Sec. 24, T. 4 N., R. 5 E., and directly overlie incomplete Glendon sections in AG-32, Sec. 24, T. 4 N., R. 5 E., and AG-33, Sec. 36, T. 4 N., R. 5 E.

Mint Spring Marl

The type locality for Mint Spring marl is Mint Spring Bayou in Sec. 12, T. 16 N., R. 3 E., Warren County. The name was suggested by Cooke[41] in 1918 for sands and marls exposed at the type locality.

The Mint Spring marl is a gray-green, fine- to coarse-grained sand, fossiliferous to very fossiliferous, glauconitic, sometimes clayey in part and often limy. It often contains phosphatic fossils and pyrite. Monroe[42] described what he considered one of the best exposures of Mint Spring marl on a branch of Lime Creek, at a waterfall in the SW/4, SW/4, SE/4, Sec. 15, T. 4 N., R. 1 E. He described 9 feet of Mint Spring marl underlying Glendon and overlying Forest Hill as follows: "3.0 feet of limestone, hard, coarsely sandy, and glauconitic (or limy sandstone), containing much phosphatic material and many shell fragments; *Pecten poulsoni*" overlying "6.0 feet of sand, soft blue-gray, highly glauconitic, angular to sub-rounded fine-grained; contains considerable phosphatic material; bottom foot contains abundant water-worn *Pectens* and oysters and a few clay pebbles reworked from overlying bed; *Pecten poulsoni* and *Ostrea vicksburgensis*." He noted that the best fossil-collecting locality known in the area is on a branch of Lime Creek, in the SE/4, SW/4, NW/4, Sec. 22, T. 4 N., R. 1 E., where approximately 6 feet of fossiliferous blue-gray glauconitic Mint Spring overlies black lignitic clay of the Forest Hill.

Ferruginous sandstone, limonitic and manganiferous nodules and concretions seem to be the end product of Mint Spring after weathering. It is evidenced at numerous outcrops as a rusty-brown to yellow-brown concentration of limonitic and manganiferous material. It is rare to find even a fragment of poorly preserved fossil because of the intense weathering. Limonitic and manganiferous nodules and concretions are abundant on weathered outcrops of Mint Spring marl.

The Mint Spring outcrops between the Forest Hill and Glendon and because it is rather thin, occupies very little surface area in Rankin County.

The Mint Spring marl varies in thickness from about 6 feet to a maximum of approximately 30 feet in Rankin County. Eleven test holes drilled in the course of this study penetrated the Mint Spring. The average thickness of the formation in these holes was 11 feet. The average thickness of the formation in the County is perhaps no more than 12 to 15 feet.

The Mint Spring overlies the Forest Hill disconformably and the lower limit of the Mint Spring is placed at the first occurence of fine-grained, micaceous, carbonaceous sands or carbonaceous silty clays. The upper limit of Mint Spring is placed at the lowest indurated ledge of Glendon limestone.

Outcrops of Mint Spring in Rankin County are rare and are usually quite badly weathered. In describing a quarry wall in the Magnolia Lime Company quarry (in Sec. 34 and 35, T. 6

N., R. 3 E.) north of Brandon, Mellen[43] stated "The Vicksburg limestones and marls, lying above the quarry floor of the Forest Hill member of the Jackson formation, consists of 12 feet of Mint Spring marl and 22 feet of overlying hard limestone and softer marl."

Mint Spring marl was observed by the writer along roadcuts of State Highway 471 near section line between Secs. 4 and 9, T. 5 N., R. 3 E., north of Brandon and in roadcuts in NE/4, NW/4, Sec. 12, T. 5 N., R. 3 E., where residual Mint Spring is overlain by terrace material and underlain by Forest Hill. Mint Spring was observed as a ferruginous sandstone in NE/4, SE/4, Sec. 8, T. 5 N., R. 4 E., along railroad cut at Rankin. Badly weathered Mint Spring was also observed in numerous road cuts in Secs. 25 and 27, T. 5 N., R. 5 E., Secs. 11, 12, 13 and 14, T. 4 N., R. 5 E.

Fossils are abundant in the unweathered Mint Spring. *Pecten poulsoni* is a common fossil in the Mint Spring in the unweathered state, however most outcrops of the formation are weathered too badly to contain any recognizable fossils. Freshly exposed Mint Spring in Marquette Cement Company quarries adjacent to Brandon offer an abundance of fossils in the Mint Spring. Exposures in Secs. 15 and 22, T. 4 N., R. 1 E., were cited by Monroe[44] as the best fossil collecting locations in the Jackson area for Mint Spring species.

The Mint Spring marl is resistant in the weathered state, being indurated in ferruginous concretionary layers and forming small cuestas. Waterfalls are formed in other instances where indurated Mint Spring is found in stream beds.

Glendon Limestone

The Glendon type locality is a siding on the Southern Railway in Clarke County, Alabama and its name was suggested by Cooke[45] in 1918. It was raised to formational rank by Cooke[46] in 1923.

The Glendon limestone is comprised of alternating beds of limestone and marl. The limestone beds are usually from 1 to 2 feet thick, thin to less than ½ foot, thicken to about 4 feet, and are gray in the unweathered state. They contain glauconite, are fossiliferous and occasionally slightly sandy to sandy.

The limestone is often very hard, but is frequently only slightly hard and sometimes soft and chalky. Marl beds vary from less than 1 foot to more than 5 feet in thickness. Thicker beds of marl are found, but usually are broken with thin layers of limestone, often too soft to notice in drilling. The marls are gray-green, fossiliferous, glauconitic and slightly sandy to sandy.

Weathered Glendon is readily noticed in exposures as resistant light-gray to gray limestone ledges, often intermittantly apparent in dark-brown residuum, a product of the weathered marls and limestones of the Glendon formation. In some outcrops a white waxy clay is present on the surface of the residuum. Moore[47] had some of this material from Hinds County analyzed by Z. S. Altschuler of the Petrological Services and Research Branch of Experimental Geochemistry and Mineralogy of the United States Geological Survey. Moore stated, "His findings indicate the material is a clay giving an x-ray pattern of major montmorillonite and halloysite in which kaolinite is still a trace constituent." Completely weathered Glendon leaves a dark-brown residuum. Intermediate stages of weathered Glendon are gray-tan to tan, then reddish-tan to reddish-brown before reaching the dark-brown color of the residuum.

The Glendon limestone outcrops between the Mint Spring marl and the Byram marl. It occupies more surface area in T. 5 N., R. 3 E., than any other of the members of the Vicksburg group in Rankin County. Its outcrop belt can be observed southeasterly across Mississippi from southwest Yazoo County through central Rankin County and through northeastern Wayne County into Alabama.

The Glendon limestone in Rankin County varies in thickness from approximately 15 feet to as much as 50 feet. Test holes drilled at 7 locations relative to this study penetrated the Glendon and another 4 test holes penetrated incomplete Glendon intervals overlain by either Catahoula channel deposits or terrace deposits. In test holes penetrating Glendon overlain by Byram and underlain by Mint Spring, the thickness of the formation varied from 17 feet in AG-35 (Sec. 36, T. 3 N., R. 3 E.), to 36 feet in AG-5 (Sec. 21, T. 5 N., R. 3 E.) and averaged 24 feet, which is about the average thickness of the Glendon in Rankin County.

The Glendon is underlain conformably by the Mint Spring marl and overlain conformably by the Byram marl. The lower limit of the Glendon is placed at the base of the lowest indurated limestone bed of the formation and the upper limit is normally placed at the top of the highest indurated limestone ledge of the Glendon. In some instances when indurated limestone is not found in the Glendon, the upper limit is placed at the top of the highest soft, chalky lime and the lower limit is placed at the base of the lowest bed of soft, chalky lime overlying glauconitic fossiliferous sand of the Mint Spring marl. Exact determination of upper and lower limits of the Glendon when indurated ledges of limestone are not present is sometimes quite difficult when using electrical logs for correlations.

Outcrops of Glendon limestone in Rankin County are more easily recognized than are either of the other three members of the Vicksburg group. The dark-brown residuum is a readily apparent clue when indurated ledges or remnant boulders of limestone are not present. Many outcrops of Glendon were described by Monroe[48]. Some notable ones are along the east bank of the Pearl River at Hemphill Bluff, NE/4, NE/4, Sec. 20, T. 4 N., R. 1 E., 1½ miles southeast of Plain in E/2, SW/4, NE/4, Sec. 12, T. 4 N., R. 1 E., in a railroad cut and at the Robinson quarry in the NE/4, NE/4, SW/4, Sec. 19, T. 5 N., R. 4 E. Logan[49] described a Glendon section approximately 22 feet thick in the Robinson quarry. He observed limestones from 1 foot to 2 feet thick interbedded with alternating beds of marls of comparable thickness.

Outcrops were observed by the writer at numerous localities in Rankin County other than those mentioned above. Many good exposures were available for observation by the writer in the Marquette Cement Company quarries in Secs. 17, 19 and 20, T. 5 N., R. 3 E. Indurated ledges of Glendon were observed north of road in walls of creek in SW/4, NE/4, Sec. 4, T. 4 N., R. 2 E. Remnants of lower Glendon limestone were observed in NE/4, NW/4, NW/4, Sec. 8, T. 5 N., R. 3 E. Glendon limestone can be observed on the north and the south side of Interstate 20 in Sec. 17, T. 5 N., R. 3 E., for a distance of approximately ¾ mile in portions of Marquette quarries. Residuum overlying slightly weathered Glendon limestone in northwest cut of Illinois Central Railroad just north of U. S. 80 overpass in NW/4, NW/4, Sec. 16, T. 5 N., R. 3 E., in west

Figure 18.—Residuum overlying slightly weathered Glendon limestone along west bank of railroad cut in west Brandon. May 1, 1971.

Brandon is seen in Figure 18. Glendon limestones and marls were observed along southeast railroad cut at several places northeast from this location in SE/4, SW/4, Sec. 9, T. 5 N., R. 3 E., and in several railroad cuts in the SE/4 of the same section.

Limestone ledges were observed in the south roadcut of U. S. Highway 80 in east Brandon in the NE/4, SW/4, SE/4, Sec. 15, T. 5 N., R. 3 E. Residuum from weathered Glendon and remnants of Glendon ledges were observed in numerous roadcuts along county roads in Secs. 23, 24 and 25, T. 5 N., R. 4 E., and Secs. 19, 20 and 29 in T. 5 N., R. 5 E. In several of these roadcuts the white, waxy clay previously mentioned was observed in the dark-brown residuum.

The Glendon limestone is very fossiliferous. Specimens of *Lepidocyclina sp.* and *Pecten sp.* are abundant. Figure 19 shows very fossiliferous Glendon limestone in east roadcut of State Highway 43 in NE/4, NW/4, Sec. 15, T. 4 N., R. 5 E. According to Monroe [50] "*Pecten poulsoni* is common in the Mint Spring and the overlying sandstone but is replaced by *Pecten byramensis* in the Glendon; *Lepidocyclina supera* abruptly appears in the base of the Glendon, but has not been found below, although the Marianna species *Lepidocyclina mantelli* has been doubtfully recognized."

Figure 19.—Fossiliferous Glendon limestone in east ditch along State Highway 43 in NE corner, NE/4, NW/4, Sec. 15, T. 4 N., R. 5 E. May 1, 1971.

Gently rolling hills are developed on much of the Glendon outcrop area due to the weathering characteristics of the formation. Weathering of much of the Glendon deposits can be noted in only a few months of exposure. Small sinks were suspected by the writer in the Glendon outcrop belt in some localities. The only large one due to the near surface presence of the Glendon was near the center of Sec. 30, T. 5 N., R. 5 E. This sink is oxbow shaped and is almost 800 feet across in a southwest-northeast direction and is as much as 400 feet wide. The surface has sunk in excess of 10 feet in portions of it.

Byram Marl

The type locality of the Byram marl is in adjoining Hinds County in NW/4, NW/4, Sec. 19, T. 4 N., R. 1 E., near Byram and is exposed along the west bank of the Pearl River. Moore[51] states, "The name 'Byram' was first used by Casey in 1901 although he incorrectly placed the marl exposed at Byram below the limstone exposed at Vicksburg." The Byram formation of Monroe [52] was composed of the Glendon limestone member, the middle marl member and the Bucatunna clay member.

The Byram marl in the unweathered state is a gray-green, glauconitic, fossiliferous, clayey, sometimes slightly sandy to sandy marl. It seldom contains much sand in Rankin County and is often quite fossiliferous and glauconitic.

Byram marl weathers to a brownish-red, slightly sandy clay. Small ferruginous concretions are present on the surface of weathered Byram.

In the drilling program relative to this study, 8 holes were drilled which penetrated the Byram marl. Varying thicknesses were encountered from a minimum of 8 feet in AG-6 (NW corner SW/4, SW/4, Sec. 4, T. 3 N., R. 1 E.) and AG-35 (NW/4, SE/4, SE/4, Sec. 36, T. 3 N., R. 3 E.) to a maximum thickness of 20 feet in AG-37 (SW/4, NW/4, NE/4, Sec. 28, T. 3 N., R. 1 E.). The average thickness of the Byram in test holes penetrating the formation was 14 feet.

In this report the lower limit of the Byram marl is placed at the top of the highest indurated bed of limestone of the Glendon member and the upper limit is placed at the base of the lowest overlying dark-gray, plastic, carbonaceous clay of the Bucatunna member of the Vicksburg. Contact with the Bucatunna above and with the Glendon below is considered by the writer to be conformable in Rankin County.

The Byram marl is quite thin in Rankin County and occupies comparatively little surface area. It is often covered by surficial material in the outcrop area.

Fossils are abundant in the Byram marl. The foraminifera of the formation have been the subject of several studies.

Bucatunna Clay

The type locality of the Bucatunna clay is along Bucatunna Creek north of Denham Post Office in Sec. 19, T. 8 N., R. 5 W., Wayne County, Mississippi. The Bucatunna was named by Blanpied[53] and others in 1934 and assigned to the Catahoula group of the Miocene. Cooke[54] in 1935 stated, "Chickasawhay marl and Bucatunna clay of Blanpied are accepted as members of Byram marl (of Vicksburg group, Oligocene), in which formation the beds thus designated have heretofore always been included." Moore[55] stated, "The Bucatunna now is generally considered to be Oligocene in age. . ." and designated it the uppermost unit of the Vicksburg group. The writer considers this to be applicable in Rankin County as well and it is considered in that respect in this report.

Unweathered Bucatunna clay is dark-gray, finely carbonaceous, rarely pyritic, often quite plastic, with occasional thin silt laminae. Gray-green, sandy marl streaks were noted in several test holes cored. These were usually thin, contained fine- to medium-grained, glauconitic sand and were slightly micaceous.

Weathered Bucatunna clay is chocolate-brown, has a conchoidal, blocky fracture, is slightly micaceous, slightly silty and usually has gypsiferous and limonitic material on the surface of outcrops. Some badly weathered Bucatunna is dark-brown to reddish-brown while other weathered Bucatunna resembles a silty loam and in many cases weathering renders it difficult to identify.

The Bucatunna is traceable in an outcrop belt across southeastern Mississippi and southwestern Alabama except in the many areas that it is covered by surficial deposits.

The Bucatunna varies in thickness from approximately 20 feet to a maximum of 70 feet in Rankin County. No average thickness for the Bucatunna is proposed in this report due to the extreme variability of the formation thickness. AG-10 in NW/4, SE/4, Sec. 3, T. 3 N., R. 5 E., penetrated 139 feet of Catahoula unconformably overlying Glendon limestone. Upper portions of the Vicksburg group were found to be missing in several places in southeastern Rankin County. The Union Water Association well in SW/4, NW/4, SE/4, Sec. 11, T. 3 N., R. 5 E., penetrated 160 feet of Catahoula unconformably overlying approximately 100 feet of Forest Hill. The basal 132 feet of Catahoula in this hole is a massive sand. This is the most significant unconformity found in Rankin County involving formations mapped on the surface. AG-26, located in NW/4, SW/4, NW/4, Sec. 12, T. 4 N., R. 2 E., penetrated 66 feet of dark-gray Bucatunna clay with occasional thin silt laminae and one bed of marly, fossiliferous, medium-grained, gray-green sand.

Bucatunna is underlain conformably by Byram marl and overlain disconformably in Rankin County by the Catahoula formation. Monroe[56] suggested the contact of the Bucatunna and Catahoula be placed at the top of the carbonaceous layer shown in Figure 20. He interpreted "this carbonaceous bed as

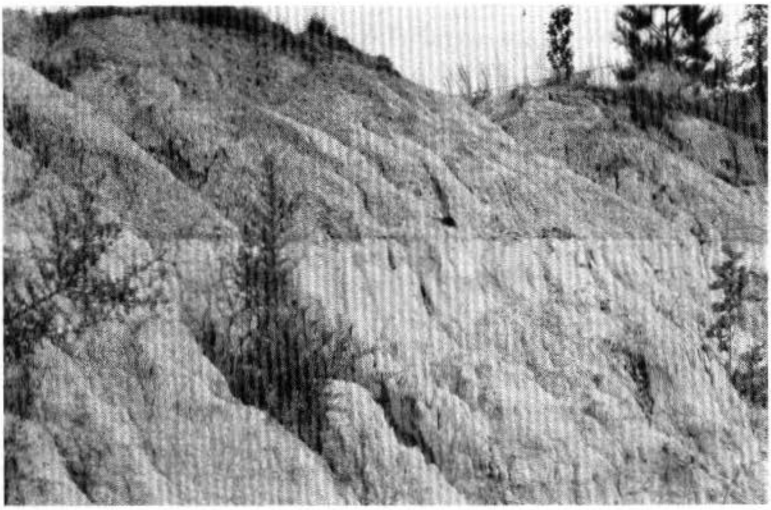

Figure 20.—Carbonaceous layer in basal Cathahoula exposed in cut north of U. S. Highway 80 in west Brandon, Sec. 16, T. 5 N., R. 3 E. Carbonaceous layer marked by top of hammer in center of photo. May 1, 1971.

an old soil zone formed in late Oligocene time before deposition of the Catahoula sandstone." He stated that this carbonaceous layer had been seen by him in many places in the Jackson area and appeared to be traceable over a large area. This carbonaceous layer has been seen by the writer in several places during the course of this study. This interval was cored in AG-25, SE/4, NE/4, SE/4, Sec. 8, T. 4 N., R. 2 E. A 3-inch bed of lignite was cored at 22 feet. It was underlain by 10 feet of gray-tan to gray-green, clayey, slightly sandy silt which the writer considers to be basal Miocene Catahoula material. The writer proposes however, that this carbonaceous layer is not always present (as was the case in AG-26, for instance), is difficult to determine in cuttings from drilled holes and neither is it a point that can be correlated on electrical logs. Materials found below the carbonaceous layer at the location in Figure 20 more closely resemble Miocene Catahoula materials to the writer than do those immediately above it. The writer prefers to place the disconformable contact of the Bucatunna and Catahoula at the top of the first dark-gray (weathered color would be chocolate-brown) plastic clay underlying the lowest recognizable Miocene deposits. The writer finds this correlation point to be more workable when dealing with electrical logs and cuttings from test holes in addition to surface outcrop observations in Rankin County.

Numerous outcrops of Bucatunna were observed by the writer. One notable outcrop is in the north railroad cut, SE/4, SW/4, NE/4, Sec. 10, T. 5 N., R. 3 E., approximately 400 feet east of north-south gravel road where chocolate-brown fractured Bucatunna clay with limonitic stains on fractures is exposed. Approximately 150 feet north of this outcrop is the location of test hole AG-16. Immediately north of the outcrop shown in Figure 20, chocolate-brown Bucatunna clay is exposed on the surface in the excavation for roadbed material. In the south wall of Richland Creek in SW corner, NW/4, NW/4, Sec. 12, T. 4 N., R. 2 E., dark-brown Bucatunna clay can be seen during the dry season when the water is low. Bucatunna clay is exposed in ditches along private road in SE/4, SW/4, Sec. 36, T. 5 N., R. 3 E., and along asphalt surface County road in E/2, Sec. 30, T. 5 N., R. 5 E.

Fossils were not observed in surface exposures of Bucatunna, but cuttings in the lower portions reveal some fossils and fossil fragments. The thin marls in the Bucatunna, which are usually in the lower part of the formation, contain an abundance of fossils.

The Bucatunna is often expressed physiographically as low relief, gradually sloping hills with rather steep, rugged topography often developed immediately south of the Bucatunna-Catahoula contact. The more rugged topography of this area is due to the presence of indurated surface and/or near surface siltstones and sandstones of the lower Catahoula.

CATAHOULA FORMATION

The type locality for the Catahoula formation is Catahoula Parish, Louisiana. Veatch[57] proposed the name as a replacement for the lower part of the Grand Gulf group and included in it " . . . . the sandstone bearing clays betwen the Vicksburg and Fleming Oligocene."

The Catahoula formation in the unweathered state in Rankin County is composed of non-marine clays, silts and sands. The clays are gray, green, buff and rarely purple, and are usually variably silty. Some very plastic clays are found in the Catahoula, but are very thin and usually occur as lenses in clayey silt. Thin bentonitic clays occur infrequently in the Catahoula in Rankin County. AG-6, located in NW corner, SW/4, SW/4, Sec. 4, T. 3 N., R. 1 E., penetrated a thin bed of bentonite. Lignite is present in some areas, but is uncommon and when present is only inches thick. The silts are usually light-gray to whitish-gray and buff, and are often clayey or sandy. The sands are usually gray to gray/buff, very fine- to fine-grained, are often silty, sometimes clayey, and rarely contain small pea gravel. Sands are present primarily in lenses and discontinuous beds that grade laterally and vertically to silt and clay. The white color of the sands and silts is due to the presence of much kaolinotic interstitial material. Few noticeably hard sandstones and siltstones are encountered in the subsurface in the formation, even though indurated sandstones and siltstones are quite common in surface exposures. Indurated Catahoula on the surface is primarily a result of weathering.

Hilgard[58] discovered an extraordinary amount of salt in some intervals of the Catahoula in Rankin County. He stated, "Outcrops of this kind are very common on the water of Steen's Creek, where the saltiness of the clays give rise to numerous cattle-licks; in some instances, the cattle have eaten caves into the hillsides; and I have found a crust of white salt, ¼ inch thick, formed by evaporation on a ledge of clay in the bed of Steen's Creek." Figure 21 shows an exterior view of the entrance to the largest of the caves created by animals in the north wall of a ravine in SW/4, NE/4, Sec. 25, T. 3 N., R. 2 E. This particular cave is known locally as the "Rock House." Other smaller caves are situated in the walls of this ravine. Figure 22 shows the depressions created by the tongues of animals in the back interior wall of the "Rock House". The bed containing the cattle-licks is a somewhat soft, loosely cemented light-gray-buff fine-grained sandstone approximately 7 feet thick. According to Monroe[59] "Analyses of the rock containing the salt by Francis L. Schmehl formerly with the Geological Survey show that it contains from 0.52 to 2.12 percent NaCl."

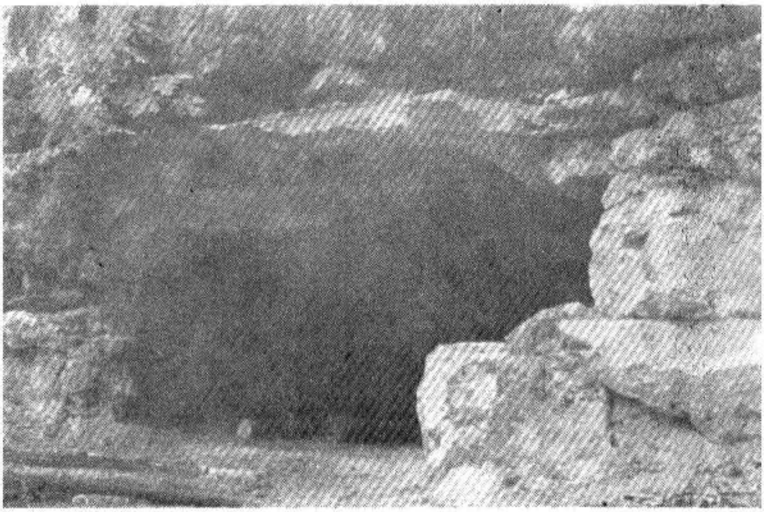

Figure 21.—Exterior view of entrance to the "Rock House" in north wall of ravine in SW/4, NE/4, Sec. 25, T. 3 N., R. 2 E.

Figure 22.—Interior of "Rock House" showing animal licks in rear wall and ceiling.

Light-gray to whitish-gray sandstones and siltstones interbedded with light-gray, buff and rarely purple, variably silty clays are typical of weathered Catahoula in Rankin County. Figure 23 shows alternating beds of Catahoula sands, silts and

Figure 23.—North bank by lake in Sherwood Forest Subdivision showing bedding of Catahoula. May 1, 1971.

silty clays exposed on north hillside by a lake in Sherwood Forest Subdivision, SE/4, NE/4, Sec. 3, T. 4 N., R. 3 E. More than 50 feet of Catahoula formation of similar lithology was exposed above the lake water level directly across the lake when the photo shown in Figure 23 was made. Thick discontinuous beds of indurated sandstone were observed outcropping at higher elevations in the sides of steep, rugged hills in the vicinity of this lake in Sherwood Forest.

The Catahoula formation outcrops over the entire southern third of Rankin County and is overlain in its outcrop area only by surficial deposits of alluvium, terrace materials, colluvium and Citronelle. Outliers of Catahoula deposits are found in the Brandon area in T. 5 N., R. 3 E., and are masked by terrace deposits in much of this area.

The entire thickness of the Catahoula formation is not present in Rankin County. The maximum thickness of the Catahoula is approximately 420 feet. AG-36, located in S/2, SE/4, Sec. 36, T. 3 N., R. 1 E., penetrated 411 feet of Catahoula and represents the thickest section encountered in test holes drilled relative to this report.

The Catahoula-Vicksburg contact, as explained in the discussion of the Bucatunna clay, is placed at the top of the first dark-gray carbonaceous clay underlying recognizable Miocene materials. In some instances, the contact seems to grade upward from dark-gray carbonaceous clays of the Bucatunna to lighter colored silty clays of the Catahoula. Due to the highly irregular thickness of the Bucatunna and the often abrupt lithologic change observed, this contact is considered by the writer to be generally disconformable. The upper portion of the Catahoula formation is not present in Rankin County and therefore the upper contact with the Hattiesburg clay is not found in the County.

Outcrops of Catahoula are abundant in Rankin County. Hilgard[60] reported, "It has been stated that most of the sandstones of this group, when exposed to the weather, show a tendency to cleave at right angles to the plane of stratification. . ." Figure 24 shows this cleavage in a sandstone overlying gray, silty clay.

Figure 24.—Massive Catahoula sandstone with right angle cleavage in east roadcut in NW/4, Sec. 25, T. 3 N., R. 2 E.

Catahoula sandstones, siltstones and silty clays were observed in the north roadcut of County road in NE/4, SE/4, Sec. 25, T. 5 N., R. 4 E., where basal Catahoula is exposed. Catahoula sandstones and silty clays were observed along sides of County road underlying Citronelle deposits in SE/4, Sec. 29, T. 5 N., R. 4 E. Numerous outcrops of siltstones, sandstones and silty clays of portions of the lower 100 feet of Catahoula are exposed in numerous roadcuts in the Sherwood Forest Subdivision in Secs. 1, 2, 3 and 11, T. 4 N., R. 3 E. Many outcrops of light-gray to whitish-gray, kaolinitic sandstones, siltstones and silty clays were observed in numerous outcrops; in and around the crossroads at Thomasville in T. 4 N., R. 3 E., along County road in Sec. 15, T. 3 N., R. 1 E. near Brown Hill Church, along numerous roads in all directions of Star in T. 3 N., Rs. 2 and 3 E., and along State Highway 18 from the north side of Hebron Hill in Sec. 36, T. 5 N., R. 3 E. to Sec. 8, T. 3 N., R. 5 E. Figure 25 shows whitish-gray kaolinitic sandy clayey silts in west road-cut of State Highway 18 in SE corner, NE/4, SW/4, Sec. 7, T. 4 N., R. 4 E.

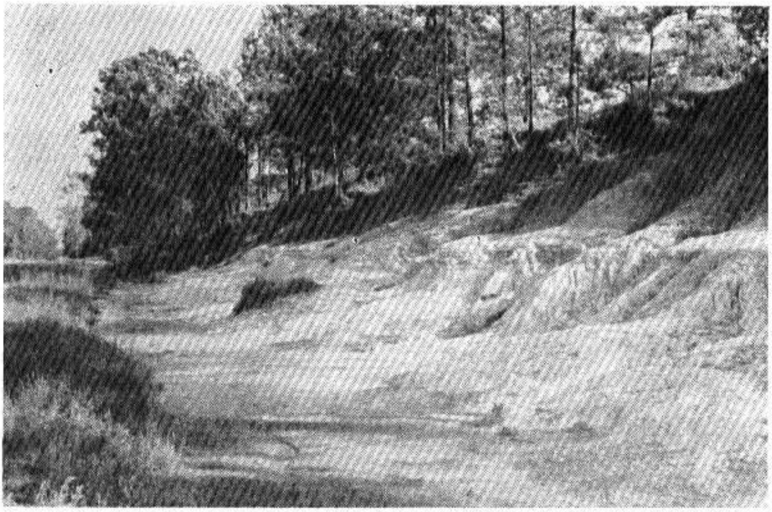

Figure 25.—Kaolinitic sandy clayey silts in west roadcut of State Highway 18. May 1, 1971.

Few animal fossils have been recovered from the Catahoula formation and none were observed by the writer in Rankin County. Monroe[61] states, "Berry (1916 b, p. 231) has described a meager flora from the Catahoula sandstone, including a specimen of a climbing fern *(Lygodium mississippiensis Berry)* from a locality near King, 5 miles south of Florence, Rankin County."

The Catahoula outcrop is expressed physiographically in Rankin County as the Southern Pine Hills which lies immediately south of the Vicksburg Hills. It is within the Catahoula outcrop area that the most rugged topography in the County is found. Steep, rugged hills separated by narrow valleys are commonplace where the resistant discontinuous Catahoula sandstones and siltstones are found.

CITRONELLE FORMATION

Matson[62] applied the name Citronelle formation to sediments of Pliocene age, chiefly non-marine, that occur near the seaward margin of the Gulf Coastal Plain, extending from a short distance east of the west boundary of Florida westward to Texas. The type locality is Citronelle, Alabama. Doering[63] suggests there is a fair basis for assuming that the Citronelle is Pleistocene, and for the purpose of this report, the writer considers the Citronelle to be Pleistocene in age.

The Citronelle is composed of chert and quartz gravel and fine- to coarse-grained sand. Doering[64] reproduced ". . .the structural contours drawn by Jones (1956, Pl. 8) on the 'Base of the Pleistocene' in southwest Louisiana, and the structural contours drawn by Lowman (1949, Fig. 32) in southeast Louisiana (with the addition of some intermediate contours)." The elevations of the base of the Pleistocene on that map correlates favorably with the base of graveliferous deposits in the general area south of Star in NW/4, SE/4, Sec. 19, T. 3 N., R. 3 E. A ferruginous conglomeritic sandstone is present at the contact with the Catahoula at this location. A similar occurrence of this ferruginous sandstone was observed at other locations in the County and seemed to correlate favorably with the elevations shown on the aforementioned map. Since this marker was not always present, elevation was the criteria used by the writer in mapping those Citronelle deposits shown on the Geologic Map (Plate 1). Citronelle was indicated on Doering's maps at elevations of approximately 450 feet in southwest Rankin County and at progressively higher elevations in the remainder of the County. The maximum thickness of the Citronelle in Rankin County, as mapped, is approximately 110 feet. Figure 26 shows a portion of gravel pit containing Citronelle gravels and sands in NW/4, Sec. 32, T. 3 N., R. 4 E.

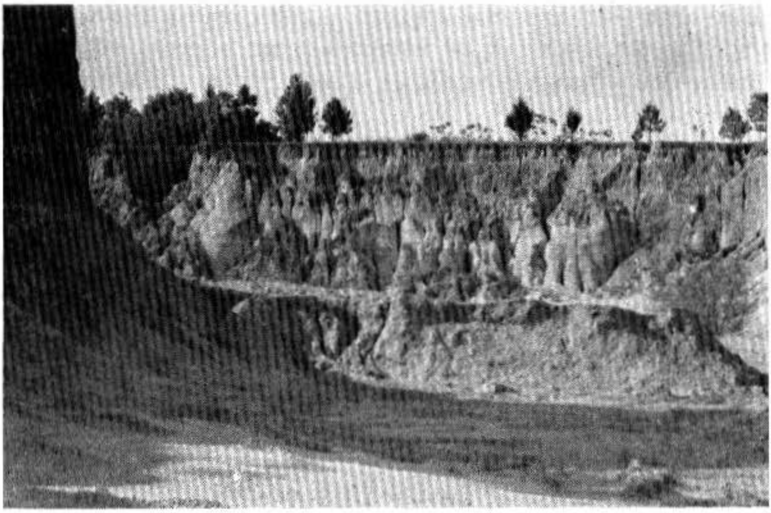

Figure 26.—Gravel pit in Citronelle formation in NW/4, Sec. 32, T. 3 N., R. 4 E. May 1, 1971.

PRE-LOESS TERRACE DEPOSITS

In adjoining Hinds County, Moore[65] designated sand and gravel deposits excepting Citronelle, and the sands and gravels found in present-day stream beds and alluvial plains as pre-loess terrace deposits. He considered them to be Pleistocene in age. The term has since been used by Bicker[66] in describing similar deposits in adjoining Claiborne and Copiah Counties. The writer used the term in the same manner in Rankin County.

The pre-loess terrace deposits consist of fine- to coarse-grained sand, locally containing small amounts of gravel, mostly pebble size, and occasional clay lenses are found overlying all formations observed in surface outcrops in the County. The sands are commonly stained orange-red to buff. Gravels are generally finer than those found in the Citronelle and are composed of chert and quartz. Clays are red, pink, yellow, orange, occasionally white and purple and occur in discontinuous lenses in the sands and gravels.

In general, the writer attempted to map only those terrace deposits of significant areal extent and in excess of 10 to 15 feet in thickness. Exceptions were made in the case of the lower stream terraces which were mapped primarily from exposures along roadcuts. Many lower stream terraces were inferred in inaccessible areas from observations made of those observed along roads and represent probable terraces. Many of these lower terraces are quite small in areal extent and in numerous instances are less than 10 feet thick and thus insignificant.

The largest and most significant high terrace deposits were observed: On Ware Hill, located in Secs. 19 and 30, T. 6 N., R. 5 E.; approximately 3 miles north of Pelahatchie in Secs. 10, 11 and 15., T. 6 N., R. 5 E.; in the Fannin Community, primarily in Secs. 25 and 26, T. 7 N., R. 3 E.; at Goshen Springs in Secs. 5 and 6, T. 7 N., R. 4 E.; at Red Hill in Secs. 15, 16, 20 and 21, T. 5 N., R. 2 E.; 1.5 miles northeast of Luckney in Sec. 24, T. 6 N., R. 2 E.; in the vicinity and south of Cleary in T. 4 N., R. 1 E.; in the Monterey area near the center of T. 4 N., R. 2 E. Numerous other less extensive and thinner high terrace deposits are present in the County and may be noted on the Geologic Map, Plate 1.

Local, sometimes extensive deposits of colluvium effectively mask otherwise observable bedrock-terrace contacts in the County. One such area is found in southeastern Rankin County in the Puckett area. Another such area is in southwest Rankin in T. 3 N., R. 1 E. Contacts of the stream terrace and Catahoula are arbitrarily drawn in these areas and do not necessarily represent the true contact.

A test hole drilled by the Mississippi State Highway Dept., on Red Hill in 1964, at an elevation of 450 feet in SW/4, SW/4, NW/4, Sec. 21, T. 5 N., R. 2 E., penetrated 110 feet of terrace materials overlying Yazoo clay. Figure 27 shows portion of extensively mined terrace sands in Red Hill sand pit. Test hole AG-38 near center S/2, Sec. 19, T. 6 N., R. 5 E., on Ware Hill, penetrated 92 feet of terrace materials overlying Yazoo clay and AG-47, NW/4, SW/4, NW/4, Sec. 25, T. 7 N., R. 3 E., in Fannin community penetrated 157 feet of terrace materials overlying Yazoo clay. The deposits penetrated in these holes were composed of fine- to coarse-grained sand with thin lenses of white and pink clay.

Figure 27.—Pre-loess terrace sands in sand pit on Red Hill in SE/4, SW/4, Sec. 16, T. 5 N., R. 2 E. May 1, 1971.

ALLUVIUM

Extensive alluvial plains have been developed in Rankin County by the two rivers and some of their tributaries. The Pearl River alluvial plain is the largest in areal extent in the County. It varies from less than 100 feet wide in T. 3 N., R. 1 E., to more than 3 miles wide in T. 5 N. The Strong River alluvial plain is approximately 2 miles wide in T. 3 N., R. 5 E., where it passes through the southeast corner of the County. The Pelahatchie, Richland, Steen and Fannegusha Creeks, each tributareis of the Pearl, have developed alluvial plains in excess of 1 mile in maximum width. Purvis, Campbells and Dobbs Creeks, each tributaries of the Strong River, have developed alluvial plains with maximum widths greater than ½ mile.

The alluvial deposits consist of gravel, sand, silt and clay in interbedded sequences with the larger materials occupying the lower portions of the deposits. The thickest alluvium penetrated in the drilling program of this study was 32 feet in AG-4. This hole was drilled in the Pearl River alluvial plain in SW/4, NW/4, SW/4, Sec. 4, T. 5 N., R. 2 E. The thickness of alluvium varies greatly and the maximum thickness of 45 feet shown in Figure 5 represents the thickest alluvium verified by information in the Survey office. Alluvium thicker than 45 feet is doubtless present in old channels of the Pearl River in Rankin County.

Alluvium shown on the Geologic Map, Plate 1, is mapped to show the approximate upstream limits of alluvial deposits in Rankin County. Bedrock can be observed in some places within that shown as being covered by alluvium, but is not shown on the Geologic Map, Plate 1.

STRUCTURE

Rankin County is located on the east flank of the Mississippi Embayment portion of the Gulf Coast Geosyncline. The syncline plunges to the south and the axis of it is approximately 25 miles west of Rankin County. Regional dip in the County (determined from Moodys Branch structure map—Plate 3) is approximately 25 feet per mile S 31° W, except in the area influenced by the Jackson Dome. Other minor structural features effect local changes of dip. Rate of dip increases with depth. Rankin County lies immediately southwest of the Pickens-Pollard Fault Zone as shown in Figure 28.

Structure maps were constructed by the writer using as datums the Glendon limestone member of the Vicksburg group (Plate 2) and the Moodys Branch marl (Plate 3). Datum points shown on the structure maps represent locations of core holes, oil tests, water wells or test holes with control data. Only those locations having control data for each respective map are shown on the map. The data was obtained from electrical logs of the various holes and much of the data was substantiated by sample examination. Most known deep structures reflect little of their structural features at shallower depths and are represented on the Moodys Branch structure map primarily by nosing. Study of the deep subsurface structure was not attempted by the writer.

The main structural feature in Rankin County is the Jackson Dome. The crest of the dome is located near the southeast corner of T. 6 N., R. 1 E., in adjoining Hinds County. The City of Jackson occupies the area of highest relief. The magnitude of this structure is easily recognized from surface outcrops and subsurface information available. Dips on the Moodys Branch marl (Plate 3) are in excess of 100 feet per mile at

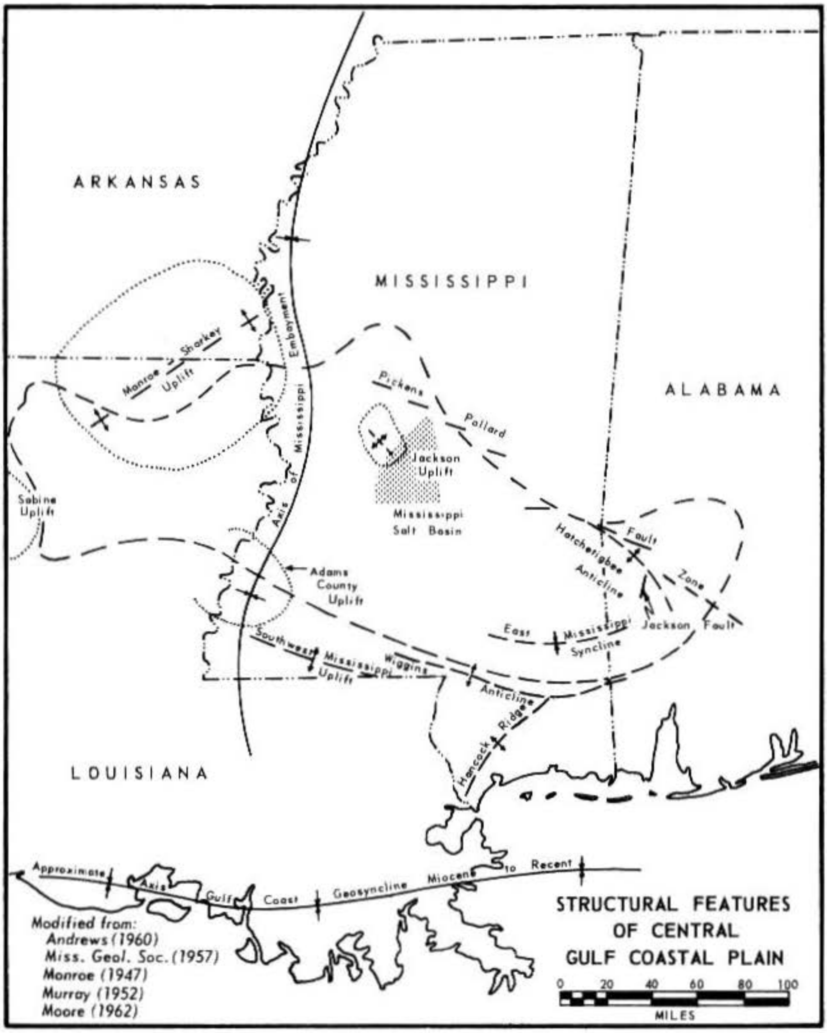

Figure 28.—Structural features of Central Gulf Coastal Plain. Rankin County shown as stipled area.

some positions on the dome. Deeper formations exhibit much steeper dips. Igneous materials from less than 3000 feet have been identified in cuttings from wells drilled on the dome. Intrusive rocks were encountered in some of the wells while in a few wells both ash and intrusive rocks were found. The structural and stratigraphic relationship of the Jackson Dome is shown on cross section B-B' (Plate 4).

No shallow piercement salt domes are present in Rankin County. Rufus Dome, a deep piercement salt dome, was discovered in 1960 by the drilling of the Placid Oil Company's No. 1 J. C. Murray. This test was drilled in Sec. 12, T. 4 N., R. 5 E., and encountered salt at 12,476 feet. Cap rock was reported at 12,392 feet. A test drilled in Sec. 11, T. 4 N., R. 5 E., by Triad Oil and Gas Company, et al in 1964 reported cap rock in samples at 11,994 feet.

Low anticlinal and synclinal features are developed east-southeast of the Jackson Dome in Ts. 4 and 5 N., Rs. 2 and 3 E. These are apparent on the Moodys Branch map (Plate 3). Other structural disturbances indicating possible anomalies shown on Moodys Branch map (Plate 3) are: nosing in Ts. 6 and 7 N., R. 3 E.; high centered in Sec. 27, T. 5 N., R. 5 E.; nosing in Secs. 10, 11, 14 and 15, T. 4 N., R. 5 E.; a high centered in W/2, Sec. 25, T. 4 N., R. 5 E.; high in SE/4, T. 3 N., R. 3 E. (interpreted as nose from inadequate control).

Surface and shallow subsurface faulting is minor in Rankin County and no faults are shown on the Geologic map (Plate 1) or either of the structure maps (Plates 2 & 3). Faults of small displacement and anomalous dips were mentioned by Monroe[67] as suggesting that faults of considerable magnitude might be present in the Wansley Bend area in T. 4 N., R. 1 E., along the Pearl River. This area shows up as a nose on the Glendon structure map (Plate 2), but has no anomalous definition on the Moodys Branch structure map (Plate 3). Lack of sufficient surface exposures of reliable marker beds prohibit accurate determinations of possible surface faults in the County.

Local anomalous dips were observed in surface outcrops in Rankin County. Northwest dip was observed in Catahoula beds in north roadcut in NW/4, NE/4, SW/4, Sec. 5, T. 3 N., R. 2 E. Echols[68] observed anomalous northeast dip in Forest Hill beds in SW/4, SE/4, SE/4, Sec. 7, T. 5 N., R. 5 E., as evidence of structure. In 1962, in SE/4, NW/4, Sec. 18, T. 5 N., R. 5 E., the discovery well of Pelahatchie Field was drilled on this structure as a result of reflection seismic surveys.

Structural features forming known hydrocarbon traps are described by Bicker in the section "Rankin County Mineral Industries."

ECONOMIC GEOLOGY

General Statement

One of the chief purposes of the Rankin County investigation was to locate and report mineral resources of known or probable economic value. Because of the expense of testing materials and the limited funds available for this phase of the investigation, only those considered to be representative of materials available were selected for testing. Of the 49 holes cored or drilled during this investigation, 19 were cored and 17 of these were located specifically for the purpose of obtaining samples for various testing procedures. Of the 17 holes cored, 14 samples from 8 of the locations were selected for various analyses.

Clays and Clay Mixtures

Clays and clay-like materials are present in large quantities in Rankin County. Results of various tests performed on selected samples of Rankin County clays confirm that some of them are worthy of further investigation.

The writer realizes that all materials selected for the various tests do not satisfy all the requirements to be defined as a clay. Grim[69] in his text on clay mineralogy defines clay as "a rock term and also a particle-size term in the mechanical analysis of sedimentary rocks, soils, etc. As a rock term it is difficult to define precisely, because of the wide variety of materials that have been called clays. In general the term clay implies a natural earth, fine-grained materials which develops plasticity when mixed with a limited amount of water. By plasticity is meant the property of the moistened material to be deformed under the application of pressure, with the deformed shape retained when the deforming pressure is removed. Chemical analysis of clays shows them to be essentially silica, alumina and water, frequently with appreciable quantities of iron, alkalies and alkaline earths. . . As a particle size term, the clay fraction is that size fraction composed of the smallest particles. The maximum size of particles in the clay size grade is defined differently in different disciplines. In geology the tendency has been to follow the Wentworth scale and to define the clay grade as material finer than about 4 microns."

All of the Rankin County clay samples selected for testing exhibit clay properties, but most of them contain varying amounts of silt-sized and sand-sized particles, and therefore do not meet all requirements for a clay. The term "natural clay mixtures" used by Moore[70] is appropriate in defining them.

Numerous exposures of clays and clay mixtures were observed in Rankin County. Lithologic character, accessibility and thickness were considered wherever possible. Seventeen holes were cored to obtain samples for testing. Due to limited funds available for testing, 14 samples were selected from 8 of the holes cored. Of the samples tested, 2 were from the Yazoo, 6 were from the Bucatunna and 6 were from the Catahoula.

Ceramic tests on samples selected were conducted by Thomas E. McCutcheon, Ceramic Engineer at the Georgia Institute of Technology in the School of Ceramics laboratories. Examination and descriptions of residues from screen analyses were made by Theo H. Dinkins, Mississippi Geological Survey stratigrapher. Chemical analyses were made by Siltstone Testing Laboratory of New Orleans, Louisiana. Results of ceramic test procedures are included in the section titled Rankin County Clay Test. Screen analyses results are listed in Table 2 (McCutcheon) and chemical analyses are graphically illustrated in Figure 1 (McCutcheon) and in detail in Table 1 (McCutcheon).

Clays from the Yazoo formation are the most abundant in Rankin County. Yazoo clay is utilized as lightweight aggregate material in adjoining Hinds County. Two holes were cored to sample Yazoo clay. One of the holes was cored in the upper Yazoo and the other was cored in the lower Yazoo. Two samples were tested from the hole cored in the lower Yazoo. Of the limited possibilities for use of this clay, the best one would be to act as a flux clay in the manufacture of light-colored ware.

Six samples from 4 test holes cored in Bucatunna clay were selected for tests. These clays are particularly suited for the manufacture of lightweight aggregate. Considerable quantities of this clay are available in several locations and merit further investigation.

Bucatunna clay is known locally in Jasper and Smith Counties as an "acid iron earth" (a clay bearing copperas, an iron sulfate). The iron sulfate is extracted from it and used as a medicine called "Nature's Aid," a livestock feed supplement and a soil conditioner. Deposits of Bucatunna in Rankin County are probably suitable for the same purpose.

Six samples from 3 test holes cored in the Catahoula were selected for testing. All Catahoula clays tested showed a consistent range of characteristics throughout the burning cycle except the samples from test hole AG-29, 32' - 37', which bloated. These clays are suited for the manufacture of high grade face brick and common brick, structural tile, fireproofing and other related products. Burned colors were red to brown.

Sand and Gravel

Sand and gravel deposits are essential sources for road bed material and topping for roads. Rankin County is one of the fastest growing counties in the state and much sand and gravel is needed in the construction industry of the County.

Unfortunately, Rankin County lies north of the extensive Citronelle gravel deposits. Citronelle deposits are present in T. 3 N., Rs. 2, 3 and 4 E., and have been used for many years as a primary source of gravel for topping in the County. Smaller deposits of Citronelle sands and gravels have been mined for years in T. 4 N., R. 5 E., and T. 5 N., Rs. 4 and 5 E. These deposits as well as smaller deposits of Citronelle may be noted on the Geologic map (Plate 1). Much of the Citronelle in Rankin County contains minor amounts of gravel and some deposits are all sand.

Pre-loess terrace deposits of sand and minor amounts of gravel are present in numerous localities in Rankin County. These deposits primarily contain sand, but in most cases contain some gravel. Gravel contained in pre-loess terrace deposits is usually pea gravel and occurs as thin lenses or is scattered in the matrix of sand. Occasional clay lenses are found in the pre-loess terraces. The thickest and most extensive of these sand deposits are found in Secs. 16, 20 and 21, T. 5 N., R. 3 E., Secs. 5, 6, 7 and 8, T. 7 N., R. 4 E., Secs. 25, 26, 35 and 36, T. 7 N., R. 3 E., Secs. 19 and 10, T. 6 N., R. 5 E. These and other pre-loess terrace deposits are shown on the Geologic map (Plate 1).

Limestone and Marl

Rocks of the Vicksburg group outcropping in an arcuate band across the County contain several beds of limestone interbedded with marl. Uses and potential uses of these materials are: in the manufacture of Portland cement, the manufacture of rock wool and as agricultural lime. The limestones of Rankin County could be used for any of these purposes. Vicksburg limestones, marls and clays are used in the manufacture of cement in Rankin County and will be discussed in the section titled Rankin County Mineral Industries (Bicker).

The need for an agricultural lime plant in the central part of the State has been apparent for several years. Rankin County is favorably located for such a plant and the Vicksburg limestones and marls could be produced for this purpose. Agricultural lime is produced in a small plant in adjoining Smith County.

Rock wool is a potential product of Vicksburg limestones and marls in Rankin County. A discussion of the possibilities of producing rock wool from rocks of the Vicksburg group in Warren County is discussed in Bulletin 43, "Warren County Mineral Resources." Vicksburg limestones and marls in Rankin County are very similar to those of Warren County. Rock wool could also be produced from the lower Yazoo since it is quite limy and sometimes approaches the hardness and chemical composition of limestone.

Building Stone

Catahoula sandstones have been used locally in Rankin County as a building stone. Several homes have been constructed using sandstones of the Catahoula formation in southwest Rankin County where indurated layers of Catahoula sandstones are accessible. The varying degree of induration in these rocks prohibits more than a limited use of them as a building stone. They can be used as a road metal and as rip-rap around ponds and lakes.

Glauconite

Glauconite in varying amounts is present in Vicksburg limestones and marls and in the Moodys Branch marl. Glauconite is used as a zeolitic water softener and as a source of potassium for fertilizer. Insufficient amounts of glauconite are present in these formations to be of importance in Rankin County.

Lignite

Lignite is present primarily in the Forest Hill formation in Rankin County. Thin beds of lignite are commonly found in the sands and clays of the formation. In the subsurface, beds several inches thick have been reported. Lignites in Rankin County have no commercial importance.

Salt

Only one piercement salt dome is present in Rankin County and it is at considerable depth, as previously discussed in the section titled Structure. No commercial worth can be placed on salt deposits in the County due to the excessive depth to salt stock.

Oil and Gas

Production of hydrocarbons has been established in 4 localities in Rankin County since the discovery of Jackson Gas Field (now used for gas storage). A fifth field was discovered in 1969 by Shell Oil Company in Sec. 28, T. 4 N., R. 3 E. Gas reserves were assured in 1970 in a yet unnamed field in Sec. 28, T. 3 N., R. 3 E. Both of these discoveries are reported to be in the Smackover formation. The deep production in Pelahatchie Field is reported to be from the Norphlet formation, however some geologists believe this production is from lower Smackover.

Future exploration in Rankin County will doubtless contine in search of Jurassic production since promising discoveries in the Thomasville and Piney Woods areas of the County have been made. Interpretations of the deep Jurassic stratigraphy will no doubt be the key to most future oil and gas finds in Rankin County.

ACKNOWLEDGMENTS

The writer expresses his appreciation to the many citizens of Rankin County who gave him information about geological features and other places of interest.

Special acknowledgments are due to the various oil companies who furnished numerous core hole logs for use in the

on deeper test holes depreciated noticeably with increased depth. AG-39 was drilled to 1033 feet, setting a depth record for the Survey. Deep samples on this hole were rather poor but the electrical log (to 1032 feet) provides valuable information on the Kosciusko formation as an important fresh water aquifer with great potential.

Test Holes AG-1 through AG-10 were drilled in 1964 and AG-11 through AG-15 were drilled in 1965. A certain amount of weathering was noted in describing these samples. This was evidenced primarily in color changes. AG-5 showed more change in color than did any of the cuttings examined from these test holes. Some of the limestone in the cuttings had changed color from gray to gray-tan with some red staining. Gypsum, which occurs in weathered Yazoo, was observed in cuttings well below weathering and has been deleted from descriptions.

AG-1

Location: On east side of road just north of power line near center NW/4, SE/4, Sec. 10, T. 5 N., R. 3 E.

Elevation: 475 feet (from topographic map) Date: March 3, 1964

Purpose: Drilled to 150 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 150 feet.

Thickness	Depth	Description
		Terrace deposit
8	8	Sand, brown-tan with occasional red streaks, medium- to very coarse-grained.
		Catahoula formation
9	17	Clay, gray, silty in part.
5	22	Sand, red and yellow stained, fine- to medium-grained, silty in part.
		Vicksburg group (Bucatunna clay)
6	28	Clay, chocolate-brown, plastic, limonite on joints, selenite.
14	42	Clay, dark-gray, carbonaceous, fossiliferous, slightly sandy, rare glauconite.
4	46	Marl, gray-green, very fossiliferous, slightly glauconitic, rare pyrite, slightly sandy.
2	48	Clay, dark-gray, carbonaceous.
		Vicksburg group (Byram marl)
17	65	Marl, gray to gray-green, very fossiliferous, rare glauconite, sandy.
		Vicksburg group (Glendon limestone)
2	67	Limestone, gray, galuconitic, fossiliferous, hard.
1	68	Marl, gray, fossiliferous, limy, rare pyrite, glauconitic.

4	70	Limestone, gray, glauconitic, fossiliferous.
4	74	Marl, gray, fossiliferous, glauconitic.
4	78	Limestone, gray, glauconitic, fossiliferous.
5	83	Marl, gray, glauconitic, fossiliferous and thin ledges limestone, gray, glauconitic, fossiliferous, soft to slightly hard.
		Vicksburg group (Mint Spring marl)
6	89	Marl, gray to gray-green, glauconitic, fossiliferous, pyritic, sandy, clayey.
3	92	Clay, gray, slightly silty.
9	101	Sand, gray, fine- to medium-grained, marly to very marly, fossiliferous, pyritic, some black phosphatic fossils, glauconitic.
		Forest Hill formation
5	106	Clay, gray, carbonaceous, silty.
14	120	Sand, gray, very fine-grained, silty, micaceous, carbonaceous.
23	143	Clay, gray, carbonaceous, silty, finely micaceous, very silty thin lenses.
7	150	Sand, gray, very fine- to fine-grained, finely micaceous.

AG-2

Location: On west side of gravel road on right-of-way in the southwest corner of Sec. 18, T. 5 N., R. 3 E.

Elevation: 330 feet (from topographic map) Date: June 24, 1964

Purpose: Drilled to 500 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 498 feet.

Thickness	Depth	Description
		Terrace deposit
18	18	Sand, gray with some yellow and brown staining, medium- to very coarse-grained with small amount of red and tan clay.
		Forest Hill formation
2	20	Clay, gray, silty, rare mica, rare carbonaceous particles.
3	23	Silt, tan and clay, gray, silty.
11	34	Sand, gray, very fine-grained, silty, lignitic, clayey.
18	52	Clay, gray, lignitic, silty in part, finely micaceous.
12	64	Sand, gray, very fine-grained, lignitic, clayey, silty, finely micaceous.
		Yazoo formation
36	100	Clay, gray to gray-green, calcareous, fossil fragments, pyrite.
240	340	Clay, gray-green, calcareous, fossiliferous, rare mica.
50	390	Clay, gray-green, calcareous, fossiliferous, rare pyrite, slightly silty in part.
26	416	Clay, gray-green, calcareous, very fossiliferous in part, rare mica, rare glauconite, slightly silty, pyrite.
44	460	Clay, gray-green, calcareous, fossiliferous, rare pyrite.
11	471	Clay, gray-green to gray, calcareous, slightly glauconitic, fossiliferous, slightly limy to limy.
		Moodys Branch formation
18	489	Sand, gray-green, medium-grained, fossiliferous, glauconitic.
		Cockfield formation
11	500	Clay, gray-brown, carbonaceous.

AG-3

Location: On State Highway 18, 1.5 miles southeast of Brandon City limits and 40 feet east of center line in the NW/4, NW/4, Sec. 36, T. 5 N., R. 3 E.

Elevation: 376 feet (from topographic map) Date: June 26, 1964

Purpose: Drilled to 500 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 499 feet.

Thickness	Depth	Description
4	4	Soil, silt and sand.
		Vicksburg group (Bucatunna clay)
23	27	Clay, chocolate-brown, blocky with limonitic partings, gypsiferous, slightly silty in part.
9	36	Clay, dark-gray, gypsiferous, fossil fragments, carbonaceous.
		Vicksburg group (Byram marl)
13	49	Marl, gray, very fossiliferous, glauconitic, pyrite, clayey in part.
		Vicksburg group (Glendon limestone)
1	50	Limestone, gray, glauconitic, fossiliferous, pyritic, hard.
2	52	Marl, gray, fossiliferous, glauconitic, clayey.
3	55	Limestone, gray, fossiliferous, glauconitic, slightly pyritic, hard.
3	58	Marl, gray, fossiliferous, glauconitic.
4	62	Limestone, gray, fossiliferous, glauconitic, slightly pyritic, marly near base.
2	64	Marl, gray, fossiliferous, glauconitic.
2	66	Limestone, gray, fossiliferous, glauconitic.
8	74	Marl, gray, fossiliferous, glauconitic, sandy.
3	77	Limestone, gray, fossiliferous, glauconitic.
		Vicksburg group (Mint Spring marl)
21	98	Marl and limy sand, gray-green, very fossiliferous, glauconitic, rare pyrite, medium-grained sand.
		Forest Hill formation
8	106	Silty clay and clayey silt, finely micaceous, carbonaceous, clayey.
6	112	Sand, gray, very fine- to fine-grained, micaceous, silty.
4	116	Clay, gray-brown, carbonaceous, finely micaceous.
6	122	Sand, gray, very fine- to fine-grained, carbonaceous.
33	155	Clay, gray, finely micaceous, carbonaceous and sand, very fine-grained, silty, lignitic, rare pyrite.
1	156	Lignite.
3	159	Clay, gray, finely micaceous.
8	167	Sand, gray, very fine- to fine-grained, argillaceous, finely micaceous, lignitic and thin streaks lignite.
5	172	Clay, gray, carbonaceous.
12	184	Sand, gray, very fine- to fine-grained, lignitic, micaceous with thin streaks lignite.
10	194	Clay, gray-brown, carbonaceous, finely micaceous, silty in part.
16	210	Sand, gray, fine-grained, rare mica, silty, clayey and lignitic in part.
		Yazoo formation
6	216	Clay, pale-green, calcareous.
84	300	Clay, gray-green, calcareous, fossiliferous, occasional pyrite, rare mica.

20	320	Clay, gray-green, calcareous, fossiliferous, rare fine mica.
30	350	Clay, gray-green, calcareous, fossiliferous, occasional pyrite, rare mica.
38	388	Clay, gray-green, calcareous, slightly shaly, slightly fossiliferous.
112	500	Clay, gray-green, calcareous, fossiliferous.

AG-4

Location: Approximately 100 feet east of center line of north-south section line road and on north side of pipeline right-of-way in SW/4, NW/4, SW/4, Sec. 4, T. 5 N., R. 2 E.

Elevation: 278 feet (from topographic map) **Date:** June 30, 1964

Purpose: Drilled to 500 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 498 feet.

Thickness	Depth	Description
		Alluvium
11	11	Sand, tan, fine- to medium-grained, with silty and argillaceous material.
7	18	Clay, light-gray, silty.
14	32	Sand, white, coarse-grained, some frosty quartz, some milky quartz, occasional pebble.
		Yazoo formation
28	60	Clay, gray to gray-green, calcareous, fossiliferous.
20	80	Clay, gray-green, calcareous, very fossiliferous.
34	114	Clay, gray-green, calcareous, fossiliferous.
7	121	Clay, gray-green, fossiliferous, limy to very limy and glauconitic near base.
		Moodys Branch formation
17	138	Sand, gray, fine- to coarse-grained, glauconitic, fossiliferous, calcareous.
		Cockfield formation
4	142	Clay, brown, silty, micaceous, carbonaceous.
14	156	Sand, gray, very fine-grained, micaceous, lignitic and silty, clayey in part.
7	163	Clay, brown, silty, carbonaceous, micaceous.
77	240	Sand, gray, very fine- to fine-grained, micaceous, silty to very silty.
14	254	Clay, gray, silty with streaks lignite.
18	272	Sand, gray, medium-grained, glauconite, heavy minerals.
2	274	Clay, gray, silty.
23	297	Sand, gray, fine- to medium-grained, heavy minerals, occasional glauconite, rare pyrite.
7	304	Clay, gray, silty.
96	400	Sand, gray, fine- to medium-grained, heavy minerals, and clay breaks, gray, silty, carbonaceous.
		Cook Mountain formation
50	450	Clay, gray, carbonaceous, micaceous, pyrite.
15	465	Clay, gray, carbonaceous, pyrite, glauconite, micaceous, silty.
22	487	Clay, gray, silty, carbonaceous and lime, light-gray, sandy, slightly glauconitic, fossiliferous.
13	500	Clay, gray-brown, carbonaceous, rare pyrite.

AG-5

Location: On west side of gravel road in NW/4, SE/4, Sec. 21, T. 5N., R. 3E.

Elevation: 400 feet (from topographic map) Date: July 2, 1964

Purpose: Drilled to 310 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 304 feet.

Thickness	Depth	Description
		Terrace deposit
7	7	Silt, yellow-brown, sandy and sand, red, very fine-grained, clayey.
		Vicksburg group (Bucatunna clay)
23	30	Clay, light-gray-brown to chocolate-brown, iron stains, silty in part, with some gypsum.
6	36	Clay, chocolate-brown, gypsiferous, blocky.
2	38	Clay, dark-gray, slightly fossiliferous, rare glauconite.
		Vicksburg group (Byram marl)
18	56	Marl, gray, sandy, very fossiliferous, glauconitic, clayey in part.
		Vicksburg group (Glendon limestone)
12	68	Marl, cream-tan, fossiliferous, glauconite, limy streaks, clayey near base.
14	82	Limestone, gray-tan with red staining, glauconitic, fossiliferous, and marly clay, gray, glauconitic, fossiliferous.
10	92	Limestone, gray, very fossiliferous, phosphatic, rare pyrite, glauconitic, sandy to very sandy in part, argillaceous.
		Vicksburg group (Mint Spring marl)
11	103	Sand, gray, fine-grained, glauconitic, very fossiliferous.
		Forest Hill formation
6	109	Clay, gray, carbonaceous, silty, micaceous.
5	114	Sand, gray, very fine- to fine-grained.
21	135	Clay, gray, carbonaceous, silty to very silty, micaceous with thin streaks of lignite.
22	157	Sand, gray, very fine-grained, slightly carbonaceous, and sandy lignitic clay.
8	165	Sand, gray, fine-grained, micaceous with streaks of lignite.
15	180	Sand, gray, fine-grained, silty near base.
		Yazoo clay
18	198	Clay, light-gray-green, fossil fragments, calcareous, slightly silty in part.
62	260	Clay, gray-green, fossiliferous, calcareous, occasional pyrite inclusion.
10	270	Clay, gray-green, very fossiliferous, calcareous.
23	293	Clay, gray-green, fossiliferous, calcareous, rare glauconite, pyrite.
2	295	Lime, light-gray, fossiliferous, clayey.
15	310	Clay, gray-green, fossiliferous, calcareous.

AG-6

Location: On south side of county road and east of private drive in NW corner, SW/4, SW/4, Sec. 4, T. 3 N., R. 1 E.

Elevation: 300 feet (from topographic map) Date: October 16, 1964

Purpose: Drilled and cored as a stratigraphic test and to obtain clay samples for testing. Descriptions from cores 0-67 feet; from cuttings 67-170 feet. Electrical log to 170 feet.

Thickness	Depth	Description
1	1	Top soil, tan, silty, sandy, clayey.
		Catahoula formation
3	4	Sand, light-gray to buff with limonitic staining, very fine-grained, silty to very silty, clayey, with some red streaks, with 8 inches bentonite from 3-4 feet, dark-gray, very plastic clay near base.
4	8	Siltstone, light-gray with yellow, tan and red streaks, sandy, rare mica, hard, argillaceous, thin streak gray-tan plastic clay at 5 feet.
8	16	Clay, light-gray to gray with limonitic staining in part, slightly silty in part to rarely sandy.
3	19	Clay, gray to slightly purple-gray, silty to sandy, dark-gray streaks near base.
2	21	Clay, gray, mottled dark-gray, limonitic staining, occasional limonitic concretion, silty to slightly sandy.
6	27	Clay, light-gray with occasional dark-gray streak, limonitic staining, silty to finely sandy.
7	34	Clay, dark-gray with light-gray mottles, silty to slightly sandy.
7	41	Clay, gray to light-gray, silty, slightly sandy near base.
3	44	Clay, gray, sandy.
6	50	Clay, gray to gray-green, sandy, silty to very silty, rare mica.
2	52	Clay, gray-green, silty to slightly sandy, rare mica, rare pyrite.
2	54	Clay, dark-gray-green with dark-gray streaks carbonaceous clay, bentonitic in part.
2	56	Clay, gray-green, smooth.
2	58	Sandstone, light-gray, fine- to medium-grained, much kaolinitic material, argillaceous.
2	60	Sandstone, gray-green, fine-grained, clayey in lower part.
7	67	Silt, light-gray-green, clayey, sandy.
7	74	Sand, light-gray, very fine- to fine-grained, clayey, silty.
		Vicksburg group (Bucatunna clay)
8	82	Clay, dark-gray, carbonaceous.
2	84	Sand, gray, very fine-grained, micaceous.
24	108	Clay, dark-gray, plastic, carbonaceous, very finely micaceous, rare glauconite.
4	112	Clay, dark-gray, carbonaceous, sandy.
23	135	Clay, dark-gray, finely carbonaceous, micaceous, plastic with thin silt laminae and fossiliferous, marly lenses.
5	140	Marl, gray-green, very fossiliferous, glauconitic, clayey.
6	146	Clay, dark-gray, fossiliferous, carbonaceous, plastic.
		Vicksburg group (Byram marl)
8	154	Marl, gray, glauconitic, very fossiliferous, limy, clayey in part, slightly sandy.
		Vicksburg group (Glendon limestone)
2	156	Limestone, gray, glauconitic, fossiliferous, moderately hard.
1	157	Marl, gray-green, glauconitic, fossiliferous, clayey.
3	160	Limestone, gray, glauconitic, fossiliferous, marly, soft.
2	162	Limestone, gray, glauconitic, fossiliferous, hard.
1	163	Marl, gray-green, glauconitic, fossiliferous.
4	167	Limestone, gray, glauconitic, fossiliferous, marly in part.
3	170	Marl, gray-green, glauconitic, fossiliferous, clayey in part, slightly sandy.

AG-8

Location: On south side of State Highway 13 at juncture of gravel road to south in southeast corner of SE/4, SW/4, Sec. 12, T. 3 N., R. 5 E.

Elevation: 376 feet (Altimeter) Date: October 19, 1964

Purpose: Drilled to 140 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 140 feet.

Thickness	Depth	Description
3	3	Soil, sandy, silty.
		Catahoula formation
20	23	Clay, light-gray, mottled purple and buff, sandy, silty to very silty in part, rare mica.
7	30	Sand, gray-white with limonitic staining on many grains, medium-grained, with streak gray plastic clay at 25 feet.
4	36	Sand, gray-white with limonitic staining on many grains, medium- to coarse-grained.
26	62	Clay, dark-gray, with thin silty laminae, carbonaceous in part, rare mica.
8	70	Sand, gray, with some limonitic staining, fine- to coarse-grained with some pebbles, poorly sorted.
31	101	Sand, white with buff mottling, fine- to coarse-grained, some pebbles, and clay, white, very sandy.
		Vicksburg group (Glendon limestone)
3	104	Clay, dark-gray, very pyritic, very glauconitic.
14	118	Limestone, light-gray, fossiliferous, glauconitic, argillaceous, chalky, soft, and marl, slightly sandy, fossiliferous, limy, glauconitic.
		Vicksburg group (Mint Spring marl)
9	127	Marl, gray-green, fossiliferous, glauconitic, sandy, silty to clayey in part.
		Forest Hill formation
13	140	Clay, gray, silty, lignitic, finely micaceous.

AG-9

Location: On west side of asphalt road in southeast corner of SW/4, NE/4, Sec. 25, T. 4 N., R. 5 E.

Elevation: 442 feet (Altimeter) Date: October 20, 1964

Purpose: Drilled to 120 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 120 feet.

Thickness	Depth	Description
		Terrace deposit
18	18	Clay, gray-tan with red-brown stains, very silty and sandy with streaks pink clay.
12	30	Sand, white with limonite staining, fine- to medium-grained.
16	46	Sand, white, fine- to medium-grained.
14	60	Sand, white, fine- to coarse-grained.

		Catahoula formation
4	64	Clay, buff-white, bentonitic.
8	72	Clay, gray, carbonaceous, silty to very silty, sandy in part.
		Vicksburg group (Glendon limestone)
13	85	Limestone, light-gray, very fossiliferous, glauconitic, chalky, soft to hard and marl, gray, glauconitic, fossiliferous.
		Vicksburg group (Mint Spring marl)
11	96	Marl, light-gray, glauconitic, fossiliferous, slightly sandy in lower part.
		Forest Hill formation
24	120	Clay, gray, carbonaceous, silty to very silty, finely micaceous, sandy in part.

AG-10

Location: Adjacent to gravel road in NW/4, SE/4, Sec. 3, T. 3 N., R. 5 E.

Elevation: 435 feet (Altimeter) Date: October 21, 1964

Purpose: Drilled to 180 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 180 feet.

Thickness	Depth	Description
		Catahoula formation
10	10	Sandstone, gray-buff with pink and yellow, very fine-grained, argillaceous, rare mica.
10	20	Clay, gray, rare lignite, slightly silty to silty.
13	33	Sand, light-gray to white, very fine- to fine-grained, kaolinitic interstitial material, rare mica, very argillaceous.
7	40	Sand, light-gray to white, fine- to medium-grained, argillaceous, slightly micaceous, kaolinitic in part.
4	44	Sandstone, white, fine-grained, argillaceous, with layer of ironstone and ferruginous sandstone at base.
4	48	Clay, light-gray-tan, silty to sandy.
6	54	Sand, buff-yellow, fine-grained with streaks clay and thin streak hard sandstone at 60 feet, fine-grained, very manganiferous, ferruginous in part.
9	63	Sand, buff-yellow, fine-grained, with some limonitic staining, and streaks sandy clay.
11	74	Sand, gray with yellow and red staining, fine- to medium-grained, argillaceous.
11	85	Clay, gray, carbonaceous, silty, pyritized wood fragments.
7	92	Silt, gray, carbonaceous, slightly sandy, slightly pyritiferous, clayey.
27	119	Clay, gray, carbonaceous, silty, rare glauconite and pyrite.
12	131	Clay, gray, silty, carbonaceous, rare glauconite and pyrite, sandy streaks.
8	139	Sand, gray, medium- to coarse-grained, rare pyrite and glauconite, streaks clay, heavy minerals.
		Vicksburg group (Glendon limestone)
1	140	Limestone, light-gray, fossiliferous, glauconitic, hard.
2	142	Marl, gray, glauconitic, fossiliferous.
1	143	Limestone, light-gray, fossiliferous, glauconitic, hard.

1	144	Marl, gray, glauconitic, fossiliferous.
2	146	Limestone, light-gray, fossiliferous, glauconitic, slightly sandy.
5	151	Marl, gray, glauconitic, fossiliferous.
11	162	Limestone, light-gray, fossiliferous, glauconitic, chalky and marl, gray-green, fossiliferous, glauconitic, limy.
		Vicksburg group (Mint Spring marl)
10	172	Sand, gray-green, medium- to coarse-grained, fossiliferous, glauconitic to very glauconitic.
8	180	Marl, gray-green, sandy to clayey, glauconitic, fossiliferous.

NOTE: Circulation was lost on this hole at 43 feet, circulation regained, but fluid loss continued, thus making samples poor for descriptions of formations drilled.

AG-11

Location: In front of junk yard on east side of asphalt road near center S/2, SW/4, Sec. 12, T. 5 N., R. 1 E.

Elevation: 267 feet (from topographic map) Date: January 26, 1965

Purpose: Drilled to 50 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 38 feet.

Thickness	Depth	Description
2	2	Road fill, gravel, sand.
		Alluvium
6	8	Clay, gray-tan, silty, sandy to very sandy.
17	25	Sand, white, medium-grained, rare heavy minerals, extremely rare glauconite and small gravel, pebbles at base.
		Cockfield formation
25	50	Clay, gray, carbonaceous, silty. Samples poor.

AG-12

Location: In wooded area north of house and barn in SW/4, SE/4, SW/4,, Sec. 29, T. 6 N., R. 2 E.

Elevation: 271 feet (from topographic map) Date: January 28, 1965

Purpose: Drilled to 80 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 77 feet.

Thickness	Depth	Description
1	1	Top soil.
		Alluvium
4	5	Clay, yellow-tan with gray streaks, silty, slightly sandy.
6	11	Clay, gray with tan streaks, very silty, slightly sandy.
13	24	Sand, white, medium- to coarse-grained, some very coarse-grains.
		Yazoo formation
9	33	Clay, gray, slightly calcareous to calcareous.
18	51	Clay, gray to gray-green, glauconitic, fossiliferous, limy to very limy near base.

		Moodys Branch formation
16	67	Sand, gray-green, medium- to coarse-grained, very glauconitic, very fossiliferous.
		Cockfield formation
3	70	Clay, gray-brown, carbonaceous, silty, rare pyrite.
4	74	Sand, gray, very fine-grained, silty.
2	76	Clay, gray, very lignitic, silty.
4	80	Sand, gray, very fine-grained, rare mica, lignitic, silty.

AG-13

Location: Approximately 200 feet east of north-south street in NW/4, SE/4, NW/4, Sec. 6, T. 5 N., R. 2 E in Flowood.

Elevation: 272 feet (from topographic map) Date: January 28, 1965

Purpose: Drilled to 50 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 48 feet.

Thickness	Depth	Description
		Alluvium
10	10	Clay, gray with limonitic staining, rare fossil fragment, rare glauconite.
9	19	Sand, white, medium- to very coarse-grained and silt, gray, sandy.
9	29	Sand, gray-white with ferruginous staining, medium- to very coarse-grained.
		Cockfield formation
13	42	Silt, gray to gray-brown, carbonaceous, sandy, rare mica, clayey.
8	50	Sand, gray-brown, fine-grained, very carbonaceous, argillaceous, rare mica, silty.

AG-14

Location: On west side of GM&O Railroad approximately 200 yards north of Cataphote plant near center NE/4, Sec. 6, T. 5 N., R. 2 E in Flowood.

Elevation: 270 feet (from topographic map) Date: January 29, 1965

Purpose: Drilled to 70 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 69 feet.

Thickness	Depth	Description
3	3	Top soil, surface material.
		Alluvium
7	10	Clay, gray with limonitic stains, limonitic and manganiferous nodules, silty to slightly sandy, organic material.
4	14	Clay, gray, silty to very silty, sand grains interspersed in matrix.
9	23	Sand, white, medium- to coarse-grained.
		Yazoo formation
6	29	Clay, gray to gray-green, fossiliferous, calcareous.
5	34	Clay, gray, fossiliferous, slightly glauconitic, limy.
5	39	Clay, gray, fossiliferous, very glauconitic, very limy, rare sand.

		Moodys Branch formation
14	53	Sand, gray-green, medium- to coarse-grained, glauconitic, fossiliferous, rare pyrite to pyritic in part, calcareous to slightly limy in part.
		Cockfield formation
2	55	Clay, gray-brown, carbonaceous, silty.
5	60	Sand, gray, fine-grained, silty, slightly micaceous.
2	62	Clay, gray-brown, silty, lignitic.
8	70	Sand, gray, very fine-grained, micaceous, lignitic.

AG-15

Location: On east side of GM&O Railroad in NW/4, NE/4, NW/4, Sec. 13, T. 5 N., R. 1. E.

Elevation: 265 feet (from topographic map) Date: January 29, 1965

Purpose: Drilled to 60 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 59 feet.

Thickness	Depth	Description
		Alluvium
4	4	Silt, gray with some limonitic staining, argillaceous, slightly sandy.
5	9	Clay, gray with some ferruginous nodules and concretions, silty to slightly sandy.
17	26	Sand, white, coarse- to very coarse-grained with some manganiferous material on grains and pea gravel, particularly near base.
		Yazoo formation
10	36	Clay, light-gray-green to light-gray, slightly glauconitic to glauconitic, limy to very limy, fossiliferous.
		Moodys Branch formation
8	44	Sand, gray-green, fine- to medium-grained, very fossiliferous, very glauconitic, calcareous.
		Cockfield formation
16	60	Clay, gray-brown, carbonaceous, finely micaceous, silty, rare glauconite.

AG-16

Location: In pasture east of dead end gravel road to house and north of Illinois Central Railroad in SE/4, SW/4, NE/4, Sec. 10, T. 5 N., R. 3 E.

Elevation: 455 feet (from topographic map) Date: June 10, 1969

Purpose: Cored to 51 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
1	1	Soil, brown, silty.
		Catahoula formation
8	9	Sand, buff to gray and yellow, fine- to medium-grained.
5	14	Sand, red, mottled red and gray, ferruginous, clayey, fine- to medium-grained.
5	19	Sand, yellow, red, gray-white with ferrugineous lenses near base, fine-grained, micaceous, clayey.

		Vicksburg group (Bucatunna clay)
8	27	Clay, chocolate-brown, blocky with limonitic partings, rarely micaceous.
3	30	Clay, chocolate-brown, mottled yellow and tan, blocky with limonite partings, silty and sandy.
2	32	Clay, chocolate-brown, mottled yellow with limonite partings, slightly gypsiferous, blocky.
2	34	Clay, gray-green, mealy, slightly glauconitic, slightly micaceous, silty, finely sandy in part.
4	38	Clay, gray-green, mega-fossils, slightly glauconitic, fossiliferous to very fossiliferous, micaceous, occasionally carbonaceous, marly, sandy.
4	42	Clay, dark-gray, gray-green, rarely pyritic, streaks marl, slightly micaceous, slightly silty in part.
		Vicksburg group (Byram marl)
2	44	Marl, dark-green, gray-green, very fossiliferous, glauconitic, clayey, sandy.
7	51	Marl, light-gray-green, fossiliferous to very fossiliferous, micaceous, slightly pyritic.

AG-17

Location: In north end of borrow pit along east side of north-south asphalt road in NW/4, SE/4, SW/4, Sec. 32, T. 5 N., R. 5 E.

Elevation: 530 feet (from topographic map) **Date:** June 11, 1969

Purpose: Cored to 34 feet to obtain stratigraphic information. Descriptions from cores. No electrical log.

Thickness	Depth	Description
		Catahoula formation
2	2	Sand, yellow, tan to light-brown, fine-grained.
4	6	Clay, light-gray, tan to reddish-tan, silty, sandy.
2	8	Clay, gray to light-gray, plastic, slightly silty.
6	14	Silt, light- to dark-gray with streaks gray clay, plastic, gummy, slightly pyritic, silty, sandy in part, argillaceous.
4	18	Silt, light-gray to gray, slightly micaceous, sandy.
2	20	Sand, gray, occasional yellow streaks, very fine- to fine-grained, slightly micaceous.
2	22	Clay, gray to blue-gray, pyritic, plastic, occasional fine silt.
1	23	Clay, tan with yellow mottles, plastic, slightly silty.
9	32	Sand, light-gray, to gray, fine-grained, iron stains, rare mica, carbonaceous streaks.
2	34	Sand, gray, fine-grained, slightly micaceous, slightly carbonaceous.

AG-18

Location: Approximately 40 feet north of gravel road in old log road in NW/4, NW/4, SW/4, Sec. 35, T. 5 N., R. 4 E.

Elevation: 475 feet (from topographic map) **Date:** June 12, 1969

Purpose: Cored to 16 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
		Colluvium
2	2	Sand, gray, brown, fine- to medium-grained, silty.
		Catahoula formation
4	6	Silt, gray, mottled red and yellow, and sand, fine- to medium-grained.
9	15	Sand, gray, mottled red and tan with gray streaks, fine- to medium-grained, silty.
1	16	No return - abandoned.

AG-19

Location: In old logging road on north side of county road and east of small pond in NE/4, NE/4, SW/4, NE/4, Sec. 34, T. 5 N., R. 4 E.

Elevation: 490 feet (from topographic map) Date: June 12, 1969

Purpose: Cored to 30 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
1	1	Top soil, sandy, some gravel (wash from road topping).
		Catahoula formation
10	11	Sand, gray with iron stains, very fine- to fine-grained, kaolinitic, slightly micaceous, clayey.
3	14	Silt, gray, slightly carbonaceous, with some fine-grained sand, clayey in part.
7	21	Silt, gray to dark-gray, occasional iron stains, slightly micaceous, slightly carbonaceous, clayey.
9	30	Sand, gray, very fine-grained, argillaceous in part, slightly micaceous, silty.

AG-20

Location: At edge of woods in back of cotton field along side log road in NW/4, SW/4, NW/4, Sec. 16, T. 3 N., R. 4 E.

Elevation: 378 feet (from topographic map) Date: June 13, 1969

Purpose: Cored to 28 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
5	5	Soil, silt and fine sand.
		Catahoula formation
5	10	Silt, gray, scattered limonitic stains, sandy in part.
2	12	Silt, gray-buff with limonitic streaks, micaceous, sandy, clayey.
8	20	Silt, light-gray to buff and sand, very fine-grained, clayey in part.
2	22	Silt, tan to gray-tan with brown and yellow-brown stains, kaolinitic, clayey.
2	24	Silt, gray to gray-white, kaolinitic, sandy.
4	28	Sand, light-gray, with iron staining, very fine- to fine-grained, kaolinitic, silty.

AG-21

Location: In front yard of abandoned house place in NW/4, SE/4, NW/4, Sec. 26, T. 4 N., R. 3 E.

Elevation: 400 feet (from topographic map) Date: June 13, 1969

Purpose: Cored to 21 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
2	2	Top soil, tan, silty.
		Catahoula formation
4	6	Silt, gray with brown and yellow mottles, clayey.
6	12	Clay, buff-white, rarely carbonaceous, kaolinitic, silty.
2	14	Sand, light-gray, with yellow and tan streaks, very fine- to fine-grained, kaolinitic, silty.
4	18	Sand, gray, with yellow streaks and mottled yellow and red, very fine- to fine-grained, kaolinitic interstitial material, silty.
3	21	Sandstone, gray, fine-grained, much kaolinitic interstitial material, silty, clayey in part.

AG-22

Location: On hill in pasture south of blacktop road in SW/4, SW/4, NE/4, Sec. 21, T. 3 N., R. 1 E.

Elevation: 320 feet (from topographic map) Date: June 16, 1969

Purpose: Cored to 24 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
4	4	Soil, silt and sand.
		Catahoula formation
1	5	Clay, gray, mottled red, silty.
5	10	Silt, gray, mottled yellow, sandy in part.
3	13	Clay, gray, gypsiferous, slightly silty.
1	14	Clay, gray, mottled yellow, slightly micaceous, silty, sandy.
1	15	Sand, gray with yellow and brown mottles, fine-grained, clayey.
1	16	Clay, gray with light-gray streaks, silty.
2	18	Silt, gray, brown and yellow, sandy, clay in part.
2	20	Clay, gray, with limonitic staining in part, silty.
1	21	Clay, gray, plastic, slightly bentonitic.
3	24	Sand, yellow, brown, and gray, fine- to coarse-grained, rare black chert.

AG-23

Location: At east end of old chicken house and just west of gravel road in SW/4, SW/4, SE/4, Sec. 6, T. 4 N., R. 2 E.

Elevation: 403 feet (from topographic map) Date: June 24, 1969

Purpose: Cored to 22 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
1	1	Top soil.
		Catahoula formation
11	12	Sand, buff to gray-tan with iron stains, very fine- to fine-grained, finely micaceous, clayey in part.
2	14	Silt, red, mottled red and yellow with gray streaks, ferruginous, clayey.
2	16	Sand, yellow-brown with purple and gray streaks, very fine- to fine-grained, silty, clayey.
5	21	Sand, yellow-brown with limonitic streaks, fine- to medium-grained.
1	22	Sandstone, light-gray, very fine- to fine-grained, very hard, silty.

AG-24

Location: On east side of gravel road in SW/4, NE/4, SE/4, Sec. 6, T. 4 N., R. 2 E.

Elevation: 380 feet (from topographic map) Date: June 24, 1969

Purpose: Cored to 53 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
2	2	Sand, reddish-brown, fine- to coarse-grained (road bed material).
		Terrace deposit
3	5	Sand, reddish-brown, fine- to medium-grained.
3	8	Sand, reddish-brown, with gray streaks, fine- to medium-grained, silty.
3	11	Sand, brown and red, fine- to medium-grained, silty.
5	16	Sand, tan and yellow with gray streaks, fine- to medium-grained, silty.
		Catahoula formation
2	18	Sand, pinkish-gray, with brown and tan streaks, medium-grained, silghtly carbonaceous.
2	20	Sand, pink to red with gray and brown streaks, fine-grained, silty, argillaceous in part.
4	24	Sand, yellow and light-gray, fine-grained, silty.
9	33	Sand, tan with brown streaks, occasional light-gray to white, very fine- to fine-grained, silty.
		Vicksburg group (Bucatunna clay)
18	51	Clay, dark-gray, plastic, slightly micaceous in part, carbonaceous, slightly silty to silty in streaks.
		Vicksburg group (Byram marl)
2	53	Marl, gray-green, very fossiliferous, glauconitic, sandy.

AG-25

Location: In pasture on north side of paved road in SE/4, NE/4, SE/4, Sec. 8, T. 4 N., R. 2 E.

Elevation: 360 feet (from topographic map) Date: June 25, 1969

Purpose: Cored to 63 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
1	1	Soil, silt, sand, tan.
		Terrace deposit
10	11	Sand, tan with light-tan mottles, fine- to coarse-grained.
		Catahoula formation
1	12	Clay, gray with tan and yellow mottles, silty, sandy.
2	14	Clay, blue-gray to purple with red and brown mottles, gray streaks, silty.
2	16	Clay, gray to light-gray with dark-gray and tan streaks, slightly micaceous, silty.
6	22	Sand, gray with tan and dark-gray streaks, fine- to medium-grained, slightly micaceous, streaks silty clay, 3 inches lignite at 22 feet.
6	28	Silt, gray-tan with yellow streaks, streak selenite near base, clayey, slightly sandy.
4	32	Silt, gray-green, slightly micaceous, clayey, occasional very fine-grained sand.
		Vicksburg group (Bucatunna clay)
2	34	Silt, dark-gray to gray, micaceous.
5	39	Clay, dark-gray to gray with dark-gray streaks, slightly micaceous, slightly carbonaceous, streaks very fine- to fine-grained sand, silty.
9	48	Clay, dark-gray, plastic, micaceous, slightly silty to silty in streaks.
1	49	Silt, very fine-grained sand, gray, carbonaceous.
8	57	Clay, gray to dark-gray, plastic, finely micaceous, carbonaceous, rare pyrite, occasional fossil fragments, silty.
6	63	Clay, dark-gray, plastic, slightly micaceous, slightly silty.

AG-26

Location: In pasture on hill approximately 150 feet east of State Highway 469 in NW/4, SW/4, NW/4, Sec. 12, T. 4 N., R. 2 E.

Elevation: 331 feet (from topographic map) Date: June 27, 1969

Purpose: Cored to 94 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
1	1	Soil, tan to brown, sandy.
		Terrace deposit
6	7	Sand, red to yellow-red, fine- to coarse-grained, ferruginous sandstone 2 inches thick at 5½ feet.
		Catahoula formation
3	10	Sand, gray and yellow mottled, fine-grained, slightly clayey.
3	13	Sand, gray with yellow-tan and red streaks, fine- to coarse-grained, clayey in part.
1	14	Clay, gray with tan and red streaks, sandy.
11	25	Sand, light-gray to gray with reddish-yellow streaks, fine- grained, kaolinitic interstitial material, silty to very silty, clayey in part.
		Vicksburg group (Bucatunna clay)
11	36	Clay, dark-gray to gray, finely micaceous, carbonaceous, silty.
16	52	Clay, dark-gray, plastic, micaceous, carbonaceous, silty in part, 3 inches fine-grained sand and glauconite at 48½ feet.

4	56	Sand, gray-green, medium-grained, marly, fossiliferous.
6	62	Clay, gray to dark-gray, marly, slightly pyritic, sandy streaks, fossiliferous, glauconitic.
29	91	Clay, dark-gray, slightly micaceous, carbonaceous, occasional pyrite, streaks sandy marl, fossiliferous, with thin silt laminae.
		Vicksburg group (Byram marl)
3	94	Marl, gray-green, glauconitic, fossiliferous, clay streaks, silty to sandy.

AG-27

Location: In pasture west of paved road in SW/4, NE/4, NE/4, Sec. 12, T. 3 N., R. 2 E.

Elevation: 356 feet (from topographic map) Date: June 30, 1969

Purpose: Cored to 33 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
1	1	Soil, silty, sandy.
		Alluvium
6	7	Silt, gray-tan, sandy.
4	11	Sand, gray to light-gray, fine- to very coarse- grained, rare mica, carbonaceous material, occasional quartz and chert gravel, silty.
1	12	Gravel, yellow-brown, sandy.
3	15	Clay, gray with tan streaks, sandy in part, silty.
4	19	Sand, gray to tan, fine- to very coarse-grained, with quartz and rare chert pebbles at base.
		Catahoula formation
10	29	Clay, tan with yellow-brown streaks, plastic to silty, sandy streaks.
4	33	Sand, gray, very fine- to fine-grained, slightly clayey in part.

AG-28

Location: South and east of intersection of gravel road and across gravel road from cemetery in NW/4, NE/4, SW/4, NW/4, Sec. 14, T. 3 N., R. 2 E.

Elevation: 407 feet (from topographic map) Date: July 1, 1969

Purpose: Cored to 34 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
1	1	Silt, tan and gray, finely sandy.
		Catahoula formation
9	10	Sand, light-gray to white, occasional yellow streaks, very fine- to fine-grained, kaolinitic interstitial material, clayey in part.
5	15	Sand, gray and yellow-tan with light-red stains, fine- to medium-grained.
1	16	Clay, gray-green to light-brown, silty.
6	22	Silt, gray, limonitic stains, rare mica, clayey.
2	24	Clay, gray-tan, slightly silty.

1	25	Sand, gray and yellow-tan with red mottles, fine-grained.
4	29	Sand, light-gray, fine-grained, slightly micaceous, kaolinitic interstitial material.
4	33	Sand, yellow to buff, fine-grained, streak tough plastic clay at 32 feet.
1	34	Sandstone, light-gray, very fine- to fine-grained, kaolinitic, very hard-unable to core and eject from core barrel.

AG-29

Location: In pasture on side of hill approximately 250 feet west of State Highway 469 in NW/4, NW/4, NE/4, Sec. 19, T. 3 N., R. 2 E.

Elevation: 328 feet (hand level) Date: July 2, 1969

Purpose: Cored to 44 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
4	4	Soil, sandy, silty.
		Catahoula formation
6	10	Sand, gray to tan, fine-grained, gypsum crystals in partings, silty with streaks clay.
4	14	Sand, gray-brown with red streaks, very fine- to fine-grained, silty, clayey.
6	20	Silt, light-gray with limonitic partings, slightly sandy, clayey.
12	32	Silt, light-gray to blue-gray, rare pyrite, kaolinitic, clayey, sandy to very sandy in part.
6	38	Clay, dark-gray to greenish-gray, smooth, silty to very silty, sandy in part.
3	41	Clay, tan with brown streaks, silty.
1	42	Sand, brown and yellow, fine- to medium-grained, limonitic, with streaks clay.
2	44	Sand, buff to gray, medium-grained, heavy minerals.

AG-30

Location: In pasture approximately 75 feet south of Mississippi Highway 43 and approximately 50 feet east of drive to tenant house in NW corner NE/4, NW/4, SW/4, Sec. 9, T. 5 N., R. 5 E.

Elevation: 398 feet (from topographic map) Date: July 16, 1969

Purpose: Cored to 44 feet to obtain clay samples for testing. Descriptions from cores. No electrical log.

Thickness	Depth	Description
2	2	Soil, brown-red, silty, sandy, clayey.
		Yazoo formation
3	5	Clay, tan with gray mottles, plastic, calcareous, foraminifera.
7	12	Clay, tan to pale-green, calcareous, plastic, occasional sandy streaks, selenite crystals, fossil fragments.
15	27	Clay, tan to olive-tan, calcareous, gypsiferous to very gypsiferous streaks, fossiliferous.
17	44	Clay, dark-gray-green, plastic, fossiliferous, calcareous, rare pyrite, slightly silty.

AG-31

Location: In woods on west side of log road in SW/4, NE/4, SE/4, Sec. 24, T. 4 N., R. 5 E.

Elevation: 431 feet (from topographic map) Date: July 17, 1969

Purpose: Drilled for stratigraphic information. Lost circulation on hole. Abandoned hole at 53 feet after efforts to regain circulation failed. Descriptions from cuttings. No electrical log.

Thickness	Depth	Description
		Terrace deposit
10	10	Sand, red, fine-grained to coarse-grained.
37	47	Sand, yellow-tan, medium- to coarse-grained, very rare chert.
		Vicksburg group (Byram marl)
5	52	Marl, gray-green, fossiliferous, slightly glauconitic, limy clay, sandy.
		Vicksburg group (Glendon limestone)
1	53	Limestone, light-gray, glauconitic, fossiliferous, slightly sandy, hard.

AG-32

Location: In woods on east side of log road near the center of SE/4, SE/4, Sec. 24, T. 4 N., R. 5 E.

Elevation: 450 feet (from topographic map) Date: July 24, 1969

Purpose: Drilled to 220 feet for stratigraphic information. Description from cuttings. Electrical log to 218 feet.

Thickness	Depth	Description
		Terrace deposit
30	30	Sand, red, fine- to medium-grained, silty, clayey in part.
35	65	Sand, red to brown, fine- to medium-grained, streaks pink, white and tan clay.
		Vicksburg group (Glendon limestone)
16	81	Limestone, marls, light-gray to gray-green, fossiliferous, glauconitic, slightly sandy, hard streaks.
		Vicksburg group (Mint Spring marl)
12	93	Marl, green, fossiliferous, glauconitic, sandy.
		Forest Hill formation
7	100	Clay, gray, slightly carbonaceous, mica.
18	118	Sand, gray, very fine-grained, finely micaceous, silty, slightly carbonaceous.
6	124	Clay, gray, carbonaceous, silty.
26	150	Sand, gray, very fine- to fine-grained, finely micaceous, rare pyrite, carbonaceous, lignitic, clayey in part.
4	154	Clay, gray, finely micaceous, silty.
15	169	Sand, gray, very fine-grained, carbonaceous, slightly micaceous, silty, argillaceous.
23	182	Clay, gray, slightly carbonaceous, rare mica, slightly silty.

4	186	Clay, dark-gray, carbonaceous, lignite, trace pyrite.
13	199	Sand, gray, very fine- to fine-grained, mica, slightly carbonaceous, argillaceous.
6	205	Clay, gray, rare mica, very silty, slightly carbonaceous.
3	208	Sand, gray, very fine-grained, micaceous, silty.
10	218	Clay, gray, finely micaceous, silty, slightly carbonaceous.

AG-33

Location: Behind barn lot on south side of log road in NW/4, SE/4, NW/4, NE/4, Sec. 36, T. 4 N., R. 5 E.

Elevation: 422 feet (from topographic map) Date: July 28, 1969

Purpose: Drilled to 270 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 260 feet.

Thickness	Depth	Description
		Terrace deposit
10	10	Sand, red, fine- to coarse-grained, silty, clayey.
20	30	Sand, tannish-gray to white, medium- to very coarse-grained, rare black chert.
10	40	Sand, red with white and red clay, medium- to very coarse-grained.
20	60	Sand, white, medium- to very coarse-grained.
2	62	Clay, white with red and pink streaks.
10	72	Sand, white to gray with red stains, medium- to very coarse-grained.
		Vicksburg group (Glendon limestone)
10	82	Marl, gray-green, glauconitic, clayey to sandy with thin beds of limestone, gray, glauconitic, slightly fossiliferous, fairly hard in thin ledges.
		Vicksburg group (Mint Spring marl)
13	95	Marl, gray-green, glauconitic, sandy, clayey, fossiliferous.
		Forest Hill formation
5	100	Clay, gray, silty, carbonaceous, finely micaceous.
18	118	Sand, gray, fine-grained, poor samples.
2	120	Clay, gray, carbonaceous.
34	154	Silt, gray to dark-gray, argillaceous, carbonaceous, streaks lignite, clayey.
7	161	Sand, gray, fine-grained, poor samples.
21	182	Clay, gray, slightly carbonaceous, silty.
8	190	Sand, gray, very fine-grained, lignitic, rare mica, silty.
18	208	Silt, gray, carbonaceous, sandy, finely micaceous.
		Yazoo formation
38	246	Clay, gray to pale-gray-green, silty, calcareous, bentonitic in part. Samples poor.
24	270	Clay, gray-green, calcareous, fossiliferous. Samples poor.

AG-34

Location: In pasture on north side of small pond and north and east of crossroads in SE/4, SE/4, NW/4, Sec. 5, T. 3 N., R. 4 E.

Elevation: 433 feet (from topographic map) Date: August 1, 1969

Purpose: Drilled to 510 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 509 feet.

Thickness	Depth	Description
		Terrace deposit
27	27	Sand, red to yellow, fine- to very coarse-grained, clayey, silty.
		Catahoula formation
4	31	Sand, buff to white, very fine-grained, silty, slightly micaceous.
18	49	Clay, gray, slightly silty to silty, sandy.
2	51	Sandstone, red to yellow, very fine- to fine-grained, ferruginous, hard.
8	59	Sand, light-tan, medium- to very coarse-grained, silty.
2	61	Clay, light-gray to gray, silty.
19	80	Sand, light-gray, very fine- to fine-grained, clayey in part.
18	98	Silt, light-gray, clayey, sandy in part.
9	107	Sand, light-gray, fine- to medium-grained, clayey, silty.
20	127	Silt, light-gray, clayey, sandy in part.
38	165	Sand, light-gray to white, very fine- to fine-grained, argillaceous, silty to very silty.
26	191	Silt, light-gray-green, clayey, slightly sandy.
27	218	Silt, light-gray-green, clayey, and sand, white, fine- to coarse-grained, clayey, silty.
8	226	Clay, light-gray, silty.
14	240	Sand, gray, very fine- to coarse-grained, rare mica, silty.
		Vicksburg group (Bucatunna clay)
42	282	Clay, gray to dark-gray, slightly silty, carbonaceous, fossiliferous in lower part.
3	285	Sand, gray, medium-grained.
9	294	Clay, dark-gray, silty to slightly sandy, carbonaceous.
6	300	Sand, gray-green, fine- to medium-grained, marly, glauconitic, fossiliferous, clayey in part.
8	308	Clay, dark-gray, carbonaceous, silty to slightly sandy.
		Vicksburg group (Byram marl)
12	320	Marl, gray-green, glauconitic, fossiliferous, sandy, clayey in part.
		Vicksburg group (Glendon limestone)
1	321	Limestone, gray, glauconitic, fossiliferous.
3	324	Marl, gray-green, slightly glauconitic, fossiliferous, sandy, clayey.
4	328	Limestone, gray, glauconitic, fossiliferous, marly, hard in part.
2	330	Marl, gray-green, glauconitic, fossiliferous.
15	345	Limestone, gray, glauconitic, fossiliferous, hard with alternating beds of marl, gray-green, glauconitic, fossiliferous, sandy.
		Vicksburg group (Mint Spring marl)
15	360	Marl, gray-green, glauconitic, fossiliferous, sandy to very sandy.
		Forest Hill formation
10	370	Clay, gray, silty, finely micaceous, carbonaceous.
6	376	Sand, gray, fine-grained, micaceous, carbonaceous.
3	379	Clay, gray, carbonaceous.
10	389	Sand, gray, micaceous, carbonaceous, very fine- to fine-grained, silty.
2	391	Clay, gray, carbonaceous.
30	421	Sand, gray, micaceous, carbonaceous, very fine- to fine- grained, silty with thin streaks lignite, clayey in part.
61	482	Silt, gray, clayey, finely carbonaceous, slightly micaceous, lignitic.

		Yazoo formation
28	510	Clay, gray-green, calcareous, very poor samples.

AG-35

Location: In pasture approximately 150 yards behind house and barn in NW/4, SE/4, SE/4, Sec. 36, T. 3 N., R. 3 E.

Elevation: 338 feet (from topographic map) Date: August 7, 1969

Purpose: Drilled to 440 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 438 feet.

Thickness	Depth	Description
3	3	Top soil, red to yellow, sandy.
		Catahoula formation
14	17	Clay, light-gray to white, silty.
23	40	Sand, gray-white, fine- to medium-grained, silty to very silty.
20	60	Clay, light-gray to gray-tan, silty to very silty, slightly sandy.
18	78	Sand, light-gray, fine-grained, silty, clayey, rare pyrite.
11	89	Clay, light-gray-tan, silty.
4	93	Sand, gray, fine- to medium-grained, kaolinitic interstitial material.
2	95	Clay, gray-tan, silty.
7	102	Sand, gray-tan, fine- to medium-grained, slightly micaceous, rare pyrite.
12	114	Sand, gray-tan, very fine- to medium-grained, clayey to silty.
10	124	Sand, gray-tan, fine-grained, argillaceous, clayey in part.
16	140	Sand, gray to dark-gray, fine- to medium-grained, with lignite, rare mica, clayey in part.
26	166	Clay, gray to tan, silty, finely carbonaceous in part.
12	178	Sand, gray, very fine-grained, silty, clayey in part.
15	193	Sand, gray, medium- to coarse-grained, argillaceous.
41	234	Clay, light-gray to white, silty to very silty, slightly sandy to sandy near base.
		Vicksburg group (Bucatunna clay)
44	278	Clay, gray to dark-gray, slightly carbonaceous in part, rare pyrite, slightly calcareous and fossiliferous near base.
		Vicksburg group (Byram marl)
8	286	Marl, gray-green, fossiliferous, glauconitic, calcareous, sandy.
		Vicksburg group (Glendon limestone)
4	290	Limestone, gray, slightly fossiliferous, hard.
2	292	Marl, gray, glauconitic, fossiliferous, clayey, slightly sandy.
3	295	Limestone, gray, slightly fossiliferous, hard.
3	298	Marl, gray, glauconitic, fossiliferous, clayey, slightly sandy.
5	303	Limestone, gray, fossiliferous, fairly hard to soft, marly.
		Vicksburg group (Mint Spring marl)
6	309	Marl, gray, glauconitic, fossiliferous, sandy.
		Forest Hill formation
3	312	Clay, gray, silty, finely carbonaceous.
16	328	Sand, gray, very fine-grained, lignitic, silty, clayey in part.

6	334	Clay, gray, finely micaceous, silty.
66	400	Sand, gray, very fine- to fine-grained, streaks lignite, streaks clay, micaceous, silty to very silty.
		Yazoo formation
10	410	Clay, gray to gray-green, calcareous, fossiliferous, silty in part.

AG-36

Location: In wooded area on top of hill in old log road near center S/2, SE/4, Sec. 36, T. 3 N., R. 1 E.

Elevation: 439 feet (Barometer) Date: August 15, 1969

Purpose: Drilled to 470 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 470 feet.

Thickness	Depth	Description
		Catahoula formation
22	22	Sand, white to tan, very fine- to fine-grained, kaolintic interstitial material, loosely cemented near surface.
16	38	Clay, gray-tan, silty.
4	42	Sand, gray, very fine-grained, limonitic staining in part, clayey.
10	52	Silt, gray-tan, clayey.
12	64	Sand, white, very fine- to fine-grained, argillaceous, silty, kaolinitic, rare mica.
16	80	Clay, gray-white, silty.
38	118	Clay, gray-tan, silty in part.
12	130	Sand, light-gray-tan, very fine-grained, kaolinitic interstitial material, argillaceous.
20	150	Clay, light-gray-tan, slightly silty in part.
28	178	Silt, gray-tan, clayey, with very fine-grained sand.
15	193	Clay, greenish-tan, silty.
10	203	Sand, light-gray, very fine-grained, argillaceous, silty.
25	228	Clay, light-green, silty carbonaceous in part, rare mica.
23	251	Silt, gray-green, slightly micaceous, sandy, clayey in part.
1	252	Sandstone, white, medium-grained, kaolinitic interstitial material, hard.
28	280	Sand, gray, medium- to very coarse-grained, some quartz and chert granules.
6	286	Clay, light-greenish-gray, silty, slightly sandy.
10	296	Sand, gray, medium- to coarse-grained, silty.
10	306	Clay, tan-green, slightly micaceous.
10	316	Sand, gray, fine- to medium-grained, silty, clayey in part.
3	319	Sandstone, gray, fine-grained, silty, hard.
41	360	Clay, green-tan, slightly silty to silty, finely micaceous in part.
20	380	Clay, gray, plastic to slightly silty.
8	388	Sand, gray, fine- to medium-grained, argillaceous.
23	411	Clay, pale-green to gray, plastic to silty in part.
		Vicksburg group (Bucatunna clay)
38	449	Clay, gray to dark-gray, finely carbonaceous, silty in part, rare pyrite, slightly glauconitic to glauconitic, rare fossils near base, slightly calcareous near base.
		Vicksburg group (Byram marl)
19	468	Marl, gray-green, glauconitic, fossiliferous, sandy in part, clayey.
		Vicksburg group (Glendon limestone)
2	470	Limestone, gray glauconitic, fossiliferous, very hard.

AG-37

Location: In edge of old field and directly across road from residence in SW/4, NW/4, NE/4, Sec. 28, T. 3 N., R. 1 E.

Elevation: 310 feet (from topographic map) Date: August 22, 1969

Purpose: Drilled to 490 feet for stratigraphic and hydrologic information. Descriptions from cuttings. Electrical log to 483 feet.

Thickness	Depth	Description
		Terrace deposit
12	12	Clay, brown to red, silty, sandy to very sandy.
32	44	Sand, white, stained yellow to red with iron, coarse- to very coarse-grained, some chert and quartz pea gravel.
		Catahoula formation
12	56	Sand, gray, mottled yellow-brown, very fine- to coarse-grained, very silty.
12	68	Silt, gray, sandy, argillaceous.
12	80	Silt, gray-green, slightly sandy, clayey.
12	92	Sand, gray, coarse-grained.
2	94	Clay, gray-green, silty.
10	104	Sand, gray, medium- to coarse-grained.
79	183	Silt, light-gray to gray-green, rare mica, carbonaceous in part, sandy, clayey.
15	198	Clay, light-gray to gray-green, smooth, silty.
14	212	Sand, light-gray, fine- to medium-grained, silty, argillaceous.
68	280	Sand, gray, medium- to coarse-grained.
		Vicksburg group (Bucatunna clay)
24	304	Clay, dark-gray, carbonaceous, plastic.
		Vicksburg group (Byram marl)
20	324	Marl, gray-green, glauconitic, fossiliferous, clayey, sandy.
		Vicksburg group (Glendon limestone)
4	328	Limestone, gray, glauconitic, fossiliferous, very hard.
1	329	Marl, gray-green, glauconitic, fossiliferous, limy.
3	332	Limestone, gray, glauconitic, fossiliferous, marly in part, moderately hard.
4	336	Marl, gray-green, glauconitic, fossiliferous, clayey to very clayey.
2	338	Limestone, gray, glauconitic, fossiliferous.
2	340	Marl, gray-green, glauconitic, fossiliferous, clayey.
2	342	Limestone, gray, glauconitic, fossiliferous, hard.
		Vicksburg group (Mint Spring marl)
21	363	Sand, gray, medium- to coarse-grained, very glauconitic, fossiliferous.
		Forest Hill formation
14	377	Clay, gray-brown, micaceous, slightly silty.
28	405	Sand, gray, very fine- to medium-grained, micaceous, lignitic in part, clayey.
6	411	Clay, gray to gray-brown, carbonaceous, lignitic, silty.
21	432	Sand, gray, very fine- to medium-grained, silty in part.
		Yazoo formation
58	490	Clay, gray-green, slightly calcareous to calcareous.

AG-38

Location: Approximately 200 feet east of asphalt road in east edge of sand pit on Ware Hill near the center of the S/2 of Sec. 19, T. 6 N., R. 5 E.

Elevation: 498 feet (Barometer) Date: September 11, 1969

Purpose: Drilled to 633 feet for stratigraphic and hydrologic information. Descriptions from cuttings. Electrical log to 292 feet.

NOTE: Drill pipe twisted off at 633 feet. Fished out pipe and due to hole condition, this hole was abandoned.

Thickness	Depth	Description
		Terrace deposit
92	92	Sand, white, stained red, medium- to coarse-grained, occasionally white and pink clay, slightly micaceous.
		Yazoo formation
71	163	Clay, gray-green, calcareous, gypsiferous, fossiliferous, macro- and micro-fossils.
17	180	Clay, gray-green, calcareous, slightly silty, fossiliferous.
8	188	Clay, gray-green, calcareous, fossiliferous.
32	220	Clay, gray-green, calcareous, fossiliferous, slightly silty, rare pyrite.
12	232	Clay, gray-green, calcareous, slightly fossiliferous.
28	260	Clay, gray-green, calcareous, fossiliferous, slightly silty.
30	290	Clay, gray-green, calcareous, fossiliferous, limy in part.
20	310	Clay, gray-green, calcareous, slightly fossiliferous, rare mica.
10	320	Clay, gray-green, calcareous, fossiliferous.
15	335	Clay, gray-green, calcareous, fossiliferous, glauconitic.
45	380	Clay, gray-green, calcareous, fossiliferous.
10	390	Clay, gray, very limy, glauconitic, fossiliferous.
		Moodys Branch formation
25	415	Marl, gray-green, glauconitic, fossiliferous, sandy.
		Cockfield formation
3	418	Clay, brown, silty, slightly carbonaceous, finely micaceous.
82	500	Clay, gray, very silty, carbonaceous, slightly sandy in part.
30	530	Sand, gray, medium-grained, heavy minerals.
7	537	Clay, gray, silty.
13	550	Sand, gray, fine- to medium-grained, heavy minerals, slightly micaceous.
21	571	Clay, gray, silty.
9	580	Sand, gray, very fine- to fine-grained.
28	608	Clay, gray, argillaceous, silty to sandy, carbonaceous in part.
17	625	Sand, gray, fine- to medium-grained.
		Cook Mountain formation?
7	632	Clay, samples very poor.
1	633	Rock, drill stem twisted off at this point.

AG-39 and AG-39A

Location: Behind house and barn alongside log road in N/2, SE/4, NW/4, Sec. 17, T. 6 N., R. 5 E.

Elevation: 398 feet (Barometer) Date: September 23 & 25, 1969

Purpose: **AG-39 drilled to 1033 feet for stratigraphic and hydrologic information. Twin hole AG-39A cored to 34 feet to obtain samples of Yazoo clay for paleontological studies. Descriptions from cores 0-34 feet; from cuttings 34-1033 feet. Electrical log** to 1032 feet. Deep samples poor.

Thickness	Depth	Description
		Colluvium
10	10	Silt, yellow mottled, clayey, occasional coarse sand, occasional pebbles.
4	14	Silt, tan-yellow mottled, clayey.
		Yazoo formation
5	19	Clay, tan, greenish-tan mottled, manganiferous streaks, slightly gypsiferous, calcareous in part, bentonitic, plastic.
5	24	Clay, greenish-tan, manganiferous streaks, slightly gypsiferous, calcareous, plastic, limonitic streaks, occasional limonitic nodule.
6	30	Clay, greenish-tan, slightly silty, slightly manganiferous, slightly gypsiferous, calcareous, limonitic streaks, iron concretions.
4	34	Clay, gray, silty partings, fossiliferous, calcareous, plastic.
6	40	Clay, gray-green, calcareous, fossiliferous.
90	130	Clay, gray-green, calcareous, fossiliferous.
40	170	Clay, gray-green, calcareous, fossiliferous to very fossiliferous in part.
38	208	Clay, gray-green, calcareous, fossiliferous.
42	250	Clay, gray, calcareous, rare pyrite, slightly glauconitic, slightly silty.
22	272	Clay, gray-green, calcareous, fossiliferous.
13	285	Clay, gray, very limy, fossiliferous, glauconitic.
		Moodys Branch formation
24	309	Marl, gray-green, glauconitic, fossiliferous, calcareous, very sandy.
		Cockfield formation
3	312	Clay, brown, silty, carbonaceous.
40	352	Sand, gray, fine- to fine-grained, micaceous, argillaceous, silty in lower part.
34	386	Silt, gray, argillaceous, slightly sandy to sandy in part, carbonaceous in part.
39	425	Sand, gray, very fine-grained, clayey in part, very silty.
77	502	Silt, gray, slightly sandy in part, clayey to very clayey.
6	508	Sand, gray, very fine- to fine-grained.
19	527	Silt, gray, streaks clay.
48	575	Sand, gray, very fine- to medium-grained, micaceous, silty in part.
		Cook Mountain formation
13	588	Clay, gray-brown, carbonaceous, silty.
4	592	Sand, gray, very fine-grained.
60	652	Clay, gray-brown, micaceous, silty, carbonaceous in part, sandy in lower part.
12	664	Marl, light-gray, glauconitic, sandy, limestone in part, fossiliferous.
6	670	Clay, gray-brown, carbonaceous, slightly silty.
12	682	Clay, light-gray, sandy, calcareous.
7	689	Clay, gray-brown, carbonaceous.
4	693	Marl, light-gray, sandy, silty.
7	700	Clay, gray-brown, carbonaceous, finely micaceous, shaly.
6	706	Marl, light-gray, fossiliferous, glauconitic.
28	734	Clay, gray-brown, silty.

		Kosciusko formation
20	754	Sand, gray, very fine- to medium-grained, micaceous.
16	770	Clay, gray, silty.
18	788	Sand, gray, fine- to medium-grained, micaceous.
6	794	Clay, gray, silty.
8	802	Sand, gray, very fine-grained, silty.
8	810	Clay, gray, silty.
6	816	Sand, gray, very fine-grained, silty, argillaceous, lignitic.
6	822	Clay, gray, carbonaceous.
12	834	Sand, gray, very fine- to medium-grained, clayey in part.
26	860	Clay, gray, silty, lignitic in part.
17	877	Sand, gray, very fine- to fine-grained, clayey in part.
25	902	Sand, gray, medium-grained.
31	933	Sand, gray, fine- to medium-grained, heavy minerals, slightly micaceous.
51	984	Sand, gray, medium-grained, heavy minerals, rare mica.
6	990	Clay, gray, carbonaceous, silty, sandy.
43	1033	Sand, gray, medium- to coarse-grained, heavy minerals, rare mica.

AG-40

Location: Approximately 190 feet north of asphalt road in north edge of pine grove in NW/4, SE/4, SE/4, Sec. 7, T. 5 N., R. 5 E.

Elevation: 400 feet (from topographic map) Date: September 25, 1969

Purpose: Cored to 34 feet to obtain clay samples from Yazoo clay for paleontological studies. Descriptions from cores. No electrical log.

Thickness	Depth	Description
2	2	Soil, silty, clayey.
		Terrace deposit
6	8	Silt, tan to buff with red and light-gray streaks, occasional pebbles.
		Forest Hill formation
2	10	Silt, fine sand with silt, buff to light-gray with yellow-tan streaks, slightly micaceous.
		Yazoo formation
1	11	Clay, silty streaks, gray to tan with yellow-brown streaks, calcareous.
14	25	Clay, tan, greenish-tan, gypsiferous, slightly silty, fossiliferous, silty partings, calcareous.
2	27	Clay, tan, green-tan, gray-green streaks, gypsiferous, fossiliferous, calcareous.
1	28	Clay, gray-green, slightly fossiliferous, calcareous.
1	29	Clay, tan, fossiliferous, calcareous, pyritiferous.
5	34	Clay, green, gray-green, fossiliferous, calcareous.

AG-41

Location: On top of hill north of Illinois Central Railroad and south and west of asphalt road in NW/4, NW/4, SE/4, Sec. 8, T. 5 N., R. 4 E.

Elevation: 470 feet (Barometer) Date: September 29, 1969

Purpose: Drilled to 220 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 220 feet.

Thickness	Depth	Description
		Terrace deposit
11	11	Sand, yellow to brown, fine- to coarse-grained, ferruginous nodules, some pink and white clay.
2	13	Clay, red and gray, silty.
		Forest Hill formation
5	18	Sand, gray to buff with limonitic stains, very fine- to medium-grained.
4	22	Clay, gray, carbonaceous, micaceous.
12	34	Sand, buff to yellow-gray, very fine- to fine-grained, slightly micaceous, clayey to silty in part.
9	43	Clay, dark-gray, lignitic, silty.
22	65	Sand, gray, very fine- to fine-grained, argillaceous, lignitic, finely micaceous, silty.
3	68	Clay, gray, carbonaceous, silty.
12	80	Sand, gray, very fine- to fine-grained, lignitic, slightly micaceous.
12	92	Clay, gray, carbonaceous, silty in part.
6	98	Silt, gray, sandy, argillaceous, carbonaceous.
26	124	Clay, gray, carbonaceous, rare mica, lignitic in part, sandy in part, silty.
8	132	Sand, gray, very fine-grained, lignite streaks, rare mica.
11	143	Silt, gray, carbonaceous, clayey and fine-grained sand.
3	146	Sand, gray, very fine-grained.
6	152	Silt, gray, clayey, rare pyrite.
5	157	Sand, gray, very fine- to fine-grained, slightly micaceous.
1	158	Lignite.
2	160	Sand, gray, very fine- to fine-grained.
1	161	Lignite.
5	166	Sand, gray, very fine-grained, silty, micaceous.
1	167	Clay, gray, carbonaceous.
11	178	Sand, gray, very fine-grained, silty, micaceous, lignitic in part, clayey in part.
8	186	Sand, gray, very fine- to fine-grained, lignitic in part.
7	193	Clay, dark-gray, carbonaceous, silty.
11	204	Sand, gray, very fine- to fine-grained, lignitic.
2	206	Clay, dark-gray, carbonaceous.
6	212	Sand, gray, very fine- to fine-grained, micaceous, lignitic.
2	214	Clay, dark-gray, carbonaceous.
6	220	Sand, gray, fine-grained, lignitic.

AG-42

Location: On east side of State Highway 471 at intersection of road in SE/4, SE/4, SW/4, Sec. 5, T. 7 N., R. 4 E.

Elevation: 465 feet (Barometer) **Date:** October 10, 1969

Purpose: Drilled to 100 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 99 feet.

Thickness	Depth	Description
		Terrace deposit
5	5	Sand, stained yellow and red, fine- to very coarse-grained.
4	9	Clay, yellow to buff, silty, sandy.
9	18	Sand, yellow to red, very fine- to fine-grained, silty, clayey.

13	31	Sand, stained red, coarse- to very coarse-grained.
1	32	Clay, white and red, sandy.
29	61	Sand, stained red, fine- to very coarse-grained.
9	70	Sand, stained yellow, medium- to very coarse-grained, rare mica with some white clay.
12	82	Sand, stained yellow, fine- to coarse-grained, occasional white and red clays.
		Yazoo formation
18	100	Clay, gray-green, plastic, non-calcareous.

AG-43 and 43A

Location: In pasture approximately 150 feet east of juncture of north-south road and gravel road running east in NE/4, SW/4, NE/4, Sec. 5, T. 8 N., R. 5 E.

Elevation: 354 feet (from topographic map) Date: October 9, 1969

Purpose: Drilled to 860 feet for hydrologic and stratigraphic information. Twin hole AG-43A cored to 61 feet to obtain clay samples for testing. Descriptions from cores 0-61 feet; from cuttings 61-860 feet. Electrical log to 842 feet.

Thickness	Depth	Description
1	1	Soil, gray with tan streaks, silty.
		Yazoo formation
9	10	Clay and clayey silt, tan with gray streaks, manganiferous.
19	29	Clay, tan to gray-tan, manganiferous, gypsiferous, calcareous, limy in part, rare fossils to fossiliferous in bottom few feet.
23	52	Clay, gray-green, manganiferous, fossiliferous, limy.
6	58	Clay, gray-green, very fossiliferous, limy.
8	66	Clay, light-green, very limy, very fossiliferous, glauconitic, silty.
		Moodys Branch formation
10	76	Marl, gray-green, fossiliferous, glauconitic, sandy.
		Cockfield formation
2	78	Clay, gray, micaceous, silty.
24	102	Sand, gray, very fine-grained, carbonaceous, micaceous, silty, clayey in part.
3	105	Clay, gray, very silty, carbonaceous.
11	116	Sand, gray, very fine-grained, silty.
50	166	Sand, gray, very fine- to medium-grained, slightly micaceous.
27	193	Sand, gray, very fine-grained, silty with thin streaks lignite.
3	196	Clay, gray-brown, carbonaceous.
3	199	Silt, gray, micaceous.
15	214	Clay, gray-brown, lignitic.
7	221	Sand, gray, very fine-grained, silty.
10	231	Clay, gray, silty.
47	278	Sand, gray, very fine-grained, micaceous, silty.
4	282	Clay, gray, silty.
33	315	Sand, gray, very fine- to medium-grained, micaceous.
17	332	Clay, gray, carbonaceous, silty in part, lignitic, finely micaceous.
41	373	Sand, gray, very fine- to fine-grained, micaceous, lignitic in part.
3	376	Clay, gray, carbonaceous.
29	405	Sand, gray, very fine-grained, micaceous, lignitic in part.

		Cook Mountain formation
67	472	Clay, gray-brown, finely carbonaceous in part, micaceous, slightly silty in part.
6	478	Marl, gray, glauconitic, sandy, fossiliferous.
6	484	Clay, gray-brown, micaceous.
16	500	Marl, light-gray, glauconitic, fossiliferous, limy, sandy in part.
3	503	Clay, gray-brown, carbonaceous.
		Kosciusko formation
10	513	Sand, gray, fine- to medium-grained.
4	517	Lignite.
42	559	Sand, gray, fine- to medium-grained, silty in part.
14	573	Clay, gray, micaceous, shaly, silty.
22	595	Sand, gray, fine- to medium-grained, silty in part, lignitic in part, slightly micaceous.
43	638	Clay, gray, silty to sandy and sand, fine-grained, lignitic.
15	653	Sand, gray, medium-grained, slightly micaceous, lignitic.
67	720	Sand, gray, medium- to coarse-grained, slightly micaceous.
42	762	Clay, gray, finely carbonaceous, shaly.
95	857	Sand, gray, medium- to coarse-grained, heavy minerals, rare pyrite.
		Zilpha formation?
3	860	Clay - poor samples, unable to determine formation for certain.

AG-44

Location: In old public road behind and north of Eureka Church and cemetery near northwest corner NE/4, NE/4, Sec. 28, T. 8 N., R. 5 E.

Elevation: 340 feet (Barometer) Date: November 3, 1969

Purpose: Drilled to 410 feet for stratigraphic and hydrologic information. Descriptions from cuttings. Electrical log to 410 feet.

Thickness	Depth	Description
4	4	Silt, tan, sandy, clayey (Road bed material and soil).
		Yazoo formation
6	10	Clay, yellow-tan, slightly calcareous, silty.
15	25	Clay, yellow-tan with gray-tan streaks, calcareous, slightly gypsiferous.
27	52	Clay, gray-tan to gray, very calcareous, slightly fossiliferous to fossiliferous, limy near base.
		Moodys Branch formation
14	66	Marl, gray, glauconitic, very fossiliferous, sandy, limy.
		Cockfield formation
2	68	Clay, gray-brown, finely carbonaceous, slightly micaceous.
6	74	Sand, gray, very fine-grained with thin streak lignite.
19	93	Silt, gray to gray-brown, finely micaceous, argillaceous, finely carbonaceous, slightly sandy in part, thin streaks lignite.
52	145	Sand, gray, medium-grained, slightly micaceous with thin streaks lignite, silty in part.
42	187	Silt, gray, carbonaceous, finely micaceous, slightly sandy to sandy in part with thin lignitic streaks, argillaceous.

21	208	Sand, gray, very fine-grained, silty to very silty, clayey in part.
19	227	Clay, gray-brown, finely carbonaceous, micaceous, silty and thin streaks sand, gray, very fine-grained.
13	240	Sand, very fine- to fine-grained, micaceous, silty in part, lignitic streak.
32	272	Silt, gray, clayey, and sand, very fine-grained, silty with thin streaks lignite.
35	307	Sand, gray, fine- to medium-grained, micaceous, heavy minerals.
3	310	Clay, gray, finely carbonaceous, slightly silty.
12	322	Sand, gray, fine- to medium-grained, with thin streak silty clay near base.
6	328	Clay, gray to gray-brown, carbonaceous.
32	360	Sand, gray, fine- to medium-grained, slightly micaceous, heavy minerals, thin streaks lignite near base, silty.
		Cook Mountain formation
38	398	Clay, dark-gray, micaceous, finely carbonaceous and thin hard siltstone ledges, white, rare glauconite, micaceous, gypsiferous, sandy, occasionally calcareous.
12	410	Clay, dark-gray and gray-brown, glauconitic to very glauconitic, finely micaceous, rare fossil fragment, calcareous, slightly sandy.

AG-45

Location: In cattle pen adjacent to and south of Allen Chapel Church in SE/4, SW/4, NE/4, Sec. 14, T. 8 N., R. 5 E., Scott County, Mississippi.

Elevation: 381 feet (Barometer) Date: November 6, 1969

Purpose: Drilled to 110 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 110 feet.

Thickness	Depth	Description
3	3	Top soil, silty, sandy.
		Yazoo formation
7	10	Clay, yellow-brown to buff, manganiferous, slightly calcareous, slightly silty.
20	30	Clay, buff with tan streaks, occasional fossil fragments, calcareous, rare glauconite.
28	58	Clay, gray, occasional fossil fragments, calcareous, occasional blebs dark-gray clay.
9	67	Clay, light-gray, limy, fossiliferous, rare glauconite to glauconitic.
		Moodys Branch formation
11	78	Sand, gray-green, fine- to medium-grained, very glauconitic, fossiliferous, calcareous.
		Cockfield formation
2	80	Silt, gray-brown, lignitic, clayey.
15	95	Sand, gray, very fine-grained, finely micaceous, lignitic, silty, clayey.
9	104	Sand, gray, very fine-grained, carbonaceous, silty.
6	110	Sand, gray, very fine-grained, clayey, carbonaceous, silty.

AG-46

Location: In pasture behind abandoned tenant house west of asphalt road in NE/4, SE/4, NE/4, Sec. 14, T. 8 N., R. 4 E.

Elevation: 345 feet (Barometer) Date: November 10, 1969

Purpose: Drilled to 460 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 460 feet.

Thickness	Depth	Description
2	2	Soil, sandy, silty, clayey.
		Yazoo formation
8	10	Clay, yellow-tan, manganiferous, slightly calcareous.
16	26	Clay, buff with gray-tan streaks, foraminifera, calcareous, manganiferous streaks.
4	30	Clay, gray-green, calcareous, slightly manganiferous and gypsiferous, fossiliferous.
42	72	Clay, gray-green, fossiliferous, calcareous, blebs dark-gray clay.
16	88	Clay, light-gray, fossiliferous, limy, rare glauconite.
		Moodys Branch formation
10	98	Sand, gray-green, medium-grained, fossiliferous, calcareous, very glauconitic.
		Cockfield formation
4	102	Clay, gray-brown, carbonaceous, silty.
42	144	Sand, gray, very fine-grained, silty, finely micaceous, and clay, gray-brown, carbonaceous, finely micaceous, silty, thin streak lignite at 131 feet.
6	150	Sand, gray, very fine-grained, silty.
10	160	Sand, gray, very fine-grained, micaceous, much lignite.
16	176	Sand, gray, very fine- to fine-grained, micaceous with streaks lignite.
12	188	Clay, gray, micaceous, finely carbonaceous, silty to sandy, streaks lignite.
23	211	Sand, gray, very fine-grained, silty, much lignite to streaks lignite.
10	221	Sand, gray, medium-grained, micaceous, silty in part.
30	251	Silt, gray, micaceous, carbonaceous, sandy in upper part.
10	261	Clay, gray, carbonaceous, very silty.
42	303	Sand, gray, very fine- to fine-grained, micaceous, silty, with streaks lignite in upper part.
20	323	Silt, gray, carbonaceous, clayey.
15	338	Sand, gray, very fine- to fine-grained, clayey streaks, silty, carbonaceous.
26	364	Sand, gray, fine- to medium-grained, silty streaks, rare glauconite.
26	390	Sand, gray, medium-grained, slightly micaceous to micaceous, streaks lignite.
		Cook Mountain formation
6	396	Clay, gray-brown, finely carbonaceous, silty.
4	400	Siltstone, white, micaceous, glauconite, gypsiferous, slightly calcareous in part.
13	413	Clay, gray, finely micaceous, carbonaceous, silty.
7	420	Sand, white, very fine-grained, micaceous, gypsiferous, finely carbonaceous in part.
12	432	Clay, gray-brown, finely carbonaceous, shaly, silty, micaceous.

10	442	Sand, white, very fine-grained, micaceous, gypsiferous, rare glauconite to glauconitic.
18	460	Clay, gray-brown, micaceous, finely carbonaceous, shaly.

AG-47

Location: In old gravel road approximately 125 feet north of cemetery east and adjacent to State Highway 471 in NW/4, SW/4, NW/4, Sec. 25, T. 7 N., R. 3 E.

Elevation: 448 feet (Barometer) **Date:** November 13, 1969

Purpose: Drilled to 170 feet for stratigraphic information. Descriptions from cuttings. Electrical log to 170 feet.

Thickness	Depth	Description
2	2	Red sand (road bed material).
		Terrace deposit
8	10	Sand, red to tan, medium- to coarse-grained.
4	14	Clay, white and pink, sandy in part.
46	60	Sand, red, medium-grained, thin streaks pink, yellow and white clay, rare mica.
62	122	Sand, reddish-tan, medium-grained, clay, pink and white, occasionally sandy.
23	145	Sand, reddish-tan to pink, fine- to medium-grained, and streaks pink and white clay, sandy in part.
12	157	Sand, reddish-tan, medium-grained, and clay, white and pink.
		Yazoo formation
13	170	Clay, gray-green, slightly calcareous, smooth, rare fossil fragment.

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RANKIN COUNTY CLAY TESTS

by

Thomas E. McCutcheon

INTRODUCTION

Fourteen core samples of clay from Rankin County were tested to determine their ceramic properties and other characteristics. The work was conducted in the laboratories of the Ceramic Engineering School at the Georgia Institute of Technology and under the surveillance of Dr. Lane Mitchell, Director. A five pound ground and screened sample was furnished the Survey to obtain chemical analyses and other tests. The chemical analyses were made by the Shilstone Testing Laboratories. The screen analyses were made by the writer and the description of the screen residue was made by Theo H. Dinkins, Jr. Test hole records showing the location from which samples were taken, the description of the various strata and stratigraphic position of samples tested and related data are given under the test hole records. This work was conducted by Wilbur T. Baughman.

The ceramic tests are given in the tables under the headings of PHYSICAL PROPERTIES IN THE UNBURNED STATE AND PYROPHYSICAL PROPERTIES.

Three types of clay are represented in the group tested. They are from three different formations; namely, the Bucatunna, the Catahoula and the Yazoo.

COMMENTS

Screen Analyses

Most of the residue caught on the coarse screens and the fine screens is quartz. The other minerals are in minute quantities and are of no importance except pyrite and calcium sulfate. The quartz retained, which is in variable quantities, is not of sufficient quantities to have any appreciable effect on the physical properties and the pyrophysical properties of the clays for the uses indicated.

Chemical Analyses

The clays of the Bucatunna and of the Catahoula formations are very much alike so far as the silica, alumina and iron contents are concerned. The principal variation between these three constituents is probably due to the variable quartz content. Calcium and magnesium oxides are slightly higher in the Bucatunna clays. The "loss on ignition" is higher in the Bucatunna clays and is probably due to the high carbonaceous content. This is indicated by the brown to black color of the clay.

The Yazoo clay is characterized by its high calcium content and its high "loss on ignition."

Physical Properties in the Unburned State

Water of plasticity is higher for the Bucatunna clays than the Catahoula clays. This is probably due to the finely divided carbon content. The linear drying shrinkage is also higher for the same reason. The strength of the clays, modulus of rupture, is very good for heavy clay products, although only the Catahoula clays are suited for this purpose. The working properties of all the clays, including the Yazoo, is very good but only that of the Catahoula is of importance when the clays are considered for their most advantageous uses.

Pyrophysical Properties

Bucatunna Clays. The Bucatunna clays were burned at cones 2, 3, 4 and 6, and no data was taken because the test pieces were bloated and a measure of their characteristics would not be of value when the clays are considered for ordinary uses. Exception is made for sample AG-16, 19'-32' where the linear shrinkage and modulus of rupture were obtained. This data is not considered reliable.

Catahoula Clays. These clays were burned at cones 2, 3, 4, 6 and 8, and with one exception showed a consistent range of characteristics throughout the burning cycle; the exception, the clay from test hole AG-29, 32'-37' bloated.

There is little alteration in the porosity, absorption and linear shrinkage of the clays from test holes AG-27 and AG-28 over their entire burning range. The strength of these clays is adequate for most heavy clay products. The small variations in porosity, absorption and linear shrinkage between 2124° F. and 2305° F. point to the manufacture of very high grade ware.

Yazoo Clays. Samples from test hole AG-43a were burned at several different temperatures. The clay burns to a steel-hard body and to a cream color at cones 2, 3 and 4.

The samples were cracked and blistered, and no reliable data could be obtained. Both samples from the test hole melted when burned to cone 6, 2232° F.

POSSIBILITIES FOR UTILIZATION

Bucatunna Clays. These clays are particularly suited for the manufacture of lightweight aggregate. The clays, with the exception of sample AG-16, 19'-32', were very uniform in their behavior. They showed no evidence of melting throughout a 100° F. temperature range. This is very important as it assures a material that will not stick to the inside of a rotary kiln. Such a characteristic is very desirable and a further investigation as to the quantity of clay available is recommended.

Catahoula Clays. For the manufacture of any clay product, a clay having uniform properties over a wide range of temperature is desirable. The Catahoula clays show approximately 1% variation in their burning behavior between cones 2 and 8, and between samples from separate test holes with the exception of sample AG-29, 32'-37' which showed a tendency to blister and bloat. The burned colors were red to brown.

Because of the desirable plastic, drying and burning properties of the clays they are suitable for the manufacture of high grade face brick and common brick, structural tile, fireproofing and other related products. They can also be made into garden pottery and flower pots. The clays are worthy of further investigation.

Yazoo Clays. Due to the undesirable burning behavior, these clays have limited possibilities. One of the best uses of these clays would be to act as a flux clay in the manufacture of light colored ware. Many of the light burning clays in Mississippi are too refractory and porous for the best grade of brick. The Yazoo clays in limited quantities could be added to a blend of the light burning clays in order to reduce porosity without increasing temperature. This also holds for the red burning clays such as the loess.

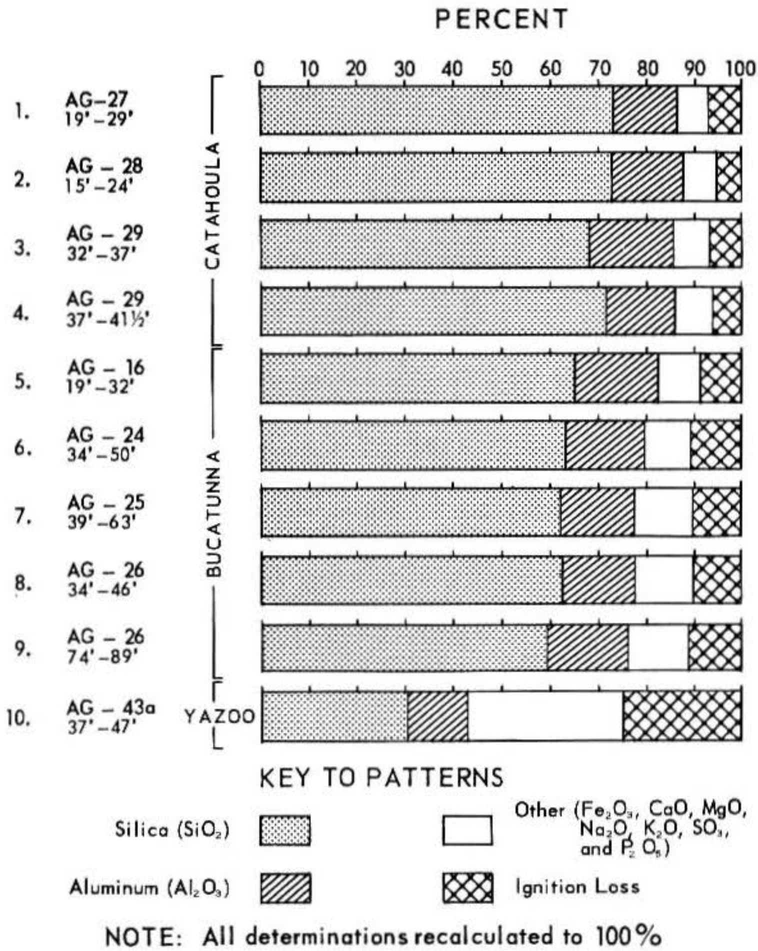


Figure 1.—Plotted chemical analyses (recalculated to 100%) of the 14 Rankin County clay samples tested. See data, Table 1.

TABLE 1

CHEMICAL ANALYSES OF CLAYS

RANKIN COUNTY, MISSISSIPPI

SHILSTONE TESTING LABORATORY, ANALYST

NO. 9412-CL, APRIL 7, 1970

Sample No.	Geologic Unit	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O	SO_3	P_2O_5	Ign.	Total
AG-16 (19-32)	Bucatunna	65.37	17.13	5.50	0.79	1.90	0.07	0.48	None	0.06	8.92	100.22
AG-24 (34-50)	Bucatunna	62.10	16.12	5.45	1.30	1.58	0.06	0.16	0.88	0.12	10.52	98.29
AG-25 (39-63)	Bucatunna	61.47	15.08	6.56	1.42	1.90	0.12	0.16	1.48	0.12	10.00	98.31
AG-26 (34-46)	Bucatunna	62.07	14.92	6.29	1.46	1.92	0.14	0.51	1.64	0.12	9.80	98.87
AG-26 (74-89)	Bucatunna	59.15	16.67	6.43	2.45	2.55	0.15	0.51	0.40	0.13	10.87	99.31
AG-27 (19-29)	Catahoula	71.69	13.17	4.68	0.67	0.84	0.09	0.14	0.09	0.06	6.68	98.11
AG-28 (15-24)	Catahoula	72.36	14.89	4.51	0.77	0.86	0.05	0.41	0.04	0.08	5.30	99.27
AG-29 (32-37)	Catahoula	67.19	17.23	4.14	0.87	1.53	0.13	0.50	0.17	0.07	6.69	98.52
AG-29 (37-41½)	Catahoula	70.82	14.27	4.60	0.96	1.25	0.27	0.56	0.26	0.08	5.73	98.80
AG-43A (37-47)	Yazoo	30.01	12.47	3.33	26.21	1.88	0.02	0.19	0.18	0.08	24.16	98.53

Table 2.

SCREEN ANALYSIS

TEST HOLE AG-16 . 19 TO 32 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	0.3	Limonitic clay (C) silty; limonite (C) kaolinitic material (C) quartz (C) clay (S) organic material (S) mica (T)
60	0.6	Limonitic clay (C) silty; limonite (C) quartz (C) clay (C) organic material (S)
100	2.6	Quartz (A) limonitic clay (C) silty; limonite (C) clay (S) manganiferous material (S) organic material (S)
250	4.8	Quartz (A) limonitic clay (C) silty; limonite (C) manganiferous material (S) mica (S) organic material (T)
PAN	91.7	Silt (A) clay (S)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-24 . 34 TO 50 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Quartz (A) gray clay (C) fossil fragment (T) pyrite (T) manganiferous material (T)
60	0.2	Quartz (A) gray clay (S) pyrite (S) kaolinitic material (S) limonitic silt (S) hematitic material (S) foraminifera (T) glauconite (T)
100	1.0	Quartz (A) foraminifera (S) pyrite (S) kaolinitic material (S) manganiferous material (S) glauconite (S) limonitic clay (T)
250	3.0	Quartz (A) gray clay (C) glauconite (S) manganiferous material (S) kaolinitic material (S) foraminifera (S) limonitic clay (T)
PAN	95.8	Gray clay (A) silty; selenite crystals (S)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-25 . 39 TO 49 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Quartz (A) organic material (C) gray clay (S)
60	0.1	Quartz (A) gray clay (S) glauconite (S) manganiferous material (S) limonite (T) limonitic clay (T) kaolinitic material (T) organic material (T) chert (T)
100	0.4	Quartz (A) gray clay (C) glauconite (S) limonitic clay (S) manganiferous material (S) limonite (S) pyrite (S) organic material (S) mica (T)
250	4.2	Gray clay (A) quartz (C) glauconite (S) pyrite (S) manganiferous material (S) limonite (S) limonitic clay (S) organic material (S)
PAN	95.3	Gray clay (A) silty; silt (S) selenite crystals (S)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-25 . 49 TO 63 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Quartz (A) clay (C) gray clay (T) organic material (T) pyrite (T)
60	Nil	Quartz (A) gray clay (C) manganiferous material (S) organic material (S) pale-gray clay (S) calcareous
100	0.2	Quartz (A) gray clay (C) pyrite (S) manganiferous material (S) limonitic clay (S) clay (S) glauconite (S) organic material (S)
250	3.0	Gray clay (A) quartz (S) manganiferous material (S) pyrite (S) glauconite (S) mica (S) organic material (T) pale-gray clay (T) calcareous
PAN	96.8	Gray clay (A) silty; silt (S) selenite crystals (S)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-26, 34 TO 46 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Gray clay (A) quartz (C) pyrite (C) manganiferous material (S) kaolinitic material (T) organic material (T)
60	0.1	Gray clay (A) quartz (C) pyrite (S) glauconite (S) manganiferous material (S) foraminifera (T) kaolinitic material (T) organic material (T) mica (T)
100	2.0	Gray clay (A) quartz (S) pyrite (S) glauconite (S) foraminifera (S) manganiferous material (S) kaolinitic material (S)
250	7.5	Gray clay (A) quartz (S) pyrite (S) glauconite (S) manganiferous material (S) mica (S) kaolinitic material (T) organic material (T)
PAN	90.4	Silt (C) gray clay (C) slightly silty; selenite crystals (S)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-26 . 74 TO 89 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Quartz (A) fossil fragments (C) gray clay (S) slightly calcareous; pyrite (S) organic material (T)
60	0.1	Gray clay (A) slightly calcareous; quartz (C) fossil fragments (C) pyrite (C) limonitic clay (S) silty; manganiferous material (T) organic material (T)
100	0.8	Gray clay (A) slightly calcareous; quartz (C) fossil fragments (C) pyrite (S) manganiferous material (S) limonitic clay (S) silty; organic material (T) mica (T)
250	2.5	Gray clay (A) slightly calcareous; quartz (C) fossil fragments (C) pyrite (S) mica (S) manganiferous material (S) organic material (S)
PAN	97.6	Gray clay (A) slightly calcareous; silt (S)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-27 . 19 TO 24 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	1.1	Quartz (A) chert (C) one piece containing oolites; silt (S) organic material (S) limonitic silt (S) pyrite (T)
60	0.1	Quartz (A) silt (C) limonitic in part; clay (C) limonitic in part; organic material (S) chert (S) pyrite (T)
100	0.2	Quartz (A) clay (C) limonitic clay (C) organic material (S) pyrite (S) chert (S) manganiferous material (T)
250	1.8	Quartz (A) clay (S) limonitic clay (S) mica (S) organic material (S) manganiferous material (T) chert (T) pyrite (T)
PAN	96.8	Silt (A) clay (S)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-27 . 24 TO 29 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	0.2	Quartz (A) clay (C) limonitic clay (C) silty; organic material (C) kaolinitic material (S) chert (T)
60	0.3	Quartz (C) clay (C) silty; limonitic clay (C) silty; organic material (S) kaolinitic material (S) chert (T) manganiferous material (T)
100	0.5	Clay (A) quartz (C) limonitic clay (C) silty; kaolinitic material (S) manganiferous material (T) organic material (T)
250	3.0	Clay (C) quartz (C) limonitic clay (C) mica (S) kaolinitic material (T)
PAN	96.0	Silt (A) clay (C) silty in part

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-28 . 15 TO 19 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Quartz (A) organic material (C) limonitic clay (C) clay (S) hematitic material (S) manganiferous material (T)
60	0.1	Quartz (A) limonitic clay (C) silty; kaolinitic material (C) hematitic material (C) clay (S) manganiferous material (S) organic material (S)
100	1.0	Quartz (A) limonitic clay (C) kaolinitic material (C) hematitic material (S) manganiferous material (S) organic material (S) foraminifera (S)
250	8.3	Quartz (A) limonitic clay (S) kaolinitic material (S) hematitic material (S) mica (S) organic material (S)
PAN	90.6	Silt (A) clay (C)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-28 . 19 TO 24 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Quartz (A) silt (C) organic material (C) limonitic silt (S)
60	Nil	Silt (A) quartz (C) limonitic silt (S) organic material (S) foraminifera and fossil fragments (T)
100	0.6	Quartz (A) silt (C) limonitic silt (C) organic material (S) manganiferous material (S) foraminifera (T) mica (T)
250	7.0	Quartz (A) limonitic clay (S) clay (S) manganiferous material (S) mica (S) organic material (S)
PAN	92.4	Silt (A) clay (S)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-29 . 37 TO 41.5 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	0.1	Limonitic clay (A) silty in part; quartz (C) pyrite (C) manganiferous material (S) clay (S) organic material (S) kaolinitic material (S) chert (T) foraminifera (T)
60	0.3	Quartz (A) limonitic clay (C) silty in part; pyrite (C) clay (C) kaolinitic material (S) chert (S) manganiferous material (S) foraminifera and fossil fragments (T) organic material (T)
100	0.3	Quartz (A) limonitic clay (C) silty in part; pyrite (C) clay (S) kaolinitic material (S) manganiferous material (S) foraminifera (T) organic material (T)
250	2.1	Quartz (A) clay (C) limonitic clay (S) pyrite (S) mica (S) organic material (T) foraminifera (T)
PAN	97.2	Silt (A) clay (C) silty

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-29 . 32 TO 37 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Quartz (C) clay (C) organic material (C) pyrite (C) fossil fragments (T)
60	Nil	Pyrite (A) quartz (C) clay (C)
100	Nil	Pyrite (A) clay (C) quartz (C) clay (S) gray; organic material (T)
250	0.5	Clay (A) quartz (C) pyrite (C) organic material (T) mica (T)
PAN	99.5	Clay (C) silt (C)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-43a . 37 TO 42 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	0.1	Foraminifera (A) quartz (C) organic material (C) lime nodules (S) pyrite (S) manganiferous material (T)
60	0.1	Foraminifera (A) quartz (S) lime nodules (S) organic material (T) manganiferous material (T)
100	0.9	Foraminifera (A) organic material (S) mica (T) quartz (T)
250	1.8	Foraminifera (A) mica (S) organic material (T)
PAN	97.3	Clay (A) calcareous; silt (C)

Table 2.—(Continued)

SCREEN ANALYSIS

TEST HOLE AG-43a, 42 TO 47 FEET

SIEVE SIZE (MESH)	PERCENT RETAINED	CHARACTER OF RESIDUE
35	Nil	Foraminifera (A) quartz (S) organic material (S) manganiferous material (T) pyrite (T)
60	0.1	Foraminifera (A) quartz (C) lime nodules (S) limonitic clay (T) silty; manganiferous material (T) organic material (T)
100	0.7	Foraminifera (A) quartz (S) manganiferous material (T) organic material (T) mica (T)
250	1.7	Foraminifera (A) quartz (S) mica (S) manganiferous material (S) organic material (T)
PAN	97.5	Silt (A) clay (C) calcareous

Table 3.

PHYSICAL PROPERTIES IN THE UNBURNED STATE

HOLE NO.	DEPTH	WATER OF PLASTICITY WET BASIS (PERCENT)	WATER OF PLASTICITY DRY BASIS (PERCENT)	LINEAR DRYING SHRINKAGE (PERCENT)	MODULUS OF RUPTURE lBS. SQ. IN.	PLASTICITY	EXTRUSION	WARPAGE	COLOR (DRY BAR)	REMARKS
					BUCATUNNA					
AG-16	19-32'	29.0	40.0	6.5	650	Good	Good	No	Dark Tan	
AG-24	34-50'	28.6	37.5	6.0	480	Good	Good	No	Black	
AG-25	39-49'	25.7	35.0	6.5	245	Good	Good	No	Black	
AG-25	49-63'	25.2	34.6	7.0	369	Good	Good	No	Black	
AG-26	34-46'	25.6	34.3	7.0	396	Good	Good	No	Black	
AG-26	74-89'	26.2	35.6	7.0	463	Good	Good	No	Black	
					CATAHOULA					
AG-27	19-24'	17.8	19.8	4.5	466	Good	Good	No	Grayish Tan	
AG-27	24-29'	17.65	24.6	4.5	495	Good	Good	Yes, and cracked	Grayish Tan	
AG-28	15-19'	19.6	22.0	5.5	410	Good	Good	No	Grayish Tan	
AG-28	19-24'	17.9	21.8	5.5	1020	Good	Good	No	Pinkish Tan	
AG-29	32-37'	24.2	31.5	7.0	320	Good	Good	No	Medium Gray	
AG-29	37-41½'	17.8	20.0	5.5	312	Good	Good	No	Grayish Tan	

Table 3.—(Continued)

PHYSICAL PROPERTIES IN THE UNBURNED STATE

HOLE NO.	DEPTH	WATER OF PLASTICITY WET BASIS (PERCENT)	WATER OF PLASTICITY DRY BASIS (PERCENT)	LINEAR DRYING SHRINKAGE (PERCENT)	MODULUS OF RUPTURE LBS. SQ. IN.	PLASTICITY	EXTRUSION	WARPAGE	COLOR (DRY BAR)	REMARKS
					YAZOO					
AG-43A	37-42'	24.6	28.6	7.5	306	Good	Good	No	Light Gray	
AG-43A	42-47'	22.3	29.7	7.5	248	Good	Good	No	Light Gray	

Table 4.

PYROPHYSICAL PROPERTIES

HOLE NO.	DEPTH	TEMPERATURE °F.	AT CONE	POROSITY (PERCENT)	ABSORPTION (PERCENT)	BULK SPECIFIC GRAVITY	APPARENT SPECIFIC GRAVITY	TOTAL LINEAR SHRINKAGE (PERCENT)	MODULUS OF RUPTURE IN 1B./SQ. IN.	COLOR	REMARKS
						BUCATUNNA					
AG-16	19-32'	2124	2	N. D.	N. D.	N. D.	N. D.	10.0	1300	Red	Bloated
AG-16	19-32'	2134	3	N. D.	N. D.	N. D.	N. D.	9.5	1710	Red	Bloated
AG-16	19-32'	2167	4	N. D.	N. D.	N. D.	N. D.	9.7	1010	Red	Cracked
AG-16	19-32'	2232	6	N. D.	N. D.	N. D.	N. D.	10.5	695	Brown	Slightly Bloated
AG-24	34-50'	2124	2	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-24	34-50'	2134	3	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-24	34-50'	2167	4	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-24	34-50'	2232	6	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Dark Red	Bloated
AG-25	39-49'	2124	2	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-25	39-49'	2134	3	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-25	39-49'	2167	4	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-25	39-49'	2232	6	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red Brown	Slightly Bloated

Abbreviation N. D., Not Determined

Table 4.—(Continued)

PYROPHYSICAL PROPERTIES

HOLE NO.	DEPTH	TEMPERATURE °F.	AT CONE	POROSITY (PERCENT)	ABSORPTION (PERCENT)	BULK SPECIFIC GRAVITY	APPARENT SPECIFIC GRAVITY	TOTAL LINEAR SHRINKAGE (PERCENT)	MODULUS OF RUPTURE IN 1B./SQ. IN.	COLOR	REMARKS
AG-25	49-63'	2124	2	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-25	49-63'	2134	3	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Blistered
AG-25	49-63'	2167	4	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-25	49-63'	2232	6	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red Brown	Bloated
AG-26	34-46'	2124	2	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-26	34-46'	2134	3	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-26	34-46'	2167	4	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Cracked
AG-26	34-46'	2232	6	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red Brown	Bloated
AG-26	74-89'	2124	2	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-26	74-89'	2134	3	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-26	74-89'	2167	4	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-26	74-89'	2232	6	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated

Abbreviation N. D., Not Determined

Table 4.—(Continued)

PYROPHYSICAL PROPERTIES

HOLE NO.	DEPTH	TEMPERATURE °F	AT CONE	POROSITY (PERCENT)	ABSORPTION (PERCENT)	BULK SPECIFIC GRAVITY	APPARENT SPECIFIC GRAVITY	TOTAL LINEAR SHRINKAGE (PERCENT)	MODULUS OF RUPTURE IN 1B./SQ. IN.	COLOR	REMARKS
						CATAHOULA					
AG-27	19-24'	2124	2	12.4	6.25	1.99	2.28	7.5	1300	Red	
AG-27	19-24'	2134	3	11.9	4.95	2.02	2.20	8.0	2650	Red	
AG-27	19-24'	2167	4	13.65	5.85	2.30	2.73	8.5	2480	Red	
AG-27	19-24'	2232	6	10.4	5.1	2.03	2.28	8.6	4200	Dark Red	
AG-27	19-24'	2305	8	9.85	4.66	2.06	2.28	8.5	1470	Brown	
AG-27	24-29'	2124	2	12.15	5.85	2.07	2.36	8.2	2700	Red	
AG-27	24-29'	2134	3	10.25	4.72	2.16	2.40	8.5	2260	Red	
AG-27	24-29'	2167	4	9.95	4.76	2.08	2.30	8.5	1085	Red	
AG-27	24-29'	2232	6	6.85	3.25	2.10	2.26	8.6	3400	Dark Red	
AG-27	24-29'	2305	8	8.5	3.52	2.29	2.5	9.5	890	Brown	
AG-28	15-19'	2124	2	12.4	6.25	1.99	2.28	8.5	1560	Red	
AG-28	15-19'	2134	3	13.2	6.57	2.01	2.30	8.5	1790	Red	
AG-28	15-19'	2167	4	12.7	6.05	2.10	2.40	8.5	1120	Red	
AG-28	15-19'	2232	6	14.6	6.95	2.10	2.48	9.3	1930	Red	
AG-28	15-19'	2305	8	13.1	6.42	2.02	2.34	9.2	2220	Dark Red	

Table 4.—(Continued)

PYROPHYSICAL PROPERTIES

HOLE NO.	DEPTH	TEMPER-ATURE °F.	AT CONE	POROSITY (PERCENT)	ABSORPTION (PERCENT)	BULK SPECIFIC GRAVITY	APPARENT SPECIFIC GRAVITY	TOTAL LINEAR SHRINKAGE (PERCENT)	MODULUS OF RUPTURE IN IB/SQ. IN.	COLOR	REMARKS
AG-28	19-24'	2124	2	15.2	7.36	2.10	2.46	8.5	3000	Light Red	
AG-28	19-24'	2134	3	14.6	7.1	2.06	2.40	8.5	2650	Light Red	
AG-28	19-24'	2167	4	15.0	7.15	2.09	2.46	8.5	1960	Red	
AG-28	19-24'	2232	6	16.3	7.9	2.07	2.47	9.3	3200	Red	
AG-28	19-24'	2305	8	15.1	7.2	2.09	2.45	9.5	3860	Brown	
AG-29	32-37'	2124	2	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Red	Bloated
AG-29	32-37'	2134	3	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Dark Red	Bloated
AG-29	32-37'	2167	4	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Dark Red	Bloated
AG-29	32-37'	2232	6	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Brown	Bloated
AG-29	37-41½'	2124	2	17.2	9.06	2.28	2.76	8.5	1250	Red	Cracked
AG-29	37-41½'	2134	3	17.5	8.64	2.40	2.49	9.5	1290	Light Red	
AG-29	37-41½'	2167	4	19.0	9.67	1.94	2.40	8.5	1250	Red	
AG-29	37-41½'	2232	6	18.2	9.7	2.00	2.30	9.0	600	Dark Red	Cracked
AG-29	37-41½'	2305	8	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Brown	Over-burned

Abbreviation N. D., Not Determined

Table 4.—(Continued)

PYROPHYSICAL PROPERTIES

HOLE NO.	DEPTH	TEMPERATURE °F.	AT CONE	POROSITY (PERCENT)	ABSORPTION (PERCENT)	BULK SPECIFIC GRAVITY	APPARENT SPECIFIC GRAVITY	TOTAL LINEAR SHRINKAGE (PERCENT)	MODULUS OF RUPTURE IN 1B /SQ. IN.	COLOR	REMARKS
						YAZOO					
AG-43A	37-42'	2124	2	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Cream	Blistered
AG-43A	37-42'	2134	3	N. D.	N. D.	N. D.	N. D.	11.0	2260	Cream	Blistered
AG-43A	37-42'	2167	4	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Light Green	Blistered
AG-43A	37-42'	2232	6	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Green	Melted
AG-43A	42-47'	2124	2	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Cream	Blistered
AG-43A	42-47'	2134	3	N. D.	N. D.	N. D.	N. D.	11.0	2240	Cream	Blistered
AG-43A	42-47'	2167	4	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Light Green	Blistered
AG-43A	42-47'	2232	6	N. D.	N. D.	N. D.	N. D.	N. D.	N. D.	Green	Melted

Abbreviation N. D., Not Determined

RANKIN COUNTY MINERAL INDUSTRIES

ALVIN R. BICKER, JR.

ABSTRACT

Early mineral resources for Rankin County were limited to production of structural materials for local use. Such materials as brick, lime, limestone, sandstone, sand and gravel were utilized in the building industry and road construction. Discovery of the Jackson Gas Field, located in Hinds and Rankin Counties, increased the value of the mineral resources and added materially to the economy of the area. Gas from the field supplied the City of Jackson and several surrounding towns for a number of years. In the early 1950's cement production became the leading mineral resource for the County.

In the past 10 years activity in the petroleum industry resulted in the discovery of oil and gas at the Puckett, Pelahatchie, Pisgah and Thomasville Fields. Continued success in the petroleum industry should increase the value of mineral production and enlarge the percentage which this industry contributes to the overall mineral production. In 1969 Rankin County ranked 14th among Mississippi counties reporting mineral production.

HISTORY OF MINERAL PRODUCTION

Information concerning the early mineral production of Rankin County is scarce. Reports show that among products produced through the years were clay, limestone, sandstone, sand and gravel, petroleum and natural gas.

The earliest mineral production was utilized for construction materials. Clay, lime, limestone and sandstone were produced for a number of years. Of these products limestone for cement manufacture is the only resource now being produced. Logan[1] reported that two brick plants had been operative prior to 1907. One plant was located southeast of the town of Brandon, the other was near the railroad station of Brandon. Clay used in the brick manufacture was local brown loam which was possibly weathered loess. It is possible that some weathered Vicksburg material was also utilized at the plant located near the railroad station. Indurated sandstone and limestone were used in construction of home foundations and chimneys, as was common local practice during earlier years.

Sand and gravel has been produced for local road construction and as a building material. Limited deposits and demand govern production. Exploitation has been by small local con-

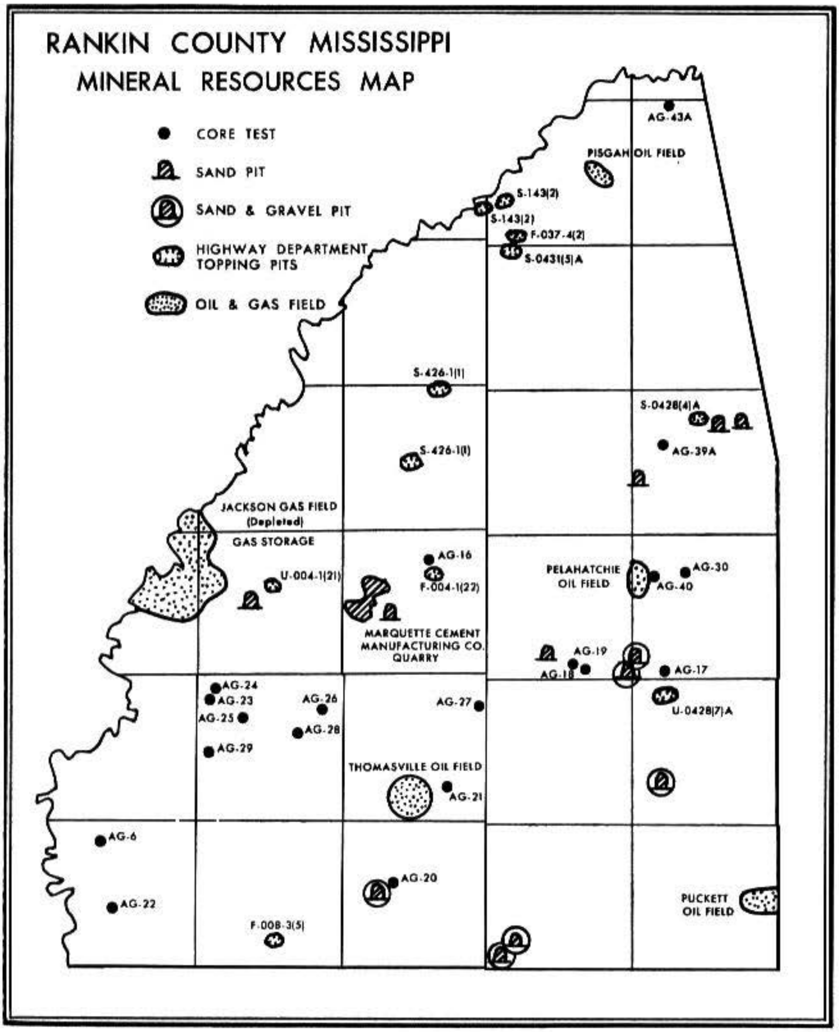


Figure 1.

tractors and county road maintenance personnel. During 1954 glass sand was quarried near Jackson by the Worley Brothers Sand and Gravel Co. Building and paving sand and gravel were also reported dredged from the Pearl River alluvial plain in 1955 and 1956.

Oil and gas contribute a large part to the value of mineral resoures of the County. However, the ratio of the value of oil and gas to other minerals is not as great as is common throughout most of the State. In Rankin County oil and gas contribute approximately 50 per cent of the total value of mineral production.

This figure will be revised upward with the completion of a sulfur extraction plant and further development in the oil industry. In 1969 the Mississippi Oil and Gas Board reported a total of 33 producing oil and gas wells in Rankin County. These wells were in the Pelahatchie, Pisgah and Puckett Fields. In 1970 plans were announced by the National Cryogenics Company to establish a liquid carbon dioxide plant in northern Rankin County, however, construction of the plant has not progressed beyond dedication ceremonies.

The Minerals Yearbook published by the Bureau of Mines includes data on the value and types of mineral production for many counties. In 1969 data released by the Bureau shows that Rankin County ranked 14 among Mississippi counties reporting mineral production. The value of mineral production for Rankin County has been compiled and listed separately since 1960. Previously, the total for the County had been included with other counties to avoid disclosure of individual company data. Value for the mineral resources as reported to the Bureau of Mines is shown in Table 1. The decrease in value in 1967 is partly due to the manner of reporting the mineral commodities.

Table 1.

RANKIN COUNTY MINERAL PRODUCTION

1960 - 1969

Year	Value	Mineral Commodity
1960	$4,373,163	Cement, stone, petroleum
1961	4,958,737	Cement, stone, petroleum, natural gas
1962	5,751,231	Cement, stone, petroleum, natural gas
1963	5,808,555	Cement, stone, petroleum, natural gas
1964	6,532,294	Cement, stone, petroleum, natural gas
1965	6,461,323	Cement, stone, petroleum, natural gas
1966	7,031,052	Cement, petroleum, natural gas, sand, gravel
1967	5,199,880	Cement, petroleum, natural gas, sand, gravel
1968	5,915,000	Petroleum, cement, natural gas, sand, gravel
1969	6,140,000	Petroleum, cement, natural gas, sand, gravel

Data from Minerals Yearbook, Bureau of Mines

LIMESTONE AND CEMENT

Limestone is one of the earliest reported mineral resources for Rankin County. In 1860 Hilgard[2] reported the presence and potential of limestone in the County. Reference was made to Yost's lime-kiln, which was located east of the railroad station at Brandon. Lime from the kiln was reported suitable for all purposes when properly burned. However, Hilgard's discussion mainly concerned the use of the lime as a mortar for building purposes.

Later reports lists limestone quarried in the County for construction and agricultural purposes. Several quarries operated intermittently through the period 1900 to 1950. One of these quarries was known as the Robinson quarry, located southeast of Brandon in Sec. 19, T. 5 N., R. 4 E. Limestone from the Robinson quarry was reported to have been crushed and used in the foundation of the new capitol building. This would indicate the quarry operated as early as 1901. Records do not show the length of time this quarry was operative. However, in 1920 Lowe[3] reported operations at this site had been discontinued. Lowe reported that 18 feet of section was exposed at the quarry site. The material mined was of Vicksburg age and consisted of beds of limestone two to three feet thick interbedded with thin layers of soft sand. Overburden consisted of four to six feet of clay soil. In a report published in 1906, Crider[4] reported 14.5 feet of section exposed at the quary. Crider described the section as follows:

Surface soil	1.0-2.0 feet
Limestone, weathered	1.00
Marl with lime nodules	1.00
Yellowish limestone	1.50
Marl	1.50
Yellowish rotten limestone	.75
Marl	1.50
Blue hard limestone, quarry rock	1.00
Gray to chocolate-colored marl	1.75
Blue limestone, quarry rock	1.50
Sandy gray marl	1.00
Blue limestone	1.00
Marl	1.00
Limestone bottom of quarry	

Chemical analyses of the limestone made by the state chemist and published in 1907 are shown in Table 2.

Table 2.

ANALYSES OF LIMESTONE

Robinson Quarry

Silica (SiO_2)	4.22	4.55	5.56	1.58
Alumina (Al_2O_3)	.75	.00	1.09	4.40
Iron oxide (Fe_2O_3)	4.37	4.25	4.01	3.31
Lime oxide (CaO)	49.62	49.92	48.44	48.40
Magnesium oxide (MgO)	.09	.09	.78	1.27
Volatile matter (CO_2)	40.05	39.61	38.12	39.70
Sulphur Trioxide (SO_3)	.36	.72	.24	.45
Moisture	.88	.95	1.61	.66

Monroe gave the thickness of the limestone and marl exposed at the quarry as approximately 22 feet. He identified the section as the Glendon member, reporting that the upper limestone bed exposed at the quarry to be the top of the Glendon. Other limestone beds exposed in the quarry are easily recognizable and are found at exposures throughout Hinds and Rankin Counties.

The Magnolia Lime Company operated an agricultural lime quarry north of Brandon during the early 1940's. Location of

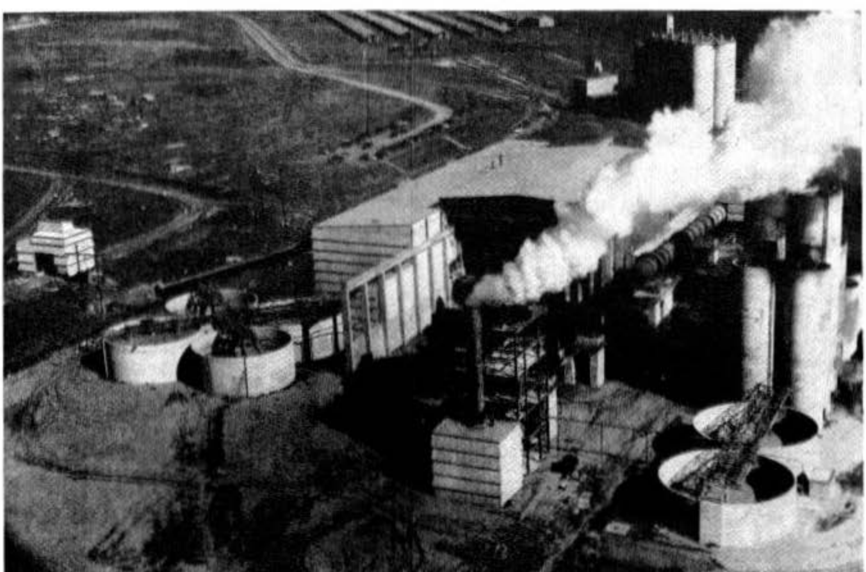


Figure 2.—Marquette Cement Manufacturing Company plant at Brandon, Rankin County. Photo by Bob Hand.

the quarry was reported as the southeast quarter of Section 35 and the southwest quarter of Section 36, T. 6 N., R. 4 E. Strata of the Vicksburg group are exposed at this location. The section consists of 12 feet of Mint Spring marl overlying strata of Forest Hill age. Above the Mint Spring are approximately 22 feet of interbedded limestone and marl, which are presumed to belong to the Glendon member. Thickness of the individual limestone and marl beds were not reported. However, limestone beds up to two feet thick are reported nearby.

The first portland cement produced in Mississippi was manufactured in Rankin County. Production of cement began in 1950 when the Marquette Cement Manufacturing Company commenced operation of their Brandon plant. The plant is located near the western corporate limits of Brandon in Section 17, Township 5 North, Range 3 East, with quarry sites in sections 17 and 19. This location is near the Illinois Central Railroad which provides rail transportation for the facility. Operations have been continuous since the plant was established. Rated capacity of the Brandon plant is reported to be 1,250,000 barrels of cement per year. Both portland and masonry cement is produced.

Basic raw materials used are clay, limestone and marl. At the quarry site the material is strip mined from strata of the Vicksburg group. Overburden is removed by bulldozer and consolidated material is loosened by blasting. Power shovels load the broken material into rear dump rock wagons for transport to the plant. At the plant the raw material is dumped into a roll crusher which breaks the large blocks of material to smaller size. From the primary crusher the feed is conveyed to a wash mill. Here the clay and marl is washed and converted to a slurry and the remaining rock particles are separated from the slurry. After the rock particles are pulverized in a secondary crusher they are recombined with the slurry. Feed is then conveyed to a ball mill where the mixture is finely pulverized and pumped to blending tanks. Final quality control before the mixture enters the kiln is made at this point.

The kiln is cylindrical in shape, 450 feet in length and 12 feet in diameter. It is inclined so that the upper end, or point of feed entry, is 19 feet higher than the point of exit. Approximately 220,000 cubic feet of natural gas per hour is used to fire the kiln. Temperatures in the kiln reach 2750° F. As the feed enters the upper end, the rotation of the kiln causes the feed to flow down the inclined structure. Chains in the upper end carry the feed up into the stream of hot gases. Moisture is removed from the feed in the upper end of the kiln and as the material flows through the kiln it becomes calcined until finally the lime, silica, alumina and iron are fused into a portland cement clinker. The cement clinker then moves to a storage area where it may be held until needed. The final step in the manufacture of cement is the grinding of the clinker in a ball mill.

Additives, such as gypsum to control setting time and limestone for producing masonry cement, move into the feed stream at this point. At the ball mill the clinker is finely ground to the final product. Finished cement is stored in silos to await bagging or loading in bulk transport.

OIL AND GAS INDUSTRY

Prior to the discovery of gas at the Jackson Gas Field, five unsuccessful tests had been drilled for oil and gas in Rankin County. The earliest recorded test was the Jacob Klumb, Finkbine Lumber Company, No. 1, drilled in 1925. Location of the test was in southern Rankin County in Section 7, Township 3 North, Range 4 East. In 1927 three other wildcat wells were drilled near the Klumb test. The latest of these five early tests was drilled in 1929. Location of the 1929 test was on the southern flank of the Jackson Dome, approximately six miles south of subsequent gas production in the Jackson Gas Field.

In February 1930, gas was discovered in adjacent Hinds County. Within five months gas production was established in Rankin County. Drilling of field wells progressed rapidly during the next two years and by 1933 most of the more desirable locations in the Rankin County part of the Jackson Gas Field had been drilled.

Exploration continued intermittently without success until 1961 when oil was discovered at the Puckett Field. This was followed by discovery of the Pelahatchie Field in 1962 and the Pisgah Field in 1964. Drilling of deeper tests in the Puckett and Pelahatchie Fields resulted in additional pool discoveries for these fields. Wells drilled to test the Jurassic formations led to the discovery of large gas reserves which contain high percentages of carbon dioxide in some reservoirs in northern Rankin County and hydrogen sulfide gas in the southern part of the County. The discovery well for the Thomasville Field was completed in 1969. Production from the field will be natural gas which contains a high percentage of hydrogen sulfide.

Potential gas reserves were indicated by the Shell Oil Company, Cox No. 1. Location of the Shell test well is in the Piney Woods School area of southern Rankin County, approximately 6 miles south of the Thomasville Field. Unfortunately, in March 1970, as drilling approached total depth the well blew out and ignited. The well burned uncontrolled for one month before bridging over and the flow of gas was temporarily cut off. In April 1971 the well was reported permanently sealed. A second well drilled to test the potential reservoir is nearing its objective depth.

Data published by the Mississippi Oil and Gas Board shows the total cumulative production for Rankin County through 1969 to be 3,538,856 barrels of oil and 3,787,808,000 cubic feet of gas. These figures do not include gas production from the Jackson Gas Field. However, production from several wells in Smith County is included with the data for the Puckett Field.

Table 3.

CUMULATIVE PRODUCTION

Rankin County

Field	Oil (bbls.)	Gas (Mcf.)
Pelahatchie	981,897	461,141
Pisgah	361,766	177,796
Puckett	2,195,193	3,148,193

JACKSON GAS FIELD

The Jackson Gas Field is located in Hinds and Rankin Counties and includes parts of Townships 5 and 6 North, Ranges 1 and 2 East. Discovery well for the field was the Jackson Oil and Gas Company No. 1 Mayes, completed in February 1930. Location of the discovery well was Section 2, Township 5 North, Range 1 East, Hinds County. First successful producer for the Rankin County part of the field was the Pearl River Oil and Gas, No. 1 Littlefield, completed in July 1930. Location of the Littlefield well was Section 12, Township 5 North, Range 1 East. During the productive life of the field a total of 78 producing wells were reported completed in Rankin County. Some wells produced for only one or two years before being depleted. From the discovery date, production increased rapidly until 1939 when 113 wells located in Hinds and Rankin Counties reported an annual production of 15.1 billion cubic feet of gas.

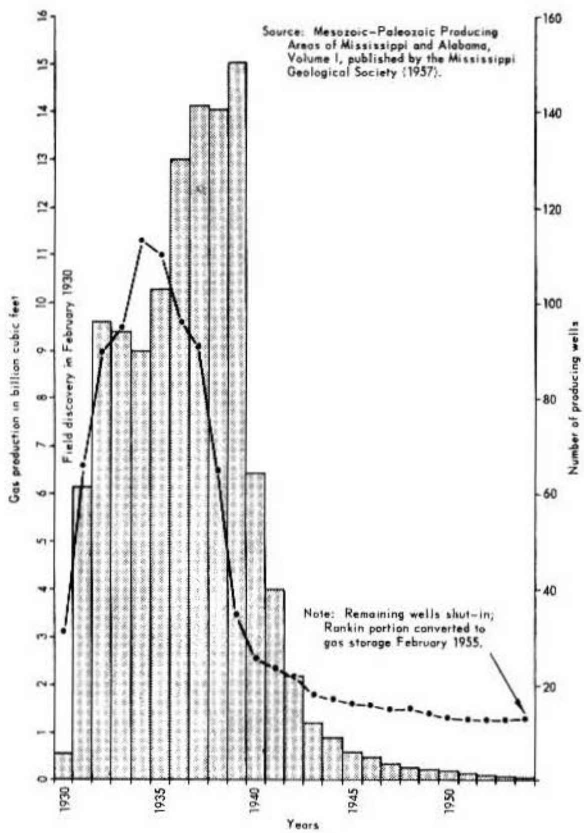


Figure 3.—Production of natural gas, Jackson Gas Field.

The Upper Cretaceous reservoir rock consists of porous, chalky, reef-type limestone which grades downward into soft crystalline limestone. Producing depths range from 2060 feet to 2330 feet below sea level. Structure of the field is an anticlinal dome overlying intrusive igneous material. At the top of the producing horizon the dome is very irregular, consisting of several individual high areas separated by small synclines.

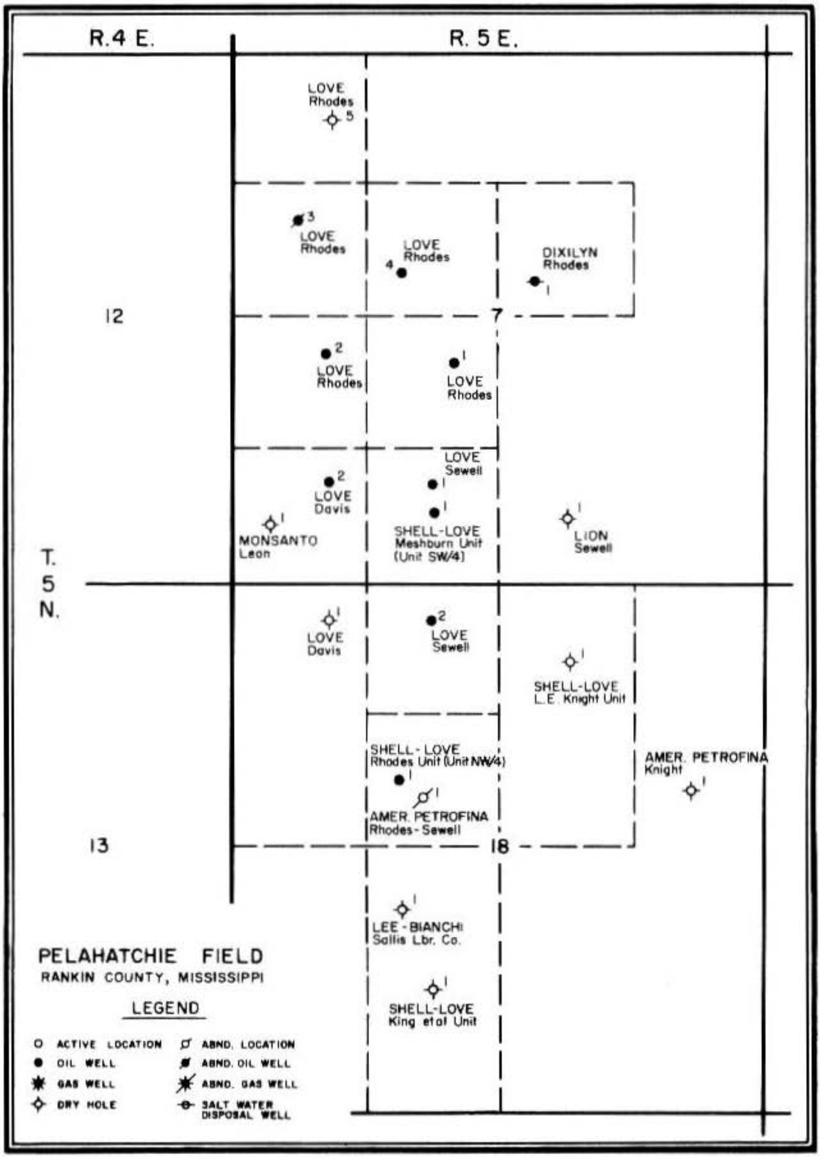
Figure 3 shows the annual production of gas from the field. Development activity increased from 1930 to 1934 when a maximum of 113 wells were producing. The number of producing wells declined rapidly as salt water intrusion began. Annual production increased steadily until 1939 when a reported maximum of 15,100,000,000 cubic feet of gas was produced from 35 wells.

Thereafter, production declined rapidly until 1955 when the remaining wells were shut-in and the Rankin County portion of the field was converted to an underground gas storage facility. United Gas Company operates the storage facility which has a reported capacity of 5,750 million cubic feet. At the time of conversion the Mississippi Oil and Gas Board reported the cumulative production of the Jackson Gas Field to be 117,514,251,000 cubic feet of gas. In 1969 a small gas well was completed in the Hinds County part of the field. As of December 1969 the cumulative production of this well was 23,346,000 cubic feet of gas. During 1965 in Rankin County, two gas wells were completed in a basal Wilcox sand. Cumulative production of the Wilcox pool in December 1969 was reported to be 24,495,000 cubic feet of gas. Shows of heavy asphaltic oil were reported in some of the wells drilled in the field. Although 4 wells located on the southern flank of the reservoir in Rankin County produced some oil, the production was not considered to be economical and was soon abandoned. Less than 20,000 barrels of low gravity crude oil was produced from all wells.

PELAHATCHIE FIELD

The Pelahatchie Field is located approximately three miles southwest of the town of Pelahatchie, Rankin County, Mississippi. Producing wells are in Sections 7 and 18, Township 5 North, Range 5 East. Initial discovery well for the field was the American Petrofina Company No. 1 Rhodes-Sowell, completed in December 1962. Production was established through perforations from 9828 to 9831 feet opposite sands in the Mooringsport formation of Lower Cretaceous age. Initial production of the discovery well was 229 barrels of 44° gravity oil per day.

Oil production was established for the Paluxy Oil Pool with the completion of the Love Petroleum Company and Carlton


R.4 E.
R. 5 E.
LOVE
Rhodes
5
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Rhodes
4
DIXILYN
Rhodes
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12
7
2
LOVE
Rhodes
1
LOVE
Rhodes
LOVE
Sewell
2
LOVE
Davis
1
1
1
MONSANTO
Leon
SHELL-LOVE
Meshburn Unit
(Unit SW/4)
1
LION
Sewell
T.
5
N.
1
LOVE
Davis
2
LOVE
Sewell
1
SHELL-LOVE
L.E. Knight Unit
SHELL - LOVE
Rhodes Unit (Unit NW/4)
1
1
AMER. PETROFINA
Rhodes-Sewell
AMER. PETROFINA
Knight
1
13
18
1
LEE-BIANCHI
Sallis Lbr. Co.
1
SHELL-LOVE
King et al Unit
PELAHATCHIE FIELD
RANKIN COUNTY, MISSISSIPPI
LEGEND
ACTIVE LOCATION
OIL WELL
GAS WELL
DRY HOLE
ABND. LOCATION
ABND. OIL WELL
ABND. GAS WELL
SALT WATER DISPOSAL WELL

Figure 4.

Billups No. 1 Rhodes et al in September 1963. Production was from perforations at 9185 to 9191 feet. The well pumped 120 barrels of 43.8° gravity oil per day. The Mooringsport Oil Pool was abandoned in July 1966 and the Paluxy Oil Pool was abandoned in September 1965. Other Lower Cretaceous oil pools were developed in the Rodessa, Hosston and Sligo formations. Information concerning the discovery wells for these pools is tabulated in Table 4.

Jurassic production was discovered with the completion of the Shell Oil Company - Love Petroleum Company No. 1 Rhodes, in August 1967. The well was completed for 448 barrels of 51° gravity oil per day through perforations 17,152 to 17,160 feet. Operator reports the producing interval as Norphelt formation and the Mississippi Oil and Gas Board lists the production as the Norhplet Oil Pool. There is disagreement among some geologists as to the stratigraphic age of the producing sands. Some believe the producing interval to be in the basal Smackover formation.

Lithology of the reservoir rocks is similar in all the Cretaceous pools. The rocks consist of gray, fine- to medium-grained, calcareous and lenticular sands. Average porosity of the Cretaceous sands is 18 per cent. The Jurassic reservoir consists of light to dark-gray, very fine- to fine-grained sands with thin layers of carbonaceous material. The sandstone contains approximately 20 per cent by weight of halite, which fills some pore spaces. Minor amounts of anhydrite is also found in the pore spaces. Average porosity of the Jurassic reservoir is reported as 11 per cent. The inter-granular halite causes some production problems as the salt is precipitated in the tubing and flowlines, requiring intermittent flushing with fresh water. The upper Smackover section contains carbon dioxide gas as is common in northern Rankin County.

Structure of the Pelahatchie Field is an elongated anticline. Major axis of the structure trends north-south. Cretaceous horizons show very little structural closure. However, the structure becomes more pronounced with depth and the Jurassic formations show considerable closure. Gravity and seismic surveys indicate the presence of a north-south trending salt ridge underlying the field.

Table 4.

PELAHATCHIE FIELD DISCOVERY WELLS

Well	Location	Date	Initial Production BOPD	Producing Depth (feet)	Oil Pool
American Petrofina No. 1 Rhodes	18-5N-5E	12-1-62	229	9,828-9,831	Mooringsport Oil Pool
Love Petroleum No. 1 Rhodes	7-5N-5E	9-30-63	120	9,185-9,191	Paluxy Oil Pool
Love Petroleum No. 2 Rhodes	7-5N-5E	12-17-63	201	10,256-10,306	Rodessa Oil Pool
Love Petroleum No. 4 Rhodes	7-5N-5E	5-15-64	115	11,244-11,258	Hosston Oil Pool
Love Petroleum No. 1 Sowell	7-5N-5E	9-4-64	216	10,776-10,790	Sligo Oil Pool
Shell-Love No. Rhodes et al	18-5N-5E	8-26-67	448	17,152-17,160	Norphlet Oil Pool

Table 5.

PRODUCTION STATISTICS FOR PELAHATCHIE FIELD
MOORINGSPORT OIL POOL

YEAR	PRODUCING WELLS	ANNUAL			CUMMULATIVE		
		Oil (Bbl.)	Water (Bbl.)	Gas (MCF)	Oil (Bbl.)	Water (Bbl.)	Gas (MCF)
1963	3	37,861	19,792	2,444	39,158	19,792	2,444
1964	1	6,662	22,150	0	45,820	43,942	2,444
1965	0	0	0	0	45,820	43,942	2,444
		PALUXY OIL POOL					
1964	1	9,112	2,298	0	9,112	2,298	0
1965	1	5,138	1,788	0	14,250	4,086	0
1966	0	0	0	0	14,250	4,086	0

Table 6.

PRODUCTION STATISTICS FOR PELAHATCHIE FIELD
RODESSA OIL POOL

YEAR	PRODUCING WELLS	ANNUAL			CUMMULATIVE		
		Oil (Bbl.)	Water (Bbl.)	Gas (MCF)	Oil (Bbl.)	Water (Bbl.)	Gas (MCF)
1964	3	90,388	1,397	0	90,388	1,397	0
1965	5	156,584	2,344	0	246,972	3,741	0
1966	4	67,714	27,817	0	314,686	31,558	0
1967	3	21,506	72,137	0	336,192	103,695	0
1968	2	6,842	58,998	0	343,034	162,393	0
1969	1	6,466	96,210	0	349,500	258,903	0

Table 7.

PRODUCTION STATISTICS FOR PELAHATCHIE FIELD
SLIGO OIL POOL

YEAR	PRODUCING WELLS	ANNUAL			CUMMULATIVE		
		Oil (Bbl.)	Water (Bbl.)	Gas (MCF)	Oil (Bbl.)	Water (Bbl.)	Gas (MCF)
1964	1	13,722	0	0	13,722	0	0
1965	1	37,598	71	0	51,320	71	0
1966	1	9,511	1,365	0	60,831	1,436	0
1967	2	2,292	4,460	0	63,123	5,896	0
1968	1	622	5,512	0	63,745	11,408	0
1969	0	0	0	0	63,745	11,408	0

Table 8.

PRODUCTION STATISTICS FOR PELAHATCHIE FIELD
HOSSTON OIL POOL

YEAR	PRODUCING WELLS	ANNUAL			CUMMULATIVE		
		Oil (Bbl.)	Water (Bbl.)	Gas (MCF)	Oil (Bbl.)	Water (Bbl.)	Gas (MCF)
1964	1	17,152	0	0	17,152	0	0
1965	1	21,129	115	0	38,281	115	0
1966	2	14,582	10,302	0	52,363	10,417	0
1967	2	11,825	21,265	0	64,188	31,282	0
1968	2	1,829	19,166	0	66,017	50,848	0
1969	1	72	1,200	0	66,089	52,048	0

Table 9.

PRODUCTION STATISTICS FOR PELAHATCHIE FIELD
NORPHLET OIL POOL

YEAR	PRODUCING WELLS	ANNUAL			CUMMULATIVE		
		Oil (Bbl.)	Water (Bbl.)	Gas (MCF)	Oil (Bbl.)	Water (Bbl.)	Gas (MCF)
1967	1	64,555	664	57,617	64,555	664	57,617
1968	2	288,495	62,367	325,674	353,050	63,031	383,291
1969	2	89,443	173,217	75,406	442,493	236,248	458,697

PISGAH FIELD

The Pisgah Field is located in northern Rankin County approximately 10 miles northwest of the town of Pelahatchie. Producing wells are in Sections 14 and 23, Township 7 North, Range 4 East. The field was discovered in October 1964 with the

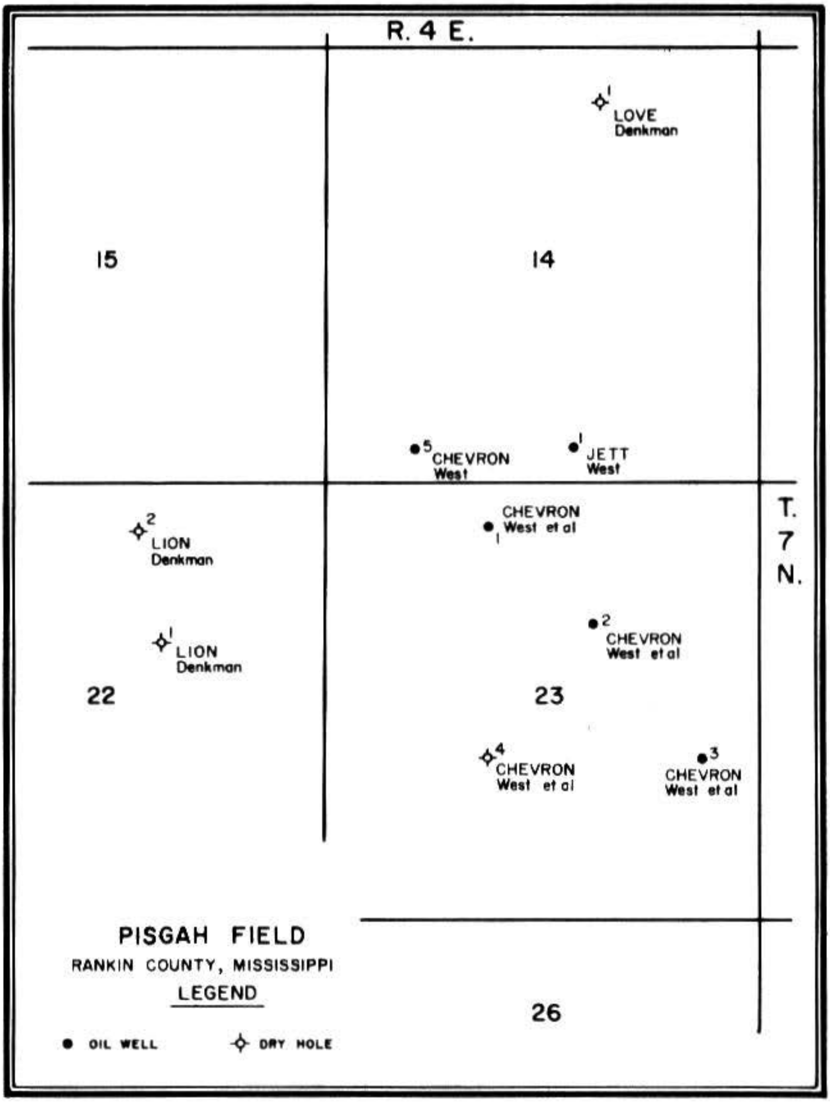

Figure 5.

completion of the George M. Jett Drilling Company No. 1 West et al. Production was established through perforations from 10,165 to 1,175 feet, opposite sands in the Hosston formation of lower Cretaceous age. Initial production was 125 barrels of 52° gravity oil per day.

Oil production was established for the Rodessa Oil Pool with the drilling of the Chevron Oil Company No. 2 W. M. West et al 2. The well was completed through perforations from 9361 to 9391 feet. During the potential test, the well flowed 144 barrels of 47° gravity oil per day.

Reservoir rocks of the Hosston and Rodessa Oil Pools are lithologically similar. Both reservoirs consists of fine- to medium-grained, lenticular sands with associated shales. Average porosíty of the Hosston reservoir is reported to be 15 per cent and the reported average porosity of the Rodessa producing interval is 19 per cent.

Structurally the field is a simple anticline, most probably related to salt uplift, similar to the structure of the Pelahatchie Field. Subsurface maps show a small amount of closure present in the lower Cretaceous formation. Sufficient subsurface data is not available to indicate the structural configuration of pre-Cretaceous formations. Within the productive limits of the field, the Hosston is the oldest stratigraphic unit that has been penetrated by test wells.

Table 10.

PISGAH FIELD DISCOVERY WELLS

Well	Location	Date	Initial Production BOPD	Producing Depth (feet)	Oil Pool
Jett No. 1 West et al	14-7N-4E	10-2-64	125	10,187-10,192	Hosston Oil Pool
Chevron No. 2 West et al 2	23-7N-4E	4-25-65	144	9,360-9,395	Rodessa Oil Pool

Table 11.

PRODUCTION STATISTICS FOR PISGAH FIELD
RODESSA OIL POOL

YEAR	PRODUCING WELLS	ANNUAL			CUMMULATIVE		
		Oil (Bbl.)	Water (Bbl.)	Gas (MCF)	Oil (Bbl.)	Water (Bbl.)	Gas (MCF)
1966	1	8,231	1,384	2,321	8,231	1,384	2,321
1967	1	5,815	12,466	2,098	14,046	13,850	4,419
1968	3	10,448	24,177	2,953	24,494	38,027	7,372
1969	2	24,873	48,350	8,477	49,367	86,377	15,849

Table 12.

PRODUCTION STATISTICS FOR PISGAH FIELD
HOSSTON OIL POOL

YEAR	PRODUCING WELLS	ANNUAL			CUMMULATIVE		
		Oil (Bbl.)	Water (Bbl.)	Gas (MCF)	Oil (Bbl.)	Water (Bbl.)	Gas (MCF)
1964	1	8,130	0	6,309	8,130	0	6,309
1965	4	68,425	14,878	33,906	76,555	14,878	40,215
1966	3	76,778	20,772	41,401	153,333	35,650	81,616
1967	3	72,591	27,306	35,560	225,924	62,956	117,176
1968	2	50,394	21,883	27,677	276,318	84,839	144,853
1969	2	36,081	22,489	17,094	312,399	107,328	161,947

Approximately three quarters of a mile west of the field Lion Oil Company drilled the No. 2 Denkman. This test reached a total depth of 16,276 feet and was abandoned in rocks of the Smackover formation. Drill stem tests of the Smackover formation in this well indicate the presence of large volumes of gas with high contrations of carbon dioxide.

PUCKETT FIELD

The Puckett Field is located in Rankin and Smith Counties approximately 20 miles southeast of the town of Brandon. Producing wells in the Rankin County part of the field are in Section 13, Township 3 North, Range 5 East. Annual bulletins published by the Mississippi Oil and Gas Board shows the discovery well for the Puckett Field to be the California Company (Chevron Oil Company) No. 1 Laughlin. The well was completed in September 1961 as a dual producer from the Upper and Lower Tuscaloosa formation. Initial production was 151 barrels of 35.4° gravity oil per day through perforations from 7684 to 7688 feet. The lower producing interval flowed 114 barrels of 32.4° gravity oil per day through perforations from 8052 to 8057 feet. Prior to the completion of the California Company discovery test well, the Carter Oil Company drilled the No. 1 Kennedy. The Carter test was temporarily abandoned at a total depth of 12,398 feet. Shows of oil and gas were noted at different intervals in the lower Cretaceous formations.

Since discovery of the field, additional pools have been discovered. The 1969 annual bulletin of the Oil and Gas Board lists 11 active pools producing oil and/or gas. A total of 18 pools have produced oil and/or gas during the life of the field. Some of these pools have been depleted and abandoned. The field produces from various horizons in the Mooringsport, Paluxy, Tuscaloosa and Washita-Fredericksburg formations of Cretaceous age. Discovery wells for each pool are shown in Table 13.

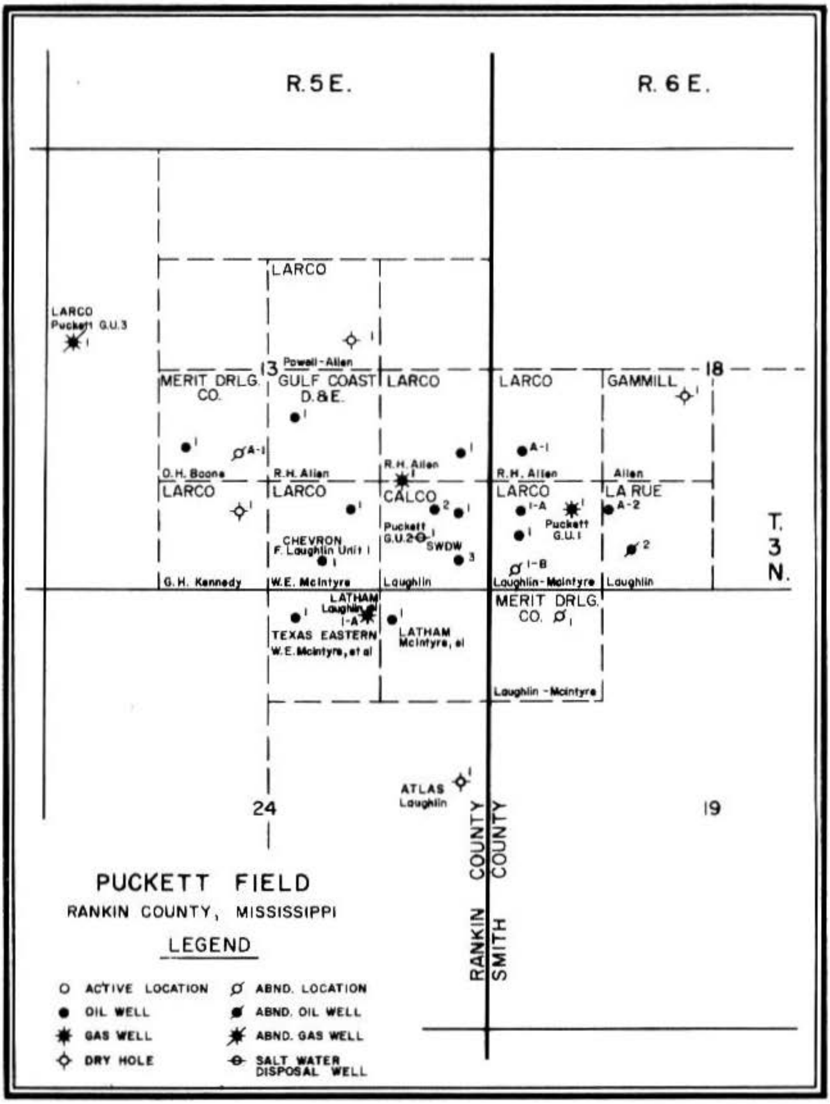

Figure 6.

Reservoirs of the various pools are lenticular sandstones. The sandstones are gray to white in color, fine- to medium-grained and grade vertically into silty, shaly sands and sandy shales.

Sands of the Upper Tuscaloosa pool are calcareous and contain chlorite and mica. Porosity and permeability of the various pools are generally good. Average porosity varies from 18 to 30 per cent.

Structure of the Puckett Field is an elongated east-west trending anticline related to salt uplift. The oldest stratigraphic horizon tested by drilling was of Jurassic age. The Texas Eastern Transmission Company No. 1 McIntyre et al reported encountering salt at a depth of 13,950 feet. Location of this test is Section 24, Township 3 North, Range 5 East. The well encountered abnormal stratigraphic sections in sediments of Jurassic age. The upper Jurassic sections were thin and the Smackover formation reportedly was absent. Structural closure at various Cretaceous horizons is very pronounced indicating a large amount of upwarping. Structural contour maps of Eocene formations also show closure (See Plate III, Baughman). The pronounced

Table 13.

PUCKETT FIELD DISCOVERY WELLS

Well	Location	Date	Initial Production BOPD	Producing Depth (Feet)	Oil Pool
Chevron Oil No. 1 Laughlin	13-3N-5E	9-7-61	151	7,684-7,688	7650' Oil Pool
		9-7-61	114	8,032-8,076	8050' Oil Pool
Chevron Oil No. 2 Laughlin	13-3N-5E	5-4-66	147	8,122-8,134	Washita-Fredericksburg Oil Pool
Chevron Oil No. 1 Laughlin Unit	13-3N-5E	4-6-67	285	10,511-10,533	Mooringsport Oil Pool
Larco No. 1 Puckett Gas Unit 2	13-3N-5E	9-11-68		8,620-8,632	8630' Washita-Fredericksburg Gas Pool
Larco No. 1 Laughlin-McIntyre	18-3N-6E	2-15-68	196	9,048-9,052	9050' Washita-Fredericksburg Oil Pool
Latham No. 1 Laughlin-McIntyre	24-3N-5E	11-29-68		10,160-10,186	10,160 Plauxy Gas Pool
		11-29-68		9,457-9,480	9,457 Plauxy Gas Pool
Latham No. A-1 Laughlin-McIntyre	24-3N-5E	3-16-69		10,128-10,150	10,130 Paluxy Gas Pool
Transcontinental No. A-1 Boone	13-3N-5E	11-7-69		8,818-8,845	8,820 Washita-Fredericksburg Oil Pool
		12-10-69	116	8,134-8,139	8,150 Washita-Fredericksburg Oil Pool

Table 14.

PRODUCTION STATISTICS FOR PUCKETT FIELD
7650' OIL POOL

YEAR	PRODUCING WELLS	ANNUAL Oil (Bbl.)	ANNUAL Water (Bbl.)	ANNUAL Gas (MCF)	CUMMULATIVE Oil (Bbl.)	CUMMULATIVE Water (Bbl.)	CUMMULATIVE Gas (MCF)
1960	1	13,417	507	0	13,417	507	0
1961	8	94,468	34,385	1,489	107,885	34,892	1,489
1962	3	59,687	48,920	138,877	94,454	53,286	139,756
1963	3	51,499	77,407	118,021	145,953	130,693	257,777
1964	3	41,585	178,896	82,865	187,538	309,589	340,642
1965	3	45,137	166,415	50,933	232,675	476,004	391,575
1966	2	47,361	100,610	7,764	280,036	576,614	399,339
1967	2	22,580	46,862	0	302,616	623,476	399,339
1968	1	0	0	0	302,616	623,476	399,339

1960-61 Figures show combined production of 7650' Oil Pool and 8050' Oil Pool

Table 15.

PRODUCTION STATISTICS FOR PUCKETT FIELD
8050' OIL POOL

YEAR	PRODUCING WELLS	ANNUAL Oil (Bbl.)	ANNUAL Water (Bbl.)	ANNUAL Gas (MCF)	CUMMULATIVE Oil (Bbl.)	CUMMULATIVE Water (Bbl.)	CUMMULATIVE Gas (MCF)
1960-61 Reported with 7650' Oil Pool Statistics							
1962	5	135,757	65,503	15,015	206,249	89,785	15,015
1963	6	133,966	116,611	30,159	340,215	206,396	45,174
1964	6	141,657	193,818	41,690	481,872	400,214	86,864
1965	6	136,208	186,941	37,995	618,080	587,155	124,859
1966	5	138,432	286,468	22,325	756,512	873,623	147,184
		LOWER TUSCALOOSA OIL POOL					
1967					84,155	334,192	3,940
1968	5	101,453	339,228	16,058	185,608	673,420	19,998
1969	5	91,074	212,339	17,504	276,682	885,759	37,502

Table 16.

PRODUCTION STATISTICS FOR PUCKETT FIELD
WASHITA-FREDERICKSBURG OIL POOL

YEAR	PRODUCING WELLS	ANNUAL Oil (Bbl.)	ANNUAL Water (Bbl.)	ANNUAL Gas (MCF)	CUMMULATIVE Oil (Bbl.)	CUMMULATIVE Water (Bbl.)	CUMMULATIVE Gas (MCF)
1966	2	45,496	18,952	7,433	45,496	18,952	7,433
1967	4	132,537	246,026	8,586	178,033	264,978	16,019
1968	3	85,912	297,870	22,476	263,945	562,848	38,495
1969	6	107,451	328,559	217,468	371,396	891,407	255,963
		8150' WASHITA-FREDERICKSBURG OIL POOL					
1969	1	4,234	0	0	4,234	0	0
		8820' WASHITA-FREDERICKSBURG OIL POOL					
1969		579	0	0	579	0	0

Table 17.

PRODUCTION STATISTICS FOR PUCKETT FIELD
MOORINGSPORT OIL POOL

YEAR	PRODUCING WELLS	ANNUAL Oil (Bbl.)	ANNUAL Water (Bbl.)	ANNUAL Gas (MCF)	CUMMULATIVE Oil (Bbl.)	CUMMULATIVE Water (Bbl.)	CUMMULATIVE Gas (MCF)
1966	1	6,935	156	3,676	6,935	156	3,676
1967	3	113,301	4,413	66,201	120,236	4,569	69,877
1968	4	126,225	36,898	81,716	246,461	41,467	151,593
1969	3	102,440	27,110	23,572	348,901	68,577	175,165

Table 18.

PRODUCTION STATISTICS FOR PUCKETT FIELD
8630' WASHITA-FREDERICKSBURG GAS POOL

YEAR	PRODUCING WELLS	ANNUAL Oil (Bbl.)	ANNUAL Water (Bbl.)	ANNUAL Gas (MCF)	CUMMULATIVE Oil (Bbl.)	CUMMULATIVE Water (Bbl.)	CUMMULATIVE Gas (MCF)
1968	2	8,021	261	280,856	8,021	261	280,856
1969	2	22,468	3,919	772,877	30,489	4,180	1,053,733
		8800' WASHITA-FREDERICKSBURG GAS POOL					
1967	2	5,518	14,211	240,187	5,518	14,211	240,187
1968		7,405	28,780	356,179	12,923	42,991	596,366
		8950' WASHITA-FREDERICKSBURG GAS POOL					
1967	2	2,249	276	137,942	2,249	276	137,942

Table 19.

PRODUCTION STATISTICS FOR PUCKETT FIELD
9050' OIL POOL

YEAR	PRODUCING WELLS	ANNUAL Oil (Bbl.)	ANNUAL Water (Bbl.)	ANNUAL Gas (MCF)	CUMMULATIVE Oil (Bbl.)	CUMMULATIVE Water (Bbl.)	CUMMULATIVE Gas (MCF)
1968	2	30,626	9,132	8,940	30,626	9,132	8,940
1969	1	53,258	46,594	28,719	83,884	55,930	82,648
			10,160' PALUXY GAS POOL				
1969		935	114	46,835	935	114	46,835
			10,130' PALUXY GAS POOL				
1969		593	80	4,909	593	80	4,909

Table 20.

PRODUCTION STATISTICS FOR PUCKETT FIELD
MERIT-KENNEDY GAS POOL

YEAR	PRODUCING WELLS	ANNUAL Oil (Bbl.)	ANNUAL Water (Bbl.)	ANNUAL Gas (MCF)	CUMMULATIVE Oil (Bbl.)	CUMMULATIVE Water (Bbl.)	CUMMULATIVE Gas (MCF)
1967	1	359	139	32,228	359	139	32,228
1968		74	31	1,573	433	170	33,801
			9400' PALUXY GAS POOL				
1968		2,110	1,985	132,543	2,110	1,985	132,243
			9550' PALUXY GAS POOL				
1968		188	20	21,156	188	20	21,156
			9457' PALUXY GAS POOL				
1969		469	55	24,085	469	55	24,085

salt uplift is not uncommon as shown by the stratigraphic sequence encountered at the Placid Oil Company No. 1 Murray. This test reported salt at 12,476 feet. The salt penetrated into lower Cretaceous Hosston formation. Location of the test is Section 12, Township 4 North, Range 5 East. Oil and gas maps published by the Oil and Gas Board refer to this salt intrusion as the Rufus Dome.

THOMASVILLE FIELD

The Thomasville Field is located approximately 7 miles south of Brandon, Mississippi, in Township 4 North, Range 3 East. Although the field has been assigned the name Thomasville, as of yet no well has been officially completed. Three wells have been drilled to the Smackover formation. Production casing was set in all wells and then the wells were temporarily abandoned. A fourth well is currently being drilled in the field. Reported objective depth of this well is 22,000 feet.

Drilling of the Shell Oil Company No. 1 Garrett uncovered a major Smackover gas accumulation in the area. The well, located in Section 28, was temporarily abandoned in June 1969. Reports indicate this well is capable of producing large volumes of gas which contains high concentrations of hydrogen sulfide. During testing the well also produced 1300 barrels of condensate per day. In the fall of 1970 after drilling and testing of three wells, Shell Oil Company announced plans to construct a sulfur extraction plant in the area.

The plant, reported to be the largest sulfur extraction unit in the United States, will process sour Smackover gas from the Thomasville Field and probably from the Piney Woods School area. Announced plans indicate the plant will have the capacity to produce 50,000,000 cubic feet of sweet gas and 1250 long tons of sulfur per day. Plant construction is underway with a schedule completion date in 1972.

SAND AND GRAVEL

For many years sand and gravel have been produced for use in local building construction and road maintenance. At the time of this investigation no processing plants were operating within the County and all material currently being mined is utilized in the unprocessed state. Many deposits of sand and gravel are small or inaccessible and possibly would not support permanent installations. Production has been temporary or intermittent, either to supply needs for road construction or local demands for building material.

The Bureau of Mines has reported sand and gravel production in the County for the period 1966 through 1969. Mining was by contractor and County road maintenance personnel. Production data for material is shown in Table 21. As can be seen from the figures production is small reflecting the size of operations. The data was secured by voluntary reporting and does not represent total production as some operations may not have been reported.

Table 21.

SAND AND GRAVEL PRODUCTION

1966 - 1969

	SAND		GRAVEL	
	Quantity	Value	Quantity	Value
Year	Tons	Dollars	Tons	Dollars
1966	6,000	6,000	6,000	6,000
1967	8,000	8,000	16,000	16,000
1968	3,000	2,000	5,000	5,000
1969	27,000	24,000	41,000	44,000

Although terrace sand deposits are widely distributed throughout Rankin County most of the ones being utilized are located in the southern half of the County. This is a result mostly of demand as centers of population are also located in this area. However, many terrace deposits do not contain gravel or contain sufficient gravel for effective use as road metal. Therefore most material used as a road metal is obtained from deposits found in the Citronelle formation. Outcrops of the Citronelle are limited to the southern part of Rankin County. A number of sand and gravel pits were observed by W. T. Baughman during the field investigation phase of this bulletin. Table 22 shows the location of the observed pits. General distribution of the pits are shown in Figure 1. A number of apparently abandoned pits have not been included in this summary, nor are these locations to infer that these are the only areas where sand and gravel may be located.

Table 22.

SAND AND GRAVEL PITS

Location	Material	Geologic formation
17-3N-3E	Sand and gravel	Citronelle
31-3N-4E	Sand and gravel	Citronelle
29-3N-4E	Sand and gravel	Citronelle
29-4N-5E	Sand and gravel	Citronelle
16-5N-2E	Sand	Terrace
20-5N-3E	Sand	Terrace
29-5N-4E	Sand	Terrace
36-5N-4E	Sand and gravel	Citronelle
31-5N-5E	Sand and gravel	Citronelle
10-5N-5E	Sand	Terrace
11-6N-5E	Sand	Terrace
19-6N-5E	Sand	Terrace

Data concerning Mississippi State Highway Department topping pits is shown in Tables 23 and 24. This data is included to give an indication of the size range of this material in Rankin County. The data represents only those pits which have been surveyed and analyzed and is not to be construed to be representative of all material within the County.

Table 23.

MISSISSIPPI STATE HIGHWAY DEPARTMENT
TOPPING PITS

Pit Number	Location Quar.	Sec.	T.	R.	Project Number	Owner	Area Acres	Quantity Cu. Yds.	Date Estimated	Thickness of Material	Thickness of overburden
5-211	E/2	25	8N	3E	S-143 (2)	Int. Paper Co.	5.22	44,000	4-26-54	7	0-3
5-199	NE/4	30	8N	4E	S-143 (2)	G. W. Schultz	4.00	30,000	12-5-50	9	0
5-290	NE/4	3	6N	3E	S-426-1 (1)	- - Alridge	4.07	102,000	3-23-53	19	0-4
5-278	NE/4	21	6N	3E	S-426-1 (1)	J. B. Collum	3.64	72,000	2-24-53	17	0-3
5-951	SE/4	10	5N	3E	F-004-1(22)	J. R. Wood	1.24	28,000	12-29-60	19	0-6
5-529	SW/4	27	3N	2E	F-008-3(5)	E. Morris	1.44	36,000	8-25-55	23	0-2
5-867	NW/4	15	5N	2E	U-004-1(21)	R. D. Morrow	2.26	71,000	1-11-60	24	0-6
5-965E	SW/4	5	4N	5E	U-0428(7)A	L. Huff	3.30	20,000	3-16-61	29	0-6
5-803	NE/4	9	6N	5E	S-0428(4)A	C. C. Coats	2.77	50,000	3-5-59	29	0-11
5-295	NW/4	5	7N	4E	S-0431(5)A	Barksdale Est.	1.04	21,000	3-3-58	13	0-5
5-707	SW/4	32	8N	4E	F-037-4(2)	Int. Paper Co.	2.28	30,000	2-7-58	35	0

Table 24.

MECHANICAL ANALYSES OF TOPPING PITS

Pit No.	Material	U. S. Standard Seive Sizes[1] No. 10	No. 40	No. 60	No. 200	No. 270	Silt (%)	Clay (%)	Liquid Limit	Plasticity Index
5-211	Sand-clay	100	67-90 79	16-67 42	4-7 6	3-6 5	2-5	0-1	14-22	11-17
5-199	Sand-clay	100	92-98 95	58-96 77		22-86 54	8-60	4-41	20-44	0-26
5-290	Sand-clay	100	91-100 91	34-97 66	14-75 44	22-72 46	6-44	6-28	18-27	11-14
5-278	Sand-clay	100	95-100 98	58-45 52		14-20 17	6-7	8-13	20-22	0-17
5-951	Sand-clay	100	90-95 93	31-51 41	15-20 18	13-20 17	5-10	8-9	15-29	0-15
5-529	Sand-clay	100	84-94 90	36-61 47	10-21 15	9-19 14	5-10	4-10	14-28	0-14
5-867	Sand-clay	100	99-100 100	83-90 86	11-28 18	11-28 18	3-14	6-14	17-26	0-7
5-965	Sand-clay	100	94-98 96	69-80 75	17-26 22	16-25 20	5-8	7-13	18-22	0-18
5-965E	Sand-clay	100	91-97 95	58-83 71	19-26 24	15-24 21	3-7	12-19	0-30	0-12
5-803	Sand-clay	100	84-100 94	37-82 55	11-21 14	11-18 14	4-9	6-12	17-32	0-21
5-295	Sand-clay	100	95-97 96	65-71 68	8-17 12	21-27 24	8-16	10-13	19-22	0
5-707	Sand-clay	100	80-92 87	46-59 53	6-27 11	6-26 11	3-12	3-14	17-23	0-8

[1] Percent passing; Upper numbers pit range, lower number pit average.
Analyses by Mississippi State Highway Department Laboratory.

All exploration and analyses for the listed pits were performed by the Highway Department and the data remains in the Highway Department files. Each prospect was explored by a number of test holes and samples from each test hole were analyzed. Data shown in the tables represents the average analysis of each pit. The pit average was derived by securing the average of each test hole and then calculating the average of all test holes. In determining the pit range and pit average each size classification was calculated individually.

ACKNOWLEDGEMENTS

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SUBSURFACE STRATIGRAPHY OF RANKIN COUNTY

Theo H. Dinkins, Jr.

ABSTRACT

The stratigraphic column applicable to the subsurface of Rankin County includes strata from the Norphlet formation of Jurassic age to the Moodys Branch formation of Jackson age.

The formations and their contacts are discussed in general terms. Formations discussed in this report, with the exception of the Clayton formation, are based on rock unit subdivisions and should be regarded as such.

With the deep Jurasic drilling program presently underway in the area, the outlook for new oil and gas discoveries in Rankin County and adjacent areas is good.

STRATIGRAPHY

General Statement

The stratigraphic column applicable to the Rankin County subsurface follows the terminology now in use in Mississippi. Because of the standard use of this terminology, no derivation of nomenclature of these units is given. This column, with the range of thickness of the units and their general lithologic description is shown by Plate 1, Dinkins.

With the exception of the Selma-Clayton contact, the correlations in this report are based on rock-stratigraphic units. The units are defined primarily on lithologic characteristics and supplemented with paleontological and electrical log data. Correlations are constituted so that their boundaries are as sharp and distinct as possible, being drawn on practical rock units which are distinguishable from adjacent formations by lithologic characteristics.

Contact relationships discussed in this report are based primarily on examination of samples. The writer's conclusions on the nature of these formational contacts is, of necessity, based on the gross character of sediments on either side of the contacts. Quality of the samples, lack of cored sections at the formation contacts and incomplete sampling techniques leaves much to be desired in any study of contact relationships. Until such time as the contact zones are cored, actual contact relationships will be subject to conjecture.

Norphlet Formation

The oldest strata penetrated in Rankin County, other than the Louann Salt, is the Norphlet formation of Jurassic age.

The Norphlet formation of this report is essentially a "red bed" sequence and is not the reported "Norphlet" reservoir in the Pelehatchie Field.

A series of 27 cores, beginning at 15,300 feet in Haynesville sediments and ending at 17,044 feet in Louann Salt, were cut in the Chevron Oil Company #1 J. O. Cox et al in Sec. 8, T. 7 N., R. 4 E. Unusual deviation problems were encountered during the coring program. However, this series of cores serves as an excellent record of Jurassic sedimentation in the northern part of Rankin County.

Only 12 feet of Norphlet strata was cored in the #1 Cox et al before penetrating the top of the underlying salt uplift. This thin sequence of Norphlet sediments is believed to be the result of piercement and/or structural effects related to salt uplift and deviation problems encountered while coring.

Norphlet strata in the #1 J. O. Cox et al is a sequence of red, light-red and pink very fine-to-fine and fine-grained slightly dolomitic sandstones and siltstones with scattered sub-rounded and rounded medium- and coarse-grained sand and small quartz pebbles. Finely disseminated anhydrite and patches of anhydritic cement are present throughout these sandstones and siltstones. Rare traces of gray and light-tan anhydritic siltstone were the only non-red sediment noted in the Norphlet sequence in this well. Some red and dark-red silty finely micaceous shales are usually present in Norphlet sequences. From its known lithology, the Norphlet formation of this report, will probably never be seriously considered as an exploration objective.

Presently available data is insufficient to indicate normal thicknesses of Norphlet strata within the County. Available deep Jurassic information is restricted generally to the northern half of the County. Several deep tests have been drilled in the southern half of the County. However, information on these tests has not been released at this time.

The contact between the Norphlet and the overlying Smackover clastics is believed to be transitional. Core evidence indicates that deposition was essentially contemporaneous. The coring program in the #1 J. O. Cox revealed a transition zone of approximately 9 feet between strata of definite Norphlet or Smackover lithology. This transition zone consists of a sequence of massive white sands with pink interstitial silt. Cores through this zone appear to consist of pink to red sands. However, microscopic examination of core samples reveals that the pink interstitial silt is responsible for the pink to red shades of core samples. Cuttings through this zone do not reveal the subtle transition.

Smackover Formation

General Statement

Throughout much of the central part of the State a simple practical two-fold division of the Smackover formation into Lower Smackover and Upper Smackover is generally utilized. The Lower Smackover throughout this part of the State is characterized by a brown and dark-brown dense commonly argillaceous limestone. However, appreciable amounts of sandstone may be present. Because of its distinctive lithology, the Lower Smackover is commonly referred to as the Brown Dense Limestone Unit.

Present control indicates that Rankin County was a depocenter during Smackover time, so that most of the Smackover sediments in Rankin County are clastic. The flood of clastics and fresh water entering the Rankin County area during Smackover deposition resulted in a predominately clastic Smackover sequence in which generally only subordinate amounts of carbonates are present. This abundance of clastic sediments prevents differentiation of the Smackover into Lower and Upper units in most of the wells examined for this report.

Lower Smackover

Early Smackover sediments in Rankin County were clastics. Deltaic-type deposition resulted in massive porous to non-porous very fine- to coarse-grained and conglomeritic sandstones. The winnowing action of waves and currents resulted in massive, generally "clean" sands. Individual sands tend to contain sub-rounded to rounded grains. The cementing material in these sands varies from calcite to dolomite and silica. Minor amounts of secondary anhydritic cementing material may be present, usually in the lower half of the section. Salt encrusted cores of these massive lower Smackover sands leave little doubt that halite, probably secondary in origin, is present in some of these sands. Petrographic analysis by J. A. Hartman[1], Shell Oil Company, New Orleans, Louisiana, on the deep reservoir in the Pelahatchie Field indicates that the producing sands contain about 20% halite, the halite filling the pore spaces shortly after deposition of the sands.

The deep reservoir in the Pelahatchie Field has been tentatively assigned a Norphlet age by operators. However, as indicated in the discussion of the Norphlet formation, the writer is of the opinion that these producing sands are Smackover deposits.

The flood of fresh water carrying river-derived clastics to the Rankin County area tended to prevent limestone deposition so that the brown and dark-brown dense argillaceous limestone characteristic of the lower Smackover throughout most of the central part of Mississippi is not always a reliable marker in Rankin County. Present available information indicates that the brown dense limestone characteristic of the lower Smackover is present in the Pelahatchie Field area.

There has been a tendency to place the first sequence of gray or dark-brown dense carbonates, encountered stratigraphically below the Haynesville formation, in the lower Smackover. This method of correlation has resulted in miscorrelations which have caused further confusion in the stratigraphic succession when sandstone bodies stratigraphically below any dark dense carbonates are classified as Norphlet. This type of correlation tends to greatly exaggerate the thickness of the Norphlet formation at the expense of the Smackover formation. The writer is of the opinion that in many cases these dark dense argillaceous carbonates should be classified as upper Smackover deposits.

Upper Smackover

The upper Smackover sediments within the County consist of a somewhat variable combination of carbonates and sands. In some wells, such as the Chevron Oil Company #1 J. O. Cox et al in Sec. 8, T. 7 N., R. 4 E., the upper Smackover consists of an upper carbonate sequence underlain by massive sands. In other wells, the upper Smackover consists of interbedded carbonates and sandstones as in the Tidewater Oil Company (formerly Love Petroleum and Carleton Billups et al) #1 C. M. Gooch, in Sec. 31, T. 6 N., R. 5 E.

Upper Smackover carbonates are light-gray to dark-gray dense, sparingly fossiliferous, occasionally oolitic, variably argillaceous limestones and light-gray to brown very fine- to finely crystalline and sucrosic variously argillaceous dolomitic carbonates. These carbonates are occasionally sandy, especially when interbedded with sands. Occasionally the dolomitic carbonates contain scattered crystals and small patches of crystalline anhydrite. Core chips and cuttings of these upper Smackover carbonates do not readily reveal their true texture. In thin section, many of these carbonates contain varying amounts of clastic grains. These generally dark variably argillaceous upper Smackover carbonates are believed to have been deposited during periods of delta shifting when the supply of fresh water and sediments were low. As the deltaic area continued to slowly subside, the sea transgressed the area resulting in the deposition of carbonates.

The sands vary from very fine- to coarse-grained and are sub-angular to sub-rounded, with most being in the fine-to medium-grained range.

The cementing agent in these sands varies from carbonate to silica. Minor amounts of patchy anhydritic cement may also be present. A few thin zones of conglomeritic sandstone are present in the upper Smackover.

The contact of the upper Smackover with the overlying Haynesville sediments is generally believed to be conformable. The contact of the basal anhydritic strata of the Haynesville is generally sharp. However, deposition through the contact zone was essentially contemporaneous.

Haynesville Formation

The Haynesville formation consists of a varying sequence of interbedded sandstones, shales, anhydrites, limestones and dolomitic carbonates with a persistent basal anhydritic zone. The top of the Haynesville formation is placed at the first occurrence of light-gray to pale-gray sandy oolitic and/or pseudo-oolitic limestones or anhydritic sediments stratigraphically below the top of the Pink Sandstone facies of the Cotton Valley group. Available data indicates that the Haynesville varies from 760 to 1200+ feet, thickening to the south and southwest.

The Haynesville is quite sandy in the Northern part of the County. Here the formation is a sequence of predominantly fine- to coarse-grained commonly conglomeritic sandstones, anhydrites and anhydritic strata with only minor amounts of shale. Carbonate deposition was suppressed in this part of the County during Haynesville deposition and only a few thin-bedded generally sandy carbonates were deposited. Downdip, to the south and southwest, an increasing percentage of shales and carbonates are present in the Haynesville. A corresponding decrease in anhydrite and anhydritic strata takes place downdip.

Haynesville shales are dark-red, maroon, gray, dark-gray and black. The dark-red and maroon shales are variably silty and finely micaceous and occasionally slightly sandy. The dark-gray and black shales tend to be finely micaceous occasionally flaky, splintery and slightly calcareous.

The sandstones are white, light-red and pink, very fine- to coarse-grained and sub-angular to sub-round and occasionally conglomeritic. Cementing agents in these sandstones vary from silica to calcite or dolomite and anhydrite or a combination of these agents. Rare thin lentils of oolitic (sand grain nuclei) sandstones were also noted in the Haynesville.

White, pink, light-gray and colorless finely crystalline to dense and translucent anhydrites and sandy anhydrites are common in wells located in the northern part of Rankin County. While the amount of anhydrite in the formation decreases downdip, the same colors and varieties of anhydrite are also generally present downdip.

Haynesville limestones are pale-gray, light-gray, gray and dark-gray to light-brown, dense to very finely crystalline generally oolitic and pseudo-oolitic and occasionally sandy. Nuclei of the oolites in these limestones are commonly sand grains. Dolomitic carbonates are light-tan, light-gray and gray and usually very finely sucrosic to very finely crystalline. Occasionally these dolomitic carbonates are sandy, some contain poorly preserved oolites and others contain inclusions of anhydrite crystals.

The contacts between the Haynesville and the overlying Cotton Valley group, as defined in this report, vary from unconformable to possibly transitional in down-dip areas. The diverse local depositional environments are reflected in both vertical and lateral variations in sedimentation.

Cotton Valley Group (Schuler Formation)

General Statement

In this report, the sequence of Jurassic sediments between the Haynesville and the overlying Hosston formation (Lower Cretaceous) are assigned to the Schuler formation. The Schuler consists of two members, a lower Shongaloo member and an upper Dorcheat member. These members are distinguishable by reasonably obvious gross lithologic characteristics. If any stratigraphic lithic equivalents of the Bossier formation of Louisiana are present in Rankin County, regional lateral variations and facies changes have effectively masked their identity.

Schuler Formation

Shongaloo Member

Overlying the Haynesville is a sequence of dark-red and maroon silty finely micaceous shales and white, red, light-red and pink fine-to coarse-grained sandstones and subrodinate to minor amounts of purple and dark-gray shales and light-gray and light-green mudstones. A greater percentage of red sandstone is present in the Shongaloo in the northern part of the County than downdip, to the south and southwest. Presently available information indicates that the Shongaloo varies from 1700 to 1900 feet in thickness, thickening in a general southwesterly direction.

The lower one-half to two-thirds of the Shongaloo in Rankin County is characterized by a rather distinctive pink sandstone facies referred to locally by the descriptive term "Pink Sandstone." This distinctive sequence is characterized by an abundance of pink, light-red and red fine- to coarse-grained commonly sub-rounded often conglomeritic sandstones, although varying amounts of white fine- to coarse-grained sandstones may also be present. In the more northern parts of the County this pink sandstone facies comprises approximately the lower two-thirds of the Shongaloo. Downdip, the pink sandstone facies comprises progressively less of the total Shongaloo sequence. Noticeable variations in the percentage of white sandstones to pink or red sandstones may occur downdip and along strike. Basinward thickening of the Shongaloo between the top of the Pink Sandstone and the base of the overlying Dorcheat is primarily due to the presence of younger beds in the top of the Shongaloo. Correlative zones of vari-colored novaculitic chert have been noted within the pink sandstone facies in the northern two-thirds of the County. "Coarser" commonly conglomeritic sandstones grade downdip into "finer" generally better sorted sandstones.

Rankin County continued to receive appreciable amounts of sand throughout Cotton Valley time and the division of the Cotton Valley group is not as clearly defined as in areas east of the County where predominantly finer interdeltaic clastics and variable amounts of carbonates are characteristic of the overlying Dorcheat member. Depending on the criteria used to differentiate Shongaloo and Dorcheat sediments, unit contacts may vary from unconformable to transitional in short distances.

The top of the Shongaloo member of the Schuler formation is placed at a point where a marked decrease of pale-green and light-gray mudstones, typical of the Dorcheat member, occurs. A subtle color change usually occurs. However, this change is not always distinct enough to be readily recognized.

Throughout most of the County, the Shongaloo-Dorcheat contact, as defined in this report, is believed to be more or less transitional. However, some contacts may be diastemic. Lithologic variations associated with the contact zone are believed to be due primarily to a fluctuating environment.

Dorcheat Member

The top of the Dorcheat (top of the Cotton Valley group) is placed at the first in cuttings of light-gray, pale-green and pale-greenish-gray mudstones and very fine-and fine-grained sandstones, commonly containing siderite and incipient siderite concretions, below the coarser massive conglomeritic sandstones of the Hosston formation.

The Dorcheat consists of a 900-1100 foot sequence of dark-red, maroon and purple often silty and finely micaceous shales, light-gray, pale-green, pale-greenish-gray and purple mudstones and very fine- to coarse-grained sandstones and siltstones. The Dorcheat thickens to the south and southwest. A few intervals of conglomeritic sandstone with associated quartz and chert pebbles are present in the Dorcheat, being more prominent in the northern part of the County. Relatively minor amounts of red very fine- and fine-grained sandstones are present in the Dorcheat, being generally restricted to the lower half of the member. The very fine-grained sandstones, siltstones and the light-gray, pale-green and pale greenish-gray mustones commonly contain siderite and/or incipient siderite concretions, especially in the upper part of the Dorcheat member. A few thin zones of lignite, lignitic strata or coal are occasionally noted.

The change from the coarser massive conglomeritic basal sandstones of the Hosston to the finer sandstones and siltstones of the Dorcheat is quite evident in the more northern parts of Rankin County. Here the Hosston generally overlies the Cotton Valley sediments with apparent unconformity. Downdip, in the southwestern part of the County the contrast between basal Hosston strata and the underlying Cotton Valley sediments is much less apparent. The lower Hosston strata in the Humble Oil and Refining Company No. 1 Ridgway Management, Inc. et al in Sec. 4, T. 4 N., R. 3 E. consists of maroon shales, very fine- and fine-grained sandstones and some light-gray and light-green mudstones. The upper strata of the underlying Cotton Valley group consists of maroon shales, very fine- and fine-grained sandstones and siltstones, some with incipient siderite concretions. Other than some increase in the amount of shales and mudstone and the inclusion of siderite and incipient siderite inclusions in the sandstone, siltstones and mudstones, no pronounced change in sedimentation appears to have taken place.

Hosston Formation

The Hosston formation, the oldest stratigraphic unit of the lower Cretaceous, consists of a shale and sandstone sequence with associated quartz and chert pebbles and chips and minor amounts of mudstone. The Hosston varies from 1150 feet in the Carter Oil Co. No. 1 Henry Kersh in Sec. 18, T. 8 N., R. 5 E. to 2500 feet in thickness in the Humble Oil and Refining Co. No. 1 Ridgway Management, Inc. et al in Sec. 4, T. 4 N., R. 3 E. Information is not available at this time on several other deep tests in the southern part of the County.

Hosston shales are predominantly dark-red and maroon variously silty finely micaceous and occasionally slightly sandy. Generally minor amounts of light-gray and gray to dark-gray shales, light-gray and light-green mudstones and lignite and lignitic strata are also present in the Hosston. Pale-gray, white, tan and red nodular limestones are also noted in the Hosston, being more common in wells in the northern part of the County.

The sandstones are red, white and pink and predominantly fine-to coarse-grained commonly massive and conglomeritic. Generally only minor amounts of very fine-grained sandstone are present in the Hosston. Sandstones in the northern part of the County are coarser and more conglomeritic than those downdip in the southern part of the County. Vari-colored quartz and chert pebbles and chips are more abundant throughout the Hosston in the northern part of the County, particularly the northeastern part.

In the northern part of the County the lower part of the Hosston generally contains more coarse conglomeritic sandstones and chert and quartz pebbles than the upper part of the formation. Downdip the Hosston still contains appreciable amounts of coarser sandstones and some quartz and chert pebbles. The precentage of finer-grained sandstones increases downdip. In the southern part of the County the upper two-thirds of the Hosston usually contains the coarser sandstones and pebbles with the lower third of the formation containing finer-grained sandstones.

The top of the Hosston is placed at the top of a sequence of medium- and coarse-grained conglomeritic sandstones generally with associated quartz and chert pebbles below the lowest sandstone and shale sequence of the overlying Sligo formation. Because the lithology of the Hosston and the overlying Sligo may be quite similar the criteria used to differentiate the Hosston and Sligo may vary. However, there is usually a general increase in grain size and abundance of sandstones in passing from strata of the basal Sligo into the sediments of the upper Hosston. Downdip the contrast is not nearly as apparent.

The Hosston-Sligo contact appears to be transitional. Essentially contemporaneous deposition through the transition zone is suggested and would seem to be indicated by similar lithology on either side of the Hosston-Sligo contact.

Sligo Formation

The thickness of the Sligo formation is much less variable than that of the underlying Hosston, varying from 340 feet in the more northern part of the County to 400 feet in the southern part of Rankin County.

The lithology of the Sligo is similar to that of the underlying Hosston formation. Sligo shales are predominantly dark-red and maroon and are usually finely micaceous. Subordinate amounts of pale-gray, light-gray, gray and light-green mudstones and minor amounts of purple shale are also present in the Sligo. Some gray and dark-gray shales were also noted in the Sligo in the southern half of the County. Vari-colored nodular limestones were noted in the Sligo, particularly in the northern part of the County.

Sligo sandstones are red and white very fine-to coarse-grained and are variably conglomeritic. The red sandstones are of a finer grain size than the white sandstones.

The Sligo contains more mudstones than the underlying Hosston and, in updip positions more varied colors of mudstones are present. Proportionately more fine- and medium-grained sandstones are present in the Sligo than in the upper part of the Hosston formation. Other than the two aforementioned exceptions, the lithology of the Sligo formation is quite similar to that of the upper part of the underlying Hosston formation. The Hosston-Sligo contact is regarded to be essentially transitional.

Pine Island Formation

Overlying the Sligo is a 340 to 380 foot sequence of dark-red, maroon and purple occasionally finely micaceous shales, light-gray, pale-gray and light-green to pale-green mudstones and very fine- to medium-grained sandstones. The mudstones, some of which contain small siderite concretions characterize the Pine Island formation in Rankin County, as well as through much of the central part of the State. The distinctive lithology of the Pine Island formation provides a reliable correlation point in wells penetrating the formation. The Pine Island is a primary marker in wells located beyond the updip limits of the anhydrites of the Ferry Lake formation.

The upper half of the Pine Island usually contains more shales and mudstones than the lower part of the formation. Variable amounts of very fine- and fine-grained sandstones are also generally present in the upper half of the formation. The lower half of the Pine Island is lithologically similar to the upper half. However, the sandstones are generally fine- and medium-grained. The Pine Island sandstones are predominantly white. However, subordinate amounts of red sandstone may be present in wells situated in the northeastern part of the County.

The contact of the Pine Island with the underlying Sligo formation, as well as the overlying Rodessa formation as defined in this report, is regarded as transitional.

Rodessa Formation

The Rodessa consists of a 260 to 450 foot sequence of dark-red and maroon to purple silty finely micaceous shales, varying amounts of light-gray and light-green mudstones, red and white very fine- to coarse-grained occasionally calcareous sandstones and some vari-colored quartz pebbles. Subordinate amounts of dark-gray shales and pale-gray and red nodular limestones are also present in the Rodessa. Red sandstones are subordinate to the white sandstones and tend to be of a finer grain size than the white sandstones. The Rodessa thickens to the south and southwest within the County.

Where the anhydrites of the Ferry Lake formation are present, the top of the Rodessa formation is placed at the base of the lowest anhydrite or anhydrite and limestone sequence of the Ferry Lake. With the depositional limit of the anhydrites of the Ferry Lake occuring in a west-northwesterly direction across the approximate southern third of the County, the criteria used to determine the top of the Rodessa formation in the northern two-thirds of the County cannot be based on the lowest anhydrite or limestone and anhydrite sequence of the Ferry Lake formation.

North of the updip limit of the Ferry Lake anhydrites, a few thin stringers of pale-gray to dark-gray fossiliferous and pseudo-oolitic limestones are the only recognizable remnants of the downdip anhydrite and limestone sequence of the Ferry Lake formation. These thin limestones extend for some distance updip, but are not present in the more northerly parts of the County. Dark-red, maroon, dark-gray and black shales, light-gray and light-green mudstones and very fine- and fine-grained sandstones and siltstones are commonly associated with these thin limestone stringers. Because of the rock unit classification used in this report, these thin limestone stringers and associated strata are included in the Mooringsport formation in updip areas.

Electrical log correlations of the top of the Rodessa in much of the County north of the updip limits of the Ferry Lake anhydrites are placed at the top of the first sandstone sequence below the lowest section of Mooringsport shales and mudstones. In most cases these sandstone sequences consist of very fine- and fine-grained sands and silts and are included in the Mooringsport formation in this report.

In this report the top of the Rodessa formation north of the updip limits of the Ferry Lake anhydrites is placed at the top of a sequence of fine- and medium-grained sandstones below the basal shales, mudstones and finer sandstones and siltstones of the Mooringsport formation. In the more northern parts of the County, the upper part of the Rodessa generally contains coarse-grained sandstones and associated quartz pebbles.

The contact of the Rodessa sandstones and shales with the anhydrites, limestones and shales of the overlying Ferry Lake formation is sharp, but believed to be essentially conformable. Updip from the depositional limits of the anhydrites of the Ferry Lake, no conspicuous evidence of unconformable conditions was noted between those sediments classified as Rodessa and Mooringsport. The absence of anhydrites and limestones in the northern part of the County is believed to be due primarily to depositional environment rather than erosion.

Ferry Lake Formation

The Ferry Lake formation consists of a sequence of pale-gray and white anhydrites with interbedded pale-gray to dark-gray fossiliferous and pseudo-oolitic or spherulitic limestones and associated dark-gray and black shales.

The anhydrites which characterize the Ferry Lake formation are present in cuttings only in the approximate southwestern third of the County. Within the depositional limits of the anhydrites, their distinctive character serves as a key marker in wells penetrating this horizon. The Ferry Lake formation as defined in this report varies from 0 to 250 feet in thickness, thickening to the southwest.

The top of the formation is placed at the contact of the anhydrites with the basal fossiliferous and pseudo-oolitic or spherulitic limestones and/or dark-red and maroon shales of the overlying Mooringsport formation. The contrasting lithologies result in a rather sharp contact. However, deposition is believed to have been contemporaneous throughout this time zone.

Because of the rock unit classification used to define the Ferry Lake formation, any contemporaneous sedimentation updip from the depositional limits of the Ferry Lake anhydrites is included in the Mooringsport formation.

Mooringsport Formation

The Mooringsport consists of a 300 to 450 foot sequence of shales, mudstones, sandstones and siltstones with a few thin basal stringers of fossiliferous and pseudo-oolitic or spherulitic limestones. Minor amounts of nodular limestone are present in the Mooringsport.

The top of the Mooringsport formation is picked on a marked increase of dark-red and maroon shales with associated gray, green or greenish-gray mudstones below the lowest sandstone sequence of the Paluxy formation. The Mooringsport-Paluxy contact is transitional.

Mooringsport shales are predominantly dark-red, maroon and purple and are generally finely micaceous. Minor amounts of dark-gray shale were noted in the wells examined. The most persistent occurence of these dark-gray shales is in association with the thin basal Mooringsport limestone stringers. Light-gray, green, light-green and light greenish-gray mudstones are commonly noted in the Mooringsport sequence.

The sandstones and siltstones are red and white generally slightly micaceous and calcareous. The sandstones are predominantly very fine- and fine-grained. Subordinate amounts of medium-grained sandstone are generally present, more being present in updip areas. Traces of lignite and lignitic sandstones were also noted in a number of wells.

As noted previously in the discussion of the Rodessa formation, thin stringers of fossiliferous and pseudo-oolitic or spherulitic limestone, included in the basal Mooringsport of this report, extend updip beyond the depositional limits of the Ferry Lake anhydrites for varying distances. Although not present in the more northern parts of the County, these thin limestones are excellent lithologic markers.

Red, white, pale-gray, light-tan and light-gray nodular limestones are present in varying amounts in the Mooringsport. These thin limestones are generally interbedded with shales and mudstones and commonly occur at a higher stratigraphic interval than the basal fossiliferous and pseudo-oolitic or spherulitic limestones of the Mooringsport. These nodular limestones are generally more prominent and therefore more diagnostic in areas where basal Mooringsport limestones are not developed.

Paluxy Formation

The Paluxy sediments consist of a sequence of alternating sandstones and shales with minor amounts of nodular limestone and mudstone.

The top of the Paluxy is placed at the top of a sequence of fine- to coarse-grained generally conglomeritic sandstones with associated quartz pebbles below the lowest shale or sandy shale sequence of the Washita-Fredericksburg sediments.

The contact of the Paluxy formation with sediments of the overlying Washita-Fredericksburg group is regarded as transitional. A general overall thickening of the Paluxy sediments takes place to the south and southwest, within the County. Local abnormal thickness variations, not related to faulting, are the products of local vertical and lateral variations. These local facies changes produce time-transgressive lithologic boundaries in which time-stratigraphic equivalents are placed in adjacent formations. The Paluxy sediments vary from 930 to approximately 1580 feet in thickness.

Paluxy shales are, for the most part, dark-red and maroon silty finely micaceous and sparingly sandy. Subordinate amounts of dark-gray and black finely micaceous shales and pale-gray, gray and green mudstones are also present in the Paluxy formation.

The sandstones are white, pink and red and vary from very-fine-to coarse-grained, but predominantly are fine-to medium-grained and commonly finely micaceous. Some of the sandstones are slightly calcareous. Occasionally pink and amber grains are noted in some of the white sandstones. Red and pink sandstones are present in varying amounts, generally throughout the formation. Basal Paluxy sandstones, in most of the wells examined, are very fine- and fine-grained finely micaceous and commonly slightly calcareous. Minor amounts of finely micaceous calcareous siltstone are also present in the basal Paluxy.

Washita-Fredericksburg Group

The Washita-Fredericksburg sediments are the youngest sediments of Lower Cretaceous age in most of Rankin County. Rankin County is north of the eroded updip limit of the Dantzler facies of the Washita-Fredericksburg group and therefore the Washita-Fredericksburg sediments are treated as an undifferentiated unit.

The top of the Lower Cretaceous is placed at the unconformable contact of eroded shales and sandstones of the Washita-Fredericksburg group and Paluxy formation with the basal conglomeritic occasionally slightly ashy sandstones of the overlying Tuscaloosa group. The contact is sharp and usually easily distinguishable in cuttings. Fragments of vari-colored limestones, present in Lower Cretaceous sediments, but not in the succeeding Tuscaloosa sediments, also serve as lithologic marker.

Washita-Fredericksburg sediments have been eroded from the approximate northern third of the County, so that the first sediments of Lower Cretaceous age encountered below the Tuscaloosa strata are Paluxy. The Washita-Fredericksburg sediments thicken from an eroded feather-edge in the northern part of the County to approximately 1500 feet in the southern part of Rankin County. This wide variation in thickness, exclusive of faulting, is due not only to the unconformity at the top of the Lower Cretaceous but also to vertical and lateral facies changes producing varying unit thicknesses.

Washita-Fredericksburg shales are predominantly dark-red and maroon usually silty and finely micaceous. Subordinate amounts of dark-gray and black shales and light-red and dark-maroon to purple silty finely micaceous shales and minor amounts of vari-colored mudstones, mottled mudstones and vari-colored, though more commonly red and white, nodular limestones are present in this sequence.

The sandstones are white, red and pink and are generally fine-to medium-grained occasionally slightly calcareous slightly micaceous and rarely lignitic. Generally minor amounts of very fine-grained sandstones are also noted in the cuttings. Zones of medium- and coarse-grained sandstones with associated quartz pebbles are also present in the Washita-Fredericksburg sequence.

Tuscaloosa Group

General Statement

The Tuscaloosa group is divisible into three distinct lithologic units: Lower Tuscaloosa, Middle Tuscaloosa and Upper Tuscaloosa.

Present sample control indicates only a 130 foot variation in isopachous thicknesses of the Tuscaloosa group. Somewhat greater variations are noted in individual formation thicknesses. Fluctuating local environmental conditions resulted in time-stratigraphic equivalents being placed in adjacent rock units.

Lower Tuscaloosa

The Lower Tuscaloosa in Rankin County is divisible into two sequences or units. The lower unit consists of a basal sequence of porous generally conglomeritic sandstones with subordinate amounts of mudstone and shale. Overlying this lower unit is a sequence of alternating shales, mudstones and very fine- to medium-grained sandstones and some siltstones.

The thickness of the Lower Tuscaloosa sediments is quite variable, ranging from 170 to 600 feet. This widely varying thickness is directly influenced by the erosional surface upon which it was deposited. The thicker sequences of Lower Tuscaloosa sediments were deposited in those areas which were topographically lowest on the pre-Tuscaloosa erosional surface. As indicated previously in the discussion on the Washita-Fredericksburg, the approximate northern one-third of the County was subjected to erosion or non-deposition to the extent that basal Tuscaloosa sediments rest unconformably on Paluxy strata rather than Washita-Fredericksburg sediments. It is in the northern part of the County that the Lower Tuscaloosa attains a thickness of 600 feet. Throughout the remainder of the County, thicknesses of 300 to 350 feet are common.

The top of the Lower Tuscaloosa is placed at the first occurrence of very fine- and fine-grained calcareous glauconitic sandstones stratigraphically below the shales, mudstones, fine sandstones and siltstones of the Middle Tuscaloosa.

The upper part of the Lower Tuscaloosa consists of a sequence of alternating generally thin-bedded very fine- and fine-grained sandstones, siltstones, shales and mudstones. The sandstones and siltsones of the upper 60 to 160 feet of Lower Tuscaloosa are characteristically glauconitic finely micaceous, calcareous occasionally slightly ashy and rarely lignitic and fossiliferous.

Lower Tuscaloosa shales are dark-gray and black commonly flakey and splintery finely micaceous occasionally slightly sandy and/or silty and rarely calcareous and fossiliferous. Minor amounts of light-gray and light-green mudstones are frequently present. Traces of lignite and lignitic shales and mudstones are occasionally noted.

The lower half to three-quarters of the Lower Tuscaloosa consists of alternating sandstones, shales and mudstones. This section is characterized by thicker bedded or more massive non-glauconitic occasionally slightly ashy sands and generally substantial amounts of red and purple shales and vari-colored mudstones. The sandstones in this section of the Lower Tuscaloosa are predominantly fine- and medium-grained, although zones of coarse-grained sandstones are present locally throughout the section.

The basal strata of the Lower Tuscaloosa throughout the County is generally marked by a variable thickness of coarser conglomeritic sandstone. Those areas which were topographically high on the pre-Tuscaloosa erosional surface received little or none of these coarser basal sediments. As as example, the Pelahatchie area, T. 5 N., R. 5 E., was apparently high during deposition of these coarser sands and as a result only fine-grained sideritic sandstones overlie Lower Cretaceous sediments.

In the southeastern third of the County, vari-colored chert pebbles are present in the basal Tuscaloosa sediments. Present sample information indicates that throughout the remainder of the County chert pebbles are not present in the basal Tuscaloosa strata.

Red fine- to coarse-grained sandstones are present in basal Tuscaloosa strata in several wells in the northern third of the County. Traces of red fine-grained sandstone were also noted in the basal Tuscaloosa in the Larco Drilling Company-Toler-Bryant No. 1 W. C. Hemphill in Sec. 20, T. 4 N., R. 1 E. Other than the above mentioned occurrences, red sandstones are not present in Lower Tuscaloosa sediments.

Middle Tuscaloosa Formation

The Middle Tuscaloosa varies from 70 to 165 feet in thickness, the thicker sequences generally being found in the southern parts of the County.

The Middle Tuscaloosa consists of a sequence of gray, dark-gray, red, dark-red and purple shales, vari-colored mudstones and subordinate amounts of very fine- to fine-grained calcareous micaceous and occasionally slightly ashy sandstones and siltstones. Occasionally siderite concretions are noted in the mudstones. More gray and dark-gray shales are present in wells in the southern and southwestern parts of the County than in the northern and northeastern parts of the County.

The top of the Middle Tuscaloosa is picked on an increase of shales and mudstones below basal porous Upper Tuscaloosa sandstones. These basal Upper Tuscaloosa sandstones contain small vari-colored chert grains and in all but the southwest quarter of the County are usually accompanied by vari-colored quartz and chert pebbles.

Due to the time-transgressive nature of the contact of the Middle Tuscaloosa with the Upper Tuscaloosa, the Middle Tuscaloosa-Upper Tuscaloosa contact is regarded as generally transitional, with unconformable contacts being only local in nature. Suspected unconformable contacts are directly overlain by more or less massive conglomeritic sands. Transitional contacts appear to be the result of a fluctuating succession of depositional environments in which thin-bedded sandstones alternate with shales and mudstones.

Upper Tuscaloosa Formation

The Upper Tuscaloosa consists of a sequence of interbedded shales, mudstones and sandstones. The formation thickens from 500 feet in the more northerly parts of the County to 800+ feet in the south half of the County.

The top of the Tuscaloosa group in this report is placed at the first appearance in cuttings, of pale-gray, light-gray, gray or pale-green mudstones with accompanying siderite concretions. In the more northern parts of Rankin County, purple, ochre and red mudstones and mottled mudstones may be noted near the top of the Upper Tuscaloosa.

Upper Tuscaloosa shales are for the most part various shades of red and purple and are occasionally finely micaceous. Some gray, dark-gray and black shales are also present. The amount of gray, dark-gray and black shales in the Upper Tuscaloosa increases to the south within the County. The mudstones are pale-gray, light-gray, gray, red, purple, green, lavender and occasionally ochre. Some of the mudstones are mottled and some may be slightly sandy. The pale-gray, light-gray and light-green mudstones often contain siderite concretions. Occasionally red and purple mudstones containing siderite concretions are noted. These mudstones are believed to have been oxidized after deposition as the included siderite concretions do not form under pronounced oxidizing conditions.

Upper Tuscaloosa sandstones are predominantly fine- and medium-grained with generally subordinate amounts of medium- to coarse-grained sandstones and minor amounts of very fine-grained sandstones and siltstones. Some of the sandstones contain pink and amber grains and small vari-colored chert grains. Generally relatively minor amounts of red fine- and medium-grained sandstones were noted in the Upper Tuscaloosa. As mentioned previously in the discussion of the Middle Tuscaloosa, the basal strata of the Upper Tuscaloosa of this report is marked by "cherty" sandstone usually accompanied by vari-colored chert and quartz pebbles. Present sample control indicates that the zone or zones of vari-colored chert and quartz pebbles marking the base of the Upper Tuscaloosa are not present in the southwest quarter of the County. However, the "cherty" sandstones are still present.

The general south and southwestward thickening is believed to be due to fluctuating local environmental conditions as opposed to erosion and/or non-deposition. The Tuscaloosa-Eutaw contact in Rankin County, based on the gross lithology of sediments on either side of the contact, is believed to be essentially transitional. Environmental changes which precluded the advent of more marine conditions during deposition of the succeeding Eutaw sediments had apparently begun to influence sedimentation in late Tuscaloosa time. In some of the wells examined, the sands directly overlying definite Tuscaloosa strata are not glauconitic and commonly contain random vari-colored chert grains. These sands are more typical of Tuscaloosa type sediments than Eutaw type sediments. Because these sands are not associated with the characteristic mudstones of the Upper Tuscaloosa, they are classified as Eutaw. Occasionally siderite stain, cement and a few inclusions of siderite crystals may be noted in the glauconitic sandstones of the basal Eutaw. The gray and dark-gray shales of the uppermost Tuscaloosa beds are indistinguishable from those of the overlying Eutaw. Only the associated pale-gray to gray and light-green mudstones serve to differentiate the shales as Tuscaloosa. With the presence of strata on either side of the Tuscaloosa-Eutaw contact appearing to be, at least in part, genetically related to the adjacent depositional environment, the Tuscaloosa-Eutaw contact, as defined in this report, is regarded as more or less transitional.

Eutaw Group

The Eutaw group of this report includes those sediments between the underlying Tuscaloosa group and the overlying chalks of the Selma group. Locally, on the flanks of the Jackson Dome, Eutaw sediments are overlain by Gas Rock. Upper Eutaw strata, which is represented by a chalk facies, is included in the overlying Selma chalks and is therefore not included in the Eutaw group of this report. While strata of lower Eutaw (Eagle Ford) and upper Eutaw age are present in the subsurface of Rankin County, a convenient marked lithologic break is not always present. No formal subdivision of Eutaw sediments into upper and lower units will be used in this report. These sediments, restricted as they are, will be treated as a single depositional unit and referred to as Eutaw. Eutaw sediments are from 0 to 670 feet in thickness.

The Eutaw sediments in Rankin County consist of a sequence of gray, dark-gray and black commonly finely micaceous sparingly sandy calcareous and fossiliferous often silty shales and very fine-to medium-grained calcareous glauconitic generally slightly micaceous sparingly fossiliferous sandstones and siltstones. In some of the wells examined, some of the sandstones in the lower part of the Eutaw occasionally have tan siderite stain, contain scattered patches of sideritic cement and less frequently rare scattered grains of crystalline siderite. The basal sands of the Eutaw group also contain more fossil fragments than the overlying sands.

The contact of Eutaw sediments with the chalks of the overlying Selma group is transitional. On the flanks of the Jackson Dome transitional to unconformable contacts exist between Eutaw sediments and the Gas Rock. Here, truncated Eutaw sandstones are overlain unconformably by reef-type deposits of the Jackson Gas Rock.

Selma Group

In this report the Selma group includes the entire Upper Cretaceous "chalk" sequence. As defined, the sequence includes beds of Navarro, Taylor and Austin ages. The Selma is not divided into formations in this report and no attempt is made to differentiate restricted paleontologic zones. Over and on the flanks of the Jackson Dome, beds of the Selma group grade into a shallow complex reef-type carbonate sequence. The Selma group varies from 230 to 1240 feet in thickness. The thicker sequences of chalk generally tend to complement the thinner sequences of Eutaw sediments.

The Selma group consists of light-gray, gray, pale-gray and white chalks and interbedded gray and dark-gray shales and calcareous shales. Some of the chalks are quite argillaceous, especially the light-gray and gray chalks. Traces of sparingly glauconitic chalk were noted in the lower third of the chalk sequence in some of the wells examined. The basal few feet of the Selma is usually silty and sparingly sandy at the contact with the underlying Eutaw sediments. Generally minor amounts of pale-gray, white and bluish-white bentonitic material are noted in the Selma sequence. Wells located on the flanks of the Jackson Dome may contain considerable amounts of vari-colored volcanic material. In such cases, the volcanic material is usually overlain by the Gas Rock facies of the Selma. Off the flanks, but in the proximity of the dome, volcanic material may also be noted in the chalks of the Selma group.

Though the uppermost Selma and the overlying Clayton formation (basal Paleocene) are lithologically similar, the top of the Selma may be readily differentiated from the Clayton sediments by rather distinctive electrical log characteristics. Marker fossils substantiate these correlations. Faunal evidence indicates that the Selma-Clayton contact is unconformable. The complex reef-type facies developed over the Jackson Dome during Selma and lower Paleocene time makes exact correlations difficult and generally no attempt is made to subdivide the complex carbonate mass over the crest of the dome.

Jackson Dome and "Gas Rock"

The Jackson Dome, a prominent structural and topographic feature of the Gulf Coastal area, resulted from igneous activity which probably began during Selma time in the Rankin-Hinds County area. Igenous intrusion produced an uplift whose positive altitude influenced local sedimentation throughout the remainder of the Mesozoic and the following Cenozoic era. Both intrusive and extrusive igenous rocks have been encountered in wells drilled on or near the uplift. Dikes from the main body of the intrusion penetrated the older strata which contain extrusive material consisting mostly of water-laid volcanics. Drilling on the dome has penetrated tilted and truncated Jurassic, Lower Cretaceous and early Gulf age strata.

While chalk deposition prevailed during Selma time around the uplift, a thick complex "reef-type" carbonate began to develop over the crest and flanks of the uplift. This thick carbonate complex, varying from 230 to 500+ feet in thickness in Rankin County, consists of pale-gray and white variously porous occasionally slightly sandy usually quite fossiliferous limestone. Usually the upper part of the complex is porous, grading downward into denser crystalline limestones. Much of the carbonate has a chalky appearance. Pyrite is occasionally noted in the limestones. This complex carbonate facies is referred to as "Gas Rock" and/or "Jackson Gas Rock." These terms stem from the enormous quantities of gas generated by and confined in this carbonate sequence and from the location of the city of Jackson on the uplift.

This carbonate complex is generally believed to have begun during Taylor time and continued into the early Paleocene. This reef-type facies thins away from the dome and grades into the chalks of Selma and Clayton ages. Exact determination of the top of the Cretaceous is generally difficult in wells drilled on the uplift. A diverse faunal assemblage and poor preservation of fauna add to this difficulty. Because of the depositional environment prevailing over the uplift, sediments of Clayton age (basal Paleocene) may be difficult to separate from those of the underlying Cretaceous strata and are regarded as a part of the whole carbonate complex.

Clayton chalks, in wells located away from the Jackson Dome are usually more argillaceous than the chalks in the top of the underlying Selma group. In some of the wells located on the Jackson Dome, the limestones at the top of the Gas Rock complex are light-gray and may in most cases, represent Clayton age sediments on the uplift.

Midway Group

Clayton Formation

The Clayton formation consists of light-gray and pale-gray impure chalks and calcareous sparingly fossiliferous shales varying from approximately five feet in thickness on the Jackson Dome to 85 feet in thickness in the southern part of Rankin County. The varying thicknesses are due not only to the unconformable Selma-Clayton contact but are also due to depositional thinning over the Jackson Dome. Traces of bentonitic material are also occasionally noted in Clayton sediments. Moore[2] reports the Clayton, usually a limestone on the crestal areas of the Jackson Dome, in Hinds County to be as thin as three feet.

As mentioned in the previous discussion, Clayton sediments in wells drilled on the Jackson Dome are often so difficult to separate from the underlying Cretaceous carbonate complex that they are generally grouped with the Gas Rock complex.

Off the Jackson Dome, Clayton sediments are transitional with the overlying Midway shale. Moore[3] reports the Clayton-Midway shale contact on the Jackson Dome in Hinds County to be gradational. The same type of contact relationship prevails on the portion of the uplift located in Rankin County.

Away from the Jackson Dome, the top of the Clayton is placed at the first occurrence of pale-gray and light-gray impure chalks below the underlying shales of the Midway group.

Midway Shale

Overlying the Clayton formation is a sequence of gray and dark-gray occasionally finely micaceous and silty shales and less indurated clay shales. This rather distinctive shale unit is usually referred to as Midway shale.

The Midway shale unit varies from 70 to 800 feet in thickness. Moore[3] reports the Midway to be about 75 feet thick over the Jackson Dome in Hinds County. A similar approximate thickness of Midway is present over the dome in Rankin County. The Midway thickens in all directions off the dome.

The top of the Midway group (top of Midway shale) is picked on a marked increase of gray, dark-gray and black shales below the lowest sandstone sequence of the overlying Wilcox group. The basal sandstone sequence of the Wilcox group contains appreciable amounts of interbedded shale. The contact between sediments of the Midway group and the Wilcox group is transitional.

The Paleocene-Eocene boundary has not been satisfactorily established in the subsurface of Mississippi. A time-rock unit concept, based on restricted faunal zones, would greatly expand the thickness of the Paleocene beds to include substantial amounts of the overlying strata now classified as Wilcox (Eocene). Because of its general acceptance as a rock unit, perpetrated mainly by the need for a reliable and easily identifiable electrical log correlation, the Midway is treated as a rock unit. In this sense the Paleocene sediments are restricted to a basal calcareous unit, the Clayton formation and an upper shale unit, the Midway shale.

Wilcox Group

The Wilcox group in Rankin County consists of an undifferentiated mass of complexly interstratified clays, clay shales, sandstones, silts and a few thin marls. The Wilcox varies from 1100 feet to approximately 1300 feet in thickness over the Jackson Dome. Off the dome, Wilcox sediments attain a thickness of 2830 feet in the more southern part of the County.

Wilcox sandstones are very fine- to coarse-grained. Quartz pebbles are commonly associated with the coarser sandstones. Most of the sandstones contain at least some lignitic or carbonaceous material and are also commonly slightly micaceous. The sandstones and silts are white, pale-gray, light-gray and light-green, the varying amounts of clay, silt and carbonaceous matrix materials producing the various colors. Some of the sandstones are glauconitic and calcareous. In some cases, these glauconitic sandstones were associated with the thin pale-gray to light-gray sandy marls.

The clays and clay shales are pale-gray, light-gray, gray and dark-gray. The gray and dark-gray clays and clay shales generally contain finely divided carbonaceous and lignitic material. Numerous seams of lignite were noted.

Any Meridian sand equivalents in the subsurface of Rankin County are included in the Wilcox group rather than in the Claiborne group. The inclusion of the Meridian sand in the Wilcox group is common practice when it is not easily separable from the subjacent Wilcox sediments.

The top of the Wilcox is picked on the first occurrence in cuttings of very fine- to coarse-grained sandstones or carbonaceous sandstones and silty carbonaceous clays or clay shales stratigraphically below the pale-gray and white limy finely glauconitic siltstones of the Tallahatta formation (basal Claiborne). Samples through the Wilcox-Tallahatta contact zone were generally of very poor quality so that no satisfactory conclusions as to the contact relationship was possible. The sample information available would seem to indicate a disconformable contact.

Claiborne Group

General Statement

Separation of Tallahatta and Winona sediments in the subsurface of Rankin County is extremely difficult. Interfingering of calcareous finely glauconitic siltstones, typical of Tallahatta sediments, with the chalks and marls of the Winona formation tend to obscure the true thickness of the Winona. Because of the interfingering of one facies of deposition with the other, the Tallahatta and Winona formations are treated as a single depositional unit.

Tallahatta Formation

The Tallahatta formation consists of interbedded pale-gray, white and light-gray calcareous slightly fossiliferous finely glauconitic commonly finely micaceous siltstones and light-gray and light-green slightly calcareous sparingly fossiliferous clay shales. Some of these clay shales may be sparingly glauconitic. As defined in this report, the upper part of the Tallahatta sequence also contains interbedded pale-gray to light-gray silty glauconitic chalks or marls typical of the overlying Winona formation.

The top of the Tallahatta formation of this report is picked at the top of the first occurrence, in cuttings, of pale-gray, white or light-gray calcareous finely micaceous glauconitic siltstones below the silty glauconitic chalks and marls of the Winona. The Tallahatta is 70 to 130 feet in thickness over the Jackson Dome and thickens to 270 feet off the dome.

Winona Formation

The Winona consists of a sequence of interbedded pale-gray and pale-grayish-white silty glauconitic chalks, sandy marls and minor amounts of light-gray and light greenish-gray slightly calcareous and fossiliferous clay shales and clays.

The Winona formation is only 10 to 15 feet thick over the Jackson Dome. Thickening occurs in all directions off the dome and up to 65 feet of Winona, restricted as it is in this report, have been recorded in the eastern parts of the County.

Zilpha Formation

The Zilpha varies from a minimum of 200 feet in thickness on the Jackson Dome to a maximum of 420 feet in the southwestern part of the County. Facies changes produced by local depositional environments, as well as structural thinning over the Jackson Dome account for the divergence in formation thickness.

The lower part of the Zilpha formation consists of a sequence of gray slightly fossiliferous clay shales often containing finely disseminated lignite or carbonaceous material. The basal strata of the Zilpha is slightly glauconitic and calcareous at the contact with the glauconitic chalks and marls of the underlying Winona formation.

The upper part of the formation is variably sandy and the clay shales tend to be silty and slightly micaceous. A fluctuating succession of one facies of deposition by another resulted in an interstratified sequence of clay shales and very fine- to medium-grained sands. These sands are finer than the basal sands of the overlying Kosciusko formation. Some of the finer sandstones in several wells were slightly glauconitic. Traces of reddish-brown slightly sandy and glauconitic clay ironstones were also noted in several wells. The few available sets of cuttings through this interval were of such poor quality that any distribution pattern of the glauconitic sandstones and clay ironstones could not be determined.

The top of the Zilpha is placed at the base of the lowest massive sand sequence of the Kosciusko formation. While the upper part of the Zilpha may be quite sandy, these sands are usually finer than the basal Kosciusko sands. The presence of the marker fossil, **Cyclamnina caneriverensis,** in cuttings, may be used to definitely identify strata of the Zilpha formation. The Zilpha-Kosciusko contact is regarded as transitional.

Kosciusko Formation

The Kosciusko formation consists of a sequence of gray often lignitic or carbonaceous silty clays and clay shales, clayey commonly lignitic or carbonaceous silts and very fine- to coarse-grained sands. Small quartz pebbles are often associated with the coarser sands. Some of the clays and silts are slightly micaceous.

Moore[4] reported rare glauconite in Kosciusko sediments in Hinds County. The only glauconite noted in Kosciusko strata in Rankin County was incorporated in tan to reddish-brown sandy and sparingly fossiliferous slightly calcareous clay ironstones near the contact of the Kosciusko with the overlying Cook Mountain formation. Traces of glauconite may be present elsewhere in the Kosciusko sequence. However, the poor quality of the cuttings prevented any conclusive evidence of its presence.

The formation reaches a maximum thickness of 500 feet in the southern part of the County, thinning to 250 feet over the Jackson Dome. Based on available sample data, which is poor, no satisfactory conclusions on contact relationship is possible. Electrical log data indicates that basal Cook Mountain limestones directly overlie Kosciusko sands. Available contact data would seem to indicate that the Kosciusko-Cook Mountain contact is probably disconformable.

Cook Mountain Formation

The Cook Mountain formation consists of a sequence of clays, chalks, marls and chalky limestones. The formation reaches a maximum thickness of 190 feet, thinning to approximately 100 feet over the Jackson Dome.

The upper part of the Cook Mountain is characterized by light brownish-gray finely lignitic or carbonaceous variably silty clays. These clays tend to be more silty near their contact with the overlying Cockfield formation and in some wells thin lenticular very fine-grained sandstones may be developed.

The Cook Mountain-Cockfield contact is transitional. Vertical and lateral facies changes in depositional environment cause these formations to thin or thicken at the expense of the other.

The top of the Cook Mountain in this report is picked on a general increase of light brownish-gray finely lignitic or carbonaceous clays below the fine- and medium-grained sands of the basal Cockfield.

The lower part of the Cook Mountain consists of a sequence of interbedded brownish-gray slightly calcareous sparingly lignitic or carbonaceous fossiliferous glauconitic clays and light-gray and pale-gray silty occasionally slightly sandy chalks, marls and limestones.

Cockfield Formation

The Cockfield formation is a sequence of sands, silts and clays with a few thin beds of lignite. As stated previously, the Cook Mountain-Cockfield contact is transitional, and as such thick Cockfield sections tend to be complemented by thin Cook Mountain sequences. The Cockfield varies from 200 feet to a maximum of 330 feet in thickness.

Cockfield clays are light-gray to gray, usually silty and variably sandy and micaceous and lignitic or carbonaceous. The sands range from very fine- to medium-grained and are generally argillaceous or clayey and variously lignitic or carbonaceous and micaceous. The silts are clayey variably micaceous and usually contain finely disseminated lignitic or carbonaceous material.

The top of the Cockfield is picked on the appearance in cuttings, of lignitic or carbonaceous clays, silts or sands below the calcareous to limy glauconitic fossiliferous sandy marls of the Moodys Branch.

Moodys Branch Formation

The Moodys Branch consists of a 15 to 40 foot sequence of light-green to greenish-gray calcareous fossiliferous clayey glauconitic conglomeritic sands and pale-gray and pale-green fossiliferous sandy glauconitic marls. The abundance of glauconite in this formation is responsible for the characteristic green color.

In some wells, the marls of the Moodys Branch directly overlie lignitic or carbonaceous strata of the Cockfield formation and the regional disconformity between the Cockfield (upper Claiborne) and Moodys Branch (basal Jackson) is apparent. In other wells, a thin sequence of variably silty clays exists between strata of definite (readily identifiable) Claiborne and Jackson ages. The lack of cored contacts and the usual poor quality of the cuttings prevent any satisfactory resolution of this problem.

The contact of the Moodys Branch is gradational into the overlying calcareous clays of the Yazoo formation. Because of the rock-unit classification used in this report, the top of the Moodys Branch is placed at that point where the lithology of the sediments becomes predominantly sand.

Oil and Gas Possibilities

Oil and gas have been tested or produced from sediments ranging from Eocene (basal Wilcox) to Jurassic (basal Smackover) in age. Deep Jurassic zones capable of producing vast quantities of hydrocarbons are the current exploration objectives.

Non-commercial quantities of oil and gas have been tested from basal Wilcox sands on the flanks of the Jackson Field in Rankin County. While Rankin County is considered to be north of the more favorable areas for oil and gas production from the Wilcox, basal Wilcox sands should be considered in any future drilling programs in the immediate vicinity of the Jackson Dome.

The porous reefal carbonate complex of the Jackson Field, once productive of vast quantities of gas, is now used primarily for gas storage. Hydrocarbons, in commercial quantities may still remain untapped in isolated structural and stratigraphic traps on the flanks of the Jackson Dome.

Side wall core samples have recovered oil stained sands from the Eutaw formation in Puckett Field, but no commercial production has been established from the formation within the County.

Sands of the Tuscaloosa, Washita-Fredericksburg, Paluxy and Mooringsport formations have produced oil and gas in the Puckett Field. Presently, the Rankin County segment of the field produces from Washita-Fredericksburg, Paluxy and Mooringsport pools.

For a time, the Pelahatchie Field produced from the Paluxy, Mooringsport, Rodessa, Silgo, and Hosston formations of the Lower Cretaceous age. Of these original pools, only the Rodessa formation is productive. With the completion of the Shell Oil Company and Love Petroleum Company #1 W. D. Rhodes et al Unit in Sec. 18, T. 5 N., R. 5 E., in August 1967, deep Jurassic (lower Smackover) production was established in Pelahatchie Field.

Pisgah Field, in the northern part of Rankin County is productive of oil and gas from Rodessa and Hosston pools.

Deep Jurassic drilling has tested commercial quantities of carbon dioxide and hydrogen sulfide gases in the Haynesville and Smackover formations. Plans to further develop and market these gases and/or their by-products have been announced by several organizations.

Although Cotton Valley sediments have not proven productive in Rankin County, deep Jurassic tests in the southwestern part of the County may encounter favorable source and reservoir beds.

The outlook for new oil and gas discoveries in Rankin County and adjacent areas is good. With the deep Jurassic drilling program presently underway in the area, shallower Cretaceous horizons may also be evaluated. Several deep Jurassic tests in other Counties, which did not encounter commercial quantities of hydrocarbons at their objective depths, resulted in commercial production from Cretaceous age reservoirs.

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WATER RESOURCES OF RANKIN COUNTY

by

THAD N. SHOWS

ABSTRACT

Rankin County is underlain by large quantities of fresh water. Several aquifers are available and have the capacity to supply municipal, industrial and domestic wells. Aquifers which underlie the County include the Wilcox, Meridian sand, Kosciusko (Sparta), Cockfield, Forest Hill, Catahoula and Alluvium. A large number of the wells throughout the County are screened in the Kosciusko or Cockfield aquifers. Geographic location within the County determines the aquifers which underlie a particular site.

The base of fresh water ranges from 2,900 feet below sea level in the north to 1,500 feet below sea level in the south. Very few wells have penetrated the entire fresh-water section.

The larger municipal and industrial wells yield 500 to 600 gallons per minute. Some of the aquifers have the potential of supplying 1,000 to 2,000 gallons per minute to properly constructed wells. A few of the aquifers are poor at some locations and will yield 100 gallons per minute or less. Transmissibility values range from 900 to 154,000 gallons per day per foot.

Wells are from less than 100 feet to 1,200 feet deep. The majority of wells are 500 feet or more in depth.

The quality of water is generally good for most purposes. Most of the water is a soft, sodium or calcium-bicarbonate type with low to medium mineralization.

Water from the Kosciusko and Cockfield aquifers is usually of excellent quality in most locations in the central and southern part of the County. Air compressor water pumps are common on wells completed in the Cockfield aquifer in the northern half of Rankin County. Some of the water contains minerals that render the water unsuitable for particular uses. Excessive iron concentration, low ph or acid water, and excessive color are a few of the problems concerning some of the water. Most of the quality problems, with the exception of color removal, are corrected with minor treatment.

Large amounts of surface water are available from the Pearl River which forms the western boundary. The Strong River is a medium sized stream that crosses the southeastern corner of the County. A large number of small streams form a dendritic drainage pattern in the County. Storage facilities would be necessary on the small streams to provide a dependable water supply. The Ross Barnett Reservoir is a large lake on the Pearl River in the northern part of Rankin County. Rankin County Lake is a medium-sized lake located north of Pelahatchie which is used for recreational purposes.

The highest stream flow normally occurs in the winter and early spring seasons. Low flows generally occur on most of the streams during late summer and fall. Flooding is a possibility along many of the flood-

plains of the streams. Some flood protection structures have been completed in the Flowood and Jackson areas.

The quality of water from the natural streams is generally good. The City of Jackson uses about 14,000 gpm from the Pearl River for municipal water supply. The quality of water is extremely poor in the Pearl River below Jackson because of the untreated sewage discharged by the City. Pollution of varying degrees is present on a number of the smaller streams.

INTRODUCTION

A study of the water resources of Rankin County was begun in the summer of 1969. The water resources study was emphasized in evaluating the mineral resources of the County.

A dependable, economical, and useable water supply is needed to attract industry to a particular site or area. All the ingredients for a successful economic growth may be present but the potential will be hampered if adequate water is not available for use.

A scientific analysis of the available water should be beneficial to the County and reap numerous economic benefits. The water managers, engineers and others may find useful information in this report concerning the quantity and quality of water available in Rankin County.

Cooperation and Acknowledgements

A sincere appreciation is expressed to the water well contractors, engineers, various officials and well owners for providing information used in the report. Several governmental agencies assisted in furnishing information that was not available from other sources. The chemical analyses of water from wells in Rankin County was provided by the Division of Sanitary Engineering, Mississippi State Board of Health.

Present Water Use

All of the municipal and domestic water supplies in Rankin County are from ground-water sources. The following cities or areas are supplied by a municipal water system: Brandon, Jackson Municipal Airport, Pelahatchie, Pearl River Valley Water Supply District, and Mississippi State Hospital. There were 17 rural water associations and 6 private water companies operating in the County in August 1970', serving areas outside the municipalities. A number of manufacturing plants are supplied by their own private systems.

A number of industries are located in the industrial area of Flowood and several are supplied from individual wells. There are industrial wells in the vicinity of every town in the County.

The majority of the large capacity wells are completed in the Cockfield or Kosciusko aquifer. Some of the areas of heavy pumpage are located at Flowood, Plain, Pearl, Jackson Municipal Airport, Brandon, Ross Barnett Reservoir, and Pelahatchie. The Cockfield supplies a large number of industrial, municipal, and rural water supply wells throughout Rankin County. A number of large wells are completed in the Kosciusko aquifer in the central part of Rankin County.

In 1970 there were 9 permits issued for withdrawing surface water in Rankin County[2]. Surface water is mainly used for irrigation and fish farming operations. Several of the surface water users are located in the Flowood area. The City of Jackson uses about 30 cfs per day from the Pearl River above the low-head dam.

GROUND WATER

Availability

Rankin County is underlain by several geologic units that are capable of supplying water to wells. The principal source of recharge for these units is precipitation on the outcrop area of permeable strata or from adjacent beds. A number of the aquifers are recharged within the County or slightly to the north in adjoining counties.

Most of the aquifers are composed of sand. An exception would be the Mint Spring marl of the Vicksburg group. Aquifers vary in depth from near the surface to several thousand feet deep across the County. The principal aquifers include the Wilcox, Meridian sand, Kosciusko (Sparta), Cockfield, Forest Hill and Catahoula (Table 1). A deep well in the northern part of Rankin County would penetrate the Cockfield, Kosciusko, Meridian sand and Wilcox aquifers. A well in the southern part would encounter the Catahoula, Forest Hill, Cockfield and Kosciusko aquifers.

SYSTEM	SERIES	GROUP	STRATIGRAPHIC UNIT	THICKNESS (feet)	WATER RESOURCES
QUATERNARY	RECENT		Alluvium	0-45	Generally not an aquifer. A potential aquifer along the Pearl River and some of the larger streams. Poor quality water is typical from this aquifer.
	PLEISTOCENE		Terrace deposits	0-156	Generally not an aquifer. A few domestic wells are completed in this aquifer.
			Citronelle formation	0-110	Not an aquifer.
TERTIARY	MIO-CENE		Catahoula formation	Up to -420	An important aquifer in the southern part of Rankin County. A larger number of domestic wells are completed in this aquifer. A few large wells supply the school at Piney Woods. Most of the wells are less than 400 feet deep across this area.
	OLIGOCENE	VICKSBURG	Bucatunna clay	20-70	Generally not an aquifer. The Mint Spring is essentially a sand at many locations. A number of domestic wells are completed in the Mint Spring in the central part of Rankin County. Quality of water is usually good from this aquifer.
			Byram marl	8-22	
			Glendon limestone	15-50	
			Mint Spring marl	6-30	
			Forest Hill formation	65-210	Supplies a number of domestic and medium-sized wells in the central part of Rankin County. Large yields are not common from this aquifer. Quality of water is fair to poor and colored water is a common complaint at some locations.
	EOCENE	JACKSON	Yazoo formation	340-460	Not an aquifer.
			Moodys Branch formation	15-40	Generally not an aquifer. A few domestic wells are completed in this aquifer.
		CLAIBORNE	Cockfield formation	200-350	An important aquifer throughout Rankin County. Numerous municipal, industrial and domestic wells are completed in this aquifer. Large yielding wells are possible in the northern part of the County. Quality of water is generally good from this aquifer.
			Cook Mountain formation	100-220	Not an aquifer.
			Kosciusko formation	200-500	An important aquifer in Rankin County. A large number of municipal, industrial and domestic well utilize this aquifer in the northern and central part of the County. Quality of water is generally good.
			Zilpha formation	200-420	Not an aquifer.
			Winona formation	10-50	Generally not an aquifer. Water from a test well (A4) at Sand Hill contained high mineralization and excessive flourides.
			Tallahatta formation: Undifferentiated	70-270	Not an aquifer.
			Tallahatta formation: Meridian sand	100-150	A potential aquifer in the northern half of Rankin County. No wells have been completed in this aquifer.
		WILCOX	Undifferentiated	980-2780	A potential aquifer in the northern third of Rankin County. No wells have been completed in this aquifer.

Table 1.—Stratigraphic column and water resources in Rankin County.

Minor aquifers include the Mint Spring marl, Forest Hill, Terrace and Alluvial deposits. The central part of the County is underlain by the Mint Spring marl and Forest Hill aquifers which supply a number of domestic water wells. Terrace deposits blanket the entire County and in some locations contain sands capable of supplying domestic wells. Alluvial deposits are located along the major streams and the thickness may be up to 45 feet along the Pearl River.

Fresh water is available in the northern part of Rankin County to a depth of about 2,900 feet and in the southern part to about 1,500 feet (Fig. 1). Fresh water is defined as water containing less than 1,000 mg/1 (milligrams per liter) of dissolved solids. Wells range in depth from shallow, less than 100 feet to 1,250 feet deep (Fig. 2, Table 2).

Table 2.—Records of wells in Rankin County.

Well No.: Numbers correspond to those on well-location maps, chemical-analysis tables and pumping test tables.

Majority of wells are rotary drilled.

Water Level: M, Measured; R, Reported.

Method of Lift: A, Air Lift; C, Cylinder; F, Natural Flow; J, Jet; N, None; P, Pitcher; T, Turbine; S, Submersible; B, Bucket.

Elevation: Elevations determined mostly from topographic maps having contour intervals of 10 or 20 feet.

Use of Well: D, Domestic; I, Industrial; IR, Irrigation; N, None; O, Observation; P, Public Supply; S, Stock; T, Test.

Remarks: C, Chemical Analysis; O, Observation Well; P, Pumping Test.

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Water Bearing Unit	Elev. of land surface datum (ft.)	Water Level: Above(+) or below land surface (ft.)	Water Level: Date of Measurement	Method of Lift	Use	Yield: Gallons per Minute	Yield: Date	Remarks
A1	Pearl River Valley Water Supply District, Highway 43 well	1965	502	10	Cockfield	310	71m	1970	T	P	150	1970	C,P
A4	Pisgah Water Association	1968	382	8	Cockfield	385	145m	1970	T	P	164	1968	C
B1	Coy Shoemaker	1969	535	2	Kosciusko	330	183	1969	A	D	15	1969	
B3	Loyd Denson	1968	304	2	Cockfield	335	80	1968	A	D	15	1968	
C1	Fannin Community water System	1966	1,202	8	Kosciusko	405	247m	1970	T	P	126	1966	C
C2	Jackson Fire Dept. Lodge	1966	600	4,2	Cockfield	303	86	1966		P	35	1966	
C3	F. C. Lawrence	1967	580	4,2	Cockfield	322	80	1967		D	15	1967	
C6	John C. McIntyre	1963	631	2	Cockfield	335	132	1963	J	D			
D1	B. F. Little	1966	505	4,2	Cockfield	365	100	1966	S	D	20	1966	
D3	Pisgah Elementary School	1964	555	6,2	Cockfield	393	163m	1970	S	P	20	1970	
E1	Leesburg Water Association	1968	832	10	Kosciusko	378	152	1969	T	P	275	1969	
F2	Drake Water Association	1967	952	6	Kosciusko	275	134	1967	T	P	102	1967	C

Table 2.—Records of wells in Rankin County. (Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Water Bearing Unit	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Method of Lift	Use	Yield: Gallons per Minute	Yield: Date	Remarks
F4	National Sales Co.	1965	786	2	Kosciusko	275	120	1965	J	I			
F5	Metropolitan Water Co.	1967	644	4,2	Cockfield	300	109	1967	S	P	40	1967	
F6	Jackson Municipal Airport	1961	618	10	Cockfield	324	132m	1962	T	P	301	1961	P
F8	Jackson Preparatory School	1970	400	6,4	Cockfield	280	100	1970	S	P	90	1970	
G2	Langford Water Association	1967	772	8	Cockfield	415	222	1967	T	P	200	1967	C
G4	Pearl River Valley Water Supply District, Bay View Drive Well	1965	626	10	Cockfield	335	131m	1970	T	P	260	1970	P
H3	Evergreen Water Association	1966	810	8	Cockfield	442	237m	1970	T	P	106	1967	
H4	Clark Mashburn	1969	352	4	Cockfield	387			S	D	10	1969	
J2	Town of Pelahatchie Well No. 1-D	1962	1,000	10	Kosciusko	360	160m	1970	T	P	490	1970	C,P
J5	Rankin County Rec. Center	1968	448	2	Cockfield	390	145	1968	A	P	15	1968	
J6	Pelahatchie Poultry Co., Well No. 1	1958	859	10,6	Kosciusko	346	120	1958	T	I	536	1958	C
J7	Pelahatchie Poultry Co., Well No. 2	1966	855	10	Kosciusko	345	154	1966	T	I	510	1966	
J8	Town of Pelahatchie Observation Well	1927	594	8,6	Cockfield	360	110	1970	N	O			O
J9	Town of Pelahatchie Well No. 1	1949	592	8,6	Cockfield	360	97	1949	N	N			C,P
J11	Town of Pelahatchie	1960	577	8	Cockfield		105	1960	T	P	200	1970	
K1	Mississippi State Hospital Whitfield-Well No. 6	1967	838	18,10	Cockfield	320	167	1967	T	P	820	1967	C
K8	Johnny Cleveland Trailer Court, Well No. 1	1964	590	4,2	Kosciusko	265	137	1964	S	P			
K18	Johnny Cleveland Trailer Court, Well No. 2	1967	695	4,2	Kosciusko	267	140	1967	S	P	20	1967	

Table 2.—Records of wells in Rankin County. (Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Water Bearing Unit	Elev. of land surface datum (ft.)	Water Level: Above (+) or below land surface (ft.)	Water Level: Date of Measurement	Method of Lift	Use	Yield: Gallons per Minute	Yield: Date	Remarks
K19	Metropolitan Water Co., Well No. E. B.	1968	861	16	Kosciusko	287	150m	1968	T	P	602	1968	C,P
K20	Mississippi Law Enforcement Officers Training Academy	1967	860	10	Cockfield	320	168	1967	T	D	40	1967	
K22	Ausie Westerfield	1968	692	4,2	Cockfield	264	132	1968	S	D	18	1968	
K24	Washington Water Assn.	1968	1,300	6,4	Kosciusko	394	245	1968	S	P	90	1968	
K27	Metropolitan Water Co. Well No. E. A.	1968	1,142	16	Kosciusko	325	168m	1968	T	P	602	1968	C,P
K28	Metropolitan Water Co. Well No. E. C.	1968	874	16	Kosciusko	304	159m	1968	T	P	602	1968	C,P
K29	Metropolitan Water Co. Well No. E. D.	1968	984	16	Kosciusko	309	171m	1968	T	P	668	1968	C,P
K30	Russum Motel Well No. 2	1969	636	4,2	Kosciusko	268	144m	1969	S	D	60	1969	P
K33	Town of Flowood Well No. 2	1970	724	8	Kosciusko	272	152	1970	T	P	246	1970	
K36	Jackson Municipal Airport	1961	623	10	Cockfield	324	127	1962	T	P	314	1961	C
K37	Richland Water and Sewer District, Well No. 1	1956	782	12,8	Kosciusko	275	112	1959	T	P	140	1959	C
K38	United Gas Compressor Station, Well No. 3	1961	458	10,6	Cockfield		100	1961	T	I	192	1961	P
K39	John Cleveland	1933	?	10	Wilcox	255	+22m	1959	N	S	400		C
K40	Valentour Dairy Products	1943	1,180	3	Wilcox	273	+6m	1958	N	S	5	1958	C
K41	Mississippi State Hospital Whitfield	1956	920	12	Cockfield		149	1956	T	P	400	1956	
K42	Mississippi State Hospital Whitfield	1969	834	12	Cockfield	335	183	1969	T	P	575	1969	
K43	Mississippi State Hospital Whitfield	1962	828	18	Cockfield		158	1962	T	P	961	1962	C
L1	Horseshoe Utility Co.	1967	789	10	Cockfield	374	191	1967	T	P	278	1967	
L4	Dow Chemical Corp.	1966	659	4,2	Cockfield	338	150	1966		I			

Table 2.—Records of wells in Rankin County. (Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Water Bearing Unit	Elev. of land surface datum (ft.)	Water Level: Above(+) or below land surface (ft.)	Water Level: Date of Measurement	Method of Lift	Use	Yield: Gallons per Minute	Yield: Date	Remarks
L8	Taylorsville Water Assn.	1966	786	8	Cockfield	410	216	1970	T	P	129	1970	C,P
L13	Town of Brandon Well No. 2	1963	1,283	12	Kosciusko	472	283	1963	T	P	575	1970	C
L14	Greenfield Water Assn.	1966	918	8	Cockfield	420	238	1966	T	P	136	1966	
L15	Marquette Cement Plant Well No. 2	1970	808	10	Cockfield	351	168	1970	T	I	302	1970	
L18	Town of Brandon Stand-by Well	1953	860	12	Cockfield	470	260	1953	T	P	300	1953	C
M5	Girl Scouts of America Camp Wahi, Well No. 2	1969	871	7	Cockfield	530	326	1969	S	P	80	1969	C,P
M6	Malcolm L. Stone	1969	1,240	2	Kosciusko	423	252	1969	A	D			
M7	Southern Natural Gas Co. Well No. 2	1970	831	8	Cockfield		235	1970	T	I	235	1970	
M9	Southern Natural Gas Co. Well No. 1	1948	821	8	Cockfield	442	213	1948	T	I	201	1948	C
N1	E. E. Varner	1966	650	4,2	Cockfield	467	80	1966	S	D	10	1966	
N6	A.C.L. Water Assn. Well No. 1	1967	1,285	8	Kosciusko	490	267	1969	T	P	216	1969	
N7	Stuckey's Pecan Shoppe	1970	561	4	Cockfield	350	120	1970	S	I	30	1970	
O1	Southern Acres	1967	844	2	Cockfield	390	225	1967	A	P	35	1967	
O3	Ran-Co Water Co. Well No. 5	1969	1,084	10	Cockfield	396	243	1969	S	P	180	1969	C,P
O11	Richland Water and Sewer District, Well No. 2	1958	951	10,6	Kosciusko	302	149m	1958	T	P	136	1959	C
P1	Town of Florence	1966	955	8	Cockfield	320	137m	1970	T	P	195	1966	C,P
P12	Slater R. Gordon	1965	1,037	4,2	Cockfield	360	160	1965	S	D	20	1965	
P19	Southern Rankin Water Assn.	1969	948	8	Cockfield	360	201m	1969	T	P	122	1969	P

Table 2.—Records of wells in Rankin County. (Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Water Bearing Unit	Elev. of land surface datum (ft.)	Water Level: Above(+) or below land surface (ft.)	Water Level: Date of Measurement	Method of Lift	Use	Yield: Gallons per Minute	Yield: Date	Remarks
P22	Florence High School	1962	126	4	Catahoula	311	12	1962	S	P	20	1962	
P23	Southwood Subdivision	1964	980	4,2	Cockfield	345	165	1964	S	P	20	1964	
Q6	Dewey Myers	1964	261	2	Forest Hill	365	74	1964	J	D			
Q9	Lindsey Alison	1968	55	2	Terrace	368	18	1968	J	D	7	1968	
Q12	Sherwood Forest Subdivision Well No. 2	1969	850	6,4	Cockfield	425	230	1969	S	P	100	1969	
Q13	Juanita Buckhaulter	1969	200	2	Vicksburg	385	100	1969	J	D	7-8	1969	
Q18	McLaurin School	1958	405	4	Forest Hill	360	73	1959	S	P	30	1959	C,P
Q19	McLaurin School	1959	416	4	Forest Hill	360	73	1959	S	P	30	1959	P
R1	A. P. May	1967	388	4,2	Forest Hill	397	23	1967	J	D			
R2	W. H. Worley	1967	72	2	Catahoula	439	45	1967	J	D	10	1967	
R5	W. H. Crawford	1967	175	4,2	Vicksburg	400	36	1967	S	D, Ir	30	1967	
R6	Mrs. D. B. Morrow	1966	787	4,2	Cockfield	424	74	1966	J	D	12	1966	
R8	E. O. Burnham	1969	120	2	Catahoula	380	60	1969	J	D	7	1969	
R9	Mims Williams	1969	100	2	Catahoula	385	25	1969	A	D	30	1969	
R10	W. H. Crawford Well No. 2	1970	72	2	Catahoula	420	32	1970	A	D, Ir	15	1970	
S4	Billy Means	1968	750	4,2	Cockfield	442	180	1968	S	D	15	1968	
S5	L. L. Thornton	1968	1,160	4,2	Kosciusko	440			A	D			
S6	A.C.L. Water Assn. Well No. 2	1969	1,260	8	Kosciusko	550	346m	1969	T	P	157	1969	
S9	James S. Ross	1969	160	2	Forest Hill	415	68	1969	J	D	5	1969	
T1	Ruby Sweat	1965	242	2	Vicksburg	382	147	1965	J	D			
T2	J. E. Goodsell	1964	199	2	Vicksburg	310	90	1964	J	D			
T3	E. B. Morrison	1966	212	2	Vicksburg	303	47	1966	J	D			
T9	Willie Gibson	1970	362	2	Forest Hill	310	80	1970	J	D	6	1970	

Table 2.—Records of wells in Rankin County. (Continued)

Well No.	Owner	Year Drilled	Depth (ft.)	Casing Diameter (in.)	Water Bearing Unit	Elev. of land surface datum (ft.)	Water Level: Above(+) or below land surface (ft.)	Water Level: Date of Measurement	Method of Lift	Use	Yield: Gallons per Minute	Yield: Date	Remarks
U1	Star Water Co., Well No. 2	1966	679	6,4	Forest Hill	531	283	1966	S	P	101	1970	P
U4	Capitol 66 Oil Co.	1966	374	4,2	Forest Hill	375	130	1966	S	I	35	1966	
U19	Anse Water Co., Well No. 1B	1969	498	6	Forest Hill	390	144	1969	S	P	45	1969	
U25	Plantation Shores	1970	163	4	Catahoula	356	60	1970	S	P	36	1970	
V4	Calvin Smith	1969	226	2	Catahoula	420	143	1969	A	D			
V7	Shell Oil Co. Supply Well for Dual Drlg.	1970	404	6	Catahoula	470	175	1970	S	I	60	1970	
V8	Shell Oil Co. Supply-Penrod Drlg. Co.	1970	317	4	Catahoula	490	195	1970	S	I	60	1970	
V25	Piney Woods School Well No. 4	1965	341	12	Catahoula	396	98	1970	T	P	125	1970	P
V26	Piney Woods School Well No. 1	1946	297	8,6	Catahoula	455	160	1946	T	P	50-75	1970	C
V27	Piney Woods School Well No. 2	1952	295	10	Catahoula	460	163	1958	T	P	164	1964	
V28	Piney Woods School Well No. 3	1958	298	10	Catahoula	455	171	1958	T	P	199	1958	
W1	Adams Egg Farm	1967	1,110	4,2	Cockfield	370	151	1967	S	I	40	1967	
W2	R. C. Walter	1967	126	2	Catahoula	355	68	1967	J	D	8-10	1967	
W3	John L. Overby	1968	316	4,2	Forest Hill	385	70	1968	S	D			
W4	F. A. Shotts	1969	980	2	Cockfield	363	146	1969	J	D	8-10	1969	
W5	F. B. Bolin	1969	940	2	Cockfield	400	180	1969	A	D	18	1969	
W9	Robert Stevens	1969	340 ?	2	Mint Spring	415	120	1969	J	D	6	1969	
W10	Morris Goodman	1970	990	2	Cockfield	360	120	1970	A	D	20	1970	
X3	Village of Puckett	1967	1,168	8,6	Kosciusko	375	168	1967	S	P	100	1967	C
X4	T. Boone	1965	146	2	Catahoula	390	30	1965	J	D	10	1965	
X5	Union Water Association	1968	1,238	6,4	Kosciusko	400	186	1970	S	P	187	1970	C,P

Quality of Water

The quality of water is an important property when considering particular uses for it. Water of good quality and containing no objectionable constituents is needed for most municipal and domestic use. Water systems are faced with a loss of revenue from the sale of poor quality water. Some industrial requirements are not as stringent as those for domestic or municipal water supplies.

Table 3 is a tabulation of selected available chemical analyses of ground water in Rankin County. The quality of water is generally good. Typically, several general categories of water are available depending on particular aquifers and geographic location. Most of the water is a soft, sodium or calcium-bicarbonate type with low to moderate mineralization. The calcium-bicarbonate water near the outcrop changes to a sodium bicarbonate type down the dip. The ph of the water ranges from acid to alkaline (5.0 to 8.8 ph). Excessive carbon dioxide is a problem associated with acid type water (low ph) and generally occurs in shallow water near the outcrop. The low acid and carbon dioxide water attacks metal and is detrimental to casing and plumbing systems.

The quality of water is not perfect in every situation in the County. Some of the problems include excessive iron concentration, high color, low ph and high concentration of carbon dioxide. These problems are not unique to any particular aquifer or aquifers.

Water with an iron concentration of above 0.3 mg/1 is the most persistent complaint. A large number of wells in the northern part of the County are equipped with air compressor type pumps. The injected air reduces the iron content or aerates a part of the iron content of the water. The Cockfield aquifer in the northern half of the County generally yields water containing excessive iron. Aeration is the usual treatment of water containing high iron concentration (up to 1 or 2 mg/1) and is generally used on municipal and rural water system wells.

The Kosciusko aquifer generally yields water with iron concentrations lower than 0.3 mg/1. The Meridian Sand and Wilcox aquifers are thought to be low in iron content across the northern part of the County. The Forset Hill aquifer usually does not contain above 0.3 mg/1 iron in the central part of the County.

Table 3.—Chemical analyses of water from wells in Rankin County.

Analyses by Mississippi State Board of Health
Milligram per liter, Mg/l

Well No.	Depth	Water Bearing Unit	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
A1	502	Cockfield	1966		2.0						15			54	6.1	
A4	382	Cockfield	1969	3.2	2.0	67.30	11.66	42.25	4.25	79.83	34	0	356.13	216	7.2	
A4	1,460	Winona	1966	12	.6	2	.7	484*		22.8	9	3.6	1157		8.3	
C1	1,202	Kosciusko	1970	7.2	.5	0	0	80.02	1.25	7.74	7	0	190.85	0	7.5	82
F2	952	Kosciusko	1970	9.6	0	0		88.78	.5	7.08	7	0	217.93	0	8.3	84
G2	772	Cockfield	1969	4.0	.75	2.40	0	81.63	1.75	20.08	14	0	210.89	6	7.0	78
J2	1,002	Kosciusko	1963	2.8	Trace	0	0	83.03*		6.91	5		197.77	0	8.1	82
J6	864	Kosciusko	1959	3.2	.13	.1	.1	84	1.7	6.0	3	0	240	0	8.3	80+
J9	592	Cockfield	1956		1.1	1.3	3.5	110	5.7	90	42	.3	386	47	8.3	74+
J10	561	Cockfield	1970		1.5						22			50	7.3	
K1	838	Cockfield	1970	4.8	0	0	0	166.64	.30	63.04	43	0	419.13	0	8.5	85
K19	861	Kosciusko	1967		.4						50			5	8.6	86
K27	1,142	Kosciusko	1968		Trace									0	8.8	89
K28	874	Kosciusko	1968		Trace						9			0	8.8	89
K29	984	Kosciusko	1968		Trace						9			Trace	8.7	
K36	623	Cockfield	1963	7.2	0	0	0	118.29*		32.92	24	.2	295.85	0	8.4	80
K37	782	Kosciusko	1960	6.4	0	0	0	105.11*		10.37	5	.3	240.29	0	8.6	84
K39		Wilcox	1958	12	.21	1.7	.3	575	14	1330	51	3.0	1340	5	8.2	89+
K40	1,180	Wilcox	1956		.17	2.0	.5	588	15	1410	90	5.0	1470	7	8.2	80+
K43	828	Cockfield	1962		.1	4.0					39			10	8.4	
L8	786	Cockfield	1970	8.8	.4	0	0	127.57	.80	49.5	25	0	404.87	0	8.3	80
L13	1,283	Kosciusko			.3	1.36	.5							5	8.5	

Table 3.—Chemical analyses of water from wells in Rankin County. (Continued)

Well No.	Depth	Water Bearing Unit	Date Analyzed	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Total Dissolved Solids	Total Hardness as $CaCO_3$	pH	Temperature (°F)
						Analyses by Mississippi State Board of Health Milligram per liter, Mg/l										
L18	860	Cockfield	1958	16	.34	1.8	1.2	114	3.6	63	36	.2	355	10	7.8	+
M5	871	Cockfield	1969		.4	0	0	88.80	0	0	11	0.3	213.79	Trace	8.1	80
O3	1,084	Cockfield	1968		.1						41	.2			8.5	85
O11	951	Kosciusko	1960	27.2	0	0	0	172.04*		4.77	7	.6	427.89	0	8.6	82
P1	955	Cockfield	1967	6.4	.1	1.20	.24	131.00*		40.66	40	.4	330.54	4	8.5	84
Q18	405	Forest Hill	1959	5.5	2.2	2.4	1.2	135	3.1	7.8	1	1.0	385	11	8.4	72+
V26	297	Catahoula	1968	10.4	.3	2.80	1.94	99.48*		77.86	20	0	285.71	15	6.5	65
X3	1,168	Kosciusko	1967	4.8	0	0	0	80.00*		0	7	.2	190.24	0	8.4	86

* Sodium and Potassium as Na + USGS Analyses

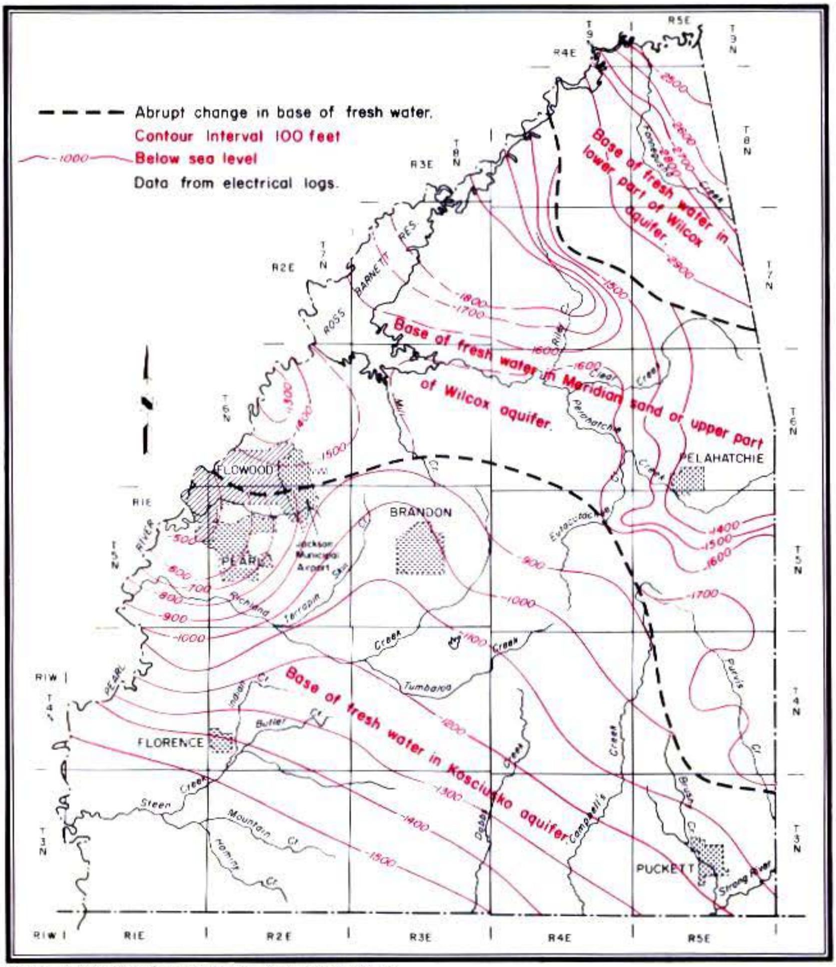

Figure 1.--Configuration of the base of fresh-water in Rankin County.

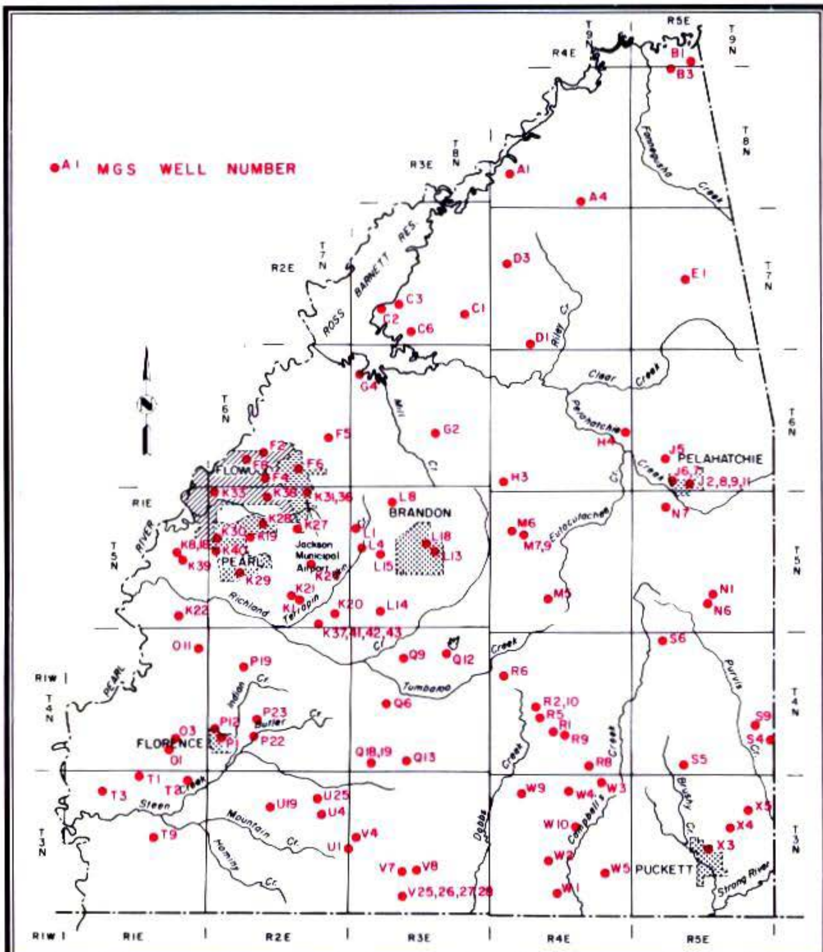

Figure 2.–Location of wells in Rankin County.

Water from the Cockfield and Kosciusko aquifers is colored to varying degrees in the western and southern part of the County. Color units range from low (less than 10) to highly colored (greater than 70) in this area. The color is derived from organic material in the aquifer. Color may be removed from water by treating with the chemical "alum" but the cost is prohibitive in most instances.

There is very little ground-water pollution in Rankin County. The few recorded instances of pollution is related to man's activity in a local area. Organic pollution may be present in shallow aquifers in the vicinity of sewage outfalls. Oil field activity may have polluted some of the shallow aquifers in a local area.

High pressure gas polluted several fresh-water aquifers in the vicinity of a wild gas well in southern Rankin County (Sec. 28, T. 3 N., R. 3 E.). The No. 1 Cox well was later closed by a relief well and the source of pollution ended.

Water Levels

Water levels range from flowing wells to about 300 feet below the surface. Most of the wells have water levels within 100 feet of the surface. The deeper water levels are located at high elevations and in areas of heavy pumpage. Flowing wells are reported along the Pearl River in the southern part of Rankin County.

Water levels are declining at the rate of less than 1 foot to 2 feet per year in the heavily pumped aquifers. The water level has declined 8 feet in 15 years according to records from an observation well (Fig. 3) in the Cockfield aquifer at Pelahatchie.

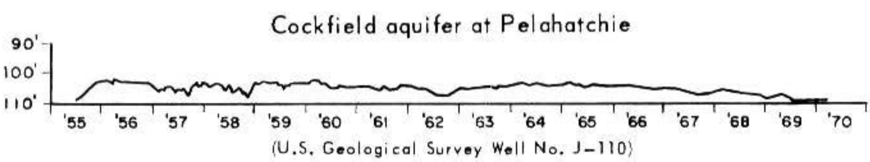

Figure 3.—Hydrograph of observation well J-8 at Pelahatchie.

Water levels are thought to be declining 1 to 2 feet per year in the heavily pumped areas of Flowood, Pearl, Whitfield, Plain and Brandon.

Deeper than necessary pumping levels increase the pumping costs to well owners. Minimum spacing of wells is often practiced whereas greater distances would lessen pumping costs and save money over the years. A fully efficient well is one in which the pumping water level inside the well is the same as the water level in the aquifer immediately outside the well. An increase in specific capacity and a decrease in pumping depths is the reward of more efficient wells.

Test Drilling

The Mississippi Geological Survey drilled a total of 34 test holes in the present investigation of the mineral resources of Rankin County. The locations are shown on Figure 6 (Baughman). A number of the test holes were drilled to delineate the aquifers in the County. All of the test holes were electrically logged with the exception of the shallow core holes. Samples of cuttings were catalogued and stored in the Survey Sample Library for future reference.

A number of holes were drilled in the northern part of the County as very little information was available on aquifer thickness. Test holes were drilled in other parts of the County where information was needed.

Test hole AG-39 (J4) was drilled north of Pelahatchie in Sec. 17, T. 6 N., R. 5 E. The log indicated the following Cockfield sands: 288-306, 526-550, 556-574 feet. A thick sand was indicated from 862 to 985 feet and from 992 to 1032 feet in the Kosciusko aquifer. The lower sand was not completely penetrated at total depth. The thick sand in the Kosciusko is capable of supplying large amounts of water.

Test hole AG-43 (B1) is located in Sec. 5, T. 8 N., R. 5 E., near the community of Ratliff. The purpose of this test hole was to drill to the base of the Kosciusko which was located at 856 feet. The following sands were indicated in the test hole: 110-154, 283-312, 334-362, 376-404 (Cockfield aquifer), 640-720, and 760-856 feet (Kosciusko aquifer). Wells yielding large amounts of water are possible from the Kosciusko aquifer.

Aquifer Tests

Twenty-one aquifer tests were run on wells in Rankin County. Tests were conducted on wells completed in four aqui-

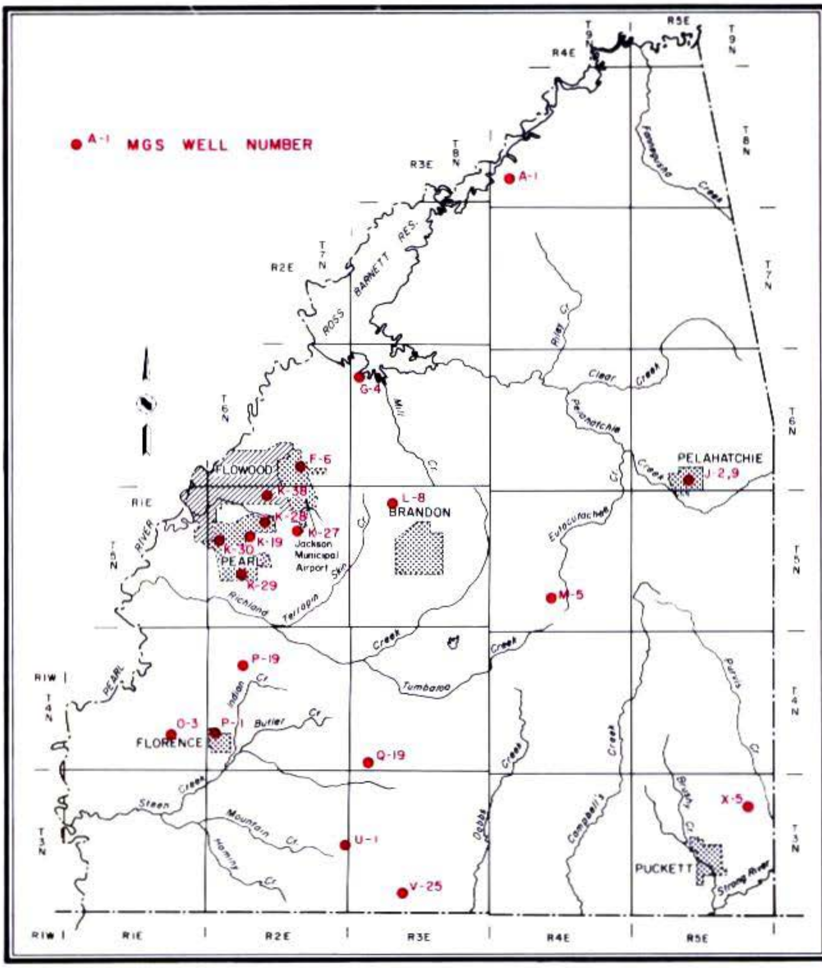

Figure 4.–Location of pumping tests.

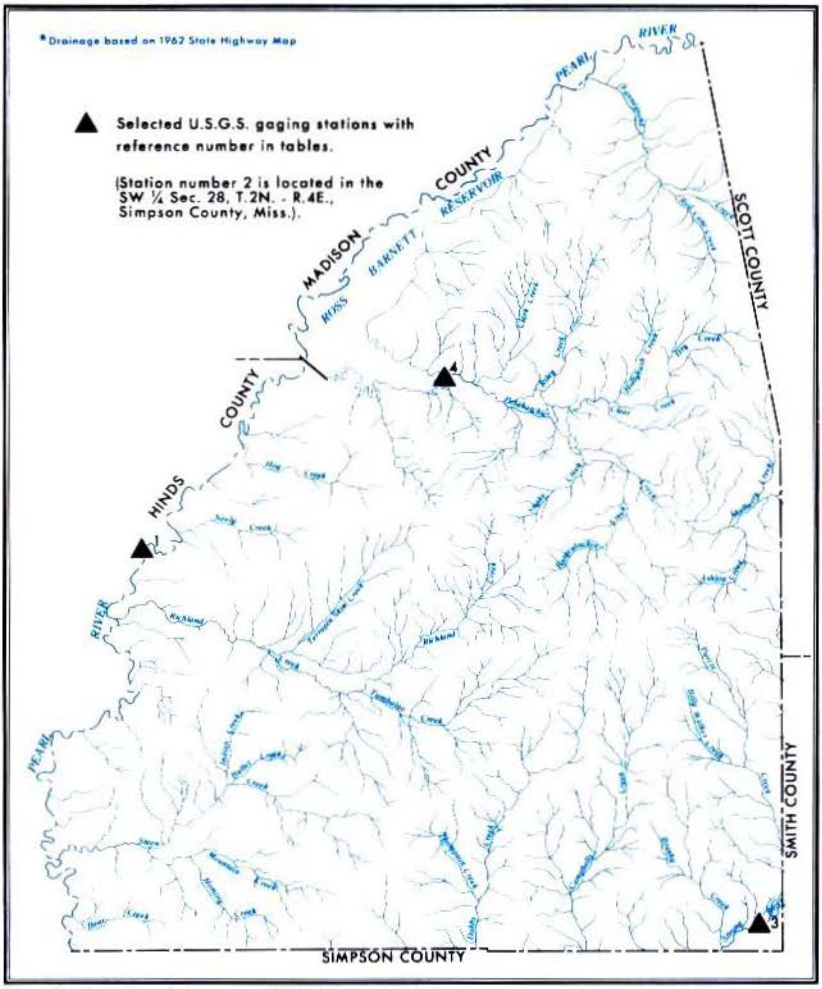

Figure 5. - Location of streams and U.S.G.S. gaging stations.

fer systems. The data from aquifer tests are an important tool in analyzing the ability of an aquifer to yield water to wells. Aquifer tests are usually run after the well or test well is completed.

An explanation of the various terms used in pumping test results are summarized below: Transmissibility (T) is the rate of flow of water through a vertical strip of the aquifer one foot wide under the unit hydraulic gradient. Units are gallons per day per foot. Transmissibility is the index of an aquifer's ability to transmit water.

Permeability (P) is the rate of flow of water through a cross section 1 foot of an aquifer under a hydraulic gradient of 1 foot per foot. Permeability units are gallons per day per square foot. It is usually calculated by dividing transmissibility (analysis of a pumping test) by the aquifer thickness.

Coefficient of storage (S) is the volume of water an aquifer releases from storage per unit of surface area to the unit decline in the component of head normal to that surface. The storage coefficient ranges from about 0.00001 to about 0.001 for artesian aquifers and ranges from about 0.05 to 0.3 for water table aquifers.

Specific capacity is the gallons per minute produced for each foot of decline in the water level in the well. Specific capacity is usually calculated for a one-day period.

Table 4 is a tabulation of the various tests and Figure 4 is a map showing the location of the tests. Most of the aquifer tests were run on large industrial or municipal type wells completed in the Kosciusko and Cockfield aquifers. One test was run on a well completed in the Catahoula aquifer. Two tests were available on wells completed in the Forest Hill aquifer.

The results of the tests indicate that the hydraulic characteristics of the aquifers change rapidly across the County. Most of the results indicate local information rather than general information.

Table 4.—Aquifer and well characteristics determined from pumping tests.

Well No.	Owner	Depth of Well (Ft.)	Aquifer Thickness (Ft.)	Hydraulic Coefficients: Transmissibility (gpd/ft.)	Hydraulic Coefficients: Permeability (gpd/ft²)	Hydraulic Coefficients: Storage	Specific Capacity (gpm/ft. at the end of 24 hours)	Remarks
				CATAHOULA AQUIFER				
V25	Piney Woods School	341	23	2,400	104	--	1.6	
				FOREST HILL AQUIFER				
Q19	McLaurin School	416	35	900	26	.0001	--	USGS Test
U1	Star Water Co.	679	50	12,000	240	.003	6.	USGS Test
				COCKFIELD AQUIFER				
A1	Pearl River Valley Water Supply District	502	32	33,000	1,031	--	6.5	
F6	Jackson Municipal Airport	618	58	22,000	379	--	8.8	USGS Test
G4	Pearl River Valley Water Supply District	626	91	56,000	615	--	12.8	
J9	Town of Pelahatchie	592	74	13,000	176	.0008	--	USGS Test
K38	United Gas Compressor Station	458	113	41,000	363	--	5.6	USGS Test
L8	Taylorsville Water Assn.	786	38	40,000	1,053	--	8.3	
M5	Girl Scouts of America, Camp Wahi	871	64	2,400	37	--	1.1	
O3	Ran-Co Water Co.	1,084	54	9,000	167	--	3.0	
O3	Ran-Co Water Co.	1,006	76	3,000	39	--	.2	
P1	Town of Florence	955	57	20,000	541	--	6.2	
P19	Southern Rankin Co. Water Assn.	948	35	22,000	629	--	3.3	
				KOSCIUSKO AQUIFER				
J2	Town of Pelahatchie	1,000	59	90,000	1,525	--	30.10	
K19	Metropolitan Water Co.	861	88	19,000	216	--	9.8	
K27	Metropolitan Water Co.	1,142	75	59,000	787	--	16.6	
K28	Metropolitan Water Co.	874	90	30,000	333	--	13.9	
K29	Metropolitan Water Co.	984	94	76,000	809	--	16.5	
K30	Russum Motel	636	70	42,000	600	--	.9	
X5	Union Water Assn.	1,238	80	154,000	1,925	--	10.9	

Aquifer tests were not run on the Wilcox or Meridian sand aquifers due to the lack of wells in these aquifers.

The Kosciusko aquifer is capable of yielding large volumes of water to properly developed wells. Results of pumping tests indicate that up to 2,000 gpm may be obtained from this aquifer at some locations. Transmissibility values range from 19,000 to 154,000 gpd per foot and the permeability ranges from 216 to 1,925 gpd per square foot. The aquifer appears to be more permeable in the eastern part of the County according to the electrical logs and pumping tests. The Kosciusko aquifer should be considered for large capacity wells throughout most of the County.

The Cockfield aquifer is capable of supplying large volumes of water to wells at some locations. Small to medium sized wells are possible throughout most of the County in the Cockfield aquifer. Transmissibility values range from 2,400 to 56,000 gpd per square foot. The Cockfield aquifer is thicker and coarser in the northern half of Rankin County, increasing the probability of wells yielding large volumes of water.

The Forest Hill aquifer is a poor aquifer for developing large wells. Available pumping tests and electrical logs indicate a poor aquifer in the potential use area. Transmissibility values range from 100 to about 1,500 gpd per foot. Exceptions may occur but this would be only isolated cases. Another aquifer would have to be chosen if large volumes of water is required. Wells capable of yielding up to 200 gpm may be possible at some locations in south-central Rankin County.

The Catahoula aquifer is a poor to fair aquifer in the southern part of the County. The aquifer is typically lenticular and lithologic changes occur in short distances. Wells yielding up to 300 gpm may be possible at certain locations. Transmissibility values are expected to range from 500 to 3,500 gpm per foot. The aquifer is generally poor for developing large capacity wells.

AQUIFERS

Wilcox Aquifer (lower)

The lower part of the Wilcox is a potentially important aquifer in the northern third of Rankin County. Fresh water is available to a depth of 2,500 to 2,900 feet below sea level across this area (Fig. 1).

Electrical logs of oil tests indicate individual sand thicknesses of up to 200 feet. The sands have an average thickness of 75 to 100 feet. The thicker sands are developed in T. 8 N., R. 5 E., and thin to the south and west.

There are no known wells completed in the lower part of the Wilcox in northern Rankin County. The availability of the shallower Kosciusko and Cockfield aquifers and the depth of the Wilcox has limited well development in this aquifer. This rural area is practically undeveloped and most of the land is in forests.

Flowing wells may be possible near the Barnett Reservoir and Fannegusha Creek. The water level should be within 100 feet of the surface within the general area.

Quality of Water

The quality of water is predicted to be good for most general purposes. Colored water may be present at isolated locations but should not be a regional problem. The water is probably a soft, sodium-bicarbonate type water with a high ph and low iron content.

Wilcox Aquifer

(upper)

The upper zone of the Wilcox is a potential aquifer in the northern part of Rankin County. Thick sands in the upper zone of the Wilcox are developed at a number of locations. Sand thicknesses range from 50 to 240 feet across the area.

Fresh water is available across the area from 1,300 to 1,700 feet below sea level (Fig. 1). At a number of locations there is no distinct break between the Meridian sand and a thick sand in the upper part of the Wilcox. Other sands are usually present in the upper zone of the Wilcox aquifer. Most of these sands are capable of yielding large quantities of water to wells provided they are properly developed and constructed.

There are no known wells completed in this aquifer. Depth of the aquifer, lack of economic development, and availability of other aquifers has limited well development in the aquifer.

Water levels would probably be similar to the water levels in the lower part of the Wilcox. The water levels may not be quite as high as in the lower Wilcox. Wells would probably flow in the deeper stream valleys.

Quality of Water

The water of the upper Wilcox should be similar in quality to the lower Wilcox.

Meridian Sand Aquifer

The Meridian sand is a potential aquifer in the northern part of the County. The base of fresh water is from less than 1,800 feet below sea level in north central Rankin County to 1,300 feet below sea level slightly north of Flowood. The aquifer is considerably shallower in the Flowood area due to the influence of the Jackson Dome. The Meridian sand is not developed as a good aquifer at every location.

The thickness of the Meridian is from 100 to 150 feet across most of north Rankin County. Most of the unit is composed of sand with some thin clay layers. At some locations the Meridian sand is connected to a thick sand in the upper part of the Wilcox aquifer and separation of the two units is difficult.

Well development in the Meridian has generally been lacking in Rankin County. Depth of the aquifer and availability of shallower aquifers has restricted the use of this aquifer. A few wells may have been completed in the Meridian in the vicinity of Flowood. The top of the Meridian is at 1,470 feet in the north (Sec. 15. T. 8 N., R. 4 E.), and is at 1,670 feet near Pelahatchie (Sec. 31, T. 6 N., R. 5 E.).

Water levels would be high and would probably flow in the deeper stream valleys of the Pearl River and Fannegusha Creek. The water level should be above 100 feet in north Rankin County.

Quality of Water

The quality of water is considered to be fair to good from the Meridian. The color and mineralization may be high at some locations. High concentrations of fluoride and color are a possibility at some locations. A well for the town of Morton recently tested the Meridian and the color was high (about 70 units). The aquifer appears to be moderately mineralized according to the electrical logs in the area.

Kosciusko Aquifer

The Kosciusko (Sparta) is a very important aquifer in Rankin County supplying a large portion of the ground-water needs across the central section of the County. Wells completed in the Kosciusko aquifer furnish water for Brandon, Flowood, Pearl, Pelahatchie, Plain and several community water systems. A number of industrial and domestic wells are screened in the Kosciusko in the area. A few wells are completed in the aquifer in the north and southeastern parts of the County. Two community wells in the vicinity of Puckett are completed in the Kosciusko. The availability of shallower aquifers and the lack of industrial development has limited the wells in the southern part of the County.

Thickness of the unit ranges from 360 feet in the north to 532 feet near Piney Woods in the south. The thickness generally increases from the north to the southwest. Individual sands may be from quite thin to several hundred feet. Thick sands are usually located near the base of the formation but may be present at any horizon.

The top of the Kosciusko is at 500 feet at Ratliff in the north to 1,368 feet at Piney Woods in the south. The top of the Kosciusko is at 740 feet at Pelahatchie in the east and 570 feet at Pearl (K19) in the west. The shallow depth of the Kosciusko is due to the effect of the Jackson Dome near Flowood and Pearl.

Yields of wells vary from small to above 600 gpm from this aquifer. Table 4 includes data from a number of wells screened in the Kosciusko. Yields of several thousand gallons per minute are possible from properly constructed wells at a number of locations. Yields of wells reflect need at a particular time and should not be used to determine the quantity of water available from an aquifer. Aquifer tests are used to help determine availability at a particular location.

The Kosciusko aquifer is composed of beds of sand and clay. Most of the sand is medium- to coarse-grained and contains some lignite in places. Generally, the Kosciusko sand is coarser than the Cockfield sand. This is particularly true at most places in the northern portion of the County.

Water levels are fairly deep in the vicinity of Brandon and the area south of Pelahatchie. One of the deeper measured water levels was 346 feet below the ground in the A. C. L. Water Association Well (S6). A number of wells have deep water levels in the vicinity of heavy pumpage in a small geographic area. Most of the water levels are below 100 feet in the deeper stream valleys and the average depth would probably be near 200-225 feet. One disadvantage in developing Kosciusko wells is the increase in pumping cost for deep water levels.

Quality of Water

The quality of water is good for most purposes from the Kosciusko. Most of the water is used without any treatment and the quality is acceptable for most uses. The water is generally soft, calcium or sodium-bicarbonate type with low to medium mineralization. The ph of the water is generally above 8.0 in central Rankin County. Table 3 includes a number of analyses of water from the Kosciusko aquifer.

Colored water of varying degrees is a characteristic of the water at some locations. Highly colored water was reported in a test hole for the Natchez Trace Parkway, T. 7 N., R. 2 E., on the west side of the Pearl River. A domestic well (B1) completed in the Kosciusko aquifer yields white water in the vicinity of Ratliff. There is a tendency to condemn an entire area because of one well that yields colored water. A number of the wells in the Flowood, Pearl and Plain area yield water that is slightly colored to dark colored.

Excessive iron content may be a problem in some wells particularly in the northern part of the County.

Cockfield Aquifer

The Cockfield aquifer is an important source of water supply in Rankin County. Numerous domestic, industrial and some municipal wells utilize the Cockfield aquifer throughout the County. This aquifer is the most widely used in Rankin County.

The top of the Cockfield is 80 feet at Ratliff in the north and is 910 feet near Piney Woods in the south. The top of the Cockfield is 320 feet at Pelahatchie and is 142 feet at Pearl (K19). The Cockfield is slightly below the surface at Flowood. The shallow depth in the Flowood area reflects the uplift of the

Jackson Dome. The structure map compiled by Baughman may be used to locate the top of the Cockfield at a particular location.

Thickness of the entire unit averages 300-350 feet across the County. Individual sands may be 70-100 feet in thickness. The sands are present at various positions within the unit but generally are thicker near the base. The entire thickness should be penetrated before deciding on which zone to screen.

The Cockfield aquifer is composed of sand, sandy clay, and clay. The sand is generally fine-grained except at some locations in the north. Medium- to coarse-grained sand was collected from test hole AG-38, north of Pelahatchie. The sand is typically fine-grained in the south and southeastern part of Rankin County. The formation includes beds of lignite and the sand contains disseminated lignite at particular locations.

Well yields range up to about 1,000 gpm from this aquifer. Wells capable of yielding 1,000 to 1,500 gpm are possible at a number of locations in the north and central part of the County. Smaller yields are common in the southern part and the aquifer is poor at a number of locations. A well (P1) completed in the Cockfield at Florence yields 195 gpm and is considered to be a high yielding well for that area. Well yields of 100-300 gpm are typical from Cockfield wells in the south. Larger yields may be possible at some locations. Recently, two industrial wells were completed in the Cockfield aquifer near Thomasville. The wells had a specific capacity of 10 gpm per foot or better.

Water levels range from less than 100 feet to more than 325 feet below ground surface. Most water levels are below 100 feet and are deeper at higher elevations. A well at Camp Wahi (M5) had a water level in 1969 of 326 feet below ground level. The shallower water levels would be in the deeper stream valleys.

Quality of Water

The water from the Cockfield aquifer is of good quality for general use. Minor water treatment is required at some locations in the northern part of the County. Excessive iron and low ph is the common water quality complaint across this area.

Most of the water is soft, calcium or sodium-bicarbonate with low to moderate dissolved solids. The ph varies from low acidic near the outcrop to high ph in the central and southern part of Rankin County.

Numerous domestic wells use air compressors for pumping equipment. The water is aerated to a certain degree by the air and the quality is improved in most instances. This treatment would be ineffective in large yielding wells and if an excessive concentration of iron is present. A booster pump has to be employed to deliver the water into the system.

Colored water of varying degrees is present in the central and southern part of Rankin County.

Forest Hill Aquifer

The Forest Hill is a potential aquifer in the south half of Rankin County. The formation outcrops across the central part of the County.

The Forest Hill is composed of silty sand, carbonaceous clay and thin beds of lignite. Most of the sand is a dark gray and contains disseminated lignite.

Thickness of the unit ranges from 65 to 210 feet and individual sand beds may be 50 feet thick at some locations. The sand is generally very fine- to fine-grained.

Domestic and small community wells are completed in this aquifer across the southern part of the County. Several wells utilize this aquifer in the vicinity of Florence.

Well yields are generally low from this aquifer. Yields of up to 200 gpm are possible at some locations. Depth of the aquifer varies according to location but most wells are less than 500 feet deep.

Quality of Water

The quality of water is fair to good. The water is typically hard near the outcrop area and soft down the dip. Excessive amounts of fluoride and color are occasionally problems associated with water from the Forest Hill.

Catahoula Aquifer

The Catahoula formation outcrops in the southern part of Rankin County (Townships 3 and 4). Generally, the Catahoula is not an important aquifer. One school supply well and a number of local domestic wells are completed in the aquifer.

The unit is composed of fine- to coarse-grained sand and clay layers. The sands are lenticular and irregular. Thickness of sands range from thin to 50-60 feet.

Large yielding wells are generally not possible from the Catahoula aquifer. The water supply for Piney Woods Country Life School is from this aquifer and wells are reported to yield up to 199 gpm. The school's wells range from 295 to 341 feet deep and the water levels range from 98 feet to 171 feet below ground surface.

Water levels are expected to be generally low and the amount of available drawdown is limited. A few wells may flow at low elevations in the Pearl River Valley.

Quality of Water

The quality of water is fair to good from this aquifer. The water is generally moderately hard near the outcrop area to fairly soft near the Simpson County boundary. Practically all of the water from the Catahoula aquifer has a low ph and is corrosive to metal.

Excessive iron concentration may be a problem at some locations. Minor treatment would be suggested for municipal use. Treatment should consist of aeration and ph adjustment. The water at Piney Woods is of good quality except for low ph.

SURFACE WATER

Introduction

Surface water is an important natural resource in Rankin County. The largest surface water potentials in the County are the Pearl and Strong Rivers. Most of the other streams are small and have flows insufficient to supply a large user. Storage facilities are necessary on any of the streams except the Pearl River to maintain an adequate supply of water. The Ross Barnett Reservoir on the Pearl River is available for recreation and related use.

Availability

Large quantities of surface water are available at some locations in Rankin County. The Pearl and Strong Rivers are the largest streams in the County. The Pearl River forms the western boundary of the County and the Ross Barnett Reservoir is located in the northwestern part of the County. The Strong River flows across the southeastern corner of the County.

Numerous smaller streams are present and form an intricate dendritic drainage system. The major drainage into Pearl River from within Rankin County include Fannegusha, Pelahatchie, Richland and Steen Creek (Fig. 5). Streams draining into the Strong River from within the County include Dobbs, Campbell, Brushy and Purvis Creeks and some smaller unnamed streams.

A large amount of water is available from the Pearl River during most of the year. The average discharge of the Pearl River at Jackson is 3,739 cfs (cubic feet per second) based on records of 52 years[3] (Table 5). The minimum daily discharge was 45 cfs on October 5, 1956 and September 18, 1962[4] (regulated to a degree). The maximum discharge was 85,000 cfs on March 31, 1902 and the minimum daily discharge for the water year October 1968 to September 1969 was 91 cfs in August 1969[5]. The maximum daily discharge for the water year October 1968 to September 1969 was 44,100 cfs in April 1969[6].

The Strong River is the major surface water supply in the southeastern part of the County. Stream flow records are available at D'Lo 9 to 10 miles downstream from the Rankin County boundary. The stream flow of the Strong River would probably be 10 to 20 percent less in Rankin County due to the contribution of various tributaries in Simpson County.

The average discharge of the Strong River was 538 cfs for 41 years of record (Table 5). The minimum discharge recorded was 12 cfs on September 1, 1954 and September 20, 1956, and the maximum discharge recorded was 24,800 cfs on January 7, 1950[7]. The minimum discharge was 25 cfs on October 4-6, August 17, 1968, and the maximum discharge was 6,320 cfs on April 19, 1969 during the 1969 water year[8].

Stream flow is relatively low in the smaller streams during much of the year. Most of the streams have small drainage areas and flow depends on the amount of precipitation in the immediate drainage basin. No significant sustained flow has been recorded on any of the minor streams. Storage facilities on the

Table 5.—Summary of data from stream-gaging stations.

Ref. No.	Stream and Location	Drainage area (sq. mi.)	Records Available	Average Discharge: Years	Average Discharge: (cfs)	Minimum Daily Discharge: (cfs)	Minimum Daily Discharge: Date	Maximum Discharge: (cfs)	Maximum Discharge: Date	Remarks
1	Pearl River at Jackson *	3,100	1901-13 1928-69	52	3,739	45	Oct. 5, 1956	85,000	Mar. 31, 1902	30 cfs diverted upstream for municipal supply
2	Strong River at D'Lo*	429	1928-69	41	538	12	Sept. 1, 1954	24,800	Jan. 7, 1950	
4	Pelahatchie Creek near Fannin**	205	1950-60	10	216	0	Several times	13,500	Apr. 13, 1955	Gage site indunated by Ross Barnett Reservoir-1965

Average discharge in cubic feet per second (cfs)

** Geological Survey Water-Supply Paper 1724, Compilation of Records of Surface Waters of the United States, October 1950 to September 1960, page 438.

* Records from U. S. Geological Survey Water Resources Data for Mississippi 1964-68

smaller streams could produce a dependable supply of surface water.

Richland Creek, near Plain, has been leveed and widened to store excessive runoff from the Pearl River. The flow of the Creek is reversed during the time it is used for storage.

Pearl River Reservoir

The Ross Barnett Reservoir on the Pearl River was constructed for recreational purposes and as a water supply source. The reservoir is located in the northern part of Rankin County. The reservoir was filled to its normal level on January 1, 1965. Local monies were used to finance the construction of the Reservoir. The Reservoir is a relatively shallow lake and the average depth is probably 8 to 10 feet. The Reservoir has a storage capacity of about 31,000 acres and a potential storage capacity of about 305,000 acre-feet of water.

A slight amount of streamflow regulation results from the Reservoir although the structure was not designed for flood control.

Quality of Water

The quality of the surface water is good from the natural streams. Analyses are indicators of chemical quality of a stream at a given flow and deviations are common where pollution is involved. A relationship has been established between some constituents and the discharge of a stream. Total dissolved solids and silica content tend to increase during low flow when ground water is contributing most of the flow.

Available analyses of surface water is included in Table 6. An analyses of high and low flow were chosen to represent varying conditions of streamflow.

Individual parameters of use vary widely according to need and product. An individual user should collect several samples of water for analyses at various stages of streamflow. These results should give a general range for the various constituents. Unusual conditions such as a drought or floods may slightly alter the water chemistry. Turbitity and color usually increase during high flows.

Figure 6.—Chemical analyses of water from streams.

(Analytical results in parts per million, except as indicated)

(Analyses by U. S. Geological Survey)

Reference No.	Date of Collection	Discharge[a] (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved Solids	Hardness		Specific conductance (micro-mhos at 25°C)	pH	Color
															Residue on evaporation at 180°C	Calcium, Magnesium	Noncarbonate			
										Pearl River at Jackson*										
1	Mar. 23, 1964	23,800		5.9	0.12	2.5	1.9	2.3	1.6	15	4.2	2.5	0.2	0.6	29	14	2	47	6.8	100
	Aug. 3, 1964	560		6.3	.10	4.5	2.6	2.1	1.9	24	4.8	3.1	.1	.3	38	22	2	67	6.4	30
										Strong River near Puckett*										
3	Feb. 8, 1967	784		4.9	.20	15	1.1	5.3	4.0	28	20	8.0	.2	1.3	90	42	19	125	6.0	50
	Oct. 24, 1967	5.4		7.8	.25	11	2.1	5.6	3.4	41	5.6	8.1	0	.1	74	36	2	106	6.5	30

* Records from U. S. Geological Survey Water Resources Data for Mississippi 1964-68

Organic pollution is a serious problem in certain reaches of the Pearl River. Studies indicate that the Pearl River south of Jackson is highly polluted and unfit for most purposes. The City of Jackson (1971) is currently planning a sewage treatment plant which will alleviate some of the pollution.

Most of the small towns in Rankin County utilize sewage lagoons. Some of the industries and private homes may dump raw sewage into the creeks in a local area. This problem should be solved before considering any type of dam or storage facility on a stream. The Air and Water Pollution Control Commission is currently working with municipalities, industries and others in seeking compliance with the rules and regulations adopted by the Commission.

Flood Hazard

All of the streams and rivers are subject to flooding unless the area is protected by levees or dikes. The Flowood area along the Pearl River has a system of levees and a diversionary canal for flood protection.

Flood history should be considered before constructing any type of structure in the flood plain or near any stream. A history of past floods is of value in designing engineering structures such as bridges, levees, dams and in utilizing the full potential of surface water resources.

Floods may occur at any time during periods of excessive rainfall. Generally, floods coincide with the heavy rainfall in late winter and early spring. Record floods have occurred in practically every month of the year. Rivers having large drainage areas are subject to floods from upstream runoff. Smaller streams respond rapidly to rainfall within the drainage basin.

Generally, the majority of the rainfall occurs in the winter and spring months, with the Pearl River flooding at corresponding times. According to local residents the largest recorded flood was in April 1902, and the discharge at Jackson was 80,800 cfs[9]. The upstream Ross Barnett Reservoir has a tendency to delay and semi-regulate the flow of the Pearl. There is excessive rainfall in the large Pearl River drainage area almost every year and flooding results.

The Strong River is subject to flooding in the southeastern part of Rankin County. Severe floods occurred on the Strong

River in 1930 and 1950. A record discharge of 24,800 cfs occurred on January 7, 1950[10]. The 1930 flood has been estimated to be similar to the 1950 flood.

Records are available on the streamflow on Pelahatchie Creek from 1951 to 1958 (Table 5). An unusual flood occurred in January 1950, and the discharge was estimated to be 27,000 cfs[11]. A large part of Pelahatchie Creek near the mouth is now a part of the Ross Barnett Reservoir.

Conclusions

An abundance of surface and ground water is available for use in Rankin County. A small part of the available water is currently being used. Some areas of the County have a larger share of the water resources than others.

Ground water provides most of the water needs for industrial, municipal and individual water supplies in Rankin County. Practically each area is underlain by multiple aquifers capable of supplying large volumes of water to wells. Ground-water development is expected to increase as the population and industrialization increases in the future.

The majority of ground-water pumpage is from the Cockfield and Kosciusko aquifers in the central part of the County. The Cockfield is probably the most widely used aquifer. Several deep aquifers in the northern third of the County are unused and the Kosciusko aqufier is practically unused in the southern part. Availability of shallow aquifers has limited the use of deep aquifers at most locations.

Quality of water is generally good and meets the requirements for general use. Variations in quality range from a low acid, calcium-bicarbonate type near the outcrop to alkaline, sodium-bicarbonate type down the dip. The problems associated with quality may include excessive iron, excessive color, low ph and high carbon dioxide content. Most of these problems may be corrected with minor treatment or selecting another aquifer that does contain good quality water. The majority of the water is good and is used without treatment.

A large supply of surface water is available for use in Rankin County. The largest streams in the County are the Pearl and

Strong Rivers. Large quantities of water are available from the Pearl River without storage. The City of Jackson pumps about 30 cfs per day from the Pearl River for municipal use.

Many small streams are located throughout the County. The base flow of most of the minor streams is zero or near zero during part of the year. Storage facilities would be necessary to provide any type of sustained draft of water. Low flows are probably the greatest hinderance to developing surface water supplies for industry. Flooding is a problem on some of the streams but is usually confined to the immediate stream valley.

Large industrial development in a small area will need a dependable supply of surface water. The smaller streams usually contain the better quality water but the volume is limited without storage.

Pollution is a serious problem on the Pearl River below Jackson. Some of the smaller streams are polluted to various degrees. Man made pollution is a problem to consider in selecting a surface water source.

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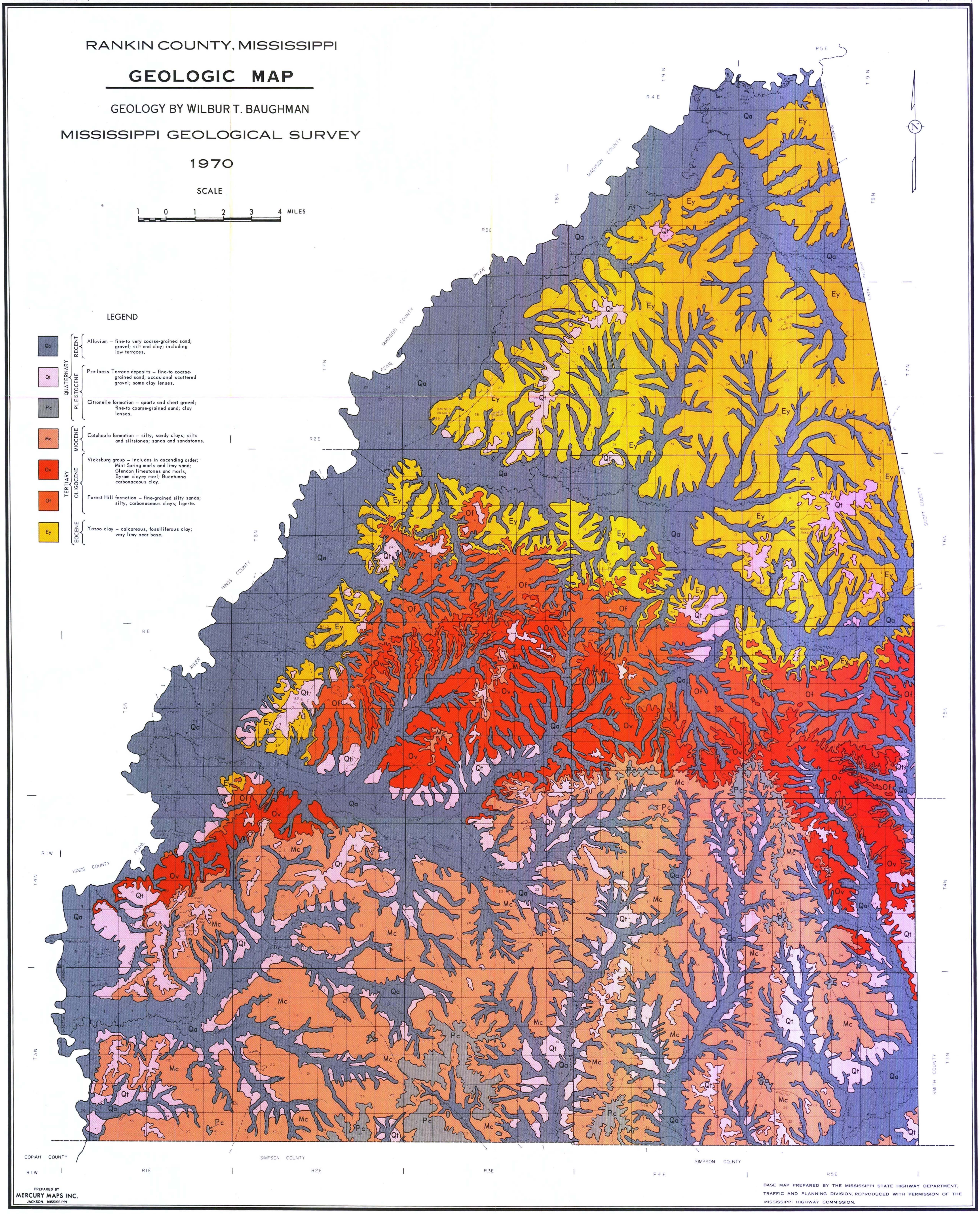
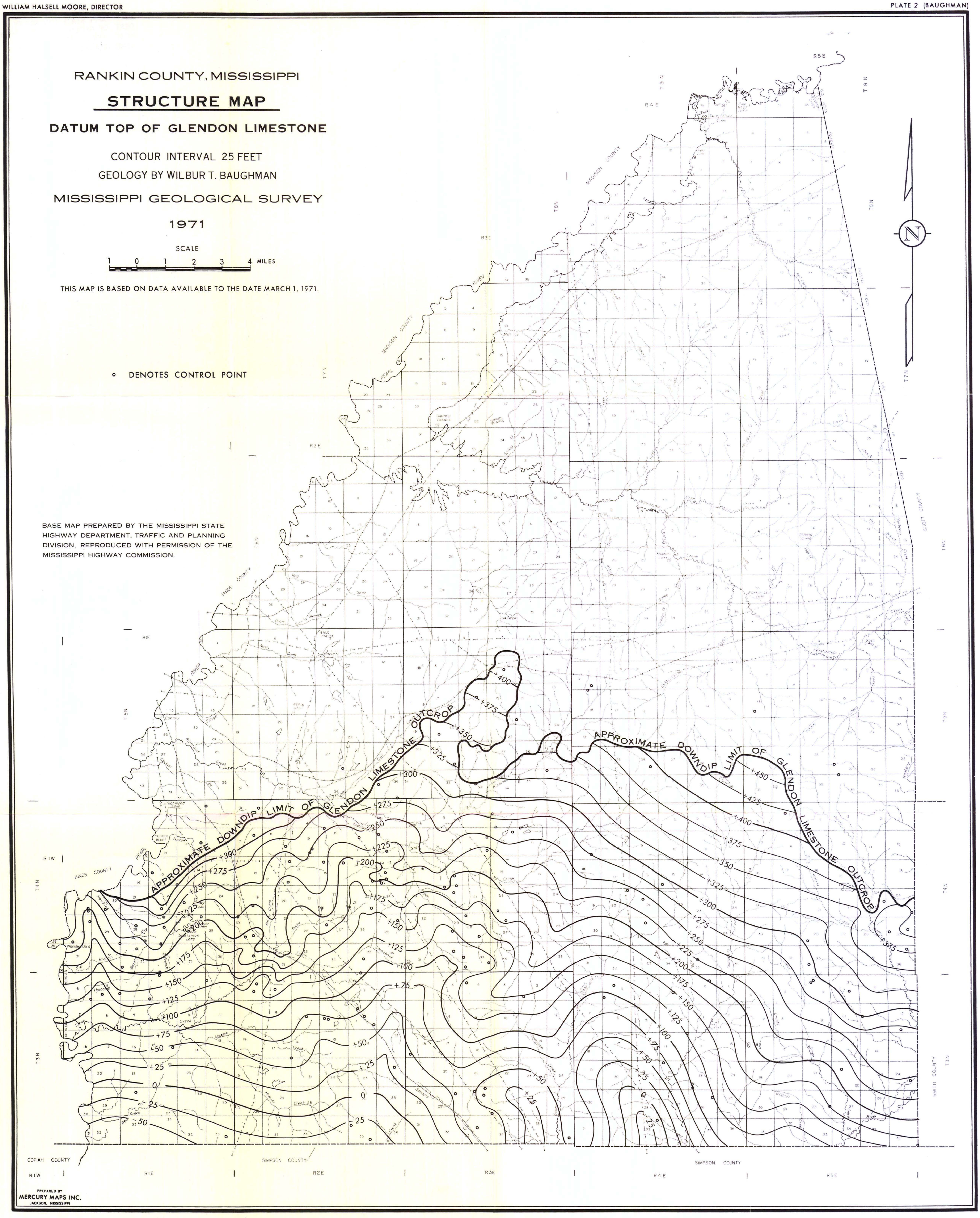
1. Mississippi Public Service Commission, Oral Communication, August 14, 1970.
2. Mississippi Board of Water Commissioners, Oral Communication, August 20, 1970.
3. U. S. Geological Survey, Water Resources Data for Mississippi, issued annually, 1969, p. 63.
4. U. S. Geological Survey, op. cit.
5. U. S. Geological Survey, op. cit.
6. U. S. Geological Survey, op. cit.
7. U. S. Geological Survey, op. cit. p. 64.
8. U. S. Geological Survey, op. cit.
9. Wilson, K. V. and Trotter, I. L., Jr., Floods in Mississippi Magnitude and Frequency, Mississippi State Highway Dept., 1961, pp. 117-118.
10. Wilson, K. V. and Trotter, I. L., Jr., op. cit., pp. 119-120.
11. Wilson, K. V. and Trotter, I. L., Jr., op. cit., p. 114.

SYSTEM	SERIES	GROUP	FORMATION	THICKNESS (Feet)	GENERAL LITHOLOGY
TERTIARY	EOCENE	JACKSON	Moodys Branch	15-40	Light-green to greenish-gray calcareous fossiliferous clayey glauconitic conglomeritic sands and pale-gray and pale-green fossiliferous sandy glauconitic marls.
		CLAIBORNE	Cockfield	200-300	Light-gray to gray, usually silty, variably sandy, micaceous and lignitic or carbonaceous clays. Argillaceous or clayey variably lignitic or carbonaceous and micaceous sands and silts.
			Cook Mountain	100-190	Light brownish-gray finely lignitic or carbonaceous variably silty clays and a few lenticular sands in the upper part. Lower sequence of interbedded brownish-gray slightly calcareous sparingly lignitic or carbonaceous fossiliferous glauconitic clays and light-gray and pale-gray silty occasionally sandy chalks marls and limestones.
			Kosciusko	250-500	Gray often lignitic or carbonaceous silty clays, clay shales and clayey commonly lignitic or carbonaceous silts and sands.
			Zilpha	200-420	Gray slightly fossiliferous clay shales and lignitic clay shales, variably sandy in the upper part of the formation.
			Winona	10-65	Pale-gray and pale grayish-white silty glauconitic chalks, sandy marls and light-gray and light greenish-gray slightly calcareous and fossiliferous clays and clay shales.
			Tallahatta	70-270	Pale-gray, white and light-gray calcareous slightly fossiliferous finely glauconitic finely micaceous siltstones and light-gray and light-green slightly calcareous sparingly fossiliferous clay shales.
		WILCOX	Wilcox (Undifferentiated)	1100-2830	Pale-gray to dark-gray variably lignitic or carbonaceous clays, very fine- to coarse-grained sands and silts, thin seams of lignite.
	PALEOCENE	MIDWAY	Midway Shale	70-800	Dark-gray and gray occasionally finely micaceous silty shales and clay shales.
			Clayton	5-85	Pale-gray and light-gray impure chalks and calcareous sparingly fossiliferous shales. Locally a limestone facies over the Jackson Dome.
UPPER CRETACEOUS	GULF	SELMA	(Navarro age beds) (Taylor age beds) (Austin age beds)	230-1240	Light-gray, gray and pale-gray and white chalks and interbedded gray and dark-gray shales and calcareous shales. Generally minor amounts of volcanic material. Locally a reef-type carbonate complex over the Jackson Dome.
		EUTAW	Eutaw	0-670	Dark-gray, gray and black finely micaceous sparingly sandy calcareous and fossiliferous shales. Very fine-to medium-grained slightly micaceous sparingly fossiliferous glauconitic sandstones and siltstones.
		TUSCALOOSA	Upper Tuscaloosa	500-800+	Vari-colored mudstones, some containing siderite concretions. Red, purple and gray to black shales. Very fine-to medium-grained sandstones. Basal strata generally containing vari-colored chert and quartz pebbles.
			Middle Tuscaloosa	70-165	Gray, dark-gray, red, dark-red and purple shales and vari-colored mudstones. Subordinate amounts of very fine-grained calcareous micaceous occasionally slightly ashy sandstones and siltstones.
			Lower Tuscaloosa	170-600	Dark-gray, black, red and purple shales. Vari-colored mudstones. Very fine and fine-grained sandstones and siltstones in the upper part. Fine-to coarse-grained occasionally slightly ashy sandstone in the lower part, with a basal sequence of coarser conglomeritic sands.
LOWER CRETACEOUS	COMANCHE	WASHITA-FREDERICKSBURG	Washita-Fredericksburg	0-1500	Dark-red, light-red, maroon and purple silty finely micaceous shales. Dark-gray and black shales. Vari-colored mudstones. Nodular limestones. White, red and pink very fine-to coarse-grained sandstones. Zones of quartz pebbles.
		TRINITY	Paluxy	930-1580	Dark-red and maroon silty finely micaceous shale. Dark-gray and black finely micaceous shale. Pale-gray, gray and green mudstones. White, pink and red very fine-to coarse-grained generally conglomeritic sandstones. Zones of quartz pebbles. Minor amounts of siltstone.
		TRINITY — SUB-GROUP — UPPER GLEN ROSE Restricted	Mooringsport	300-460	Dark-red, maroon, purple and dark-gray finely micaceous shales. Light-gray, green, light-green and light greenish-gray mudstones. Very fine- and fine-grained generally slightly micaceous and calcareous sandstones and siltstones. Thin stringers of fossiliferous and pseudo-oolitic or spherulitic limestones in basal part of the formation. Rare lignitic strata. Vari-colored nodular limestones.
			Ferry Lake	0-250	Sequence of pale-gray and white anhydrites with interbedded pale-gray to dark-gray fossiliferous and pseudo-oolitic or spherulitic limestones and associated dark-gray and black shales.
		TRINITY — SUB-GROUP — LOWER GLEN ROSE	Rodessa	260-450	Sequence of dark-red, maroon to purple silty finely micaceous shales, dark-gray shales, light-gray and light-green mudstones and red and white very fine-to coarse-grained sandstones and vari-colored quartz pebbles.
			Pine Island	340-380	Dark-red, maroon and purple occasionally finely micaceous shales. Light-gray, pale-gray and light-green to pale-green mudstones, some containing small siderite concretions. Red and white very fine-to medium-grained sandstones.
			Sligo	340-400	Dark-red and maroon finely micaceous shales. Dark-gray and gray shales. Pale-gray, light-gray, gray and light-green mudstones. Vari-colored nodular limestone fragments. Red and white very fine-to coarse-grained sandstones and conglomeritic sandstones.
	COAHUILA		Hosston	1150-2500	Dark-red and maroon silty, occasionally slightly sandy shales. Light-gray, gray and dark-gray shales. Light-gray and light-green mudstones. Vari-colored nodular limestone fragments. Red, white and pink very fine-to coarse-grained often conglomeritic sandstones. Vari-colored quartz and chert pebbles. Rare lignitic strata.
JURASSIC	UPPER	COTTON VALLEY	Schuler	900-1100 1700-1900	Dorcheat member - Dark-red, maroon and purple often silty finely micaceous shales. Light-gray, pale-green and pale greenish-gray mudstones, some containing siderite concretions. Very fine-to coarse-grained sandstones. Very fine-grained sandstones and siltstones with incipient siderite concretions. A few zones of conglomeritic sandstone and accompanying quartz and chert pebbles. Rare lignitic strata. Shongaloo member - Dark-red and maroon silty finely micaceous shales. Purple and light-gray shales. Light-gray and light-green, red, white and pink very fine-to coarse-grained sandstones and conglomeritic sandstones. Pink Sandstone facies - A distinctive pink sandstone facies characterized by pink and red fine-to coarse-grained often conglomeritic sandstones and generally subordinate amounts of white sandstones and minor amounts of shale and mudstone.
		LOUARK	Haynesville	760-1200+	Dark-red, maroon, gray, dark-gray and black shales and silty finely micaceous shales. White, red and pink very fine-to coarse-grained occasionally conglomeritic sandstones. Rare oolitic sandstones. Pale-gray, light-gray, gray and dark-gray to light brown, dense to very finely crystalline generally oolitic and pseudo-oolitic and occasionally sandy limestones. Light-tan, light-gray and gray very finely sucrosic to very finely crystalline occasionally sandy dolomitic carbonates. White, pink, light-gray and colorless anhydrites.
			Smackover	960-1500+	Upper Smackover - Light-gray, dark-gray and brown dense to very fine-to finely crystalline sparingly fossiliferous occasionally oolitic sandy variably argillaceous limestones and dolomitic carbonates. Very fine-to coarse-grained generally calcareous or dolomitic sandstones. Lower Smackover - Very fine-to coarse-grained sandstones and conglomeritic sandstones. Some dark-brown dense argillaceous in a few wells.
			Norphlet		Red, light-red and pink very fine-to fine and fine-grained slightly dolomitic and sparingly anhydritic sandstones and siltstones with a few scattered grains of coarser sand grains. Rare gray and light-tan anhydritic siltstones.

Stratigraphic column of subsurface of Rankin County.


RANKIN COUNTY, MISSISSIPPI
GEOLOGIC MAP
GEOLOGY BY WILBUR T. BAUGHMAN
MISSISSIPPI GEOLOGICAL SURVEY
1970
SCALE
1 0 1 2 3 4 MILES
LEGEND
QUATERNARY
RECENT
Qa Alluvium – fine-to very coarse-grained sand; gravel; silt and clay; including low terraces.
PLEISTOCENE
Qt Pre-loess Terrace deposits – fine-to coarse-grained sand; occasional scattered gravel; some clay lenses.
Pc Citronelle formation – quartz and chert gravel; fine-to coarse-grained sand; clay lenses.
TERTIARY
MIOCENE
Mc Catahoula formation – silty, sandy clays; silts and siltstones; sands and sandstones.
OLIGOCENE
Ov Vicksburg group – includes in ascending order; Mint Spring marls and limy sand; Glendon limestones and marls; Byram clayey marl; Bucatunna carbonaceous clay.
Of Forest Hill formation – fine-grained silty sands; silty, carbonaceous clays; lignite.
EOCENE
Ey Yazoo clay – calcareous, fossiliferous clay; very limy near base.
MADISON COUNTY
HINDS COUNTY
SCOTT COUNTY
SMITH COUNTY
COPIAH COUNTY
SIMPSON COUNTY
PEARL RIVER
R1W
R1E
R2E
R3E
R4E
R5E
T3N
T4N
T5N
T6N
T7N
T8N
T9N
PREPARED BY
MERCURY MAPS INC.
JACKSON, MISSISSIPPI
BASE MAP PREPARED BY THE MISSISSIPPI STATE HIGHWAY DEPARTMENT. TRAFFIC AND PLANNING DIVISION. REPRODUCED WITH PERMISSION OF THE MISSISSIPPI HIGHWAY COMMISSION.


RANKIN COUNTY, MISSISSIPPI
STRUCTURE MAP
DATUM TOP OF GLENDON LIMESTONE
CONTOUR INTERVAL 25 FEET
GEOLOGY BY WILBUR T. BAUGHMAN
MISSISSIPPI GEOLOGICAL SURVEY
1971
SCALE
1 0 1 2 3 4 MILES
THIS MAP IS BASED ON DATA AVAILABLE TO THE DATE MARCH 1, 1971.
DENOTES CONTROL POINT
BASE MAP PREPARED BY THE MISSISSIPPI STATE HIGHWAY DEPARTMENT, TRAFFIC AND PLANNING DIVISION. REPRODUCED WITH PERMISSION OF THE MISSISSIPPI HIGHWAY COMMISSION.
APPROXIMATE DOWNDIP LIMIT OF GLENDON LIMESTONE OUTCROP
MADISON COUNTY
HINDS COUNTY
SCOTT COUNTY
SMITH COUNTY
SIMPSON COUNTY
COPIAH COUNTY
PEARL RIVER
R1W
R1E
R2E
R3E
R4E
R5E
T3N
T4N
T5N
T6N
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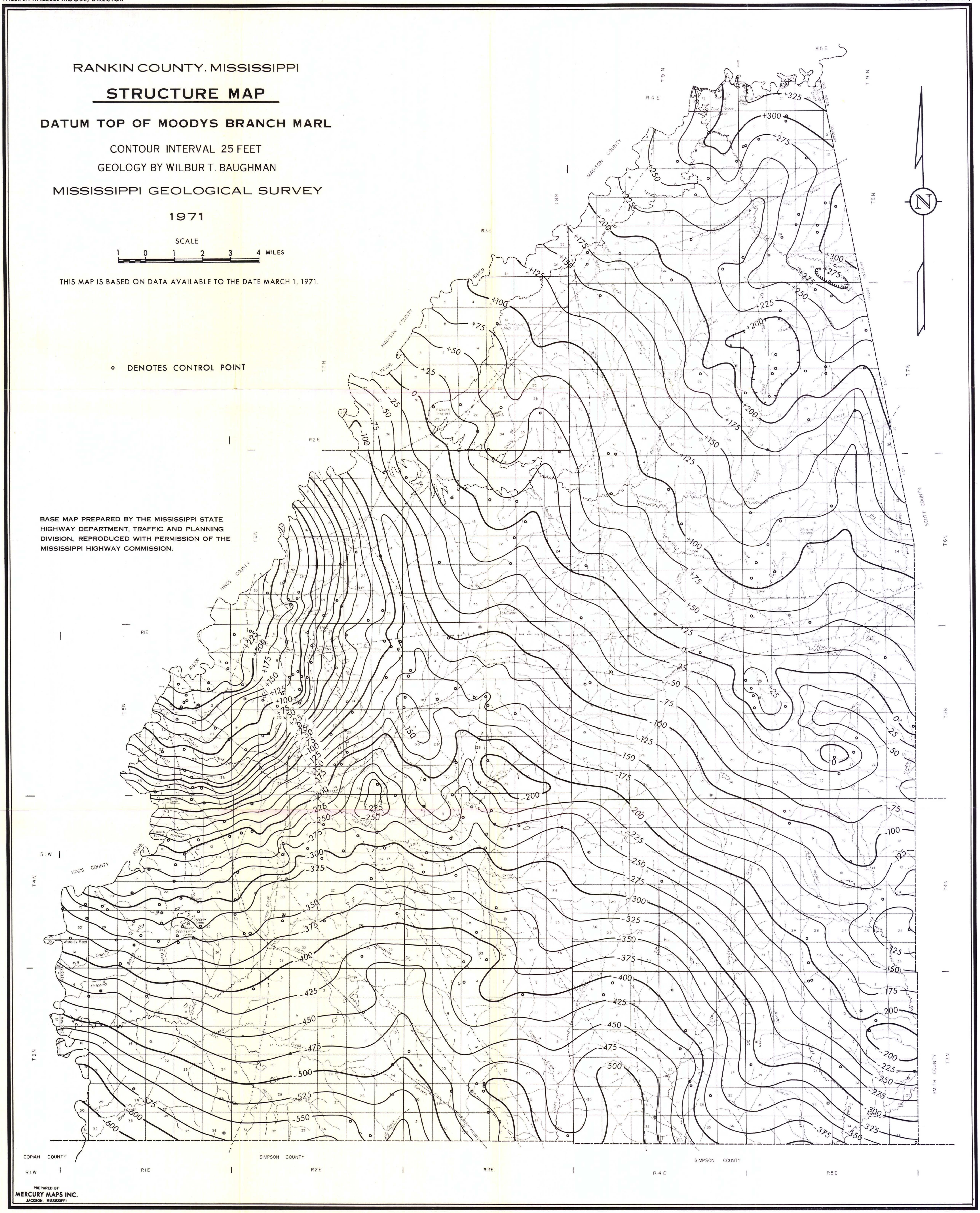
RANKIN COUNTY, MISSISSIPPI
STRUCTURE MAP
DATUM TOP OF MOODYS BRANCH MARL
CONTOUR INTERVAL 25 FEET
GEOLOGY BY WILBUR T. BAUGHMAN
MISSISSIPPI GEOLOGICAL SURVEY
1971
SCALE
1 0 1 2 3 4 MILES
THIS MAP IS BASED ON DATA AVAILABLE TO THE DATE MARCH 1, 1971.
DENOTES CONTROL POINT
BASE MAP PREPARED BY THE MISSISSIPPI STATE HIGHWAY DEPARTMENT, TRAFFIC AND PLANNING DIVISION, REPRODUCED WITH PERMISSION OF THE MISSISSIPPI HIGHWAY COMMISSION.
MADISON COUNTY
HINDS COUNTY
SCOTT COUNTY
SMITH COUNTY
SIMPSON COUNTY
COPIAH COUNTY
PEARL RIVER
N
R1W
R1E
R2E
R3E
R4E
R5E
T3N
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PREPARED BY
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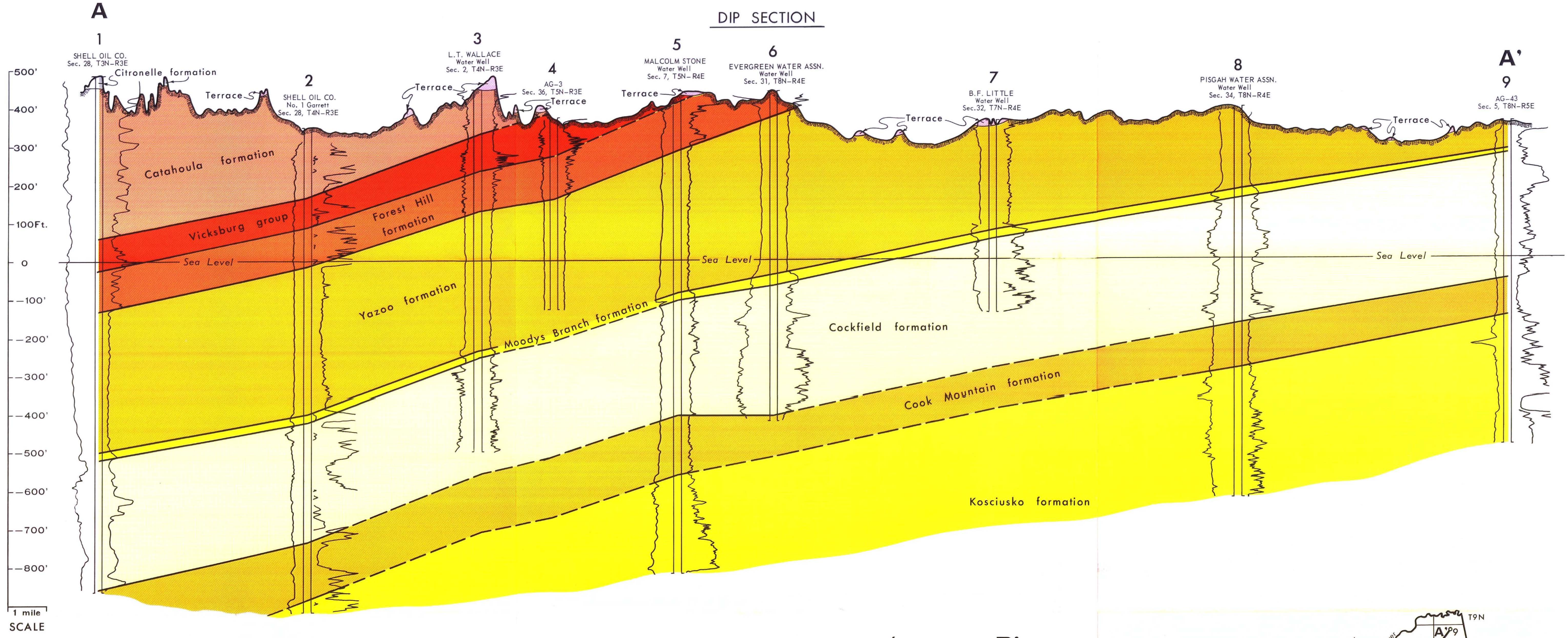

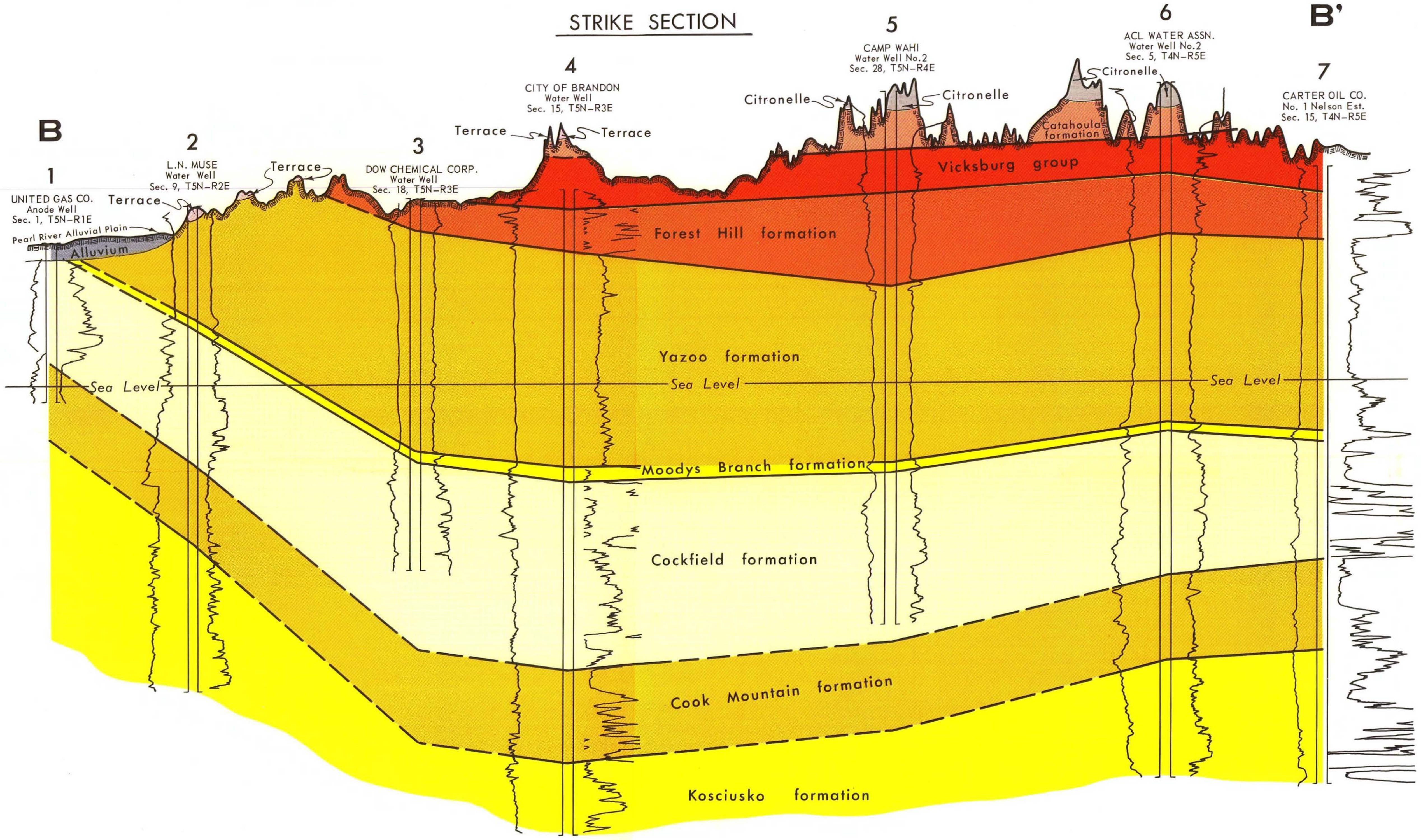

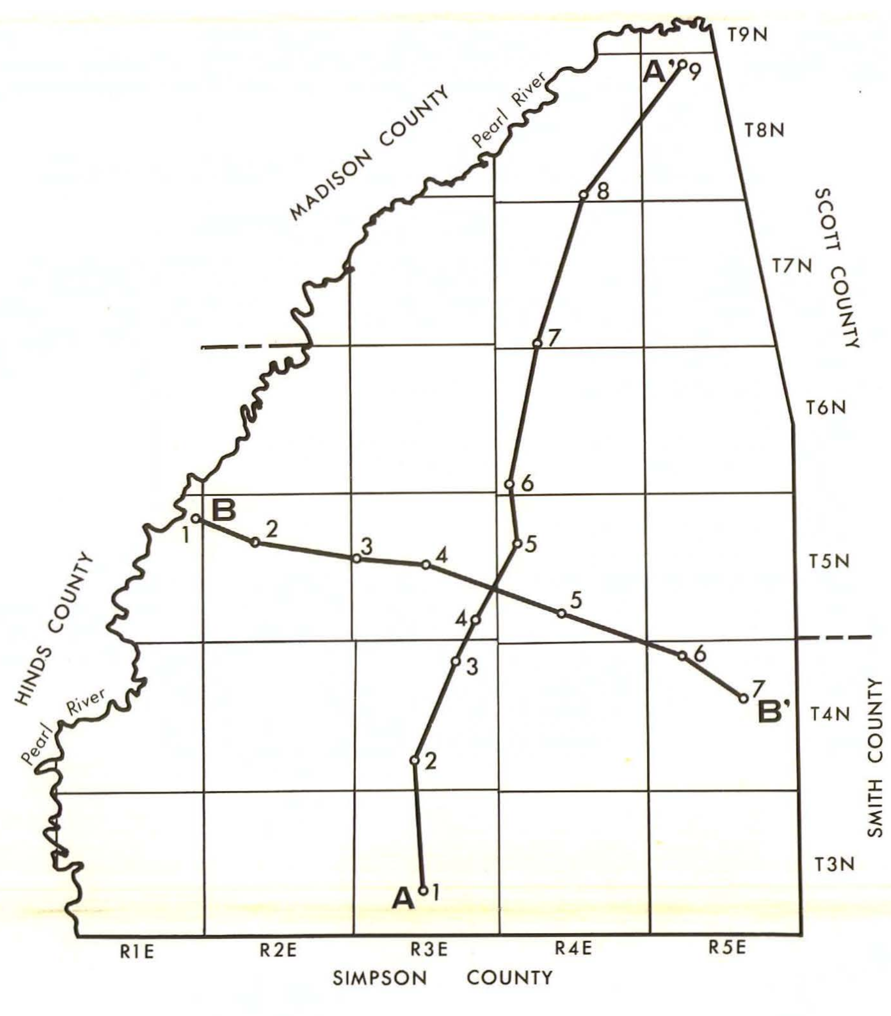

LOCATION MAP

STRATIGRAPHIC - STRUCTURAL CROSS SECTIONS

RANKIN COUNTY, MISSISSIPPI

MISSISSIPPI GEOLOGICAL SURVEY

Wilbur T. Baughman, Geologist

March, 1971

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