Geologic Study Along Highway 80 From Alabama Line to Jackson, Mississippi

RICHARD R. PRIDDY

Prepared in cooperation with the Mississippi State Highway Department

BULLETIN 91

MISSISSIPPI GEOLOGICAL SURVEY
TRACY WALLACE LUSK
DIRECTOR AND STATE GEOLOGIST

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LETTER OF TRANSMITTAL

Office of the Mississippi Geological Survey

University, Mississippi

June 22, 1961

Hon. Henry N. Toler, Chairman, and
Members of the Geological Survey Board

Gentlemen:

Herewith is Mississippi Geological Survey Bulletin 91, Geologic Study Along Highway 80 From Alabama Line to Jackson, Mississippi, by Richard R. Priddy.

This report brings to a successful conclusion the second cooperative project with the Mississippi State Highway Department. Again we wish to acknowledge this cooperation and the efforts of those responsible—Mr. T. C. Robbins, Director of the Highway Department, Mr. H. O. Thompson, Chief Testing Engineer, Mr. Clyde Clark, Highway Department Geologist.

The author not only describes in detail the geologic units that crop out along the route but also suggests ways of improving the stability of the roadbed. Specific locations for obtaining suitable topping material are cited.

It is indeed fortunate that the geologic information afforded by the new cuts along Interstate 20 could be studied and recorded before sodding. Once the slopes are sodded, the same information is virtually impossible to obtain and any attempt would necessarily be at a much greater cost.

We anticipate that as a result of this work, the savings to the Highway Department in the construction of Interstate 20 will be many times the cost of the investigation.

Respectfully submitted,

Tracy W. Lusk
Director and State Geologist

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GEOLOGIC STUDY ALONG HIGHWAY 80 FROM ALABAMA LINE TO JACKSON, MISSISSIPPI

RICHARD R. PRIDDY

ABSTRACT

A study of stratigraphy, structure, and physiography along U. S. Highway 80, Alabama line west to Jackson, Mississippi, benefits both participants, the Mississippi Geological Survey and the Mississippi Highway Department. Data are illustrated in four geologic highway profiles across Lauderdale, Newton, Scott, and Rankin Counties. The highway distance of 108.9 miles traverses about 1,671 feet of bedrock strata, ranging in age, east to west, from Eocene lower Wilcox through Eocene Claiborne, Eocene Jackson, and Oligocene Vicksburg, and into Miocene lower Catahoula beds. A few of the steeper hills along the highway are capped by Pleistocene and(or) Recent terrace sands up to 43 feet in thickness.

The study shows west regional dip across Lauderdale, Newton, Scott, and east Rankin Counties. In west Rankin County the dip is reversed, on the flank of the Jackson Dome. Brandon lies in the syncline between these dips. In addition, four local structural anomalies are described. Two may merit further investigation.

The cross-section profiles depict 17 kinds of rocks and 23 geologic units which are discussed in detail. The kinds of strata and their dips help explain sharp hills and deep valleys, and broad rounded hills separated by broad flat valleys. The rock types and their attitudes also explain failure of highway subgrade in many places where clays or silty clays slump as they are alternately wetted and dried. Wherever cause of the failure is ascertained suggestions are made for excavating and for backfilling. Sources of sands or silts for fill are cited so that construction of the four-lane new Interstate Highway 20 will be made easier.

INTRODUCTION

This profile study of U. S. Highway 80 from the Alabama line west 108.9 miles to Jackson was undertaken jointly by the Mississippi Geological Survey and the Mississippi State Highway Department. The route is shown in Figure 1. Most of

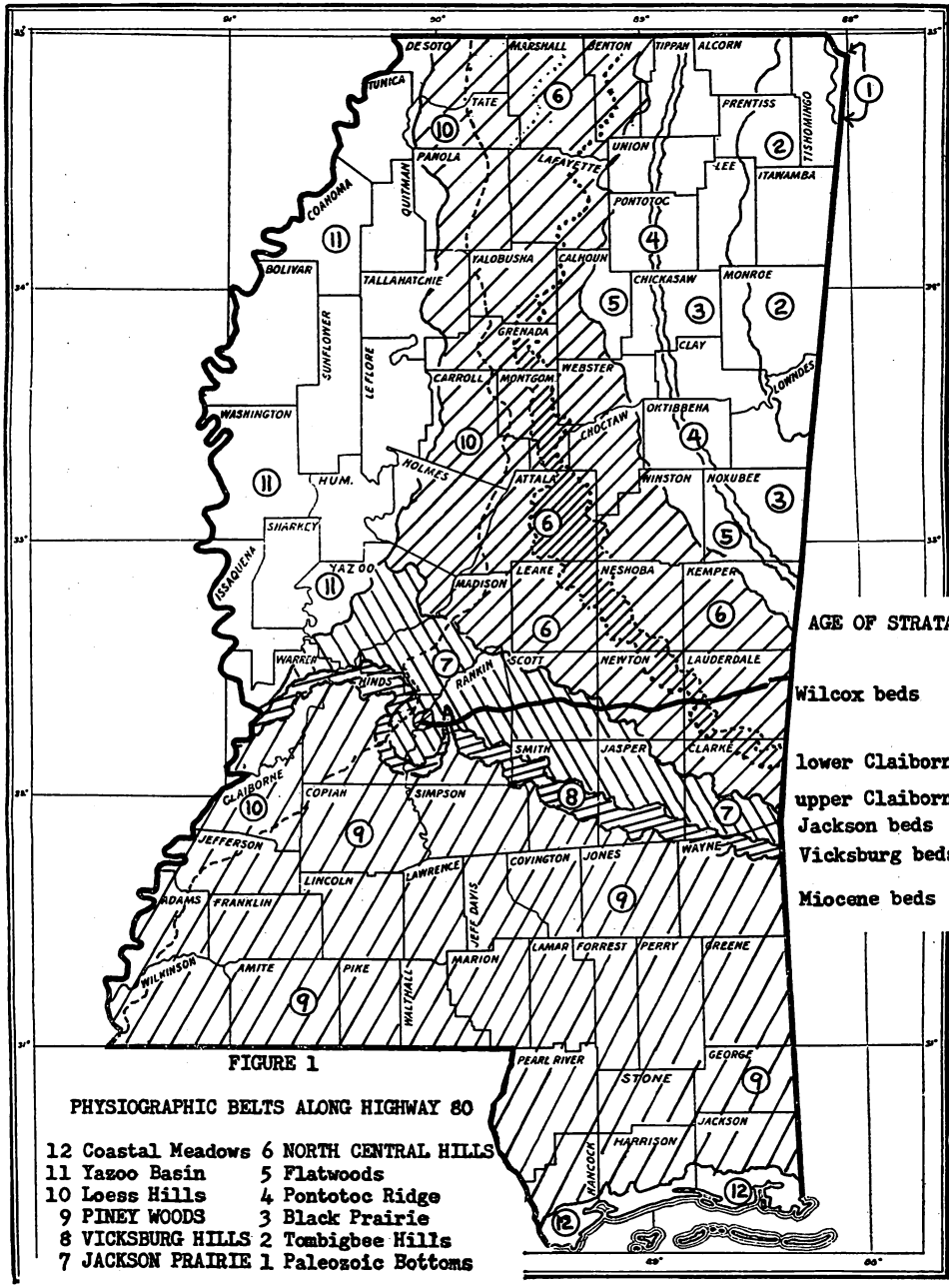

FIGURE 1

PHYSIOGRAPHIC BELTS ALONG HIGHWAY 80

12 Coastal Meadows	6 NORTH CENTRAL HILLS
11 Yazoo Basin	5 Flatwoods
10 Loess Hills	4 Pontotoc Ridge
9 PINEY WOODS	3 Black Prairie
8 VICKSBURG HILLS	2 Tombigbee Hills
7 JACKSON PRAIRIE	1 Paleozoic Bottoms

the field and office expenses were born by the Survey. The Highway Department furnished transportation, drilled 11 test holes to help in field interpretation, and drafted the road profiles in their final form (Plates 1, 2, 3, and 4).

The field work not only furnished the Survey with important stratigraphic and structural information, but also provided data for the Highway Department on the thicknesses and nature of the bedrock and its weathered products. This data will be useful in the construction of Interstate Highway 20, which will closely parallel most of U. S. Highway 80. Because Interstate 20 is now only partly routed, it is not shown on Figure 1.

This study will furnish teachers of Mississippi geology with a road log for many good field trips because of the numerous exposures of beds from lower Wilcox to lower Miocene. These strata are in belts as drawn in Figure 1. They aggregate 1,671 feet in thickness as shown by the stratigraphic column (Figure 2). A few of the steeper bedrock hills are capped by Pleistocene or Recent terrace sands or both up to 43 feet in thickness.

ACKNOWLEDGMENTS

The investigation was supervised jointly by Mr. Tracy W. Lusk, Director of the Survey, and Mr. H. O. Thompson, Chief Testing Engineer of the Highway Department. Drilling of test holes along the highway was made possible by Mr. W. E. Sneed, District Testing Engineer at Newton. The writer also is indebted to Mr. Clyde V. Clark, Highway Geologist, Mr. E. P. Goff, of the Highway Photronics Division, and Mr. J. O. Snowden, Jr., graduate student in geology, all spent several days in the field with the author. Thanks are due Mr. I. B. Kelly, Highway Chemist, for pH determinations of surface waters. Thanks are also due Mr. F. A. Lossing, Assistant Testing Engineer, who furnished 35 plan-profiles of U. S. Highway 80 and 3 plan-profiles of Interstate Highway 20 which is already under construction east of Meridian. Special thanks are due to Mr. C. T. McCormick, Mapping Engineer of the Traffic and Planning Division of the Highway Department, who supervised the drafting of the profiles for publication.

The mechanics of highway geologic profile making was made easier by following the procedure used in two Mississippi Geolo-

Figure 2
Generalized Section of Exposed Strata along U. S. Highway 80

Era	System	Series	Group	Formation	Member or Facies	Lithologic character	Thickness (feet)	Outcrop span in miles
Cenozoic	Quaternary	Pleistocene-Recent		Terrace		Sand, clayey, ferruginous, orange-red to dark-red. Sands medium-to coarse-grained. Scattered grit of quartz or small pebbles of quartz. Stream deposited.	0-43	
						erosional contact		
	Tertiary	Miocene		Catahoula		Sands, silty sands, and silty clays: buff, micaceous, cross-bedded. Weather orange-buff to red-buff.	35	96.6-97.4
						erosional contact		
		Oligocene	Vicksburg	Marianna	Bucatunna	Clay, tan, well bedded, slightly micaceous, slightly silty. Swells on wetting; cracks on drying.	55	97.4-98.1 96.05-96.6
					Byram	Marl, gray-tan, fairly glauconitic, fossiliferous. Weathers to red-brown ferruginous concretions.	7	98.3 96.05
					Glendon	Alternating light-gray, clayey, fossiliferous limestones and limy shales. Mostly dissolved leaving dark-red clay.	30	98.2-98.5 94.9-96.0
					Mint Springs	Marl, gray-green, fairly glauconitic, sandy. A few fossils. Partings of dark silty clay. Weathers to purplish-red ferruginous concretions capping hills.	6	99.9-101.4 91.9-94.9

Cenozoic	Tertiary			Forest Hill		Thin-bedded, interbedded buff silts and gray silty clays enclosing lenses of carbonaceous shale in lower two-thirds. Upper one-third chiefly buff, cross-bedded, medium-grained, micaceous sand.	120	101.5-103.4 90.0-91.9
		Eocene	Jackson	Yazoo		Clay, blue-gray, slightly silty, fairly calcareous, massive. Weathers to olive-gray, then to tan. Swells when wet and shrinks when dry. Marine.	375	103.4-104.4 80.9-90.2
					Pachuta (?)	Lenses of fossiliferous marl in lower 90 feet in west Newton County which may be equivalent to Pachuta of Wayne County.		56.4-80.9 50.7-56.4
				Moodys Branch		Marl, green-gray, slightly glaconitic, fairly fossiliferous, silty. Weathers brown, then red. Concretionary.	17	50.3-51.2
						erosional contact		
			Claiborne	Cockfield		Sands, nearly white, medium-grained, weather buff to orange-red. Massive in lower half. Thin lenses of sands and silts in upper part. Perched water tables where silts or sands overlie thin clays. Thick clay at base.	105	45.9-51.3
				Wautubbee	Gordon Creek	Shale, carbonaceous, dark-brown, slightly silty. Weathers to a gray-tan silty clay. Wet for most of the year.	20	45.6-45.9
					Archusa-Potterchitto	Marl, gray-green, clayey, micaceous, fairly fossiliferous. Weathers to a gray-buff, limy, waxy clay.	70	42.7-45.6
						erosional contact		
				Kosciusko		Thin-bedded, micaceous clays and silts in lower 70 feet. Upper 95 feet mostly massive sand.	165	36.3-42.7

Figure 2

Cenozoic	Tertiary	Eocene	Claiborne	Zilpha		Clay, chocolate-brown, slightly silty, massive, blocky. Weathers to a gray-tan plastic clay. Expands when wet.	38	29.9-36.3
				Winona		Sand, green, fairly glauconitic, fairly fossiliferous, marly. Weathers to dark-red ferruginous concretions.	18	29.8-34.8
				Talla-hatta		Claystone in beds of 1 to 4 inches separated by thin clayey silts which thicken toward top. Contains siltstones and a few buhrstones. Resistant.	90	25.3-33.6
						erosional contact		
				Meri-dian		Sand, buff, massive, cross-bedded, micaceous. Weathers orange-red.	70	23.5-27.5
						erosional contact		
			Wilcox	Zone 5 (Hatche-tigbee)		Silts, silty clays, sands, carbonaceous clays and lignites complexly intertongued and interlensed.	125	13.1-23.5
				Zone 4 (Bashi)		Four horizons of marl or marlstone interbedded or interlensed with silts, silty clays, sandy silts and lignites.	100	8.5-19.8
				Zone 3		Intertongued and interlensed silty clays, silts, lignites, carbonaceous shales, and blocky clays.	110	5.7-8.5
				Zone 2 (Tusca-homa?)		Sand, massive, buff, micaceous. A few thin beds or partings of silt or clay.	90	0.1-6.3
				Zone 1 (Nana-falia?)		Silty clays and fine-grained micaceous sand. Weather buff. Base not exposed.	25	0.0-2.5

gical Survey Publications: Bulletin 48, The Claiborne, by Emil Paul Thomas, 1942, which contains partial geologic profiles of 6 highways in Mississippi; and Bulletin 89, Geologic Study along Highway 16 from Alabama line to Canton, Mississippi, 1960, by Bahngrell W. Brown.

METHOD

The usual geologic methods were employed in the highway study.

In the field, roadcut and ditch exposures were visited and located on the 38 highway plan-profiles, on county highway maps, and on U. S. Geological Survey topographic maps. These outcrops were then sectioned as carefully as grassed-over and deeply weathered slopes permitted. Hand auger holes were drilled where bedrock was partly concealed. In some places power augers drilled 50-foot holes where the beds were completely covered, where abnormal dips were observed, where thicknesses had to be determined, or where the sequence of beds had been lost.

In the office a continuous geologic profile was constructed, the length of the project, 108.9 miles (which was later cut up for inclusion in this report as Plates 1, 2, 3, and 4). On it was scaled the land surface, the highway elevation, and the cuts and fills. The sections measured in the field were transferred to the geologic profile. Then lithologic correlations were made after the regional dip was established by the study of logs of adjacent oil tests and after due account was taken of the apparent divergences of dip created by deviations in the direction of the highway. Finally, the distribution of beds was reconciled with the latest 1945 geologic map of Mississippi and with published geologic work in the area traversed by Highway 80.

The making of a geologic road profile is a relatively old method of stratigraphic study which aids the geologist as well as the road builder. As reviewed by Brown[1] in 1960, a closer alliance of the professions was advocated as early as 1895. Since those horse and buggy days, auto and truck travel have required better road foundations, paving, gentler curves, and lower gradients. Fortunately, the lower gradients dictated deep cuts on many hilltops and the ditching of hillslopes.

In hilly country, such as along most of Highway 80, the deeper cuts, deep roadside ditches, and adjacent borrow pits have furnished the geologist with far more reliable exposures than are to be found naturally in the cut banks of streams. Consequently, he is able to determine the nature of the bedrock and its colluvial cover, and, at most places, the attitude of the beds. These sections, when arranged in profile, should enable the highway engineer to determine causes of subgrade failure of existing roads and help him build better highways through the selection of fill material, the calculation of cut depths and cut slopes, the stepping of deep cuts, and the selection of bridge types.

Five major bedrock units are exposed along U. S. Highway 80 (Figure 1). The units are, from east to west, oldest to youngest, Wilcox, lower Claiborne, upper Claiborne, Jackson, Vicksburg, and Catahoula. In Lauderdale, Newton, and Scott Counties, and in east Rankin County these strata dip southwest. In west Rankin County the bedrock units are reversed, Vicksburg and Jackson, due to east dip off Jackson Dome. Jackson Dome is shown in Figure 1 as a small circle on the Rankin-Hinds County line.

On weathering the bedrock produces the four physiographic belts shown by capital letters in the legend of Figure 1: most of the North Central Hills on the east, the full width of the Jackson Prairie in Scott County, a small updip remnant of the Piney Woods flanked by the narrow Vicksburg Hills in Rankin County, and part of Jackson Prairie repeated in west Rankin County on the east wall of Pearl River valley.

Figure 2, the stratigraphic column from the Alabama line to Jackson, was constructed to show details of the sequence of 22 beds comprising the 5 bedrock units—the lithology when fresh, the products of weathering as seen at many places in the roadcuts, and the apparent thicknesses. The next to the last column shows the span of outcrop of each unit with respect to the 4 highway profiles included in this report. The last column shows the span of outcrop of each unit in miles west of the Alabama line.

THE PROFILES

The chief product of the field and office studies is the four-part profile, Plates 1, 2, 3, and 4, infolded in this bulletin. The nearly equal segments had to be used rather than a single long profile because of difficulties encountered in reproduction.

Plate 1 spans Lauderdale County	0.0 - 31.9 miles
Plate 2 spans Newton County	31.9 - 56.4 miles
Plate 3 spans Scott County	56.4 - 80.8 miles
Plate 4 spans Rankin County and includes about 0.7 miles of Hinds County	80.8 - 108.9 miles

This east-west order of treatment is necessary because beds must be described geologically in order of succession, oldest to youngest, dictated by the regional southwest dip along most of Highway 80. The order is satisfactory for the highway engineers because many of the plan-profiles used are already numbered east-west. The east-west treatment is also necessary because the Alabama line serves as an ideal starting point for the study, much better than southeast Jackson where highway interchanges are now being made and where more are contemplated.

In order to serve both engineers and geologists the bedrock indicated in each profile is discussed from several viewpoints: (1) the topography produced through bedrock erosion; (2) the lithologic description of the several units in the sequence with appropriate observations on weathering, relative stability of the highway as it crosses each unit, suggestions for constructing new Interstate Highway 20, and the sources of construction materials; and (3) two structures indicated by interruptions in dip. In this discussion references to regional geology and problems of stratigraphic correlation are held to a minimum.

HORIZONTAL SCALE

On all four plates the horizontal component of the profile is scaled in both miles and feet, to serve both geologists and engineers. The scales appear near the base of each profile. Between the heavier grid lines the horizontal distance is 5,000 feet. Between the lighter grid lines the distance is 500 feet.

Mileage is indicated by two sets of numbers. The larger, lower, figure shows distance west from the starting point, the

Alabama line. The smaller, upper, figure indicates mileage east from the southeast corner of Jackson, for those who may wish to study the survey from west to east or who may wish to study segments of the highway. In the stratigraphic review which follows, all mileage references are from east to west.

The starting point, at the Alabama line, is 0.0 feet on the highway plan-profile FAP (Federal Aid Project) 117, one of the 38 such profiles which comprise Plates 1, 2, 3, and 4, combined. This and other segments are indicated at the top of each plate by the Highway Department designation, span of plan-profile by arrows, and length in miles. Some plan-profiles overlap where old segments of the highway have been entirely rebuilt as at mileages 46.3 - 48.5 or where it has been regraded as at mileages 48.5 - 56.6 (Plate 2). Note that some profile-plans are not available, as in Forest (mileages 66.1 - 66.6, Plate 3) and in Brandon (mileages 97.9 - 99.0, Plate 4). These cities built and maintain parts of the highway, necessitating a topographic survey to complete this investigation. Note, also, the breaks in profile at mileage 5.9 and at 16.5 (Plate 1), where the study of Highway 80 was replaced by an investigation of the abundant, fresh cuts on new Interstate 20 which is being built a short distance to the south.

The survey stations numbered vertically at the base of the plates are the same as on the highway plan-profiles. Some of these references are easily found where the highway segment has been constructed of concrete and where the slab has not been surface treated. Intervals of even 500 feet are marked by figures moulded in the concrete. Each 100-foot interval is marked by an impressed dash. For accurate plotting of distances, intervals of 500 feet are rarely shown on the profiles because only a few highway segments start or end at even feet, as noted by the figures offset above the mileage figures near the bases of the profiles.

VERTICAL SCALE

The vertical scale of the profiles is 50 feet between heavy grid lines. Between the lighter grid lines the vertical distance is 5 feet. All elevations are based on sea level. Some were taken directly from the more recent profile-plans. Others were calculated from the older profile-plans which used assumed ele-

vations. Transposition was accomplished by altimeter traverses run at night from bench marks shown on topographic maps or from the newer, adjoining, segments of the highway. Errors in elevation are believed to be less than 4 feet. For convenience in determining topography and thicknesses of beds the vertical scale is repeated several places on each plate.

The vertical exaggeration of 100 (5,000 feet horiontal to 50 feet vertical) may seem unusually large but it is necessary to show the bedrock details which are the subject of this report.

PLATE 1, LAUDERDALE COUNTY

TOPOGRAPHY

Four topographic divisions are noted on Plate 1: (1) a lowland eroded from sands and clays along U. S. Highway 80 from 0.0 mile at the Alabama line west to 7.1 miles near the village of Toomsuba; (2) a rugged highland developed on silts, sands, clays, and marls along new Interstate 20 from mileage 6.1 to the northeast outskirts of Meridian at mileage 16.4; (3) a broad lowland on silts and sands from mileage 16.4 through Meridian to mileage 23.3; and (4) a series of sharp cuestas and deep vales from mileage 23.3 west to the Newton County line at 31.9 miles, carved in sand, claystone, and clay. These features constitute a part of the North Central Hills (Figure 1).

STRATIGRAPHY

The bedrock strata encountered along U. S. Highway 80 and Interstate Highway 20 in Lauderdale County (Plate 1) are indicated in the stratigraphic column (Figure 2). They aggregate 633 feet in thickness. Most of the strata are differentiated on lithologic bases although several can be recognized by fossil content: 5 Wilcox zones, Meridian sand, Tallahatta claystone, Winona greensand, Zilpha clay, and the terrace sands which may overlie any of the above. The base of Zone 1 Wilcox is not exposed and only the lower one-fourth of the Zilpha is present. Where identified with certainty, the strata are described in geologic sequence, from base upward, in the following paragraphs. Terrace sands up to 21 feet in thickness may overlie the bedrock.

Concluding the geologic treatment of each unit, observations are made for possible use by the highway engineer.

ZONE 1 WILCOX (NANAFALIA?) (MILES 0.0 - 2.5)

On a west valley wall at the Alabama line Zone 1 lower Wilcox thin-bedded, gray, fairly micaceous, silty clays and thin lenses of buff-colored, fine-grained, micaceous sand aggregate 25 feet in thickness. The base is not exposed. On the geologic map these beds are called Nanafalia. These are apparently the strata which Foster[2] identified as Ackerman. The clays weather buff and the sands orange red. No fossils were found here but several miles to the southeast the same strata contain a few thin lenses of sparingly fossiliferous marl. The same gray silty clays are seen on the flanks of a hill at mileages 0.7 - 0.8 and on the east valley wall of Toomsuba Creek at mileages 2.3 - 2.5.

The silty clays and sands of Zone 1 Wilcox make a stable roadbed.

ZONE 2 WILCOX (TUSCAHOMA?) (MILES 0.1 - 6.3)

Middle Wilcox massive, buff, cross-bedded, medium-grained, micaceous sands and thin lenses of gray silts and clays aggregating 90 feet in thickness overlie Zone 1 Wilcox strata along U. S. Highway 80. This is the sandy interval which Foster[3] called "lower Holly Springs" in Lauderdale County, and which Hughes[4] and Brown[5] describe as Tuscahoma in nearby Kemper County. Some 30 feet of massive sand is being removed from a borrow pit (Figure 3) at Kewanee, mileage 2.0, for a huge fill across Toomsuba Creek valley to the west. The sands and silts weather orange buff and the clays weather red. At the base of the unit is a cobble conglomerate of Nanafalia-type silty clays on hillsides at mileages 0.8 - 0.9.

The massive sands and the lenses of silts make an excellent foundation as evidenced by the good condition of this very old segment of U. S. Highway 80.

ZONE 3 WILCOX (UPPER HOLLY SPRINGS?) (MILES 5.7 - 8.5)

Some 110 feet of strata lying above Zone 2 Wilcox sands and below the zone containing Bashi marls are the same as those designated by Foster[6] as Holly Springs. The interval consists of interbedded, interlensed, and intertongued: gray, micaceous silts; gray, silty clays; buff, silty, micaceous sands; and chocolate-brown lignites (Figure 4) mostly in fresh cuts of new

Figure 3.—Zone 2 Wilcox (Tuscahoma?) sands in borrow pit just west of Kewanee, north side of Highway 80, mileage 2.0. September 4, 1960.

Figure 4.—Zone 3 Wilcox thin-bedded silty clays (light) and lignite (dark), south cut, new Interstate Highway 20, mileage 7.4, one mile west-southwest of Toomsuba. Strata dip noticeably west. September 4, 1960.

Interstate 20. At the base of the unit, at miles 5.7 - 5.9 and at mile 6.6, is a coarse, angular, quartz sand. The clays may be massive near the middle of the zone as at mileages 7.3 - 7.6 along Interstate 20, or they may be paper thin as near the base of the unit at Toomsuba along Highway 80 at mile 5.8. The silts, sands and lignites are all thin bedded. The silts weather buff. The sands weather orange buff. The lignites bleach quickly to tan. From miles 7.2 to 9.0 all these strata are involved in peculiar dips as discussed in "Structure 1".

The sands, silts, and silty clays erode rapidly so roadcut slopes must be made gentle. However, the lignites of Zone 3 Wilcox present the greatest difficulty in highway construction for they are water soaked even in dry weather, causing serious sloughing. It is suggested that they should be undercut and backfilled with sand or silt. Another problem is the highly acid water the lignites produce—pH 3.8 to 4.5 as reported by the Highway chemist. These waters are too acid to permit the usual cover grasses to grow.

In order to sod the banks soaked by acidic water produced by the lignite, it is suggested that special grasses might be imported. Research has indicated that several species could be used. As pictured and described by Blomquist[7] six are rice-like or barley-like plants which have a climatic range from New York to Florida, a satisfactory range in altitude, a preference for boggy terrane, and a liking for peaty, highly acid soils. They are:

Uniola laxa
Dunthonia sericea
Panicum mattamuskeetense
Panicum barbulatum
Panicum lucidum
Panicum trifolium

Several species of *Panicum* and *Uniola* (especially *U. parriculata*—seaoats) have been recognized by Channel[8] on Horn Island, a barrier island off the Mississippi Gulf Coast. It is possible that in the marshy terrane where the pH is discovered to be very low the grasses may be found which are needed for sodding the lignitic or highly carbonaceous roadcuts which

are presently uncovered along U. S. Highway 80 and which will be made in the construction of Interstate Highway 20.

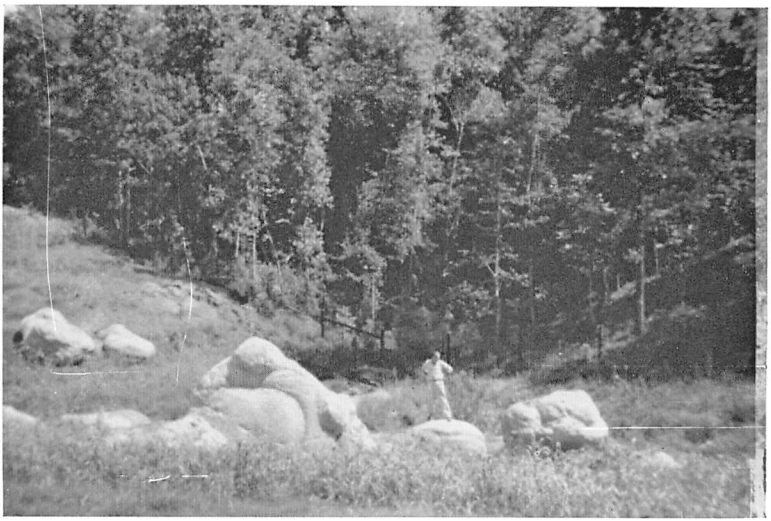

Figure 5.—Huge upper Bashi marlstone boulders pushed into a small valley, south side Interstate Highway 20, mileage 13.1. September 4, 1960.

ZONE 4 WILCOX (BASHI) (MILES 8.5 - 19.8)

Four discontinous fossiliferous marls distinguish Zone 4 Wilcox, Bashi marl zone. Along Interstate Highway 20 east of Meridian the interval has a thickness of 100 feet as measured from the lowest horizon containing marly beds, mileage 9.5, to the thick marlstones which in many places are at the unit's top, mileage 16.0. Near the middle of the unit there may be a thin marly silt, at mileage 8.9, containing a few fossils. Some 10 to 15 feet below the top is a thick, very fossiliferous marl which may include marlstones as at mileage 13.1. Here boulders (Figure 5) proved such a nuisance in road building that they had to be bulldozed aside. Boulders from the top of the interval have been left in a hillside borrow pit just north of Interstate 20 at mileage 16.0. Others of the same horizon are visible 400 feet south of Highway 80 (mileages 17.6 - 17.9) where they were exposed by grading for several commercial properties. Badly weathered upper Bashi marlstones are on the south shoulder of the highway, mileage 19.6, where they have been exposed for at least 20 years. All marls contain nearly the same coral-

Figure 6.—Intertongued Bashi zone silty sands and silty shales. Light beds at left are buff-colored silty sands. Dark beds at right are silty shales. North cut at underpass south of Russel, Interstate Highway 20, mileage 12.2. September 4, 1960.

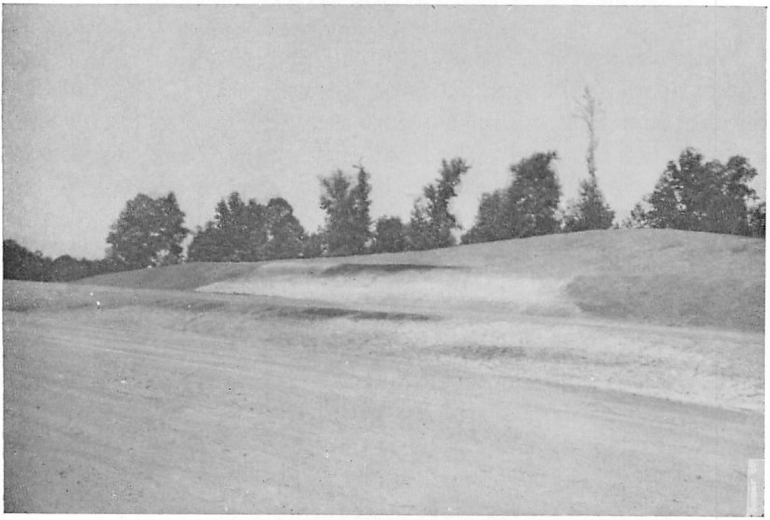

Figure 7.—Intertongued Bashi zone lignites (dark), carbonaceous silty clays (lighter), and blocky clays (very light). North cut, Interstate Highway 20, mileage 8.5. September 4, 1960.

gastropod-pelecypod fauna. Pointed teeth of fishes and the pavement teeth and barbs of sting rays are common.

Although the boulders are firm they are at most places too large and too unevenly distributed to be used as road metal. Likewise, they are too large for a portable rock crusher.

The Bashi zone was described by Foster[9] from the mileage 19.6 locality and several sections farther east. In 1940 he based his Alamucha structure partly on the distribution of two of the marls, not realizing that there were 4 marly zones, as this investigation has shown.

Whereas the marls define the zone, they constitute less than 5 percent of the interval. The other rocks, in order of abundance are: thin-bedded, dark-gray, silty shales; thin-bedded, gray-green, micaceous silts; thin-bedded, buff, micaceous, silty sands; massive, blocky, light-gray clays; and thin lenses of dark-brown, carbonaceous, silty clay which may include lenses of lignite. In some places these beds are confusingly intertongued and interlensed, as in Figures 6 and 7. Although the Bashi beds may seem complicated as drawn on Plate 1, they are much more complex in the field.

In addition to the nuisance caused by huge marlstone boulders the entire Bashi zone has created problems in highway construction: as in Zone 3, the carbonaceous clays and lignites produce waters so acid that grasses will not grow on those roadcut banks; the thin-bedded sands and silts erode quickly; and the blocky clays shrink as they dry to produce rockfalls or expand when wet to cause serious slumping. In an effort to minimize erosion before seeding and to afford protection for sprouting grass, highway contractors sprayed the raw roadcuts with coarsely ground straw suspended in an emulsion of asphalt and water which hid many outcrops and made the making of geologic sections difficult.

ZONE 5 WILCOX (HATCHETIGBEE) (MILES 13.1 - 23.5)

The Hatchetigbee beds which constitute Zone 5 Wilcox aggregate about 125 feet in thickness. They lie above the Bashi marl zone and underlie the Meridian sand. "Hatchitigbee" strata have been adequately described in Lauderdale County by Foster[10]. His best section can still be observed, beginning at mileage 18.8, the corner of 31st Avenue and 5th Street in Meridian, and

Figure 8.—Zone 5 Wilcox (Hatchetigbee) complexly intertongued and interlensed silts and clays (light) overlain by terrace sand (dark) in south cut of Interstate Highway 20 just east of Meridian, mileage 15.6. September 4, 1960.

Figure 9.—A lower Hatchetigbee conglomerate composed of angular pebbles and cobbles of light-gray silty clay in buff-colored silt. South cut of Interstate Highway 20 at underpass, mileage 15.3, one mile east of Meridian. September 4, 1960.

leading southwesterly 1.1 miles distant to the crest of Mt. Barton (Seymores Hill).

Along U. S. Highway 80, at the south edge of Meridian, at miles 21.9 and 19.5- 19.7, the lower half of the Hatchetigbee is thin-bedded, green-gray, micaceous, clayey silts or silty clays, capped by thin, buff-colored, micaceous sands parted by yellow clay. However, eastward, along Interstate Highway 20, these strata become siltier and sandier, as at mileage 16.0 and at mileage 15.6 (Figure 8), where silts and silty clays are complexly interlensed and intertongued; and at miles 13.1 - 14.0 where massive but thin-bedded, buff-colored sands predominate. These latter have been borrowed for construction of highway subgrade. At a few places the unit contains a buff-colored silt 5 to 10 feet in thickness in which are embedded angular pebbles and cobbles of light-gray silty clay (Figure 9).

A few outcrops of the upper half of the Zone 5 Hatchetigbee beds are along U. S. Highway 80 and only one on Interstate 20. Those on Highway 80 are all west of Meridian. Three exposures and three 50-foot auger tests on the steep west valley wall of Okatibbee Creek, mileages 22.7 - 23.3, indicate that these strata are chiefly micaceous silts and silty sands which include two, possibly three, lignite-carbonaceous clay lenses at several horizons. The records of the test holes 9, 10, and 11 are in the appendix. One lignitic zone is exposed at the base of the valley wall at 22.8 miles. Another is near the very top of the Hatchetigbee, at mileage 23.3, where Figure 10 shows carbonaceous clay, lignite, and silt of Hatchetigbee age overlain by Meridian sands. These strata are gently flexed as explained in "Structure 2". The upper Hatchetigbee silty sands along Interstate 20 are shown in Figure 8, as part of the dark sands near the top of the photograph, just beneath a capping of terrace sands.

As farther east, the lignite-carbonaceous material presents problems in road construction for it is constantly wet, causing heaving of the subgrade unless it is dug away and backfilled, and produces ground water which is too acid to maintain a sod cover.

MERIDIAN (MILES 23.5 - 27.5)

Massive, cross-bedded Meridian sands are above the Hatchetigbee beds and under Tallahatta claystones. Some geologists

Figure 10.—Zone 5 Wilcox (Hatchetigbee) thin-bedded carbonaceous clays and dark-gray silts and massive lignite overlain by Meridian sand in south cut of U. S. Highway 80 about 2 miles west of Meridian, mileage 23.3. September 4, 1960.

Figure 11.—Meridian-Tallahatta contact partly covered by slump in cut of abandoned road on north side of U. S. Highway 80, 5 miles west of Meridian, mileage 26.3. September 4, 1960.

include the Meridian in the Wilcox group. Others call these sands basal Claiborne. In this report they are included in the Claiborne group.

Exposures of Meridian sand are abundant in hilltop cuts and hillside cuts of U. S. Highway 80, 2 to 5 miles west of Meridian. The unit is at least 70 feet in thickness as measured on the outcrop and in test holes 8, 9, and 10 on Lost Gap Hill, mileages 23.5 - 24.2. The lower, Hatchetigbee, contact is distinct, as shown in Figure 10. The upper, Tallahatta, contact is gradational in the region but good exposures are unavailable along the highway due to mantling by huge claystone slump blocks, mileages 25.3 - 26.3. The lone certain, but poor, Meridian-Tallahatta contact is shown in Figure 11, mileage 26.3.

Most highway cuts of Meridian sand are either well sodded or are badly weathered. The best exposure observed is at the crossroad at mileage 23.8 where thin, buff, clayey silts and silts are cross-bedded with orange-buff, iron-stained, micaceous, medium-grained sand. Downhill to the east massive, nearly white Meridian sands are being borrowed from pits on both sides of the highway and trucked to Meridian where they are mixed with residual clay for road building. The sands cropping out on Lost Gap Hill, mileages 23.5 - 24.2, are involved in the same flexing as the upper Hatchetigbee strata downhill to the east.

TALLAHATTA (MILES 25.3 - 31.9)

Lower Claiborne Tallahatta beds make the most conspicuous roadcuts of Highway 80, especially where they form 3 cuestas at miles 25.3 - 26.2, 27.8 - 28.7, and 29.7 - 30.4. Several cuts are 50 to 80 feet in depth and expose nearly the full thickness of the unit—90 feet. To avoid sheer walls and the consequent danger of falling slabs many Tallahatta roadcuts have been shaped in 3 to 5 steps of 12 to 15 feet each.

The Tallahatta has been carefully described in Lauderdale County by Foster[11] who mentions thicknesses of 74, 88, and 94 feet.

The lower two-thirds of the unit is chiefly claystone in beds of 1 to 4 inches in thickness, separated by partings of clayey, micaceous silt as at miles 25.4 - 25.9 and 27.9 - 28.6. However, at any horizon, siltstone beds of 6 to 16 inches in thickness can

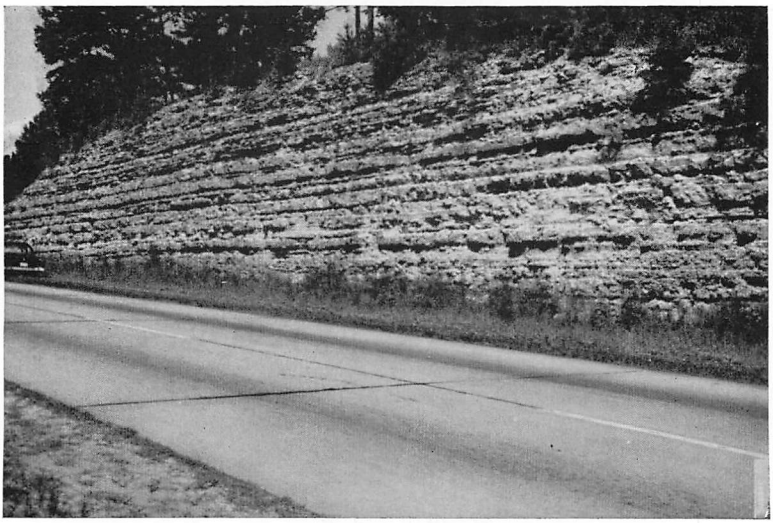

Figure 12.—Lower Tallahatta claystones and siltstones, north cut, U. S. Highway 80, mileage 25.5, 4 miles west of Meridian. September 4, 1960.

Figure 13.—Upper Tallahatta thin-bedded siltstones overlain by weathered Winona greensand, top of south cut, U. S. Highway 80, mileage 29.9, 9 miles west of Meridian. September 4, 1960.

be observed. Near the base there may be several buhrstone zones 8 to 14 inches in thickness—nests of quartz sand and very dark glauconitic sand distributed through dense claystone which in turn is enclosed in clayey siltstone, the whole forming a rock which, when freshly quarried, has been dressed for use as millstones. Claystones, siltstones, and buhrstones are gray tan when fresh but they rapidly weather gray white. The bedding is accentuated as the partings weather first and leave the resistant claystones, siltstones, and buhrstones standing in relief (Figure 12).

Siltstones are more abundant than claystones in the upper one-third of the Tallahatta, as at mileages 29.6 - 29.7, 29.9, and 30.3 - 30.5. The siltstones are but 1 to 3 inches in thickness and are parted by micaceous silts less than one inch in thickness. On weathering these silty rocks produce fairly smooth walls of roadcuts which show few strata standing in relief (Figure 13).

The necessity for maintaining a highway grade through the three cuestas presents problems in excavation and protection against rock fall. At the same time the cut material removed is disposed to good advantage in making stable fill in the valleys. Each proposed deep roadcut should be cored to determine the thicker, more resistant beds to cap each step in the wall.

WINONA (MILES 29.9 - 30.25)

The Winona greensand is present along U. S. Highway 80 in only two fairly new roadcuts in Lauderdale County, at mileages 29.9 - 30.1, and at 30.15 - 30.25 (and in 6 much older, deeply weathered cuts in Newton County distributed through miles 33.0 - 34.8, Plate 2). The outcrops show Indian-red, clayey sand with warty limonitic concretions which mask the original bedding. This material is the residuum of greenish-gray, highly glaucontic, fairly fossiliferous marl. (There is no development of an underlying non-fossiliferous, non-glauconitic Neshoba sand as that developed a short distance to the northwest.)

The unit's thickness is 18 feet atop the third Tallahatta cuesta at 30.2 miles and 16 feet to the west in Test Hole 5 at 34.3 miles. When the cut was new in 1951 the lower contact (Figure 13) was sharp but it is now difficult to distinguish due to the red, clayey sand which mantles the weathering upper Tallahatta siltstones.

In contrast, the upper contact with the Zilpha is sharp even after prolonged exposure (Figure 14).

The clayey Winona sand residuum makes good topping for the subgrade in highway construction, therefore, it is unfortunate that the unit is so thin. However, Winona capped hills both south and north of the highway at mileages 30 and 36 should provide enough material.

Figure 14.—Dark Winona strata overlain by light Zilpha clay. Figure stands on the contact. North cut of U. S. Highway 80 mileage 30.2, about 9 miles west of Meridian. September 4, 1960.

ZILPHA (MILES 29.9 - 30.25)

The slightly silty, fairly carbonaceous Zilpha clay is exposed along Highway 80 in Lauderdale County where it overlies the Winona greensand marl at miles 29.9 - 30.1 and at 30.15 - 30.25 (and farther west at miles 34.0 - 34.8 and 36.0 - 36.2 in Newton County). The lower 10 feet are exposed, of a 38 foot thickness in Test Hole 4 in nearby Newton County at mile 36.25. The clay is massive and has a conchoidal fracture. Freshly dug samples are dark brown but in roadcuts it weathers rapidly to a gray-tan plastic clay having a checked surface. Its contact with the Winona is sharp (Figure 14).

Fortunately for highway construction the Zilpha is a relatively thin unit. As it is, the weathering surfaces cause foundation troubles due to expanding of plastic clays when they are wetted and shrinking when they are dried. It is suggested that

the clays be removed and backfilled with clayey Kosciusko or clayey Winona sand when the new highway is constructed.

TERRACE SAND

Pleistocene or Recent terrace sands commonly cap the higher hills cut by U. S. Highway 80 in Lauderdale County. On Plate 1 the deposit is distinguished by a capital T. The material is the weathered remnant of an alluvial deposit which once covered much of Mississippi.

The terrace material is usually poorly bedded, medium-grained to coarse-grained, orange-red to dark-red, ferruginous, clayey sand which overlies all units irrespective of their lithology. Where terrace sands are draped over hills of clay or silt or silty shale they are easily distinguished. But where they cap weathered Wilcox sands or Meridian sands they are difficult to identify except where they contain coarse grit of quartz or small pebbles of quartz or concentrations of petrified wood fragments. The terrace capping may be only a few feet or may be 21 feet as on Lost Gap Hill, mileage 24.1.

In Lauderdale County, several Wilcox and Meridian sands provide most of the topping for subgrade material but some terrace sands near the Alabama line, miles 0.2 and 0.8, may be of value in finishing Interstate Highway 20. Terrace sands atop Lost Gap Hill may also be useful in making the second lane of the Highway across the three Tallahatta cuestas, at miles 24, 25 - 26, and 27.8 - 28.6. Thicknesses of terrace sands on various hilltops along the highway in Lauderdale County are:

Miles	Thickness (ft.)	Miles	Thickness (ft.)
0.2	4	11.5	11
0.4	5	12.0	8
0.8	7	12.2	11
1.7	4	14.2	11
5.7	6	14.8	7
8.4	4	15.6	14
8.7	12	19.5	8
9.0	15	19.6	11
9.9	6	22.8	4
11.3	8	23.9	18
10.6	9	24.1	21
10.7	12	24.4	5

STRUCTURE

The two structures already cited in Lauderdale County involve (1) Zones 3, 4, and 5 Wilcox strata along Interstate Highway 20 at miles 7 to 10 and (2) upper Hatchetigbee-Meridian beds along Highway 80 at miles 21 - 25.

STRUCTURE 1.

Structure 1 consists of the following elements: gentle west dip from miles 0 to 7; steepened west dip at miles 7 - 8 (Figure 4) noticeably reversed, east, dip at miles 8 - 9; and steepened west dip from mileages 9 to 16.

Four interpretations of the anomaly are possible: (1) it is merely an evidence or irregular sedimentary deposition; (2) it is downhill slump of strata on the west valley wall of Toomsuba Creek; (3) it is the flexure such as might be produced as a fault north or south of the highway is dying out; or (4) it is actually a fault, upthrown on the west, downdip side, similar to the faults of the northwest-southeast Pickens-Gilbertown fault zone which passes some 30 miles to the south of the anomaly and which produces Eutaw oil at Langsdale and Gilbertown fields on the Alabama-Mississippi line.

Interpretations (1) and (2) are ruled out because of the size of the feature but there is some evidence for the other two. Foster[12] reported an "Alamucha Structure" based partly on his belief that there were but two Bashi marls (not four as this report shows) and based partly on the assumption that fossiliferous marls just over the Alabama line were Bashi, not Nanafalia marls as they are now recognized. Nevertheless his grounds for some faulting 3 miles south of Toomsuba, mileage 6, appear to be sound, faulting which if projected northwest would intersect Highway 20 at the synclinal flexure at mileage 8. If there is faulting at the highway, the east dipping beds from miles 8 to 9 are drag on the upthrown, west, side of a fault and steepened west dip from miles 7 to 8 are drag on the downthrown, updip, east side of the concealed fault plane.

As the area east of Meridian has been extensively explored by geophysical means, it is doubtful if the surface feature at Structure 1 indicates a subsurface anomaly worthy of further exploration. But, in the event it is core drilled, the writer sug-

gests that the Clayton limestone marl at depths of 1,200 to 1,400 feet be used as datum, rather than the undulating top of the Porters Creek black shale which would be encountered at depths of only 700 to 900 feet.

STRUCTURE 2.

Structure 2 at Lost Gap Hill west of Meridian, is recognized where gentle west regional dip from miles 17 to 20 is steepened at miles 20-23, sharply reversed at miles 23 - 24, and steepened again from mileages 24 to 25, despite the fact that Highway 80 here runs nearly with the strike of the beds.

At first the reverse dip at mileages 23 - 24 was considered hillside slump on the west valley wall of Hog Nose Creek but hand-auger holes showed that the carbonaceous beds in the upper Hatchetigbee (Figure 11) are either repeated at the base of the hill or that another carbonaceous zone is present in the middle of the unit which is not present east of Meridian along Interstate Highway 20 or in that city along Highway 80.

Subsequently 50-foot test holes 8, 9, and 10 were drilled atop Lost Gap Hill at the crest of the valley wall, to determine the position of the Hatchetigbee-Meridian contact. A fourth hole, Hole 11, was drilled to confirm the carbonaceous beds at the base of the valley wall. The results of drilling are shown on Plate 1.

As in "Structure 1", the anomaly at Structure 2 may be due to (1) flexing as a fault is dying out or (2) actual faulting. If there is faulting it is much like that of Structure 1. The steepened strata from miles 21 - 23 represent drag on the downthrown, updip, side of the fault plane, the reverse dips at miles 23 - 24 are drag on the upthrown, downdip, side of the plane, and the steepened west dips at mileages 24 - 25 represent accentuation of normal dip by thrusting.

Field geologists and geophysicists are doubtless aware of the anomaly at Structure 2. However, if core drilling is attempted it will be an expensive undertaking as this writer knows of no reliable beds for a datum younger than the Clayton limestone-marl at depths of some 2,000 to 2,200 feet.

PLATE 2, NEWTON COUNTY

TOPOGRAPHY

A series of vales and cuestas constitutes the topography crossed by U. S. Highway 80 in Newton County, mileages 31.9-56.5. The chief features are: (1) the broad valley of Chunky River, miles 31.9 - 38.9, underlain by upper Tallahatta, Winona, Zilpha, and lower Kosciusko strata; (2) a low cuesta held up by upper Kosciusko sands from miles 28.9 to 42.6; (3) the narrow valley of Dunnagin Creek at miles 42.6 - 44.4 eroded from lower Archusa-Potterchitto marls; (4) a narrow cuesta at Newton capped by basal Cockfield sands which protect clays and marls, miles 44.5 - 47.4; (5) a narrow vale eroded in Cockfield beds, miles 47.4 - 48.3; and (6) a broad, low cuesta held up by Cockfield sands and basal Yazoo clays from mile 48.3 west into Scott County through the village of Lake, at mile 57.3. These features are a west continuation of the North Central Hills (Figure 1) except for a segment of the cuesta west of mileage 50.7 which is the Cockfield-Moodys Branch contact and is consequently the east margin of the broad Jackson Prairie.

STRATIGRAPHY

As shown in the stratigraphic column (Figure 2) nine bedrock units are recognized along U. S. Highway 80 in Newton County, Plate 2. These, in the order of their deposition and treatment, are Tallahatta, Winona, Zilpha, Kosciusko, Archusa-Potterchitto (lower Wautubbee), Gordon Creek (upper Wautubbe), Cockfield, Moodys Branch and Yazoo. The total thickness of these units in Newton County is about 563 feet. This figure includes some strata which are also shown on Plate 1, Lauderdale County; the upper 40 feet of Tallahatta and the full thicknesses of the Winona and Zilpha, 18 and 38 feet, respectively. The figure also includes the lower 90 feet of the Yazoo clay which underlies the highway in Scott County to the west. As in Lauderdale county, terrace sands may overlie any of the above bedrock units.

Concluding the treatment of each unit observations are made possible for use by the highway engineer.

TALLAHATTA (MILES 31.9 - 33.6)

The upper, thin-bedded Tallahatta siltstones are deeply weathered along U. S. Highway 80 in Newton County, from miles 39.1 - 33.6. Bedrock is detected in a few low knobs rising above the floor of Chunky River valley at the village of Chunky and in the bed and banks of the stream.

In most of the valley the Tallahatta forms a gray-white silty clay which forms a good support for the highway subgrade.

WINONA (MILES 33.0 - 34.8)

In Newton County roadcuts of Highway 80, the greensand is so badly weathered that it can be recognized only as an Indian-red, clayey, residual sand, as at miles 33.0 and 33.8. A test hole, Hole 5, drilled on the hilltop at mile 34.3 showed a thickness of 16 feet of partly weathered, greenish-brown glauconitic sand beneath 18 feet of Zilpha clay.

ZILPHA (MILES 34.0 - 36.3)

In contrast to the deeply weathered Tallahatta and Winona, the overlying Zilpha along Highway 80 in Newton County is barely weathered. Gray-tan plastic clays only one or two inches in thickness mantle chocolate-brown, blocky, slightly silty Zilpha clay on the low hill at miles 34.1, 34.3, and 34.6. Hole 5 was drilled through 18 feet of the clay and into Winona and Tallahatta strata at mileage 34.3, about 4 miles east of the village of Hickory.

The Zilpha-Kosciusko contact was discovered in roadcuts at miles 36.1 and 36.25 where Test Hole 4 was drilled and showed 38 feet of Zilpha. At these places the chocolate-brown Zilpha clays are separated from the Kosciusko by several feet of glauconitic greensand. This stray marine sand has been pointed out by Thomas[13] along Mississippi Highway 15, 15 miles north of Newton and some 18 miles northwest of Hole 4. It is mentioned here because the glauconitic material suggests Winona greensand.

KOSCIUSKO (MILES 36.3 - 42.7)

Sands, silts and silty clays of the Kosciusko are exposed in badly weathered cuts of Highway 80 in Newton County, miles 36.3 - 42.7. The Kosciusko is known in the subsurface as the

Sparta sand and is so designated on the recent, 1945, map of Mississippi. The unit has a thickness of some 165 feet. Its contact with the underlying Zilpha at 36.3 mile just east of Hickory has been described. The contact with the overlying Archusa-Potterchitto marl is much more difficult to find due to a clay residuum of marl which mantles the upper Kosciusko sands, as at mileages 42.3, 42.6, and 42.7 some 3 miles west of Hickory. These upper contacts were discovered by drilling shallow hand auger holes.

Figure 15.—Massive upper Kosciusko sands overlain by terrace sands at hilltop, mileage 40.8, north cut, U. S. Highway 80, 2 miles west of Hickory. Contact is at figure's waist. September 4, 1960.

The lower 70 feet of the Kosciusko is chiefly thin-bedded, silty, micaceous clay and thin-bedded, gray-green, micaceous, clayey silt. In places they are separated by thin interbeds of buff, fine-grained, micaceous sand. All weather to a gray silty colluvium which mantles the low bench on which the city of Hickory is built.

The upper 95 feet of the Kosciusko is massive, gray-buff, slightly micaceous sand with lenses and partings of gray silts or silty clays. The sands weather orange buff to red buff and are easily confused with the terrace sands (Figure 15), mileage 40.8, which cap the sand hill cuesta 1 to 4 miles west of Hickory.

From the condition of the segment of the highway which crosses the Kosciusko outcrop, the lower silts and silty clays appear to form a good road foundation through Hickory, but the massive sands which have produced a more rugged topography west of Hickory do not furnish a good support.

ARCHUSA-POTTERCHITTO (MILES 42.3 - 45.6)

Along Highway 80 deeply weathered marls, about 70 feet in thickness, which are here called Archusa-Potterchitto, floor the valley of Dunnagin Creek and form the steep east front of the cuesta on which Newton is built, miles 44.4 to 45.5. The marls

Figure 16.—Badly weathered Archusa-Potterchitto marls, north cut, U. S. Highway 80, one mile east of Newton at mileage 44.8. September 4, 1960.

can be distinguished one mile north of Newton at the new Interstate Highway 20 overpass of Mississippi Highway 15 where they and the overlying Gordon Creek clay have been sectioned by Thomas[14]. However, the marls can not be differentiated along Highway 80.

Nine exposures show gray-buff, calcareous, micaceous, silty clays which are the weathered products of the Archusa-Potterchitto marl (Figure 16). However, digging with a spade or hand auger reveals the parent material, gray-green, clayey, micaceous, marls containing an abundance of small pelecypods, gastropods,

and corals, and a few huge oysters. The upper 12 feet were penetrated by Test Hole 6 drilled at the intersection of Highway 80 and Mississippi Highway 15 in east Newton at mileage 46.0 and the upper 35 feet of the Archusa-Potterchitto marl were tested on Highway 80 by Hole 7 drilled at mileage 45.7 downhill and 0.3 mile farther east of the east corporation limit of Newton.

The lower contact (with the Kosciusko) is difficult to find due to the mantling by clay residuum of the marl. In contrast, the upper contact is easily discerned in roadcuts where dark Gordon Creek shales lie above the gray marl residuum and in hillside cultivated fields where dark soils overlie gray soils.

The marls appear to be unsatisfactory for road fill, as indicated by the creep of the concrete pavement. It is suggested that in future highway construction the marls should be excavated and backfilled with Cockfield sand mixed with noncalcareous lower Cockfield clay, both are available atop the cuesta in Newton.

GORDON CREEK (MILES 45.6 - 45.9)

A dark-brown, slightly silty, carbonaceous shale, the Gordon Creek shows in the cuts on the east face of the Newton cuesta along Highway 80 at miles 45.6 - 45.9. The unit is about 20 feet thick here but it thins to only 10 to 12 feet 0.5 mile to the north along Mississippi Highway 15 where fresher cuts expose its contact with the Potterchitto marl. The whole thickness was obtained in Test Hole 6 at mileage 46.0 and the lower half was penetrated in Hole 7 at mileage 45.7.

On prolonged exposure the dark-brown shale becomes gray-tan silty clay. However, the weathered color is so persistent that the Gordon Creek soils in cultivated fields can be distingushed from the red-orange Cockfield sandy soils above and the light-gray marl derived soils below.

An intermediate stage in the weathering appears to be a tan-brown, waxy, silty clay as seen in excavations for a water main. As the material retained ground water for a surprisingly long time it is believed that in highway construction Gordon Creek shale should be excavated well below grade and then

backfilled with sandy Cockfield which is so abundant at the top of the Newton cuesta.

COCKFIELD (MILES 45.9 - 51.3)

The Cockfield along Highway 80 from Newton to Lawrence is chiefly massive, medium-grained sand as exposed in road-cuts and on hillsides from mileages 45.9 to 51.3. Its thickness is 105 feet. The sands contain lenses or thin beds of fine-grained sands, micaceous silts, and silty clays, at any horizon. Figure 17 shows typical Cockfield strata at the sharp hill, mileage 48.0 in west Newton. The massive sands are nearly white when

Figure 17.—Typical Cockfield strata in borrow pit, south side of U. S. Highway 80, mileage 48.0, in west Newton. The figure stands on thin-bedded silts and silty clays. Above him is massive, micaceous, medium-grained sand capped by a thin deposit of terrace sand. September 4, 1960.

fresh but they weather quickly to buff, orange buff, and orange red. The finer sands, silts, and silty clays are gray when fresh. They become buff upon weathering.

Massive Cockfield sands are best developed in the lower half of the unit, as top the Newton cuesta, miles 45.9 - 47.3, and on the lower west valley wall of the Potterchitto Creek, miles 48.5 - 49.3. The upper half of the unit is interbedded and interlensed thin sands, silts, and silty clay from mileage 49.3 to Lawrence at 50.7 mile.

The lower contact is easy to determine at mileage 45.9 where a gray, silty clay lens of Cockfield rests on the darker Gordon Creek weathered shale. However, the upper contact at Lawrence, miles 50.7 - 51.3, is mantled by dark-red highly weathered Moodys Branch sandy residuum and must be ascertained by hand augering.

Although the paving from miles 48.5 to 51.3 is old, the writer believes that its sliding is due to the cutting of perched water tables in the upper Cockfield. Observations indicate that most displacement develops near the base of the roadcuts. Atop the cuts red sandy colluvium feeds ground water to the thin silts and sands which are floored by silty clays. These arrest further downward movement of the water and form seeps for much of the year. For construction of the new Interstate Highway 20, the writer suggests excavating the silty clays and backfilling with sandy materials.

MOODYS BRANCH (MILES 50.3 - 51.2)

At the village of Lawrence, miles 50.7 - 51.2, a railroad cut provides the only evidence of the Moodys Branch marl along U. S. Highway 80. In the cut dark-red ferruginous sands have slid over upper Cockfield orange-buff sands, concealing the contact. Between the top of the cut and the highway, at mileage 50.7, are yellow-brown limonitic concretions containing casts of Moodys Branch fossils (Figure 18). To the west, in roadcuts at 50.8, 51.2, and 51.3 miles, a tan-buff silty clay residuum of the Yazoo masks the upper contact.

However, farther west, Test Hole 3 was drilled at mileage 51.6 and showed 17 feet of weathered glauconitic marl. Hole 2 at mileage 52.0 revealed 16 feet of less weathered greenish-brown slightly glauconitic, fairly fossiliferous, silty marl below olive-gray Yazoo clay and above dark-gray Cockfield silty clays.

The dark-red clayey sand residuum should make excellent topping material for subgrade. Hillside exposures of this ferruginous material were noted just north of the village of Lawrence.

YAZOO (MILES 50.7 - 56.4)

The Yazoo has the broadest belt of outcrop of any unit along U. S. Highway 80, as the span in miles above shows. In New-

ton County, Yazoo clays and marly clays make the cuesta from Lawrence at mileage 50.7 to Lake at mileage 56. The part of the Yazoo exposed is the lower 90 feet of the unit which farther west at Morton, miles 75 - 77, has a thickness of about 375 feet.

In Newton County, the Yazoo is mostly clay which contains extensive lenses of silty to sandy, sparingly fossiliferous marl at many horizons.

Figure 18.—Limonitic concretions containing casts of Moodys Branch fossils, atop railroad cut south of U. S. Highway 80, east edge of Lawrence, mileage 50.7. September 4, 1960.

When fresh the clay is blue gray, slightly silty, fairly calcareous, and massively bedded. On weathering it first alters to dark olive gray and then to buff tan. Color change is accompanied by alternate swelling when wet and shrinking when dry so that bedding is soon obliterated, as in roadside ditches and in field ditches as at miles 51.8, 54.5, and 55.7.

When fresh the marls are gray green to olive green depending on the amount of glauconitic sand they contain. On exposure the marls alter buff and then to greenish brown as the ferrous iron in the glauconite oxidizes. They are best seen in the roadcuts at miles 52.5, 53.3, 53.5, 54.1, and 56.0, in Newton County and at 57.0 just west of Lake in Scott County. In these exposures are numerous Bryozoa and small *Pecten* and *Turritella*

and a few single valves of huge *Ostrea,* the latter remaining after the marl and the other fossils had been leached away. However, in some places, as at miles 53.3, 53.5, and 54.1, the best evidence for lenses of marl is a form of caliche, gray-white spongy masses of calcium carbonate, which have been concentrated at the surface by the upward moving ground water.

This silty, sandy marl in the lower Yazoo may represent the northwest extension of the Pachuta marl, a facies recognized by Murry[15] who in 1947 established a four-fold division of the Yazoo formation in eastern Mississippi as follows:

Shubuta clay member (top)
Pachuta marl member (*Zeuglodon* or *Pecten*-Bryozoan bed)
Cocoa sand member
North Creek clay member

The two older facies, North Creek and Cocoa, are developed to the southeast in Jasper and Clarke Counties and are of no importance here. As Thomas[16] believes that the Pachuta marl member can be traced northwest into Yazoo County, where it is found some 85 feet above the Moodys Branch marl, it could very well be included in the lower Yazoo strata near Lake.

However, this writer does not recognize these Pachuta type marls as a member of the Yazoo along U. S. Highway 80 because the top of the marls can not be defined. Likewise the marls are lenses as shown by Test Holes 1, 2, and 3 which encountered clays, not marls, despite Hole 1 having been started on a hilltop at mileage 54.05, some 10 feet above and just east of a thick caliche bed containing *Pecten* and large *Ostrea.*

TERRACE SAND

Fewer hilltops along Highway 80 in Newton County are capped by terrace sands than in Lauderdale County. In most of the roadcuts showing this Pleistocene or Recent deposit, the sands overlie Kosciusko sands atop the cuesta just west of Hickory from miles 39.2 to 41.7 (Figure 15). Thicknesses of the red clayey terrace sand bearing small gravel are from 4 to 13 feet on the sharper divides. An isolated but thin terrace sand caps the sharp hill in west Newton at mileage 48.0 (Figure 17) and another crowns a Cockfield hill at mileage 49.4.

Probably the only terrace sands which can be used for topping the subgrade of future highways are on the cuesta just west of Hickory. The locations and thicknesses of terrace sands in Newton County are in roadcuts, as follows:

Miles	Thickness (ft.)	Miles	Thickness (ft.)
39.2	4	41.3	8
39.6	6	41.6	13
40.5	9	41.8	11
40.9	11	48.1	4
41.1	11	49.4	7

STRUCTURE

There are no structures in Newton County as prominent as the two which are described in Lauderdale County (Plate 1). However, the cross-section (Plate 2) shows several anomalies: (1) unusually gentle dip of Tallahatta, Winona, and Zilpha strata at mileages 32.5 - 34.9; (2) flattening of Kosciusko sands and silts at Hickory, mileages 28.5 - 41.0; and (3) anticlinal folding of Archusa-Potterchitto, Gordon Creek, and lower Cockfield beds, 45.1 - 46.7 at Newton.

The orientation of the highway at (1) accounts for some, but not all, the gentle dip. The actual attitude of the beds can be determined by drilling 100- to 150-foot holes to the top of the Meridian sand.

On the other hand, the flattening at (2) may be due entirely to the northwest-southeast trend of the highway in west Hickory, coincident with the local strike of Kosciusko strata.

However, the folding at (3) seems to be an actual structure despite some curving of the highway in north Newton. Its existence could be easily determined by 50- to 150-foot holes drilled to the top of the Archusa-Potterchitto clayey marl.

PLATE 3, SCOTT COUNTY

TOPOGRAPHY

A succession of low rounded hills and shallow valleys characterizes the Jackson Prairie topography crossed by U. S. Highway 80 in Scott County, Plate 3, miles 56.4 - 80.9. The valleys are carved in the Yazoo clay. A few of the hills may represent cuestas held up by marly lenses in the Yazoo, as at mile 69.3

and as at Morton, miles 75 to 77. But most of them are divides left by streams which head close to the highway. The three groups of the highest hills are at Forest, miles 65 - 67; west of Forest at miles 68.5 - 70.8; and at Morton, miles 75 - 77. The only valley of any consequence is that of Pelahatchie Creek west of Morton at the Scott-Rankin Counties line.

STRATIGRAPHY

Only two bedrock units are exposed in Scott County, Yazoo and Forest Hill. Two hills west of Morton have a thin capping of terrace sand.

The Yazoo constitutes all of the surface crossed by Highway 80 except in the village of Morton where basal Forest Hill silty sands overlie the Yazoo clay. As the Forest Hill is badly weathered, has a thickness of only 5 to 20 feet, and is mostly concealed in Morton, details of that unit's stratigraphy are discussed in "Plate 4, Rankin-Hinds Counties."

Terrace sands 2 feet in thickness cap a sharp hill at mileage 78.3. A lower hill at 78.5 mile shows 2 feet of terrace material.

YAZOO (MILES 56.4 - 80.9)

In Scott County the Yazoo along Highway 80 is poorly exposed because most of the segments of the highway are old and have been built over the hills and have not cut the crests. Thus most of the clay outcrops are in the ditches which drain the hillsides or they are in the borrow pits.

The basal 30 feet of the Yazoo clay are exposed on the valley walls of Warrior Creek near the Newton County line. Westward along the highway to Morton progressively younger Yazoo strata crop out. The full thickness of the unit at Morton is believed to be approximately 375 feet, based on thicknesses of the Yazoo in oil tests drilled down the dip.

The clay has been described in detail by Bergquist[17] in his 1942 report of Scott County, especially its microfossil content from test holes and the apparent structure these fossils showed.

This highway investigation shows a montonous Yazoo lithology and no structures. Where hillside ditches are newly eroded or where they have been recently recut the clay is olive green,

slightly silty, slightly calcareous, and massive, as at miles 57.3, 67.4, 69.3, 71.3, 77.2, and 80.0. But very old exposures are buff tan or buff, silty, noncalcareous or only slightly calcareous. A plastic clay with a checked surface appears to be an intermediate stage in the weathering, caused by swelling when wetted and shrinking when dried. A lens of fossiliferous marl in a cut at mile 57.0 near Lake is similar to others described in the lower Yazoo of nearby Newton County. There are only two higher beds of a marl. One is at 62.0 mile and has a cap of caliche containing *Pecten.* The other is atop the highest hill of Highway 80, west of Forest at mileage 69.4, where both caliche and large *Ostrea* are abundant.

From the highway engineer's standpoint, the Yazoo clay is a problem and the Scott County segment of Highway 80 is one of his worst headaches. As explained, the Yazoo clay expands when wetted and shrinks when it dries, changes in volume which are repeated many times each year and which cause continued sliding of the pavement as the subgrade moves downhill. In addition, the load carrying capacity of the highway is markedly decreased during the rainy season as the following data provided by the Mississippi State Highway Department shows:

Volume change of Yazoo clay from dry to saturated ..... 100 to 235 percent
Load carrying capacity of Yazoo clay in dry weather ..... 800-1000 pounds per square inch
Load carrying capacity of Yazoo clay at optimum moisture (best moisture content for compaction) ..... 200-300 pounds per square inch
Load carrying capacity of Yazoo clay in wet weather (clay is saturated ..... 50-100 pounds per square inch

When treated with 6 percent lime by weight the following load carrying capacities have been obtained:

At optimum moisture (best moisture for compaction) ..... 1500-2000 pounds per square inch
When saturated (prolonged wet weather) ..... 800-1200 pounds per square inch

Future highway subgrades on the Yazoo clay may be stabilized by constructing a thick fill of sandy material, or treating

the clay with hydrated lime, or topping the subgrade with light weight aggregate made from the clay. For the first method the nearest sands are (1) Cockfield 1 mile north of Lake, (2) Cockfield to the east at miles 48 - 51, (3) Cockfield 4 miles northeast of Forest, (4) Forest Hill 1 to 3 miles south of Morton, (5) terrace sand capping hills just northeast of Forest, and (6) Citronelle gravelly clay 1 to 3 miles south of Forest. For the second method, which has already been used in parts of Mississippi, the subgrade is built in thin layers of native clay, each layer being treated with hydrated lime before compacting. The third method would require making light weight aggregate from the Yazoo clay for blanketing a clay subgrade, thus cutting off the capillary rise of waters and assuring lateral drainage.

TERRACE SAND

Only two hilltops along U. S. Highway 80, one mile west of Morton, in Scott County show terrace sands as follows:

Miles	Thickness (ft.)
78.3	2
78.5	2

PLATE 4, RANKIN-HINDS COUNTIES

TOPOGRAPHY

The topography along Highway 80 in Rankin County and eastern Hinds County consists of the following 8 features, from east to west: (1) the broad composite valley of Pelahatchie and Eutacutachee Creeks eroded from the upper 90 feet of Yazoo clays from Morton at mileage 77 to mileage 90; (2) the Rankin east facing cuesta, miles 90 to 92, carved from west dipping Forest Hill strata; (3) a vale from miles 92 to 96 dissolved from calcareous west dipping Vicksburg beds; (4) Brandon Hill, miles 96 to 98 held up by Catahoula strata and terrace sands which cap synclinal Vicksburg marls, limestones, and limy shales; (5) a vale from miles 98 to 101.5 dissolved from the same calcareous units as the vale at (3) but which here dip east off Jackson Dome; (6) a west-facing Forest Hill cuesta, miles 101.5 - 103.4, carved from east dipping sands, silts, and clays; (7) broad, low hills at the base of the cuesta on the east valley wall of Pearl River, miles 103.4 - 104.4, eroded from Yazoo clays dipping east

off Jackson Dome; and (8) a broad alluvial plain of Pearl River, miles 104.4 - 108.9, eroded from the upper 90 feet of Yazoo beds.

The above topographic features and the dipping beds can be identified in Plate 4. Figure 1 shows that features (1), (7), and (8) constitute parts of the Jackson Prairie physiographic belt, features (2), (3), (5), and (6) make up the only part of the Vicksburg Hills crossed by Highway 80, and feature (4) is a small updip remnant of the Piney Woods preserved on Brandon Hill and surrounded by Vicksburg terrane.

STRATIGRAPHY

Seven bedrock units and terrace sand are encountered along U. S. Highway 80 in Rankin County. The units aggregate 628 feet in thickness, but only 343 feet of bedrock strata are actually exposed by virtue of the broad alluvial plain of Pearl River which conceals all but the upper 90 feet of the Yazoo clay. All exposed bedrock strata may be capped by terrace sands.

Due to the structural syncline at Brandon the beds just east of Brandon and just west of Brandon are duplicated both as to units and lithology. The 5 units which are repeated are, from base upward, oldest to youngest; Yazoo, Forest Hill, Mint Springs, Glendon, and Byram. In the Brandon Hill syncline they are overlain by Bucatunna, Catahoula, and terrace sands.

Although it is concealed by Pearl River alluvium, the Moodys Branch marl dips steeply eastward off Jackson Dome, as indicated at miles 108.4 - 108.9.

YAZOO (MILES 80.9 - 104.4)

The upper 90 feet of the 375-foot thickness of Yazoo clay is exposed in two places as Highway 80 crosses Rankin County, miles 80.9 - 90.2 on the east and miles 103.4 - 104.4 on the west. Except for the absence of marl and the presence of one thin bentonite, possible two, its lithology is identical to the Yazoo clay of Scott County. The bentonite is inches in thickness and is situated 35 feet below the top of the unit at mile 86.9 and 65 feet below its top at 82.6 (Figure 19).

The Yazoo clay creates the same problem in highway construction in Rankin County as in Scott County—sliding of the pavement due to alternate expanding and shrinking of the clays.

Figure 19.—A 6-inch bed of bentonite (at figure's head) in upper Yazoo clays exposed in southwest cut of U. S. Highway 80, just west of railroad underpass, 2 miles east of Pelahatchie, mileage 82.6. September 4, 1960.

FOREST HILL (MILES 90.0 - 103.4)

West dipping Forest Hill strata are exposed on the east-facing cuesta just east of the Rankin community, miles 90.0 - 91.9. The unit has a thickness of about 120 feet. Its lower two-thirds is comprised of thin-bedded, interbedded, buff, micaceous silts and gray silty clays enclosing lenses of brown, flaky, thin-bedded, carbonaceous shales. The silts and silty clays weather orange buff and the shales alter first to tan and then to gray tan. All contain fragments and small logs of petrified wood. The upper one-third of the Forest Hill is chiefly buff, cross-bedded, medium-grained, micaceous sand parted by yellow-buff silts. The sands weather orange buff or red buff.

Numerous perched water tables in the lower two-thirds of the Forest Hill cause slipping and sliding of the concrete pavement between miles 90 and 91.5, just as other water tables in the lower Cockfield of Newton County cause pavement displacement. The same remedy is suggested, excavating the contacts of thin silts and the underlying clays and backfilling with sands from the upper part of the unit.

MINT SPRINGS (MILES 91.9 - 101.4)

The Mint Springs marl is about 6 feet in thickness. Although the Mint Springs is not fresh along Highway 80, it exerts a profound effect on the physiography for it helps form the floor of the two vales, (3) and (5) east and west of Brandon.

Weathered marl caps low ridges rising from the floor at miles noted above, east and west of Brandon. It is recognized as purplish-red, ferruginous concretions in the roadcuts and on the adjacent hilltops. Sizes range from that of a pea to that of a hen egg, as shown in the photograph (Figure 20) taken at mileage 93.05. On digging, some of the parent material can be recognized—gray-green, fairly glauconitic, sparingly fossiliferous, sandy marl with thin partings of dark silty clay.

Apparently the concretions topping the hills are stablized against further weathering. If tests show that this is true, the ferruginous material could be scraped up and used for subgrade building.

GLENDON (MILES 94.9 - 98.5)

Along Highway 80, limestone beds in the Glendon are at only three places, miles 95.65, 98.0, and 98.4 (Figure 21). The lower contact is not exposed and the upper contact may be seen only at the base of the railroad underpass at the west edge of Brandon, mileage 98.0. However, the Mint Springs-Byram interval indicates a Glendon thickness of some 30 feet.

One judges from walls of the Marquette Cement Manufacturing Company quarry 0.5 mile south of mileage 98.7 that fresh highway cuts would show beds of light-gray, clayey, fossiliferous limestone up to 3 feet in thickness alternating with gray-white, sparingly fossiliferous, calcareous shales 3 to 5 feet in thickness. But along the highway all the shales have been eroded and most of the limestone has been so badly weathered that only purplish-red, silty clays remain. At mileage 94.9 a limestone remnant is undergoing change—first to white chalky caliche; then to gray-black, blocky, waxy, silty clay; and finally to ferruginous silty clay.

Apparently solution of the limy Glendon strata is so advanced that the highway is not affected by creep.

Figure 20.—Ferruginous concretions, residual from Mint Sprints marl, north cut of U. S. Highway 80, mileage 93.05, 3 miles east of Brandon. September 4, 1960.

Figure 21.—A solution remnant of lower Glendon limestone at the base of an abandoned quarry, northwest cut of U. S. Highway 80, 0.2 mile west of Brandon, mileage 98.4. September 4, 1960.

BYRAM (MILES 96.05 - 98.3)

The Byram is a gray green, fairly glauconitic, fossiliferous marl about 7 feet in thickness as determined by hand auger holes along U. S. Highway 80 at the west edge of Brandon. Basal Byram marl is fairly fresh where it overlies the most upper Glendon limestone at rail height in the railroad underpass at mileage 98.0. Elsewhere it is badly weathered, its presence being indicated by surface accumulations of yellow-brown to red-brown, ferruginous, pea-sized concretions derived from the weathering of the glauconite. Some concretions partly enclose the large Foraminifera *Lepidocyclina* and fragments of *Pecten*.

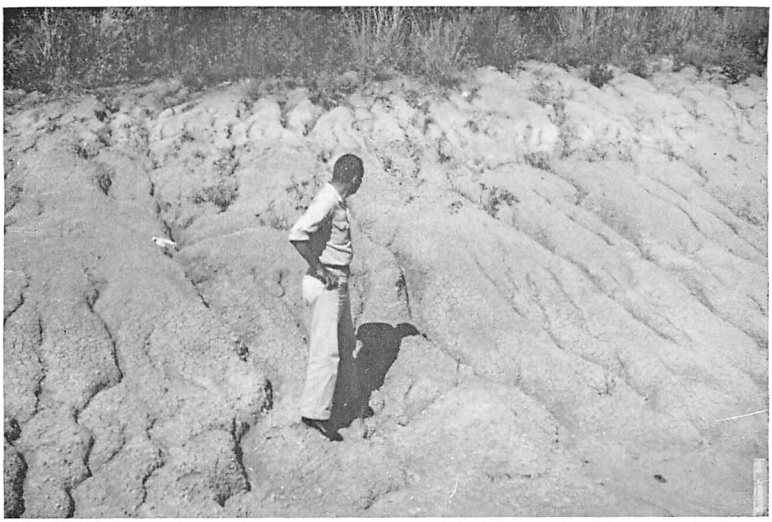

Figure 22.—Checked surfaces in weathering Bucatunna clays on north side of U. S. Highway 80 in west Brandon, mileage 97.6. September 4, 1960.

Although the concretions might have value in road construction the hillside outcrops indicate a limited quantity available.

BUCATUNNA (MILES 96.05 - 98.1)

Probably the best exposure of Bucatunna clay in Mississippi is in west Brandon where the village excavated material before making an extensive sand fill for the segment of Highway 80 which it maintains (Plate 4). Here the upper 40 feet of the full 55-foot thickness of the unit has been recently cleaned for com-

mercial property, miles 97.35 - 97.55 and the lower 15 feet is available for study in cuts at miles 97.6 and 97.8.

In these exposures the Bucatunna is tan, well bedded, slightly micaceous, slightly silty clay which swells on wetting and cracks as it dries (Figure 22). In the drier months the checked surface is littered with crystals of selenite, a variety of gypsum, which is deposited by ascending waters. On weathering the clay first lightens in color and then darkens to a tan brown. Its final product is a light-brown silty loam as seen in deep cuts of access streets and driveways in east Brandon.

Figure 23.—Catahoula-terrace sand contact marked by an undulating limonitic siltstone at figure's feet. Northeast cut of U. S. Highway 80 in west Brandon, mileage 97.35. September 4, 1960.

Bucatunna clays may cause displacement of pavements. Breaks in the segment of Highway 80 in east Brandon may be due to slumping caused by high gradient or they may be due to hillside sliding as the Bucatunna clays slip. In contrast, the pavement at the even steeper gradient of the village maintained segment in west Brandon, which is built on thick sand fill, shows negligible slump. In building new Interstate Highway 20 it is suggested that the Bucatunna should be carefully excavated and backfilled with sandy material.

CATAHOULA (MILES 96.6 - 97.4)

Brandon Hill is held up by basal Miocene Catahoula sands, silty sands, and silty clays overlain by terrace sands. The Catahoula thickness here is about 35 feet, the very base of a unit whose thickness on the Mississippi Gulf Coast is at least 2,000 feet. As shown in Figure 1 and as explained in physiography, Catahoula beds on Brandon Hill constitute a remnant of the Piney Woods surrounded by Vicksburg terrane.

At the west edge of the Brandon business district, Catahoula strata (Figure 23) are exposed beneath thick terrace sands. When fresh the Catahoula sands are buff, fine grained to medium grained, micaceous, cross bedded, and cross laminated. They weather orange buff and then red buff. At any interval in the sand body are interbeds and thin lenses of gray-buff silty sands and silty clays which contain angular to rounded fragments of light-gray clay. At many places a thin shell of limonitic siltstone has been deposited by ground water at the juncture of sand above and clay below.

When Catahoula sands overlie the Bucatunna, a thin, undulating, yellow-brown, limonitic claystone has been deposited by ground water. However, where Catahoula clays lie above Bucatunna clays, the distinction in units must be made on the color of the clays. As shown in Figure 23, the sharp Catahoula-terrace sand contact is marked by another undulating limonitic siltstone.

The Catahoula sands, silty sands, and silty clays would all make good subgrade material for future highway construction. More of these beds and the overlying terrace sands could be removed from the rugged hills on the west side of the Brandon business district, but it is doubtful if the quantity would suffice to build a 4 lane Interstate Highway across the Vicksburg Hills belt. It is suggested that rugged Catahoula and terrace capped hills just northeast of Brandon be examined for additional material.

TERRACE SAND

Terrace sands capping bedrock hills are thicker in Rankin County than anywhere else along the Jackson-Alabama segment of U. S. Highway 80. They are at least 12 feet in thickness in

west Brandon (Figure 23), 15 feet about 2 miles east of Pelahatchie (Figure 24) and nearly 50 feet on the south side of the highway at miles 102.9 - 103.1 some 5 miles east of Jackson and 5 miles west of Brandon. These three localities have been extensively worked for fill materials and the last one is presently being exploited. One huge sand hill has recently been removed from the north side of the highway, miles 102.8 - 103.1, some of it for masonry sand. The leveled base is the site of a new church.

Figure 24.—Terrace sands containing pea gravel in the south cut of U. S. Highway 80, mileage 82.75, about 2 miles east of Pelahatchie. September 4, 1960.

The other terrace-capped hills have been cited in the hope that exploration on both sides of Highway 80 may reveal other, even higher, thicker sands which can be used in the construction of new Interstate Highway 20. Thicknesses of terrace sands on various hilltops along Highway 80 in Rankin County are:

Miles	Thickness (ft.)	Miles	Thickness (ft.)
82.5	8	96.9-97.1	12
82.75	15	97.2-97.3	8
88.5	6	102.4	8
89.05	6	102.9-103.1	43
96.2	9	103.2	9
96.6	5	103.4	7
		104.3	11

DRILL HOLE RECORDS

Drill Hole 1—1797 + 00 F. A. P. FI 004-2(7), Plate 2, 2.5 miles east of Lake.

Thickness feet	Depth feet	Description
		Yazoo
7	7	Clay, greenish-buff, slightly silty, very slightly calcareous, plastic
3	10	Clay, yellow-buff, slightly silty, slightly calcareous, weathered fossil fragments
10	20	Clay, very light-buff, slightly silty, fairly calcareous
15	35	Clay, light greenish-gray, slightly silty, fairly calcareous
10	45	Clay, light greenish-gray, fairly silty, very calcareous
5	50	Clay, greenish-gray, silty, fairly limy

Drill Hole 2—1683 + 00 F. A. P. FI 004-2(7), Plate 2, 0.5 mile west of Lawrence.

Thickness feet	Depth feet	Description
		Yazoo
6	6	Clay, light-gray mottling yellow-buff, fairly silty
2	8	Clay, tan-brown, very silty
2	10	Clay, yellow-brown, fairly silty
2	12	Clay, light greenish-gray, very silty
3	15	Clay, yellow-tan, fairly silty
2	17	Clay, light greenish-gray with yellow mottling, very slightly silty, very slightly calcareous
10	27	Clay, yellow-buff, slightly silty, limy
3	30	Clay, yellow-tan, silty, slightly limy
		Moodys Branch
6	36	Marl, yellow-tan, silty, slightly glauconitic, fairly limy
10	46	Marl, greenish-tan, very silty, slightly glauconitic, fossil fragments
		Cockfield
4	50	Clay, dark-gray, silty

Drill Hole 3—1668 + 00 F. A. P. FI 004-2(7), Plate 2, 0.2 mile west of Lawrence.

Thickness feet	Depth feet	Description
		Yazoo
5	5	Clay, dark-gray with yellow mottling, slightly silty
12	17	Clay, yellow-buff, fairly silty, fairly calcareous

		Moodys Branch
10	27	Marl, yellow-buff, silty, slightly glauconitic, very limy
7	34	Marl, yellow-buff, clayey, slightly glauconitic, very calcareous
		Cockfield
8	42	Clay, tan-buff, fairly silty
8	50	Clay, gray-brown, fairly silty, slightly micaceous

Drill Hole 4—783 + 00 N. R. H. 6, Plate 2, 2.1 miles east of Hickory.

Thickness feet	Depth feet	Description
		Colluvium
2	2	Silt, yellow-buff
		Zilpha
17	19	Shale, buff with yellow streaks, silty
21	40	Clay, gray-brown, carbonaceous, slightly silty.
		Winona
10	50	Marl, gray-green, sandy, very glauconitic, very calcareous, many fossil fragments.

Drill Hole 5—681 + 50 N. R. H. 6, Plate 2, 4.1 miles east of Hickory.

Thickness feet	Depth feet	Description
		Colluvium
2	2	Sand, gray-buff, fine-grained, slightly micaceous.
		Zilpha
4	6	Clay, dark-red, ferruginous, silty.
14	20	Clay, dark-brown, carbonaceous, silty.
		Winona
16	36	Marl, greenish-gray, fairly glauconitic, sandy, fossil fragments near top.
		Tallahatta
6.5	42.5	Shale, light-gray, silty, fairly micaceous.
	42.5TD	on hard siltstone

Drill Hole 6—1350 + 00 N. R. H. 185 C, Plate 2, intersection U. S. Highway 80 and Mississippi 15, in east Meridian.

Thickness feet	Depth feet	Description
		Cockfield
2	2	Silt, buff with yellow mottling, clayey
4	6	Silt, gray-buff, clayey
4	10	Clay, gray-white, silty, slightly micaceous

		Gordon Creek
2	12	Clay, medium-gray, silty, fairly micaceous
6	18	Clay, dark-gray, slightly micaceous
3	21	Clay, dark-gray, slightly micaceous
5	26	Clay, medium-gray, slightly silty, plastic
4	30	Clay, greenish-gray, fairly silty, fairly micaceous
		Archusa-Potterchitto
8	38	Marl, greenish-gray, slightly calcareous, clayey, slightly glauconitic, shell fragments
2	40	Marl, greenish-gray, very calcareous, silty, slightly glauconitic, shell fragments.
10	50	Marl, light-gray, fairly calcareous, silty.

Drill Hole 7—1334 + 00 N. R. H. 185C, Plate 2, East Corporation line of Newton.

Thickness feet	Depth feet	Description
		Gordon Creek
4	4	Clay, gray-buff with yellow mottling, fairly silty, fairly micaceous
9	13	Clay, cream-gray, slightly silty, slightly micaceous
2	15	Silt, cream-buff, slightly clayey, fairly micaceous.
		Archusa-Potterchitto
8	23	Marl, blue-gray, slightly micaceous, clayey
2	25	Marl, blue-gray, slightly glauconitic, clayey
8	33	Marl, greenish-gray, fairly silty
17	50	Marl, light-gray, slightly silty, fossil fragments.

Drill Hole 8—440 + 00 S. P. 80-1251 (1), Plate 1, 2.6 miles west of Meridian.

Thickness feet	Depth feet	Description
		Meridian
3	3	Sand, orange-buff, fine-grained to medium-grained, slightly micaceous
1	4	Sand, orange-red, fine-grained to medium-grained; a few grains of coarse sand
4	8	Sand, orange, fine-grained, fairly micaceous
10	18	Sand, brick-red, fine-grained, clayey
8	26	Sand, orange-red, fine-grained to medium-grained
1	27	Sand, orange, fine-grained to medium-grained, slightly micaceous; pellets of buff clay
11	38	Sand, yellow-buff, fine-grained to medium-grained, slightly micaceous
12	50	Sand, orange-yellow, fine-grained, slightly micaceous; a few grains of coarse sand.

Drill Hole 9—460 + 00 S.P. 80-1251 (1), Plate 1, 2.2 miles west of Meridian.

Thickness feet	Depth feet	Description
		Meridian
6	6	Sand, dark brick-red, fine-grained to medium-grained, buff clay pellets
5	11	Sand, bright-red, fine-grained to medium-grained, fairly micaceous
11	22	Sand, orange-red, fine-grained to medium-grained, slightly micaceous
2	24	Sand, red-brown, fine-grained to coarse-grained, slightly micaceous
10	34	Sand, red-orange, fine-grained to medium-grained, slightly micaceous
13	47	Sand, orange, fine-grained to medium-grained, slightly micaceous
		Zone 5 Wilcox (Hatchetigbee)
3	50	Sand, yellow-buff, silty, fairly micaceous.

Drill Hole 10—470 + 00 S. P. 80-1251 (1), Plate 1, 2.0 miles west of Meridian.

Thickness feet	Depth feet	Description
		Meridian
13	13	Sand, yellow-buff, fine-grained to medium-grained, slightly micaceous
4	17	Sand, orange-buff, fine-grained to coarse-grained, slightly micaceous
2	19	Sand, orange-buff, fine-grained to coarse-grained
2	21	Sand, orange-buff, fine-grained to medium-grained
5	26	Sand, orange-buff, fine-grained to medium-grained, slightly micaceous
2	28	Sand, red-brown, fine-grained to medium-grained, slightly micaceous
2	30	Sand, red-buff, fine-grained; yellow-buff clay pellets.
		Zone 5 Wilcox (Hatchetigbee)
2	32	Silt, purple-buff, clayey, fairly micaceous
4	36	Silt, yellow-buff, sandy
6	42	Silt, buff, slightly micaceous
8	50	Clay, light-tan with brown lignitic streaks.

Drill Hole 11—515 + 00 S. P. 80-1251 (1), Plate 1, 1.0 mile west of Meridian.

Thickness feet	Depth feet	Description
		Zone 5 Wilcox (Hatchetigbee)
2	2	Colluvium, red-brown, sandy
7	9	Clay, dark-gray, slightly silty; carbonaceous
7	16	Clay, gray-brown, silty, carbonaceous
9	25	Sand, dark-tan, fine-grained, fairly micaceous
11	36	Sand, dark gray-tan, fine-grained, silty, fairly micaceous
5	41	Sand, dark-gray, silty, fairly micaceous; streaks dark-gray carbonaceous shale
9	50	Clay, dark-gray, very silty, slightly micaceous.

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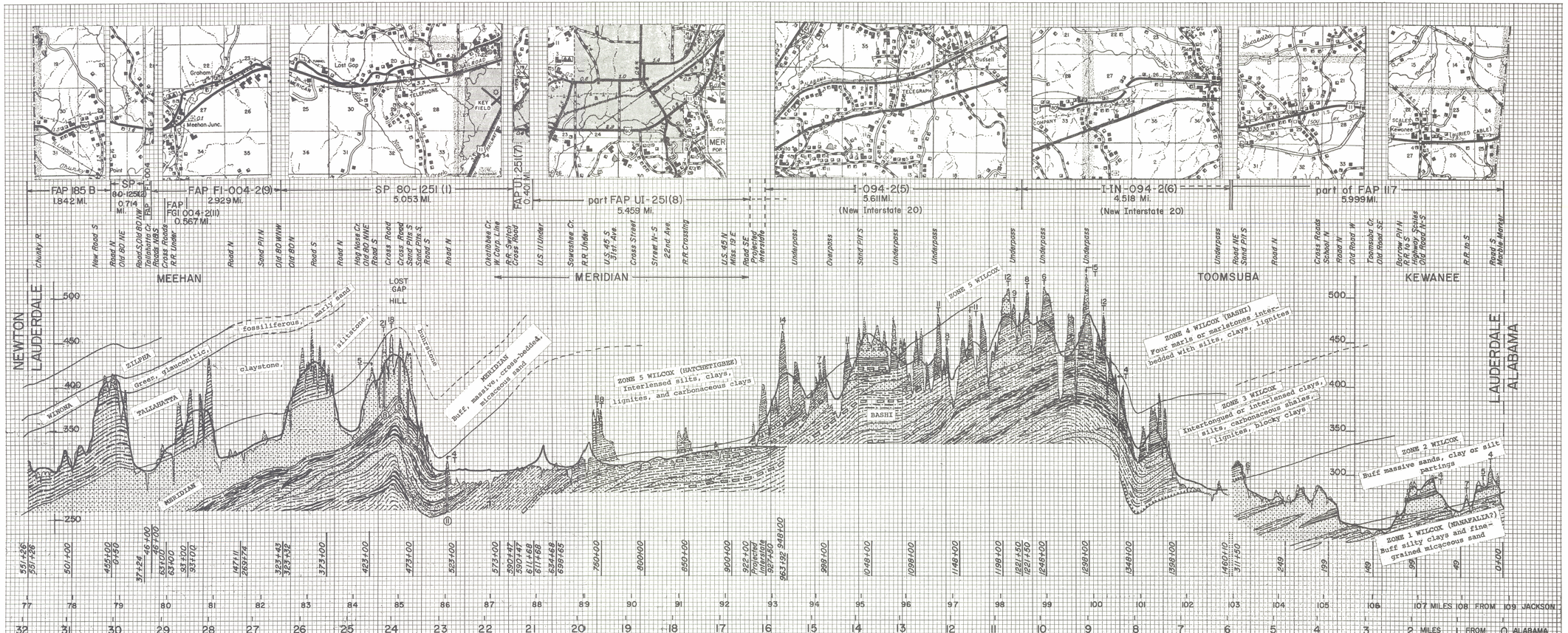


LEGEND

Profile By MISSISSIPPI STATE HIGHWAY DEPARTMENT

Geology By Richard R. Priddy

Drill Holes

Highway Profile

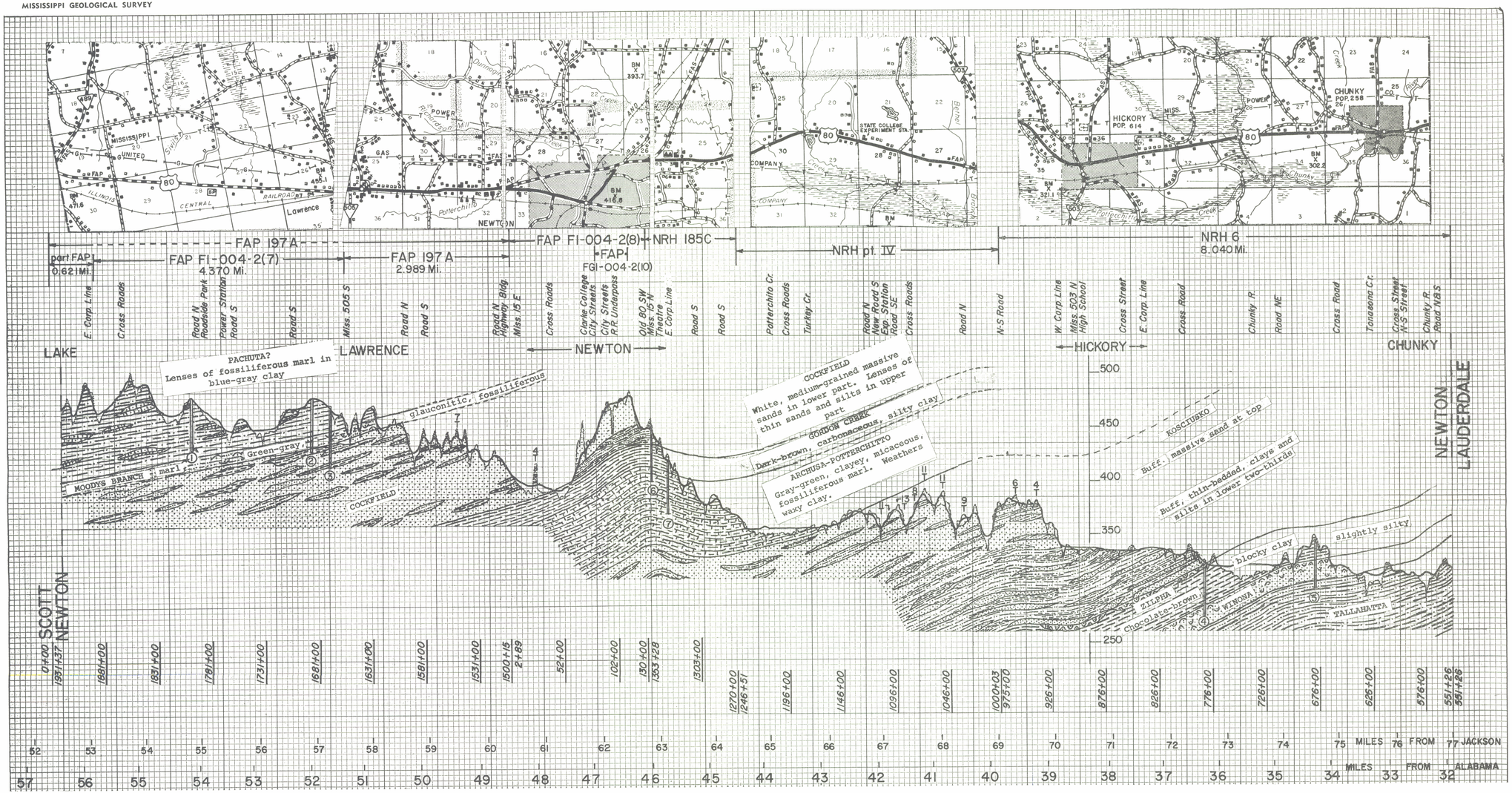
Topographic Profile

Horizontal Scale 1 Mile

Vertical Scale 50 Feet

LITHOLOGY

- Limestone
- Marly Limestone
- Marlstone
- Marl
- Limy Shale (Yazoo)
- Lenses Of Carbonaceous Shale and/or Lignite
- Lenses Of Blocky Clay
- Lenses Of Thinly Laminated Clay
- Claystone & Siltstone (Tallahatta)
- Silty Shale
- Very Silty Shale
- Silt
- Fine-Grained Sand
- Medium-Grained Sand
- Coarse-Grained Sand
- Thicknesses Of Terrace Sands On Hilltops (8 T, 23 T, 17 T)
- Cobble Conglomerate



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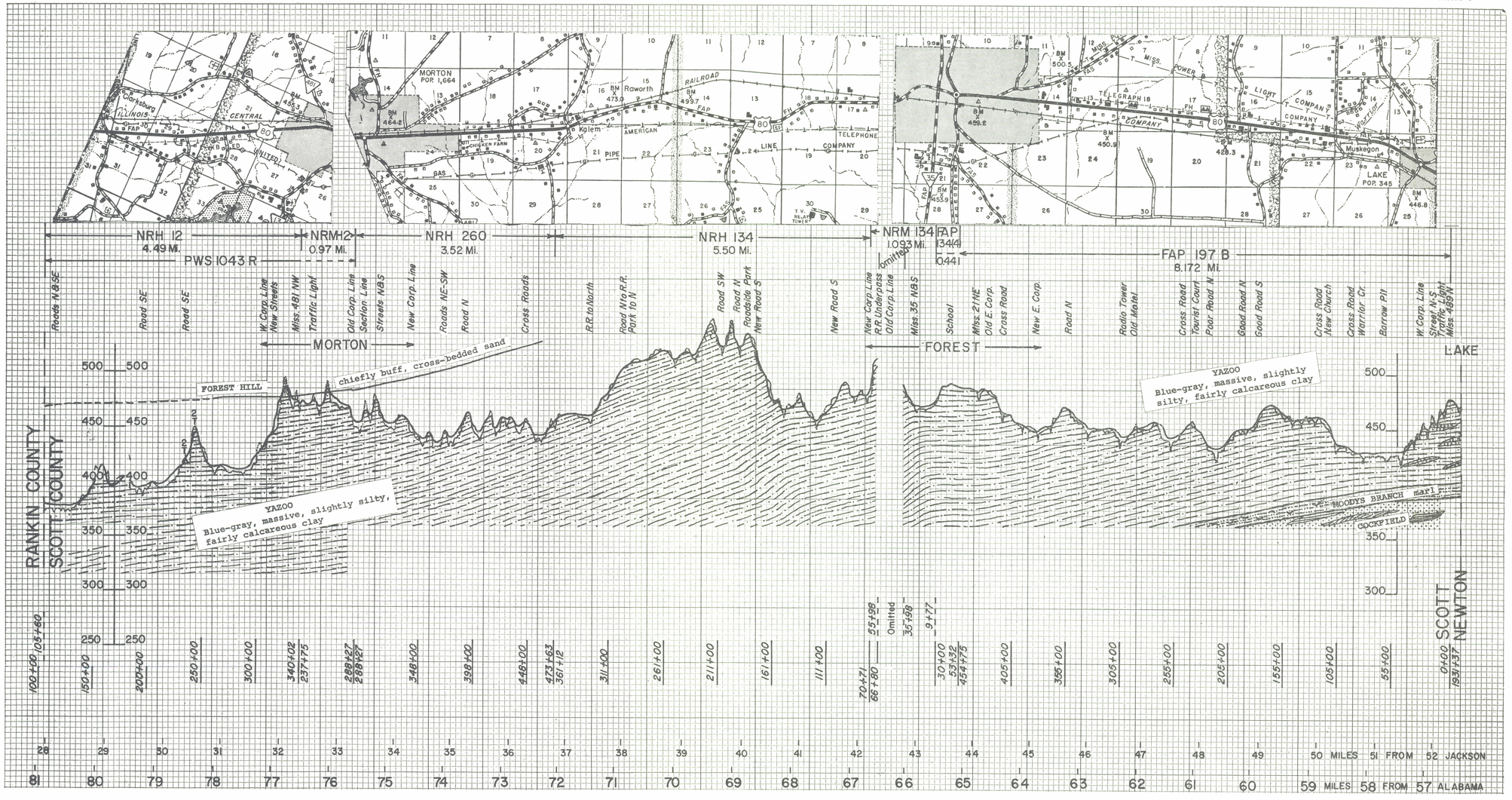

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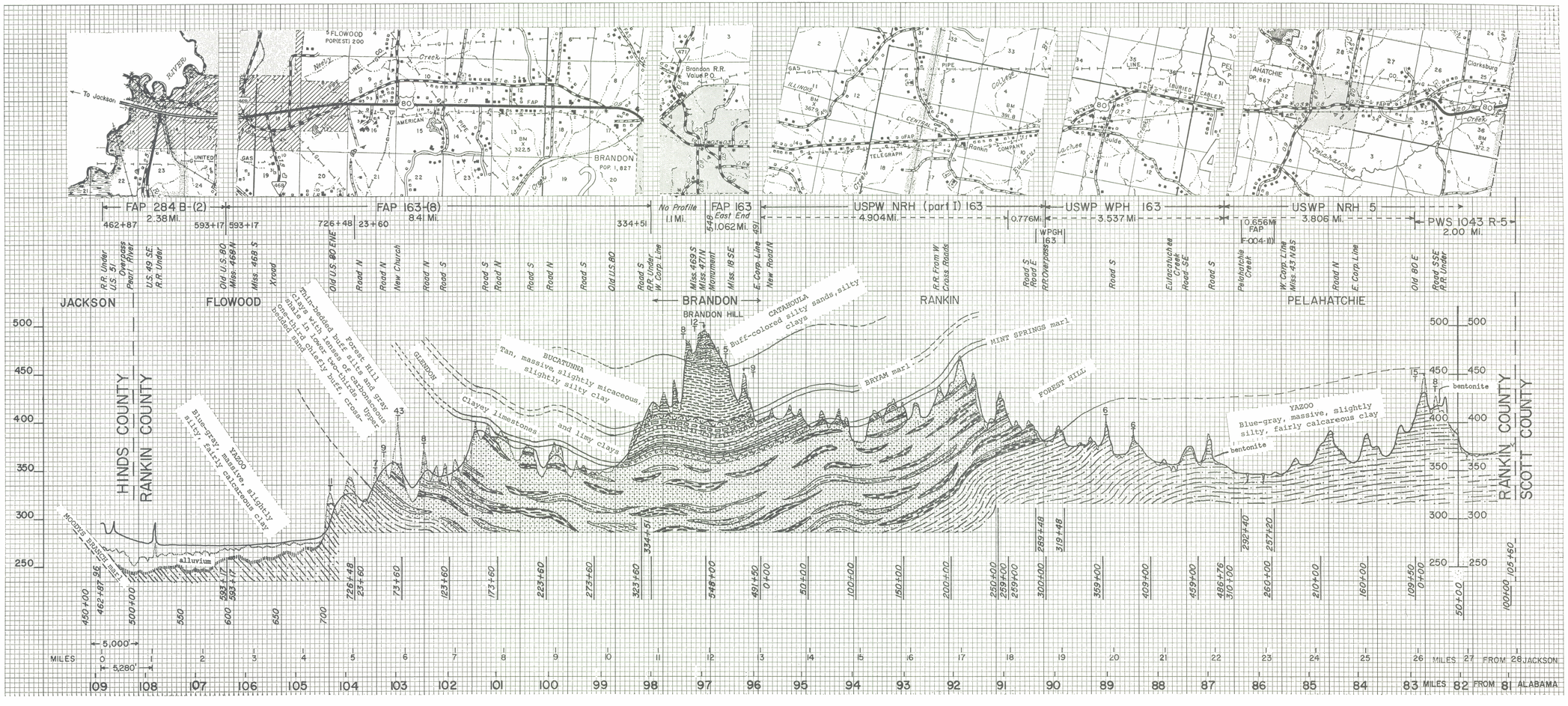

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