GEOLOGIC ATLAS OF THE FORT VALLEY AREA

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INTRODUCTION

All of the map area is within the Fort Valley Plateau and Fall Line Hills Physiographic Districts (Clark and Zisa, 1976). The eastern boundary of the geologic map of the Fort Valley Geologic Atlas is the Ocmulgee River and the western boundary is the Flint River. The southern boundary is defined by the southern boundaries of the Montezuma, Marshallville Southwest, Henderson, Perry East, and Hayneville 7.5-minute quadrangles. The northern boundary of the map is the Fall Line, which is defined by the surficial contact between the Piedmont crystalline rocks and the Coastal Plain sediments. The portion of the Fall Line bounding the map area extends, in a very irregular pattern, from the Flint River through the towns of Roberta, Knoxville, Lizella, and Macon to the Ocmulgee River. The scale of the map is 1:100,000.

The area is largely rural with most of the land used for peach and pecan orchards, dairy farming, and pulp wood production. Mineral products are sand, limestone, and, to a very minor degree, low grade kaolin used in cement production. An especially important characteristic of the region is that a sizeable portion of the Cretaceous Aquifer System crops out in the area (Arora, 1984; Pollard and Vorhis, 1980). The Cretaceous aquifer provides a source of water at a relatively shallow depth for municipal, industrial, and domestic use. However, along with this benefit goes the responsibility of keeping the local recharge area of the aquifer free from pollution.

Earlier maps of the area include those of Eargle (1955), LeGrand (1962), and the Georgia Geologic Survey's Geologic Map of Georgia (1976). Eargle's map of the area is at a scale of 1:500,000 and, although it differentiates Cretaceous formations, the Tertiary sediments are undifferentiated. The Geologic Survey's map (1:500,000) differentiates some Tertiary formations within the Fort Valley area; however, the Lower Tertiary and Cretaceous sediments are mapped as one unit. LeGrand's 1:250,000 scale map differentiates both the Tertiary and Cretaceous into formations. Differences between the correlations of these previous maps and the current atlas will be discussed in a following section.

Recently, a geologic atlas of the Central Georgia Kaolin District (Hetrick and Friddell, 1990), an area adjacent to and east of the Fort Valley area, has been published. Information from recently acquired cores and some improvements in stratigraphic correlations, which were not available for the Kaolin District map, have been incorporated into the Fort Valley area geologic map. These recent improvements in geologic knowledge resulted in several formation mismatches where the two geologic maps (Fort Valley and Kaolin District) adjoin.

In the Macon area some of the Sediments Undifferentiated of the Kaolin District map are stratigraphically equivalent to the new Unnamed Cretaceous-age formation of the Fort Valley area map. On the Fort Valley area map some sediments equivalent to the Huber Formation of the Kaolin District map were differentiated into the Marshallville and Perry Formations. Based on recent core data the Tertiary/Cretaceous boundary is considerably lower in elevation in the vicinity of Warner Robins than it is shown east of Warner Robins on the Kaolin District map.

GENERAL LITHOLOGIC AND STRATIGRAPHIC DISTRIBUTIONS

The map area is divided into two physiographic districts (Clark and Zisa, 1976), the Fort Valley Plateau and the Fall Line Hills. However, the geology of the Fall Line Hills, south of Fort Valley, is quite different from that of the Fall Line north of Fort Valley. Hence, in the text the two different portions of the Fall Line Hills District will be discussed separately.

Fall Line Hills south of Fort Valley
In the southern portion of the map area, approximately 4 miles south of Perry, there is a distinct, low angle scarp referred to in this atlas as the Perry Scarp. Between the Macon-Houston County line and Clinchfield, the scarp strikes east-west and is bounded on the north by Big Indian Creek. From Clinchfield, the scarp extends northeastward to the Ocmulgee River. West of the Macon-Houston County line the Perry Scarp extends and diminishes to the southwest, with Hogcrawl Creek marking its northwest limit. This scarp marks the northern limit of the portion of the Fall Line Hills District south of Fort Valley.

Atop the Perry Scarp, the sediments are weathered clays, cherts and clayey residua of undifferentiated Upper Eocene and Oligocene age. The bulk of the sediments that crop out on the face of the scarp are Upper Eocene limestone, chert and silty, calcareous, smectitic clay. These Upper Eocene clays and limestones extend north of the escarpment where unweathered exposures of these are rare.

Just north of the escarpment, where exposures of Twiggs Clay and Tivola Limestone would be expected, residuum is the dominant material found. The reasons for the limited distribution of the unweathered limestone and clay north of the Perry Scarp are not clear. However, it has been observed that, with only two or three exceptions, all of the exposures of Upper Eocene clay north of the scarp are 40 feet thick or more. This relationship suggests that, where erosion greatly reduced the thickness of the clay, the bulk permeability of the unit was high enough to have allowed weathering to a residuum. This process may have been facilitated by mass wasting and the calcareous nature of the clay. Apparently north of the Perry Scarp, erosion has removed enough of the Upper Eocene clay to induce chemical alteration of most of the remaining clay and limestone to residuum.

The primary land use along the Perry Scarp (and north of it for several miles) is pasture. Here, the Upper Eocene clays have only partially been reduced to residuum. The clayey soil, which develops, and the high calcium content of the subsurface sediments combine to produce excellent dairy land.

Fort Valley Plateau
Immediately north of the Perry Scarp, and comprising approximately two thirds of the map area, is the Fort Valley Plateau. The plateau is a flat to very gently rolling surface, which slopes gently to the southeast. The plateau extends northward from the Perry Scarp to approximately the Crawford-Peach and Peach-Bibb county lines, where the valley walls of Echeconnee Creek and Deep Creek mark its northern extent. Exposures of mainly Upper Cretaceous and Paleocene sediments along the steep valley walls of the Flint River mark the termination of the Fort Valley Plateau to the west. Eastward, the plateau extends to within a few miles of the Ocmulgee River. Here, the plateau surface is bordered by gentle slopes composed of Middle to Upper Eocene age sediments.

The nearly flat surface of the plateau is composed of undifferentiated Middle to Upper Eocene residuum. This surface material is clayey and sandy to pebbly and is present in thicknesses of up to 40 feet. Underlying the residuum are Middle Eocene sand and discontinuous beds of sandy kaolin. The principal agricultural crops on this surface are peach orchards and pecan groves.

Fall Line Hills north of Fort Valley
North of the plateau and extending to the Fall Line is the Fall Line Hills District, which, as the name implies, contains the greatest relief in the map area. The dominant sediments in the area are Upper Cretaceous age kaolinitic sands and lenses of sandy kaolin. Some of the higher hills are capped by Lower Tertiary sands and sandy kaolins. In one high small area, known as "Rich Hill," located six miles southeast of Knoxville (latitude 32°41'46" N., longitude 83°56'02" W.), Upper Eocene limestone and smectitic clay are found near the top of a high ridge.

Sediments at or very close to the Fall Line are commonly terrace deposits composed of poorly sorted sands and gravels. Locally, especially at the lower elevation areas of the creek valleys, deposits of pure quartz sand of probable eolian origin are common.

GEOLOGIC UNITS THAT CROP OUT IN THE MAP AREA

The lithologic descriptions in this atlas are of the geologic units as they were observed within the map area. For more information on the regional distribution patterns, descriptions, paleontology, and correlations the reader is referred to the following: Buie (1978), Buie and others (1979), Herrick (1972), Hetrick and Friddell (1990), Huddlestun and Hetrick (1978, 1979, 1986), Huddlestun and others (1974), Marsalis and Friddell (1975), Pickering (1970), Reinhardt and Gibson (1981) and Schmidt and Wise (1982).

Described below are the geologic units which are delineated on the geologic map. In addition, there are a number of geologic units included which were found to be present, but were not mapped separately because of one or more of the following circumstances: (1) the unit has very isolated occurrences; (2) there is difficulty in field identification of the unit due to the effects of weathering; (3) the geographic distribution of the unit is unpredictable; and (4) there is a strong lithologic similarity to a contiguous unit.

Alluvium (Quaternary)
The alluvium consists of sand, clayey sand, clayey silt and minor stringers and beds of quartz and chert gravel. The sediments are generally micaceous, poorly sorted and range in particle size from clay to gravel. Bedding is thin, crude to massive and locally cross bedded. The alluvium is as much as thirty feet thick in the study area. These sediments are distributed within the flood plains of present-day stream valleys and commonly underlie swampy or boggy areas, where they locally contain abundant organic matter.

Alluvium (Tertiary-Quaternary)
The Tertiary-Quaternary alluvia are similar in geographic distribution and lithology to the previously described Quaternary alluvia. However; the Tertiary-Quaternary alluvia differ from the Quaternary alluvia in that the Tertiary-Quaternary alluvia (1) underlie terrace surfaces; (2) occur at higher elevations above present streams; (3) contain considerably less clay and organic matter; (4) contain more gravel; and (5) have better defined bedding and more occurrences of cross-bedding.

In the southern half of the map area, the Tertiary-Quaternary alluvia are readily distinguished from the other described units; however, in the upper half of the map there is considerable difficulty in making this distinction. In the northern half of the map area, the geologic units older than Late Eocene contain nonmarine beds that are lithologically very similar to the Tertiary-Quaternary alluvia. This is especially true in the vicinity of Warner Robins, Macon and along the Fall Line where there are abundant beds of gravel, some of which are undoubtedly correlative with the Tertiary-Quaternary alluvia. However, due to difficulties in correlation, none of the gravels in the northern portion of the map area were mapped as Tertiary-Quaternary alluvia; rather, they were included in the Gaillard Formation and an unnamed Cretaceous formation.

Sediments and Residuum (Undifferentiated Oligocene-Upper Eocene)
The similarity of some exposures of undifferentiated Oligocene-Upper Eocene residuum to exposures of badly weathered Dry Branch Formation sediment indicates that much of the residuum is Upper Eocene. However, Pickering (1970) concluded, from an examination of the fossil fauna, that the age of some of the chert associated with the residuum is Oligocene.

A typical exposure of the undifferentiated Oligocene-Upper Eocene residuum is composed of reddish brown residual clayey sand with scattered small fragments of chert lying on the soil surface. In exposures which appear less weathered, there are brown beds of sandy clay which locally retain some greenish clayey zones and beds of massive fossiliferous chert. Imprints of fossils within the chert are commonly those of small clams and scallops. Associated with the greenish clays are zones of black manganese stained clay and sand. Contorted, thin interbeds of fine-grained sand and maroon clay are locally present. The contortion of these beds is probably due to solution of nonexposed underlying calcareous deposits.

The sediments are up to 50 feet in total thickness; however, thicknesses of individual beds are difficult to ascertain because the sediments drape over the ground surface, with the "apparent" bedding paralleling the ground surface. The exception to the above are a few beds of massive chert which have exposed thicknesses of up to 8 feet. The total thicknesses (including nonexposed portions) of these chert beds may be considerably greater.

Barnwell Group and Tivola Limestone (Upper Eocene)
The Tivola Limestone of the Ocala Group and all of the formations of the Barnwell Group **(Tobacco Road Sand, Dry Branch Formation,** and **Clinchfield Formation)** crop out in the map area. However, the **Twiggs Clay Member** of the Dry Branch Formation and the Tivola Limestone compose over ninety-five percent of the outcrop area of the Upper Eocene. On the other hand, the Ocala's contribution to the outcrop area is minor and limited to exposures along the base of the Perry Scarp and to an exposure in an abandoned quarry at "Rich Hill" near Knoxville.

From good exposures of Twiggs and Tivola at "Rich Hill" and the thick exposure of Twiggs, just west of Bonaire, it can be assumed that Upper Eocene sediments were formerly present across what is now the Fort Valley Plateau and lapped onto the Piedmont. The absence of exposures of Twiggs and Ocala from most of the plateau is probably due to a combination of erosion and weathering.

Substitution of sodium, from vadose water, for calcium in the smectite interlayer areas of Twiggs Clay causes an increase in interlayer water. The increase in interlayer water causes physical instability of the clay, resulting in slump and downhill creep of most exposures of the Twiggs. Typical exposures of the Twiggs are of a very pale greenish-gray, silty to finely sandy clay, the bedding of which has been obscured by slump or creep. The clay is fissile to blocky with hackly fracture, and most of the silt and fine-grained sand content is concentrated in laminae or thin interlayers. The best complete exposure of the Twiggs is at a currently active limestone (Tivola) quarry at Clinchfield where the Twiggs is 100 feet thick (Huddlestun, et al., 1974).

In the Clinchfield quarry, fresh exposures reveal the unweathered light- to medium-gray color and the presence of minor amounts of calcium carbonate in the clay. At Clinchfield, the Twiggs is medium- to thick-bedded with several one to four foot thick sandy beds containing glauconite. Throughout the Twiggs, and increasing in frequency of occurrence with depth, are thin beds of dense fine-grained limestone. The bottom 10 feet of the Twiggs commonly grades down into a bed of bryozoa coquina. Locally throughout the Twiggs, especially near its top and where it has been weathered, black coatings of manganese oxide occur on the clay layers.

Smectite is the dominant clay mineral in samples from the Twiggs Clay at Clinchfield along with minor kaolinite, cristobalite and uniformly distributed trace amounts of illite or degraded mica (Hetrick, 1982). Additionally, Hetrick (1982) observed an irregular pattern of increasing kaolinite with depth and a strong trend of decreasing cristobalite with depth.

Where the Tivola Limestone occurs, it conformably underlies the Twiggs Clay. At localities where the Tivola is absent, the lower portion of the Twiggs is equivalent to the Tivola. The Tivola is best exposed at Clinchfield where it is mined for use in cement. Here the Tivola is 42 feet thick and is a coarsely bioclastic limestone with a highly variable physical cohesiveness, resulting in a distinctive knobby appearance after the more friable portions have eroded or weathered.

The major bioclastic components of the Tivola is colonial byrzoan debris. Other fossil types commonly found are scallops, echinoids, clams and corals. For details on the local paleontology of the Tivola and Ocala, see Huddlestun and others (1974) and Pickering (1970). The Tivola contains traces of glauconite throughout and minor amounts of frosted quartz grains near its base (Huddlestun, et al., 1974). Hetrick (1982) found approximately equal amounts of smectite and kaolinite in the clay-size fraction of samples taken near the top of the Tivola.

The **Irwinton Sand Member** of the Dry Branch Formation was found in outcrop, in the map area, only at "Rich Hill" near Knoxville. Huddlestun and Hetrick (1986) reported the presence of 18 feet of Irwinton at this same locality, although neither the base nor the top of the unit were exposed. Thus, the original thickness could be considerably more than 18 feet. The lower 8 feet of Irwinton, exposed at "Rich Hill," consists of well-sorted medium-grained sand, interlayered with thin beds of fissile Twiggs-like clay. The upper 10 feet of the exposure is slightly coarser-grained, thin bedded and contains only scattered thin laminae of clay.

The only known exposure of the Tobacco Road Sand in the map area is in the Oakey Wildlife Management Area located southeast of Kathleen in Houston County (latitude 32°27'29" N., longitude 83°34'05" W.), where the Tobacco Road overlies the Twiggs and underlies Oligocene residuum. In this exposure, the Tobacco Road is 10 feet thick and consists of poorly sorted coarse-grained slightly clayey sand, containing gravel-size fragments of chert and a few quartz pebbles. From this exposure Huddlestun and Hetrick (1978) identified *Periarchus quinquefarius, Periarchus pileussinensis,* and a species of *Periarchus* with morphology characteristics intermediate between those of *quinquefarius* and *pileussinensis.*

Residuum (Undifferentiated Upper Eocene-Middle Eocene)
Undifferentiated Upper to Middle Eocene sediments are dominantly reddish brown clayey residuum which is up to 45 feet in thickness. The age correlation of these sediments is uncertain. Based on projections of elevations from sediments of known age, these residua could be either Upper Eocene, Middle Eocene or both. Typical exposures of this material are massive-bedded, tough, clayey, dark reddish-brown residua containing poorly sorted, fine- to coarse-grained quartz sand and pebbles of plinthite. In rare local occurrences the residuum contains gravel, kaolin clasts and zones of strongly cross-bedded very coarse-grained sand.

Perry Sand (Middle Eocene)
The Perry Sand is proposed to replace the Andersonville Sand of Huddlestun (1981). This unit was previously mapped in the area as the Gosport Formation by LeGrand (1962). Huddlestun (1981) correlates the Perry Sand with the Lisbon Formation. This most recent name change was suggested by Huddlestun (personal communication). The type locality of the Andersonville, in a kaolin mine, is much less likely to be preserved than the proposed type locality at Perry. The proposed type locality is located 1.9 miles east of the center of Perry, Georgia on Valley Drive just a few yards west of Bay Creek (latitude 32°27'47" N., longitude 83°45'47" W.).

Eighteen feet of a dense sandy kaolin underlie the Perry Sand at the type locality. The clay is massive-bedded, jointed and has subconchoidal fracture. The sand within the kaolin is very poorly sorted, very coarse-grained and irregularly distributed within the clay. The color of the kaolin is very pale-gray to tan with irregularly shaped maroon-stained patches. The kaolin is believed to be Paleocene in age and within the Marshallville Formation.

Thirty-one feet of Perry Sand is exposed at the type locality, with an approximate elevation at its base of 321 feet MSL. The contact between the kaolin and the overlying Perry Sand is unconformable, sharp and distinct. The contact is marked by a few pebbles and a fraction of an inch of coarse-grained sand in the basal Perry Sand. Locally, along the contact between the Perry and the kaolin, there is a thin (< 1") zone of partially indurated to indurated iron oxide. The Perry Sand at the type locality is a medium-to fine-grained sand which is thin-bedded and cross-bedded. The color of the sand is white to very pale-yellow to dark reddish-brown, with the strongly contrasting dark reddish-brown and white beds more commonly present in the upper third of the exposure. The sand contains numerous small kaolin clasts, many of which are concentrated along bedding planes. Some of the bedding planes are marked by a layer of kaolin, a fraction of an inch thick. Bedding is characterized by planar truncated cross-bedding with rare herringbone cross-bedding. Near the base of the Perry Sand, at the type locality, the bedding is commonly less than a foot thick. The bedding thickness increases up-section until, at approximately 15 feet above the base, bedding is typically 2 to 3 feet thick. The sand within the exposure is soft, friable and contains very little mica or heavy minerals. Partially indurated iron oxide concentration occurs along some of the bedding planes.

Above the Perry Sand, at the proposed type locality, there is 8 to 15 feet of a dark reddish-brown clayey sandy residuum. Within the basal 2 feet of this residuum, there is a zone of gravel, which is probably colluvial in origin.

Other exposures of the Perry Sand in the map area are lithologically similar to that of the type locality; and at each exposure, the sand is always overlain by residuum. Typical exposures are 10 feet in thickness, although there are rare 20 foot thick exposures. Based on maximum and minimum elevations of the exposures, within several square miles, the total thickness of the Perry is estimated to be 65 feet. Locally, some of the more weathered exposures have massive bedding with beds that are either pure white or strongly contrasting dark reddish-brown. Within the city limits of Perry, 0.5 miles south of Big Indian Creek and a few feet west of I-75, is found the least weathered exposure of the upper portion of the Perry Sand. The 8 feet exposed here is a white to reddish-brown massive sand that grades up into a residuum which is capped (to the ground surface) by 2 feet of weathered clay. Commonly at the base of the Perry, where it overlies the more clayey Paleocene sediments, there are beds of iron-cemented sandstone, typically 1 to 3 inches thick.

Lenses of hard kaolin, which occur at the top of the Perry Sand, are included within the Perry Sand due to their relatively thin and discontinuous occurrences. West of Perry, these beds are best described as kaolinitic silts or fine-grained sands. An exposure of this kaolinitic silt is present 2.7 miles south of Marshallville and 0.9 miles east of the community of Winchester. From Perry eastward, the kaolinitic beds are more abundant and occur as lenses of sandy hard kaolin that have irregular fracture and commonly contain patches of maroon staining in liesegang patterns.

Along an irregular line that extends roughly from Marshallville to Warner Robins, there is a change in the sedimentary structures, particle sizes and particle size distributions of the Perry Sand. This change is so marked that stratigraphically equivalent sediments northwest of this line are best included in with the undifferentiated Middle Eocene-Paleocene sediments. Along this line, and especially northwest of the line, scour and fill structures are common in the Middle Eocene sediments as are beds of very coarse-grained, poorly sorted sand. Additionally, there is an increase in the amount and size of the kaolin clasts.

Marshallville and Clayton Formations (Paleocene)
The Marshallville is a formation proposed by P. F. Huddlestun (personal communication), with the type locality in the Fort Valley area. On all of the previous geologic maps of the area, at least some and generally all of the Marshallville Formation was mapped as Cretaceous. The largest known exposure of the Marshallville Formation is located 2.1 miles northwest of Marshallville on a steep bluff overlooking the Flint River flood plain (latitude 32°28'43" N., longitude 83°59'17" W.). A 37 foot thick section of the Marshallville Formation is exposed along this bluff. Atop the Marshallville is approximately 5 feet of very coarse-grained, very poorly sorted, cross-bedded sand of uncertain age. The sand is dark reddish-brown and contains thin discontinuous laminae and clasts of a white clay. The Marshallville Sand exposed at the bluff is generally a thin-bedded, fine-to medium-grained, micaceous sand containing continuous interlayers of plastic clay. Most of the clay is in layers less than one inch thick. There is one sandy clay bed 12 feet above the base of the exposure, which is 0 to 3 feet thick, purple and massive-bedded with conchoidal fracture. Overlying this clay there is a zone several inches thick of clay clasts which grade up into a 1 inch thick bed of iron-cemented coarse- to very coarse-grained sand.

The Marshallville exposed along the bluff contains a few small scattered burrows. Other than these trace fossils, no fossils were found in this exposure of the Marshallville. However, a number of fragments of *Ostrea crenulimarginata*, a Clayton guide fossil, were found in a very badly weathered clayey bioturbated sand 0.5 miles north of the bluff locality in a road bank. The elevation at which *O. crenulimarginata* was found is approximately the same as the elevation of the middle of the exposure of the Marshallville on the bluff.

Commonly, exposures of the Marshallville are fill deposits of small channels 10 to 30 feet wide and probably less than 15 feet deep. Typically, the bottom several feet of the channels are filled with interlayered fine-grained sand and laminar silty clay. Fresh exposures of this clay are dark gray; locally, leaf fragments and impressions of leaves are found. Paleocene ages, based on pollen and dinoflagellates have been reported for several of these dark clays (P. F. Huddlestun, personal communication).

The sand beds of the Marshallville are thin-bedded, micaceous and variable in thickness. The bedding is clearly defined, cross-bedded and commonly variable in direction, thickness and dip. Kaolin clasts are very common, with some rare clasts up to boulder size. There is an overall tendency for the particle size to fine upward in most sections of Marshallville. Some of the beds, which are composed of well-sorted fine- to medium-grained sand, contain concentrations of heavy minerals and mica. Associated with some of the clays and clayey silts are beds of iron cemented sandstone that may be as much as a foot thick. In the vicinity of Warner Robins the Marshallville is very kaolinitic and contains some beds of sandy kaolin up to 3 feet thick.

In and just north of Montezuma, on the steep eastern bank of the Flint River, there are several exposures of the Paleocene Clayton Formation overlying Cretaceous sediments. Approximately 15 feet of the Clayton is exposed here consisting of weathered gray clay, chert nodules, and beds composed mainly of the fossil *Ostrea crenulimarginata.* Due to the very small outcrop area of the Clayton, it was included with the Marshallville on the map.

Lower Tertiary Sediments (undifferentiated Middle Eocene-Paleocene)
Northwest of a line extending approximately from Fort Valley to Warner Robins, the Lower Tertiary geologic units become progressively more difficult to distinguish from one another. In addition, channels within the Lower Tertiary units become larger and more extensive, resulting in difficulty in the use of projected elevations to predict the elevations of formation contacts. Consequently, in the northern portion of the area, sediments of the Marshallvillle Formation and **Huber Formation** and an unnamed Middle Eocene formation were combined into a single map unit.

The unnamed Middle Eocene formation included in the Lower Tertiary is composed of mostly well-sorted, thin-bedded and cross-bedded sands, very similar to those of the Perry Formation. Exposures of these sands, however, commonly occur at elevations lower than would be expected based on projections of the elevation of the base of the Perry Sand. In addition, the unnamed formation contains beds which are highly burrowed—not a feature of the Perry Sand. Due to the unpredictable occurrence of these sands and the uncertainty in their stratigraphic correlation, these channel filling sands were not mapped as a separate geologic unit.

The outcrops of Huber Formation in the Fort Valley area are composed of medium- to very coarse-grained, very poorly sorted sands with smoky quartz pebbles and beds of sandy kaolin. The exposures are typically highly micaceous, white, highly cross-bedded with an abundance of kaolin clasts, and contain lenses and thin layers of sandy kaolin and rare burrows. The distribution of the Huber Formation in the map area is very sporatic. Future investigations in the Fort Valley region may consider these sediments to be a member of the Marshallville rather than a part of the Huber Formation.

Providence and Ripley Formations (Upper Cretaceous)
In the map area, the erosional event separating Tertiary sediments from Cretaceous sediments produced an angular unconformity and removed the sediments of the Providence and Ripley Formations from areas north of the community of Zenith. For this reason, outcrops of the Providence and Ripley are limited to several small exposures north of Montezuma on the bluffs overlooking the Flint River. Because of their relatively small outcrop areas, the Providence and Ripley were combined into one map unit.

The unconformity between the overlying Clayton Formation (Paleocene) and the Providence Formation is very obvious in the river bluffs just north of Montezuma. Beneath the contact there is approximately 8 feet of Providence exposed as a dark reddish-brown, micaceous, clayey, coarse-grained sand. The sediment appears to be badly weathered and is extensively jointed. At nearby localities, where less weathered exposures of Providence were found, the Providence is composed of beds which are mostly coarse-grained, poorly sorted sand. However, some beds of fine- to medium-grained, moderately sorted sand also are present. Within these beds of fine-grained sand are thin layers of sandy gray clay and concentrations of heavy minerals and mica. Some cross-bedding was observed and some of the clay is slightly lignitic. Slump covers most of the exposure on the river bluffs; and as a result, the maximum thickness of Providence observed at any exposure was 10 feet.

At several localities along the banks of the Flint River, 5 to 6 feet of the Ripley was found exposed down to river level. At these localities, the Ripley is a dark gray clay to clayey silt which is finely micaceous and has blocky to subconchoidal fracture. Little or no bedding was found, but small resistant knobs (3 to 4 inches in diameter) are present which may be sand dikes. The weathered color of the clay is chocolate brown.

Gaillard Formation (Upper Cretaceous)
The Gaillard is a proposed new formation in the Fort Valley area (P. F. Huddlestun, personal communication) with an age, probably, equivalent to that of the Eutaw Formation, or, possibly, equivalent to the Blufftown Formation. The best exposures of the Gaillard Formation are in the mines of the Atlanta Sand and Supply Company, located in Crawford County near Gaillard (latitude 32°27'48" N., longitude 83°59'17" W.). There is approximately 25 feet of Gaillard exposed to the bottom of the pit. In this pit, the major differences in sedimentary structures between the overlying Tertiary sediments (mainly sand) and the underlying Cretaceous sediments can be observed. The Tertiary sands are deposited in a maze of channel fill structures which make it difficult to follow the trend of any given bed very far around the mine face. Some of the larger Tertiary channels are 20 feet or more deep and up to 40 feet wide. The Gaillard (Upper Cretaceous) is dominantly a sand but does contain beds of sandy kaolin. The uppermost bed of the Gaillard is a very sandy kaolin which varies from 0 to 15 feet thick in the exposures. The sand within the kaolin is very poorly sorted and is very fine- to very coarse-grained with, characteristically, angular particles in the coarser sizes. Some zones within the kaolin are gray from organic content; however, most of the organic material has oxidized leaving only maroon stained impressions of plant fragments. The sand beds of the Gaillard are thin-bedded, typically 1 to 2 feet thick, and strongly cross-bedded. The sands are very coarse-grained, very poorly sorted and contain coarse-grained flakes and books of muscovite. Kaolin balls are common in the Gaillard but not nearly as common as they are in the overlying Lower Tertiary. The feature which most obviously sets the Gaillard apart from the overlying Lower Tertiary sediments is the bedding, with the beds of the Tertiary being characterized by channels; whereas, the bedding of the Gaillard, though cross-bedded, is flat and uniform.

Unnamed Formation (Upper Cretaceous)
The unnamed formation is a newly recognized geologic unit in the proces of being named and described (P. F. Huddlestun, personal communication), which has an age probably equivalent to that of the Eutaw Formation. The best exposure of the unnamed formation is in southern Crawford County, on an unnamed county road 2.1 miles north of the community of Friendship, just south of the road's junction with Deep Creek (latitude 32°42'18" N., longitude 83°51'46" W.). Along this road, there are approximately 40 feet of the formation exposed in small outcrops. The lowest exposures are of a maroon to white, tough, clayey sand. The overall impression of this exposure is of massive bedding and uniform lithology; however, on close inspection intricate fine-scale cross-bedding was observed. The sand is fine- to coarse-grained, but on the average finer grained than the Gaillard. Higher up in the section, exposures are similar to exposures of the Gaillard; but with the unnamed formation having coarser average sand size and less distinct bedding. The uppermost exposure shows a 3 foot thick bed of sandy clay truncated by an approximately 1 foot thick bed of cross-bedded, very coarse-grained sand and pebbles. Commonly, the uppermost several feet of the exposed sediment is partially to completely indurated, providing slabs of sandstone which lie on some of the exposure slopes.

In a Georgia Geologic Survey Core (GGS 3629), taken in Houston County in the community of Elberta, 252 feet of the unnamed formation were observed. In this core the dominant lithology is a maroon to light-green, poorly sorted clayey sand. An excellent exposure of the unnamed formation can be observed at the Brad Henderson Memorial Stadium on Anthony Road in Macon (latitude 32°49'24" N., longitude 83°40'40" W.). At the stadium locality, an approximately 30 foot thick section of the unit is exposed in a near vertical face, where the unnamed formation is mostly a massively bedded, maroon, clayey sand to sandy clay. At other exposures near the Fall Line, the unnamed formation commonly contains prominent beds of gravel and very coarse-grained sand, some of which are identical to those of the Quaternary-Tertiary alluvia.

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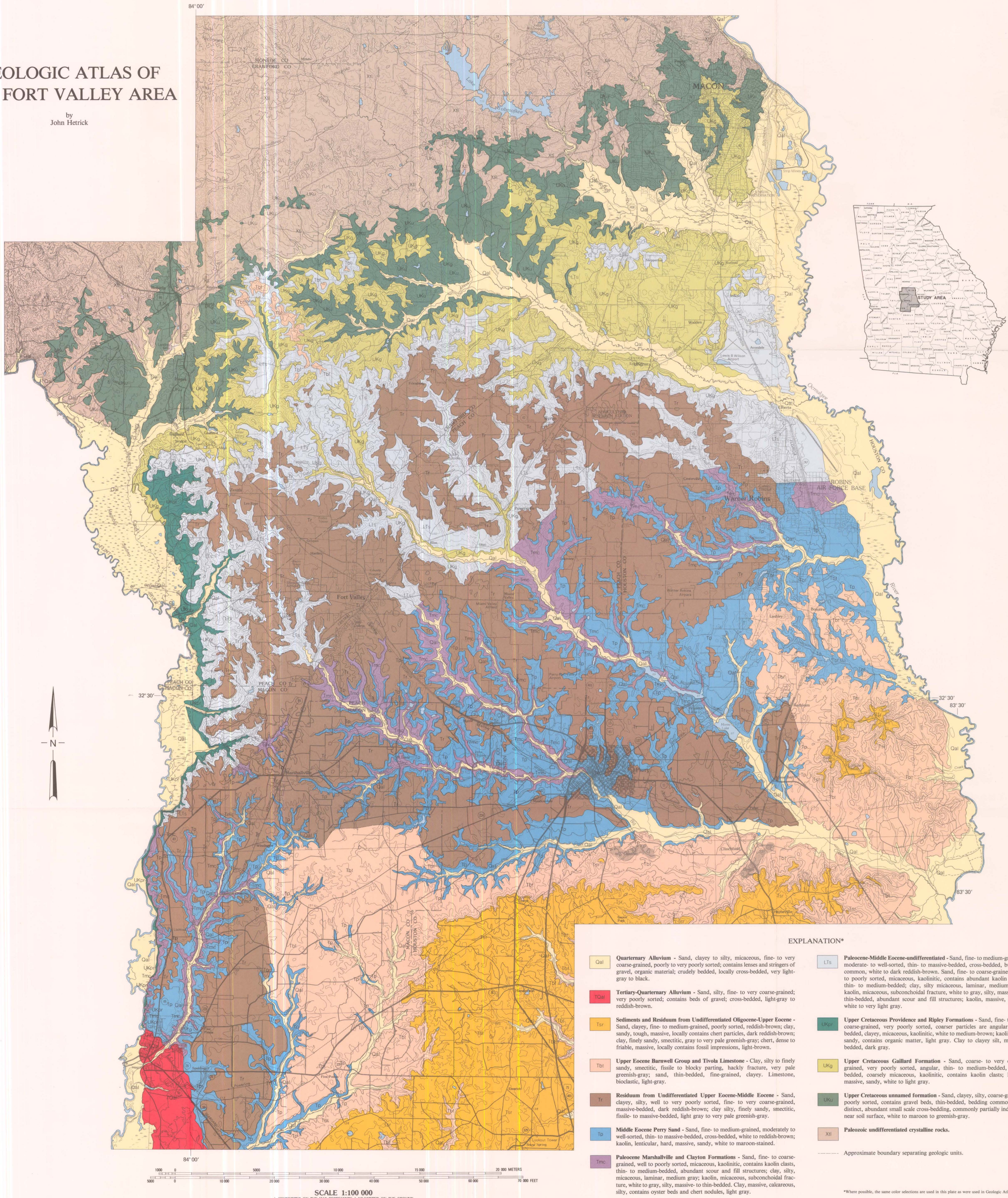
GEOLOGIC ATLAS OF THE FORT VALLEY AREA

by
John Hetrick



SCALE 1:100 000
1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND
CONTOUR INTERVAL 10 METERS

EXPLANATION*

Qal — **Quarternary Alluvium** - Sand, clayey to silty, micaceous, fine- to very coarse-grained, poorly to very poorly sorted; contains lenses and stringers of gravel, organic material; crudely bedded, locally cross-bedded, very light-gray to black.

TQal — **Tertiary-Quarternary Alluvium** - Sand, silty, fine- to very coarse-grained; very poorly sorted; contains beds of gravel; cross-bedded, light-gray to reddish-brown.

Tsr — **Sediments and Residuum from Undifferentiated Oligocene-Upper Eocene** - Sand, clayey, fine- to medium-grained, poorly sorted, reddish-brown; clay, sandy, tough, massive, locally contains chert particles, dark reddish-brown; clay, finely sandy, smectitic, gray to very pale greenish-gray; chert, dense to friable, massive, locally contains fossil impressions, light-brown.

Tbt — **Upper Eocene Barnwell Group and Tivola Limestone** - Clay, silty to finely sandy, smectitic, fissile to blocky parting, hackly fracture, very pale greenish-gray; sand, thin-bedded, fine-grained, clayey. Limestone, bioclastic, light-gray.

Tr — **Residuum from Undifferentiated Upper Eocene-Middle Eocene** - Sand, clayey, silty, well to very poorly sorted, fine- to very coarse-grained, massive-bedded, dark reddish-brown; clay silty, finely sandy, smectitic, fissile- to massive-bedded, light gray to very pale greenish-gray.

Tp — **Middle Eocene Perry Sand** - Sand, fine- to medium-grained, moderately to well-sorted, thin- to massive-bedded, cross-bedded, white to reddish-brown; kaolin, lenticular, hard, massive, sandy, white to maroon-stained.

Tmc — **Paleocene Marshallville and Clayton Formations** - Sand, fine- to coarse-grained, well to poorly sorted, micaceous, kaolinitic, contains kaolin clasts, thin- to medium-bedded, abundant scour and fill structures; clay, silty, micaceous, laminar, medium gray; kaolin, micaceous, subconchoidal fracture, white to gray, silty, massive- to thin-bedded. Clay, massive, calcareous, silty, contains oyster beds and chert nodules, light gray.

LTs — **Paleocene-Middle Eocene-undifferentiated** - Sand, fine- to medium-grained, moderate- to well-sorted, thin- to massive-bedded, cross-bedded, burrows common, white to dark reddish-brown. Sand, fine- to coarse-grained, well to poorly sorted, micaceous, kaolinitic, contains abundant kaolin clasts, thin- to medium-bedded; clay, silty micaceous, laminar, medium gray; kaolin, micaceous, subconchoidal fracture, white to gray, silty, massive- to thin-bedded, abundant scour and fill structures; kaolin, massive, sandy, white to very light gray.

UKpr — **Upper Cretaceous Providence and Ripley Formations** - Sand, fine- to very coarse-grained, very poorly sorted, coarser particles are angular, thin-bedded, clayey, micaceous, kaolinitic, white to medium-brown; kaolin, very sandy, contains organic matter, light gray. Clay to clayey silt, massive-bedded, dark gray.

UKg — **Upper Cretaceous Gaillard Formation** - Sand, coarse- to very coarse-grained, very poorly sorted, angular, thin- to medium-bedded, cross-bedded, coarsely micaceous, kaolinitic, contains kaolin clasts; kaolin, massive, sandy, white to light gray.

UKu — **Upper Cretaceous unnamed formation** - Sand, clayey, silty, coarse-grained, poorly sorted, contains gravel beds, thin-bedded, bedding commonly indistinct, abundant small scale cross-bedding, commonly partially indurated near soil surface, white to maroon to greenish-gray.

Xtl — **Paleozoic undifferentiated crystalline rocks.**

Approximate boundary separating geologic units.

*Where possible, the same color selections are used in this plate as were used in Geologic Atlas 6.