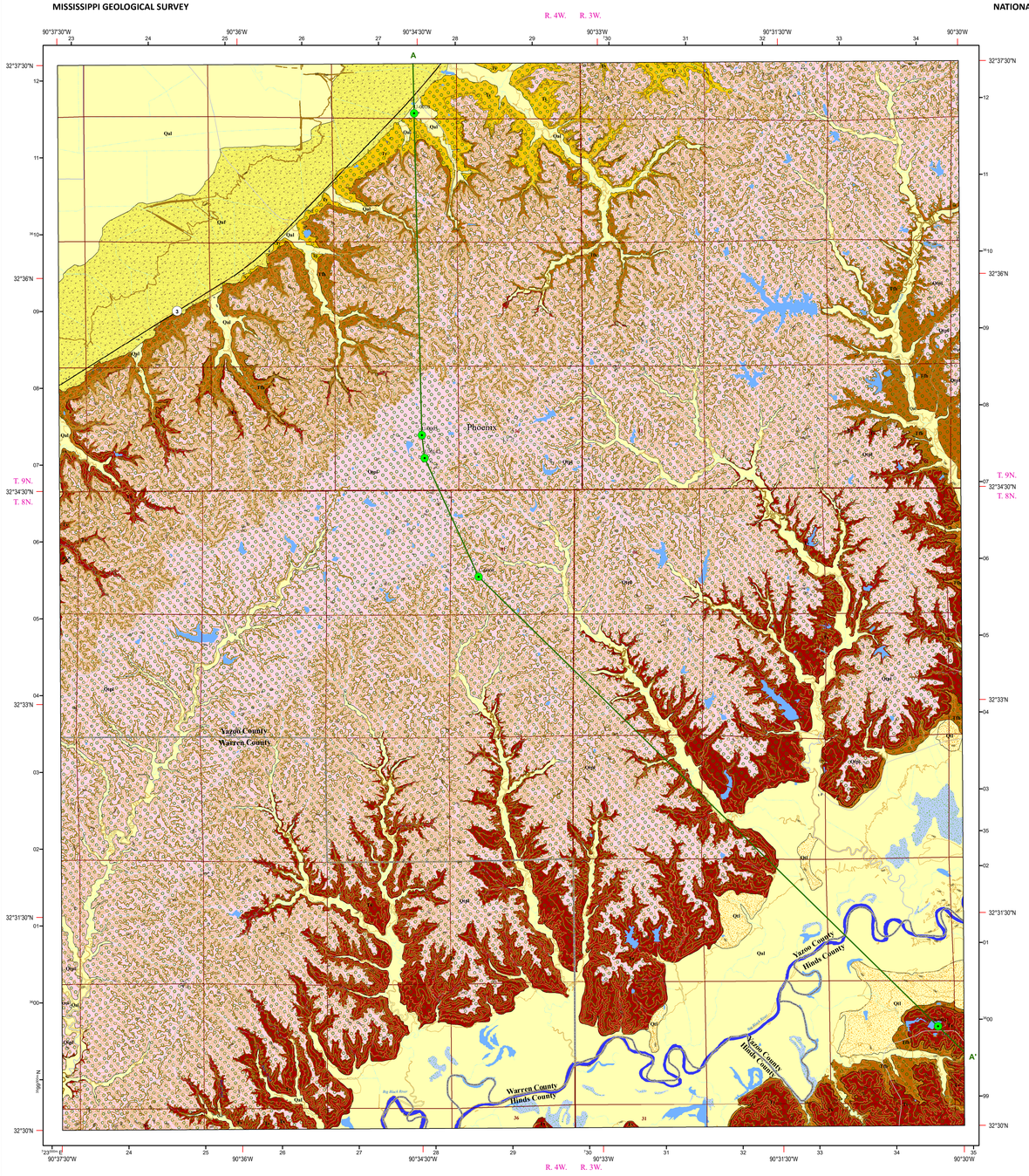
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF GEOLOGY SURFACE MAPPING DIVISION
MISSISSIPPI GEOLOGICAL SURVEY

Prepared in cooperation with
UNITED STATES GEOLOGICAL SURVEY
NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM

GEOLOGIC MAP OF THE 7.5-MINUTE PHOENIX QUADRANGLE OPEN-FILE REPORT 329



Base Map produced by the Mississippi Geological Survey
Coordinate System:NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter
Declination: World Magnetic Model, December 31, 2019, estimated Magnetic North declination in 7.5-Minute Phoenix Quadrangle, (90°33'46.318"W, 32°33'44.233"N), center area is 0.80° west of True North ± 0.37°. Annual rate of declination change is approximately 0.09° west per year.
Basemap Data sourced from https://maris.mississippi.edu/.
Contours are derived from LIDAR data.
Borehole data from Mississippi Office of Geology and Mississippi Oil and Gas Board.

Scale 1:24000
1 ½ 0 1 Mile
1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 Feet
1 0.5 0 1 Kilometers
Contour Interval 20 feet
North American Vertical Datum 1988 Geoid 12A

Adjoining 7.5' Quadrangles

Mississippi Office of Geology
Open-File Report 329

This geologic map was funded by the State of Mississippi and the United States Geological Survey, National Cooperative Geologic Mapping Program. The Survey expresses gratitude to Ms. Barbara Henderson, Mr. Carroll Potter, and Mr. William Pettis for faciliation of field work in the Phoenix quadrangle.

GEOLOGIC MAP of the PHOENIX 7.5-MINUTE QUADRANGLE

Yazoo, Warren, and Hinds Counties, Mississippi

2023

Geology by

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Mississippi Department of Environmental Quality
Mississippi Office of Geology - Surface Mapping Division
Mississippi Geological Survey
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Jackson, Mississippi 39225

Surface Mine

A-0031 Drill-hole locality and identification number

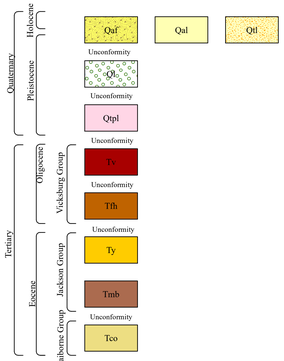
Unconformable Contact

A — A' Line of Section

LIDAR derived Bare Earth Hillshade
1 ½ 0 1 Miles

Geologic maps are only a guide to current understanding and do not eliminate the need for detailed investigations of specific sites for specific purposes. The views and conclusions contained in this Open-File Report are those of the geologists and should not be interpreted as representing the official policies, either expressed or implied, of the State of Mississippi or of the United States Government.

Correlation of Map Units



Descriptions of Map Units

Qal

Alluvium (Holocene to Pleistocene)
Sand, yellow- to brownish-white in color, fine- to coarse-grained, subrounded to rounded, predominately quartzose, locally graveliferous containing aggregate derived from the Pre-loess Terrace deposits, silty to clayey; humus lenses common; floodplain deposits are heavily loess-derived. Silicified wood common. Tributaries have narrow alluvial valleys and are deeply incised through the loess terrain. Thickness is interpreted to be approximately 10 feet with the exception of the Big Black River.

Qtl

Stream Terrace (Holocene to Pleistocene)
Flood Plain deposits dominatly associated with the Big Black River; Sand, yellow- to brownish-white in color, fine- to coarse-grained, subrounded to rounded, predominately quartzose, locally graveliferous containing aggregate derived from the Pre-loess Terrace deposits, silty to clayey; humus lenses common; floodplain deposits are heavily loess-derived. Silicified wood common. These terraces are likley locations of pre-historic archeological sites.

Qaf

Alluvial Fans (Holocene to Pleistocene)
Alternating silts, sands, and gravels deposited by streams entering the Mississippi River Alluvial Plain from the adjacent uplands. Coarsest at the apex of the fan, fining laterally (radially) from the apex of the fan. Alluvial fans interfinger with the Mississippi River Alluvium and are a significant source of recharge for the Mississippi River Alluvial Aquifer. Typically, the basal sand gravels of the Mississippi River alluvium beneath the alluvial fan can be recognized by the presence of numerous granite and metamorphic rock clasts.

Qlt

Loess (Pleistocene)
Silt, buff to tan, pale yellow, red, gray to gray-green where in anoxic conditions, quartzose to feldspathic. Loess is considered an eolian deposit derived from glacial outwash. Loess is typically calcareous with dolomite and calcite; however, the upper portion of the loess can be deeply weathered, leached / noncalcareous, and has been commonly referred to as "brown loam." Loess deposits unconformably blanket the pre-loess topography with substantial local variations in thickness but generally thickening towards the west. In places, weathered loess contains secondary deposits of small calcareous concretions (caliche, loess dolls). Loess can be locally and sparingly fossiliferous, commonly containing tests or steinkerns of pulmonate gastropods and less commonly containing fossils of Pleistocene vertebrates.

Qtpl

Pre-loess Terrace Deposits (Pleistocene)
Pleistocene ancestral Mississippi River terraces deposited prior to Pleistocene loessification. Sand, yellow, orange, purple, red, pink, fine- to coarse-grained, predominantly quartzose, cross-bedded to massive; graveliferous, pea to large cobble size clasts, boulder size ice-rafted clasts of sandstone and chert. Economically significant gravels are predominantly chert with lesser amounts of vein quartz, metaquartzite, agate, sandstone, and rare rhyolite clasts; clay, pink to white, generally occurring as discontinuous lenses and as rip-up clasts up to boulder-size. Conglomeratic ironstone ledges are common in the graveliferous sands at the base of the deposits. The base of this terrace occurs at approximately 220 ft MSL. "Head-of-hollow", terrace-derived valley-fill deposits are common at lower elevations and are isolated to valley walls adjacent to the erosional remnants of the higher of the two terrace deposits. These deposits are of such limited extent as not to warrant representation on this map.

Vicksburg Group

Tv

Vicksburg Limestone Undifferentiated (Oligocene)
Includes the Bucatunna Formation, Byram Formation, Glendon Limestone, Marianna Limestone, and Mint Spring Formation. The Glendon Limestone is white to gray, commonly indurated to semi-crystalline bioclastic limestone, either massive or with alternating ledges separated by thinly-bedded glauconitic marl. The Glendon Limestone commonly contains solution cavities at or near outcrop. Larger cavities usually form at the contact with the underlying Marianna Limestone. The Marianna Limestone is white to pale-yellow, soft to indurated, glauconitic marl, containing an admixture of fine-grained sands and clays in places. There is an abundance of the large Foraminifera *Lepidocyclina mantelli* in the Marianna Limestone and *Lepidocyclina supera* in the Glendon Limestone and the echinoid *Clypeaster rogersi*. The Vicksburg Limestone unconformably overlies the Forest Hill Formation. Thickness is approximately 100 feet.

Tfh

Forest Hill Formation
Deltaic sands, silts, and clays. Sand, fine-grained, silty, quartzose; Clay, carbonaceous, laminated, lignite and silicified wood common. Lignitic plant fossils common along fissile partings in clays. The Forest Hill Formation unconformably overlies the Yazoo Formation. Total thickness is approximately 100 feet.

Jackson Group

Ty

Yazoo Formation (Eocene)
Locally referred to as the Yazoo Clay. Clay, bluish-green to bluish gray, weathers yellowish brown to tan, montmorillonitic, calcareous, silty, locally fossiliferous, locally contains, framboidal pyrite. The Yazoo Formation conformably overlies the Moodys Branch Formation. Total thickness is approximately 500 feet.

Cross Section Units Not Exposed at the Surface

Tmb

Moodys Branch Formation
Sandy fossiliferous marl containing an abundance of marine invertebrates typically, *Glycymeris* and *Venericardia* shells. Conformably grades into the overlying Yazoo Formation. Total thickness is approximately 15 feet.

Tco

Cockfield Formation
Clay, brown, reddish-brown to grey in color; silty to fine sandy; strongly carbonaceous to lignitic, slightly micaceous, pyritic. Carbonized and silicified plant fossils common.Underlies the Moodys Branch Formation unconformably.

Field Photographs

Alluvium of Cold Creek. The creek at this point of its lower reaches as it crosses the alluvial fan becomes intermittent as it's flow is lost through the transmissivity of the fan and directly recharges the Mississippi River Alluvial Aquifer taken on October 8, 2006 in Section:14, Township: 9 North, Range 4 West.

Dominantly loess derived stream alluvium taken on October 8, 2006 in the extreme Northwest corner of Section 25, Township 9 North, Range 4 West.

Glacially ice-rafted Paleozoic chert boulder, exposed along Cold Creek derived from outcrop of the gravels of the Pleistocene ancestral Mississippi River, Pre-loess Terrace Deposit. This rectangular clast exhibits an excellent glacial polish and parallel grooved striae on the upper righthand face taken on February 15, 2008 in Section 24, Township 9 North, Range 4 West.

Glacially ice-rafted Paleozoic chert boulder, exposed along Cold Creek derived from outcrop of the gravels of the Pleistocene ancestral Mississippi River, Pre-loess Terrace Deposit. This rectangular clast exhibits an excellent glacial polish and parallel grooved striae on the upper righthand face taken on February 15, 2008 in Section 24, Township 9 North, Range 4 West.

Sioux Quartzite clast embedded in conglomeratic ironstone at the base of the from the Pleistocene ancestral Mississippi River Pre-loess Terrace Gravels at the contact with clay of the early Oligocene Forest Hill Formation. Taken on February 14, 2023 in the extreme Southwest corner of Section 24, Township 9 North, Range 4 West.

Waterfall over erosionally resistive ledges of the Lower Oligocene, open marine Glendon Limestone exposed along a dry tributary of the upper reaches of the Cold Creek watershed taken on September 09, 2009 in Section 25 , Township 9 North Range 4 West.

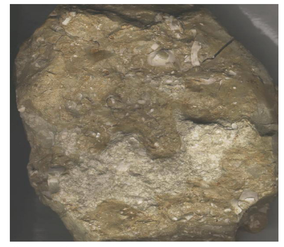
Survey Geologist James Starnes at dry waterfall over erosionally resistive ledges of the Lower Oligocene, open marine Glendon Limestone exposed along a dry tributary of the upper reaches of the Cold Creek watershed taken on September 09, 2009 in Section 25, Township 9 North, Range 4 West.

A thin bed of lignite exposed in a clay outcrop of the lower Oligocene Forest Hill Formation in the stream channel of an unnamed creek taken on February 14, 2023 in the extreme Southwest corner of Section 24, Township 9 North, Range 4 West.

Large silicified fossil log, exposed in Cold Creek along an outcrop of the sands and gravels of the Pleistocene ancestral Mississippi River, Pre-loess Terrace Deposit on February 15, 2008 in Section 24, Township 9 North, Range 4 West.

Thinly bedded deltaic sands with lignitic intervals at an outcrop of the of the lower Oligocene Forest Hill Formation exposed along the valley wall of an unnamed stream taken on February 14, 2023 in the extreme Southeast corner of Section 23, Township 9 North, Range 4 West.

The marginal marine glauconite sand bed of the uppermost part of the Forest Hill Formation dominated by pelecypod shells of the corbulid, *Tiza alta* overlain by carbonaceous estuarine silty clays of the uppermost Forest Hill taken on May 15, 2008 in Section 25, Township 9 North, Range 4 West.



Shell hash of fossil mollusks along a bedding plane in the late Eocene marine clays of the Yazoo Formation. Specimen approximately 25 cm. in length taken on April 21, 2007 in Section 24, Township 9 North, Range 4 West.

Structural Cross-Section of the Phoenix 7.5-Minute Geologic Quadrangle