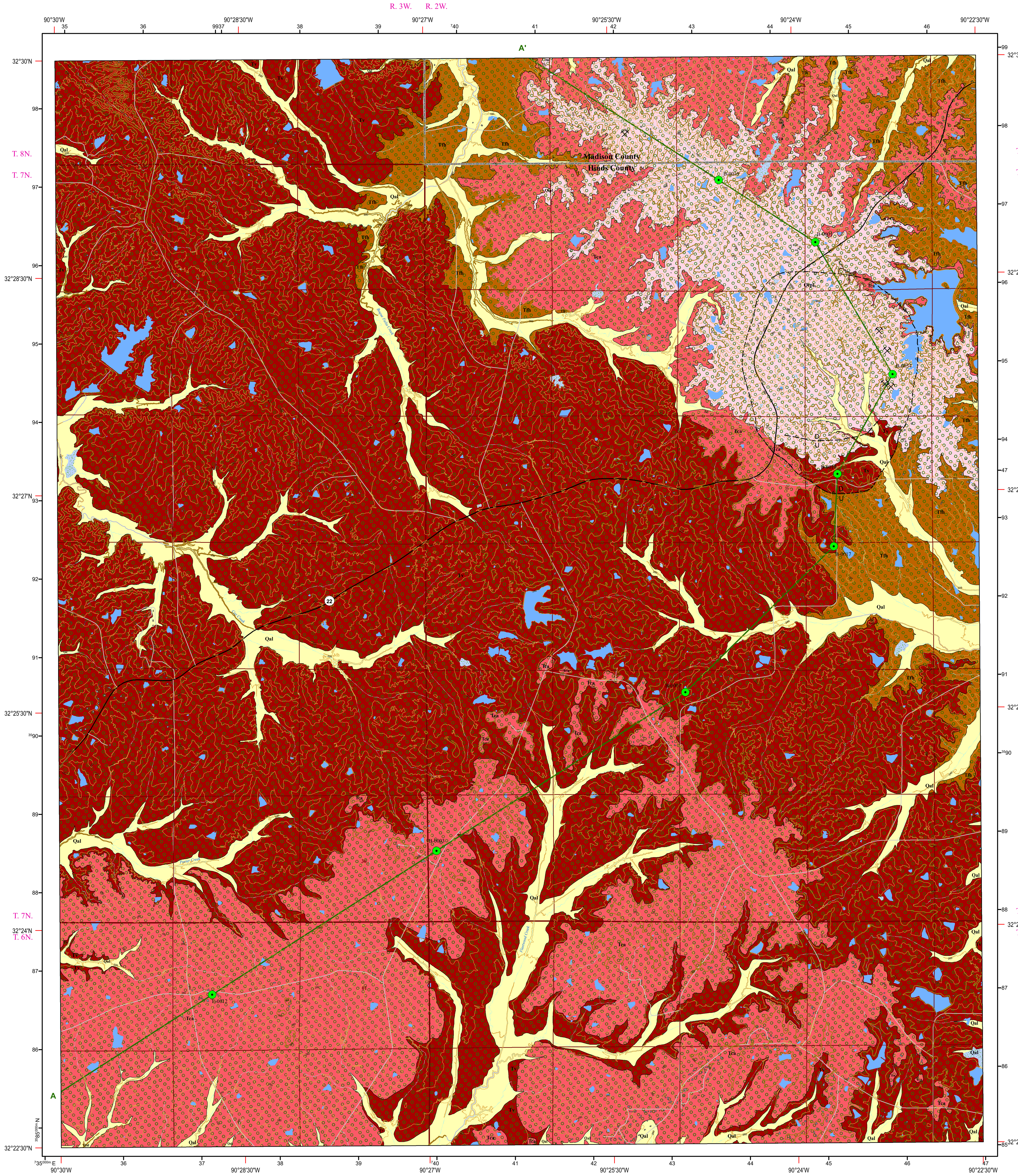
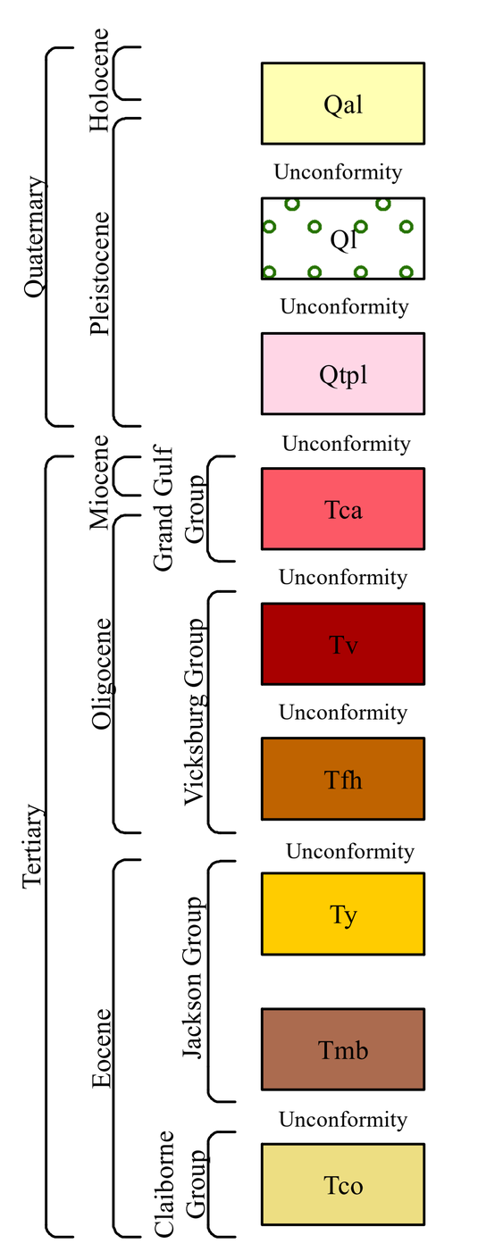


Correlation of Map Units



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.

Ql — **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 approximatel 270 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.

U / D — **Brownsville Dome**
The Brownsville Salt Dome is a diapir of Jurrasic salt with a collapsed stock. This failure created several high angle, radial, normal faults during the Late Oligocene to Early Miocene.

Grand Gulf Group

Tca — **Catahoula Formation (Oligocene)**
Deltaic sands, silts, and clays; Sand, gray, pale yellow to white, fine- to coarse-grained, cross-bedded to massive, predominantly quartzose with lesser amounts of chert, metaquartzite, mica, and heavy minerals, slightly glauconitic in places with rare thinly-bedded pea gravels, Gravels, black chert and milky quartz, highly polished, immature, subangular to well rounded; Clay, green, gray, brown, kaolinitic, weathers white to brown exhibiting a "popcorn" appearance, silty to sandy, lignite common in basal clays. Often indurates to opaline-cemented sandstones and rarer orthoquartzites where exposed, silicified wood and fossil palm common. Ironstone common where sands overlie clays. The Catahoula Formation typically unconformably overlies the Bucatunna Formation. However, in the Northwest portion of the quadrangle, a basal Catahoula Channel has incised through and eroded much of the underlying Vicksburg Group. Total thickness is approximately 560 feet but full thickness does not occur in this quadrangle.

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. A basal Forest Hill Channel incises into the Yazoo Formation over much of the western portion of the quadrangle. Total thickness is approximately 100 feet.

Cross Section Units Not Exposed At The Surface

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.

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 derived from Pleistocene loess exposed along the active channel of a stream in Section 15, Township 7 North, Range 2 West.


Chert gravel lens in Holocene stream alluvium derived from the Pre-loess Terrace Deposits in Section 15, Township 7 North, Range 2 West.


Conglomerate of kaolinitic clay rip-up clasts derived from the Catahoula Formation incorporated in stream alluvium in Section 15, Township 7 North, Range 2 West.


Pebbles of kaolinitic clay rip-up clasts derived from the Late Oligocene Catahoula Formation incorporated in stream alluvium. Section 15, Township 7 North, Range 2 West.


A boulder clast of Holocene stream alluvium conglomerate eroded into a stream channel. The kaolinitic clay rip-up clasts were derived from the Catahoula Formation and incorporated in stream alluvium in Section 15, Township 7 North, Range 2 West.

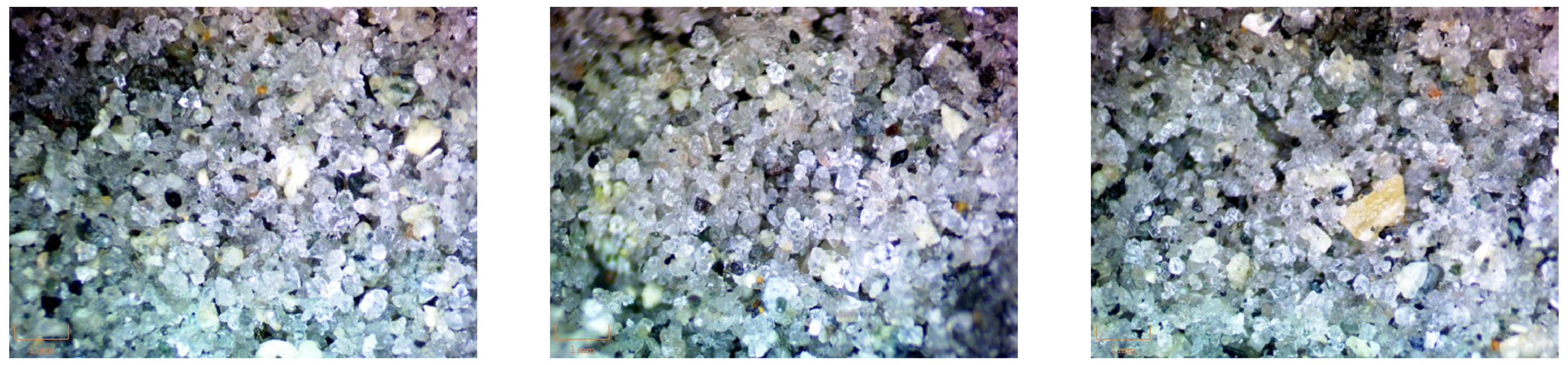

Loess and Pre-loess Terrace derived stream alluvium consisting of an indurated lateritic ironstone in Section 15, Township 7 North, Range 2 West.


Unconformable contact between Pleistocene fluvial Pre-loess Terrace Deposit and the overlying Pleistocene loess exposed in a gravel pit in Section 10, Township 7 North, Range 2 West.

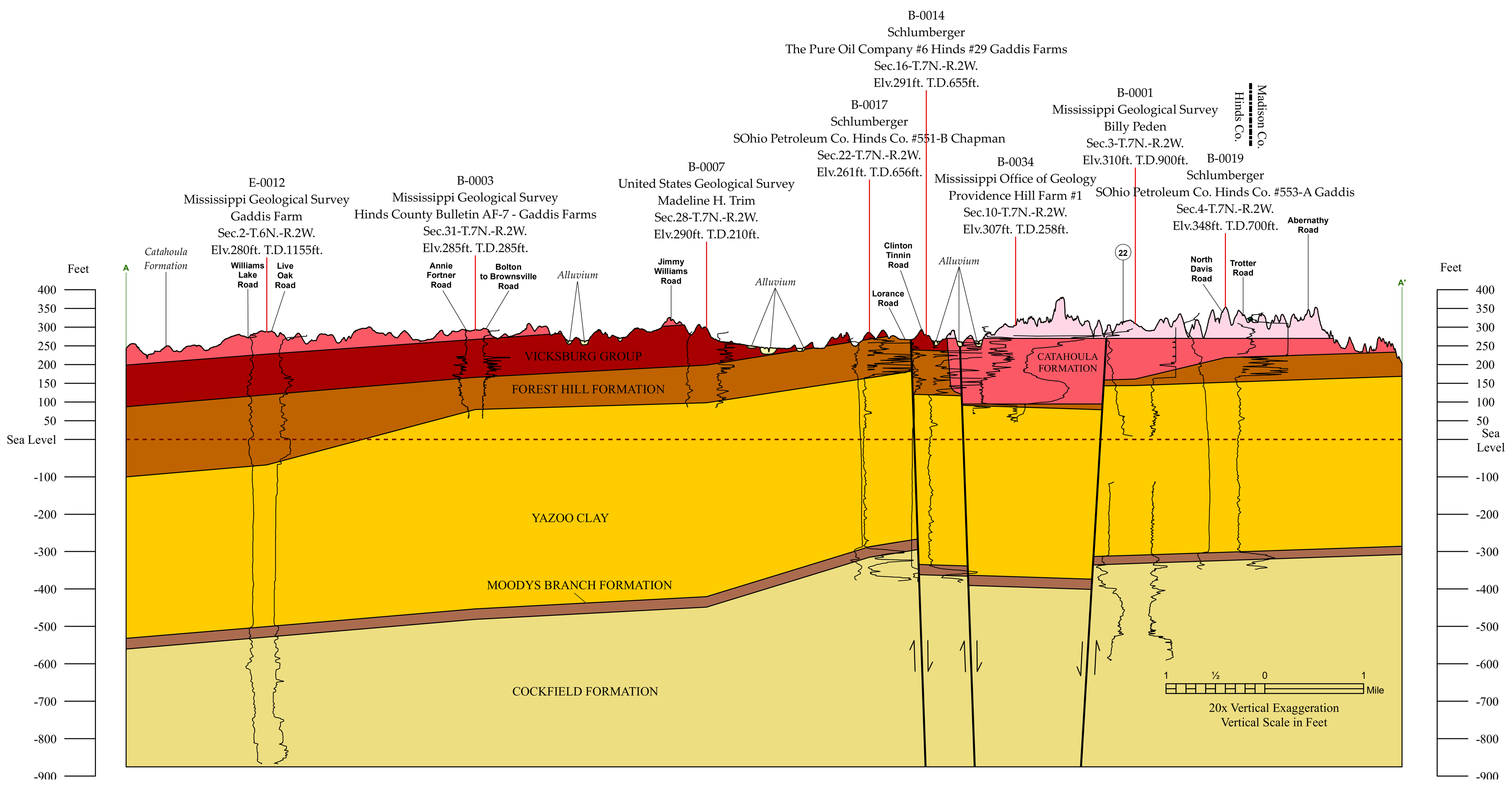

Deeply weathered exposure of lower Oligocene Glendon Limestone member of the Vicksburg Group in Section 21, Township 7 North, Range 2 West.

Closeup of deeply weathered float boulder of fossiliferous lower Oligocene Glendon Limestone in Section 21, Township 7 North, Range 2 West.


Photomicrographs of coarse-grained quartz sand with black, translucent, angular, and unweathered chert grains from the upper Oligocene Catahoula Formation recovered from a depth interval of 200-210 feet in MGS Providence Hill Farm #1 stratigraphic test hole B-0034 drilled on April 4, 2023 in Section 21, Township 7 North, Range 2 West. Scale in millimeters.


Photomicrographs of fine-grained quartz sand with pyrite, glauconite, and carbonaceous flecks from an Oligocene Forest Hill channel recovered from a depth interval of 160-170 feet in MGS-Trotter #1 stratigraphic test hole drilled on May 16, 2023 in Section 19, Township 7 North, Range 2 West. Scale in millimeters.

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



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 Brownsville quadrangle, (90°26'13.681"W, 32°26'14.35"N), center area is 0.73° 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

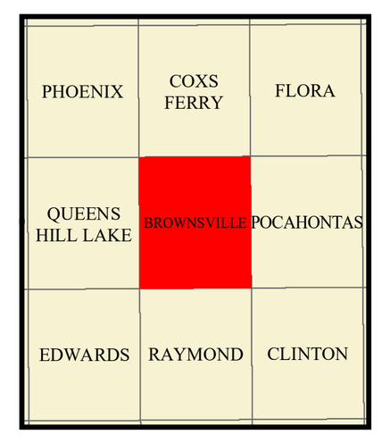
Surface Mine

E-0012 Drill-hole locality and identification number

Unconformable Contact

A — A' Line of Section

Adjoining 7.5' Quadrangles



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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 Providence Hill Farm and Mr. Alex Trotter for making their property available for drilling stratigraphic testholes.

GEOLOGIC MAP of the BROWNSVILLE 7.5-MINUTE QUADRANGLE

Hinds and Madison Counties, Mississippi

2023

Geology by

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Mississippi Department of Environmental Quality
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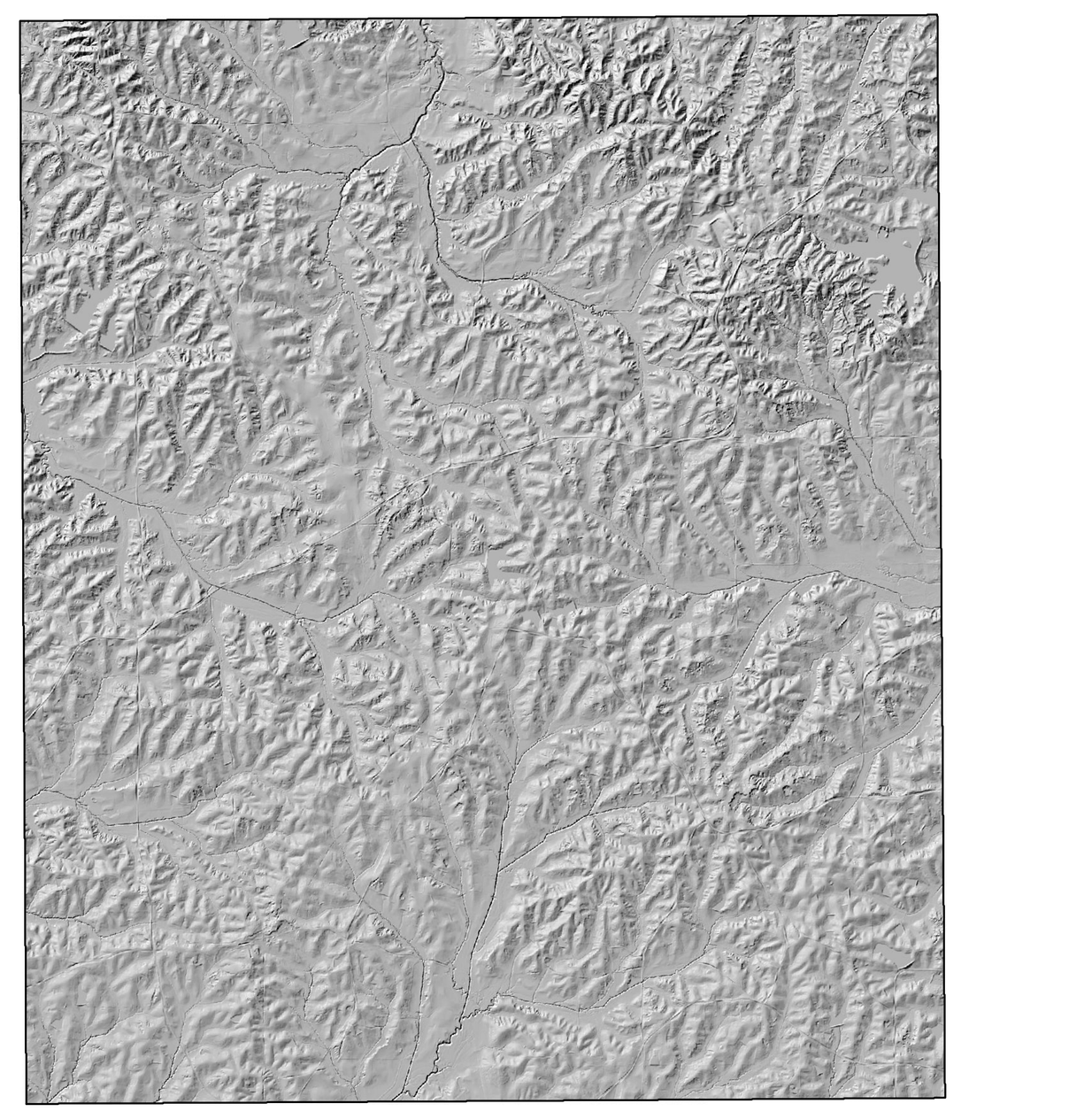
Jackson, Mississippi 39225


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.