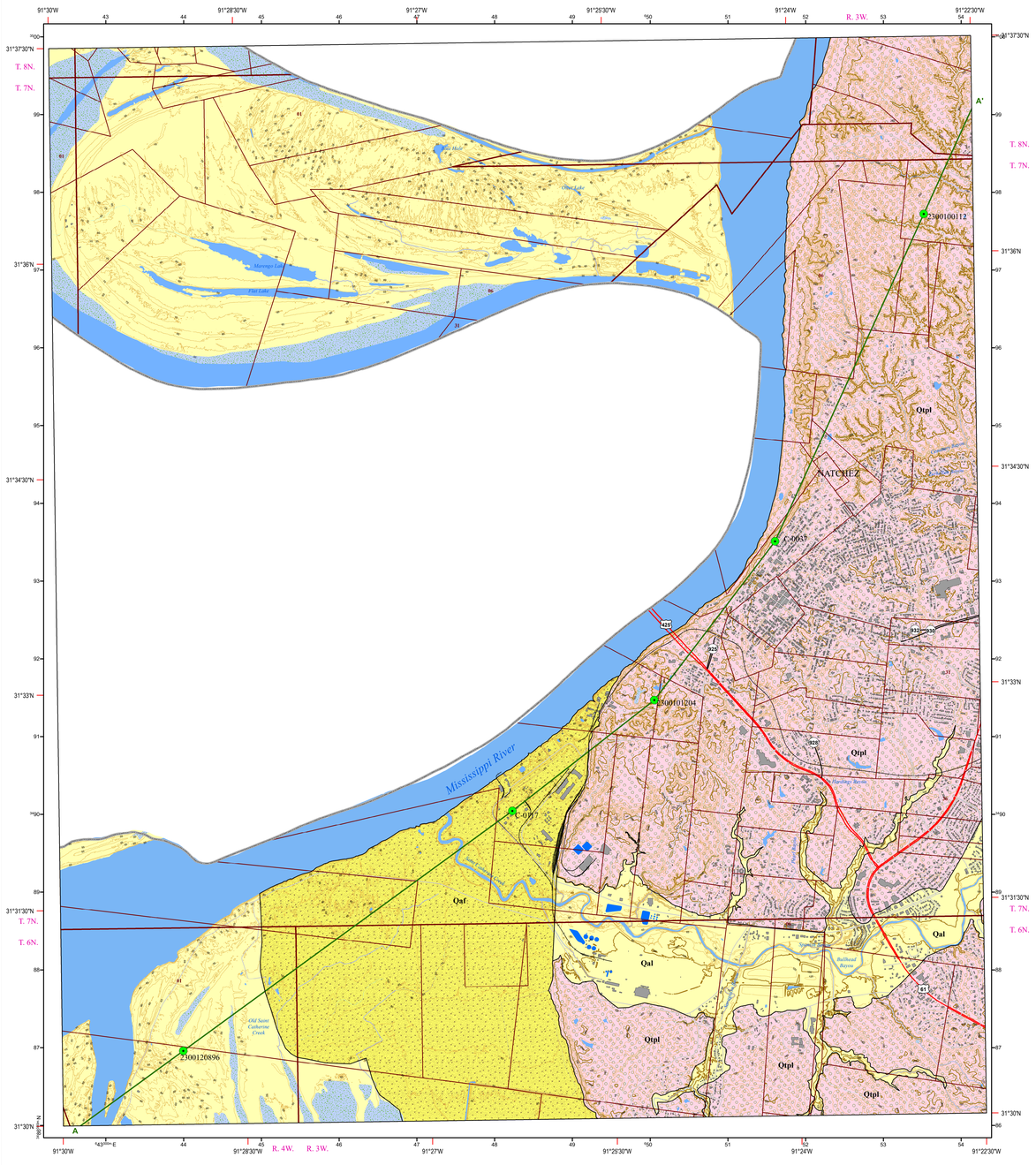
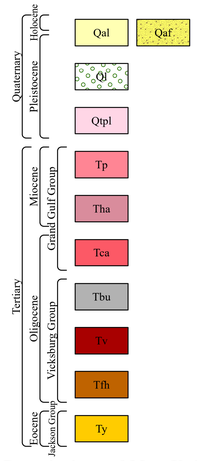
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF GEOLOGY SURFACE MAPPING DIVISION
MISSISSIPPI GEOLOGICAL SURVEY

Prepared in cooperation with
UNITED STATES NATIONAL PARK SERVICE
GEOLOGIC RESOURCES DIVISION

GEOLOGIC MAP OF THE 7.5-MINUTE NATCHEZ QUADRANGLE OPEN-FILE REPORT 336



Correlation of Map Units



Descriptions of Map Units

Qal — **Alluvium (Holocene to Pleistocene)**
Mississippi River Alluvium: Sand, yellow- to brownish-white in color, fine- to coarse-grained, subrounded to rounded, predominately quartzose, a range of gravels with province as far north as Canada. Constitutes a major aquifer system, the Mississippi River Alluvial Aquifer. Pleistocene Vertebrates common. Mississippi River Alluvium thickness is approximately 160 feet.
Stream Alluvium: Sand, yellow- to brownish-white in color, fine- to coarse-grained, subrounded to rounded, predominately quartzose, locally gravelliferous containing aggregate derived from the Pre-loess Terrace deposits and Miocene Subcrop, 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. Stream Alluvium thickness is interpreted to be approximately 10 feet.

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 as encountered in nearby test hole 063G0041 in Jefferson County.

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; gravelliferous, 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 gravelliferous sands at the base of the deposits, which overlie the Pascagoula Formation unconformably. Completely preserved terrace beneath the loess with a base perched between 20-40 feet above MSL with a relic alluvial plain surface at approximately 135 feet above MSL represented as a clay bed. This ancestral Mississippi River, Pre-loess Terrace Deposit is a first order terrace of the Mississippi River and is the "Natchez Formation" of the previous literature. Preliminary radiometric dating places the abandonment of this alluvial terrace during the height of the last glacial maxima, approximately 20,000 years B.P. "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.

Cross-Section Units Not Exposed at the Surface

Grand Gulf Group

Tp — **Pascagoula Formation (Miocene)**
Deltaic sands, silts, and clays; Clay, blue-green, gray, brown, weathers pink to off-white, silty to sandy, locally lignitic; sand, gray, pale yellow to white, fine-to coarse-grained ,cross-bedded to massive with bedded pea gravels (gravels consist of black, grey, brown chert, and milky quartz, are highly polished, sub-angular to well rounded), often indurated to sandstones and siltstones at surface, predominantly quartzose with lesser amounts of chert, metaquartzite, mica, and heavy minerals, slightly glauconitic in places, silicified and coalified wood common. The Pascagoula Formation conformably overlies the Hattiesburg Formation. Total thickness is not encountered in this quadrangle but is estimated to be approximately 1,320 feet.

Tha — **Hattiesburg Formation (Miocene)**
Deltaic sands, silts, and clays; Clay, green, gray, brown, weathers white to brown, silty to sandy, locally lignitic; sand, gray, pale yellow to white, fine- to coarse-grained, cross-bedded to massive with rare thinly-bedded pea gravels (gravels consist of black chert and milky quartz, are highly polished, sub-angular to well rounded), often indurated to sandstones and siltstones at surface, predominantly quartzose with lesser amounts of chert, metaquartzite, mica, and heavy minerals, slightly glauconitic in places, silicified and coalified wood common. The base of the Hattiesburg Formation is designated at the base of a sand unit of regional extent that occurs above the last occurrence of *Heterostegina* at the approximate horizon of the base of the Fleming Formation in Louisiana and the Amos Sand in Alabama. The Hattiesburg Formation conformably overlies the Pascagoula Formation. Total thickness is approximately 540 feet.

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 unconformably overlies the Bucatunna Formation. Total thickness is approximately 560 feet.

Vicksburg Group

Tbu — **Bucatunna Formation (Oligocene)**
Clay, dark brown to dark gray, weathers light brown to light gray, carbonaceous, silty to sandy, micaceous, laminated to massive, sparingly fossiliferous. The Bucatunna Formation conformably overlies the Byram Formation. Thickness is approximately 40 feet except where Catahoula Formation channels have incised.

Tv — **Vicksburg Limestone Undifferentiated (Oligocene)**
Includes the 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 70 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 50 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 390 feet.

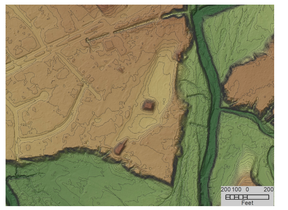
Field Photographs

Pleistocene loess (aeolian glacial silt) outcrop as a typical vertical bluff along St. Catherine Creek. Stream alluvium along the stream's valley floor is predominately loess derived with a bedload of reworked loess silt and Pre-loess Terrace sand and gravel. Section 3, Township 6N, Range 3W.

Flagstone talus of cross-bedded conglomeratic ironstone from an outcrop of an ancestral Mississippi River Pre-loess Terrace Deposit along the Mississippi River photographed during an unprecedented low water event in November, 2022. This complete alluvial terrace sequence underlies the entirety of the uplands of the Natchez Quadrangle and is masked by a thick mantle of loess. Mississippi Geological Survey Bulletin 47 describes this terrace as the "Natchez Formation" Springs emanating from this outcrop demonstrate the direct hydro-connectivity of this level of Pre-loess Terrace with Mississippi River and its alluvium. Section 24, Township 7N, Range 3W.

Remaining earthworks of the French colonial settlement of Fort Rosalie at Natchez National Historical Park. This archaeological site was founded in 1716 and built by Natchez Indian labor. It is the oldest permanent colonial settlement on the lower Mississippi River and led to the founding of the City of Natchez. Section 24, Township 7N, Range 3W.

The unconformable contact between the Pleistocene loess and the underlying ancestral Mississippi River Pre-loess Terrace Deposit outcropping in a slump along a road cut in the valley wall of the Mississippi River just above the St. Catherine Creek alluvial fan. Section 27, Township 7N, Range 3W.



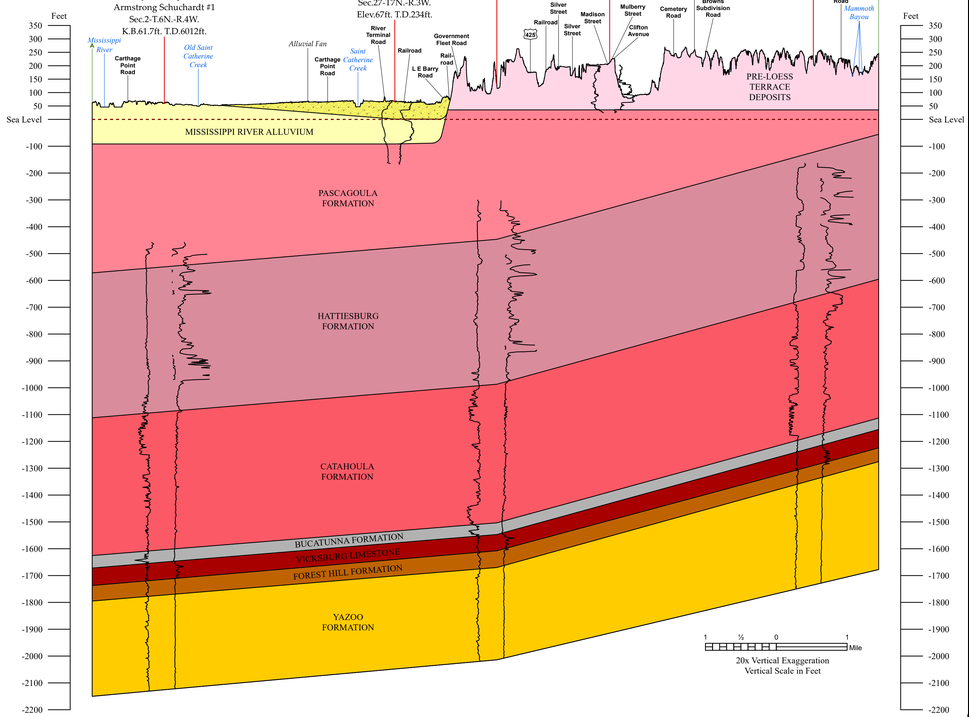
The Grand Village of the Natchez is an import native American cultural earthworks site first inhabited during the Woodland cultural period around A.D. 700. Occupation persisted through the Mississippian/Protohistoric period until 1730. A Pro-English movement within the Natchez Indians resulted in an attack on the French Colony just north along the Mississippi River at Fort Rosalie in 1729. The French brutally responded by driving the Natchez Indians from their homeland. The lidar derived bare earth hill shade of the site with color-ramped elevation and 1-foot contours depicts the sites association with the natural environment. The large mounds are situated at a vantage over the edge of a small first terrace of the adjacent St. Catherine Creek drainage. It is bordered to the east by flowing freshwater from the stream choked with an exquisite source of Pre-loess Terrace gravels for lithic tool manufacturing and kaolinic clay for the manufacturing of high-quality ceramics. Section 46, Township 7N, Range 3W.

Native American nutting/anvil stone artifact (~8 inches) with an arrangement of multiple use-wear pits on display at the visitors center of the Grand Village of the Natchez Indians state archeological park. It is made from a large, coarse-grained, Precambrian gravel clast of Sioux Quartzite from the local ancestral Mississippi River Pre-loess Terrace Deposits.

Unconformable contact between the massive Pleistocene aeolian loess and the underlying upper alluvial clay beds of the ancestral Mississippi River Pre-loess Terrace Deposits exposed along the stream valley of St. Catherine Creek adjacent to the Grand Village of the Natchez Indians state archeological park. These high-quality alluvial clays from both the ancestral Mississippi River Pre-loess Terrace Deposits and stream alluvium outcropping along St. Catherine Creek were vital to the iconic Mississippian period ceramics industry of the Natchez Indians. Section 3, Township 6N, Range 3W.

Basal ironstone and glacially rafted oversized chert cobbles of the Pre-loess Terrace Deposits in contact with clays of the underlying Miocene Pascagoula Formation exposed on the bank of the Mississippi River in Section 15, Township 7N, Range 3W.

Structural Cross-Section of the Natchez 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, January 1, 2023, estimated Magnetic North declination in 7.5-Minute NATCHEZ quadrangle, (91°26'15"W, 31°33'45"N), center area is 0.52° west of True North ± 0.35°. Annual rate of declination change is approximately 0.10° 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.

Adjoining 7.5' Quadrangles

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 5 and 20 feet
North American Vertical Datum 1988 Geoid 12A

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This geologic map was funded by the United States National Park Service, Geologic Resources Division. The Survey expresses gratitude to the Mississippi Department of Archives and History and Lance Harris, Director at the Grand Village of the Natchez Indians state archeological park.

GEOLOGIC MAP of the NATCHEZ 7.5-MINUTE QUADRANGLE
Adams County, Mississippi

2022

Geology by

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Mississippi Department of Environmental Quality
Mississippi Office of Geology - Surface Mapping Division
Mississippi Geological Survey
700 North State Street
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Surface Mine

C-0117 Drill-hole locality and identification number

Unconformable Contact

A — A' Line of Section

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.