SURFICIAL MATERIAL GEOLOGIC MAP OF THE WENTZVILLE 7.5' QUADRANGLE ST. CHARLES COUNTY, MISSOURI

Geology and Digital Compilation by
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PHYSIOGRAPHY

During the early Quaternary Period, most of northern Missouri was buried beneath glacial deposits. Upland surfaces, and some lower elevations on the Wentzville quadrangle are a result of deposition and subsequent erosion of these till deposits. At lower elevations, degradation processes have exhumed sedimentary Pennsylvanian- and Mississippian-age rocks and created their overlying thin, stony surficial materials. The quadrangle lies within the Dissected Till Plains Section of the Central Lowland Province of the Interior Plains Physiographic Division. The lowest recorded elevation of 134 meters (440 feet) mean sea level (msl) occurs on a terrace adjacent to the Cuivre River in Section 32, T48N R02E. The highest elevation of 213 meters (700 feet) msl is on a till plain summit in Section 11, T46N R01E of the quadrangle. Total relief is 79 meters (260 feet). All streams in the quadrangle are tributaries to the Mississippi River.

SURFICIAL MATERIALS

Geomorphic processes have redistributed sediments and modified former land surfaces. The remnant glacial till is pre-Illinoian and forms a significant amount of the surficial materials (Allen and Ward, 1977). Till units in the quadrangle have not been differentiated but may include a series of formations and members identified not too far from the Wentzville area as the McCredie formation and, from top to bottom, the Macon, Columbia, and Fulton members (Rovey and Kean, 1996). Glacial deposits in northern Missouri have been dated to the Middle Pleistocene (350,000 to 780,000 BP) and may be as old as two million years (Rovey and Kean, 1996). Allen and Ward (1977) divided surficial materials in St. Charles County into 26 map units based upon texture, origin and modern land surface position. The units used on this map have been simplified.

The tills commonly have high clay content and are interpreted as subglacial lodgment deposits. A few locations in the Wentzville quadrangle were observed that had gravelly and sandy deposits that are more characteristic of melt-out tills or outwash deposits. Rock fragments ranging from pebbles to boulders occur in these deposits. Allen and Ward (1977) also recognized paleosols within the till deposits. Till below these paleosols are massive, fissile and dense in the basal parts. Intervening fractures allow downward movement of water, silt and clay. On erosional slopes the tills have been truncated and redeposited or mixed with local detritus including silty sediments possibly derived from loess. At two upland locations thin, wind-blown Pleistocene-age sediments were identified during field mapping. These loess exposures were less than three meters (10 feet) thick. Below the till plain summits most of the coarse-grained pebble to gravel sized materials are derived from residual Pennsylvanian- and Mississippian-aged sedimentary rocks.

The physical properties of the materials vary considerably across the quadrangle. Geotechnical boring and laboratory data from Missouri Department of Transportation (MoDOT) depict a range of values for glacial till sequences versus alluvial deposits. These are discussed with the unit descriptions and in figures one through three at the bottom of the map.

AF ARTIFICIAL FILL
This unit comprises artificially emplaced fill material and is composed of a mixture of heterogeneous clay, silt, sand and gravel in various quantities. This unit may reach 12 meters (40 feet) in total thickness and comprises the material for highway and railroad beds, as well as waste water treatment facility fill and lake or pond dam fill material. This artificial fill has typically been placed on undisturbed materials.

Qal QUATERNARY FINE- TO MEDIUM-GRAINED ALLUVIUM
Alluvial deposits on this map are divided into fine-grained (mostly cohesive materials) and gravel dominated deposits. In St. Charles County most alluvium in larger valleys, such as Peruque and McCoy creeks, appears to be derived from glacial till. This till is dominated by fine-grained to sandy or loamy deposits with thin gravel beds (Allan and Ward, 1977). Thickness of fine-grained alluvium ranges up to 12 meters (40 feet) in Peruque Creek at Interstate 70 and about five meters (16 feet) in McCoy Creek at US Highway 61. At Peruque Creek and Interstate 70, four MoDOT borings show a range of Standard Penetration Test N60 Values from two to 47 (Figure 1). In these borings the materials are dominated by sandy and silty clays, but include fat clay and gravel intervals. Locally, fine-grained alluvium in the quadrangle may all be cohesive materials.

Qalg QUATERNARY GRAVELLY ALLUVIUM
Gravelly, poorly sorted alluvium is associated with short stream segments in narrow valleys. Along US Highway 61 and Dry Branch, gravelly alluvium is at least three and a half meters (11.5 feet) thick. These coarse-grained materials should be considered cohesionless soils.

Qt QUATERNARY ALLUVIAL TERRACE
In drainages associated with the Cuivre River (the northern part of the quadrangle), fine-grained and sandy deposits make up elevated benches above current flood plain levels. This terrace is the Femme Osage or Boschertown terraces of Allen and Ward (1977). The single accessible exposure consists of reddish-brown silt clay at the surface, which is not unlike oxidized portions of till materials in the same area. A single boring in this area intercepted 30 meters (98 feet) of sandy deposits.

Qgt QUATERNARY GLACIAL TILL
Till consists of a sequence of dominantly fine-grained deposits that include plastic, clay-rich units and less than two meters (6.5 feet) of gravelly, outwash derived beds. The observed basal till beds are oxidized reddish silty clay, which are successively overlain by less oxidized gray to yellow-brown clays that contain variable amounts of gravel, cobbles and sand. Fine-grained carbonate has been leached from most till in St. Charles County (Allen and Ward, 1977). Erratic cobbles and pebbles are rounded and smooth and include granitic and metamorphic rock types. Boring data from the northeast part of the quadrangle indicates the till exceeds 36 meters (118 feet). In the southwest part of the quadrangle along Little Dardenne Creek, the till is nearly 40 meters (131 feet) thick. Locally, considerable relief was observed on the till bedrock surface. An excavated glacial till-bedrock contact along New Melle Road (Section 17, T46N R02E) revealed a vertical contact with at least 3 meters (10 feet) relief. A second excavated contact in Section 16, T46N R02E had nearly 12 meters (39 feet) relief within 100 meters (328 feet). Late Pleistocene loess was uncommon and identified only at higher elevations in two small exposures. At both locations loess was less than 3 meters (10 feet) thick. For this map, loess is combined with glacial till.

Moist or saturated glacial till at lower elevations and along creeks may all be classified as stiff to soft soils. Figure 1 is a graph of Standard Penetration Test N60 values for a bridge project on Highway Z at Little Dardenne Creek. The mean N60 value from three borings is 14 blows/foot. These borings were all drilled in a short time period and were described as moist to wet during drilling. Till in upland or ridge top locations is more subject to drying during low rainfall periods, and boring data suggests that they are more often classed as stiff to very stiff soils. Figure 2 shows all upland till boring data and includes some plasticity index and weight percent water values. The mean N60 value from 27 blows/foot upland till locations is 32.

Cu CARBONIFEROUS OUTCROP UNDIVIDED
These areas have less than three meters (10 feet) of fine-grained surficial materials. They include Paleozoic bedrock outcrop areas where Mississippian-age limestone, or the Pennsylvanian chert breccia and clay, are exposed and weathered to produce silt- to clay-rich stony sequences. Fine-grained materials are highly variable reworked till or bedrock materials. They include stony, matrix-supported, clay-rich loam in thin colluvial or alluvial sequences in low relief areas to very stony, clast-supported, sequences along steep slopes in thin and restricted colluvial or alluvial deposits.

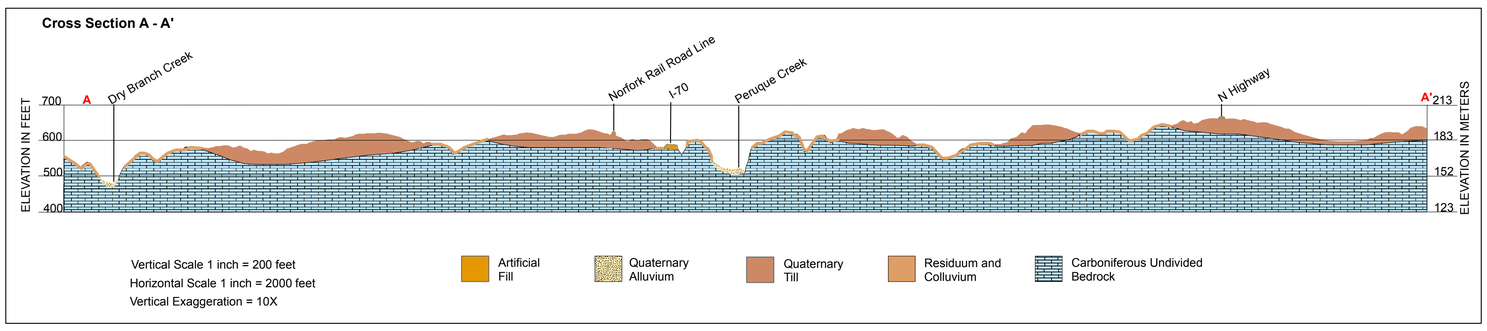
CONSTRUCTED SURFACE
These are areas of surficial materials that have been removed, altered or filled to an unknown depth in residential and commercial developments. Many sites developed after about 1990 were commonly excavated to bedrock, or near bedrock, and may also have considerable artificial fill in former ravines. Some materials were removed to decrease the potential for foundation damage due to shrinking and swelling of moderate to high plasticity clays that are present in glacial till. Berms of unexcavated materials have been left in some residential areas to serve as privacy or noise barriers along highways. The remaining surficial materials in many of the developments generally appear to be less than three meters (10 feet) thick. The areas shown were mapped from field visits and from 2005 National Agriculture Imagery Program air photos.

A——A' Line locates placement of the cross section with end line symbols.

HYDROLOGIC DISCUSSION

Glacial till in St. Charles County has been described as having low permeability with groundwater flow of less than 10^{-6} cm/sec (Dean, 1977). These rates will be higher but variable in areas where thin sand or gravel layers are present in till. During extended dry periods, large fractures develop locally in till and heal during wet seasons, which is attributable to smectitic clay content in till. The shrink-swell capacity in till clays is one reason many newer housing developments have over-excavated materials to reduce the potential for damage to concrete foundations. The thin colluvial materials (unit Cu) have moderate but variable permeability around 10^{-4} cm/sec (Dean, 1977), that is dependent on local clay content. Alluvial materials including terrace deposits (units Qal, Qalg and Qt) can be expected to have higher permeability, particularly in areas of gravel- and sand-rich deposits.

Cross Section A - A'



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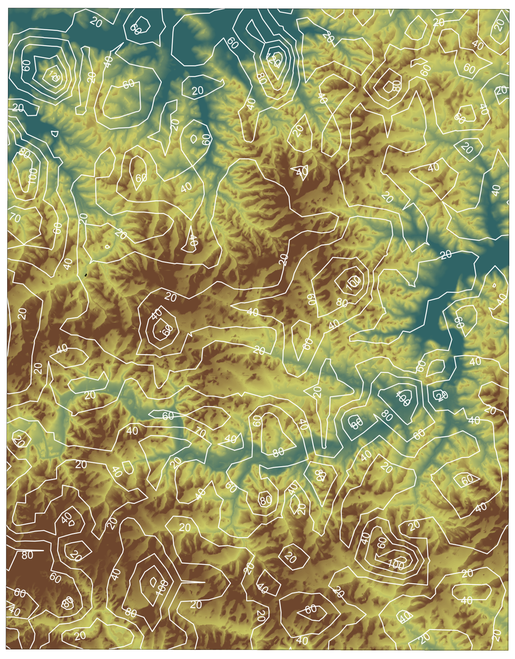
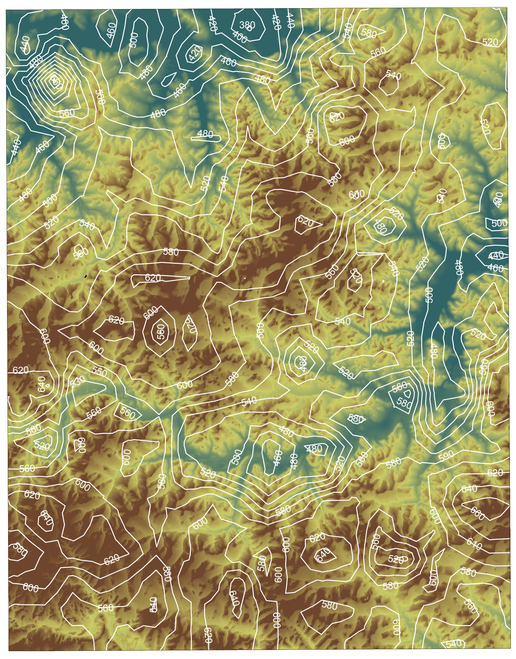
ACKNOWLEDGEMENTS

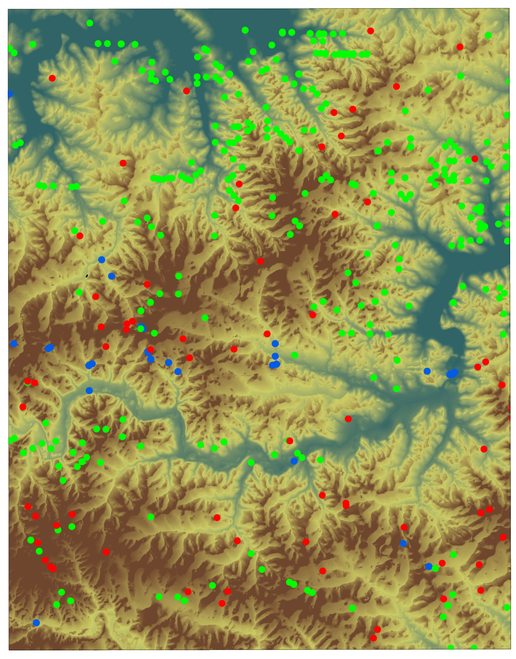
The Missouri Department of Transportation provided boring data across the Wentzville quadrangle. This data was used in conjunction with division data to determine surficial material type and thickness and to contour the top of bedrock elevation. These contributions are greatly appreciated. The assistance of Missouri Office of Administration, Information Technology Services Division staff Michael Hill, Elizabeth Retherford and intern Vicki Dove, as well as Travis Carr, Division of Geology and Land Survey, to produce contour maps from the data was invaluable.

SURFICIAL MATERIAL THICKNESS



TOP OF BEDROCK ELEVATION





Inset Legend

- Quadrangle Boundary
- Geotechnical
- Log Main
- WIMS

Digital Elevation Model
Value in Meters

High: 214.134

Low: 129.677

Scale 1: 60,000
Contour Interval = 20 feet

UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

STATE OF MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES

WENTZVILLE QUADRANGLE
MISSOURI—ST. CHARLES CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1970. Field checked 1972

Polyconic projection. 1927 North American datum
10,000-foot grid based on Missouri coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue
To place on the predicted North American Datum 1983 move the projection lines 2 meters south and 10 meters east as shown by dashed corner ticks

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092,
AND THE DIVISION OF GEOLOGY AND LAND SURVEY
MISSOURI DEPARTMENT OF NATURAL RESOURCES, ROLLA, MISSOURI 65401
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION
Primary highway, hard surface — Light-duty road, hard or improved surface
Secondary highway, hard surface — Unimproved road
Interstate Route · U. S. Route · State Route

WENTZVILLE, MO.
N3845—W9045/7.5
1972
DMA 7861 IV SE—SERIES V879