INTRODUCTION

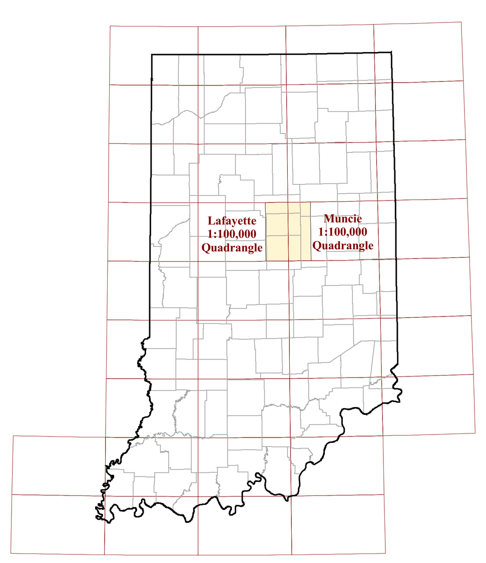
This map presents basic bedrock geologic information that contributes to the characterization of potential aggregate resources, characterization of bedrock aquifer systems, and analysis of the overlying predominantly glacial deposits. This map is based on data obtained from 17,252 water well drillers' logs, petroleum well drillers' logs, geophysical logs, descriptions of cores recovered by the Indiana Geological Survey, seismic refraction records collected by the Indiana Geological Survey, natural exposures near the map area, and exposures in active and abandoned quarries. The map was created by modeling the bounding surfaces of mapped units using a computer gridding and contouring program. Each of the computer modeled boundary surfaces is a 60-meter grid aligned with the USGS 30-meter, 1:24,000-scale digital elevation model (DEM) grid to facilitate the development of derivative map products, such as overburden maps. The techniques used to model stratigraphic boundaries are adaptations of techniques described by Hasenmueller (1995, 1998). Subcrop lines shown on the map are computed intersections between stratigraphic unit boundaries and the bedrock surface mapped by Hasenmueller (2000b).

The map shows the distribution of nearly horizontal Paleozoic sedimentary rocks subcropping on the crest of the Kankakee Arch. The simplicity of the regional structure suggests that the map can be used to make precise predictions of rock unit distribution. The remoteness of the mapped units (the bedrock surface lies as much as 400 feet below the topographic surface), presence of minor structural features disrupt the regional trend, unconformities within the Paleozoic rock sequence complicate boundary surfaces, and imprecisions inherent to some of the data used to construct the map make it inadvisable to regard this map product as the final authority on geologic conditions at specific sites within the map area. The map is a summary and interpretation of public-domain geologic information and is intended to serve as a guide to planning cost-effective evaluations of geologic conditions that are site specific.

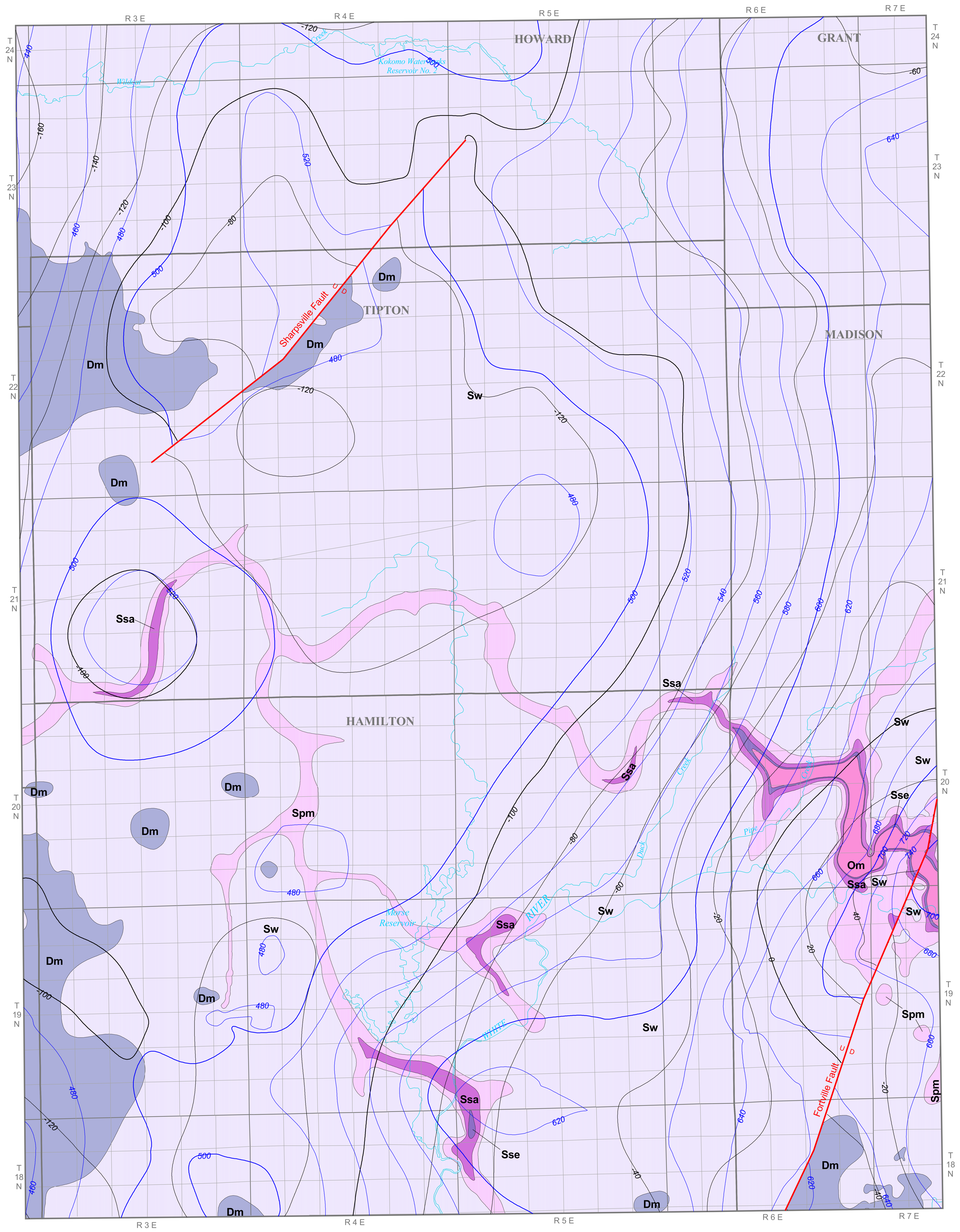
Two stratigraphic revisions are incorporated into the map. A single Silurian formation--the Sexton Creek Limestone--is mapped below the Salamonie Dolomite, and the base of the Pleasant Mills Formation and Salina Group has been moved from the base of the Limberlost Dolomite to the base of the Waldron Shale Member of the Pleasant Mills Formation. This simplification of basal Silurian stratigraphy avoids the introduction of vertical cutoffs to accommodate formation name and concept changes. The modification of the boundary between the Pleasant Mills Formation and Salamonie Dolomite was necessary because the base of the Waldron Shale is more easily and reliably identified horizon in the map area. Placing the Pleasant Mills-Salamonie boundary at the base of the Waldron Shale is likely to facilitate subsequent hydrologic and resource assessment studies because the Waldron is probably an aquitard throughout the map area and a convenient stratigraphic position for quarry benching.

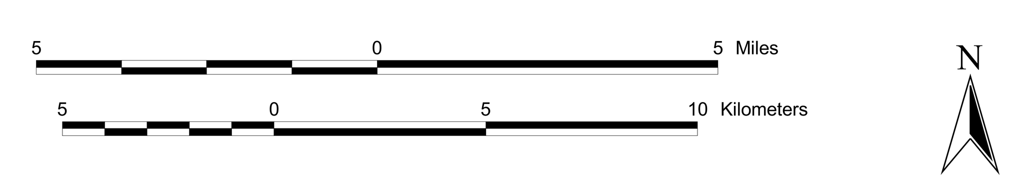
The trace of the Fortville Fault, shown in the southeast corner of the map, has been slightly modified from previously published maps of the area (Gray, Ault, and Keller, 1987). The Sharpsville Fault, located in the northwestern part of the map area, is a newly mapped structure based on statistical analysis of drill holes that document the irregular top of the Trenton Limestone in the vicinity of the fault (Hasenmueller, 2000a).

This map is the result of a cooperative mapping agreement between the U.S. Geological Survey and the Indiana Geological Survey. The mapping was supported with USGS National Mapping Program STATEMAP funds and matching funds from the Indiana Geological Survey.



Index map of Indiana showing boundaries of 1:100,000 USGS quadrangles. Study area shown in blue.





EXPLANATION OF MAP UNITS

Dm Muscatatuck Group (Devonian)-- Limestone and dolomite. The Muscatatuck Group consists of three formations; these are, in descending order, the North Vernon Limestone, Jeffersonville Limestone, and Geneva Dolomite. Muscatatuck formations were not mapped because they are thin and not well documented in or near the map area. Petroleum well drillers' logs are the principal source of information documenting the distribution of Devonian limestone in the map area. Drillers' logs, especially older ones, refer to the Muscatatuck Group as the "Corniferous Limestone" and do not differentiate units within the Muscatatuck. The contact between the Muscatatuck and overlying New Albany Shale, which is not present in the map area, is an abrupt and possibly unconformable transition from limestone to black, organic-rich shale (Droste and Shaver, *in* Shaver, and others, 1986). The contact between the Muscatatuck and underlying Silurian rocks is a diachronous regional unconformity. The Muscatatuck rests on the Wabash Formation throughout the map area but the upper members of the Wabash are missing in the southern part of the map area. The average thickness of the Muscatatuck in complete sections near the map area is 96 feet.

Sw Wabash Formation (Silurian)-- Limestone, dolomite, and argillaceous or silty dolomite. The Wabash Formation is subdivided into four irregularly developed named members; these are, in descending order, the Kenneth Limestone, Kokomo Limestone, Liston Creek Limestone, and Mississinewa Shale Members. All of the Wabash members are present in the map area but their development is too irregular to map with the data at hand. The term Huntington Lithofacies (not a formal member name) was proposed by Pinsak and Shaver (1964) to designate reef and bioherm buildups that locally replace named members of the Wabash Formation, Pleasant Mills Formation, and uppermost member of the Salamonie Dolomite (as herein defined). The Huntington Lithofacies is well developed at just a few scattered locations because the map area is located on the Wabash Platform south of the dense Silurian reef and bioherm development known as the Fort Wayne Bank (Ault, 1992; Ault and others, 1992). The upper contact of the Wabash Formation is the regional unconformity between Devonian and Silurian rocks. In the northwestern part of the map area the Kenneth Limestone Member underlies this unconformity. In the southern part of the map area rocks of the Muscatatuck Group rest on the Mississinewa Shale Member. The contact between the Wabash Formation and underlying Pleasant Mills Formation is conformable and gradational. The gradation from the Mississinewa Shale Member of the Wabash Formation to the Louisville Limestone Member of the Pleasant Mills Formation is often an interval of several feet. The Wabash Formation ranges from under 100 feet in the southeastern corner of the map area to more than 250 feet in the central and northern part of the map area.

Spm Pleasant Mills Formation (Silurian)-- Dolomite, limestone, and argillaceous dolomite. The Pleasant Mills Formation was proposed by Droste and Shaver (1982) to include, in descending order, the Louisville Limestone, Waldron Shale, and Limberlost Dolomite Members. It is rarely possible to differentiate the Limberlost Dolomite and underlying Salamonie Dolomite carbonates in the map area. The lithologic change that marks the base of the Waldron Shale Member of the Pleasant Mills Formation is distinct and commonly noted in drillers' logs and other geologic records from the map area, therefore, the Pleasant Mills Formation is herein restricted to the rocks from the top of the Louisville Limestone Member to the base of the Waldron Shale Member and the Limberlost Dolomite is assigned to the Salamonie Dolomite. Both the upper and lower contacts of the Pleasant Mills Formation, as herein defined, are conformable.The Pleasant Mills Formation ranges from under 50 feet to slightly more than 85 feet in the map area.

Ssa Salamonie Dolomite (Silurian)-- Dolomite and argillaceous limestone and dolomite. The Salamonie Dolomite was named by Pinsak and Shaver (1964) for the rocks extending from the base of the Waldron Formation to the top of the Brassfield Limestone. The Salamonie Dolomite is herein amended to include the rocks from the unconformity at the top of the Sexton Creek Limestone (Rexroad and Droste, 1982) to the base of the Waldron Shale Member of the Pleasant Mills Formation. The amended Salamonie thins irregularly from north to south in the map area. It reaches a maximum thickness of 82 feet in the northwest corner of the map area and is 24 feet thick in a drill hole located in the south-central part of the map area. Impure carbonates and thin shales are most prominent in the lower Salamonie. The upper Salamonie, which includes the Limberlost Dolomite Member, consists of relatively pure carbonates.

Sse Sexton Creek Limestone (Silurian)-- Cherty and argillaceous limestone. The name Sexton Creek Limestone is herein applied to the rocks from the unconformity at the base of the Silurian to the unconformity at the base of the Salamonie Dolomite. This usage is adopted in order to map a single thin basal Silurian formation bounded at its base and top by regional unconformities. Rexroad and Droste (1982) recognized that the Sexton Creek Limestone of western and central Indiana terminology and the Brassfield Limestone of southeastern Indiana terminology are part of a single Early Silurian blanket carbonate. The name Sexton Creek, which postdates the name Brassfield Limestone, is preferred here because these basal Silurian rocks are dominated by cherty limestones in all but the southeast corner of the map area. A thin limestone which underlies the cherty limestones or the Salamonie Dolomite is probably the equivalent of the Brassfield Limestone of southeastern Indiana. The Sexton Creek thickens rapidly from east to west in the map area. It is just over 4 feet thick in the southeastern corner of the map area and over 65 feet thick in the southwest corner of the map area.

Om Maquoketa Group (Ordovician)-- Shale and limestone. The Maquoketa Group consists of three formations: the Whitewater Limestone, Dillsboro Formation, and Kope Formation, in descending order (Gray and Shaver, *in* Shaver, and others, 1986). The Maquoketa ranges from less than 500 feet in the southwestern part of the map area to over 600 feet in the eastern part of the map area, which conforms to the regional thickness trend documented by Gray (1972). The Maquoketa is bounded by unconformities at its base and top (Gray and Shaver, *in* Shaver and others, 1986). The Whitewater Formation is present at the top of the Maquoketa in the eastern part of the map area, where the group is thickest. In the western and southwestern part of the map area where the Maquoketa is thin, Silurian carbonates rest directly on the Dillsboro Formation. Many oil and gas drillers were apparently unaware of this relationship and included the Whitewater Limestone in the dominantly carbonate sequence they called "Silurian."

Ot Trenton Limestone (Ordovician)-- Limestone and dolomitic limestone. The Trenton Limestone does not outcrop or subcrop within the map area. The elevation of the contact between the Trenton Limestone and overlying Maquoketa Group is documented in records from several thousand oil and gas wells in the Trenton Field, which includes much of the map area. Structures shown in the map area are based on the top of the Trenton because the numerous oil and gas records that document the top of the Trenton rarely record higher units. The structural analysis of the map area is complicated by the fact that the boundary between the Trenton Limestone and overlying Maquoketa Group is a regional "discontinuity" (Keith, 1986) with approximately 50 feet of relief.

EXPLANATION OF MAP SYMBOLS

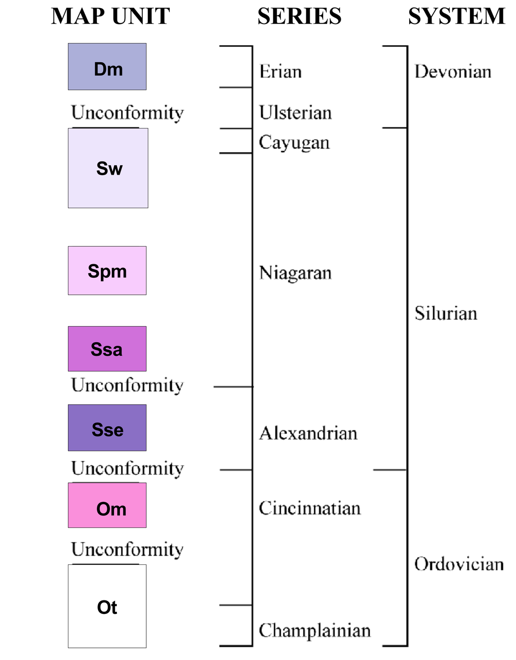
Contact - Approximately located.

Fault - Approximately located. Polylines representing fault traces were treated as breaklines when computing structure on the approximate top of the Trenton Limestone.

Structure contour - Approximately located. Drawn on the top of the Salamonie Dolomite using computer gridding and contouring software to add the interval from the top of the Salamonie Dolomite to structure on the approximate top of the Trenton Limestone. Contour interval is 20 feet (about 6 meters). The computations were carried out on 60-meter grids that extends more than 5 miles beyond the map area on all sides.

Structure contour - Approximately located. Drawn on the approximate top of the Trenton Limestone using computer gridding and contouring software to approximate the gently dipping structural component of the irregular upper surface of the Trenton Limestone. Contour interval is 20 feet (about 6 meters). Block kriging with a 3,000-meter block size and linear variogram was used to approximate structure on the top of the Trenton Limestone by smoothing the data to eliminate the effect of irregular, short-period relief on the discontinuity between the Trenton Limestone and Maquoketa Group. The resultant grid was extended to the contoured 60-meter grid using the minimum curvature algorithm. Polylines representing fault traces were used as breaklines in both gridding procedures. The computations were carried out on grids that extend more than 5 miles beyond the map area on all sides.

Correlation of Map Units



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Digital compilation by Kimberly H. Sowder

Bedrock Geologic Map of the Western Quarter of the Muncie and Eastern Quarter of the Lafayette 1:100,000-scale Quadrangles, Central Indiana

By
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2000