Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

Bedrock Geology of Repton Quadrangle

Hardin County, Illinois, and Crittenden County, Kentucky

STATEMAP Repton-BG

Mary J. Seid
2014
with Kentucky geology compiled from D.A. Seeland (1968)

EXPLANATION

- sml — Surface mine (limestone quarry) — Holocene and Pleistocene
- Quaternary:
  - Qu — Quaternary undifferentiated
  - Qt — Quaternary terrace deposits
- Pennsylvanian:
  - Pt — Tradewater Formation (b, Bell Coal) — Atokan
  - Pcv — Caseyville Formation — Morrowan
- Mississippian (Chesterian):
  - Mkdc — Kinkaid Limestone, Degonia Formation and Clore Formation
  - Mp — Palestine Sandstone
  - Mm — Menard Limestone
  - Mwv — Waltersburg Formation and Vienna Limestone
  - Mts — Tar Springs Sandstone
  - Mgd — Glen Dean Limestone
  - Mh — Hardinsburg Sandstone
  - Mg — Golconda Formation
  - Mcrb — Cypress Sandstone, Ridenhower Formation, and Bethel Sandstone
  - Mdyr — Downeys Bluff Limestone, Yankeetown Formation, and Renault Limestone
  - Mav — Aux Vases Sandstone
  - Msg — Ste. Genevieve Limestone

Symbols

- Strike and dip of bedding; number indicates degree of dip; approximate orientation where no dip number is given
- Horizontal bedding
- Vertical joint
- Vertical joint crossing
- Inclined joint crossing
- Pit or quarry
- Abandoned pit (fluorite, barite, iron, or lead)
- Abandoned shaft mine
- Field notes

Drill Holes

- Water well
- Core mineral-exploration hole
- Dry hole
- Gas well
- 125 — Numeric label indicates total depth of boring in feet.

Line Symbols

dashed where inferred or approximate; dotted where concealed

- Contact
- Fault, displacement unknown
- Normal fault; bar and ball on downthrown side
- Fault concealed questionable
- 400 — Structure contours: Drawn on base of Hardinsburg Sandstone. Contour interval is 50 feet.

Note: Well and boring records are on file at the ISGS Geological Records Unit and are available online from the ISGS website. Well and boring records in Kentucky are available on the Kentucky Geological Survey website.

Base map compiled by Illinois State Geological Survey from digital data (2012 US Topo) provided by the United States Geological Survey. Shaded relief derived from 2011 Illinois LiDAR and the National Elevation Dataset, accessed 2012. Contours from 2006 USGS Tagged Vector Contour files.

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
10,000-foot ticks: Illinois Coordinate System of 1983, east zone
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24,000
1 1/2 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

BASE MAP CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Illinois geology based on field work by Mary J. Seid, F. Brett Denny, and W. John Nelson, 2014. Kentucky geology based on Martin (2002) and Seeland (1968).

Digital cartography by Jennifer E. Carrell, John D. Zearing, Brittany M. Walbright, and Trisha S. Rentschler, Illinois State Geological Survey.

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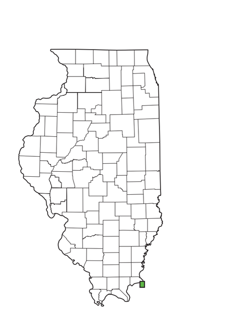
This map has not undergone the formal Illinois Geologic Quadrangle map review process. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.



1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Saline Mines
2 Dekoven
3 Sturgis
4 Cave in Rock
5 Blackford
6 Salem
7 Marion
8 Shady Grove

3°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2014

ROAD CLASSIFICATION
- U.S. Route
- State Route
- Local road

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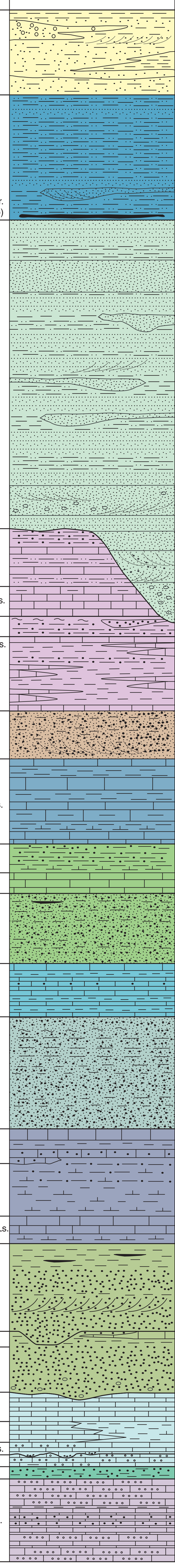

SYSTEM	SERIES	FORMATION	MEMBER or BED	THICKNESS (feet)		UNIT
QUATERNARY	HOLOCENE and PLEISTOCENE	undifferentiated fluvial, colluvial, lacustrine, and terrace deposits		0–100		A
PENNSYLVANIAN	ATOKAN / MORROWAN	Tradewater	Bell Coal Mbr. (W. Ky No. 1b)	150+		B
PENNSYLVANIAN	MORROWAN	Caseyville		310–440		C
MISSISSIPPIAN	CHESTERIAN	Kinkaid Limestone	Goreville Ls. Cave Hill Sh.	0–70		D
			Negli Creek Ls.	0–35		D
		Degonia		20–30		E
		Clore	Ford Station Ls. Tygett Ss. Cora Ls.	80–105		F
		Palestine Sandstone		40–80		G
		Menard Limestone	Allard Ls. Scottsburg Ls. Walche Ls.	80–110		H
		Waltersburg		35–50	60–75	I
		Vienna Limestone		20–35		J
		Tar Springs Sandstone		70–85		K
		Glen Dean Limestone		55–90		L
		Hardinsburg Sandstone		100–150		M
		Golconda	Haney Ls.	40–50	120–165	N
			Fraileys Sh.	50–75		
			Beech Creek Ls.	30–40		
		West Baden Ss.: Cypress Sandstone		80–120	150–210	O
		Ridenhower		10–20		P
		Bethel Sandstone		40–70		Q
		Paoli Ls.: Downeys Bluff Ls.		30–40	80–105	R
		Yankeetown Sh.		20–30		S
		Renault Ls.	Shetlerville Ls.	10–20		T
			Levias Ls.	10–20		T
		Aux Vases Ss.	"Rosiclare"	10–20		U
		Ste. Genevieve Limestone	Fredonia Ls. Spar Mtn. Ss.	100+		V

A Quaternary undifferentiated Sand, clay, silt, and gravel. This unit contains fluvial, colluvial, lacustrine, and terrace deposits. The sand is light brown very fine to coarse-grained quartz. The clay and silt are medium gray to light gray. Gravel and colluvium derived from local bedrock are common on the upland surfaces. The sand and gravel along the Ohio River may have been transported considerable distances. Along the Ohio River floodplain, a lower Holocene terrace is present between 340 and 350 feet and an upper Holocene terrace occurs above 350 feet in elevation. Higher elevation terraces may be the remnants of dissected Pleistocene-age units. Loess is present in the upland hills and is commonly 5-10 feet thick, but it is not shown on this map.

B Tradewater Formation Sandstone, siltstone, shale, conglomerate, limestone, and coal. The sandstones are white to light brown, fine- to coarse-grained quartz arenite and sublithic arenite. Mica is usually present, and a small percentage of clay is present in the sublithic arenite. Sandstones are crossbedded and ripple marked. Ichnofossils are common and include both burrowing and feeding or grazing patterns. The siltstones are gray, and mica may be present on the bedding surfaces. The shale is gray to black and fissile. The few conglomerate layers were probably reworked quartz pebbles from the underlying Caseyville Formation into which the lower portion of this unit is incised. Thin and discontinuous coal seams are reported in this unit. Where present, the Bell Coal (No. 1b) marks the base of the Tradewater. In places, the Tradewater is unconformable with the underlying Caseyville. Where the lower quartz arenite of the Tradewater is deposited over an upper Caseyville quartz arenite, it is difficult to define the contact.

C Caseyville Formation Sandstone, shale, siltstone, and conglomerate. The sandstone is usually white to gray on fresh surfaces and weathers to a brown or orangeish brown. It is composed of sub-rounded to subangular fine- to coarse-grained quartz arenite that has a sugary appearance. The Caseyville is commonly cross-bedded but also forms thin beds and massive ledges. Outcrops are usually well-exposed bluffs showing diverse fluvial and tidal patterns, including stacked channels and unidirectional and bidirectional crossbeds. Iron-rich "liesegang bands" may be very common in some sandstone outcrops. Occasional plant remains, such as *Stigmaria*, are rarely found in the sandstone but are more common within the shale. The shale is dark gray and fissile. Plant debris is common, and iron nodules or concretions may be present. Siltstone occurs in thin planar or wavy beds and is usually interbedded with shale. The conglomeratic portion most commonly contains milky white, well-rounded quartz pebbles within coarse-grained sandstone, although in some places, it contains gray shale clasts embedded in a sandstone matrix. The quartz pebbles may be several inches in diameter. The lower contact is a major regional unconformity, and within the quadrangle, the Caseyville Formation rests on units as old as the Degonia Sandstone.

D Kinkaid Limestone Limestone, shale, and mudstone. The Kinkaid Limestone consists of three members, from base to top: the Negli Creek Limestone, Cave Hill Shale, and Goreville Limestone. This formation is eroded by Lower Pennsylvanian units and is entirely missing in portions of the county. The Negli Creek is primarily a dark gray lime mudstone to wackestone. Fossils include brachiopods, fenestrate bryozoans, blastoids, bellerophontid gastropods, and *Girvanella* spheriods. The Cave Hill is composed of shale and mudstone with thin beds of limestone. The shale is dark gray, soft, fissile, calcareous, and may be laminated. The shale may grade to limestone that is mainly lime mudstone. The Goreville is a packstone to lime mudstone with a few thin shale breaks. It contains diverse marine fossils including fenestrate, trepostome, and fistuliporid bryozoans, spiriferids and other brachiopods, rugose corals, and crinoids. The bryozoan Archimedes can be abundant in the upper beds and *Pterotocrinus* wing plates have been described and studied in the formation (Gutschick, 1965). The lower contact is generally sharp but conformable.

E Degonia Formation Shale, sandstone, and siltstone. The Degonia is mostly shale that is dark gray, greenish gray, or reddish gray, partly silty, and moderately to strongly fissile. The sandstone portion is generally light brown, very fine-grained, clean quartz arenite with thin, planar to wavy bedding with ripple marks. Exposed sandstone bluffs erode out as long rectangular and wedge-shaped blocks bounded by joints. A portion of the sandstone and siltstone are dark olive to greenish gray, weathering rusty orange--a distinctive feature of this unit. Greenish gray siltstone to silty mudstone in the middle of the Degonia may be massive. The unit is poorly exposed and is mapped together with the underlying Clore Formation. The contact with the Clore is sharp to gradational.

F Clore Formation Limestone, shale, sandstone, siltstone, and chert. Limestones are mainly lime mudstones that are several feet thick, medium dark gray to olive gray, and weather to a light gray or orange-brown. Spiriferids, productid, and compositid brachiopods are common. The basal Cora Limestone Member contains thin beds and lenses of very fossiliferous limestone and greenish gray, silty, and weakly fissile shale or mudstone. A limestone bed at the top is a dark gray, very argillaceous brachiopod-bryozoan lime mudstone to wackestone that weathers yellowish gray. The middle Tygett Sandstone Member is light gray to light brown, very fine- to medium-grained quartz arenite, containing thin, ripple marked beds. The sandstone grades laterally into slitstone and shale. The upper Ford Station Limestone Member is dark gray, calcareous, and fossiliferous limestone; its shaly portion ranges from platy clay shale to silty shale with laminae and thin interbeds of light gray siltstone and limestone. The lower contact is sharp but conformable.

G Palestine Sandstone Sandstone, siltstone, shale, mudstone, and minor coal. Sandstone is light gray to white, very fine- to fine-grained quartz arenite. Bedding can be thin and tabular, flaggy and ripple marked, or crossbedded. The base of the formation is marked by a prominent sandstone bluff that is 10 to 25 feet thick. The sandstone bluff is massively bedded, cross-bedded and pock-marked on weathered faces. The shale and siltstone are white, brown, or olive gray; slightly micaceous; and contain minor amounts of interstitial clay and carbonaceous debris. At the top of the Palestine, carbonaceous black shale and coal overlie a rooted siltstone that grades downward into laminated shaly sandstone. The basal contact was not observed but is reported to be uncomfomable in places.

H Menard Limestone Limestone and shale. The lowest member is the Walche Limestone Member, which is composed of argillaceous micritic limestone. The crinoid *Pterotocrinus Menardensis* is diagnostic of this limestone and is found in the shale layers above the Walche. The middle Scottsburg Limestone Member is a light to dark gray, sublithographic lime mudstone separated by thin shale layers. The upper Allard Limestone Member contains gray lime mudstone and fine to coarse skeletal wackestone and packstone with thin shale interbeds and scattered chert nodules. Fossils within the Menard include brachiopods, bryozoans, and disarticulated crinoidal debris. The lower contact is conformable.

I Waltersburg Formation Shale, siltstone, sandstone, and thin coal. The unit is mainly dark gray, thinly laminated clay shale that becomes silty upward and grades into siltstone. Sandstone is olive-gray to brownish gray, very fine-grained, shaly, and thinly bedded. Thin coal and greenish shale may be present near the top of this unit.

J Vienna Limestone Limestone, shale, and chert. Limestone is largely dark gray to brownish gray siliceous lime mudstone and wackestone. A few thin interbeds of dark gray sandy shale are present. Dark brown chert nodules are numerous and commonly weather with a porous rind. The white to brown weathered, porous blocks of fossiliferous chert are diagnostic.

K Tar Springs Sandstone Sandstone, siltstone, shale, and thin coal. Sandstone is white when fresh, brown when weathered, very fine- to fine-grained quartz arenite. Bedding ranges from one inch to one foot thick and has ripple marks, crossbedding, small load casts, indistinct burrows, and shale rip-up clasts. Shale and siltstone are medium to dark gray, micaceous, and thinly laminated. Thin coal commonly less than one foot thick occurs near the top; the coal rests on dark gray mudstone. Dark gray claystone also occurs in the lower part of the unit. The lower contact can be gradational to sharp.

L Glen Dean Limestone Limestone and shale. The unit is generally composed of a lower limestone, a middle shale, and an upper limestone. The lower limestone is medium gray wackestone, containing crinoids and bryozoans, and is distinguished by a dwarfed crinoid fauna in the basal 5 feet. The lower limestone grades upward into the middle shale. The middle shale is thin, medium to dark gray and greenish gray, fossiliferous, and calcareous. The upper limestone is light brownish gray with a reddish tint, coarsely crinoidal packstone to grainstone, and may be oolitic. Fossils include crinoidal debris, fenestrate bryozoans, brachiopods, blastoids, and corals. The lower contact is sharp.

M Hardinsburg Sandstone Sandstone, siltstone, and shale. The lower Hardinsburg contains two fluvial sandstone bodies. The sandstone is light brownish gray to white, very fine- to fine-grained quartz arenite that is thinly bedded to massive. Ripple marks and low-angle crossbedding are common. Siltstone and shales are light brown to medium gray and are commonly interbedded, rippled, and laminated. The lower contact is generally conformable with the underlying unit.

N Golconda Formation Limestone, shale, and mudstone. The formation is divided into three members. The Beech Creek Limestone Member at the base is dark gray to brown, partly dolomitic, argillaceous limestone. The Fraileys Shale Member is largely olive to greenish gray to dark gray, calcareous, thinly fissile clay shale with limestone beds of varied texture as thick as several feet. Red shale or mudstone may occur near the top. The Fraileys Shale Member grades into the lower part of the Haney; this interval contains limestone and shale interbedded in roughly equal proportions. The Haney Limestone Member at the top is largely light to dark brownish gray, fine to coarse crinoidal wackestone to crossbedded grainstone and is oolitic in places. *Pterotocrinus capitalis* is highly characteristic of the Haney Limestone Member, and the wing plates of this crinoid are commonly found in the shaly part of this member. The lower contact is sharp.

O Cypress Formation Sandstone, shale, and siltstone. The sandstone is light gray to light brown fresh, dark brown to dark reddish brown weathered, fine- to medium-grained subangular quartz sandstone. The upper portion contains well-exposed bluff-forming sandstone in massive, rounded beds with conspicuous soft-sediment deformation; it also contains thin beds of siltstone and interbedded sandstone and shale. The lower portion is primarily thick beds of sandstone. Red and green shale may be present near the top of the formation. Locally, the contact with the underlying unit is unconformable and this unit may lie directly on the Bethel Sandstone.

P Ridenhower Formation Shale, limestone, and sandstone. The shale is dark gray with a greenish tint and may be fossiliferous. It is thinly bedded and silty to finely sandy. Limestone up to several feet thick is locally present at the top of this formation. This unit is highly variable but is dominantly dark gray shale with interbeds of grayish green siltstone and fine-grained sandstone containing molds of brachiopods. It is poorly exposed. The basal contact is conformable.

Q Bethel Sandstone Sandstone with minor shale. Sandstone is white to light brown, quartz arenite, fine- to coarse-grained, in coarsening-upward sequences. Beds are thin and laminar, but low-angle crossbedding is also present. The greenish-gray shale occurs as thin interbeds between thicker beds of sandstone. Near the base, shale and quartz pebbles may be present. Basal contact is gradational to erosional.

R Downeys Bluff Limestone Limestone, dolostone, shale, and chert. The limestone is light to dark gray crinoidal packstone to grainstone; the dolostone is brownish gray. Disarticulated crinoids may be replaced by pink chert, which is diagnostic for this unit. The upper portion is generally cherty, and the lower part may be silty. Shale occurs in thin interbeds and constitutes a minor portion of the unit. Bedding-parallel stylolites occur at approximately a 1-foot spacing. The lower contact is gradational.

S Yankeetown Shale Shale, limestone, and siltstone. The shale is dark gray, red, and green fossiliferous shale with interbedded dolomitic siltstone and thin beds of lime mudstone. The contact with the underlying unit is gradational.

T Renault Limestone Limestone, siltstone, and shale. The Renault is predominantly a light gray to brownish gray, fossiliferous, and sandy to oolitic limestone. Fossils include brachiopods, bryozoans, and echinoderms. The siltstone is coarse grained and calcareous and occurs near the base. The shales are calcareous and interbedded with limestone and siltstone. Numerous *Pentremites* sp. along with the crinoid *Talarocrinus* (in the Shetlerville Mbr.) and *Platycrinites* (in the Levias Mbr.) occur in the Renault. The contact between the Shetlerville and Levias Members is sharp and may be unconformable.

U Aux Vases Sandstone Sandstone, shale, and siltstone. The sandstone is light greenish gray when fresh, grayish orange when weathered, fine-grained, and is calcareous in places. It is thin- to medium-bedded and ripple-marked; the thicker beds are usually crossbedded. Siltstones and shales are also greenish gray and are interbedded with the sandstone. The lower contact can be gradational to sharp.

V Ste. Genevieve Limestone Limestone, dolostone, shale, and chert. The limestone is white to light gray, oolitic to micritic, and sandy in places. Beds are thick- to thin-bedded, and the oolitic beds are usually crossbedded. The Spar Mountain Sandstone Member, a sandy limestone, occurs about 60 feet below the base of the Aux Vases Sandstone. The dolomite portion of the unit is fine-grained, and the shale is gray. The entire formation is composed of a diverse marine fauna, with crinoidal debris, oolites, and brachiopods. The oolitic portion is porous and is called the McClosky sand by local drillers. The Ste. Genevieve weathers to a soil that is dark reddish brown with oolitic white chert. The unit is poorly exposed in this quadrangle but is well-exposed in several quarries in the adjacent Cave-in-Rock Quadrangle. The lower 60-80 feet of this unit is gradational with the underlying St. Louis Limestone, which contains more lime mudstone, dolostone, and chert.

Introduction

This report accompanies a geologic map of the Repton 7.5-minute Quadrangle. The Repton Quadrangle is situated in the southern part of the Illinois Basin, east of Hicks Dome and the Fluorspar Area Fault Complex (FAFC). The western and eastern portions are underlain dominantly by sandstone, and the central portion is underlain by alternating limestone and sandstone units. The topography is characterized by eastward-dipping cuestas and sandstone dip-slopes.

The Repton Quadrangle was included in previous studies by Weller et al. (1920), Baxter et al. (1963), and Seeland (1968). Martin (2002) compiled a digital version of the Kentucky geology from Seeland's map.

Bedrock units exposed in the quadrangle range from the Mississippian Ste. Genevieve Limestone (Meramecian) to the Pennsylvanian Tradewater Formation (Atokan). Quaternary deposits are present but were not differentiated. Our nomenclature was based on studies by Baxter et al. (1963), Willman et al. (1975), and Trace and Amos (1984).

A notable feature in this quadrangle is the Mississippian-Pennsylvanian unconformity (Siever 1951). Sloss (1963) named this the sub-Absaroka unconformity, a major sequence boundary across the region. In the study area, the Mississippian surface is eroded as far down as the Degonia Sandstone.

Structure and Tectonics

The Repton Quadrangle is located along the northeastern flank of the Tolu Arch and on the eastern edge of the Illinois Kentucky Fluorspar District (IKFD). Units dip about 2 to 3˚ to the east-northeast and are slightly steeper in the eastern portion of the quadrangle as they approach the Rough Creek Graben. Northeast-striking normal faults from the FAFC die out in the study area. A broad northwest-striking open anticline crosses the western part of the quadrangle as indicated by structure contours on the Hardinsburg Sandstone. Its hinge line/axis passes through Crooked Creek .

Economic Resources

Coal
The Bell Coal Member (W. Ky. No. 1b) crops out in the extreme northeast corner of the quadrangle. In the adjacent Dekoven Quadrangle, the Bell's Mines coal operation began around 1842 (Parks 1950) and continued until about 1941 (Simpson 1987). The Bell Coal seam thickness ranges from 0 to 57 inches and averages 42 inches where it has been mined. Reserves are estimated to be 0.8 million short tons in the quadrangle (Mullins, Lounsbury, and Hodgson 1965).

Oil and Gas
Thirteen oil test holes and one gas well were drilled, but no production was obtained.

Fluorspar
An unknown amount of fluorite was produced from the faulted area southwest of Fords Ferry and near The Sinks, in the southwestern corner of the quadrangle. Fourteen diamond core holes were drilled to test for bedded fluorite deposits, but the results were not reported.

Limestone
Three quarries occur along the outcrop belt of the Kinkaid Limestone along the eastern edge of the quadrangle. Two of the quarries are abandoned, and one is active—it is currently owned by Marion Quarry and Asphalt (Rogers Group) and was formerly called the Alexander Quarry.

Groundwater
Groundwater resources are present in Valmeyeran, Chesterian, Pennsylvanian, and Quaternary units. Springs emanate from the Kinkaid Limestone and the contact between the Hardinsburg Sandstone and Glen Dean Limestone (Lambert and Brown 1963).

Acknowledgments

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