

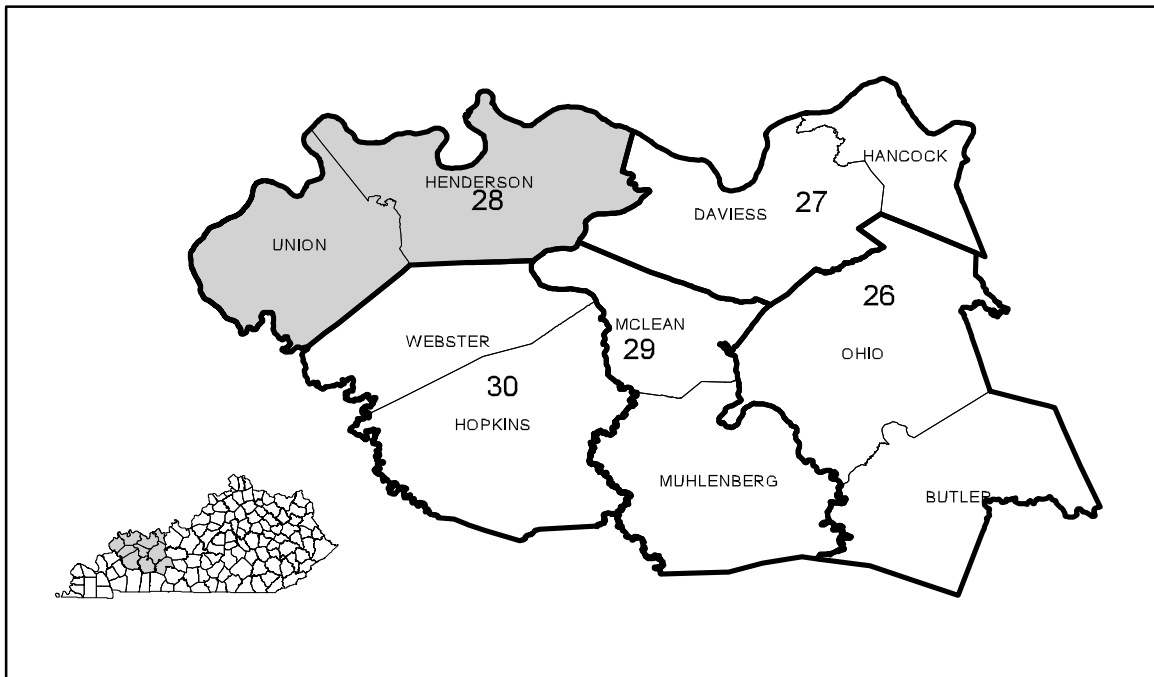
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE COMMONWEALTH OF KENTUCKY
AND THE KENTUCKY GEOLOGICAL SURVEY
UNIVERSITY OF KENTUCKY

AVAILABILITY OF GROUND WATER IN UNION
AND HENDERSON COUNTIES, KENTUCKY

By
B.W. Maxwell and R.W. Duvaul

HYDROLOGIC INVESTIGATIONS
ATLAS HA-28



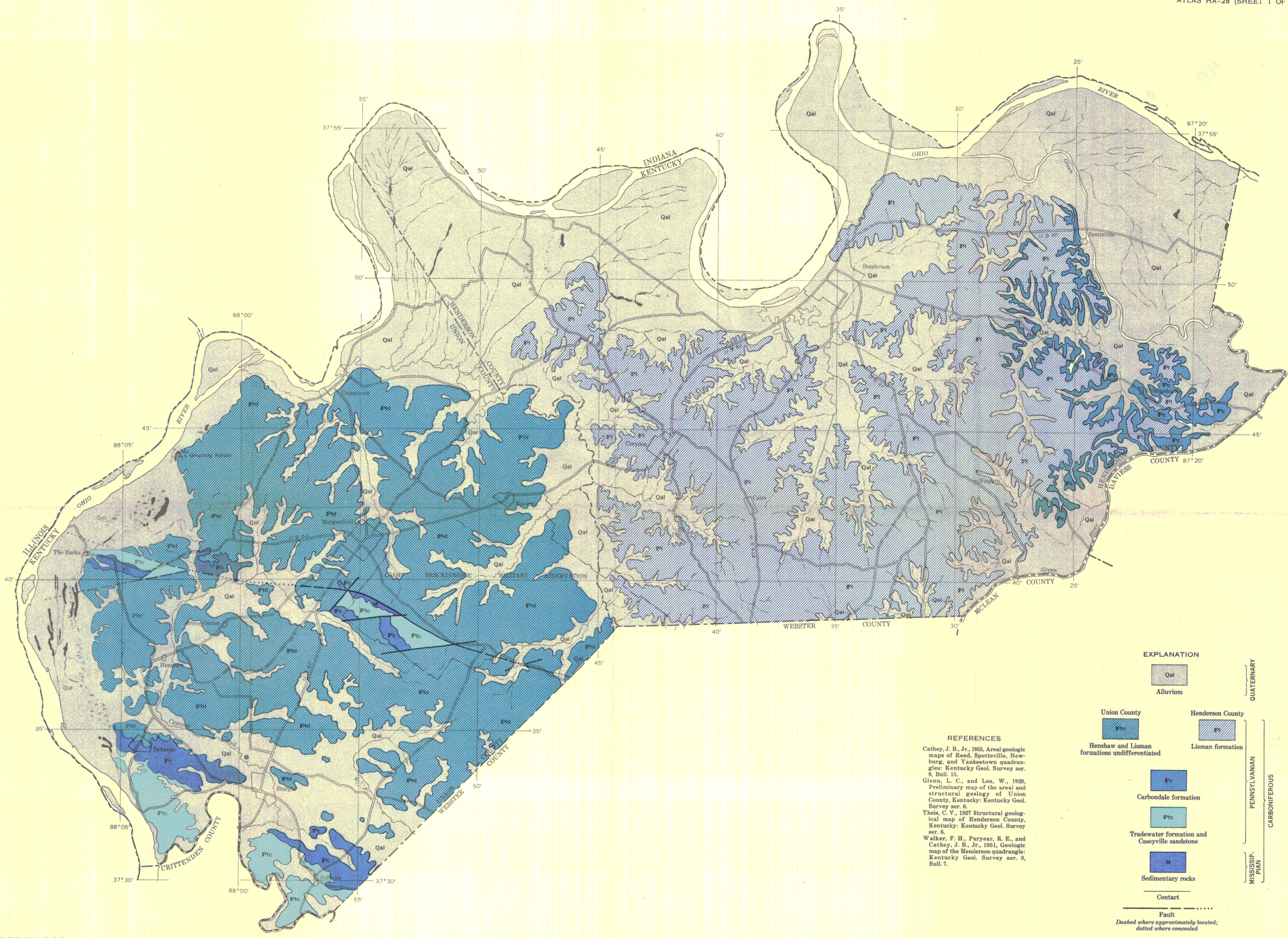
INDEX MAP OF THE WESTERN COAL FIELD REGION, KENTUCKY, SHOWING COUNTY
GROUPS AND AREA OF THIS ATLAS

This is 1 of 5 atlases (HA-26 to HA-30) showing geology and availability of ground water in the Western Coal Field region, Kentucky U.S. Geological Survey Water-Supply Paper 1599 contains a text description and illustrations providing further information on the occurrence and quality of ground water in the Western Coal Field region.

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EXPLANATION

	Quaternary Alluvium	QUATERNARY
	Union County Henshaw and Lisman formations undifferentiated	PENNSYLVANIAN
	Henderson County Lisman formation	
	Carbondale formation	
	Tradewater formation and Caseyville sandstone	CARBONIFEROUS
	Sedimentary rocks	
	Contact	MISSISSIPPIAN
	Fault	

Dashed where approximately located; dotted where concealed

REFERENCES

Cathey, J. B., Jr., 1955, Areal geologic maps of Reed, Spottsville, Newburg, and Yankeetown quadrangles: Kentucky Geol. Survey ser. 9, Bull. 15.

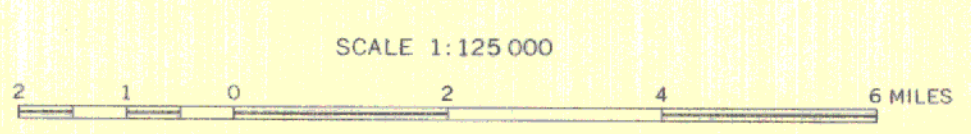
Glenn, L. C., and Lee, W., 1928, Preliminary map of the areal and structural geology of Union County, Kentucky: Kentucky Geol. Survey ser. 6.

Theis, C. V., 1927, Structural geological map of Henderson County, Kentucky: Kentucky Geol. Survey ser. 6.

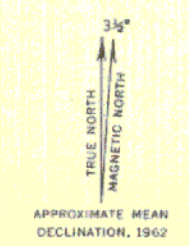
Walker, F. H., Puryear, R. E., and Cathey, J. B., Jr., 1951, Geologic map of the Henderson quadrangle: Kentucky Geol. Survey ser. 9, Bull. 7.

GEOLOGIC MAP OF UNION AND HENDERSON COUNTIES, KENTUCKY (COUNTY GROUP 28)

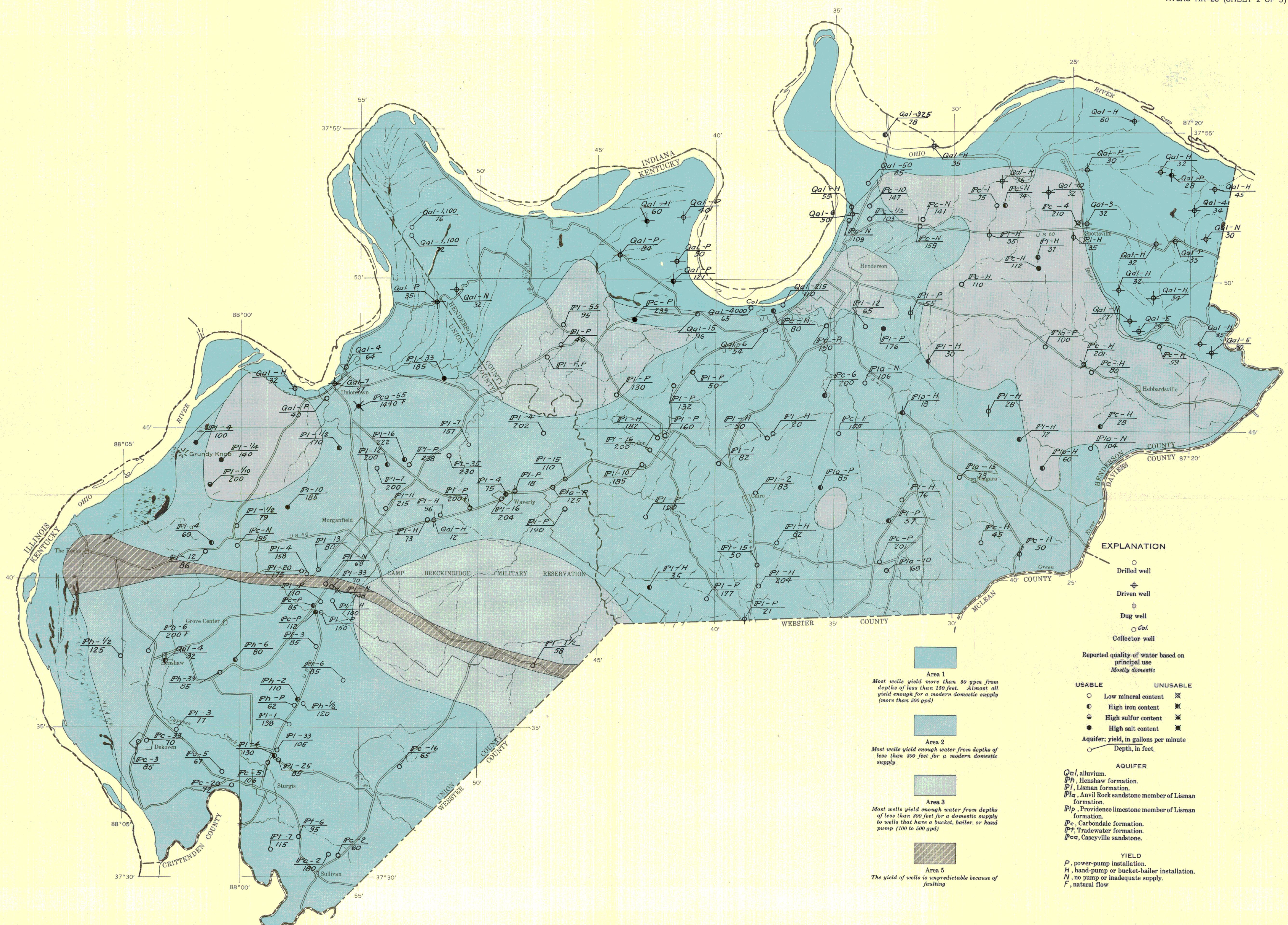
By
B. W. Maxwell and R. W. Devaul



1962



Base maps are county highway maps and adjacent county groups may not match



EXPLANATION

- Drilled well
- ⊕ Driven well
- ⊕ Dug well
- Col. Collector well

Reported quality of water based on principal use
Mostly domestic

- | USABLE | UNUSABLE |
|-----------------------|----------|
| ○ Low mineral content | ⊗ |
| ● High iron content | ⊗ |
| ● High sulfur content | ⊗ |
| ● High salt content | ⊗ |
- Aquifer; yield, in gallons per minute
Depth, in feet

AQUIFER

- Qal, alluvium.
- Ph, Henshaw formation.
- PI, Lisman formation.
- PIa, Anvil Rock sandstone member of Lisman formation.
- PIp, Providence limestone member of Lisman formation.
- Pc, Carbondale formation.
- Pt, Tradewater formation.
- Pca, Caseyville sandstone.

YIELD

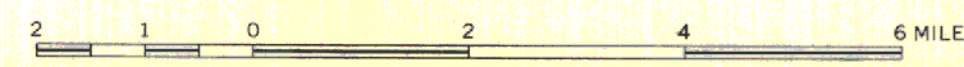
- P, power-pump installation.
- H, hand-pump or bucket-bailer installation.
- N, no pump or inadequate supply.
- F, natural flow

- Area 1**
Most wells yield more than 50 gpm from depths of less than 150 feet. Almost all yield enough for a modern domestic supply (more than 500 gpd)
- Area 2**
Most wells yield enough water from depths of less than 300 feet for a modern domestic supply
- Area 3**
Most wells yield enough water from depths of less than 300 feet for a domestic supply to wells that have a bucket, bailer, or hand pump (100 to 500 gpd)
- Area 5**
The yield of wells is unpredictable because of faulting

AVAILABILITY OF GROUND WATER IN UNION AND HENDERSON COUNTIES, KENTUCKY (COUNTY GROUP 28)

By
B. W. Maxwell and R. W. Devaul

SCALE 1:125 000



1962

Base maps are county highway maps and adjacent county groups may not match

SYSTEM	SERIES	GROUP	THICKNESS (IN FEET)	SECTION	LITHOLOGY	LOCATION	HYDROLOGY	
TERTIARY(?) QUATERNARY	Pleistocene and Recent	McLeansboro	Union formation ¹	0-70		Loess and loam, leached and oxidized.	Forms a mantle covering alluvial deposits and bedrock in most of the area. Thins to southeast.	Yields practically no water to wells.
			Alluvium	0-145		Gravel, sand, silt, and clay. Alluvium in the Ohio Valley consists largely of glacial outwash gravel from northern sources and includes fragments of sandstone, limestone, chert, shale, and coal from nearby sources; locally cemented with iron compounds. Alluvium along tributaries is generally fine grained, although gravel is present locally.	Underlies most flatland along streams.	Yields large quantities of water along the Ohio River. Vertical wells produce more than 1,000 gpm and collector-type wells produce as much as 5,000 gpm. Yields enough water for a modern domestic supply (more than 500 gpd) to wells in larger tributary valleys. Yields little or practically no water to wells in small valleys. Water is hard to very hard and may contain objectionable amounts of iron, although the dissolved-solids content may be low.
			Gravel	0-11(?)		Chert and quartz gravel and some sand and clay.	Caps hills 8 miles east and 10 miles south of Henderson at elevation of 550 feet or lower.	
			Mount			Chert and quartz gravel and some sand and clay.		
			Gilead shale ²			Shale, sandy shale, and some thin coal and limestone beds.	Crops out in Moorman syncline south of the Shawneetown-Rough Creek fault zone and from Henshaw eastward to the county line. Absent north of the fault.	Yields practically no water to wells.
			Vandenburg sandstone ¹	10-65		Crossbedded locally shaly quartz sandstone.	Crops out in Moorman syncline south of the Shawneetown-Rough Creek fault zone. Absent north of the fault. Is about 200 feet below land surface at Henshaw.	Yields enough water for a modern domestic supply to wells penetrating sandstone that is not shaly.
			Bald Hill shale ¹	0-500+		Shale, sandy shale, and some thin coal and limestone beds.	Crops out in Moorman syncline south of the Shawneetown-Rough Creek fault zone around Henshaw and eastward to the county line. Absent north of the fault.	Yields practically no water to wells.
			Dixon sandstone ¹	10-60		Medium- to fine-grained crossbedded locally shaly quartz sandstone.		Yields enough water for a modern domestic supply to wells penetrating sand. Water may be hard and may contain objectionable amounts of iron.
			Carthage limestone ³	400		Shale, sandy shale, and thin sandstone lenses, coal and limestone beds. The Carthage limestone ³ and Madisonville limestone member are the only recognizable units in this interval.	Crops out in most of Henderson County and in Union County north of the Shawneetown-Rough Creek fault zone. Crops out in flanks of Moorman syncline south of the fault. Underlies the deepest part of the syncline.	Yields practically no water to most wells. However, some wells intersecting joints in sandstone produce enough water for a modern domestic supply. Water is hard and may contain objectionable amounts of sulfur and iron.
			Madisonville limestone member	900-1000		Coarse- to fine-grained crossbedded friable to well-cemented locally feldspathic quartz sandstone; grades into shale laterally. Unconformity at base locally extends to the sandstone beneath the Kentucky No. 11 coal. The Anvil Rock is shaly or well cemented in the north and east parts of Henderson County, west of Uniontown toward Grundy Knob, southward to the Shawneetown-Rough Creek fault zone, and beneath much of the Camp Breckinridge military reservation in Union County.	Caps the bluffs along the Green River in Henderson County; crops out in flanks of the Moorman syncline, near The Rocks, and along the Camp Breckinridge military reservation boundary south of Morganfield. Its depth beneath the surface is about 200 feet at Corydon, 450 feet at Uniontown, and 1,200 feet between Grove Center and Henshaw in the Moorman syncline.	Yields enough water for a modern domestic supply except where this member is shaly or well cemented. Locally yields as much as 30 gpm. Water from the Anvil Rock, where it is near the surface, is hard, but is increasingly softer downward. Sodium bicarbonate content increases downward. Iron may be present in objectionable amounts.
CARBONIFEROUS SYSTEMS PENNSYLVANIAN	McLeansboro	Lisman formation	Anvil Rock sandstone member	0-125		Thin-bedded to massive fossiliferous gray locally shaly limestone.	Crops out beneath the No. 12 coal above and the No. 11 coal below.	Generally yields little or no water to wells. A few wells produce an adequate supply where the limestone has been subjected to solution.
			Providence limestone member			Fine- to medium-grained well-cemented quartz sandstone; grades laterally into shale. Cementing material of upper beds is calcium carbonate.	Crops out in the bluffs along the Green River in Henderson County and from Dekoven to the county line near Sullivan in Union County. Crops out in small areas along the Shawneetown-Rough Creek fault zone.	Yields enough water for a modern domestic supply to most wells. Locally yields as much as 30 gpm. This is the deepest fresh-water aquifer north of the Shawneetown-Rough Creek fault zone in these two counties. Water is soft and contains sodium bicarbonate except near the outcrop, where the water is hard. Iron may be present in objectionable amounts.
			No. 11 coal			Shale, sandy shale, and thin limestone and coal beds.	Crops out in southwestern Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies the rest of Union County and all of Henderson County.	Yields practically no water to wells.
			Upper sandstone member			Coarse- to fine-grained crossbedded friable to well-cemented locally shaly quartz sandstone.	Crops out in the southwestern tip of Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies the rest of Union County and all of Henderson County.	Yields enough water for a modern domestic supply to wells penetrating sandstone. Locally yields as much as 30 gpm. Water north of the Shawneetown-Rough Creek fault zone and in the deepest part of the Moorman syncline is salty.
			No. 9 coal	300-450		Shale, sandy shale, and thin coal beds.	Crops out in Henderson County along the Green River. Underlies entire area except in the southwestern part of Union County and small areas along the Shawneetown-Rough Creek fault zone.	Yields practically no water to wells.
			Pleasant-view(?) sandstone ⁴			Crossbedded coarse- to medium-grained friable to well-cemented and locally shaly quartz sandstone. Shaly northeast of Sullivan.	Crops out in southwestern Union County from Dekoven to near Sullivan and along the Shawneetown-Rough Creek fault zone southeast of The Rocks.	Yields enough water for a modern domestic supply to wells penetrating sandstone. Locally yields as much as 20 gpm. Water north of the Shawneetown-Rough Creek fault zone and in the deepest part of the Moorman syncline is salty.
			Schultztown coal			Shale, sandy shale, and thin limestone and coal beds.	Crops out in southwestern Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies the rest of Union County and all of Henderson County.	Yields practically no water to wells.
			Sebree sandstone ¹			Coarse- to fine-grained crossbedded friable to well-cemented locally shaly quartz sandstone.	Crops out in the southwestern tip of Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies the rest of Union County and all of Henderson County.	Yields enough water for a modern domestic supply to wells penetrating sandstone. Locally yields as much as 30 gpm. Water north of the Shawneetown-Rough Creek fault zone and in the deepest part of the Moorman syncline is salty.
			No. 7 coal			Shale, sandy shale, and thin limestone and coal beds.	Crops out in the southwestern tip of Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies the rest of Union County and all of Henderson County.	Yields practically no water to wells.
			No. 6 coal			Shale, sandy shale, and thin limestone and coal beds.	Crops out in the southwestern tip of Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies the rest of Union County and all of Henderson County.	Yields practically no water to wells.
CARBONIFEROUS SYSTEMS MISSISSIPPIAN	Upper Mississippian	Caseyville sandstone	Curlew sandstone ³			Fine-grained quartz sandstone grading laterally into shale.	Crops out in the southwestern tip of Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies rest of Union County and all of Henderson County.	Yields enough water for a modern domestic supply to wells penetrating sandstone. Locally yields as much as 10 gpm. Water north of the Shawneetown-Rough Creek fault zone and in the deeper parts of the Moorman syncline contains salt in objectionable amounts. Water near outcrop area is fresh.
			Curlew limestone ⁵	400-600		Shale, sandy shale, sandstones and thin coal and limestone beds. The Aberdeen ⁶ and Finnie ¹ sandstones locally are undeveloped.	The Aberdeen sandstone ⁶ apparently does not crop out. The Finnie sandstone ¹ crops out in the southwestern tip of Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies rest of Union County and all of Henderson County.	The sandstones in this interval generally yield only small quantities of water to wells. Water north of the Shawneetown-Rough Creek fault zone and in the deeper part of the Moorman syncline is salty.
			Aberdeen sandstone ⁶			Shale, sandy shale, sandstones and thin coal and limestone beds. The Aberdeen ⁶ and Finnie ¹ sandstones locally are undeveloped.		
			Finnie sandstone ¹			Shale, sandy shale, sandstones and thin coal and limestone beds. The Aberdeen ⁶ and Finnie ¹ sandstones locally are undeveloped.		
			Bell coal			Shale, sandy shale, sandstones and thin coal and limestone beds. The Aberdeen ⁶ and Finnie ¹ sandstones locally are undeveloped.		
			Grindstaff sandstone member	0-80		Fine-grained quartz sandstone grading laterally into shale.	Crops out in the southwestern tip of Union County and in two small areas along the Shawneetown-Rough Creek fault zone. Underlies rest of Union County and all of Henderson County.	Yields enough water for a modern domestic supply to wells penetrating sandstone. Locally yields as much as 10 gpm. Water north of the Shawneetown-Rough Creek fault zone and in the deeper parts of the Moorman syncline contains salt in objectionable amounts. Water near outcrop area is fresh.
			No. 1a coal			Shale, sandy shale, sandstone, and limestone, and some thin coal beds.	Crops out at Caseyville in Union County and along the Shawneetown-Rough Creek fault zone. Underlies rest of area.	Yields enough water for a modern domestic supply to wells penetrating sandstone or conglomerate. Locally yields as much as 23 gpm. Water north of the Shawneetown-Rough Creek fault zone is salty. Electric logs indicate that fresh water may occur at depths as great as 2,000 feet in the Moorman syncline.
			Bee Springs sandstone ⁷	300-600		Crossbedded conglomeratic medium- to coarse-grained quartz sandstone grading laterally into shale.	Crops out at Caseyville in Union County and along the Shawneetown-Rough Creek fault zone. Underlies rest of area.	Yields enough water for a modern domestic supply to wells penetrating sandstone. Locally yields as much as 50 gpm. Water north of the Shawneetown-Rough Creek fault zone is salty. South of the fault potable supplies have been obtained at depths of over 900 feet and electrical logs indicate fresh water at greater depths in some places.
			Battery Rock(?) coal			Shale, sandy shale, sandstone, and limestone, and some thin coal beds.	Crops out at Caseyville in Union County and along the Shawneetown-Rough Creek fault zone. Underlies rest of area.	Yields practically no water to wells.
			Lower conglomerate member			Crossbedded conglomeratic coarse-grained sandstone grading laterally into shale. Unconformity at base.	Crops out along the Shawneetown-Rough Creek fault zone southeast of Morganfield. Underlies rest of area.	Yields enough water for a modern domestic supply to wells penetrating sandstone or conglomerate. Locally yields as much as 23 gpm. Water north of the Shawneetown-Rough Creek fault zone is salty. Electric logs indicate that fresh water may occur at depths as great as 2,000 feet in the Moorman syncline.
Formations of late Chester age				Shale, sandy shale, and limestone.	Crops out in small area along the Shawneetown-Rough Creek fault zone southeast of Morganfield. Underlies rest of area.	Yields fresh water to small springs and dug wells in outcrop area. Water elsewhere is salty.		

¹ of Glenn (1912) ² of Glenn (1922) ³ of Owen (1856) ⁴ of Wanless (1929) ⁵ as used by Wanless (1938) ⁶ of Crider (1915) ⁷ of Norwood (1876)

GENERALIZED COLUMNAR SECTION IN UNION AND HENDERSON COUNTIES, KENTUCKY (COUNTY GROUP 28)

By
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1962