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BEDROCK GEOLOGY OF THE MINERVA QUADRANGLE, STARK, COLUMBIANA, AND CARROLL COUNTIES, OHIO

By

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OHIO DIVISION OF GEOLOGICAL SURVEY
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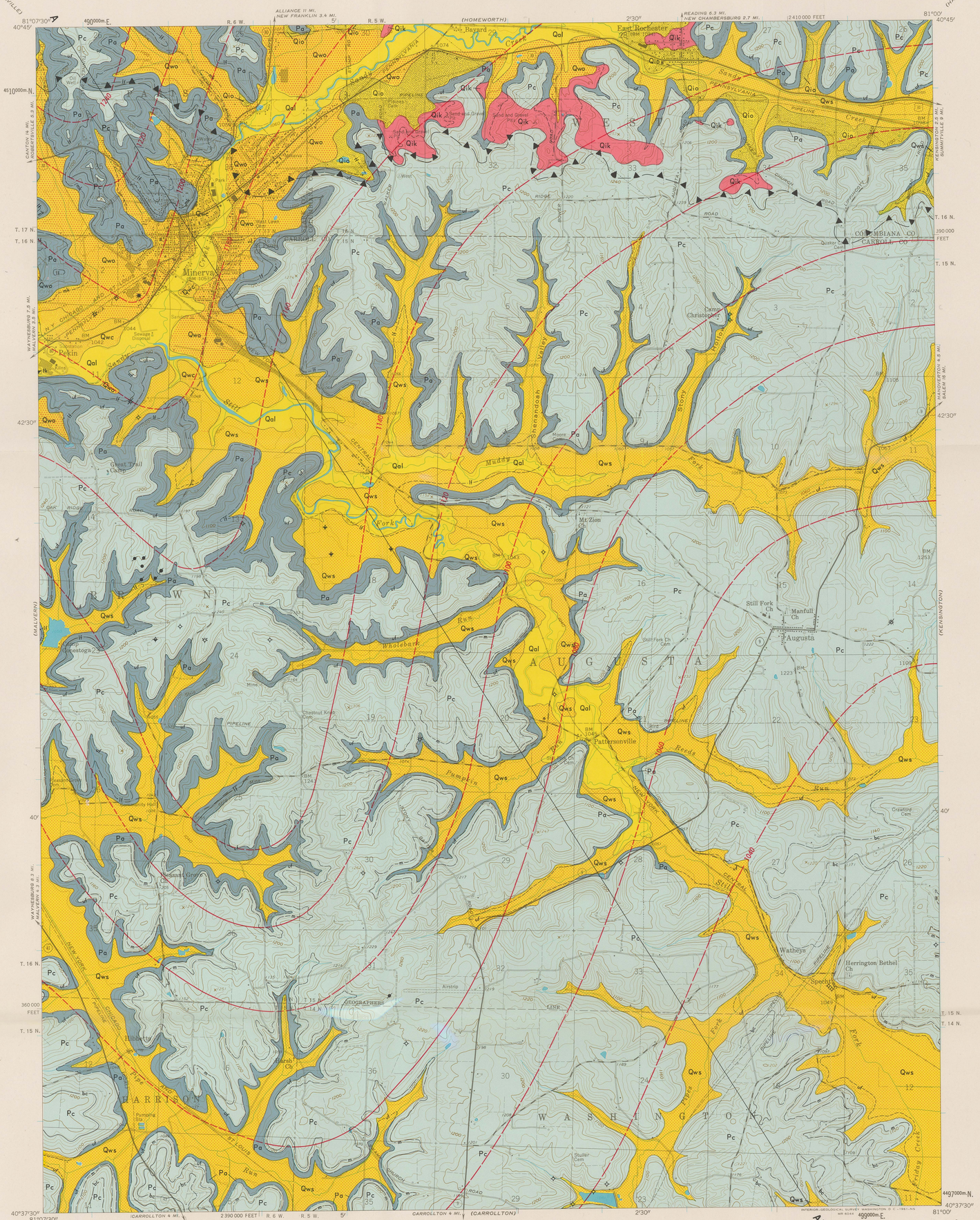
BEDROCK GEOLOGY OF THE MINERVA QUADRANGLE, OHIO

SYSTEM	GROUP	MEMBER OR BED	LITHOLOGY	THICKNESS IN FEET	DESCRIPTION
QUATERNARY		Recent alluvium Wisconsin outwash and slack-water silt Illinoian outwash Illinoian kame		0-200	Silt and fine sand, in Sandy Creek valley; probably underlain at depth by glacial gravel. Gravel, in Sandy Creek valley forming two closely related flat-topped silt-capped terraces, into which have been cut, in the Minerva area, various lower levels of erosional terraces. Slack-water silts, locally capped by generally thin alluvial materials, forming low flat terraces upstream in Sandy Creek and in all other valleys. Gravel, forming silt-capped terraces. Gravel and sand, deeply weathered, locally capped by silt.
PENNSYLVANIAN	Conemaugh	Buffalo shale		80±	Shale, gray to tan or brown; probably with some thin sandstone; nonresistant, poorly exposed.
		Brush Creek shale Brush Creek coal Brush Creek clay		0-2 0-0.2 0-1.4	Shale, black, marine, fossiliferous; irregular in occurrence; identified only in sec. 11, Harrison Township, Carroll County. Coal, thin; very local; found only in sec. 26, Augusta Township, Carroll County, where the Brush Creek shale is absent. Clay, gray, plastic, local.
		Upper Mahoning shale and sandstone		55±	Shale, tan, thin-bedded; grading upward into poorly bedded gray and pale-red shale and thin- to medium-bedded fine- to medium-grained light-gray sandstone with sandy shale interbeds.
		Mahoning coal Thornton clay		0-0.3 0.2	Coal, thin; absent over most of the area. Clay; generally thin or absent.
		Lower Mahoning shale and sandstone		40±	Shale, gray to tan; locally black roof shale overlying Upper Freeport coal; grading into gray sandstone, massive medium-grained disconformable beds to thin- to medium-bedded fine-grained beds with shaly interbeds. Locally coalescing with Upper Freeport shale and sandstone and Upper Mahoning shale and sandstone to form an uninterrupted shale-sandstone body at least 120 feet thick.
		Upper Freeport coal Upper Freeport clay Upper Freeport limestone Bolivar coal and clay		0-4 1 0-0.6 0-1	Coal, irregular in thickness, locally absent because of nondeposition. Clay, gray, sandy. Limestone, gray, nodular; poorly exposed, probably thin to irregular throughout the quadrangle area. Coal and clay; coal a mere smut streak.
	Allegheny	Upper Freeport shale and sandstone		53-82	Shale, tan to brown, thin-bedded; overlain by sandstone, very fine- to medium-grained, very micaceous; calcareous in upper part, generally poorly sorted; base of sandstone commonly medium-bedded, with conformable contact, but locally massive with disconformable contact; sandstone uniformly medium-bedded, fine-grained, and flaggy upward, near the top grading into thin- to poorly bedded tan shale. Sandstone coalescing with Lower Mahoning sandstone in secs. 31 and 34, West Township, Columbiana County, and secs. 7 and 8, Augusta Township, Carroll County.
		Lower Freeport coal Lower Freeport clay Lower Freeport limestone		1 0.5-4.0 0.3-7.0	Coal, thin. Clay, light-tan to light-gray, plastic. Limestone, nodular; irregular in occurrence, generally thin.
				0-0.1 0-2.0	Coal, local. Clay, local.
		Lower Freeport shale and sandstone		64-78	Shale; dark-gray at base, light-gray upward; thin-bedded; totals about 25 feet. Commonly grading upward into sandstone, massive to flaggy, fine-grained, very micaceous; followed by shale, tan, thin- to medium-bedded; sandy to silty at top. At Pekin massive fine-grained sandstone disconformable on Middle Kittanning coal or shale close above the coal.
		Washingtonville shale		0-1	Shale, marine; not observed but probably present as dark-gray fossiliferous shale.
		Middle Kittanning coal		2-3	Coal; with thin partings and pyrite inclusions.
		Middle Kittanning clay		7	Clay, light-gray, plastic; with some carbonaceous streaks.
		Middle Kittanning shale		15±	Shale; at drainage level, covered.

Quaternary deposits shown in solid yellow in column; not drawn to scale.



BASE BY U.S. GEOLOGICAL SURVEY, 1960

10,000-foot grid based on Ohio coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks,
zone 17, shown in blue

SCALE 1:24 000

1 MILE
1 KILOMETER

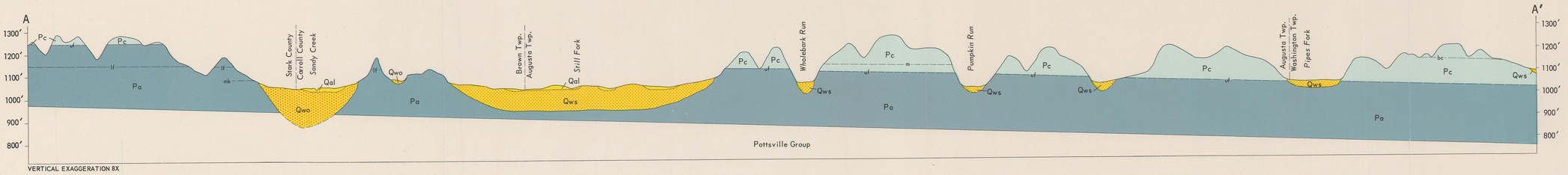
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1960

QUATERNARY DEPOSITS MAPPED BY JANE L. FORSYTH

Cartographic drafting by
James A. Brown

Quadrangle Location



VERTICAL EXAGGERATION 8X

EXPLANATION

- Recent
  - Qal — Alluvium
- Pleistocene (QUATERNARY)
  - Qwc — Wisconsin gravel outwash terrace, erosional
  - Qws — Wisconsin slack-water silt terrace
  - Qwo — Wisconsin gravel outwash terrace, constructional
  - Qio — Illinoian gravel outwash terrace
  - Qik — Illinoian gravel kame
- Middle Pennsylvanian (PENNSYLVANIAN)
  - bc / Pc / m — Conemaugh Group: bc, *Brush Creek coal or shale*; m, *Mahoning coal*
  - uf / lf / Pa / mk — Allegheny Group: uf, *Upper Freeport coal*; lf, *Lower Freeport coal*; mk, *Middle Kittanning coal*

Contact
Dashed where approximate

Coal or shale bed
Long dashed where approximately located; short dashed where concealed

1040 — Structure contours
Drawn on Upper Freeport coal bed. Dashed where approximate; short dashed where datum is above land surface; contour interval 20 feet

Illinoian glacial boundary
After DeLong and White (1963) and unpublished soils mapping by Heber Lessig, Soil Conservation Service, U.S. Dept. Agriculture

- Gravel pit
- Abandoned slope or shaft mine with coal designation
- Oil and gas well
- Dry hole
- Abandoned oil well
- Dry hole with show of oil
- Abandoned gas well
- Dry hole with show of gas

MINERAL RESOURCES

Coal.—Coal mining in the Minerva quadrangle map area has been inconstant. The Upper Freeport coal constitutes the largest coal reserve above drainage and it has been mined at several localities. In secs. 24 and 25, Brown Township, Carroll County, the coal is about 3 feet thick and has been mined by strip and underground methods; caved entrances in sec. 35, West Township, Columbiana County, and secs. 5 and 28, Augusta Township, Carroll County, indicate minable coal but the thickness is unknown. This coal is absent in places due either to nondeposition or to erosion and replacement by shale or sandstone. Because of the sparse exposures a satisfactory evaluation of the extent of minable reserves cannot be made.

The Middle Kittanning coal lies above drainage northwest of Minerva and at Pekin; it is 2 feet thick at Pekin, where it was mined in conjunction with the Lower Kittanning coal, which has about the same thickness. In the rest of the quadrangle east of this area both of these coals are present below drainage, except in the buried valleys which underlie Sandy Creek and Still Fork, where they are absent because of erosion. Each coal is estimated to be about 2 feet thick throughout this area (Brant, 1954, p. 29; 1956, p. 24).

Caved entrances to mines in the Lower Freeport coal are found in sec. 23, Brown Township, Carroll County, and southeast of Minerva. The thickness of the coal in these mines is not known, but it is probably slight.

The Mahoning coal forms a 2-foot blossom in sec. 35, Washington Township, Carroll County, but elsewhere in this area it is thin or absent.

Clay.—The only known clay mining operation in this quadrangle area was at Pekin, where the Middle Kittanning and Lower Kittanning clays were formerly mined for the manufacture of brick. At this locality the Lower Kittanning clay lies below stream level and is 6 feet thick; the Middle Kittanning clay lies slightly above stream level and is 4-6 feet thick.

The Lower Freeport clay ranges from ½ to 4 feet thick. No samples from this map area have been tested for ceramic properties, but generally in Ohio this clay is not satisfactory for the manufacture of clay products.

Shale.—Thick shale bodies occur at scattered localities. In the SE¼ sec. 24, Brown Township, Carroll County, 114 feet of shale and silty shale, representing the coalesced Lower and Upper Mahoning shales, overlies the Upper Freeport coal, and shale bodies up to 65 feet thick were measured along cross section A-A'. These shales have not been tested for ceramic properties, but the Buffalo shale, which caps the hills in the southern and southeastern parts of this quadrangle, is used for brick manufacture at Summitville in the Kensington quadrangle to the east.

Sandstone.—The Lower Mahoning and Upper Mahoning sandstones coalesce along Still Fork, where these units are near stream level. Along cross section A-A', sandstone ranges from 40 to 80 feet in thickness and consists of thin- to medium-bedded strata with fine to medium-sized angular grains. In sec. 25 and the western half of sec. 24, Brown Township, Carroll County, the Lower Mahoning sandstone is 30-50 feet thick, and consists of coarse massive beds in the lower part to fine-grained thin beds in the upper part.

Limestone.—The limestones in this quadrangle area are of fresh-water origin and irregular in thickness, but generally thin. None constitute an economically valuable resource.

Salt.—Salt that aggregates about 300 feet in thickness underlies the Minerva quadrangle at about 3,200 feet below sea level (Pepper, 1947). These beds comprise a part of the Ohio salt basin (Silurian) that underlies northeastern Ohio.

Oil and gas.—Small amounts of oil and gas have been produced from the Berea Sandstone (Mississippian). The Minerva pool in sec. 14, Brown Township, Carroll County, was discovered in 1921 and produced an unrecorded quantity of oil; one-well pools in secs. 14 and 31, Augusta Township, Carroll County, produced gas and oil. The Berea is 100-250 feet above sea level throughout this area, and is about 40 feet thick.

The Silurian age Albion ("Clinton") sandstones, as well as the Devonian age Oriskany Sandstone, were dry in a test well located in the NW¼ sec. 24, Brown Township, Carroll County. Here the former is 128 feet thick and its top is 4,300 feet below sea level.

Sand and gravel.—Poorly sorted sand and gravel, deposited by glacial meltwater, occurs along the valley of Sandy Creek. In Paris Township, Stark County, and western West Township, Columbiana County, it is found in broad flat-topped Wisconsin terraces with 3-foot silt caps; in the rest of West Township it occurs in hummocky Illinoian terraces at almost the same elevation as the Wisconsin terraces. East of East Rochester the composition of these terraces changes to silt. In the vicinity of Minerva lower Wisconsin terraces of erosional origin are also underlain by sand and gravel, but the cover of silty alluvium is generally too thick for economic recovery of the buried material. Broad flat terraces at the same level as the constructional terraces are present in most of the other valleys, including tributaries to Sandy Creek, but because these valleys did not carry meltwater the terraces are composed of slack-water silts as in the case of the terraces east of East Rochester. The only active development of sand and gravel deposits is in the northwest corner of sec. 12, Brown Township, Carroll County.

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