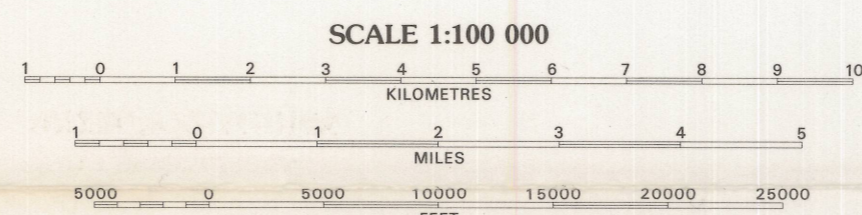


Edited by the Geological Survey
Compiled in 1976 from USGS 1:24 000-scale topographic maps dated 1946-1966
Projection and 10 000-metre grid ticks, zone 16: Universal Transverse Mercator
25 000-foot grid ticks based on Tennessee coordinate system 1927 North American datum



NATIONAL GEODETIC VERTICAL DATUM OF 1929
This map complies with national map accuracy standards

EXPLANATION

Phosphate

Phosphate has been mined in Maury County since 1896, when brown phosphate was discovered in the Mount Pleasant area. Although in the early years of mining some blue phosphate was produced from the base of the Chattanooga Shale in the western part of the county, most of the mining has been in residual deposits containing the brown variety. The principal unit containing the phosphate is the Bigby facies of the Bigby-Cannon Limestone. Second in importance is the Leipers Formation, with lesser deposits in the Catheys Formation and the Hermitage Formation.

The deposits were formed by the weathering of phosphatic Ordovician limestones. The more soluble carbonates were leached away and the relatively insoluble tricalcium phosphate, plus silica, clay, and iron oxide "impurities" remained as a residual accumulation.

The ore occurs as "muck," which is an unconsolidated claylike mixture of phosphate and soil, or as "plate rock," which is chiefly tricalcium phosphate in resistant platy beds. The term "matrix," as used by the industry for phosphate ore scheduled for electric-furnace feed, includes both plate rock and muck.

Although in the northeastern and eastern parts of the county the Bigby-Cannon Limestone contains non-phosphatic beds (Cannon and Dove-colored facies), elsewhere it is phosphatic throughout. The phosphatic facies is coarse-grained, medium-bedded, and crossbedded limestone. Its thickness ranges from 20 to 110 feet, with the thickest section in the Sandy Hook quadrangle.

In the western part of the county the Leipers and Catheys formations are, in general, lithologically similar to the Bigby. To the east, however, this phosphatic limestone is replaced by shaly, nodular, less phosphatic limestone. The residuum of the phosphatic Leipers and Catheys formations is also similar to that of the Bigby. Total tonnage of ore mined from these formations has been relatively small.

Although the Hermitage Formation is normally not very phosphatic, it is locally interbedded with basal Bigby beds, especially to the west; and the weathering of these interbedded zones adds some phosphate to the residual deposits.

"Blue phosphate" is the term used to designate bedded phosphate deposits at the base of the Chattanooga Shale. Although called blue rock, it is also gray or brown in color. Blue phosphate is different in origin from brown phosphate in that it is bedded and accumulated by residual concentration before deposition of the Chattanooga Shale; brown phosphate deposits are residual accumulations from geologically recent weathering.

All phosphate in Maury County is extracted by surface mining. Soil and subsoil are stripped off, and the underlying "muck" is removed down to bedrock by draglines. As required by state law, the soil is then placed back into the excavation, smoothed over as close to the previous natural contour as possible, and planted with grasses before the end of the next growing season. All such surface mining operations must have permits issued by the Department of Conservation, Division of Surface Mining.

Prior to the Tennessee Strip Mine Act of 1967, no such reclamation was required. Consequently, in various parts of the county old mines have never been reclaimed. These form a type of artificial "badlands" that have no commercial value. The largest such area is in the vicinity of Mount Pleasant. Most of this land was previously high-quality farmland. Even before the reclamation law was enacted, some land was restored to a useful condition as a part of the contract between the mining companies and the landowners. Today much of this reclaimed land has been returned to a state of usefulness that makes it difficult to distinguish from similar, unmined land.

In addition to loss of farmland, phosphate mining has had other adverse environmental impacts. Great quantities of silt have washed off spoil banks and into area streams. Ponding in depressions allows mosquitoes to breed. Other problems include dust and noise from mining operations, trucks carrying ore from mines to phosphate plants, and the construction of numerous settling ponds for containment of the washings from the beneficiation process. These ponds cannot be used for other activities due to their content of extremely fine mud ooze.

Mining Operations

Most past mining and much of the current mining have been in two principal areas. These are in the vicinity of Mount Pleasant and northwest of Columbia. Throughout the county approximately 10,000 acres have been mined. Of this total, 6,800 acres remain unreclaimed.

The minimum grade of ore used by the phosphate companies is about 18 percent P_2O_5 . Ore from 18 percent to 23 percent P_2O_5 is used directly in the furnace. Principal uses for phosphate are for producing electric furnace elemental phosphorus, phosphoric acid, triple super-phosphate, and ordinary super-phosphate.

Reserves

Smith and Whittatch (1940) estimated approximately 43 million tons of brown phosphate ore for Maury County on a dry basis at 40 percent B.P.L. (bone phosphate of lime). Undoubtedly the many new deposits found since then have increased the reserves despite the fact that much of the area has been mined. The overall grade of reserves has, however, declined.

If, at some time in the future, economically viable processes are developed to obtain phosphate from the unweathered limestone, the overall reserves of this material will indeed be vast.

Limestone

Limestone reserves in Maury County are areally extensive and practically unlimited. Units of the Stones River Group (Osr on Geologic map) are best suited for general use, and are excellent for road aggregate and agricultural lime. The following is a brief discussion of those limestone units in the county with the economic potential. Units are listed in order of economic importance.

Carters Limestone.—Very fine-grained to dense limestone. Upper Member is thin-bedded with thin shale partings; up to 5 feet thick. Lower Member is similar lithologically, but medium- to thick-bedded and without shale. Ranges from 40 to 80 feet thick.

Ridley Limestone.—Very fine-grained to dense, medium- to thick-bedded limestone, with minor bands of chert locally. About 100 feet thick.

Lebanon Limestone.—Very fine-grained to dense, thin-bedded limestone with thin shale partings. Thickness is about 90 feet.

Leipers and Catheys Formations.—Shaly, argillaceous, medium- to very coarse-grained limestone, thin- to medium-bedded. Some zones are less phosphatic, with higher percent of units phosphatic to west. Basal part is more shaly. Formations are less desirable than units of the Stones River Group, due to clay and phosphate content, and thin bedding.

Although the Bigby-Cannon and Hermitage formations and Silurian units are limestones, they are generally unsatisfactory for quarry stone because of excessive impurities (clay, silica, or phosphate), thin-bedding, limited outcrop, unit thinness, or inaccessibility.

Quarries

Two quarries are operating in Maury County. The Columbia Rock Products Corp. quarry is approximately 2 miles north of Columbia. It is an underground operation in the Carters and Lebanon limestones. Typical analysis: $CaCO_3$ -83.5%; $MgCO_3$ -16.7%; SiO_2 -2.0%; Fe_2O_3 -0.18%; K_2O -0.07%; Al_2O_3 -0.4%; Na_2O -0.07%.

The Blue Springs Rock, Inc. quarry is in the Lebanon Limestone, and is an open quarry operation. It is 4 miles southeast of Columbia. Typical analysis: $CaCO_3$ -90.7%; $MgCO_3$ -6.5%; Al_2O_3 -0.3%; Fe_2O_3 -0.18%; K_2O -0.11%; MnO -0.005%; SiO_2 -1.6%.

Chert

Many chert pits have been operated in Maury County. Large areas are underlain by highly siliceous Mississippian residuum derived principally from the Fort Payne Formation (Mu on geologic map). Accumulations of small chert fragments in a siliceous, clayey, tripolitic matrix are referred to as scraggy chert. This material is excellent for use as fill material and for surfacing secondary roads because of its binding characteristics and consistency of fragment size. One of the largest pits in this material is at Sawdust community on State Route 50 northwest of Columbia.

Sand and Gravel

Deposits of sand and gravel are extensive along Duck River and its larger tributaries in Maury County. The flood plains of these streams have alluvial deposits consisting of unconsolidated and poorly sorted clay, silt, chert sand, and chert gravel. Valley slopes are primarily sand and silt, and stream beds contain much gravel. Higher level (older) terrace deposits consist of chert sand and gravel with lesser amounts of silt and clay (all alluvium on the geologic map is Qar). These materials have been mined in the past, but have had adverse environmental impacts when removed from stream beds. Destruction of bottom-dwelling organisms and excess silt loads have resulted.

Oil and Gas

Only one oil test has been drilled in Maury County. This was the Putnam, et al., C.A. Brooks No. 1 approximately 1.5 miles southeast of Hampshire. It was drilled to the Knox Dolomite (total depth of 1,234 feet, and was declared to be dry and abandoned. No shows of oil or gas were reported.

Potential Resources

Some deep drilling (prospecting) for zinc has been done in Maury County. Zinc deposits in this region occur in the Knox Dolomite, the top of which averages about 1000 feet below the surface. To date, no major discoveries have been announced by any of the exploration companies prospecting in Maury County.

The Chattanooga Shale (at base of Mu unit on geologic map) is a low-grade oil shale and contains a small amount of uranium. Although samples have yielded up to 23 gallons per ton of oil from this shale, it is so thin in Maury County (mostly less than 10 feet) that it has no present commercial use. Also, the uranium is only .006 percent average, and is noncommercial at this time.

Data Sources

Include published geologic 7.5 minute quadrangle maps with mineral resource summaries (see Index Map):

Campbells Station	Lynnville	Spring Hill
Carters Creek	Mount Joy	Summertown
Columbia	Mount Pleasant	Theta
Glendale	Primm Springs	Verona
Godwin	Rally Hill	Williamsport
Greenfield Bend	Sandy Hook	

NASA high-altitude, false-color infrared photographs

Surface mining computer printout (Tennessee Division of Geology)

- Outcrop area of Bigby-Cannon Limestone
- Mine or quarry
- Pit
- Reclaimed Mine
- Phosphate
- Limestone
- Chert

Prepared in cooperation with U.S. Geological Survey

MINERAL RESOURCES MAP

Compiled by
Robert A. Miller
1983

MAURY CO., TENN.
N3524.5-W8646.5/27 x 35
1966