

INVESTIGATIONS OF MISCELLANEOUS MINERAL DEPOSITS IN EAST TENNESSEE

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PREFACE

Geologists of the Tennessee Division of Geology from time to time make examinations of mineral occurrences. These examinations may result from information supplied by prospectors or interested citizens, or may result from discoveries made by Division members in the course of other geologic investigations. Many such mineral occurrences are not described in published reports and may be unknown to those engaged in work involving the geology and resources of Tennessee.

Generally, the observations of the prospects are limited to surface exposures or shallow pits and do not permit evaluation of the property. Furthermore, it is Division policy that detailed exploration and development work on private lands is the province of private enterprise. Consequently, our examinations consist essentially of verifying the occurrence, observing its apparent characteristics, identifying the host rocks, and noting the structural setting; that is, a factual background study of the surficial features.

Such examinations result in brief memoranda reports in Division files. We believe that even though a given prospect may be too small or too low-grade to be of commercial interest, its existence is of significance in itself; and fitted into geologic context may provide useful information to those interested in the search for and development of mineral resources. With this belief the following summary of mineral occurrences recently observed is submitted.

BARITE

Chandler Mine, Unicoi County

The Chandler mine, Unicoi County, was opened and developed originally as an open-cut by Mr. Chandler about 1933. It was reopened as a shaft and drift mine in 1957 by Barite Enterprises, Inc., Elizabethton, Tennessee, under the supervision of Mr. George Walker. Only a few cars of ore were shipped altogether, chiefly because of quartz gangue in the ore, which neither operator was equipped to separate.

The mine is 2.75 miles northeast of Flag Pond, Unicoi County (map reference: 190-SE, Flag Pond quadrangle; Tennessee Coordinates: 622,650N., 3,021,500E.). The shaft is now (1963) filled with water.

The host rocks are much sheared granitoid gneisses, locally epidotized, invaded by small pegmatites and vein quartz. These rocks were termed "Cranberry" by Keith (1907).

The barite occurs in a vertical vein striking N. 85° E., which, at the time of our examination (May 1957), was opened to a depth of 30 feet. A 5- by 7-

foot drift along the vein extended 29 feet east and 21 feet west from the shaft. Some of the west drift represented cleaning up older workings. The vein consists chiefly of massive fine-grained barite, crystalline barite, and vein quartz. The vein minerals are vuggy, and the vugs contain crystalline and amorphous manganese oxides, or clay. The contact between the barite and the country rock generally is marked by a feather-edge of sericite and locally by a few inches of soft white clay. The vein ranged in width from 1.5 to 4 feet. Much of the barite has been granulated and recemented.

A similar deposit, neither opened nor well exposed, was visited 3,000 feet to the west along strike on the Higgins property (map reference: 190-SE, Flag Pond quadrangle; Tennessee Coordinates: 622,650N., 3,018,700E.). R. A. Laurence (personal communication) states that he visited the Chandler property and others known as the Willis, Stockton, and Lloyd in 1934. At that time the Chandler and Lloyd had been developed by small pits only.

The deposits are interpreted as veins along shear zones containing both replacement and fissure-filling ore. They appear to be related to the nearby and better known Del Rio-Stackhouse deposits.

Thornburg Mine, Greene County

The Thornburg property is 1.3 miles northeast of Jearoldstown, Greene County, on the northwest flank of Kyle Hill (map reference: 189-SW, Jearoldstown quadrangle; Tennessee Coordinates: 736,200E., 2,978,000E.).

Occurrences of barite were known here for many years, and small amounts were mined in the 1920's or earlier. The property was acquired by a Mr. Presnell of Elizabethton from the Dottie Jane Mining Company in 1957. Mr. Presnell developed the property as an open-cut mine and shipped an estimated 10,000 tons from it. This operation was known as the Ba-Flo Company.

The barite occurred in large masses in residual clay overlying the upper Knox Group. The ore zone trended N. 30° E. and appeared to overlie vertical beds. In August 1957 the mine was a trench some 15 feet wide and 75 feet long. The barite, in large masses weighing several tons, was white and platy. The dolomite beds in the northwest rib dipped 10° to 12° northwest, but those exposed in the footwall and southeast rib were vertical. The latter beds enclosed small veins of barite along fractures and joints. The sharp divergences in dip are believed to indicate a steeply dipping fault, which controlled the barite mineralization. Chert was the chief impurity in the barite. Mr. Presnell experienced mining problems owing to the large size of

the ore-lumps, because they required drilling and blasting before loading; and he encountered grade problems because his mill consisted only of a log washer, and thus the chert was not separated.

Solomon Mine, Greene County

The Solomon mine is 4.2 miles southwest along strike from the Thornburg mine (map reference: 189-SW, Jearoldstown quadrangle; Tennessee Coordinates: 720,000N., 2,963,500E.).

The deposit was opened by the Dottie Jane Mining Company in 1957. It produced a reported 600 tons of 94 percent BaSO_4 concentrate before being exhausted. The barite occurred as white lumps and masses ranging in size from $\frac{1}{4}$ inch to 6 inches in residual clay above the upper Knox Group. The pit reached bedrock within less than 10 feet below the original surface.

Ore from both the Solomon and Thornburg mines was washed in a log washer located on Crabtree Branch 0.75 mile northwest of Union Temple.

Prospects and Occurrences in Sullivan County

Carmack prospect. The Carmack farm, 2.5 miles south of Sullivan Gardens, east of the Mill Creek road, Sullivan County, was prospected by Harold Carmack in 1956 (map reference: 189-NE, Sullivan Gardens quadrangle; Tennessee Coordinates: 763,800N., 3,003,500E.).

Barite lumps in the clays flooring a pasture led Mr. Carmack to dig two bulldozer trenches. The trenches were perhaps 10 feet wide, 50 feet long, and 1,000 feet apart. The northern trench produced one lump of white barite, weighing 28 tons, which was massive but contained 0.5-inch rhombohedral moulds. The smaller southern pit produced 5 tons of white barite in smaller lumps.

Bedrock outcrops are sparse in the immediate vicinity of the pits. Chert and barite in the surficial clay were observed between the two pits, 1,000 feet along strike and for an equal distance southeast across the strike to the foot of a wooded ridge. Blue-gray limestone banded with gray dolomite crops out on the ridge slopes and dips vertically. The barite is believed to occur in rocks of the upper Knox Group.

Sunset Hill occurrence. A cut on the northeast side of U. S. Highway 23 near Sunset Hill, 2.5 miles southeast of Kingsport, was examined in 1957 (map reference: 188-SE, Kingsport quadrangle; Tennessee Coordinates: 790,000N., 3,019,000E.). A mass of white barite was exposed in the cut from highway level to the top of the cut, and extending 30 feet along the grade (apparent thickness). This barite was bounded on both sides by cherty residual clay of the Knox. No outcrops could be located in the field northeast of the highway cut, but barite chips were observed in soil removed for powerline pole footings; and a small vein in dolomite was noted in the bank along a farm road 500 feet northeast of the Highway 23 exposure. Southwest of the highway a water-well boring was described by the property owner, Mrs. Kirkpatrick, as penetrating 60 feet of clay and 30 feet of "white, soft, heavy

matter." The crest of the hill north of the house is littered with barite "float." The well and house are approximately 1,000 feet from the exposure in the highway cut.

Pactolus prospects and occurrences. A group of old pits and workings extends along strike from Pactolus Station on the Clinchfield Railroad northeast to the south bank of the Holston River at Kingsport (map reference: 188-SE, Kingsport quadrangle; Tennessee Coordinates: 785,500N.-790,000N., 3,017,500E.-3,020,000E.).

Unpublished reports in Division files indicate some mining was conducted here about 1915, and a revival was attempted about 1935. Neither period of operation was very productive.

The barite in this area is chiefly the cleavable, black, fetid variety typical of the Fall Branch deposits. It occurs in residual clay above the upper Knox Group. The residuum in this vicinity appears to be thin.

All the barite deposits in Greene and Sullivan counties have a common geologic setting. All are in a belt of upper Knox that is bounded on the northwest by the Cliffs fault and on the southeast by the Pulaski fault (Rodgers 1953, Plate 4). They comprise part of the deposits of the Fall Branch barite-zinc district.

Nuns Cove and Little Mountain Barite-Zinc Prospects, Sevier County

The Nuns Cove prospect is about 8 miles east of Sevierville. The property was owned by Mr. Joe Hurst at the time of our examination in 1957. Mr. Hurst stated that the mineralization was discovered in 1902 by a Mr. Holbert; and mined briefly for barite in the 1930's. William Holt and Earl Lane of Knoxville cleaned out the old workings and dug a short prospect trench along the strike in 1957. The prospect area is on the Shady Grove quadrangle, 164-NW, at Tennessee Coordinates 550,000N., 2,769,300E.

The prospect here, termed the Little Mountain, is 2,500 feet northeast of the Nuns Cove prospect at Tennessee Coordinates 552,000N., 2,770,000E. The prospect is on the property owned in 1957 by Mr. Elmer Allen, who told us it was prospected about 1902. This prospect, or one similar to it, at Tennessee Coordinates 553,200N., 2,764,700E., is probably the Fairgarden prospect of Secrist (1924, p. 151).

The Little Mountain and Nuns Cove prospects are in a faulted anticline, the Fairgarden anticline. Formations of the upper Knox are the host rocks of the prospects. The unaltered rocks are blue-gray, fine-grained, dense dolomitic limestones with some chert. The rocks are well bedded and many bedding planes are marked by thin wavy cherty partings. The rocks enclosing the barite and sphalerite are notably darker than elsewhere, and black, shaly, bituminous material occurs on the bedding planes.

The mineralization at Little Mountain consists of discrete sparse blebs of crystalline barite in aggregates as much as 6 inches across, and less abundant fine-grained light-yellow sphalerite. Crystals of calcite also occur in the gangue. The barite is both the dark-gray

fetid variety and the white cleavable type. Pits and trenches following the mineralization showed it to be rather local and not strong. The exposures provided by prospecting at Nuns Cove showed no barite and calcite.

Oak Ridge Occurrence, Anderson County

An occurrence of barite in residuum above the Knox Group in Oak Ridge was examined in 1958. The deposit was noted by W. M. McMaster, then a graduate student at the University of Tennessee engaged in geologic mapping (McMaster, 1962).

The occurrence is in a residential part of Oak Ridge in the wooded part of a lot behind a home on Black Oak Ridge (map reference: 129-SE, Windrock quadrangle; Tennessee Coordinates: 598,700N., 2,512,800E.).

No prospect work is evident and the only visible mineralization consists of a small amount of white barite in cherty residual clay. No bedrock exposures are present near the deposit and its stratigraphic position must be inferred. It appears to occur in soil above either the uppermost Longview Dolomite or lower Kingsport Formation.

Chestnut Ridge Occurrence, Roane County

An occurrence of barite in cherty residual clay derived from the Kingsport Formation was discovered by the writers and G. D. Swingle in July 1960. The barite was observed in fresh road cuts in the course of geologic mapping on Chestnut Ridge, Roane County, 1.6 miles southwest of Gallaher Bridge, where the Oak Ridge Turnpike crosses the Clinch River (map reference: 130-NW, Elverton quadrangle; Tennessee Coordinates: 567,100N., 2,473,400E.).

White, medium- to coarse-crystalline barite masses mixed with chert in a clay matrix were noted in the northeastern road cut and on the surface in the woods above the road. The zone is approximately 30 feet wide on outcrop. No prospect pits are evident, nor has the occurrence been noted previously to our knowledge.

This prospect is in the Knox in the next strike belt northwest of the Copper Ridge belt that comprises the northwestern zone of the Sweetwater barite district; and the occurrence is very nearly north of the northeasternmost deposit of the Sweetwater district.

Notchy Creek Deposit, Monroe County

A deposit of residual barite 2.1 miles south of Madisonville, Monroe County, was examined in 1957. The deposit was found in the course of geologic mapping by R. L. Wilson. It is in the woods just northwest of State Highway 68, about 3,500 feet north-east of Notchy Creek (map reference: 132-NE, Mount Vernon quadrangle; Tennessee Coordinates: 397,600N., 2,487,100E.).

The deposit is marked by indistinct old pits reportedly dug in the early 1900's. These workings are too small to have permitted much production. Bedrock at shallow depth was encountered.

The bedrock is gray dolomitic limestone, locally brecciated and cemented by white, crystalline gangue dolomite and white barite. The host rock, uppermost Kingsport, strikes N. 35° E. The barite in the mantle is composed of crystalline aggregates as much as 2 inches on a side.

The deposit is stratigraphically immediately below a large post-Knox solution feature (which has removed most of the Mascot Dolomite) now filled by large collapse blocks in a ferruginous carbonate matrix. Similar sink-solution features in the strike-belt are associated with residual limonite deposits formed from pyrite.

Lost Creek Deposit, Union County

A deposit of barite on the Lost Creek embayment, Norris Lake, Union County, is described briefly by Penhallegon (1938, p. 5). Penhallegon states that it was discovered "some years ago" and was mined briefly between 1938 and 1940. Production records are not available, but the amount of barite mined was not large. The writers examined the deposit in 1962 in the course of mapping the Maynardville quadrangle. The mine is an open pit on a dip slope of Mascot and Lower and Middle Ordovician rocks (map reference: 145-SE, Maynardville quadrangle; Tennessee Coordinates: 712,400N., 2,630,200E.).

The barite occurs as lumps in residual clays and in veinlets with pyrite in the bedrock. Mineralization is chiefly in the basal beds of Middle Ordovician age, and to a lesser extent in beds of the Mascot Dolomite. The host rocks are dolomites and argillaceous impure dolomitic limestones which are locally brecciated. The barite is light gray to white, ½ inch to 10 inches on a side, both massive and crystalline. Some of the massive specimens contain angular moulds as much as an inch across.

This deposit is on the northeast flank of the Powell anticline, in which structure deposits of lead and zinc sulfides occur in stratigraphically lower rock units.

COPPER, LEAD, AND ZINC

Gulf Fork Area, Cocke County

A number of occurrences and prospects containing pyrite, chalcopyrite, galena, and sphalerite located in southeastern Cocke County have been examined over the last few years. A notable concentration of such occurrences associated with quartz veins is present along the Gulf Fork of Big Creek and its tributaries 2.5 miles east of Hartford, Cocke County (map reference: 173-SE, Waterville quadrangle).

The sulfides generally are contained in quartz veins but are found also in slates of the Ocoee Series. The distribution of the occurrences and observations of details visible in the larger prospect openings strongly suggest localization along a series of en echelon shears parallel to the regional strike or at a low angle to it. Many occurrences are obviously small, poorly exposed, and difficult to evaluate. Steep dips and topography also prevent extensive exposures. Prospect openings are generally small shallow pits or cuts in bluff faces made by

blasting. However, the number of the occurrences and their location with respect to the nearby Del Rio barite mining district are believed to be of interest.

The best exposed prospect is on the farm of Mr. William Coggins in a bluff on the west bank of Big Creek 0.25 mile south of Cogdill Chapel (map reference: 173-SE, Waterville quadrangle; Tennessee Coordinates: 549,900N., 2,859,000E.).

Road construction along the creek has exposed light-green sugary-textured quartzites interbedded with slates. The quartzites are crossbedded locally and show cut and fill contacts with subjacent slates. The rocks are intricately folded and faulted. Tension fractures are filled with vein quartz, sulfides, and crystalline dolomite. The sulfides are chiefly galena and pyrite with minor amounts of chalcopyrite in vein quartz and, in one instance, in barite. The veins range from hairline widths to an inch or so. The sulfides occur as fine-grained, subeuhedral crystalline aggregates of galena and pyrite, and as massive blebs of chalcopyrite in the quartz. Mineralization extends some 70 feet along strike (N. 20° E.) and about 50 feet vertically up the bluff face. The dip extent is obscured by the creek and its flood plain.

A less well exposed but apparently smaller prospect known as the Leatherwood is located 1.3 miles southeast of the Coggins prospect (173-SE; Tennessee Coordinates: 543,600N., 2,862,000E.). Here, a quartz vein encloses galena and chalcopyrite. This vein, or one closely related, also crops out in Raven Branch at Tennessee Coordinates 542,600N., 2,861,600E. Approximately 2 miles southwest along strike on the Waterville quadrangle is the designation "Mine Ridge." Investigation disclosed that the name refers to an old small opening in limonite apparently derived from pyrite.

Moore Lead-Zinc Prospect, Anderson County

The Moore prospect, Anderson County, was examined in 1957 with Mr. William Holt and Mr. C. J. Hutchinson who had leased it. Investigation disclosed that the prospect was examined by TVA in 1935 or 1936.

The prospect is on the James R. Moore farm on Pine Ridge (map reference: 137-NE, Norris quadrangle; Tennessee Coordinates: 637,500N., 2,576,000E.). At the time of our examination it consisted of a small trench and adit driven in grayish-brown, medium-grained dolomite of the Rome Formation. Natural outcrop exposed the dolomite for about 60 feet along the strike (N. 50° E.), but the exposure was partly covered by an earth slide. The dolomite is approximately 50 feet thick and dips 20° southeast. The trench and adit were driven normal to the strike, were 5 feet wide, and extended 3 feet into rock.

The dolomite where mineralized contains stringers and blebs of white, crystalline gangue calcite. The host rock is fractured locally and sealed with gangue calcite. Sulfides consisting of yellow sphalerite, galena, and traces of pyrite and chalcopyrite accompany the gangue. The best grade was observed in the basal 0.5

foot of the host dolomite immediately above a maroon-colored shale. This interval contains an estimated 5 to 6 percent sulfides, and weaker mineralization extends 4 to 5 feet higher. The sulfides are disseminated through the dolomite in fine grains, though some galena crystals are as large as one-fourth inch on a side.

Rodgers (1953, Plate 1) infers a fault duplicating the Rome in the vicinity of the prospect. Divergent dips and strikes and the shattered texture of the dolomite bed support this interpretation.

Ailor Gap Copper Prospect, Union County

An occurrence of chalcopyrite in the Rome Formation was brought to our attention by Frank Dakin in the autumn of 1958. The area was visited and a brief examination made at the time. Later, Mr. Dakin and the property owner, Mr. Herbert Smith of Knoxville, trenched the prospect and had two diamond drill holes bored. Their logs were made available to us.

The prospect area is underlain by the Rome Formation comprising Comb Ridge in the vicinity of Ailor Gap (map reference: 146-NE, Graveston quadrangle; Tennessee Coordinates: 669,500N., 2,640,600E., and along Birch Hollow from 668,500N., 2,641,500E. for some 4,000 feet northeast along strike). The Rome in this vicinity is deformed intensely by folds and faults. The outcrops are of rocks typical of the formation, sandstones, variegated shales, and siltstones.

Exposures of chalcopyrite-bearing rocks are typically shales, siltstones, and fine-grained sandstones. Many beds are slickensided and broken by small joints now sealed with calcite. The chalcopyrite occurs as minute grains disseminated in both shales and sandstones.

A small intermittent stream course exposes chalcopyrite through some 50 stratigraphic feet. Chip samples from portions of this interval assayed from 0.007 to 0.11 percent copper.

Mr. Dakin reported that the drill hole bored in Mendenhall Hollow to 725 feet, at an angle of 35°, found sulfide mineralization intermittently from 80 to 706 feet. Dakin stated also that the best grade encountered was a 2-foot zone between 139 and 141 feet, which assayed 1.0 percent lead, 1.3 percent zinc, and 0.6 percent copper. Our observations of surface exposures and Dakin's log of the drilling indicate that the mineralization is confined chiefly to the clastic units of the Rome. The log records dolomite from 310 to 423 feet but indicates it to be essentially barren.

So far as we are aware, this is the first known occurrence of chalcopyrite in shales and sandstones of the Rome Formation.

Zinc Prospects, Blount County

A group of zinc occurrences in Blount County was brought to our attention by Mr. Frank Dakin of Knoxville and examined in 1962. The deposits are in the same strike belt as that on Pistol Creek at Maryville described earlier (Maher, 1959).

Little River prospect. The strongest exposed mineralization in this group is in the Copper Ridge Dolomite, where it crops out in a bluff above Little River 2,000

feet southeast of the mouth of Nails Creek (map reference: 147-SW, Maryville quadrangle; Tennessee Coordinates: 522,200N., 2,627,300E.).

The country rock is dark- to light-gray, finely crystalline dolomite containing black nodular chert. Stratigraphically, the zone is 30 feet below heavy float blocks of a quartz sandstone thought to be the base of the Chepultepec Formation. The rocks strike N. 50° E. and dip 65° southeast.

A zone some 6 to 8 feet thick has been intensely brecciated and invaded by white crystalline dolomite gangue and light-yellow sphalerite. The zone was visually estimated to contain 2 to 3 percent sphalerite.

Wildwood prospect. The Knox exposed in an unnamed creek flowing northwest from Wildwood to Nails Creek is brecciated. Although most of these breccias carry white gangue dolomite, no sulfides were observed, except sparse sphalerite in the creek bed at the Kingsport horizon at Tennessee Coordinates 522,300N., 2,630,200E. (147-SE, Wildwood quadrangle). A similar sphalerite-bearing breccia is located 4,000 feet southwest along strike in a bluff above Little River (map reference: 147-SW, Maryville quadrangle; Tennessee Coordinates: 519,700N., 2,627,500E.). A chip sample from this exposure assayed 0.70 percent zinc.

Mount Lebanon prospect. A breccia body, poorly exposed, occurs in a small wood just southeast of Mount Lebanon Church (map reference: 147-SW, Maryville quadrangle; Tennessee Coordinates: 517,000N., 2,621,500E.). This occurrence is in the upper Copper Ridge Dolomite (Cattermole, 1962). A grab sample from a small pit analyzed 0.42 percent zinc. It is noteworthy that Keith (1895) locates a limonite mine in the Kingsport southeast (up dip) from this locality and that Willis (1886) reports the limonite formed from pyrite.

Cedar Grove prospect. The most northeasterly of this group of prospects is on the east fork of a small creek south of Cedar Grove Church (map reference: 147-SE, Wildwood quadrangle; Tennessee Coordinates: 530,000N., 2,629,500E.). White gangue dolomite-bearing

breccia in the uppermost Longview or lower Kingsport from this locality assayed 1.50 percent zinc. This prospect is close to an old limonite pit.

Relationship to other prospects. These zinc prospects lie along strike from one on Pistol Creek at Maryville, which produced a sizeable geochemical anomaly (Maher, 1959). The same strike belt contains commercial bodies of residual limonite derived from pyrite in several places, generally in the Kingsport horizon, and the Notchy Creek barite occurrence of this report. Thus, the strike belt is mineralized rather thoroughly.

The stratigraphic range of the sphalerite and breccias is also of interest.

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NEWS OF TENNESSEE SCIENCE

(Continued from Page 42)

of Chemistry at Duke University, was reelected president of the Oak Ridge Institute of Nuclear Studies at the annual meeting of the ORINS Board of Directors. Eric Rodgers, dean of the Graduate School, University of Alabama, was elected vice president, succeeding Howard M. Phillips, president of Birmingham Southern College. The board reelected William G. Pollard, executive director of ORINS, as treasurer. Other members of the board include Robert T. Lagemann, dean of the Graduate School, Vanderbilt University; Clarence E. Larson, president, Nuclear Division, Union Carbide Corporation; and John L. Wood, chairman, Department of Biochemistry, University of Tennessee at Memphis.

Lawrence K. Akers, a staff member of ORINS for eleven years has been appointed Chairman of the Special Training Division, replacing Dr. Overman. Dr. Akers has served as chairman of the University Relations Division, and for one year was a member of the staff of the International Atomic Energy Agency in Vienna.

Dr. D. Frank Holtman, head of the University of Tennessee Department of Bacteriology, has recently been certified as a diplomate of the American Board of Microbiology. Certification by this board of professional bacteriologists is attained through examination in the areas of public health and medical microbiology.

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