U. S. DEPARTMENT OF THE INTERIOR

# Geologic Maps and Block Diagrams of the Barite Hill Gold-Silver Deposit and Vicinity, South Carolina and Georgia

By Sandra H.B. Clark
U.S. Geological Survey, National Center, MS 954, Reston, VA 22092



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Barite Hill is a metavolcanic-rock-hosted, stratiform gold-silver deposit located in the Piedmont physiographic province in McCormick County, South Carolina. The deposit is in the Lincolnton-McCormick district, which includes other mines and prospects for gold, silver, copper, zinc, lead, kyanite, and manganese, in rocks of the southern Carolina slate belt (pl. 1). The Barite Hill deposit was mined from 1990 to 1994, and, during this time, approximately 1,835,000 grams of gold and 3,390,280 grams of silver were produced S, Wilkerson and D.W. Halverson, Nevada Goldfields, oral commun., 1994), mainly from oxidized ores in the Main and Rainsford Pits (pl.2)

The purpose of this report is to make available a regional geologic map (pl. 1), and geologic maps (pl. 2) and block diagrams (pl. 3) of the Barite Hill mine to supplement a brief summary of the geology of the deposit (Clark, 1997) and a more detailed report by Clark, Gray, and Back (in press). The maps in this report supersede geologic maps that appear in preliminary reports on geochemical profiles (Clark and others, 1993) and results of petrographic studies (Back and Clark, 1993).

Host rocks for the Barite Hill deposit are sericitically-altered, felsic metavolcanic and metasedimentary rocks of the Late Proterozoic Persimmon Fork Formation, which consists of the Lincolnton metaryholite and the overlying lower and upper pyroclastic units. The Barite Hill deposit lies stratigraphically below an overturned contact between the upper and lower pyroclastic units. The Main Pit contains four parallel zones of gold-silver mineralization: footwall, middle, hanging wall, and Red Hill ore zones. The Rainsford Pit contains only one gold-silver-rich zone, which is the stratigraphic equivalent of the footwall ore zone in the Main Pit. Gold-silver-rich zones in the Main Pit are partly coincident with lenses of siliceous barite rock, but not confined to them, and occur more commonly in pyrite-quartz altered fragmental rock. The stratigraphically uppermost of the four ore zones in the Main Pit is overlain by a zone of barite and base-metal enrichment, which is, in turn, overlain by a talc-tremolite alteration zone. Siliceous barite zones are absent in the Rainsford Pit and gold-silver minerals are associated with silicified rocks and chert.

The Barite Hill deposit is interpreted to be the result of Kuroko-type submarine volcanogenic base-metal sulfide mineralization followed by precious metal deposition under epithermal conditions. The stages of evolution of the Barite Hill deposit as related to the regional volcanic, tectonic, and thermal history are summarized in Table 1.

Table 1. Summary of stages of evolution of the Barite Hill gold deposit.

| **Sequence of Events Recorded at Barite Hill** | **Results** | **Probable Correlation with Regional Events** |
|---|---|---|
| Submarine volcanism; hydrothermal fluids moved through, altered, and mineralized the volcanic pile, and were exhaled onto the seafloor. | Deposition massive sulfide, barite, and fine-grained silicic exhalites in pyroclasitc sequence. Alteration of volcanic host rocks and sediments near the seawater interface. | Late Proterozoic to Cambrian volcanism and sedimentation related to plate convergence and subduction, possibly in a microcontinental or island-arc setting distant from the ancestral North American continental plate. |
| Waning stages of hydrothermal activity in a failed massive sulfide system or a separate epithermal event. | Au-Ag-Te and base- and precious-metal telluride-selenide-bismuth mineralization. | Late stages of the volcanic phase or a later event. |
| Greenschist facies metamorphism, folding and thrust faulting. | Development of pervasive cleavage parallel to axial planes of tight to isoclinal folds, shearing of folds, development of greenschist-facies mineral assemblage, recrystallization of siliceous-barite and massive sulfide minerals in lenses that are elongate parallel to regional cleavage. | Middle to Late Ordovician Taconic collision of the Carolina terrane with the North American continent. |
| Late- to post-tectonic remobilization of quartz, barite, and gold. | Cross-cutting quartz and barite veins. | Late phases of Taconic orogeny, Middle Paleozoic thermal events, and (or) the Alleghanian orogeny. |
| High-angle faulting. | Offset of orebodies . | Mesozoic rifting. |
| Deep weathering and oxidation. | Removal of base-metal sulfides and precipitation of ferric oxide-hydroxide gossans and barite crystals in upper part of mineralized zone. | Quaternary exposure to ground water and atmospheric conditions. |

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PLATE 1 OF 3

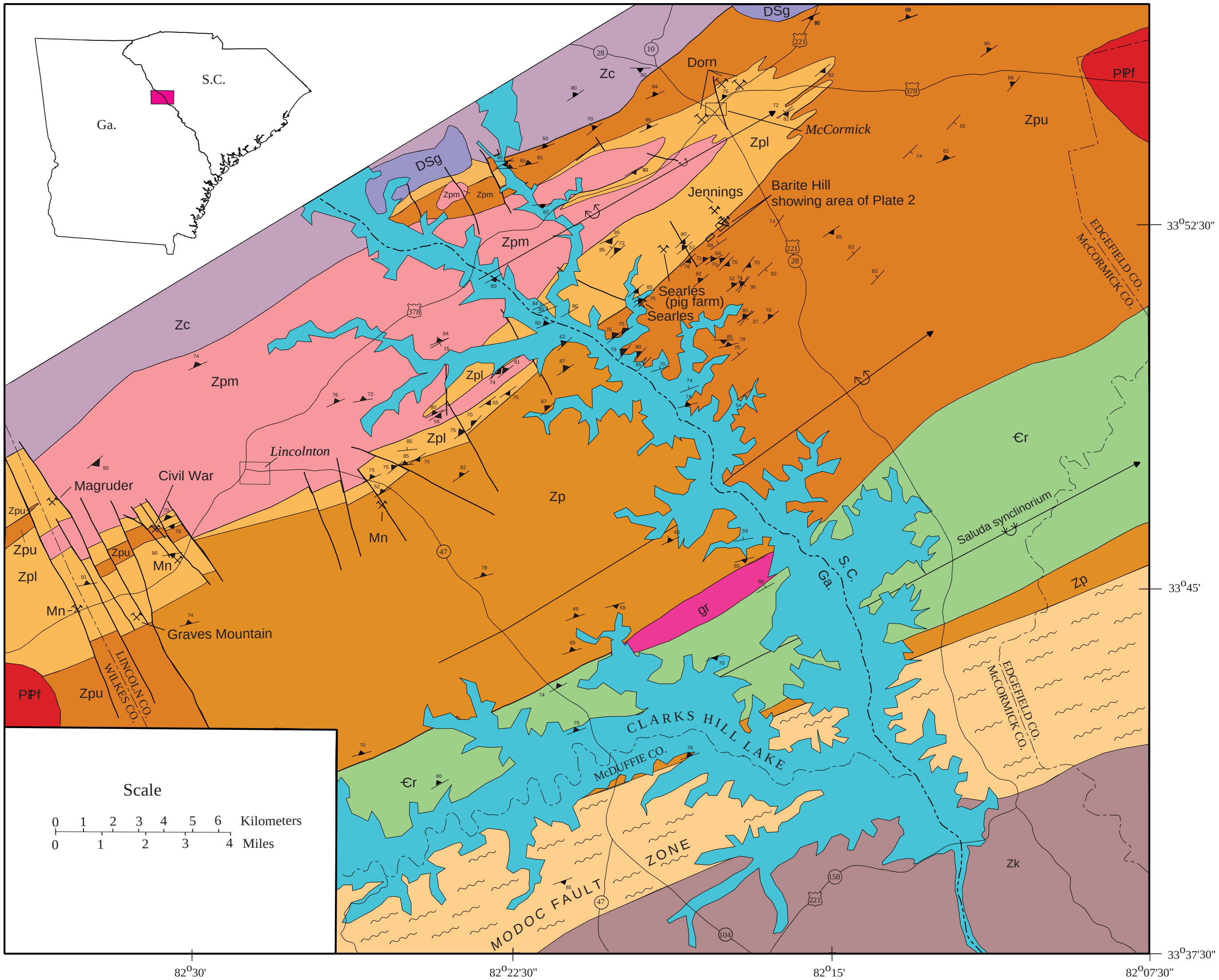


Plate 1. Bedrock geologic map showing the regional setting of the Barite Hill gold deposit and locations of other gold, base-metal sulfide, and alumino-silicate mines in of the Lincolnton-McCormick district.

## DESCRIPTION OF MAP UNITS

### PLUTONIC ROCKS

PIPf — Felsic plutonic rocks (Permian? and Pennsylvanian )--Granitic bodies that lack evidence of penetrative deformation except within the Modoc fault zone.

DSg — Gabbroic plutonic complexes (Devonian and Silurian?)--Gabbro, diorite, and syenite intrusive complexes. Show mild effects of middle Paleozoic deformation.

Modoc fault zone rocks, undivided--Includes quartzite, quartz-sericite schist, sericitic phyllite, biotite, amphibolite paragneiss, and banded amphibolite.

### CAROLINA SLATE BELT

€r — Richtex Formation (Middle Cambrian--Predominantly slate or fine-grained phyllite derived from shale or siltstone; includes poorly sorted feldspathic sandstone or graywacke locally. Well-developed slaty cleavage; original bedding generally visible in shales as minute ( 0.1 to 5 mm thick) graded laminations; sandstone beds, also graded, are 3 inches to 6 feet thick; thought to be turbidites. Locally includes andesitic or basaltic metatuffs and flows.

gr — Metagranodiorite to granite

Zp — Persimmon Fork Formation, Undivided (Secor and Wagener, 1968) (Late Proterozoic)--Mainly felsic-vitric and vitric-crystal metatuff; includes lithic and lithic-lapilli tuff, agglomerate, welded tuff, and mafic tuff. Includes the "felsic pyroclastic sequence" of Carpenter (1976).

Zpu — Upper pyroclastic unit--Metatuff, mostly dacitic associated with metasandstone, slate, and phyllite. Characterized by metatuff with predominantly quartz-feldspar matrix; locally preserved bedding in sandstone and shale; and the presence of chlorite, epidote, actinolite and tremolite schist and phyllite locally.

Zpl — Lower pyroclastic unit--Felsic metatuff, mainly rhyolitic, with predominantly sericite matrix; includes mafic flows and intercalated sedimentary lithologies that include tuffaceous graywacke, slate, and phyllite; also chert, barite, iron and manganese and base-metal sulfide-rich layers.

Zpm — Metarhyolite member of Lincolnton (Paris, 1976a)--Typically white to light pink porphyritic metarhyolite consisting of large phenocrysts of blue-gray quartz and blocky plagioclase in a cream-colored matrix of finely crystalline quartz and plagioclase; intercalated fine-grained non-porphyritic metadacite, minor mafic metatuff, mafic flows, and metasediments. Thought to represent flows, tuffs and intrusions. The porphyritic metarhyolite forms a tan to red-brown, sandy-clay saprolite with a concentration of blue-gray quartz pebbles at the surface. A siliceous hardpan is usually present within and above the saprolite.

### CHARLOTTE BELT

Zc — Rocks of the Charlotte belt, undivided (Late Proterozoic)--Mainly biotite paragneiss, mica schist, feldspathic quartzite, amphibolite, and hornblende gneiss with small amounts of calc-silicate rock and altered ultramafic rock.

### KIOKEE BELT

Zk — Rocks of the Kiokee belt, undivided (Late Proterozoic) -- Migmatitic complex made up of biotite amphibole paragneiss, leuocratic paragneiss, sillimanite schist, and amphibolite; locally contains ultramafic schist, serpentinite, and feldspathic metaquartzite.

### Symbols

Contact,approximately located

Fault

58 Strike and dip of bedding

70 Strike and dip of cleavage

Axial trace of overturned anticlinorium, showing direction of plunge

Axial trace of overturned synclinorium, showing direction of plunge

Mine

The Dorn, Jennings, Searles, Civil War, and Magruder Mines are past producers of gold associated with base-metal sulfides. Graves Mountain was a kyanite mine. Searles (pig farm) has recorded gold production and is an andalusite occurrence. The mines lableled Mn are past producers of manganese.

Geology adapted in part from mapping by Paris (1976a), Reusing (1979), Fay (1980), Goldstein (1980), Guthrie (1980), Biggs (1982), Delia (1982), Sibley (1982), and Maher and Sacks (1987).

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## DESCRIPTION OF MAP UNITS

m — Mafic to intermediate dike or sill--Massive to weakly foliated intrusive rock of basaltic to andesitic composition. Punky, orange-brown to light red weathering; post-dates mineralization.

**Persimmon Fork Formation (Late Proterozoic)**

**Upper pyroclastic unit**

ud — Metadacite porphyry--Massive to weakly foliated volcanic rock with alteration and baking at contacts (flow or shallow intrusive). Typically contains subhedral feldspar and quartz phenocrysts in aphanitic, pale green (chloritic), siliceous matrix (white where altered).

us — Metavolcanic and metasedimentary rocks—Immature, thin-bedded to finely laminated, fine- to coarse-grained, volcanogenic metasedimentary rock interlayered with felsic to intermediate metatuff. Metatuff is typically chloritic and contains quartz and feldspar as crystals and in the matrix. Metasedimentary rocks locally preserve grading and turbiditic bedding. Includes marble lenses locally. Alteration minerals include talc, tremolite, and actinolite.

**Persimmon Fork Formation (Late Proterozoic)**

**Lower pyroclastic unit**

lms — Submassive sulfide or gossan--Sulfide-rich rock; commonly with barite.

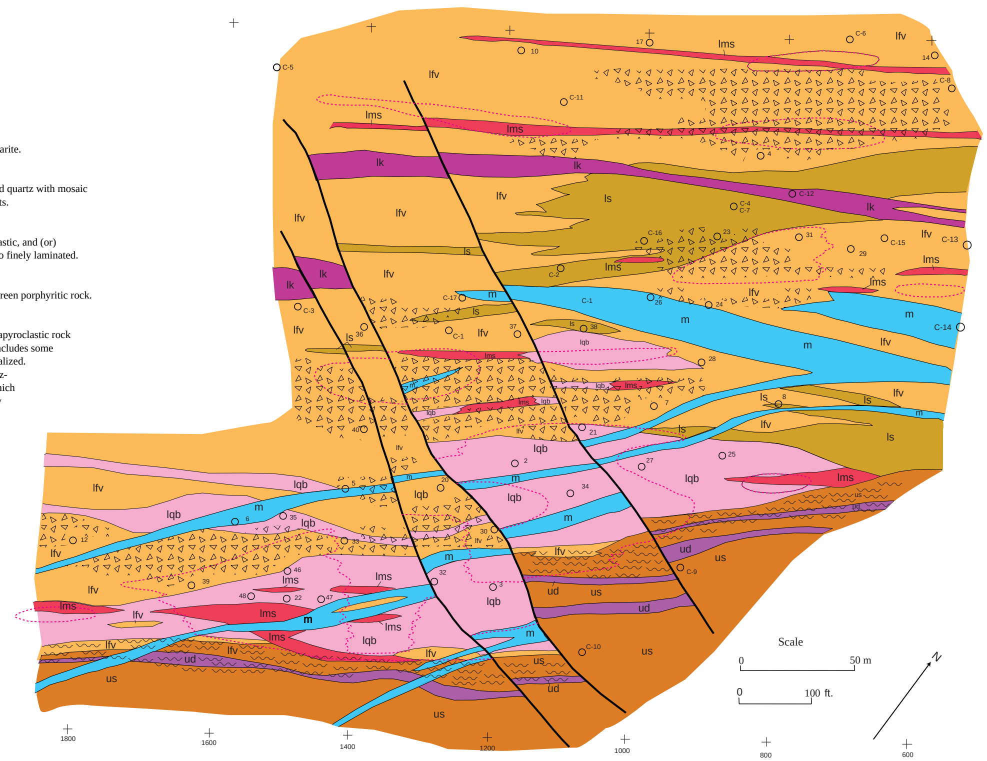
lqb — Siliceous barite-rich rock--Quartz-barite rock; typically fine-grained quartz with mosaic texture and later barite in areas between quartz clusters or in veinlets.

ls — Metasedimentary rock--Immature, coarse to fine-grained volcaniclastic, and (or) epiclastic, rocks, typically tan to green (chloritic). Thinly bedded to finely laminated. Intercalated with felsic tuff.

lk — Metakeratophyre--Fine-grained, massive to weakly foliated, light green porphyritic rock. Similar in hand specimen to metadacite porphyry.

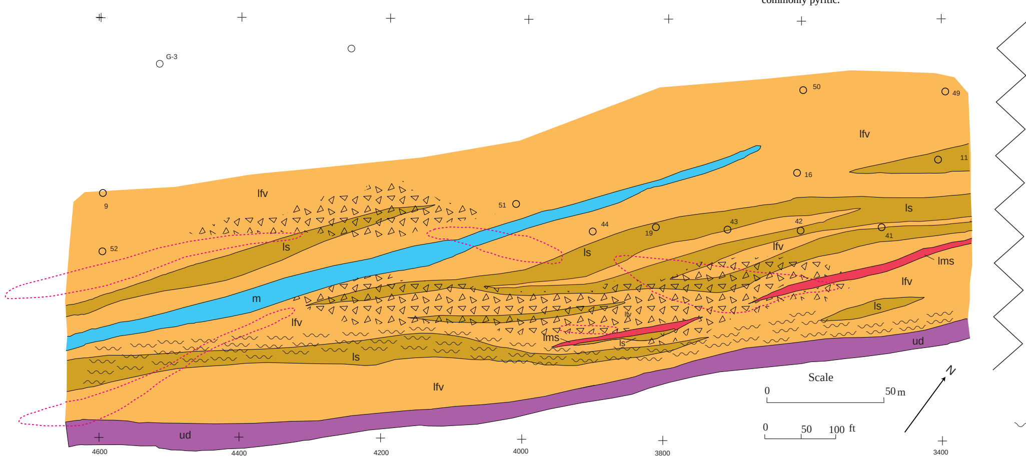
lfv — Felsic metavolcanic rock—Mostly well-foliated, pale-colored, metapyroclastic rock with subhedral quartz crystals and fragmental textures common. Includes some volcanogenic metasedimentary rock. Commonly altered and mineralized. Includes: a. sericitized lapilli schist, b. polylithic, fragmental, quartz-crystal metatuff, c. fine-grained sericitized metatuff (vitric tuff), which is indistinguishable from sericitized, fine-grained, metasedimentary rock in hand specimen, and d. fine-grained, siliceous vitric tuff, commonly pyritic.

## MAIN PIT AREA




Map modified from Padgett and Watkins (1988).

## RAINSFORD PIT AREA




### Symbols

Contact

Normal fault

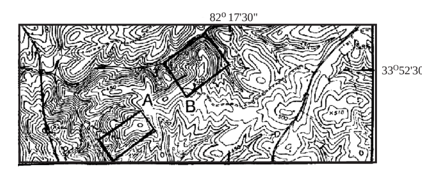
Ductile shear zone

Fragmental rocks; pyroclastic, tectonic, or hydrothermal breccias

Gold-enriched zone (average > 1 ppm)

C-3 — Drill-hole location. Most holes were drilled at an angle of about 45° a bearing of 145°. All BHD prefixes of drill hole numbers are omitted; other prefixes of drill-hole numbers (C and G) are shown.

\+ — Location of points on exploration grid. Measurements are hundreds of feet west of a base line.




Location of: A. Rainsford and B. Main Pit areas. Base from U.S. Geological Survey 7.5 minute quadrangle maps: McCormick, S.C., 1964, photorevised, 1986, and Plum Branch, S.C., 1964, photorevised, 1986.

Plate 2. Geology of the Barite Hill Gold Deposit, South Carolina



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## DESCRIPTION OF UNITS

**m** — Mafic to intermediate dike or sill--Massive to weakly foliated intrusive rock of probable basaltic to andesitic composition. Punky, orange-brown to light red weathering; post-date mineralization.

### Persimmon Fork Formation (Late Proterozoic)

#### Upper pyroclastic unit

**ud** — Metadacite porphyry--Massive to weakly foliated volcanic rock (flow or shallow intrusive) in the upper pyroclastic unit with alteration and thermal metamorphism at contacts. Typically contains subhedral feldspar and quartz phenocrysts in aphanitic, pale green (chloritic), siliceous matrix (white where altered).

**us** — Metavolcanic and metasedimentary rocks--Immature, thinly bedded to finely laminated, fine- to coarse-grained, volcanogenic, metasedimentary rock interlayered with felsic to intermediate metatuff. Metatuff is typically chloritic and contains quartz and feldspar as crystals and in the matrix. Metasedimentary rocks locally preserve grading, rip-up clasts, and turbiditic bedding. Inclues marble lenses locally. Alteration minerals include talc, tremolite, and actinolite.

#### Lower pyroclastic unit

**lms** — Massive to submassive sulfide or gossan--Sulfide-rich rock, commonly with barite.

**lqb** — Siliceous barite-rich rock--Quartz-barite rock; typically fine-grained quartz with mosaic texture and later barite in areas between quartz clusters or in veinlets.

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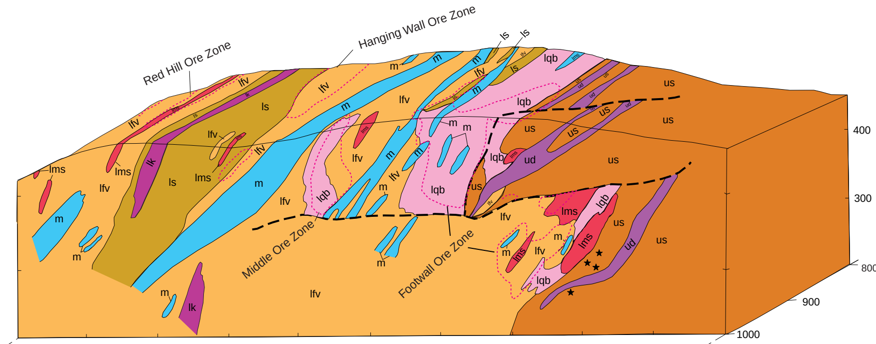
#### Symbols

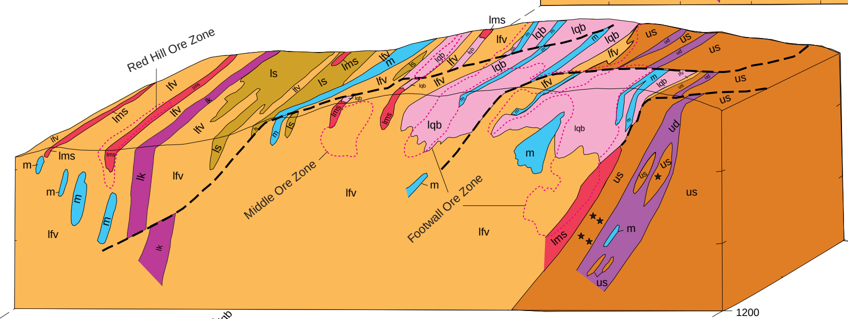
Gold-enriched zones (average > 1ppm), approximately located

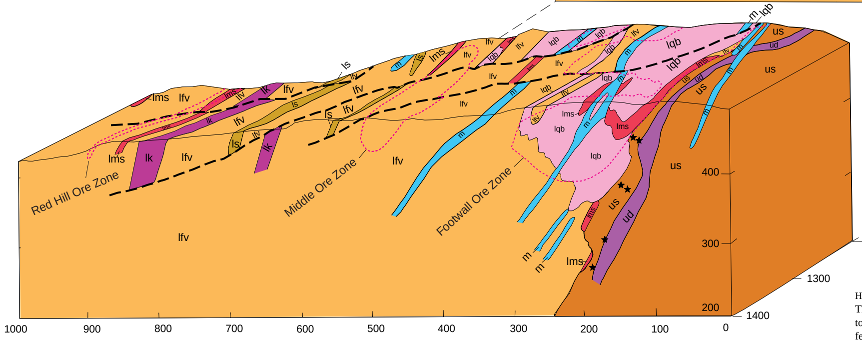
★★ Talc-tremolite alteration (in drill core)

Contact, approximately located

Fault, approximately located




Horizontal measurements are in feet corresponding to exploration grid points shown on Plate 2. The 1400 to 1800 sections are from 0 feet, the lowermost set of grid points in the Main Pit map, to 1000 feet, the uppermost set of grid points in the Main Pit map. Vertical measurements are in feet above mean sea level.

Plate 3. Block diagrams through the Main Pit, Barite Hill Mine, South Carolina



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