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Trip to Morenci September 29-30, 1950 to attend
A. I. M. E. Geological Meeting

Friday Sept. 29th. Papers on general Morenci geology by Louis Reber, and on leached outcrops at Morenci by Lewis A. Smith. Limited discussion. Trip through pit in afternoon with special attention to leached cappings. On Saturday, Sept. 30th general discussion from 8 - 9 AM, then trip to Metcalf area to see breccia areas along highway.

Pit now treating 52,000 tons per day with additional 75,000 tons perd ay waste stripping. Pit limits have been widely extended by exploratory drilling to north and west. Ore also reported to extend in considerable amount into granite area east of Chase Creek, and north of Hanna ground. Also state that pit will eventually extend through Humbolt area, but will be held until last extraction; now leaching in that area/ Considerable oxide ore being found north of main pit area where stripping now in progress which is being specially stockpiled for possible later leaching either in leaching plant or dump leaching.

As before little attention paid to rock relations in pit area. So called granite porphyry probably intrudes fine grained rock in lower part of pit on 4500 bench(present lowest). On 4700 ? bench fine grained dark rock about in center of pit contains good chalcocite mineralization. Esperanza breccia structure not observed - probably would be exposed on higher benches than seen. Copper Mt. fault not clearly observed, but is possible some old stoped areas may have

been along fault. Oxidation in pit appears now to extend to greater depth than previously; explained by Reber as influence of Copper Mt. fault cutting across pit. Many well mineralized stringers south of approximate CopperMt. fault area in contract to leaner material seen on previous visits.

Emphasis on leached outcrops in observations with detailed chart prepared to show progress of leaching to produce various types of chalcocite enrichment. No importance given to structure. Great deal of detail wrk done on actual minerals in leached materials, and emphasis on amount of enrichmnet possible in relation to reactive or non-reactive gangue. Sericite non-reactive, clay minerals, prctically non-reactive, and fresh orthoclase said to inhibit any enrichment processes. (?)

Large breccia area opposite Metcalf area s shows granite (?) with quartz stringers in fragments, quartzite, possible all sealed with fone quartz porphyry matrix. Locally some late iorn oxide quartz mineralization with some copper oxide mineralization. Mineralization generally weak, and considerable specularite appears in western part of mineralized area where cut by arroyo. Also strong fault zone cutting through breccia near western limit but was not traced to east. In general, probable increase in amount of mineralization necessary with depth to make breccia of possible economic importance in areas seen.

Apparently now converting electric-battery locomotives to diesel electric types for haulage across benches. Using 42-T drills, drilling up to 100 ft. day, something over 60 ft, normal. 50 ft. benches, with holes

drilled to 60 ft.; use bagged powder and two strands Primacord with charge at bottom of hole; crushed ore for stemming. All holes near ore sampled, using leached material as guide. Cutoff and grade not given. About 900 men working in pit, twelve days on then two off.

4/11/52 RBH - visit with LR + LS at Tucson

Recovering 500-900# MoS_2 per day at Henrici - heads ± .0075% Mo

copper grade down to 0.25 - 0.35% Cu when Mo content is high enough in particular parts of pit.

Exploration continuing to N of pit - drilling continuing.

GENERAL NOTES

Trip to Morenci Open Pit Wednesday, Oct. 29, 1947, and conversations with Dr. Louis Reber and Mr. Louis Smith, geologists, Phelps Dodge Corporation, at Morenci, Oct. 30th.

4850 Bench.

Near center of pit from north to south, top of bench shows old stoped area, probably top slice, which is reported to have reached maximum area of 400 x 400 feet. This area appears to be about in location of breccia area observed on higher bench in 1945. At shovel, which was at north edge of breccia area, there was much dark rock with heavy iron (Magnetite ?) and some later copper mineralization. General country rock in this area is feldspathic porphyry (called quartz monzonite porphyry by Morenci geologists). There is abundant copper oxide mineralization, probably post-stoping, but there is also abundant good chalcocite mineralization, and this part of the pit is reported to assay 1.5% copper. Details of structure could not be closely observed because of the old stoping, and muck near sill of bench. However, this is very likely the downward extension of the brecciated area seen before. The dark rock was reported to be a basic dike rock, but from the type of mineralization, etc., it could be highly altered and mineralized limestone included in the breccia

area. The Morenci geologists did not seem definite about the type of rock, although they stated this rock occured in definite dike-like form in the pit. Possibly the occurences they mention are not exactly similar to the material seen. Toward the south end of the bench the feldspathic porphyry contains quartzite inclusions as observed on benches above in 1945. Toward the north end of the bench the rocks are entirely quartz porphyry, called granite porphyry, which is apparently believed to be the same as coarsely crystalline granite reported to have been found in the east end of the pit on the lowest bench.

4950 Bench.

Near the north end of bench "granite porphyry" contains much quartzite in area which is showing considerable copper oxide mineralization - classed as brochantite and antlerite, with some malachite and chrysocolla, and little azurite. This area is apparently in a rock breccia, and is possibly a mineralized breccia structure. Mineralization in this part of the pit is generally oxidized, and no detailed observation was possible. However, it appears not unlikely that there is another breccia structure in this part of the quartz porphyry. No similar structure in the quartz porphyry was

observed in 1945. Further toward the south in the feldspathic porphyry, large areas of quartzite and quartz porphyry are found. These appear to be large inclusions, and are probably close to the mineralized breccia noted on the 4850 bench, lying on the west side of this structure. This bench is also now almost entirely in oxide material, but there was a sulphide "cupola" approximately above the breccia area. Toward the south end of the bench there is a strong fault structure, called the Copper Mt. fault, which strikes northwest and dips $\nearrow 70^{\circ}$ to the northeast. In the footwall of this fault weakly mineralized, oxidized quartz porphyry is found, and very little ore is reported below the oxidized zone in this rock. On the hanging wall of the fault there is feldspathic porphyry, and ore is reported to be found in this rock northeast of the fault zone.

Conversations with the Morenci geologists indicate a complete neglect of study of the geologic structures in the pit, or definite ideas about the intrusive masses, and their mineralization. They have, however, done extensive work on the leached outcrops, and have many specimen suites which show progress of leaching and resultant oxidation products. They are convinced that the chemical activity of gangue minerals, principally feldspars,

may determine possibilities for secondary enrichment. A sericite gangue is believed to be neutral, but an unaltered feldspar gangue, such as at Ajo, would materially retard, or possibly prevent, secondary enrichment processes. Moist climates and abundant iron content might not be sufficient to offset this gangue effect.

In the specimen suites observed, many of which are from narrow veins structures, emphasis is given to the kind of rock and structure of the limonite as a determining factor in the amount of enrichment that can be expected below. "Fluffy" limonite of a dark maroon to brownish color is believed best, and is believed to have originated from oxidation of a pyrite-chalcocite enriched-mineralization. Dark cellular boxworks retaining pyrite shapes with little dark brown to black oxide remaining in the boxes is believed to derive from thin chalcocite coatings on pyrite. Although they do not believe that color is a good indicator, all of the oxides in specimens reported to represent good underlying mineralization are dark brown, dark maroon to black in color when thoroughly oxidized. In oxidation of mineralization which contains a relatively high iron to copper ratio, succession shows development of borgstromite

(iron sulphate) which migrates outward from mineral grains, and with further oxidation may develop a orange coloration. Two classes of jarosite, one unstable and soluble in water, are reported to develop directly from pyrite. (This may be another mineral.) Stable jarosite may also develop from the high iron minerals, and remain in cavities as well as stain the surrounding rocks. It should be noted that all of the successions which have been developed take little account of the structural conditions in the orebody, except where the specimens have been collected from high grade veins which have been followed down. It is not known how many of the specimens of reported complete oxidation are from actual surface exposures, and how many simply from apparently completely oxidized portions of the mineralization. The Morenci geologists appear to have been largely influenced by Roland Blanchard in their belief that gangue alteration may be a major factor in secondary enrichment processes.

Currently further exploration by churn drilling is being carried on north of the pit in quartz porphyry, and some spotty low grade ore is being found. The pit is producing about 50,000 tons per day with a grade of 1.22% copper. The cut off grade is now 0.4% copper, and some material as low as 0.3% may be taken. Production continued for twelve

day period when the plant is then down for two days. Silica for smelter flux is now obtained from a cut in quartzite near the smelter. Churn drill hole stemming is crushed ore from the concentrator

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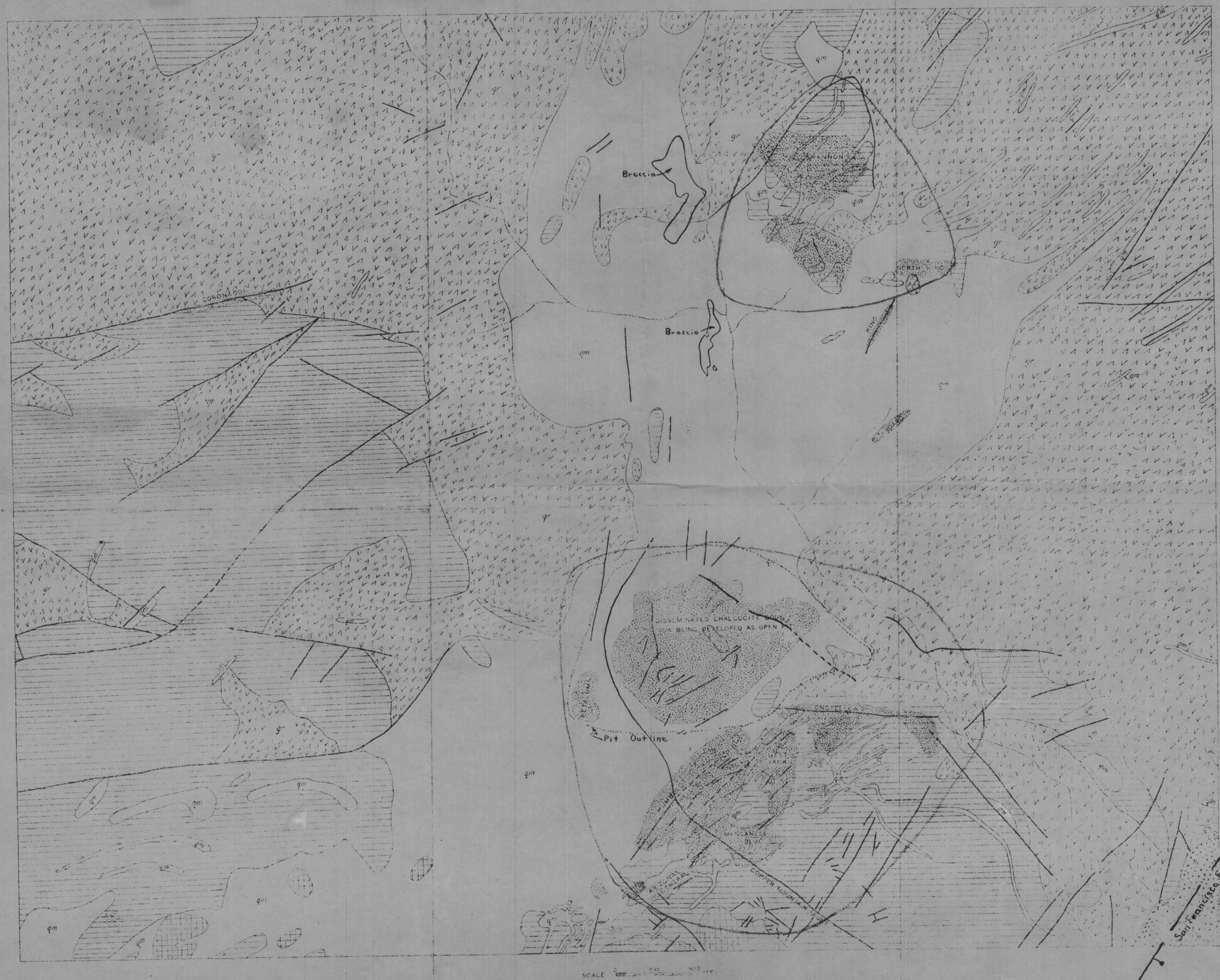

Plate XVI.—Geologic map of part of the Clifton-Morenci district, showing distribution of principal ore bodies. (Modified from Lindgren.)

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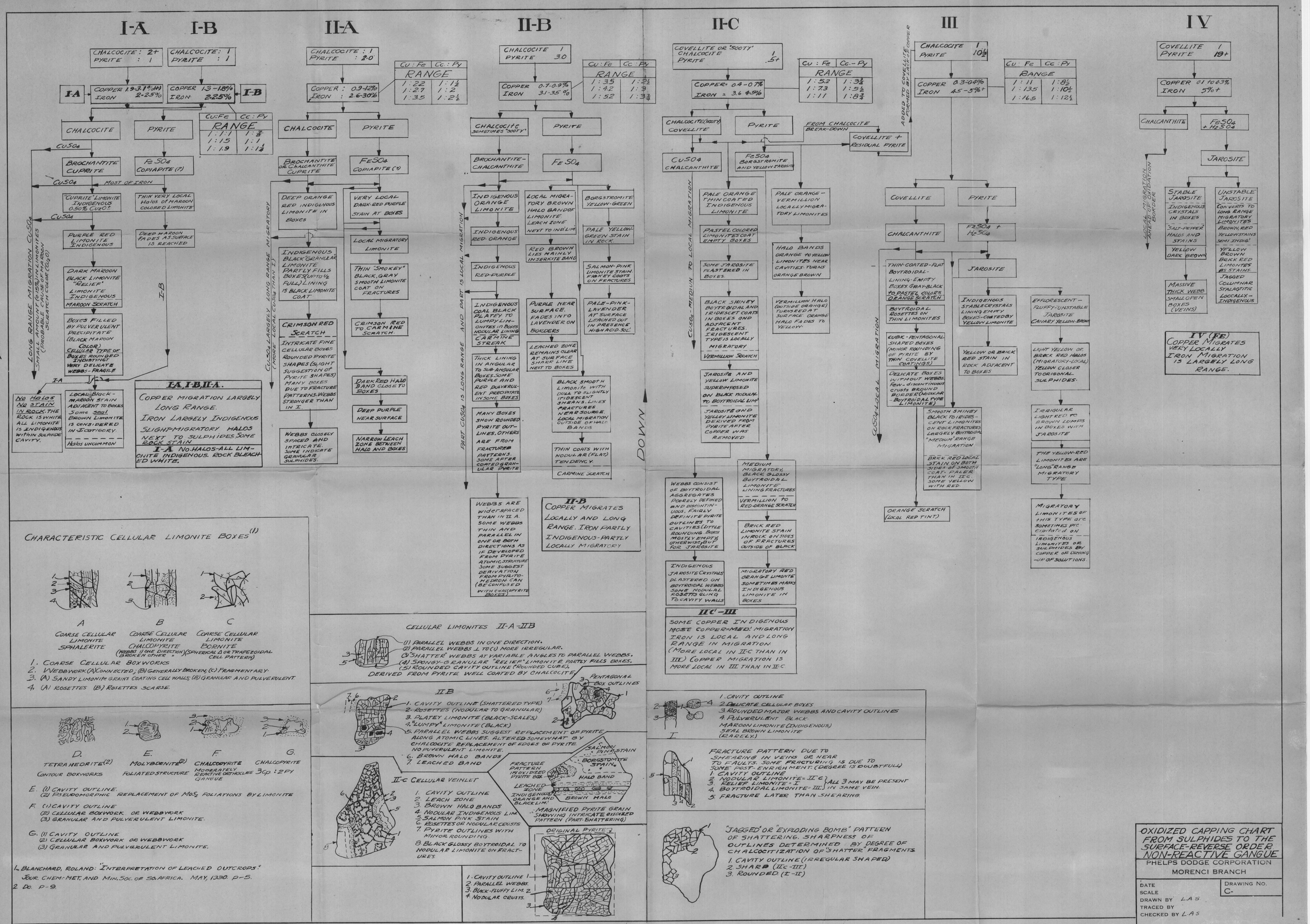
I-A
I-B
CHALCOCITE : 2+
PYRITE : 1
CHALCOCITE : 1
PYRITE : 1
COPPER 1.9-3.1% (4+)
IRON 2-2.5%
COPPER 1.3-1.8%
IRON 2.2.5%
Cu:Fe | Cc:Py
RANGE
1:1.1 | 1:⅜
1:1.5 | 1:1
1:1.9 | 1:1¼
CHALCOCITE
PYRITE
CuSO4
BROCHANTITE CUPRITE
FeSO4 COPIAPITE (?)
MOST OF IRON
"CUPRITE" LIMONITE INDIGENOUS 0.50% Cu2O
THIN VERY LOCAL Halos OF MAROON COLORED LIMONITE
PURPLE RED LIMONITE INDIGENOUS
DEEP MAROON FADES AS SURFACE IS REACHED
DARK MAROON BLACK LIMONITE "RELIEF" LIMONITE INDIGENOUS
MAROON SCRATCH
BOXES FILLED BY PULVERULENT PRECIPITATE (BLACK MAROON COLOR) CELLULAR TYPE OF BOXES ROUNDED INDISTINCT VERY DELICATE WEBBS - FRAGILE
LONG RANGE MIGRATION CuSO4
SMALL AMOUNT (0.15%) IN LIMONITES (PROBABLE CAUSE OF MAROON SCRATCH COLOR Cu2O)
No Halos
No STAIN IN ROCK. THE ROCK IS WHITE ALL LIMONITE IS INDIGENOUS within SULPHIDE CAVITY.
LOCAL: Black - MAROON STAIN ADJACENT TO BOXES Some seal Brown Limonite IS CONSIDERED IN I COTEGORY.
Halos UNCOMMON
I-A, I-B, II-A.
COPPER MIGRATION LARGELY LONG RANGE.
IRON LARGELY INDIGENOUS
SLIGHT-MIGRATORY HALOS NEXT TO SULPHIDES. SOME ROCK STAIN
I-A No HALOS-ALL LIMONITE INDIGENOUS. ROCK BLEACHED WHITE.
II-A
CHALCOCITE : 1
PYRITE : 2.0
COPPER : 0.9-1.2%
IRON : 2.6-3.0%
Cu:Fe | Cc:Py
RANGE
1:2.2 | 1:1½
1:2.7 | 1:2
1:3.5 | 1:2½
CHALCOCITE
PYRITE
BROCHANTITE OR CHALCANTHITE CUPRITE
FeSO4 COPIAPITE (?)
DEEP ORANGE RED INDIGENOUS LIMONITE IN BOXES
VERY LOCAL DARK-RED PURPLE STAIN AT BOXES
CuSO4 LARGELY LONG RANGE MIGRATORY (MORE LOCAL CuSO4 THAN I)
INDIGENOUS BLACK GRANULAR LIMONITE PARTLY FILLS BOXES (UP TO ½ FULL) LINING IS BLACK LIMONITE COAT
LOCAL MIGRATORY LIMONITE
THIN "SMOKEY" BLACK, GRAY SMOOTH LIMONITE COAT ON FRACTURES
CRIMSON RED SCRATCH
INTRICATE FINE CELLULAR BOXES ROUNDED PYRITE SHAPES (SLIGHT SUGGESTION OF PYRITE SHAPES) MANY BOXES DUE TO FRACTURE PATTERNS. WEBBS STRONGER THAN IN I.
CRIMSON RED TO CARMINE SCRATCH.
DARK RED HALO BAND CLOSE TO BOXES
DEEP PURPLE NEAR SURFACE
NARROW LEACH ZONE BETWEEN HALO AND BOXES
WEBBS CLOSELY SPACED AND INTRICATE. SOME INDICATE GRANULAR SULPHIDES.
II-B
CHALCOCITE 1
PYRITE 3.0
COPPER 0.7-0.9%
IRON 3.1-3.5%
Cu:Fe | Cc:Py
RANGE
1:3.5 | 1:2½
1:4.2 | 1:3
1:5.2 | 1:3¾
CHALCOCITE SOMETIMES "SOOTY"
PYRITE
BROCHANTITE-CHALCANTHITE
FeSO4
INDIGENOUS ORANGE LIMONITE
LOCAL MIGRATORY BROWN HALO BAND OF LIMONITE LEACH ZONE NEXT TO INDIG LIM.
BORGSTROMITE YELLOW-GREEN
INDIGENOUS RED-ORANGE
RED BROWN LIES MAINLY IN SERICITE BAND
PALE YELLOW-GREEN STAIN IN ROCK.
INDIGENOUS RED-PURPLE
SALMON-PINK LIMONITE STAIN & MOKEY COATS ON FRACTURES
FAST CuSO4 IS LONG RANGE AND PART IS LOCAL MIGRATION
INDIGENOUS COAL BLACK PLATEY TO LUMPY LIMONITES IN BOXES NODULAR LINING CARMINE STREAK
PURPLE NEAR SURFACE. FADES INTO LAVENDER ON BORDERS
PALE-PINK-LAVENDER AT SURFACE LEACHED OUT IN PRESENCE HIGH ACID SOL.
THICK LINING IN ANGULAR TO SUB-ANGULAR BOXES. SOME PURPLE AND RED PULVERULENT PRECIPITATE IN SOME BOXES
LEACHED ZONE REMAINS CLEAR AT SURFACE SHARP LINE NEXT TO BOXES
BLACK SMOOTH LIMONITE WITH DULL TO SLIGHTLY IRIDESCENT SHEARS. LINES FRACTURES NEAR SOURCE. LOCAL MIGRATION OUTSIDE OF HALO BANDS
MANY BOXES SHOW ROUNDED PYRITE OUTLINES. OTHERS ARE FROM FRACTURED PATTERNS SOME AFTER CORTED GRANULAR PYRITE
THIN COATS WITH NODULAR (FLAT) TENDENCY.
CARMINE SCRATCH
DOWN
WEBBS ARE wider spaced THAN IN II A. SOME WEBBS THIN AND PARALLEL IN ONE OR BOTH DIRECTIONS AS IF DEVELOPED FROM PYRITE ATOMIC STRUCTURE. SOME SUGGEST DERIVATION FROM PYRITOHEDRON. CAN BE CONFUSED WITH CHALCOPYRITE BOXES.
II-B
COPPER MIGRATES LOCALLY AND LONG RANGE. IRON PARTLY INDIGENOUS-PARTLY LOCALLY MIGRATORY
II-C
COVELLITE OR "SOOTY" CHALCOCITE 1
PYRITE .5+
COPPER: 0.4-0.7%
IRON = 3.6-4.5%
Cu:Fe | Cc:-Py
RANGE
1:5.2 | 1:3¾
1:7.3 | 1:5½
1:11 | 1:8¾
CHALCOCITE (SOOTY) COVELLITE
PYRITE
FROM CHALCOCITE BREAK-DOWN
COVELLITE + RESIDUAL PYRITE
CuSO4 CHALCANTHITE
FeSO4 BORGSTROMITE AND YELLOW JAROSITE
PALE ORANGE THIN COATED INDIGENOUS LIMONITE
PALE ORANGE-VERMILLION LOCALLY MIGRATORY LIMONITES
PASTEL COLORED LIMONITES COAT EMPTY BOXES
HALO BANDS ORANGE TO YELLOW LIMONITES NEAR CAVITIES. TURNS ORANGE BROWN
SOME JAROSITE PLASTERED IN BOXES.
VERMILLION HALO (OUTSIDE ORANGE) TURNS RED AT SURFACE. ORANGE HALO FADES TO YELLOW.
BLACK SHINEY BOYTEOIDAL AND IRIDESCENT COATS IN BOXES AND ADJACENT FRACTURES. IRIDESCENT TYPE IS LOCALLY MIGRATORY
VERMILLION SCRATCH
JAROSITE AND YELLOW LIMONITE SUPERIMPOSED ON BLACK NODULAR TO BOYTROIDAL LIM.
JAROSITE ON YELLOW LIMONITE DERIVED FROM PYRITE AFTER COPPER WAS REMOVED
CuSO4 - MEDIUM TO LOCAL MIGRATION
WEBBS CONSIST OF BOYTROIDAL AGGREGATES POORLY DEFINED AND DISCONTINUOUS. FAIRLY DEFINITE PYRITE OUTLINES TO CAVITIES (LITTLE ROUNDING BOXES MOSTLY EMPTY, OTHERWISE, BUT FOR JAROSITE
MEDIUM MIGRATORY, BLACK GLOSSY BOYTROIDAL LIMONITE LINING FRACTURES
VERMILLION TO RED-ORANGE SCRATCH
BRICK RED LIMONITE STAIN IN ROCK ON SIDES OF FRACTURES OUTSIDE OF BLACK
INDIGENOUS JAROSITE CRYSTALS PLASTERED ON BOYTROIDAL WEBBS SOME NODULAR ROSETTS CLING TO CAVITY WALLS
MIGRATORY RED ORANGE LIMONITE SOMETIMES MARKS INDIGENOUS LIMONITE IN BOXES
II C - III
SOME COPPER IN DIGENOUS MOST COPPER = MED. MIGRATION IRON IS LOCAL AND LONG RANGE IN MIGRATION. (MORE LOCAL IN II-C THAN IN III) COPPER MIGRATION IS MORE LOCAL IN III THAN IN II-C
III
ADDED TO COVELLITE FORMED BY LEACH OF COPPER
CHALCOCITE 1
PYRITE 10½
COPPER 0.3-0.4%
IRON 4.5-5%+
Cu:Fe | Cc:Py
RANGE
1:11 | 1:8½
1:13.5 | 1:10½
1:16.5 | 1:12½
COVELLITE
PYRITE
CHALCANTHITE
FeSO4 + H2SO4
THIN-COATED-FLAT BOYTROIDAL-LINING-EMPTY BOXES GRAY-BLACK TO PASTEL COLORS ORANGE SCRATCH
JAROSITE
INDIGENOUS STABLE CRYSTALS LINING EMPTY BOXES-COATED BY YELLOW LIMONITE
EFFLORESCENT - FLUFFY-UNSTABLE JAROSITE CANARY YELLOW-BROWN
BOYTROIDAL ROSETTES ON THIN LIMONITES
CUBIC-PENTAGONAL SHAPED BOXES (MINOR ROUNDING OF PYRITE BY THIN COVELLITE COATINGS)
YELLOW OR BRICK RED STAIN IN ROCK ADJACENT TO BOXES
LIGHT YELLOW OR BRICK RED HALOS (MIGRATORY-LOCAL) YELLOW CLOSER TO ORIGINAL SULPHIDES.
CuSO4 - LOCAL MIGRATION
DELICATE BOXES WITHOUT WEBBS. FEW - discontinuous crusts BROUND BORDER (WEAKER - BOYTROIDAL TYPE LIMONITE)
SMOOTH SHINEY BLACK TO IRIDESCENT LIMONITES ON ROCK FRACTURES. LARGELY BOYTROIDAL "MEDIUM" RANGE MIGRATION
BRICK RED LOCAL STAIN ON BOTH SIDES OF SMOOTH COAT. PALER THAN IN II C. SOME YELLOW WITH RED.
IRREGULAR LIGHT RED TO BROWN LUMPS IN BOXES WITH JAROSITE
THE YELLOW-RED LIMONITES ARE "LONG RANGE" MIGRATORY TYPE
ORANGE SCRATCH (LOCAL RED TINT)
MIGRATORY LIMONITES OF THIS TYPE ARE SOMETIMES PRECIPITATED ON INDIGENOUS LIMONITES OR SULPHIDES BY COPPER OR LOWING-UP OF SOLUTIONS.
IV
COVELLITE 1
PYRITE 19+
COPPER 0.1 TO 0.3%
IRON 5%+
CHALCANTHITE
FeSO4 + H2SO4
JAROSITE
LOCAL MIGRATION AHEAD OF OXIDATION BORDER
STABLE JAROSITE
INDIGENOUS CRYSTALS IN BOXES
SALT-PEPER HALOS AND STAINS
YELLOW DARK BROWN
UNSTABLE JAROSITE
CONVERTS TO LONG RANGE MIGRATORY LIMONITES
BROWN, RED YELLOW STAINS SEMI INDIG!
YELLOW BROWN BRICK RED LIMONITES AS STAINS.
JAGGED COLUMNAR STALAGTITIC LOCALLY - INDIGENOUS
MASSIVE THICK WEBB SMALL OPEN BOXES (VEINS)
IV (FE)
COPPER MIGRATES VERY LOCALLY
IRON MIGRATION IS LARGELY LONG RANGE.
CHARACTERISTIC CELLULAR LIMONITE BOXES (1)
A
COARSE CELLULAR LIMONITE SPHALERITE
B
COARSE CELLULAR LIMONITE CHALCOPYRITE (WEBBS 1) ONE DIRECTION) (BROKEN OTHER "
C
COARSE CELLULAR LIMONITE BORNITE (SPHERICAL OR TRAPEZOIDAL CELL PATTERN)
1. COARSE CELLULAR BOXWORKS
2. WEBBWORK (A) CONNECTED, (B) GENERALLY BROKEN, (C) FRAGMENTARY.
3. (A) SANDY LIMONITE GRAINS COATING CELL WALLS; (B) GRANULAR AND PULVERULENT.
4. (A) ROSETTES (B) ROSETTES SCARSE.
D.
TETRAHEDRITE (2)
CONTOUR BOXWORKS
E.
MOLYBDENITE (2)
FOLIATED STRUCTURE
F.
CHALCOPYRITE
MODERATELY REACTIVE ORTHOCLASE GANGUE
G.
CHALCOPYRITE
3Cp : 2Py
E. (1) CAVITY OUTLINE.
(2) PSEUDOMORPHIC REPLACEMENT OF MoS2 FOLIATIONS BY LIMONITE
F. (1) CAVITY OUTLINE
(2) CELLULAR BOXWORK OR WEBBWORK
(3) GRANULAR AND PULVERULENT LIMONITE.
G. (1) CAVITY OUTLINE
(2) CELLULAR BOXWORK OR WEBBWORK
(3) GRANULAR AND PULVERULENT LIMONITE.
1. BLANCHARD, ROLAND: "INTERPRETATION OF LEACHED OUTCROPS." JOUR. CHEM.-MET. AND MIN. SOC. OF SO. AFRICA. MAY, 1930. P-5.
2. DO. P-9.
CELLULAR LIMONITES II-A - II-B
(1) PARALLEL WEBBS IN ONE DIRECTION.
(2) PARALLEL WEBBS ⊥ TO (1) MORE IRREGULAR.
(3) "SHATTER" WEBBS AT VARIABLE ANGLES TO PARALLEL WEBBS.
(4) SANDY-GRANULAR "RELIEF" LIMONITE PARTLY FILLS BOXES.
(5) ROUNDED CAVITY OUTLINE (ROUNDED CUBE).
DERIVED FROM PYRITE WELL COATED BY CHALCOCITE
II B
1. CAVITY OUTLINE (SHATTERED TYPE)
2. ROSETTES (NODULAR TO GRANULAR)
3. PLATEY LIMONITE (BLACK-SCALES)
4. "LUMPY" LIMONITE (BLACK)
5. PARALLEL WEBBS SUGGEST REPLACEMENT OF PYRITE ALONG ATOMIC LINES. ALTERED SOMEWHAT BY CHALCOCITE REPLACEMENT OF EDGES OF PYRITE. NO PULVERULENT LIMONITE.
6. BROWN HALO BANDS
7. LEACHED BAND
PENTAGONAL BOX OUTLINES
II-C CELLULAR VEINLET
1. CAVITY OUTLINE
2. LEACH ZONE
3. BROWN HALO BANDS
4. NODULAR INDIGENOUS LIM.
5. SALMON PINK STAIN
6. ROSETTES OR NODULAR CRUSTS
7. PYRITE OUTLINES WITH MINOR ROUNDING.
8. BLACK GLOSSY BOYTROIDAL TO NODULAR LIMONITE ON FRACTURES
FRACTURE PATTERN IN OXIDIZED PYRITE BOX
SALMON PINK STAIN
BORGSTOMITE STAIN
HALO BAND
LEACHED ZONE
INDIGENOUS ORANGE AND "BLACK LIM."
BROWN HALO
MAGNIFIED PYRITE GRAIN SHOWING INTRICATE OXIDIZED PATTERN (PART SHATTERING)
ORIGINAL PYRITE
1. CAVITY OUTLINE
2. PARALLEL WEBBS.
3. BLACK-FLUFFY LIM.
4. NODULAR CRUSTS.
1. CAVITY OUTLINE
2. DELICATE CELLULAR BOXES
3. ROUNDED MAJOR WEBBS AND CAVITY OUTLINES
4. PULVERULENT BLACK-MAROON LIMONITE (INDIGENOUS) SEAL BROWN LIMONITE (RARELY.)
I
FRACTURE PATTERN DUE TO SHEARING IN VEINS OR NEAR TO FAULTS. SOME FRACTURING IS DUE TO SOME POST-ENRICHMENT. (DEGREE IS DOUBTFUL)
1. CAVITY OUTLINE
2. NODULAR LIMONITE = II C
3. RELIEF LIMONITE = I
4. BOYTROIDAL LIMONITE = III
ALL 3 MAY BE PRESENT IN SAME VEIN.
5. FRACTURE LATER THAN SHEARING
"JAGGED" OR "EXPLODING BOMB" PATTERN OF SHATTERING. SHARPNESS OF OUTLINES DETERMINED BY DEGREE OF CHALCOCITIZATION OF "SHATTER" FRAGMENTS.
1. CAVITY OUTLINE (IRREGULAR SHAPED)
2. SHARP (II C - III)
3. ROUNDED (I - II)
OXIDIZED CAPPING CHART FROM SULPHIDES TO THE SURFACE-REVERSE ORDER NON-REACTIVE GANGUE
PHELPS DODGE CORPORATION
MORENCI BRANCH
DATE
SCALE
DRAWN BY L.A.S.
TRACED BY
CHECKED BY L.A.S.
DRAWING NO.
C-