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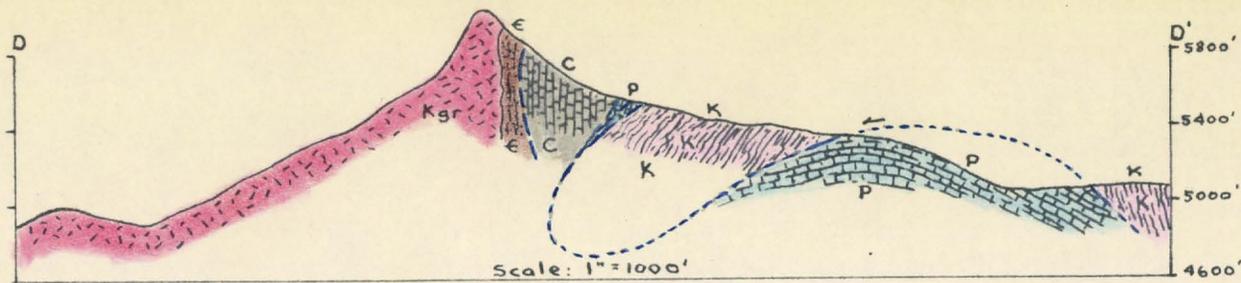
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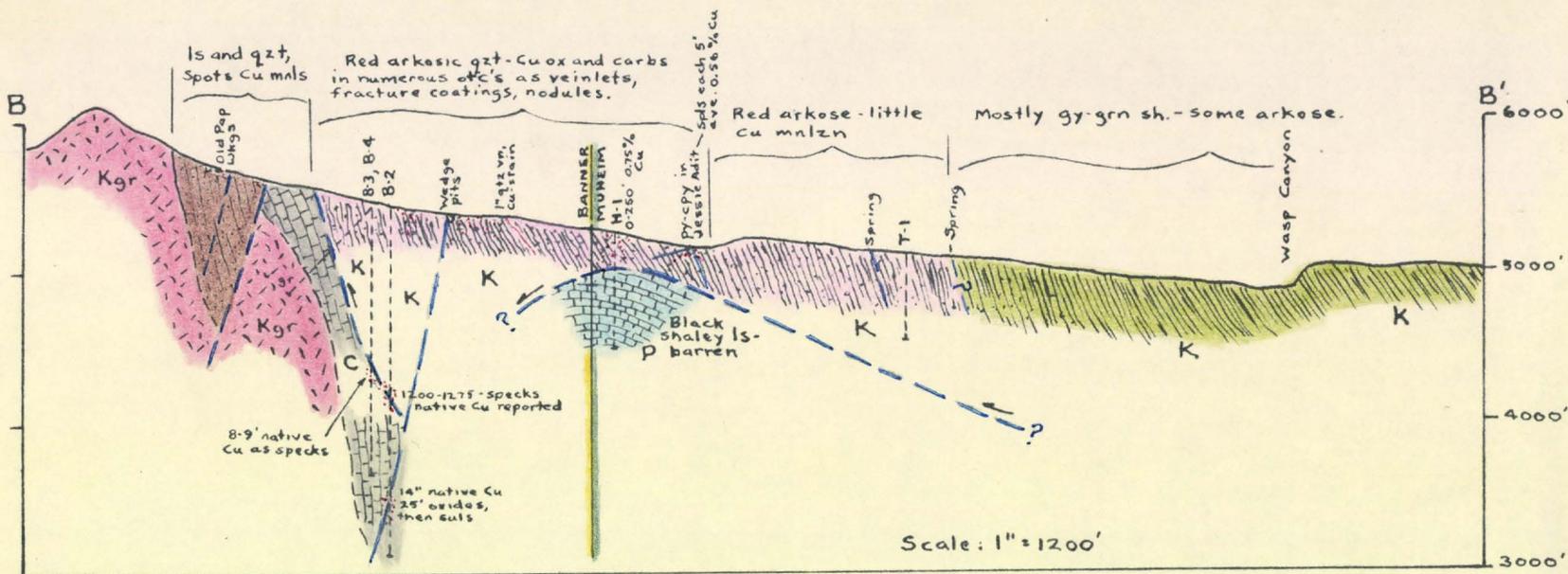
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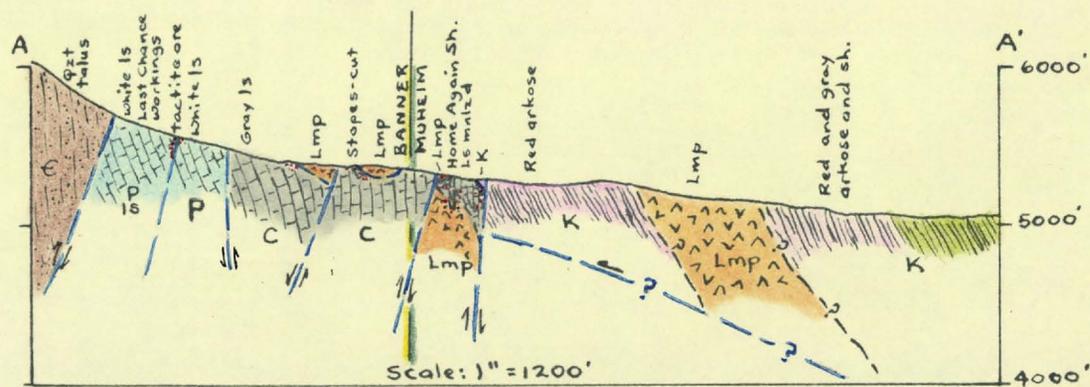
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SECTION D-D', Looking N'y. From Creasey and Quick, U.S.G.S. Bull. 1027-F.

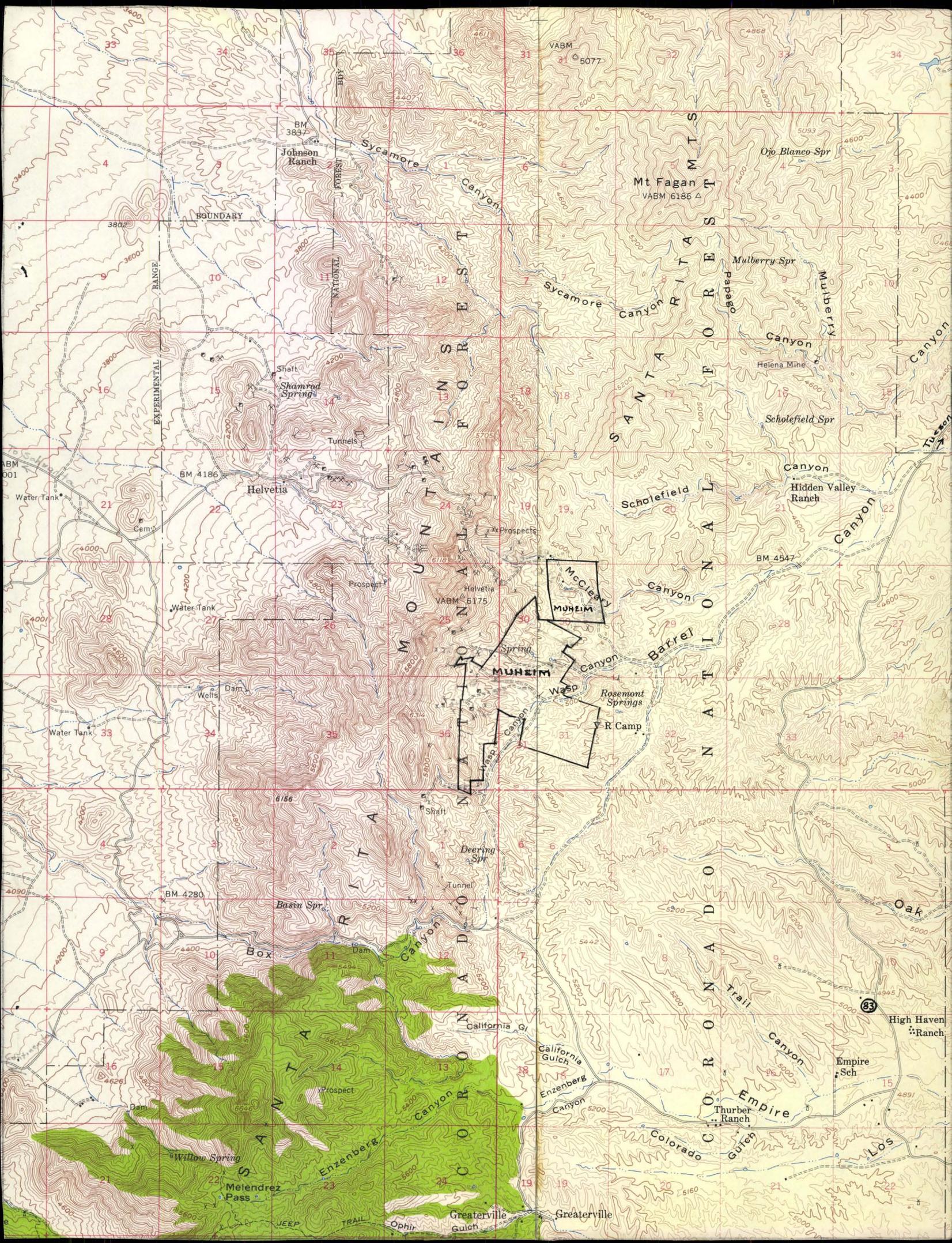


SECTION B-B', Looking N'y. Geology by Bell, October, 1962. Muhheim Property.



SECTION A-A', Looking N'y. Geology by Bell, Oct. 1962.





Johnson Ranch  
Sycamore Canyon

Mt Fagan  
VABM 6186

BOUNDARY

SANTA RITA MOUNTAINS  
SANTA RITA MOUNTAINS  
SANTA RITA MOUNTAINS

SANTA RITA MOUNTAINS  
SANTA RITA MOUNTAINS

Shamrod Springs

Helvetia

Scholefield Canyon

Hidden Valley Ranch

McCleary MUSEUM

MUSEUM

Rosemont Springs

Wasp Canyon

Wasp Canyon

R Camp

Deering Spr

Basin Spr

Box

California Gulch

California Gulch

Enzenberg Canyon

High Haven Ranch

Empire Sch

Thurber Ranch

Willow Spring

Melendez Pass

Greaterville

Greaterville

High Haven Ranch

Empire Sch

Thurber Ranch

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May 21, 1956

Mr. John H. Simpson, Vice President  
American Exploration and Mining Company  
Kass Building - 23rd Floor  
San Francisco 4

Dear John:

On May 17 and 18 I revisited Rosemont, inspecting the first 40 feet of core from the first American Exploration drill hole, studying surface geology and planning the first 1500 to 1800 feet of diamond drilling. A compass-and-pace mapping of mineralized outcrops northwesterly from the first drill hole was transferred to the 500 scale map in your Tucson office. I discussed the geology and the development plan with Mr. Lindsay and Mr. Horton, who were most helpful in every way.

The first 40 feet of extension of the 500 Foot Muhim drill hole near the west sideline of the Hunter claim cut volcanic breccia, with andesitic or arkose fragments cemented by quartz, epidote and a little garnet and calcite. There is fairly abundant pyrite, sometimes in bunches nearly an inch in diameter, and a little chalcopyrite. The bending of the breccia dips 60 degrees from the horizontal from 500 to 518 feet depth, and generally 20 to 30 degrees from 518 to 540 feet, below an apparent fault. The probability that the material is of volcanic origin is indicated by the fact that many of the fragments are partly absorbed in the cementing material, with fading instead of sharp outlines. The great amount of epidote, with some garnet, suggests proximity to an intrusion. While the material out thus far is below commercial grade, mineralization is strong enough to encourage the hope that if porphyry comes in at reasonable depth, this may be ore.

Mapping of the many surface cuts northwest of the first drill hole indicates strong mineralization with oxidized copper and iron minerals along a zone of combined bedding and shearing nearly 1000 feet wide, striking northeasterly and dipping 60 to 80 degrees southeast, toward American Exploration Hole No. 1. The rock in this area is alternately arkose and volcanic breccia or lava. Many pits show that mineralization extends from the top of a ridge for 500 feet northeasterly, to a gulch that apparently

follows a fault zone. Beyond this gulch the scanty outcrops are of less mineralized arkose, with volcanic breccia beds. From the top of the ridge for 500 feet southwest to the next gulch, in which the Muheim 160 ft. churn drill hole was located, the rock is nearly all covered by talus, much of which shows iron and copper staining. Southwest of this gulch, beyond a strong northwest fault, there is less mineralization, and a 600 ft. Muheim diamond drill hole soon passed into metamorphosed limestone. The area between the two gulches, about 1000 ft. square, is by far the most promising in the Rosemont district.

*on Busbee claim  
near tunnel  
entrance*

Although the bands of malachite are too far apart to make the whole width ore, the mineralization is intense enough to suggest that mineralized porphyry may underlie the altered, copper bearing volcanic material at moderate depth. Ore may extend beyond the boundaries of this area, but at greater depth. If no ore is found by about 1200 ft. of drilling in this section, the chance of finding a disseminated copper orebody in the Rosemont area will be remote.

The following drillholes are planned to test the promising area:

American Exploration No. 1. On Hunter claim of Muheim Group. Already started. Continue the 500 foot Muheim churn drill hole to a depth of 750 feet, or more if encouraging mineralization is found. This will develop the southeasterly part of the mineralized zone on its steep southeasterly dip.

Minimum depth of extension, 250 feet. If practicable, casing should be left in the churn drill hole, as other holes in this area may indicate that No. 1 should be extended.

American Exploration No. 2. A vertical hole 300 feet due west from No. 1, to cut the central portion of the mineralized zone in the Potomac claim of the Lewisohn property. Minimum depth, 450 ft.

American Exploration No. 3. From 300 ft. north of American Exploration No. 2, drill N 45°W down 50 degrees, to cut across the copper bearing structures in the northwestern portion of the best area. The hole will start in the Potomac claim and end in the Muller property. Minimum depth, 500 ft.

If no encouragement is met with in any of these three holes, no further work is recommended in this area. However the

following hole under the Ingersoll breccia is recommended:

American Exploration No. 4. From the low ridge east of the breccia outcrop drill S 60°W, down 50 degrees, to prove whether the breccia is a surface deposit, and so worthless, or a chimney that may be orebearing. Minimum depth, 300 ft.

American Exploration No. 5. If No. 4 above proves that the breccia is a chimney, a second hole will be worth while, starting about 100 ft. west of the shallow shaft near the northeast edge of the breccia, and inclined N 60°W, down 50 degrees, to develop under the copper stained northwest edge of the breccia. This should be drilled to a minimum depth of 300 ft., provided it is found that the claim west of the Ingersoll belongs to the Muller group or can be optioned on good terms from others.

All of the work above planned is subject to changes if the results of drilling throw further light on the structure.

Yours very truly,

*Irving B. Foraleman*

NOTES ON  
MUHEIM PROPERTY  
ROSEMONT DISTRICT, PIMA COUNTY, ARIZONA

By Ira B. Jorelemon

September 23, 1955

The following notes on the Muheim Property and parts of the adjacent Rosemont property in Arizona are based on a visit to the claims and on examination of diamond drill cores and washed churn drill cuttings on August 25 and 26, 1955, and on visits to the area in March 1954, April 1912, and December 1909. The purpose of the 1955 examination was to decide whether or not the possibility of finding a workable disseminated orebody justifies development. The conclusion is that the expenditure of about \$10,000 for diamond drilling is a good speculation. While the odds are against success, the possible reward is so great that the exploration is enthusiastically recommended.

GEOLOGY

The geology of the Rosemont District has been described in detail in U. S. Geological Survey Bulletin 582 and other reports. In brief, a high north-south ridge between the Helvetia and the Rosemont Districts is made up of Paleozoic limestone and quartzite intruded by several varieties of granite porphyry and aplite of probable Cretaceous and Tertiary age. There has been much folding, faulting and metamorphism. Scattered lenses of copper ore replacing the Paleozoic limestone have been mined at intervals since 1906. The best lenses were on claims owned by the Rosemont Copper Company. The orebodies were so small that they yielded little or no profit above capital expenditures. Further exploration of the limestone belt is not recommended.

Small intrusions of porphyry into the Paleozoic sediments on the main ridge are sparsely mineralized. Drilling by the Anaconda Company and others found nothing of commercial value.

East of the ridge of older sediments and porphyry is a broad valley, with low hills cut by steep gulches. The valley is a mile or more wide from east to west by more than two miles long. Most of this lower area is covered by talus and soil washed down from the higher ground to the west. Occasional outcrops and shallow workings show that the valley is largely made up of Cretaceous rocks. Near the main ridge sandstone, shale and silicified, metamorphosed limestone predominate. Further east most of the outcrops

are gray to reddish extrusive rocks, largely andesitic. While the stratigraphic column of the Cretaceous sediments and lava has not been worked out, it seems fairly clear that the volcanic rocks overlie the shale and sandstone, with interbedding in the transition zone.

North of the valley underlain by Cretaceous rocks is a higher ridge of slightly iron stained rhyolitic lavas, reported in USGS Bulletin 582 to be Tertiary. A ridge east of the valley, near the old town of Rosemont, is of similar iron stained rhyolitic rock, not noted on maps in the USGS Bulletin.

#### MINERALIZATION IN CRETACEOUS AREA

Widespread, though generally sparse, copper staining was noted in an area of Cretaceous volcanic rocks in the western part of the valley noted above. The copper staining is both on seams and in amygdaloidal cavities. In places the staining is so slight that it must be looked for carefully. Elsewhere it is heavy enough to make the surface material assay several tenths of a percent copper. Shallow pits and tunnels show that the copper stained material soon passes in depth into pyritic andesitic rocks, with a very small amount of chalcopyrite and chalcocite.

The copper staining has been traced on the various examinations by the undersigned from the northeast part of the "Sweet Eye and Eye" claim northeasterly for several thousand feet, in a belt 500 to 1000 feet wide. Most of this belt is on claims owned by Muhleins pros., though it may overlap the Potomac, Daniel Webster, Patrick Henry and Lafayette claims of Rosemont Copper Company.

The strongest copper stain is in shallow bulldozer pits excavated in recent years by the Muhleins east of the southern part of the Potomac Claim. The pits are in an area about 300 feet long from east to west by 100 feet wide. As much of the surface is covered by soil and talus, the strong copper staining may be considerably more extensive than this. As the sedimentary beds west of this showing dip steeply east, and the lava and sandstone south of it dip steeply south, there is some evidence of doming around the better area. Strong east-west and northwest fault gouges are exposed in pits a few hundred feet, south of the best copper stained showing. It is clear that there has been great folding and faulting in this part of the Cretaceous area.

#### POSSIBLE ORE IN DEPTH

Mineralization in the Cretaceous lava is far too sparse to suggest possible ore in this formation. There is a chance,

however, that it may be a "leakage" upward from a mineralized intrusion that did not reach the present surface. There is an even smaller chance that this buried intrusive cupole may contain a workable disseminated orebody.

As the copper stained area is at least 3000 feet long by 1000 feet maximum width, it would make 200,000 to 250,000 tons per vertical foot. If the grade of underlying material is commercial, this would mean an orebody of substantial size. With underground mining, the copper content would have to approximate 1% to yield a profit.

The great question is the depth at which this hypothetical orebody may occur. The strong copper staining east of the Potomac claim and the suggested doming of beds around this area give reason to hope that the porphyry may come in at moderate depth.

#### PAST DEVELOPMENT

Three vertical drill holes have been put down by Muhlem Bros.

Diamond Drill Hole No. 1, in the north end of the Grey Copper claim, is near the contact between Paleozoic and Cretaceous sediments. For the first 175 feet very little core of altered limestone, garnet, etc., was recovered. The remaining 425 feet cut garnetized limestone, chert, marble and quartz, with doubtful alaskite near the bottom. From 563 to 601 ft. the material averaged 0.46% copper. Although fragments in the soil and talus near the collar of this hole suggested that the surface rock was Cretaceous shale or lava, the core indicates that nearly, if not all, of the hole cut Paleozoic limestone. The hole is several hundred feet west of the area that looks most promising for deep disseminated ore.

Diamond Drill Hole #2 is 5000 feet or more northeast of Hole #1. It was sunk to 361 ft. depth. The rock on the surface near this hole is iron stained andesite, with pyritic andesite in a short tunnel south of the hole. This hole is north east of the area of copper staining. No core was recovered to 75 ft. depth. For the next 200 feet the hole cut a dense highly silicified pyritic rock that is probably altered shale. From 275 feet depth to the bottom the hole cut alternate silicified and garnetized limestone and very silicious pyritic shale. The material averages only 0.02% copper. This hole is evidently too far east or north to overlie any buried intrusion at reasonable depth.

Churn Drill Hole No. 1 was drilled to 500 feet depth about 2000 feet north of east from Diamond Drill Hole No. 1, and about 200 feet east of the best copper stained andesite area. Identification of the rocks cut by the churn drill hole is uncertain, because only cans of washed cuttings, usually at 5 foot intervals, were available. Examination with a hand lens suggests the following succession:

- 20-235 ft. Probably altered volcanic rock. Fair pyrite and some chalcocite.
- 235-275 ft. shale with a little black sulphide.
- 275-370 ft. White, dark or pink highly silicious rock, - altered shale?
- 370-475 ft. Quartz, epidote and white crystals that may be feldspar. Little pyrite and trace of chalcopyrite.
- 475-500 ft. Quartz and epidote with a little pyrite, chalcopyrite and chalcocite. The rock below 370 ft. is probably a very highly altered shale, with possible porphyry dikes.

Assays of unpanned cuttings by Jacobs & Co. of Tucson averaged as follows:

20-145 ft.	0.2% Cu
145-190 ft.	0.42% "
190-200 ft.	0.025% "
200-275 ft.	0.56% "
275-350 ft.	0.09% "
350-420 ft.	0.06% " Tr. Au, 0.04 oz. Ag
420-465 ft.	0.01% " 0.005 oz. Au, 0.7 oz. Ag
465-500 ft.	0.037% " Tr. Au, 0.5 oz. Ag

The assays from 465 to 500 ft. were disappointing, as there was much more copper sulphide in the washed cuttings than in those from 145 to 275 ft., which averaged 0.37% Cu. As the degree of concentration in washing the cuttings by the driller may have varied greatly, the amount of sulphides in the cuttings may not be representative. There was no record of the weight of cuttings for every 5 foot advance, and so it is not known how much dilution there was by lean material caving from upper parts of the hole. In spite of the low assays, the increased copper sulphide in washed cuttings from 475 to 500 ft. may be significant.

Other development in the Muheln group consists of shallow tunnels and shafts and of the bulldozer cuts mentioned above.

DEDUCTIONS FROM DEVELOPMENT AND RECOMMENDATIONS

The churn drill hole is the only development that throws any light on the possibility that the copper stained andesite may indicate a body of underlying copper bearing porphyry within accessible depth. The churn drill hole is about 200 feet east of the most attractive surface showing. This may mean that the porphyry increases in depth toward the east. The intense silicification and alteration with increasing but very lean copper mineralization in the bottom part of the hole may indicate that mineralized porphyry may come in at slightly greater depth under the churn drill hole.

While the chance of success is small, inexpensive additional development seems well worth while. The first work should consist of deepening the churn drill hole by diamond drill to a total of 700 ft. depth, or more if mineralization improves. Next should be another vertical diamond drill hole about 300 feet deep in the center of the best copper stained area, about 300 feet west of the churn drill hole. If 1000 feet of drilling in these two holes finds no ore or other great encouragement, no further development will be justified in the Luheim property.

POSSIBLE BRECCIA CHIMNEY,  
INGERSOLL CLAIM

In the north end of the Ingersoll claim of Rosemont Copper Company there is an oval outcrop of iron stained silica breccia about 300 by 500 ft. Surface silicification masks the original character of the breccia. The surrounding rocks, and many of the fragments, are gray to black shale. A pit near the west edge of the breccia suggests a flat easterly dip, while an exposed contact with shale in a gulch on the east side of the breccia is vertical. Further study of the contacts may give more definite information about the nature and attitude of the breccia.

Several of the great copper orebodies in the Southwest are in iron stained breccia chimneys with intense surface silicification and with little or no copper in the outcrops. On the other hand, other silicified breccia outcrops are underlain by pyritic material of no value.

If study of the outcrop proves that the Ingersoll is a true breccia chimney, it will be worth while to drill one hole - probably from east of the contact and inclined to the west, - to cut the breccia at depths of 100 to 300 or so feet. If copper mineralization is found, further drilling can follow. Like development of the copper stained andesite area, this is a long chance, and should be carried out only if options can be obtained on good terms, with little or no cash payments.

*Frank J. Orskov*

Notes summarizing various data on Muhheim Prospect, furnished subsequently to my report dated 1 November 1962.

Home Again Claim

Formerly called Saratoga Claim (McElvenny Rpt-1928); also called Sweet Bye and Bye Claim (Joralemon Rpt-1955).

Development: 200-foot vertical shaft, sunk in 1927. 60' drift and 80' x-c on 100 Level South; northerly drift on 185 Level. At surface near shaft, stopes in limestone. Four bench cuts on hillside above shaft. Powers Cut in ls on E. face of hill apx 300' S. of shaft area.

Sample Data: Apx 1000 tons mined 1917-1918 from 4' vein in ls near present shaft collar - partial smelter returns show 392.64 tons ave. 5.26% Cu, 1.0 oz. Ag.

In 1928, faulted zone at 65-foot depth in shaft shows face, south side of shaft, assaying 5.7% Cu, 0.3 oz. Ag. 100 Level - spotty Cu malzn, a little moly, in crushed ls.

N'ly cross-cut in thin-bedded dark shaley ls.

185 Level - not accessible 1962. Reported northerly in pinkish granitic rock, faint greenish stains.

Muhheim spl, porphyry (?) rock, bottom of shaft (200'), assay 3.26% Cu, 1.6 oz. Ag, 0.005 Au. 4-3-58.

Muhheim spls, benches above shaft site. Widths not given. 1957.

- Bench No.1 0.82% Cu, 0.4 oz. Ag, 0.01 oz Au
- " No.2 0.89% Cu, 0.4 oz. Ag, 0.005 oz. Au
- " No.3 0.83% Cu, 0.3 oz. Ag, Tr. Au
- " No.4 0.96% Cu, 0.4 oz Ag, 0.005 oz. Au.

Benches cut ls and porphyry.

## Home Again Claim (Cont'd)

Powers Cut. In ls, Cu carb on fractures. Mined for flux ore in 1960 by Wm. Powers, lessee.

Muham spl (spot?) 6.05% Cu, 5.0 oz. Ag, 0.02 oz. Au

8 Drill-holes, face of cut (probably cuttings)

0.47% Cu, 0.3 oz. Ag, 0.01 oz. Au

1.60% Cu, 1.7 oz. Ag, 0.02 oz. Au

0.67% Cu, 0.7 oz. Ag, 0.01 oz. Au

2.54% Cu, 2.0 oz. Ag, 0.02 oz. Au

## Grey Copper Claim (adjoins Home Again on north)

Camacho Incline - shallow workings, south side of draw apx 100' SE of Hole GC-1 (Joralemon designates this hole D.D.H. No. 1). Fault zone in Cretaceous, clastics.

N. side of Incline 1.81% Cu, 30.8 oz. Ag, 0.37 oz. Au

Black streak, incline 0.69% Cu, 5.0 oz. Ag, 0.04 oz. Au

S. side of incline 1.95% Cu, 1.5 oz. Ag.

Hole GC-1 (Joralemon DDH No. 1) - Joralemon description.

1st few feet probably Cret. clastics. Most of first 175 feet, altered garnetized ls, very little core. 175-601, garnetized ls, marble, chert, qtz, with alaskite(?) near bottom. 563-601, ave. 0.46% Cu.

Assay log 0-176 Tr to 0.14% Cu, ave. about 0.04

176-179 1.04% Cu

183-185.2 0.52% Cu

260.5-266.4 0.79% Cu

273-288 0.37% Cu

520-601 0.40% Cu

Mostly sulfides.  
Zones between samples shown  
ave. about 0.02% Cu.

Sludge 250-285 0.53% Cu, 0.5 oz. Ag, 0.21% Zn

525-601 0.61% Cu, 0.3 oz. Ag, 0.18% Zn

Grey Copper Claim (Cont'd)

A churn drill hole 125' deep is shown 578' S 2 E from GC-1 - no data on this.

Bisbee Claim - Athwart Grey Copper Clm on North. Open-cuts, 115-foot adit, 160' Churn Drill-hole. This claim apparently called the Tiger claim in the past, as workings are referred to as Tiger Tunnel, Tiger Churn Drill Hole, etc, but are located on Bisbee Claim as presently mapped.

Tiger Tunnel spl, McElvenny, 1928 - width not given, assay 0.4% Cu, 0.7 oz. Ag, 0.03 oz. Au.

CDH at mouth of above tunnel. 9-15-49.

0-20	No assays	McElvenny reports over 100 tons shipped from enriched pocket near mouth of above tunnel.
20-57	0.45% Cu	
57-91	0.05% Cu	
91-103	0.98% Cu	
103-160	0.05% Cu	

Open-cut about 200' NW of adit - H. Muheim reports apxly 150 tons produced, ave. 2.5% Cu. Bottom of cut (22' depth) reported to average 3.25% Cu.

Tiger Claim - one spl, location and width not given, marked Bisbee claim in McElvenny 1928 report. Seems likely that this may be from Tiger claim as presently mapped. Assays 1.7% Cu, 1.6 oz Ag, Tr. Au.

Hunter Claim - Vertical shaft, described as 100' deep in McElvenny Rpt (Hunter Shaft shown 158' deep on Amex Map). Murphy Incline Shaft (sloughed). Adit and incline near south end. 40' adit E. of Oxide Pit. Open-pit and surface cuts. Hunter churn drill hole (H-1) to 763 foot depth.

## Hunter Claim (cont'd)

Churndrill hole shown N33E 210' from Hunter Shaft - no data on this, and may be a proposed hole.

Amex DDH No. 6 drilled N 30 E (-60) to test small porphyry intrusive on Hunter claim at shallow depth.

Sample data: McElvenny, 1928, reports 360 tons ore sorted to 6.0% Cu shipped from surface cut near Hunter Shaft. McElvenny spl of Hunter ore, location not given: 4.1% Cu, 1.0 oz. Ag, Tr. Au.

### Hunter Churn Drill Log (H-1)

0-280'	0.27% Cu	} Hole averages 0.001 oz Au and 0.4 oz. Ag - spot spls.
280-500	0.05% Cu	

500-763 No assay information from Amex - reportedly not significantly mineralized.

Murphy Shaft - Muheim Spl, 4-30-58: 2.28% Cu, 2.7 oz. Ag, .01 Au

Hunter (Oxide?) Pit - Muheim Spl, 12-2-58: 1.28% Cu, 0.9 oz. Ag

Cut to 18' depth (now filled) at mouth 40' adit E. of Oxide

Pit, dug by H. Muheim - 2.50% Cu reported at 18' depth.

Stock-pile from Oxide Pit reported to average 1.0% Cu.

Joralemon logged the cuttings from H-1 CDH in 1955

20-235' - Probably alt'd Cret. volcanic rock - fair py and some chalcocite.

235-275 - Shale, a little black sulfide

275-370 - White, pink, and dark siliceous rock - alt'd sh.?

370-500 - Altered shale, possible porphyry dikes, qtz, epidote, a little py, cpy, and chalcocite.

More Cu sulfides in cuttings 465-500 than are indicated by assays.

## Hunter Claim (Cont'd)

H-1 500-540 Brecciated arkose, cemented with  
gtz and epidote, fair bunches py, some  
cpy. Fltg indicated at 518' by change  
in attitude of banding.

Müller (Wedge) claims: West of Hunter-Potomac claims, in  
Banner area. Old surface cuts, pits. McElvenny samples,

1928: 2.8% Cu, 5.0 oz. Ag, .04 oz. Au

3.0% Cu, 3.2 oz. Ag, .03 oz Au

1.0% Cu, 0.5 oz. Ag, Tr. Au

Joralemon mapped this area in 1956 as cu-stained  
andesitic rocks - fracturing and mnzn zone striking  
NE'ly, dipping 60-80 SE'ly.

Potomac Claim (Banner Ground): Amex drilled a DDH 800'  
vertically - reportedly similar lithology to H-1, little or  
no mnzn. Amex map shows a second DDH 300' N. of the  
vertical hole trending N 38 W, angled down below Wedge claim.

Jessie Claim: 60' adit, bunches py, weak Cu corbs, a little cpy.  
Thin gtz seams with cpy and chalcocite. Amex  
reported spld length in 5' cuts, ave 0.56% Cu.

Custer Claim: Short adit in pyritic arkose. DDH C-1  
(Joralemon DDH No. 2) drilled near adit, 351' depth.  
0-75' No core.  
75-275' Dense, siliceous, pyritic rock - prob. alt'd shale.  
275-351' Alternate garnetized-silicified ls and  
very siliceous pyritic shale.  
Hole averaged 0.02% Cu. Best zone was  
226-245' - ave. 0.15% Cu.

Tony Claim: Churn Drill Hole, drilled prior to 1928. 500' depth. In gray and red arkose, no mntzn.

Ingersoll Claim - Breccia pipe. Amex drilled DDH's No.s 4, 5, and 7 here - apparently shallow angle holes. No data on results.

### Miscellaneous production Data

Two smelter returns to H. Muheim

8-31-60 39.02 tons 6.24% Cu, 0.036 oz. Au, 3.435 oz. Ag.

10-17-60 103.71 tons 2.47% Cu 0.01 oz. Au, 1.375 oz. Ag

1st contains 43.7%  $SiO_2$ , 30.4% CaO.

2nd " 43.0%  $SiO_2$ , 27.9% CaO.

Probably silicified ls from Powers Cut.

Smelter shipments - partial summary, 1917-1918

314.012 T, ave. 1.82 oz. Ag, 5.34% Cu, 49.15% insol.,

11.3% Fe, 10.65% lime.

TO: Mr. H. E. Harper  
FROM: J Douglas Bell  
SUBJECT: Muheim Copper Prospect, Pima County, Arizona  
DATE: 1 November 1962

*Please return  
to H. E. Harper*

### Summary

The Muheim property, offered for our consideration by Joseph Muheim, Bisbee, Arizona, consists of 42 claims located in the SE'ly portion of the Helvetia Mining District, T 18 S, R 15 E, in Pima County, Arizona. Banner Mining Company has recently acquired the majority of claims in the district; their property surrounds the Muheim group.

Helvetia District from 1908 to 1950 produced a total of 227,333 tons of ore averaging 0.8 oz. Ag and 3.8% Cu. Production was from several mines, and almost entirely from contact replacement deposits of oxide, carbonate, and chalcocite ore. Molybdenum is a minor constituent. Geologic investigation indicates the mineralization is associated with intrusion of quartz monzonite porphyry of Laramides age, replacement occurring in tectonic zones in Cambrian, Pennsylvanian, and Permian sediments, mostly limestones.

Mapping indicates the porphyry was intruded along a zone of N-S high-angle faulting, part of which traverses Muheim ground. In addition, porphyry apparently spread outward along a low-angle thrust fault underlying Muheim claims. Carbonates, oxides, and chalcocite occur in numerous spots in the Cretaceous clastics forming the upper plate of the thrust. Small-scale production has been derived from local concentrations in the clastics, and from limestones and porphyry near the Home Again Shaft.

The Muheim property is regarded as having a favorable potential for a disseminated porphyry deposit in the vicinity of the N-S faulting, and for possible ore bodies along the thrust fault. No large ore bodies are known in the district, and it is a gamble in that sense.

### General

The period of October 17-30, 1962, was spent in examination, study, and drafting for a report on the Muheim copper prospect, suggested for our interest by C. R. Higgins, a diamond driller formerly employed by Boyles Brothers. The Muheim claims are adjoined on four sides by claims held by Banner Mining Company as a part of Banner's Gunsight Project in the Helvetia Mining District. Higgins was the driller on three of Banner's holes closest to the Muheim Group.

On October 17, Henry Muheim, one of the owners, showed me over the property, and provided a claim map. Two days of the following week were spent in mapping the geology, during which time I encountered one of Banner's field crews. Following is my report.

### Location and Ownership

The Muheim property, consisting of 42 unpatented claims which were fully abstracted in 1958, is located in Sections 25 and 36 and 30-31, T 18 S, R 15-16 E, in the Helvetia Mining District, Pima County, Arizona. This district embraces both the east and west flanks of the northerly-trending Santa Rita Mountains, and is located approximately 30 miles SE of Tucson; its location, about 15 miles east of the Pima-Twin Buttes District, can be seen by reference to your geologic map of Pima County. The Muheim claims are in the foothills of the east flank, in the old Rosemont area; access is via U. S. 80 and Arizona 83 for 38 miles SE from Tucson, thence 3.5 miles westerly on dirt road to the property. The nearest rail point is at Vail, about 15 miles to the north.

The property is owned by the Muheim family, under the direction of Joseph Muheim, presently Vice President and Manager, 1st National Bank of Arizona, in Bisbee. The claims have been held by the Muheims since 1905.

### History

The Helvetia District is an arcuate area ranging from Helvetia, near the north center of T 18 S, R 15 E, southerly along the east portion of the township to the Rosemont area. It thus crosses the sharp crest of the Santa Rita's at Gunsight Pass at an elevation of about 6000 feet. Most of the early production was confined to the NW'ly area, west of the pass, although there were several prospects on the east flank, and a smelter was operated for a short time near Rosemont.

Development in the Helvetia District commenced as early as 1880; a few quartz fissure deposits in granite were discovered, but the principal production was of copper oxide-carbonate ore and chalcocite occurring as contact replacement deposits at shallow depths in tectonic limestones. F. C. Schrader examined the district in 1909, recording his observations in U.S.G.S. Bulletin 582, 1915. During the period 1880-1909, the principal mines were developed, including the Copper World, Heavy Weight, Isle Royal, Old Dick, and Leader, controlled by the Helvetia Copper Company; these were all on the west flank of the range. Claims on the east flank were controlled principally by the Lewisohn interests. Production data for individual properties during this period is sketchy; some data is shown on the attached map. The grade averaged about 5% Cu, with some rich pockets of 12-25% Cu as chalcocite. Some silver and a little gold occur with the copper, and molybdenite is a minor constituent.

Schrader records production from 1903-1912 of 32,271 tons from the Helvetia and Empire Districts combined (30,870 tons from Helvetia District), containing 2,585,923 pounds of copper, mostly from the Helvetia District; an additional substantial production occurred during the period 1890-1902. Arizona Bureau of Mines Bulletin 140 (1936) shows production of the Helvetia District to 1929, totalling 15,150,000 lbs. Cu, \$1,000 Au, and \$124,000 Ag, valued at \$3,320,000. Production 1908-1933 totalled 227,333 tons, averaging 0.8 oz. Ag, 3.8% Cu, 0.09% Pb, and 0.24% Zn.

On the east flank of the range, the Narragansett Mine has been the largest producer. Hardly more than a prospect at the time of Schrader's visit, it yielded 6,000,000 lbs. Cu and \$40,000 in Ag during the period 1915-1920. There are numerous other workings on the east flank, mostly small, and evidencing a minor production.

The Muheim group was acquired in 1905 by the Muheim's father. Several short prospect adits are in evidence, and a shaft was sunk on the Home Again claim to 200 foot depth. During the 1940's, surface ores were mined by Henry Muheim, and several shipments of carbonate ores averaging 2-3% Cu were made. In the early 1950's, Bear Creek Mining Company proposed a consolidation and development program including the Muheim ground; the agreement was not consummated because the participants could not agree upon the division of interest. In 1958, the Muheim ground was optioned to American Exploration Company, which deepened the H-1 churn drill hole to 763-foot depth, and drilled one additional hole to 800-foot depth 300 feet west of H-1. No mineralization was encountered and the option was relinquished.

During the past two years, Banner Mining Company has acquired the former Helvetia Copper, Lewisohn, and Mueller holdings, and has staked additional claims surrounding the Muheim ground (see property map). Banner has offered the Muheim's a holding royalty of \$600 per month for their claims, without a commitment for a down-payment; the offer was refused, and the claims are available. Banner has drilled four holes on ground near the Muheim property; I do not know what has been done in the Helvetia area.

### Geology

General geology of the Helvetia District is shown on the attached map. The northwestern section is sketched from Schrader's reconnaissance map (Bulletin 582); the central portion is from Creasey and Quick (U.S.G.S. Bulletin 1027-F, 1955); the southeasterly part is the result of my two-day reconnaissance mapping.

Schrader, in 1909, mapped Cambrian quartzite, Carboniferous and Permian limestones, and Cretaceous clastics in the Helvetia area. He recognized two periods of intrusion, one in which the Paleozoic rocks were penetrated, and one in which the earlier coarse-grained granite, the Paleozoics, and the Cretaceous rocks were intruded by granite porphyry. His sections indicate that the Paleozoics have been thrust over the earlier granite in the Helvetia area, and subsequently intruded by the porphyry. High-angle faults have cut the granite and sediments; mineralizing solutions have altered the limestones to garnetiferous tactites along intrusive contacts and faults which became the sites of ore deposition. Oxidation extends to about 300 foot depth. He noted that most of the mineralization was in the limestones, and that the granite was relatively unmineralized.

Creasey and Quick, in 1943, mapped and studied the area in the vicinity of four of the larger mines, the Copper World, Leader, Rosemont Lease, and Narragansett. They recognize the batholithic granite to the west as clearly intruding the Cambrian Bolsa quartzite, and show a wedge of this granite thrust over Paleozoic limestones near the Copper World Mine; the age is indicated as Jurassic-Cretaceous. Major thrusting occurred after this intrusion, followed in Laramides(?) time by intrusion of the quartz monzonite porphyry plug north of the Narragansett Mine, apparently intruding

the thrust fault and cutting Paleozoic and Cretaceous formations. High-angle reverse faulting of N-S trends, and folding of the thrust, shown in the exposure of Permian limestone east of the Narragansett, apparently were associated with the Laramides orogeny. Section D-D (attached map and sections) from Bulletin 1027-F shows Creasey and Quick's interpretation of the structure. Again, the copper mineralization, chalcopyrite, oxides, carbonates, chalcocite, and a little molybdenite, is noted as occurring principally in lime-silicate rocks; the quartz monzonite porphyry plug is reported as being locally mineralized at the Rosemont Lease, as is the adjacent tactite.

Anaconda is noted as drilling a hole beneath a copper-stained breccia zone bordering the porphyry plug on the south; results of this drilling are not given.

My mapping was concerned principally with the extension of Creasey and Quick's geology southward. Approaching the Muheim claims from the east, you pass through a broad expanse of gray-green shale and arkosic sandstone dipping about 50° SE'ly, broken occasionally by reddish hematite-stained beds. Near Drill Holes T-1 and C-1, in the easterly Muheim claims, the rocks become predominantly red and more arkosic and quartzitic, weathering to smooth-planed brick-red chips. Copper stains on fractures and bedding planes and in thin quartz veinlets become apparent near the Jessie Adit and Hole H-1, and are encountered westerly until the contact between the reddish Cretaceous arkose and the gray Paleozoic limestone is reached. This copper mineralization in the Cretaceous rocks is spottily distributed along a belt trending from the Home Again Shaft area NNE'ly to the quartz breccia plug in the north part of Section 30. Occasional nodules of cuprite surrounded by chalcocite and carbonates are found; concentrations of these, as near Holes B-2, B-3, and B-4, have yielded a small sorted production of ore averaging 5-7% Cu. The belt is about 2000 feet in width.

Near the Oxide Pit and Hole H-1, and extending SW'ly toward Hole GC-1, the red Cretaceous clastics are strongly brecciated, and it is nearly impossible to discern bedding. Copper, mostly as cuprite, is disseminated in this area; perhaps a thousand tons has been stock-piled from the Oxide Pit in preparation for leaching. Henry Muheim stated that the stock-pile assays 1% Cu. Hole H-1 cuts 250 feet of the reddish material, sludge assays of which are reported by Muheim to assay 0.75% Cu. Below the reddish arkose, the hole passes into black, barren shaley limestone for its remaining 510 feet of depth. I interpret this brecciated mineralized arkose as lying along the axial region of the anticlinal roll in the thrust fault shown in Creasey and Quick's Section D-D'. Flat slips cut the Cretaceous rocks in the Oxide Pit and near the Bisbee Fraction ore, reflecting the thrusting stresses as the fault reaches shallow depth (see Section B-B').

To the north, the quartz breccia plug cutting the overthrust Cretaceous rocks suggests that silica-rich solutions with pyrite and chalcopyrite may have coursed along the thrust, rising along fractures in the upper plate. Ira Joralemon examined this area for American Exploration in 1958, and recommended moving to the east and drilling perhaps to 1500 foot depth, according to Muheim. In a somewhat similar geologic mode, monzonite porphyry apparently cuts the Cretaceous rocks to the east of the Home Again Shaft (map, and my section A-A').

To the south, in the vicinity of the Home Again Shaft, the geology becomes more complicated. The belt of N-S faulting shown near the Narragansett Mine is reached again here, up-faulting Paleozoic limestones which outcrop from here westerly. Monzonite porphyry, with an aphanitic light gray ground mass and quartz phenocrysts, weathering to a distinctive pitted buff-orange rock, lies in flatly-dipping fault contact with underlying limestone; these thrust (?) contacts have been displaced by the steep faults as shown in Section A-A'.

The monzonite porphyry outcrops again in the hill east of the shaft area; contacts here are not definitely exposed, and the entire porphyry area was not searched out. West of the Home Again Shaft, the porphyry can be traced NW'ly to the Chicago workings.

The porphyry is apparently intrusive upward in dike or stock-like form as indicated by its presence from 135 foot depth to the bottom of the 200 foot Home Again Shaft; this suggests that the steep N-S faults were present prior to the porphyry intrusion, that thrusting then occurred, followed by intrusion along the N-S zone of faulting and a spread outward along the thrust, followed by some post-porphyry movement displacing the porphyry-limestone thrust contacts.

Several stopes and open-cuts in the faulted area indicate that a moderate production of oxide-carbonate ore was attained here. Both the altered limestone and fractured porphyry show copper mineralization in the 1-3% range. Away from the faulted zone, porphyry outcrops show little evidence of the former presence of copper. Significantly, however, porphyry from the bottom of the shaft shows chalcocite and oxides, samples of which assay 5% Cu per Muheim.

Two sets are collapsed just below the 100 Level of the shaft, and the lower portion is not now accessible. I examined the 100 Level, consisting of about 80 feet of drift and cross-cut, all in limestone. Copper oxides, carbonates, chalcocite, and a little molybdenum occur in a zone of crushing and faulting. A second level at 185 feet is reported to have been driven N'ly in a pinkish granitic rock which showed only faint stains of copper minerals.

One further evidence of mineralized porphyry at depth is noted. Hole GC-1, about 1360 feet north of the shaft, is reported by Muheim to have cut 188 feet of brecciated red arkose from the surface, then 187 feet of barren white chert, then gray limestone with thin bands of Pb-Zn to 525 feet, then mineralized porphyry from 525 to 600 feet, the bottom. The porphyry cuttings reportedly averaged 1.5% Cu. The thrust fault was apparently cut at 188 feet and was not mineralized.

Moving westerly up the slope, shallow workings in mineralized tactite along faulting are noted in white limestone mapped as Permian because of its resemblance to that in the "window" east of the Narragansett Mine. Banner has bulldozed roads into this area, but has done no drilling here as yet. About 2500 feet NNE'ly, on the Central claim and close to the same belt of limestone and faulting, Banner has drilled 3 holes, B-2, B-3, and B-4. My Section B-B' shows these holes, and indicates that Banner is seeking ore bodies in tactites adjacent to the intrusive granite.

According to Higgins, the driller, Hole B-2 was 2300 feet in depth, in limestone most of its depth. From 1200 to about 1275 feet, the core was specked with native copper of match-head size. At 1800 feet, in garnetized limestone, 14" of native copper was cut, followed by 25 feet of oxide-carbonate mineralization, then some chalcopyrite. Hole B-3, vertical, cut 8-9 feet of the same specks of native copper at 1155-foot depth. Hole B-4, angled at 45°, entered barren granite at 600 feet. This is Higgins' report, and I cannot vouch for its verity or accuracy.

Banner has drilled one other hole, B-1, near the quartz breccia plug. I know nothing of the results here.

On the Muheim ground, two other holes have been drilled, T-1 and C-1. T-1, to 550 feet, was in barren reddish arkose, and did not reach the thrust. C-1, to 327 feet, was in reddish arkose, and also did not reach the thrust; some pyrite and chalcopyrite similar to that in the Jessie Adit was encountered. The sludge reportedly assayed 0.25% Cu.

The surface geology and drill-hole information have been correlated and interpreted on my sections A-A' and B-B', and may be compared with Creasey and Quick's Section D-D'.

#### Acquisition

The Muheims wish to realize some profit from their property while they are alive; consequently they are seeking a deal involving a down-payment (to be negotiated). With a company such as ours, I believe they would agree to an exploration period of perhaps 3 months, following which a down-payment and annual royalties would be required. Other arrangements might be made; Joseph Muheim indicated he would consider any equitable agreement.

#### Conclusions

The Helvetia-Rosemont District lies along the SE'ly projection of a general NW'ly trend embracing the Pima and Silver Bell Districts to the NW. Its history is similar to the early history of the other two districts in that in both Pima and Silver Bell, mining began with development of contact replacement deposits of copper in tactite-altered limestones adjacent to Laramides porphyry intrusives. Major low-grade copper deposits in tactites have recently been found in the Pima District, while porphyry deposits have been developed at Silver Bell. The Helvetia District therefore may constitute a good exploration target. The Muheim property is of interest since it constitutes a sizable claim block in an area surrounded by the claims of an aggressive and capable organization, Banner Mining Company.

Reviewing the history and geology of the Helvetia District, it appears that most of the contact deposits developed in the limestones have been relatively small, although it should be remembered that they were mined for shipping ores. An envelope of low-grade oxide-carbonate ore may remain, but if so, it is surprising that the district has lain dormant so many years. I believe Banner's search is for substantial contact replacement ore bodies at depth, or for mineralized porphyry deposits.

The geologic data makes it quite clear that the copper bearing solutions were associated with the intrusion of the Laramides quartz monzonite porphyry. The principal exposed masses of this rock are found on the east flank of the range, north of the Narragansett and near the Home Again Shaft. The probable control which guided the intrusive emplacement was the belt of steep N-S faulting, with lateral migration along the thrust fault. The copper mineralizers accompanying the intrusion migrated along the faults and fractures in the limestones, and in the brecciated Cretaceous rocks of the upper plate of the thrust.

The most likely area for substantial ore bodies on Muheim ground lies in the possible mineralized porphyry along the steep fault east of the Home Again Shaft, striking N'ly toward Hole GC-1. Substantial mineralization has been found in this zone at the bottom of the shaft, and at 525-600 foot depth in Hole GC-1.

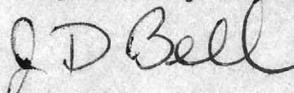
The porphyry intrusive east of the shaft area and the quartz breccia plug to the north suggest that mineralizing solutions may have migrated easterly along the thrust fault, and ore bodies may exist here as well. Tendency of solutions to migrate upward, and the relatively unfavorable nature of the arkose suggest these may be small unless a large mass of porphyry is discovered, or faulting is open and extensive. Magnetometer and induced potential geophysics might be of definite assistance in picking drilling targets in this zone.

The Muheim property includes areas of each of the above possible mineralized zones. Tentatively, three 1000-foot holes are suggested, marked on the map. Geophysics should precede Nos. 2 and 3. Further investigation may suggest areas of interest south of the Home Again Shaft.

Cost of such a program is estimated at approximately \$40,000.

In summary, this is an area in which no large ore bodies are known, but where a geologic potential for such bodies exists. It is the type of target favorably regarded by many companies in the Southwest today.

Respectfully submitted,



J Douglas Bell  
Geologist, Exploration

JDB:jan

6101 East Oak Street  
Tucson, Arizona  
December 19, 1962

Dear Pennie:

Thanks for your miner-like card - very appropriate!

Since your and Herb's visit, I have taken eight samples on the Muheim property, and thought you might be interested in the results. Locations are shown on the enclosed map excerpt.

<u>No.</u>	<u>Width</u>	<u>Oz. Ag</u>	<u>% Cu</u>	<u>%MoS<sub>2</sub></u>	<u>Description</u>
Hecla-1	67'	0.3	0.45	Tr.	NW wall of x-c from old 100' sh.; entry thru dog-hole in N'ly wall of the big open-cut.
Hecla-2	Grab	0.5	0.45	.003	Two 6' slot-grabs down side of windrowed oxide ore pile at big cut.
Hecla-3	Chips	0.5	0.03	0.013'	From the small otc of porphyry on the little hill south of big cut.
Hecla-4	26'	0.4	0.48	Tr.	Altered ls next to porphyry dike, 2nd bench above Home Again Sh.
Hecla-5	32'	0.3	0.52	.003	Mnlzd porphyry dike, 2nd bench.
Hecla-6	12'	0.2	0.03	Tr.	Porphyry, top cut on hill east of Home Again Shaft.
Hecla-7	4.5'	0.4	0.73	.018	Crushed zone in ls, 100' level, Home Again Shaft.
Hecla-8	6.0'	1.5	4.24	.003	Shoulder of shallow cut on Bisbee claim, shear zone in Cretaceous.

I thought the moly assays were rather interesting. I've sent a 200-scale map showing the sampling, etcetera, up to Herb, but haven't heard from him regarding the Muheim deal as yet.

Best regards

*Doug*

J Douglas Bell

Muheim Ground  
Helvetia  
Pima Co.

November 23, 1962

Mr. H. E. Harper  
Chief Geologist, Hecla Mining Co.  
305 Fidelity Building  
Spokane 1, Washington

Dear Herb:

Re: Muheim Copper Property  
Helvetia District  
Pima County, Arizona

The following memorandum sets forth my thoughts on the above-noted property situate about 30 miles southeast of Tucson. I briefly inspected this ground on November 17, 1962, in company with you and J. D. Bell. I have a copy of Mr. Bell's report of November 1, 1962, copies of short reports by Ira Joralemon written in 1955 and 1956, and notes by Mr. Bell summarizing various data. Inasmuch as this information gives an adequate description of the geology, and is available in your office, there is no point in my going into it here.

The Muheim property is quite irregular in shape. It is about two miles long in a NNE direction and varies from  $\frac{1}{2}$  to  $1\frac{1}{4}$  miles in width. The terrane is not too difficult as regards access.

Scattered copper showings are widespread in the westerly half of the property, throughout a length of about a mile and a width of approximately one-half mile. These showings are in the form of small pockets from which some modest shipments have been made, minor seams and stains in fractured and brecciated Cretaceous (?) sediments, and as spots and scattered stains in small bodies of monzonite porphyry. As stated by Joralemon, these showings give the impression of possibly being "upward leaks" from a deep and extensive ore body in sediments or porphyry. They constitute a lot of "smoke" and warrant careful consideration.

Although a few holes and several shafts have been put down on the Muheim property, past exploration has by no means exhausted the possibilities of the ground. I believe that it warrants some additional attention, but, because of the very speculative nature of such a project, only if the ground can be obtained on very reasonable terms.

Mr. H. E. Harper - 2 - November 23, 1962

If such can be done, then I would propose a geophysical survey by the IP method to determine if a conductor due to disseminated sulfide mineralization can be detected. If favorable results are obtained then the anomalies should be checked by drilling several holes to a depth of about 1000 feet. This geophysical work should cost around \$2,000 to \$3,000.

Considering the pattern of mineralization in the Pima-Mission district lying about 25 miles WNW in a similar geologic environment, it might be well to follow the IP survey by geophysical work employing the vertical EM method.

As regards the deal proposed by the Muheims in your preliminary discussions, the following are my thoughts:

1. An initial "free period" of nine months is satisfactory.
2. A \$25,000 cash payment at the end of nine months is not too bad if geophysical work and preliminary drilling results are satisfactory.
3. The \$60,000 annual minimum royalty seems too high because if we were fortunate enough to find a good ore body it would probably take from 5 to 10 years from the time of the initial drill hole discovery to bring it into production. (It took 7 years to bring in A.S. & R.'s Mission project).
4. The 7½% royalty is too high for a low-grade copper deposit.
5. I do not like the perpetual royalty basis and would prefer an arrangement whereby the present owners would eventually be bought out.

Mr. Bell points out that the Muheim property is completely surrounded by ground recently acquired by Banner Mining Company. This company has pursued an aggressive policy during the past decade with considerable success, and its entry into the Helvetia district is significant.

With best personal regards,

Yours sincerely

E. N. Pennebaker

ENP:mc  
cc - 2 copies enclosed  
Mr. J. D. Bell

TO: Mr. H. E. Harper  
FROM: J Douglas Bell  
SUBJECT: Muheim Copper Prospect, Pima County, Arizona  
DATE: 1 November 1962

*Please return  
to H. E. Harper*

### Summary

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The Muheim property is regarded as having a favorable potential for a disseminated porphyry deposit in the vicinity of the N-S faulting, and for possible ore bodies along the thrust fault. No large ore bodies are known in the district, and it is a gamble in that sense.

### General

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On October 17, Henry Muheim, one of the owners, showed me over the property, and provided a claim map. Two days of the following week were spent in mapping the geology, during which time I encountered one of Banner's field crews. Following is my report.

### Location and Ownership

The Muheim property, consisting of 42 unpatented claims which were fully abstracted in 1958, is located in Sections 25 and 36 and 30-31, T 18 S, R 15-16 E, in the Helvetia Mining District, Pima County, Arizona. This district embraces both the east and west flanks of the northerly-trending Santa Rita Mountains, and is located approximately 30 miles SE of Tucson; its location, about 15 miles east of the Pima-Twin Buttes District, can be seen by reference to your geologic map of Pima County. The Muheim claims are in the foothills of the east flank, in the old Rosemont area; access is via U. S. 80 and Arizona 83 for 38 miles SE from Tucson, thence 3.5 miles westerly on dirt road to the property. The nearest rail point is at Vail, about 15 miles to the north.

The property is owned by the Muheim family, under the direction of Joseph Muheim, presently Vice President and Manager, 1st National Bank of Arizona, in Bisbee. The claims have been held by the Muheims since 1905.

### History

The Helvetia District is an arcuate area ranging from Helvetia, near the north center of T 18 S, R 15 E, southerly along the east portion of the township to the Rosemont area. It thus crosses the sharp crest of the Santa Rita's at Gunsight Pass at an elevation of about 6000 feet. Most of the early production was confined to the NW'ly area, west of the pass, although there were several prospects on the east flank, and a smelter was operated for a short time near Rosemont.

Development in the Helvetia District commenced as early as 1880; a few quartz fissure deposits in granite were discovered, but the principal production was of copper oxide-carbonate ore and chalcocite occurring as contact replacement deposits at shallow depths in tuffitic limestones. F. C. Schrader examined the district in 1909, recording his observations in U.S.G.S. Bulletin 582, 1915. During the period 1880-1909, the principal mines were developed, including the Copper World, Heavy Weight, Isle Royal, Old Dick, and Leader, controlled by the Helvetia Copper Company; these were all on the west flank of the range. Claims on the east flank were controlled principally by the Lewisohn interests. Production data for individual properties during this period is sketchy; some data is shown on the attached map. The grade averaged about 5% Cu, with some rich pockets of 12-25% Cu as chalcocite. Some silver and a little gold occur with the copper, and molybdenite is a minor constituent.

Schrader records production from 1903-1912 of 32,271 tons from the Helvetia and Empire Districts combined (30,870 tons from Helvetia District), containing 2,585,923 pounds of copper, mostly from the Helvetia District; an additional substantial production occurred during the period 1890-1902. Arizona Bureau of Mines Bulletin 140 (1936) shows production of the Helvetia District to 1929, totalling 15,150,000 lbs. Cu, \$1,000 Au, and \$124,000 Ag, valued at \$3,320,000. Production 1908-1933 totalled 227,333 tons, averaging 0.8 oz. Ag, 3.8% Cu, 0.09% Pb, and 0.24% Zn.

On the east flank of the range, the Narragansett Mine has been the largest producer. Hardly more than a prospect at the time of Schrader's visit, it yielded 6,000,000 lbs. Cu and \$40,000 in Ag during the period 1915-1920. There are numerous other workings on the east flank, mostly small, and evidencing a minor production.

The Muheim group was acquired in 1905 by the Muheim's father. Several short prospect adits are in evidence, and a shaft was sunk on the Home Again claim to 200 foot depth. During the 1940's, surface ores were mined by Henry Muheim, and several shipments of carbonate ores averaging 2-3% Cu were made. In the early 1950's, Bear Creek Mining Company proposed a consolidation and development program including the Muheim ground; the agreement was not consummated because the participants could not agree upon the division of interest. In 1958, the Muheim ground was optioned to American Exploration Company, which deepened the H-1 churn drill hole to 763-foot depth, and drilled one additional hole to 800-foot depth 300 feet west of H-1. No mineralization was encountered and the option was relinquished.

During the past two years, Banner Mining Company has acquired the former Helvetia Copper, Lewisohn, and Mueller holdings, and has staked additional claims surrounding the Muheim ground (see property map). Banner has offered the Muheim's a holding royalty of \$600 per month for their claims, without a commitment for a down-payment; the offer was refused, and the claims are available. Banner has drilled four holes on ground near the Muheim property; I do not know what has been done in the Helvetia area.

### Geology

General geology of the Helvetia District is shown on the attached map. The northwestern section is sketched from Schrader's reconnaissance map (Bulletin 582); the central portion is from Creasey and Quick (U.S.G.S. Bulletin 1027-F, 1955); the southeasterly part is the result of my two-day reconnaissance mapping.

Schrader, in 1909, mapped Cambrian quartzite, Carboniferous and Permian limestones, and Cretaceous clastics in the Helvetia area. He recognized two periods of intrusion, one in which the Paleozoic rocks were penetrated, and one in which the earlier coarse-grained granite, the Paleozoics, and the Cretaceous rocks were intruded by granite porphyry. His sections indicate that the Paleozoics have been thrust over the earlier granite in the Helvetia area, and subsequently intruded by the porphyry. High-angle faults have cut the granite and sediments; mineralizing solutions have altered the limestones to garnetiferous tactites along intrusive contacts and faults which became the sites of ore deposition. Oxidation extends to about 300 foot depth. He noted that most of the mineralization was in the limestones, and that the granite was relatively unmineralized.

Creasey and Quick, in 1943, mapped and studied the area in the vicinity of four of the larger mines, the Copper World, Leader, Rosemont Lease, and Narragansett. They recognize the batholithic granite to the west as clearly intruding the Cambrian Bolsa quartzite, and show a wedge of this granite thrust over Paleozoic limestones near the Copper World Mine; the age is indicated as Jurassic-Cretaceous. Major thrusting occurred after this intrusion, followed in Laramides(?) time by intrusion of the quartz monzonite porphyry plug north of the Narragansett Mine, apparently intruding

the thrust fault and cutting Paleozoic and Cretaceous formations. High-angle reverse faulting of N-S trends, and folding of the thrust, shown in the exposure of Permian limestone east of the Narragansett, apparently were associated with the Laramides orogeny. Section D-D (attached map and sections) from Bulletin 1027-F shows Creasey and Quick's interpretation of the structure. Again, the copper mineralization, chalcopyrite, oxides, carbonates, chalcocite, and a little molybdenite, is noted as occurring principally in lime-silicate rocks; the quartz monzonite porphyry plug is reported as being locally mineralized at the Rosemont Lease, as is the adjacent tactite.

Anaconda is noted as drilling a hole beneath a copper-stained breccia zone bordering the porphyry plug on the south; results of this drilling are not given.

My mapping was concerned principally with the extension of Creasey and Quick's geology southward. Approaching the Muheim claims from the east, you pass through a broad expanse of gray-green shale and arkosic sandstone dipping about 50° SE'ly, broken occasionally by reddish hematite-stained beds. Near Drill Holes T-1 and C-1, in the easterly Muheim claims, the rocks become predominantly red and more arkosic and quartzitic, weathering to smooth-planed brick-red chips. Copper stains on fractures and bedding planes and in thin quartz veinlets become apparent near the Jessie Adit and Hole H-1, and are encountered westerly until the contact between the reddish Cretaceous arkose and the gray Paleozoic limestone is reached. This copper mineralization in the Cretaceous rocks is spottily distributed along a belt trending from the Home Again Shaft area NNE'ly to the quartz breccia plug in the north part of Section 30. Occasional nodules of cuprite surrounded by chalcocite and carbonates are found; concentrations of these, as near Holes B-2, B-3, and B-4, have yielded a small sorted production of ore averaging 5-7% Cu. The belt is about 2000 feet in width.

Near the Oxide Pit and Hole H-1, and extending SW'ly toward Hole GC-1, the red Cretaceous clastics are strongly brecciated, and it is nearly impossible to discern bedding. Copper, mostly as cuprite, is disseminated in this area; perhaps a thousand tons has been stock-piled from the Oxide Pit in preparation for leaching. Henry Muheim stated that the stock-pile assays 1% Cu. Hole H-1 cuts 250 feet of the reddish material, sludge assays of which are reported by Muheim to assay 0.75% Cu. Below the reddish arkose, the hole passes into black, barren shaley limestone for its remaining 510 feet of depth. I interpret this brecciated mineralized arkose as lying along the axial region of the anticlinal roll in the thrust fault shown in Creasey and Quick's Section D-D'. Flat slips cut the Cretaceous rocks in the Oxide Pit and near the Bisbee Fraction ore, reflecting the thrusting stresses as the fault reaches shallow depth (see Section B-B').

To the north, the quartz breccia plug cutting the overthrust Cretaceous rocks suggests that silica-rich solutions with pyrite and chalcopyrite may have coursed along the thrust, rising along fractures in the upper plate. Ira Joralemon examined this area for American Exploration in 1958, and recommended moving to the east and drilling perhaps to 1500 foot depth, according to Muheim. In a somewhat similar geologic mode, monzonite porphyry apparently cuts the Cretaceous rocks to the east of the Home Again Shaft (map, and my section A-A').

To the south, in the vicinity of the Home Again Shaft, the geology becomes more complicated. The belt of N-S faulting shown near the Narragansett Mine is reached again here, up-faulting Paleozoic limestones which outcrop from here westerly. Monzonite porphyry, with an aphanitic light gray ground mass and quartz phenocrysts, weathering to a distinctive pitted buff-orange rock, lies in flatly-dipping fault contact with underlying limestone; these thrust (?) contacts have been displaced by the steep faults as shown in Section A-A'.

The monzonite porphyry outcrops again in the hill east of the shaft area; contacts here are not definitely exposed, and the entire porphyry area was not searched out. West of the Home Again Shaft, the porphyry can be traced NW'ly to the Chicago workings.

The porphyry is apparently intrusive upward in dike or stock-like form as indicated by its presence from 135 foot depth to the bottom of the 200 foot Home Again Shaft; this suggests that the steep N-S faults were present prior to the porphyry intrusion, that thrusting then occurred, followed by intrusion along the N-S zone of faulting and a spread outward along the thrust, followed by some post-porphyry movement displacing the porphyry-limestone thrust contacts.

Several stopes and open-cuts in the faulted area indicate that a moderate production of oxide-carbonate ore was attained here. Both the altered limestone and fractured porphyry show copper mineralization in the 1-3% range. Away from the faulted zone, porphyry outcrops show little evidence of the former presence of copper. Significantly, however, porphyry from the bottom of the shaft shows chalcocite and oxides, samples of which assay 5% Cu per Muheim.

Two sets are collapsed just below the 100 Level of the shaft, and the lower portion is not now accessible. I examined the 100 Level, consisting of about 80 feet of drift and cross-cut, all in limestone. Copper oxides, carbonates, chalcocite, and a little molybdenum occur in a zone of crushing and faulting. A second level at 185 feet is reported to have been driven N'ly in a pinkish granitic rock which showed only faint stains of copper minerals.

One further evidence of mineralized porphyry at depth is noted. Hole GC-1, about 1360 feet north of the shaft, is reported by Muheim to have cut 188 feet of brecciated red arkose from the surface, then 187 feet of barren white chert, then gray limestone with thin bands of Pb-Zn to 525 feet, then mineralized porphyry from 525 to 600 feet, the bottom. The porphyry cuttings reportedly averaged 1.5% Cu. The thrust fault was apparently cut at 188 feet and was not mineralized.

Moving westerly up the slope, shallow workings in mineralized tactite along faulting are noted in white limestone mapped as Permian because of its resemblance to that in the "window" east of the Narragansett Mine. Banner has bulldozed roads into this area, but has done no drilling here as yet. About 2500 feet NNE'ly, on the Central claim and close to the same belt of limestone and faulting, Banner has drilled 3 holes, B-2, B-3, and B-4. My Section B-B' shows these holes, and indicates that Banner is seeking ore bodies in tactites adjacent to the intrusive granite.

According to Higgins, the driller, Hole B-2 was 2300 feet in depth, in limestone most of its depth. From 1200 to about 1275 feet, the core was specked with native copper of match-head size. At 1800 feet, in garnetized limestone, 14" of native copper was cut, followed by 25 feet of oxide-carbonate mineralization, then some chalcopyrite. Hole B-3, vertical, cut 8-9 feet of the same specks of native copper at 1155-foot depth. Hole B-4, angled at 45°, entered barren granite at 600 feet. This is Higgins' report, and I cannot vouch for its verity or accuracy.

Banner has drilled one other hole, B-1, near the quartz breccia plug. I know nothing of the results here.

On the Muheim ground, two other holes have been drilled, T-1 and C-1. T-1, to 550 feet, was in barren reddish arkose, and did not reach the thrust. C-1, to 327 feet, was in reddish arkose, and also did not reach the thrust; some pyrite and chalcopyrite similar to that in the Jessie Adit was encountered. The sludge reportedly assayed 0.25% Cu.

The surface geology and drill-hole information have been correlated and interpreted on my sections A-A' and B-B', and may be compared with Creasey and Quick's Section D-D'.

### Acquisition

The Muheims wish to realize some profit from their property while they are alive; consequently they are seeking a deal involving a down-payment (to be negotiated). With a company such as ours, I believe they would agree to an exploration period of perhaps 3 months, following which a down-payment and annual royalties would be required. Other arrangements might be made; Joseph Muheim indicated he would consider any equitable agreement.

### Conclusions

The Helvetia-Rosemont District lies along the SE'ly projection of a general NW'ly trend embracing the Pima and Silver Bell Districts to the NW. Its history is similar to the early history of the other two districts in that in both Pima and Silver Bell, mining began with development of contact replacement deposits of copper in tactite-altered limestones adjacent to Laramides porphyry intrusives. Major low-grade copper deposits in tactites have recently been found in the Pima District, while porphyry deposits have been developed at Silver Bell. The Helvetia District therefore may constitute a good exploration target. The Muheim property is of interest since it constitutes a sizable claim block in an area surrounded by the claims of an aggressive and capable organization, Banner Mining Company.

Reviewing the history and geology of the Helvetia District, it appears that most of the contact deposits developed in the limestones have been relatively small, although it should be remembered that they were mined for shipping ores. An envelope of low-grade oxide-carbonate ore may remain, but if so, it is surprising that the district has lain dormant so many years. I believe Banner's search is for substantial contact replacement ore bodies at depth, or for mineralized porphyry deposits.

The geologic data makes it quite clear that the copper bearing solutions were associated with the intrusion of the Laramides quartz monzonite porphyry. The principal exposed masses of this rock are found on the east flank of the range, north of the Narragansett and near the Home Again Shaft. The probable control which guided the intrusive emplacement was the belt of steep N-S faulting, with lateral migration along the thrust fault. The copper mineralizers accompanying the intrusion migrated along the faults and fractures in the limestones, and in the brecciated Cretaceous rocks of the upper plate of the thrust.

The most likely area for substantial ore bodies on Muheim ground lies in the possible mineralized porphyry along the steep fault east of the Home Again Shaft, striking N'ly toward Hole GC-1. Substantial mineralization has been found in this zone at the bottom of the shaft, and at 525-600 foot depth in Hole GC-1.

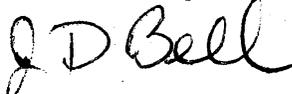
The porphyry intrusive east of the shaft area and the quartz breccia plug to the north suggest that mineralizing solutions may have migrated easterly along the thrust fault, and ore bodies may exist here as well. Tendency of solutions to migrate upward, and the relatively unfavorable nature of the arkose suggest these may be small unless a large mass of porphyry is discovered, or faulting is open and extensive. Magnetometer and induced potential geophysics might be of definite assistance in picking drilling targets in this zone.

The Muheim property includes areas of each of the above possible mineralized zones. Tentatively, three 1000-foot holes are suggested, marked on the map. Geophysics should precede Nos. 2 and 3. Further investigation may suggest areas of interest south of the Home Again Shaft.

Cost of such a program is estimated at approximately \$40,000.

In summary, this is an area in which no large ore bodies are known, but where a geologic potential for such bodies exists. It is the type of target favorably regarded by many companies in the Southwest today.

Respectfully submitted,



J Douglas Bell  
Geologist, Exploration

JDB:jan

6101 East Oak Street  
Tucson, Arizona  
December 19, 1962

Dear Pennie:

Thanks for your miner-like card - very appropriate!

Since your and Herb's visit, I have taken eight samples on the Muheim property, and thought you might be interested in the results. Locations are shown on the enclosed map excerpt.

<u>No.</u>	<u>Width</u>	<u>Oz. Ag</u>	<u>% Cu</u>	<u>%MoS<sub>2</sub></u>	<u>Description</u>
Hecla-1	67'	0.3	0.45	Tr.	NW wall of x-c from old 100' sh.; entry thru dog-hole in N'y wall of the big open-cut.
Hecla-2	Grab	0.5	0.45	.003	Two 6' slot-grabs down side of windrowed oxide ore pile at big cut.
Hecla-3	Chips	0.5	0.03	0.013'	From the small otc of porphyry on the little hill south of big cut.
Hecla-4	26'	0.4	0.48	Tr.	Altered ls next to porphyry dike, 2nd bench above Home Again Sh.
Hecla-5	32'	0.3	0.52	.003	Mnlzd porphyry dike, 2nd bench.
Hecla-6	12'	0.2	0.03	Tr.	Porphyry, top cut on hill east of Home Again Shaft.
Hecla-7	4.5'	0.4	0.73	.018	Crushed zone in ls, 100' level, Home Again Shaft.
Hecla-8	6.0'	1.5	4.24	.003	Shoulder of shallow cut on Bisbee claim, shear zone in Cretaceous.

I thought the moly assays were rather interesting. I've sent a 200-scale map showing the sampling, etcetera, up to Herb, but haven't heard from him regarding the Muheim deal as yet.

Best regards

*Doug*

J Douglas Bell

Muheim Ground  
Helvetic  
Pima Co.

Helustia Deal

9 mo. free look

Then \$25,000 Cash

Then \$60,000 Ann. Minimum

To be taken up by 7½%  
royalty on production.

18  
\$ 5.50  
1.00

5 days -  
2,000 -  
3,000

R. 15 E.

R. 16 E.

14

13

18

23

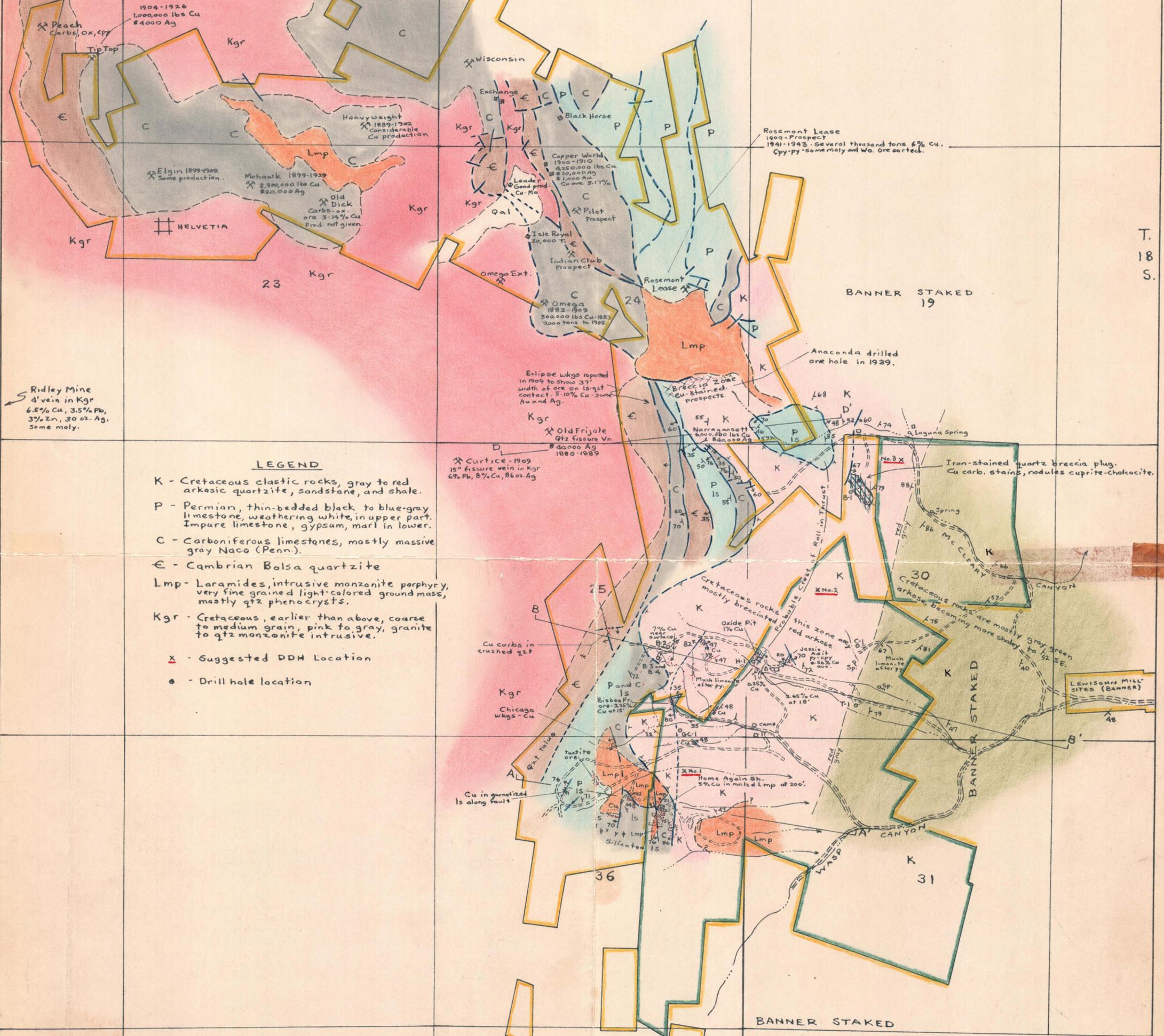
24

BANNER STAKED 19

T. 18 S.

LEGEND

- K - Cretaceous clastic rocks, gray to red arkosic quartzite, sandstone, and shale.
- P - Permian, thin-bedded black to blue-gray limestone, weathering white, in upper part. Impure limestone, gypsum, marl in lower.
- C - Carboniferous limestones, mostly massive gray Naco (Penn.).
- E - Cambrian Bolsa quartzite
- Lmp - Laramides intrusive monzonite porphyry, very fine grained light colored ground mass, mostly qtz phenocrysts.
- Kgr - Cretaceous, earlier than above, coarse to medium grain, pink to gray, granite to qtz monzonite intrusive.
- X - Suggested DDH Location
- o - Drill hole location



PROPERTY AND GEOLOGY  
**HELVETIA MINING DISTRICT**  
 PIMA COUNTY, ARIZONA

SCALE: 1" = 1200'

PROPERTY

- BANNER MINING COMPANY, 1962
- MUHEIM BROTHERS

GEOLOGY

Northern Area: from Schrader, U.S.G.S. Bull. 582  
 and Creasey, U.S.G.S. Bull. 1027-F  
 Muheim Area: Bell, J D, Oct. 1962