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COPPER CREEK FIELD TRIP

(AGS-U of A Porphyry Copper Symposium 3/20/76)

Geologically, the Copper Creek District consists of a Laramide igneous complex that includes granodiorite, diorite and several varieties of porphyry. The Laramide rocks intrude Precambrian,Paleozoic and Mesozoic rocks including Cretaceous(?) age volcanics. The area was subsequently covered by mid-Tertiary volcanics, but the older rocks in the District have been exhumed by relatively recent uplift and erosion.

The field trip has been designed to give a brief introduction to the geology at Copper Creek. Several of the breccias in the District will be examined along with the basic rock types and some of the alteration assemblages.

The buses will travel north from Tucson, then swing to the east, along the north side of the Catalina Mountains. From the town of Oracle the route drops into the San Pedro Valley, passing the San Manuel deposit and smelter. The San Pedro River is crossed at Mammoth. From Mammoth the route climbs to the east toward the Galiuro Mountains and crosses over the Plio-Pliestocene Gila Conglomerate. The clay and silt units exposed in the wash just east of the river are part of the Lake bed facie of the Gila. Some of these units contain gypsum. To the north, agricultural gypsum in the Lake beds is being mined. The Lake beds rapidly grade into and are interfingered with the coarse sand and conglomerate beds typical of the Gila.

The Gila Conglomerate is in fault contact with the Glory Hole Volcanics. The volcanics are andesitic and latitic agglomerates, lavas, flow breccias and tuffs that have been thermally metamorphosed by the intrusion of the Copper Creek granodiorite stocks to dark, fine-grained, hornfelsic-textured rocks.

The Glory Hole Volcanics exhibits a very strong east-west

of fracturing. This is the predominant "open" vein direction in the district. The areas of very strong alteration and breccia pipe development show rough, resistant, reddish-stained outcrops. The main alteration product is fine-grained quartz and sericite. Up to 10% pyrite is present, as is minor tourmaline. On crossing the creek, a breccia pipe can be seen just north of the stream.

STOP-1 - Precipitation plant site, Ranchers Exploration and Development Corp.

The bus will park here and the remaining trip will be by foot. The total round-trip distance will be 3 miles.

The Ranchers insitu leaching operation is presently shut down. The area being leached is the site of the Old Reliable Breccia Pipe. The Old Reliable contained four million tons of ~~0.08%~~ 0.74% copper. The principal copper minerals are chalcocite, chalcopyrite, malachite, chalcanthite and chrysocolla. Ranchers fractured in place an area of 400 feet in diameter and 350 feet in depth using 2,000 tons of conventional explosives.

The road bed seen along the north side of the canyon is an old railroad grade. It was built during the 1940's to carry ore from the Old Reliable and the Childs-Aldwinkle mines to a mill site almost a mile up the Canyon. The Old Reliable furnished copper, and the Childs-Aldwinkle furnished copper and molybdenite.

The tailings in the side canyon came from an old mill up the canyon near the Childs-Aldwinkle mine. The foundations of the mill are still present to the east along the road.

On leaving the bus we will proceed up the road. It will be a long walk to the next stop, so please stay close.

The first outcrop on the road is the Glory Hole Volcanics. The black color of the rock is in part due to fine-grained biotite. The contact between

the granodiorite and volcanics is just to the east. For the next 2500 feet, you will get a very close view of the Copper Creek Granodiorite. The granodiorite is cut by widely-spaced veins with quartz-sericite-chlorite alteration selvages. Almost all veins in the Copper Creek District are east-west, or within 15 north or south. Many are steep, but an occasional flat vein is present.

STOP 2 - Dark Porphyry

This is a typical plug of dark porphyry. Some good exposures of its contact with the granodiorite can be seen just below the road on the southern side of the creek. Some veining with pyrite is seen across the creek. At the eastern end of the plug, the dark porphyry and granodiorite exhibit intense quartz-sericite alteration. For those of you who want to risk the climb, it can be viewed. Continue up to the railroad bed and walk eastward to the next stop. For those who wish easier paths, follow the road across the creek and to the path to STOP 3.

STOP 3 - Breccia Pipe

This breccia is exposed in three separate outcrops aligned in a northerly direction. Note the fracture control of the breccia, its sharp contacts, the variations in fragment size and rounding, alteration within the breccia and the surrounding host, and the close association between breccia and dark porphyry.

(a) Dark Porphyry. On the road the contact of the dark porphyry and granodiorite is exposed. The porphyry shows intense quartz-sericite alteration.

(b) Southwest corner of small intensely altered area. The breccia texture is poorly developed, or obliterated by the intense alteration. Here the control of the east-west and north-south fractures is well shown. Some other features to note are:

1) the sheeting at the contact;

2) the rapid diminishing of alteration beyond the pipe;

3) the steepness of the contact;

4) presence of some tourmaline.

(c) A traverse from the railroad bed up hill across the breccia will give some idea of the breccia texture, fragment size and shape variations, the alteration, and contact relations. At this elevation, to the north, is a level area with a deep open shaft. BEWARE, as it is most difficult to extricate a person from it.

(d) In this area, on the railroad bed, the breccia fragments are easily seen. Both alteration and fragment shapes can be observed. Note the overall tightness of the breccia. The zone of sheeting at the contact, just east of the railroad bed, is relatively wide.

(e) Septum of unbrecciated, weakly altered granodiorite. This coincides with one of the subordinate fracture directions.

(f) The northern breccia contains a large dark porphyry block at the railroad bed level. Note the vuggy character and the presence of copper oxide in the porphyry. This northern breccia is more intensely altered and contains less copper mineralization than the southern breccia.

On leaving this stop, return by the path to the canyon bottom and go directly south to the main road. For those interested, the pebbly talus just south of the road is ore from the Childs-Aldwinkle. A few minutes of looking can reveal some nice moly specimens. Follow the main road up onto the narrow ridge. Straight ahead is the front steps and foundation of the Copper Creek Post Office.

STOP 4 - Breccia Pipe

The railroad bed behind the Post Office site cuts through a breccia. As you walk from the Post Office, note the dark porphyry to the right. This breccia displays some large fragments with well-developed quartz-sericite rims.

The breccia has an open texture and contains an unusual amount of specularite. Minor limonite after sulfides is also present. If you walk to the east, the sharp contact of breccia and granodiorite can be seen. At the western end of the cut the contact with the breccia and dark porphyry can be observed. Is the dark porphyry before or after the brecciation?

Leave the breccia and return to the main road. Along this road you will pass an area of granodiorite which exhibits intense fracturing, then a dark porphyry dike is exposed. Near the next stop, there is an inclusion of Glory Hole Volcanics in the granodiorite.

STOP 5 - Breccia Pipe

Argillic alteration, enhanced by weathering, borders this breccia pipe. The contact on both sides of the breccia are steep and sharp. Thin dikes of dark porphyry are present in the contact zones. The dark porphyry at the southern contact has several apophysis into the breccia. The breccia contains fragments of several different rock types, shows abundant limonite staining, and has an open texture.

On leaving this stop, continue up the road. Note the fracture direction in the road cuts. A small dike of pink porphyry in the granodiorite can be seen beyond the curve.

STOP 6 - Intrusion Breccia

In this outcrop, the relationship of the dark porphyry intrusion, contact brecciation and hydrothermal activity can be seen.

(a) Contact zone exhibiting brecciated granodiorite in a matrix of dark porphyry. Note the terminated veins in the granodiorite fragments.

(b) Dark porphyry mass. A dark and a lighter porphyry phase are exposed in the road cut. Are these two separate intrusions? Note the wisps

of pink orthoclase in the porphyry and adjacent granodiorite fragments.

(c) and (d) Brecciated granodiorite similar to (a), except some leaching is present. Note the vugginess and alteration. Look closely at the vugs and see if you can find any mineral fillings.

(e) On the ridge just above the road, intense quartz-sericite alteration occurs along the edge of the intrusion breccia. Some breccia texture is apparent. Tourmaline and limonite after sulfides are also present.

From this stop, proceed up the road to the prominent breccia pipe, the last scheduled stop. The last stop is in the area of deep copper mineralization.

STOP 7 - American Eagle Breccia Pipe

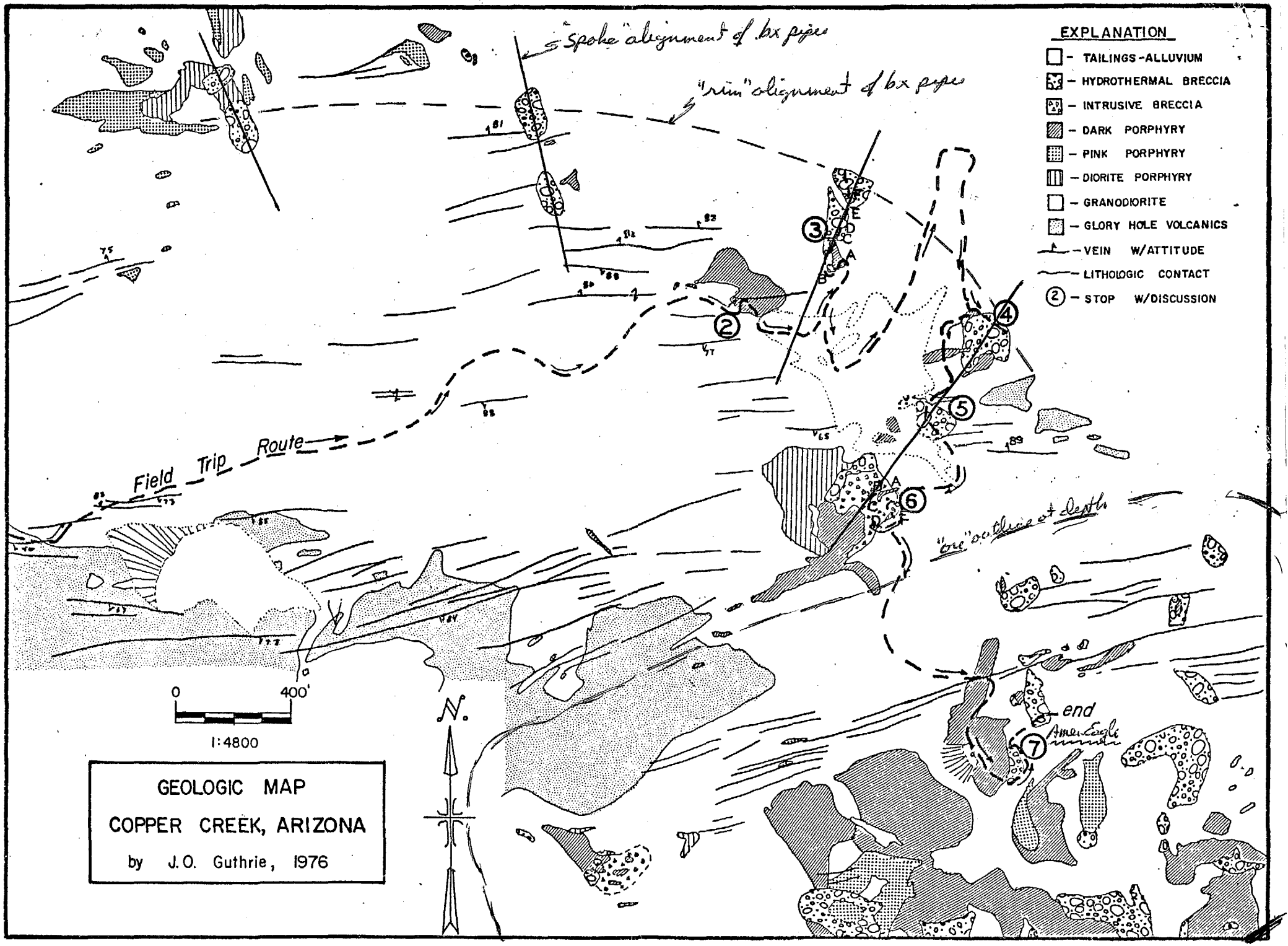
The American Eagle Breccia occurs at the edge of a dark porphyry plug. The dark porphyry along the road exhibits an intense quartz-sericite alteration. Material on the dump comes from workings in and adjacent to the American Eagle pipe. Highly altered vuggy porphyry containing specularite, and breccia specimens are present on the dump.

Mineralized breccia and the contact with the porphyry is exposed just inside the road level adit. BEWARE of the WINZE (shaft) to the left a few feet inside the adit entrance.

From the adit, walk up the road about 100 feet and then climb up to the breccia. Follow the eastern contact up to the top. Note the wrapping around of the fracturing and, near the top, the tabular fragments adjacent to the contact. Are these fragments derived from the sheeted contact by slumping, plucking or some other manner? At the top of the breccia, some crude layering can be seen in the breccia. This is shown by the alignment of oblong and tabular fragments.

This concludes the guided portion of the field trip. If time permits, there are several other breccias that can be visited. The breccia just north of the American Eagle pipe contains tourmaline in the matrix. About 700 feet to the northeast a small tourmaline-bearing, ring-shaped breccia with a dark porphyry core is exposed. Two breccias crop out on the ridge 500 feet north of the American Eagle pipe. Concentric fracturing is well-exposed around the smaller pipe.

Please return to the bus on time. Although it is downhill, it is still a mile and a half away.


"Spoke" alignment of bx pipes
"rim" alignment of bx pipes
EXPLANATION
- TAILINGS-ALLUVIUM
- HYDROTHERMAL BRECCIA
- INTRUSIVE BRECCIA
- DARK PORPHYRY
- PINK PORPHYRY
- DIORITE PORPHYRY
- GRANODIORITE
- GLORY HOLE VOLCANICS
- VEIN W/ATTITUDE
- LITHOLOGIC CONTACT
- STOP W/DISCUSSION
Field Trip Route
"ore" outline at depth
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GEOLOGIC MAP
COPPER CREEK, ARIZONA
by J.O. Guthrie, 1976

Recent Advances of Quantitative Mineralogy in Exploration, Edited by D.W. Groff.
Part IV, Applies of Quant. Mineral by X-Ray Diffrac. to Mineral Exploration by D.M. Hausen

Copper Creek

and granodiorites of the Boulder Batholith is provided by a grid study of outcrop samples from a Mo-Cu prospect in Jefferson County, Montana. Rock types show an overall systematic textural and compositional zoning from a granitic core through concentric outer envelopes of quartz monzonite and granodiorite. Pneumatolytic alteration has been widespread and locally intense, resulting in a concentric pattern of late magmatic gradational changes in rock composition.

Molybdenum mineralization (Fig. 8) is concentrated along the western fringe of a central core of quartz-orthoclase rock, where orthoclase/plagioclase ratios are in excess of 20 to 1. K-feldspathization decreases zonally outward from the central core, except to the south and east which remain essentially open, (Fig. 9).

A similar pattern is indicated by sericitic alteration (Fig. 10), which shows a gradational increase outward from the central orthoclase core. Sericitization is low in the vicinity of the geochemical molybdenum anomaly. Anomalous "lows" are also indicated for sericite to the south and east from the central core.

Quartz percentages are plotted in Figure 11, indicating a quartz "high" that overlaps the orthoclase rich core. The silicification anomaly is open to the east similar to those for sericite and K-feldspar.

Alteration Associated with Cu Mineralization in Drill Core From an Arizona Prospect

Core samples from drilling at a prospect near ~~Magma~~ Copper Creek, Arizona have been analyzed for alteration minerals and correlated with copper assays. Core samples from 21 drill holes were composited every 100 feet from 1000 to 1900 feet in elevation. Alteration parameters were plotted on surfaces representing ten different elevations, and contoured.

Composite plots from 1000 to 1900 feet elevations show major east-west alteration trends for sericitization (Fig. 12) and k-feldspathization (Fig. 13). Alteration plots also correlate with composite plots of copper essays, (Fig. 14) as well as surface outcrop features of structure and alteration. Trends of alteration and bedrock geochemistry indicate two, possibly three, potentially open ends for future exploration. Consistency of alteration trends at different elevations suggests vertical structural control.

Cross sections along AD show vertical profiles of sericitization, (Fig. 16), and copper mineralization, (Fig. 17), of similar distribution and orientation. K-feldspathization shows a progressive increase with depth, (Fig. 15), as reported in many porphyry copper deposits.

Subsurface alteration trends are thus delineated from x-ray diffraction analysis of drill pulps, which correlate with distribution of copper values.

CONCLUSIONS

It has been demonstrated that quantitative mineralogy can be utilized in rock type identification and that monomineralic contouring can assist in correlating alteration anomalies with geochemical anomalies. "Semiquantitative" x-ray measurements for sericite, k-feldspar, and quartz have been applied successfully to the geochemical exploration of porphyry type occurences. Zones of alteration may occur as isolated patches, or concentric halos around central cores of pneumatolytically altered rock, but are often interconnected structually to form elongate trends along faults or shear systems, within which the probability of finding ore is greater than outside of these trends.

The distribution of alteration varies appreciably from locality

FIGURE 12

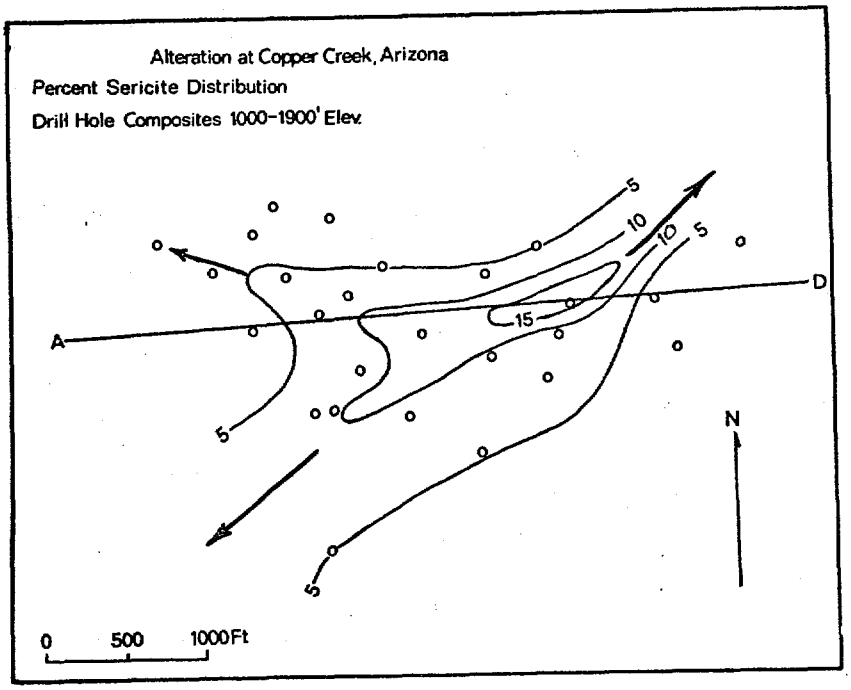


FIGURE 13

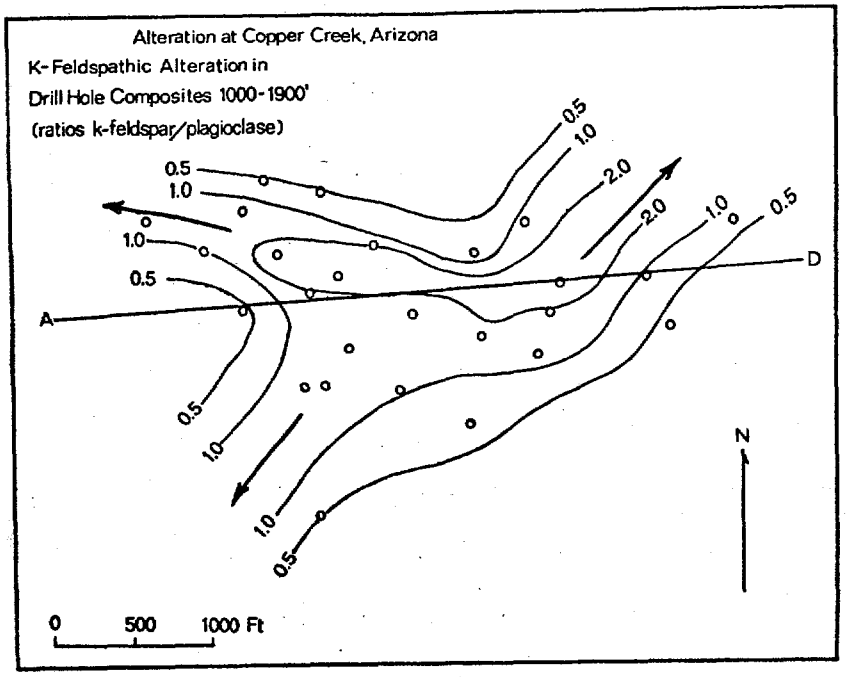


FIGURE 14

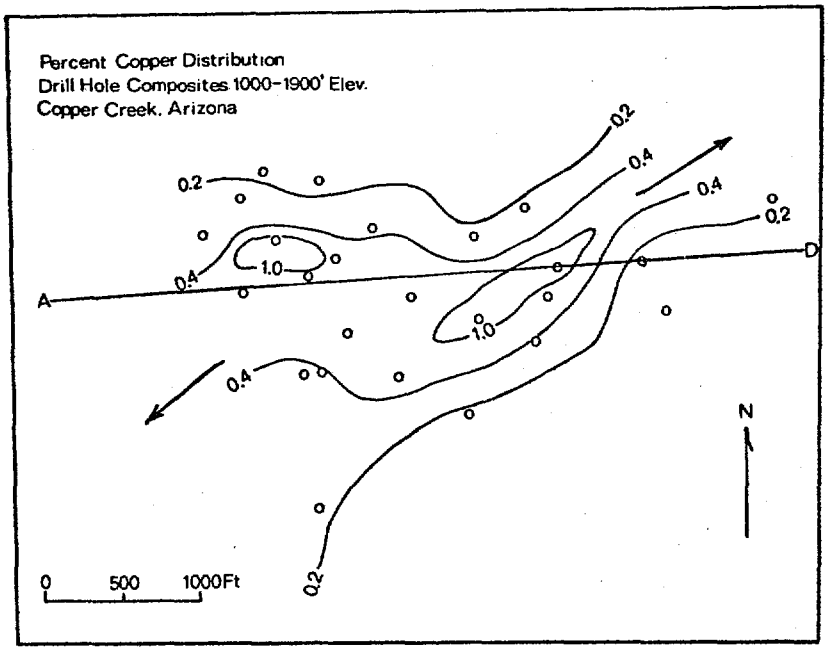
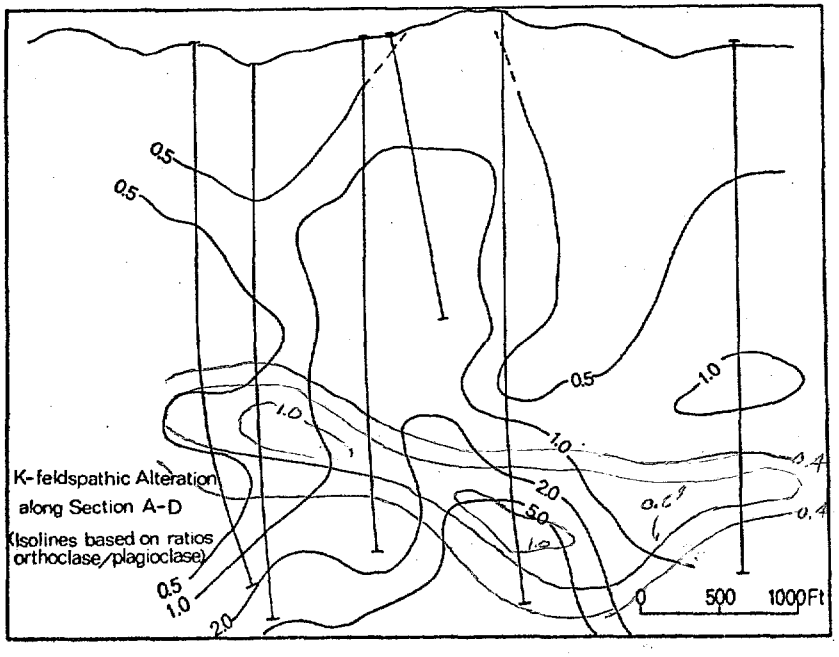
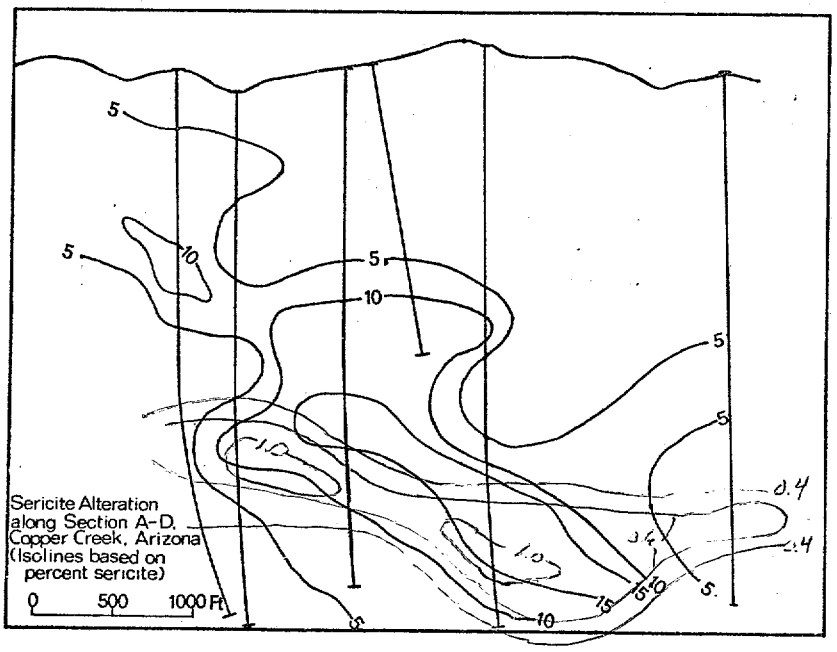


FIGURE 15



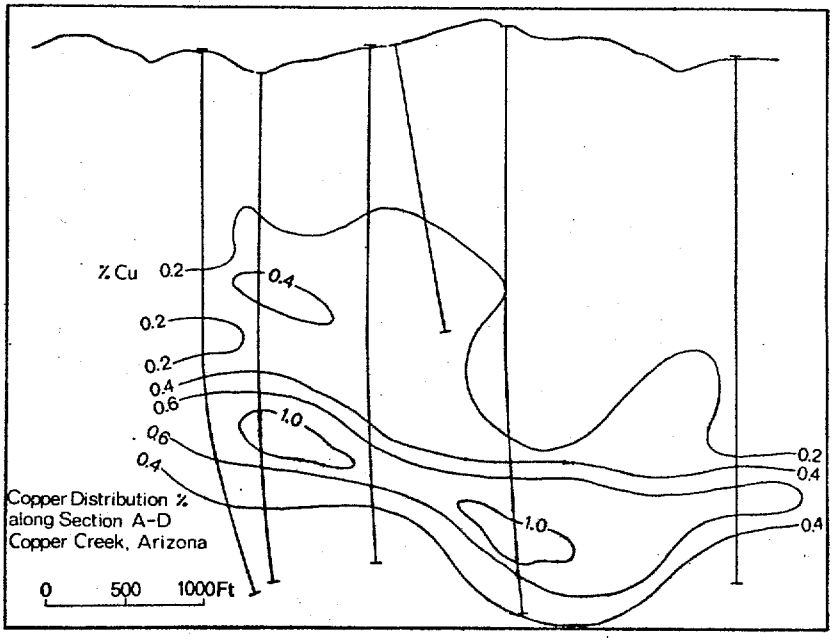
0.4 Cu Neutral %

FIGURE 16



0.4 Cu Wash %

FIGURE 17



AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 13, 1971

CONFIDENTIAL

TO: J. J. Collins
J. H. Courtright
W. L. Kurtz

FROM: W. E. Saegart

Re: Copper Creek Mining District
Pinal County, Arizona

This will serve to bring you up to date concerning recent developments and ASARCO's current status relative to the Copper Creek area.

Dave Beck of Duval Corporation indicated to me two weeks ago that he had heard a rumor to the effect that Newmont was abandoning their holdings at Copper Creek. He advised that Mr. William K. Richey, a local attorney, represented the property owners in the area and had copies of Newmont's drill logs.

I contacted Mr. Richey January 7, at which time he confirmed that he represents Bonbright, the owner of the Childs-Aldwinkle claim group and that Newmont has cancelled their option on that property. Mr. Richey loaned me copies of exploration reports covering previous work by Bear Creek and Newmont on the Childs-Aldwinkle property. A total of seven holes were drilled by these two companies and only very low grade Cu-Mo values were intersected. No further exploration opportunities are recognized within the limits of this property. These reports and assay logs were reproduced for our files and a reference made on a Research Porphyry Note File form. The reports were returned to Mr. Richey on January 11 with a letter informing him that ASARCO would not be interested in exploring that property.

On January 5, I telephoned Mr. Roy Butler, President of Samedan Oil Company in Ardmore, Oklahoma, telephone (405) 223-4110. Mr. Butler confirmed the following: Samedan has acquired Siskon Corporation which, along with Apco Oil Company, jointly own the large group of claims which include the Old Reliable mine and the area of important mineralization discovered by Newmont drilling in recent years. He further confirmed that Newmont has maintained their option on this property, their last payment being made in October, 1970. Annual pre-production royalty payments amount to $50,000. Mr. Butler referred me to Earl Smith, Chief Geologist of Samedan Oil Company and now President of Siskon Corporation.

I subsequently talked with Mr. Smith, who lives in Norman, Oklahoma, telephone (405) 321-8371. Mr. Smith indicated that as far as he knew, Newmont has no intention of abandoning control of the Old Reliable claim group but that it is seeking a joint venture partner for the development of the deep ore which has been discovered. On January 6, I talked to Robert Fulton of Newmont in New York and asked if it would be possible to arrange a visit to their Copper Creek property. Mr. Fulton advised me on his own volition that Newmont is seeking a joint venture partner to develop this property and pointedly asked me if ASARCO was interested in such an arrangement and if this subject was the motivation for my telephone call. I responded in the affirmative. Mr. Fulton then advised that Newmont is currently negotiating a joint venture agreement with another company and that he would be able to advise me by the end of January whether or not their current negotiations are successfully concluded or that Newmont would then be in a position to discuss the joint venture with ASARCO. In the event that their current negotiations are not successfully concluded, Newmont is agreeable to provide ASARCO with copies of all their exploration data on this property.

All information reported in this memo should, of course, be considered highly confidential.

W. E. Saegart

W. E. Saegart

WES:mw

bc: J. D. Sell

Note: Newmont option terms on the Old Reliable property as reported by Bob Holt are as follows: $50,000 per year pre-production royalty (this has been negotiated downward from $100,000.) Upset price is between $4 and $4-1/2 million due in 1973 or as an alternative an upset price of $1/2 million plus an NSR royalty grading from 3% to 7% depending on production rate (7% royalty at 15,000 TPD production grading down to 3% royalty at 30,000 TPD production).

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618054
TRIP

TO H.T.G. / J.D.S / W.K.K → FROM H. Kreis

SUBJECT COMPETITIVE ACTIVITY DATE 6/29/77

MESSAGE The following information was found on a Baroid Mud report of 7-16-76:

Coryell at Mammoth

Hole B-11 at 1840' (NQ Core) at cased 3½" I.D. to 1344'.

Anyone know of this project?

SIGNED Hank

REPLY

Kirby was drilling in the gravels west of Copper Creek. Didn't know he was still active in the area. Think Sell has plotted up his holes on a topo map Kirby

SIGNED DATE / /

SEND PARTS 1 AND 3 WITH CARBON INTACT - PART 3 WILL BE RETURNED WITH REPLY

Rediform® 4S 472
Poly Pak (50 sets) 4P472

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

July 18, 1974

FILE MEMORANDUM

Kirby Coryell Holes
Mammoth Area
Pinal County, Arizona

In a follow-up of my memo dated May 29, 1974 on the subject, I have located the two holes rotary drilled by Copper State Exploration Company for Kirby Coryell.

The first site put in and apparently utilized (based on mud and oil residues at the two sites) was B-1, located in the SW1/4 of Sec. 7, T8S, R18E. The hole was reported to be T.D. at 3605 feet, but no confirmation could be found.

The second site is to the south in the SE1/4 of Sec. 31, T8S, R18E. It was reported to have gone to 2880 feet. One driller's "scratchings" on a piece of cardboard recorded on shift activity as "Start 2125, #1-20-2140, #2-15-2155, #3-20-2175, work on mud pump". A line was drawn under the last notation and new handwriting added "20-2175, 15-2190, 20-2210, 15-2225". Presumably the figures are new pipe additions and depths (altho a discrepancy exists in the additions).

A third site in the NW1/4 of Sec. 12, T9S, R17E had been constructed complete with mud pits, but had not been occupied by June 13, 1974. Perhaps this is the site Coryell will drill upon securing the CSEC rig we were using.

The driller's scribblings on site B-2 were not at a depth to separate B-1 from B-2, and recent discovery of plastic sample sacks during CSEC drilling of RW-5 suggests that in the verbal reporting of the depths they have been reversed. Two large sacks were found marked:

B-1	2830-2840
B-2	3600-3610

As the CSEC help often premarked a sack or two during the RW-5 drilling, it is suggestive that they do it as a common practice. Thus, the two above sacks may represent the last sacks marked but not used at the Coryell sites in the Mammoth (15') Quad.

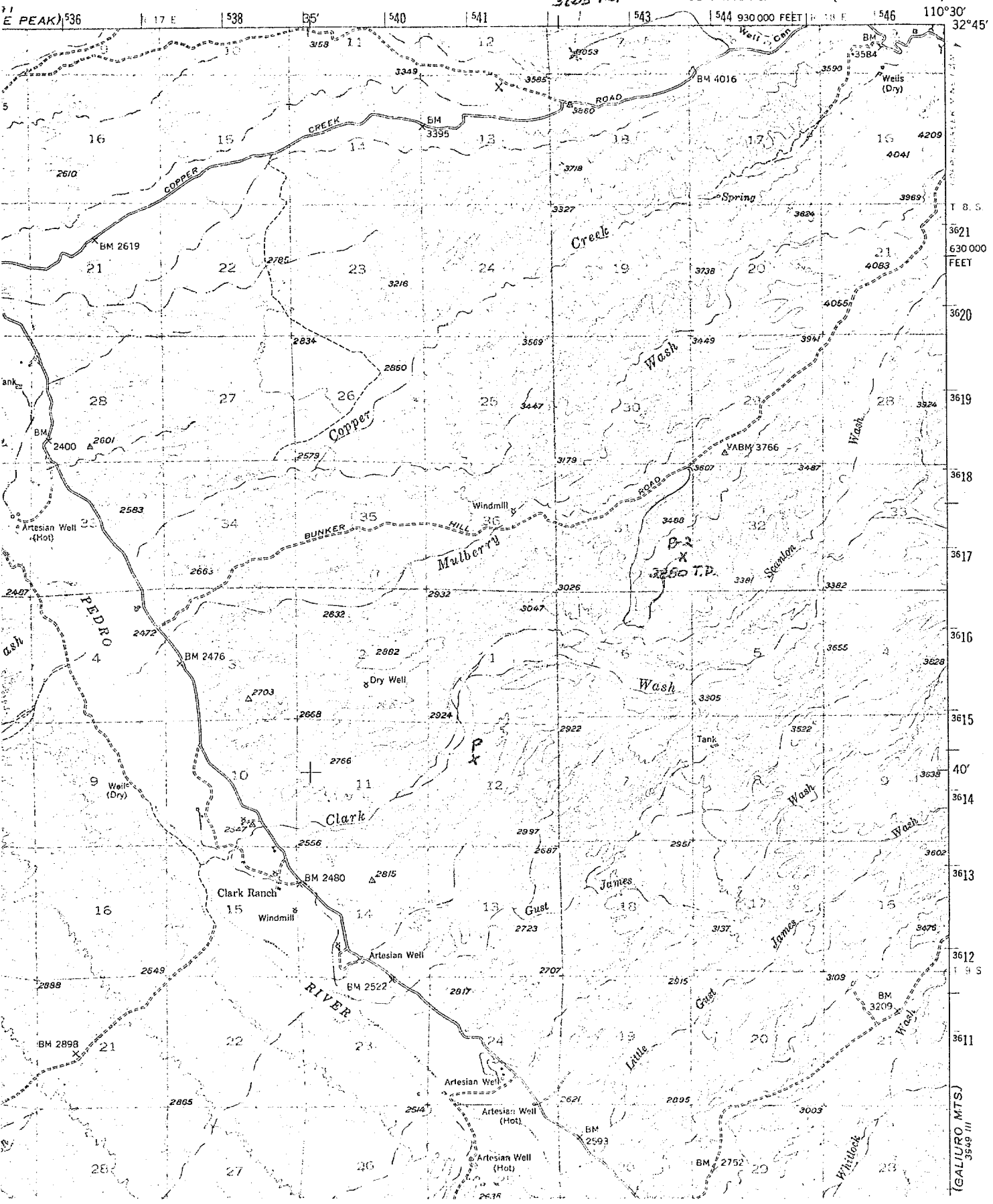
The original verbal information gleaned was that both holes bottomed in gravels and/or post-mineral volcanics.

James D. Sell

James D. Sell

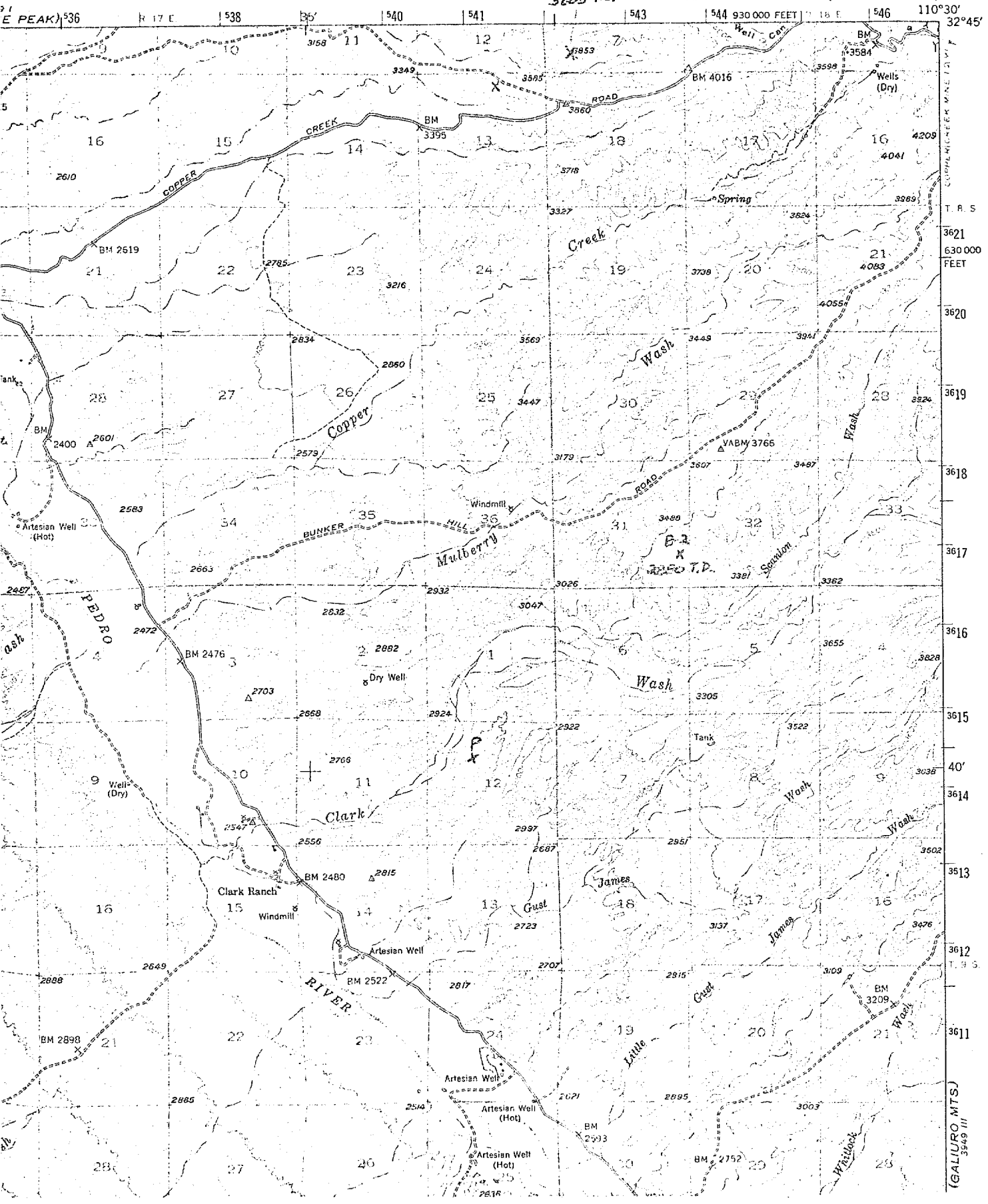
JDS:lb
Attach.

MAMMOTH QUADRANGLE
ARIZONA
15 MINUTE SERIES (TOPOGRAPHIC)



MAMMOTH QUADRANGLE
ARIZONA
15 MINUTE SERIES (TOPOGRAPHIC)

3949 IV (KLONDYKE)



AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

May 29, 1974

FILE MEMORANDUM

Kirby Coryell Holes
Mammoth Area
Pinal County, Arizona

Drill hole information concerning the recent rotary drilling by Kirby Coryell has been gathered. The holes both terminated in either Gila-type gravels or post-mineral volcanics.

The first hole, B-1, terminated at 3605 feet.

The second hole, B-2, terminated at 2880 feet.

James D. Sell

James D. Sell

JDS:lb

ASARCO

Southwestern Exploration Division

March 25, 1976

FILE MEMORANDUM

Copper Creek Area
American Eagle Basin Project
Newmont-Exxon Drilling
Pinal County, Arizona

I toured trip No. 4, Copper Creek, at the conclusion of the Porphyry Copper Symposium held March 18-20 here in Tucson. The trip was lead by Jim Guthrie of Newmont and Gary Moore of Exxon.

Attached are a copy of their abstract presented at the Symposium, a copy of the field trip log, and a copy of the topographic location of the American Eagle Basin zone of deep mineralization. Also attached are copies of the drill pattern, K-spar and sericite alteration patterns, and the mineralization outline in plan and section which had previously been released at a geochemical symposium.

Shown on Guthrie's field trip map is the approximate outline of the deep mineralization being drilled by Newmont-Exxon. Note the surface expression of a number of breccia pipes and strong fracture intensity in the American Eagle Basin. The deep mineralization is predominantly in northeast trending structural zones with minor breccias and is at a sericite-potassic interface. Over 21 holes have been drilled and the top of the mineralized zone of chalcopyrite is some 2800-3000 feet below the surface. The outline is some 1600 feet by 3000 feet, enlongate in the northeast direction. Tonnage is suggested at around 100 million tons with a grade of around 0.7% copper. A figure of 3-1/2 million dollars was suggested by some people (not the leaders) as being the project expenditures to date.

Guthrie pointed out the "spoke" and "rim" alignment of the outlying breccia pipes but said he had no real thoughts on the interpretation of these lines.

James D. Sell

James D. Sell

JDS:lb
Atts.

ABSTRACT FORM

AGS U of A

PORPHYRY COPPER SEMINAR, 3/18, 19 & 20, 1976

START TEXT OF ABSTRACT HERE.....

The Copper Creek area is located 14 miles northeast of San Manuel on the western slope of the north-central Galiuro Mountains. It is in the Bunker Hill Mining District.

Minor outcrops of Precambrian and Paleozoic sediments are found in the eastern and northeastern portions of the district. In the north, west and south portions, there is a thick, heterogeneous sequence of andesitic and dacitic volcanics designated as Cretaceous (?) Glory Hole Volcanics.

Intrusive into these older rocks is the Laramide age Copper Creek stock. Overlying the stock is the Tertiary Galiuro Volcanics, a thick group of rhyolitic to andesitic welded tuffs, flows, ash falls and agglomerates. The Plio-Pleistocene Gila Conglomerate is in fault contact with the older rocks along the western edge of the district.

AND/OR FIGURES WITHIN THESE

The Copper Creek stock consists of an equigranular-textured phase (Copper Creek granodiorite) and a porphyritic-textured phase (dacite porphyry). The porphyritic phase is divided into pink porphyry, feldspar porphyry and dark porphyry varieties.

The principal structural trends are east-northeast, northwest and north. These directions are expressed by fracturing, veins, faults and the shapes and alignment of the intrusives and breccias.

Spacially and chronologically associated with the dacite porphyry are the numerous breccia pipes. These features vary in size, shape and depth. The breccias consist of pebble to cobble-size, subangular to locally rounded fragments derived from the surrounding wall rock. Quartz and sericite are common intra-fragmental minerals. Locally tourmaline, sulfides, rock flour, biotite or orthoclase are present.

The genesis of the breccias is closely linked with the emplacement of the dacite porphyry stocks. Intersecting structures localize and control the emplacement of the porphyries and the shapes of the breccias. The intrusive force of the porphyry has fractured the host rocks and this fractured zone served as a hydrothermal fluid channelway. The fluids further enhance the breccia texture by solution leaching. Collapse by shrinkage of the porphyry and possible multiple intrusive activity may also be involved in the development of the breccia.

Significant porphyry copper mineralization is present in the American Eagle Basin located in the south-central portion of Copper Creek. The copper mineralization occurs at 2000 feet or more below the surface in an area of relatively intense veining and clusters of breccia pipes and dacite porphyry plugs.

The deposit is a low sulfide system averaging approximately 3% (by weight) total sulfide. In the upper portions the sulfide is predominately pyrite. This grades downward into the ore zone of predominately chalcopyrite. Bornite and some molybdenite occur at the base and below the ore zone. The mineralization shows strong

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fracture and breccia control throughout the system.

Zones of pervasive alteration are not well defined at Copper Creek. In the American Eagle Basin sericite is the dominant alteration product. It is associated with the breccia pipes, veins and many of the dacite porphyry plugs. Potassic and argillic alteration occur as scattered zones. Present also in lesser amounts are tourmalinization, silicification and propylitization.

The individual veins have well-developed, zoned alteration selvages. A complete zoning sequence, beginning at the central quartz-sulfide veins and going outward, consists of: (1) quartz-sericite, (2) quartz-sericite-chlorite, (3) orthoclase and (4) sericite-clays. Some areas of pervasive quartz-sericite alteration occurs where alteration selvages have coalesced. More commonly, pervasive weak propylitic alteration is present between the veins.

Potassic alteration increases with depth below the American Eagle Basin. The ore-grade mineralization occurs in a mixed zone of breccia and fracture-controlled phyllic alteration that is superimposed on the pervasive potassic alteration. Strong potassic alteration, orthoclasization, floors the ore zone. Deep drilling in the heart of this system has encountered propylitic alteration below the potassic zone.

COPPER CREEK FIELD TRIP

(AGS-U of A Porphyry Copper Symposium 3/20/76)

Geologically, the Copper Creek District consists of a Laramide igneous complex that includes granodiorite, diorite and several varieties of porphyry. The Laramide rocks intrude Precambrian,Paleozoic and Mesozoic rocks including Cretaceous(?) age volcanics. The area was subsequently covered by mid-Tertiary volcanics, but the older rocks in the District have been exhumed by relatively recent uplift and erosion.

The field trip has been designed to give a brief introduction to the geology at Copper Creek. Several of the breccias in the District will be examined along with the basic rock types and some of the alteration assemblages.

The buses will travel north from Tucson, then swing to the east, along the north side of the Catalina Mountains. From the town of Oracle the route drops into the San Pedro Valley, passing the San Manuel deposit and smelter. The San Pedro River is crossed at Mammoth. From Mammoth the route climbs to the east toward the Galiuro Mountains and crosses over the Plio-Pliestocene Gila Conglomerate. The clay and silt units exposed in the wash just east of the river are part of the Lake bed facie of the Gila. Some of these units contain gypsum. To the north, agricultural gypsum in the Lake beds is being mined. The Lake beds rapidly grade into and are interfingered with the coarse sand and conglomerate beds typical of the Gila.

The Gila Conglomerate is in fault contact with the Glory Hole Volcanics. The volcanics are andesitic and latitic agglomerates, lavas, flow breccias and tuffs that have been thermally metamorphosed by the intrusion of the Copper Creek granodiorite stocks to dark, fine-grained, hornfelsic-textured rocks.

The Glory Hole Volcanics exhibits a very strong east-west

of fracturing. This is the predominant "open" vein direction in the district. The areas of very strong alteration and breccia pipe development show rough, resistant, reddish-stained outcrops. The main alteration product is fine-grained quartz and sericite. Up to 10% pyrite is present, as is minor tourmaline. On crossing the creek, a breccia pipe can be seen just north of the stream.

STOP-1 - Precipitation plant site, Ranchers Exploration and Development Corp.

The bus will park here and the remaining trip will be by foot. The total round-trip distance will be 3 miles.

The Ranchers insitu leaching operation is presently shut down. The area being leached is the site of the Old Reliable Breccia Pipe. The Old Reliable contained four million tons of ~~0.08%~~ 0.74% copper. The principal copper minerals are chalcocite, chalcopyrite, malachite, chalcanthite and chrysocolla. Ranchers fractured in place an area of 400 feet in diameter and 350 feet in depth using 2,000 tons of conventional explosives.

The road bed seen along the north side of the canyon is an old railroad grade. It was built during the 1940's to carry ore from the Old Reliable and the Childs-Aldwinkle mines to a mill site almost a mile up the Canyon. The Old Reliable furnished copper, and the Childs-Aldwinkle furnished copper and molybdenite.

The tailings in the side canyon came from an old mill up the canyon near the Childs-Aldwinkle mine. The foundations of the mill are still present to the east along the road.

On leaving the bus we will proceed up the road. It will be a long walk to the next stop, so please stay close.

The first outcrop on the road is the Glory Hole Volcanics. The black color of the rock is in part due to fine-grained biotite. The contact between

the granodiorite and volcanics is just to the east. For the next 2500 feet, you will get a very close view of the Copper Creek Granodiorite. The granodiorite is cut by widely-spaced veins with quartz-sericite-chlorite alteration selvages. Almost all veins in the Copper Creek District are east-west, or within 15 north or south. Many are steep, but an occasional flat vein is present.

STOP 2 - Dark Porphyry

This is a typical plug of dark porphyry. Some good exposures of its contact with the granodiorite can be seen just below the road on the southern side of the creek. Some veining with pyrite is seen across the creek. At the eastern end of the plug, the dark porphyry and granodiorite exhibit intense quartz-sericite alteration. For those of you who want to risk the climb, it can be viewed. Continue up to the railroad bed and walk eastward to the next stop. For those who wish easier paths, follow the road across the creek and to the path to STOP 3.

STOP 3 - Breccia Pipe

This breccia is exposed in three separate outcrops aligned in a northerly direction. Note the fracture control of the breccia, its sharp contacts, the variations in fragment size and rounding, alteration within the breccia and the surrounding host, and the close association between breccia and dark porphyry.

(a) Dark Porphyry. On the road the contact of the dark porphyry and granodiorite is exposed. The porphyry shows intense quartz-sericite alteration.

(b) Southwest corner of small intensely altered area. The breccia texture is poorly developed, or obliterated by the intense alteration. Here the control of the east-west and north-south fractures is well shown. Some other features to note are:

1) the sheeting at the contact;

2) the rapid diminishing of alteration beyond the pipe;

3) the steepness of the contact;

4) presence of some tourmaline.

(c) A traverse from the railroad bed up hill across the breccia will give some idea of the breccia texture, fragment size and shape variations, the alteration, and contact relations. At this elevation, to the north, is a level area with a deep open shaft. BEWARE, as it is most difficult to extricate a person from it.

(d) In this area, on the railroad bed, the breccia fragments are easily seen. Both alteration and fragment shapes can be observed. Note the overall tightness of the breccia. The zone of sheeting at the contact, just east of the railroad bed, is relatively wide.

(e) Septum of unbrecciated, weakly altered granodiorite. This coincides with one of the subordinate fracture directions.

(f) The northern breccia contains a large dark porphyry block at the railroad bed level. Note the vuggy character and the presence of copper oxide in the porphyry. This northern breccia is more intensely altered and contains less copper mineralization than the southern breccia.

On leaving this stop, return by the path to the canyon bottom and go directly south to the main road. For those interested, the pebbly talus just south of the road is ore from the Childs-Aldwinkle. A few minutes of looking can reveal some nice moly specimens. Follow the main road up onto the narrow ridge. Straight ahead is the front steps and foundation of the Copper Creek Post Office.

STOP 4 - Breccia Pipe

The railroad bed behind the Post Office site cuts through a breccia. As you walk from the Post Office, note the dark porphyry to the right. This breccia displays some large fragments with well-developed quartz-sericite rims.

The breccia has an open texture and contains an unusual amount of specularite. Minor limonite after sulfides is also present. If you walk to the east, the sharp contact of breccia and granodiorite can be seen. At the western end of the cut the contact with the breccia and dark porphyry can be observed. Is the dark porphyry before or after the brecciation?

Leave the breccia and return to the main road. Along this road you will pass an area of granodiorite which exhibits intense fracturing, then a dark porphyry dike is exposed. Near the next stop, there is an inclusion of Glory Hole Volcanics in the granodiorite.

STOP 5 - Breccia Pipe

Argillic alteration, enhanced by weathering, borders this breccia pipe. The contact on both sides of the breccia are steep and sharp. Thin dikes of dark porphyry are present in the contact zones. The dark porphyry at the southern contact has several apophysis into the breccia. The breccia contains fragments of several different rock types, shows abundant limonite staining, and has an open texture.

On leaving this stop, continue up the road. Note the fracture direction in the road cuts. A small dike of pink porphyry in the granodiorite can be seen beyond the curve.

STOP 6 - Intrusion Breccia

In this outcrop, the relationship of the dark porphyry intrusion, contact brecciation and hydrothermal activity can be seen.

(a) Contact zone exhibiting brecciated granodiorite in a matrix of dark porphyry. Note the terminated veins in the granodiorite fragments.

(b) Dark porphyry mass. A dark and a lighter porphyry phase are exposed in the road cut. Are these two separate intrusions? Note the wisps

of pink orthoclase in the porphyry and adjacent granodiorite fragments.

(c) and (d) Brecciated granodiorite similar to (a), except some leaching is present. Note the vugginess and alteration. Look closely at the vugs and see if you can find any mineral fillings.

(e) On the ridge just above the road, intense quartz-sericite alteration occurs along the edge of the intrusion breccia. Some breccia texture is apparent. Tourmaline and limonite after sulfides are also present.

From this stop, proceed up the road to the prominent breccia pipe, the last scheduled stop. The last stop is in the area of deep copper mineralization.

STOP 7 - American Eagle Breccia Pipe

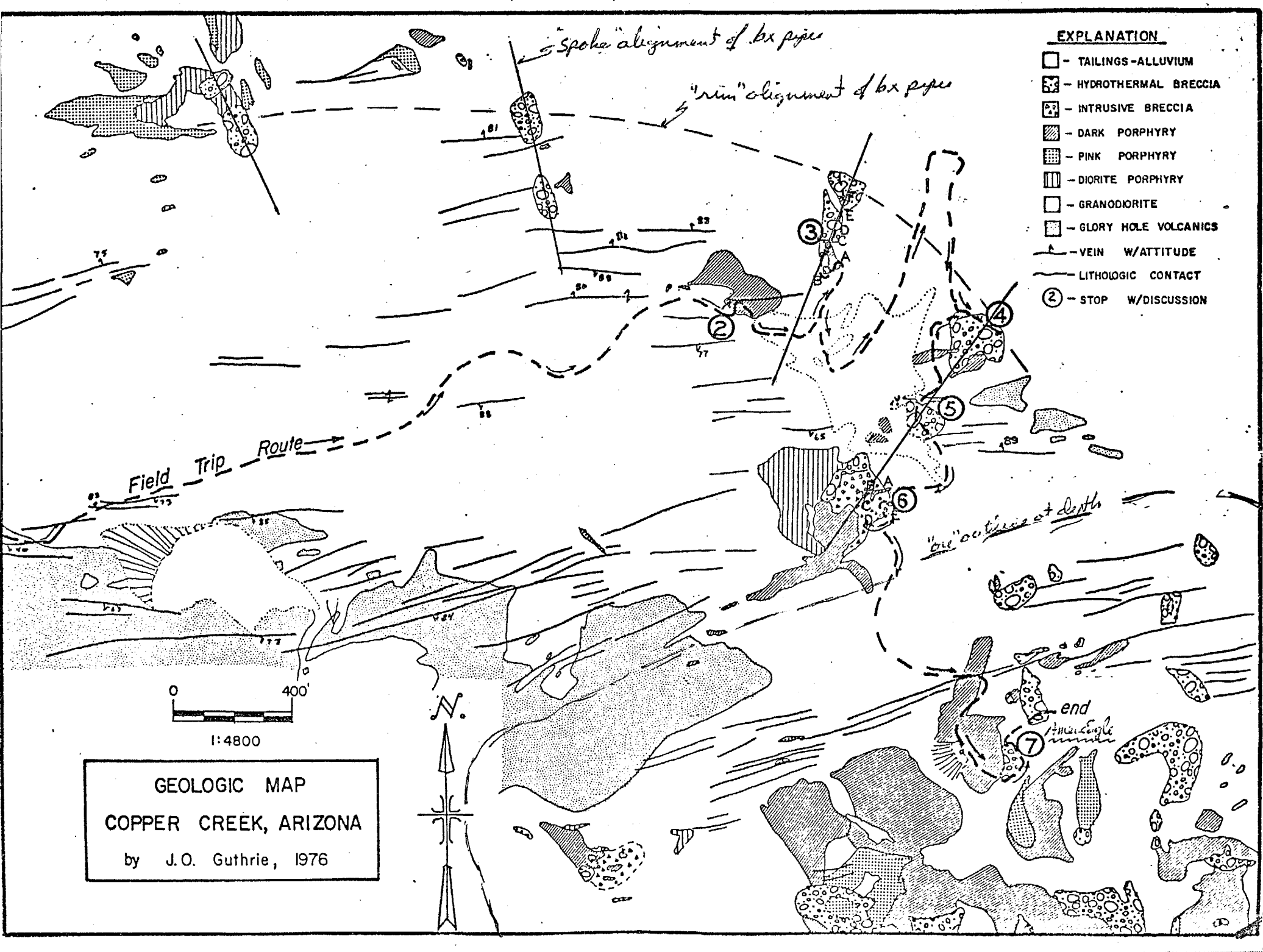
The American Eagle Breccia occurs at the edge of a dark porphyry plug. The dark porphyry along the road exhibits an intense quartz-sericite alteration. Material on the dump comes from workings in and adjacent to the American Eagle pipe. Highly altered vuggy porphyry containing specularite, and breccia specimens are present on the dump.

Mineralized breccia and the contact with the porphyry is exposed just inside the road level adit. BEWARE of the WINZE (shaft) to the left a few feet inside the adit entrance.

From the adit, walk up the road about 100 feet and then climb up to the breccia. Follow the eastern contact up to the top. Note the wrapping around of the fracturing and, near the top, the tabular fragments adjacent to the contact. Are these fragments derived from the sheeted contact by slumping, plucking or some other manner? At the top of the breccia, some crude layering can be seen in the breccia. This is shown by the alignment of oblong and tabular fragments.

This concludes the guided portion of the field trip. If time permits, there are several other breccias that can be visited. The breccia just north of the American Eagle pipe contains tourmaline in the matrix. About 700 feet to the northeast a small tourmaline-bearing, ring-shaped breccia with a dark porphyry core is exposed. Two breccias crop out on the ridge 500 feet north of the American Eagle pipe. Concentric fracturing is well-exposed around the smaller pipe.

Please return to the bus on time. Although it is downhill, it is still a mile and a half away.


EXPLANATION
- TAILINGS-ALLUVIUM
- HYDROTHERMAL BRECCIA
- INTRUSIVE BRECCIA
- DARK PORPHYRY
- PINK PORPHYRY
- DIORITE PORPHYRY
- GRANODIORITE
- GLORY HOLE VOLCANICS
- VEIN W/ATTITUDE
- LITHOLOGIC CONTACT
- STOP W/DISCUSSION
"Spoke" alignment of bx pipe
"rim" alignment of bx pipe
Field Trip Route
"ore" outcrops at depth
end
0
400'
1:4800
N.
GEOLOGIC MAP
COPPER CREEK, ARIZONA
by J.O. Guthrie, 1976

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GALIURO MTN. QUAD.
15' 1" = 1 mile

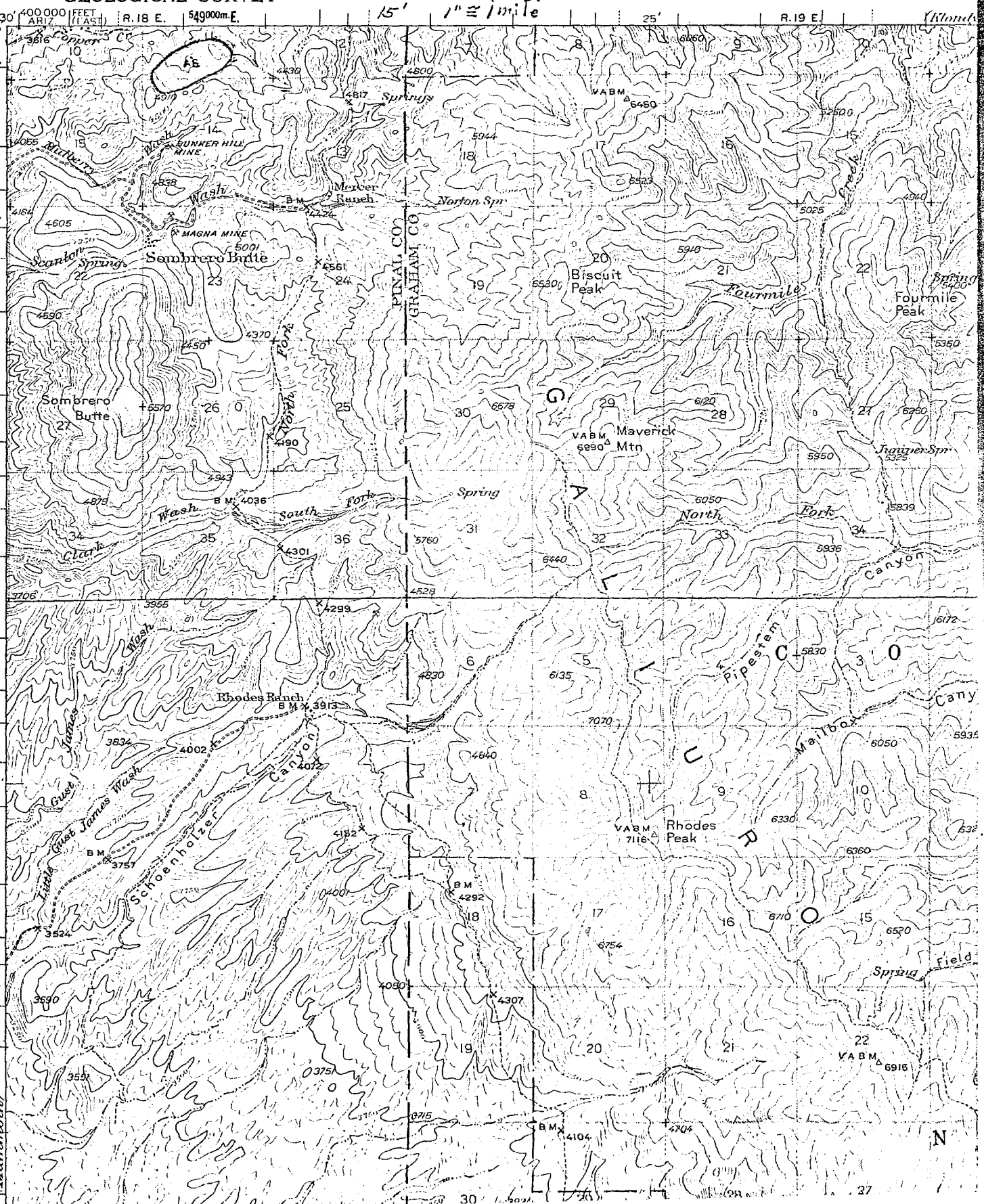


FIGURE 14

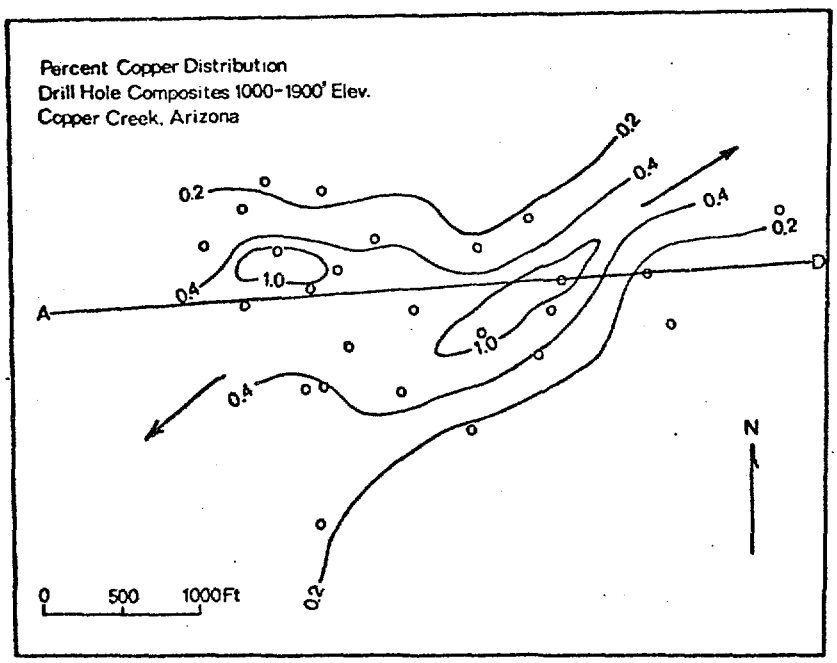
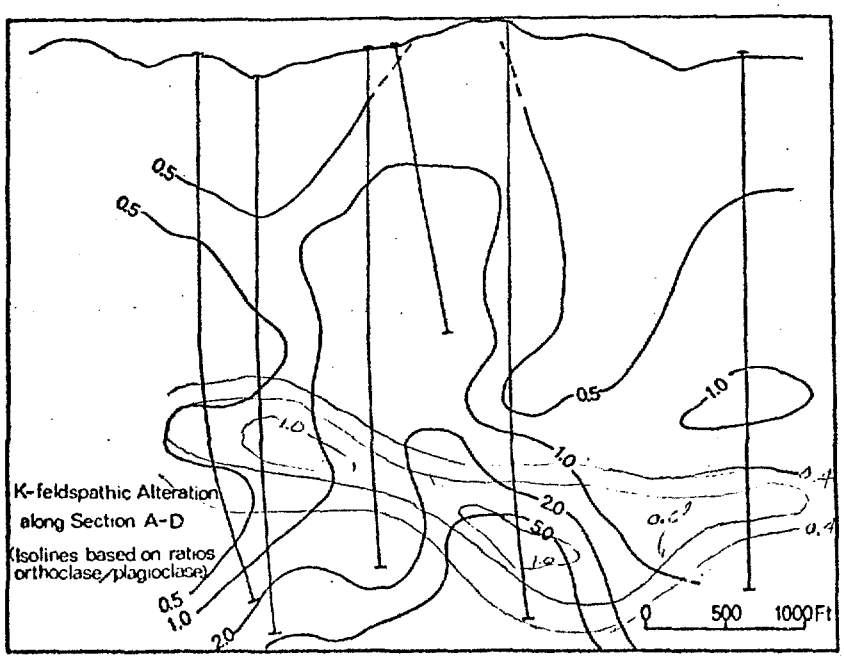


FIGURE 15



0.4 Cu

FIGURE 16

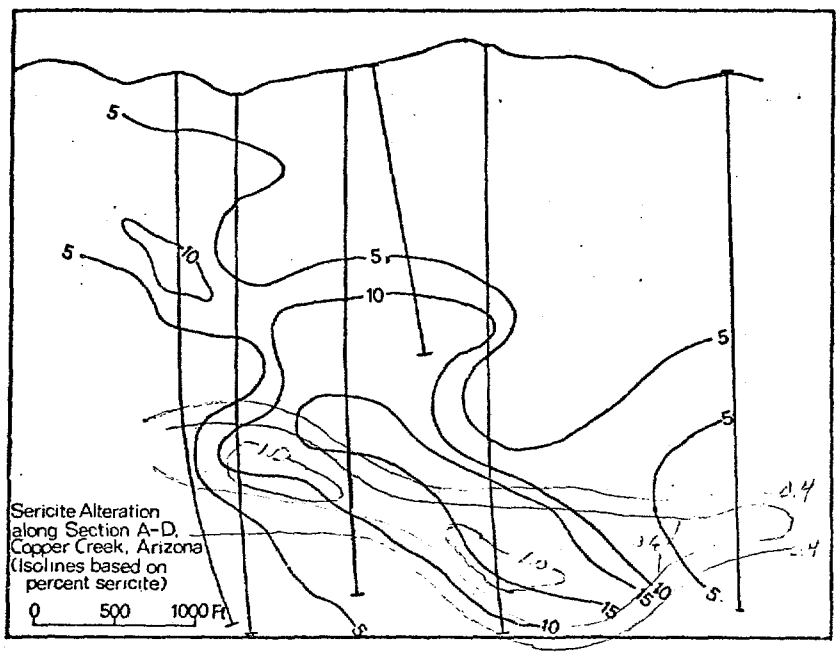
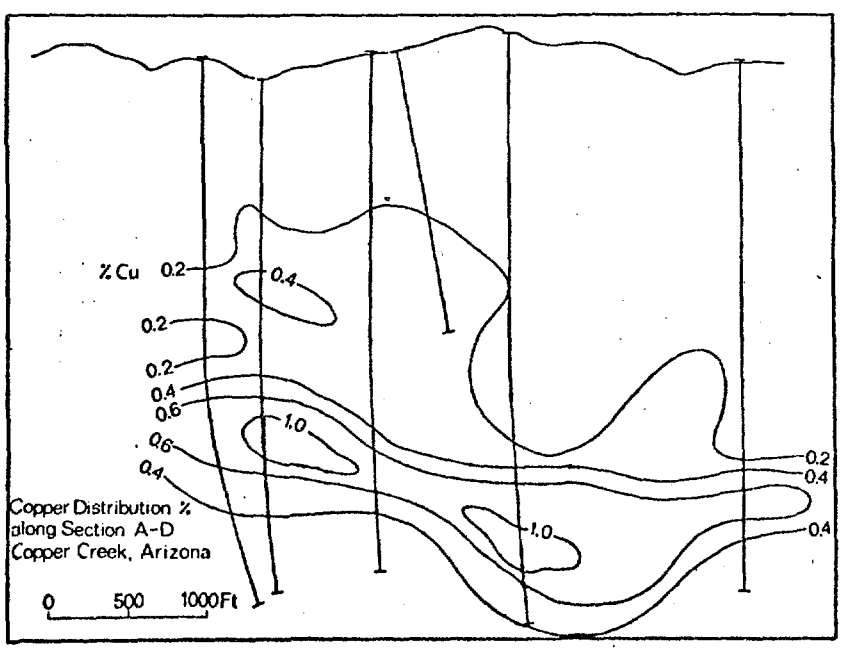


FIGURE 17



ABSTRACT FORM

AGS U of A

PORPHYRY COPPER SEMINAR, 3/18, 19 & 20, 1976

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The Copper Creek area is located 14 miles northeast of San Manuel on the western slope of the north-central Galiuro Mountains. It is in the Bunker Hill Mining District.

Minor outcrops of Precambrian and Paleozoic sediments are found in the eastern and northeastern portions of the district. In the north, west and south portions, there is a thick, heterogeneous sequence of andesitic and dacitic volcanics designated as Cretaceous (?) Glory Hole Volcanics.

Intrusive into these older rocks is the Laramide age Copper Creek stock. Overlying the stock is the Tertiary Galiuro Volcanics, a thick group of rhyolitic to andesitic welded tuffs, flows, ash falls and agglomerates. The Plio-Pleistocene Gila Conglomerate is in fault contact with the older rocks along the western edge of the district.

AND/OR FIGURES WITHIN THESE

The Copper Creek stock consists of an equigranular-textured phase (Copper Creek granodiorite) and a porphyritic-textured phase (dacite porphyry). The porphyritic phase is divided into pink porphyry, feldspar porphyry and dark porphyry varieties.

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Significant porphyry copper mineralization is present in the American Eagle Basin located in the south-central portion of Copper Creek. The copper mineralization occurs at 2000 feet or more below the surface in an area of relatively intense veining and clusters of breccia pipes and dacite porphyry plugs.

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(AGS-U of A Porphyry Copper Symposium 3/20/76)

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The first outcrop on the road is the Glory Hole Volcanics. The black color of the rock is in part due to fine-grained biotite. The contact between

the granodiorite and volcanics is just to the east. For the next 2500 feet, you will get a very close view of the Copper Creek Granodiorite. The granodiorite is cut by widely-spaced veins with quartz-sericite-chlorite alteration selvages. Almost all veins in the Copper Creek District are east-west, or within 15 north or south. Many are steep, but an occasional flat vein is present.

STOP 2 - Dark Porphyry

This is a typical plug of dark porphyry. Some good exposures of its contact with the granodiorite can be seen just below the road on the southern side of the creek. Some veining with pyrite is seen across the creek. At the eastern end of the plug, the dark porphyry and granodiorite exhibit intense quartz-sericite alteration. For those of you who want to risk the climb, it can be viewed. Continue up to the railroad bed and walk eastward to the next stop. For those who wish easier paths, follow the road across the creek and to the path to STOP 3.

STOP 3 - Breccia Pipe

This breccia is exposed in three separate outcrops aligned in a northerly direction. Note the fracture control of the breccia, its sharp contacts, the variations in fragment size and rounding, alteration within the breccia and the surrounding host, and the close association between breccia and dark porphyry.

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(b) Southwest corner of small intensely altered area. The breccia texture is poorly developed, or obliterated by the intense alteration. Here the control of the east-west and north-south fractures is well shown. Some other features to note are:

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(c) A traverse from the railroad bed up hill across the breccia will give some idea of the breccia texture, fragment size and shape variations, the alteration, and contact relations. At this elevation, to the north, is a level area with a deep open shaft. BEWARE, as it is most difficult to extricate a person from it.

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(e) Septum of unbrecciated, weakly altered granodiorite. This coincides with one of the subordinate fracture directions.

(f) The northern breccia contains a large dark porphyry block at the railroad bed level. Note the vuggy character and the presence of copper oxide in the porphyry. This northern breccia is more intensely altered and contains less copper mineralization than the southern breccia.

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STOP 4 - Breccia Pipe

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The breccia has an open texture and contains an unusual amount of specularite. Minor limonite after sulfides is also present. If you walk to the east, the sharp contact of breccia and granodiorite can be seen. At the western end of the cut the contact with the breccia and dark porphyry can be observed. Is the dark porphyry before or after the brecciation?

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STOP 5 - Breccia Pipe

Argillic alteration, enhanced by weathering, borders this breccia pipe. The contact on both sides of the breccia are steep and sharp. Thin dikes of dark porphyry are present in the contact zones. The dark porphyry at the southern contact has several apophysis into the breccia. The breccia contains fragments of several different rock types, shows abundant limonite staining, and has an open texture.

On leaving this stop, continue up the road. Note the fracture direction in the road cuts. A small dike of pink porphyry in the granodiorite can be seen beyond the curve.

STOP 6 - Intrusion Breccia

In this outcrop, the relationship of the dark porphyry intrusion, contact brecciation and hydrothermal activity can be seen.

(a) Contact zone exhibiting brecciated granodiorite in a matrix of dark porphyry. Note the terminated veins in the granodiorite fragments.

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(e) On the ridge just above the road, intense quartz-sericite alteration occurs along the edge of the intrusion breccia. Some breccia texture is apparent. Tourmaline and limonite after sulfides are also present.

From this stop, proceed up the road to the prominent breccia pipe, the last scheduled stop. The last stop is in the area of deep copper mineralization.

STOP 7 - American Eagle Breccia Pipe

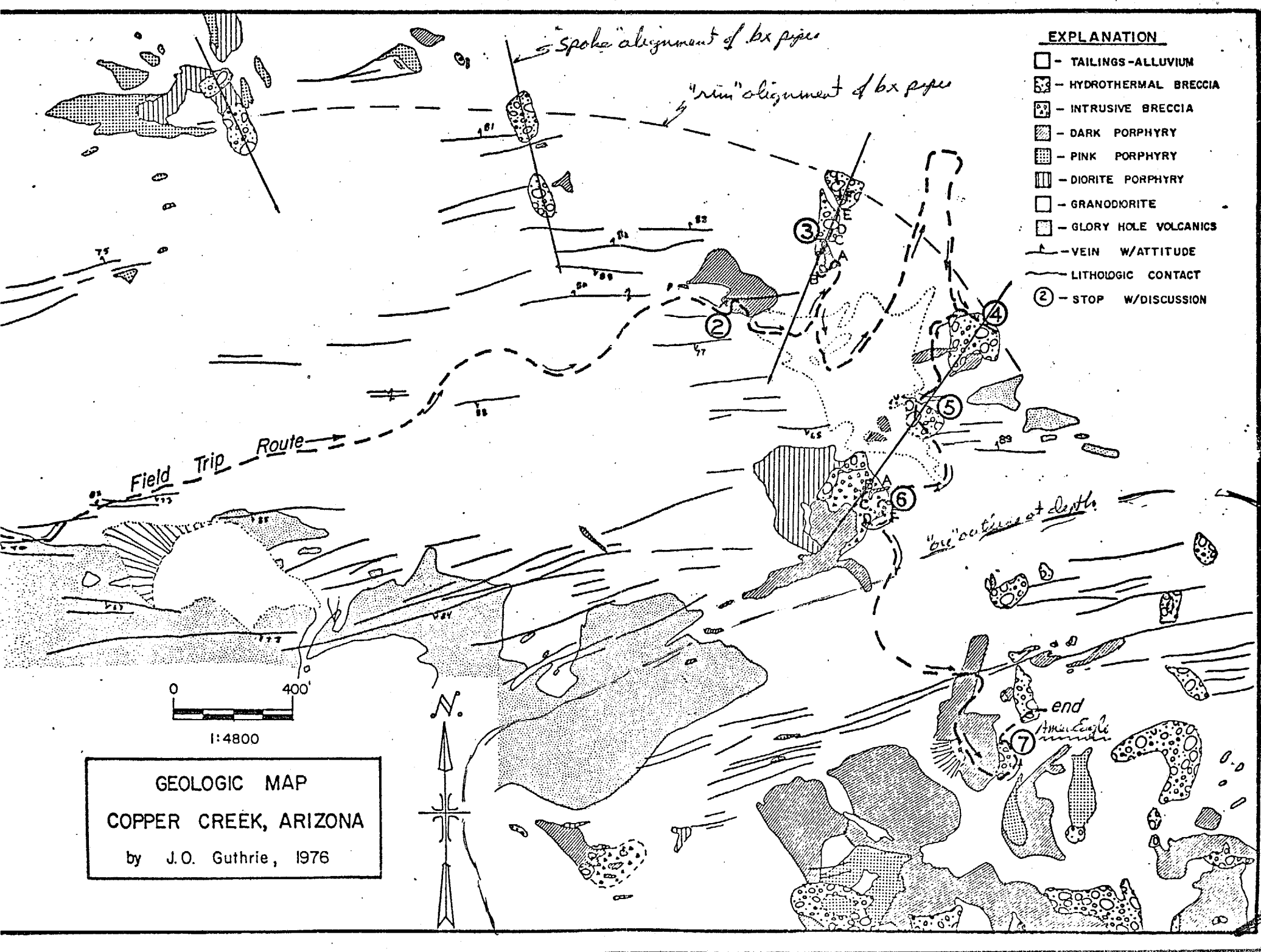
The American Eagle Breccia occurs at the edge of a dark porphyry plug. The dark porphyry along the road exhibits an intense quartz-sericite alteration. Material on the dump comes from workings in and adjacent to the American Eagle pipe. Highly altered vuggy porphyry containing specularite, and breccia specimens are present on the dump.

Mineralized breccia and the contact with the porphyry is exposed just inside the road level adit. BEWARE of the WINZE (shaft) to the left a few feet inside the adit entrance.

From the adit, walk up the road about 100 feet and then climb up to the breccia. Follow the eastern contact up to the top. Note the wrapping around of the fracturing and, near the top, the tabular fragments adjacent to the contact. Are these fragments derived from the sheeted contact by slumping, plucking or some other manner? At the top of the breccia, some crude layering can be seen in the breccia. This is shown by the alignment of oblong and tabular fragments.

This concludes the guided portion of the field trip. If time permits, there are several other breccias that can be visited. The breccia just north of the American Eagle pipe contains tourmaline in the matrix. About 700 feet to the northeast a small tourmaline-bearing, ring-shaped breccia with a dark porphyry core is exposed. Two breccias crop out on the ridge 500 feet north of the American Eagle pipe. Concentric fracturing is well-exposed around the smaller pipe.

Please return to the bus on time. Although it is downhill, it is still a mile and a half away.


"spoke" alignment of bx pipes
"rim" alignment of bx pipes
EXPLANATION
- TAILINGS-ALLUVIUM
- HYDROTHERMAL BRECCIA
- INTRUSIVE BRECCIA
- DARK PORPHYRY
- PINK PORPHYRY
- DIORITE PORPHYRY
- GRANODIORITE
- GLORY HOLE VOLCANICS
- VEIN W/ATTITUDE
- LITHOLOGIC CONTACT
- STOP W/DISCUSSION
Field Trip Route
"ore" occurrence at depth
end
Amer. Eagle
0
400'
1:4800
N.
GEOLOGIC MAP
COPPER CREEK, ARIZONA
by J.O. Guthrie, 1976

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GALIURO MTN. QUAD.
15' 1" = 1 mile

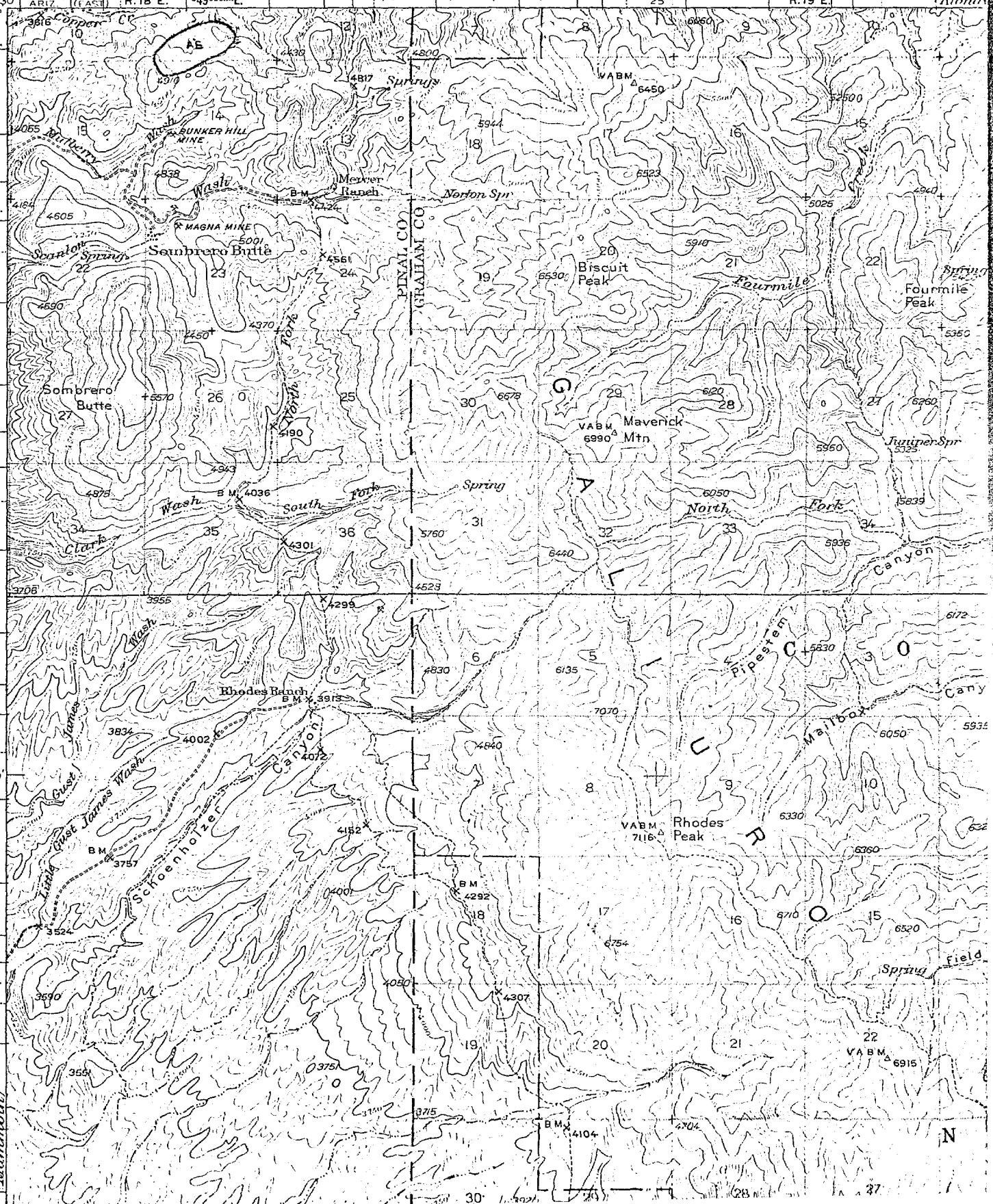


FIGURE 14

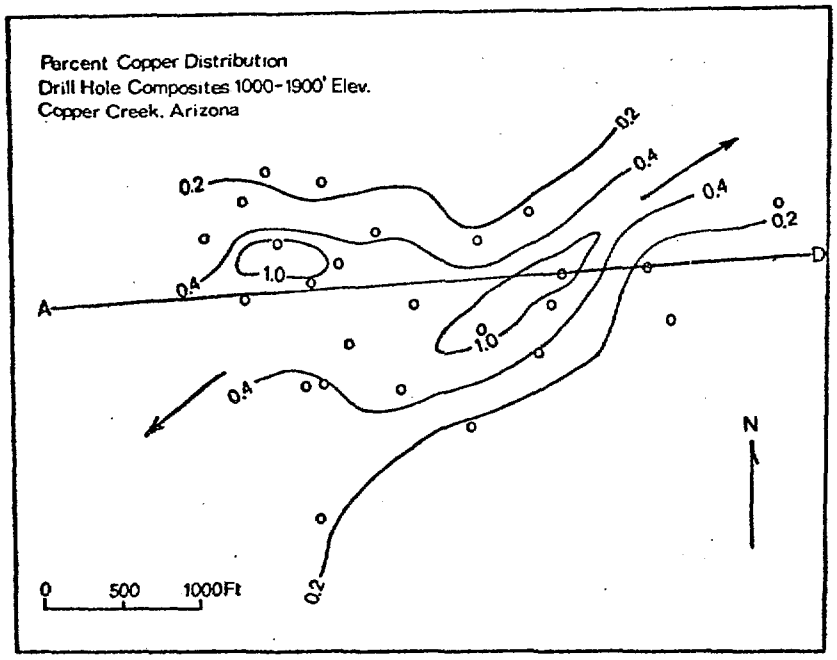
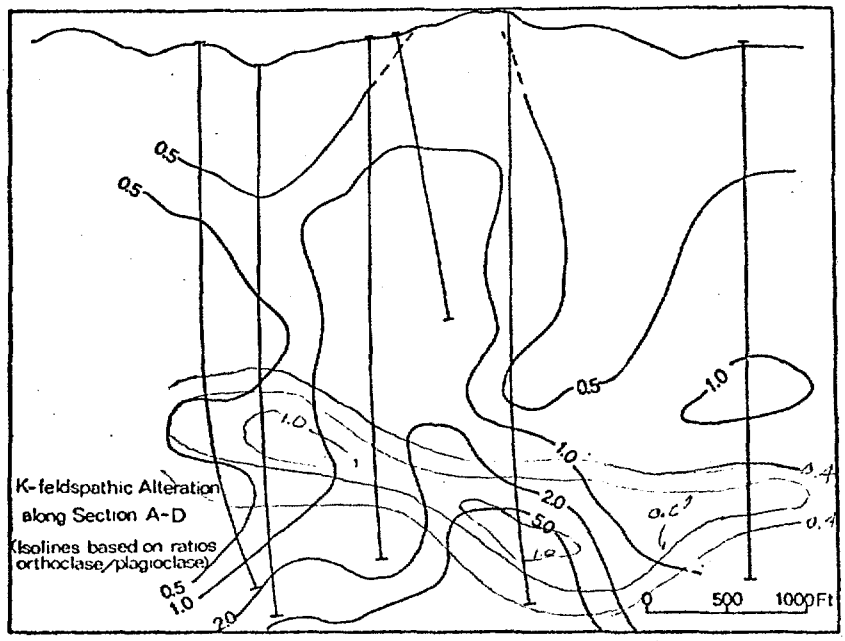


FIGURE 15



0.4 Cu

FIGURE 16

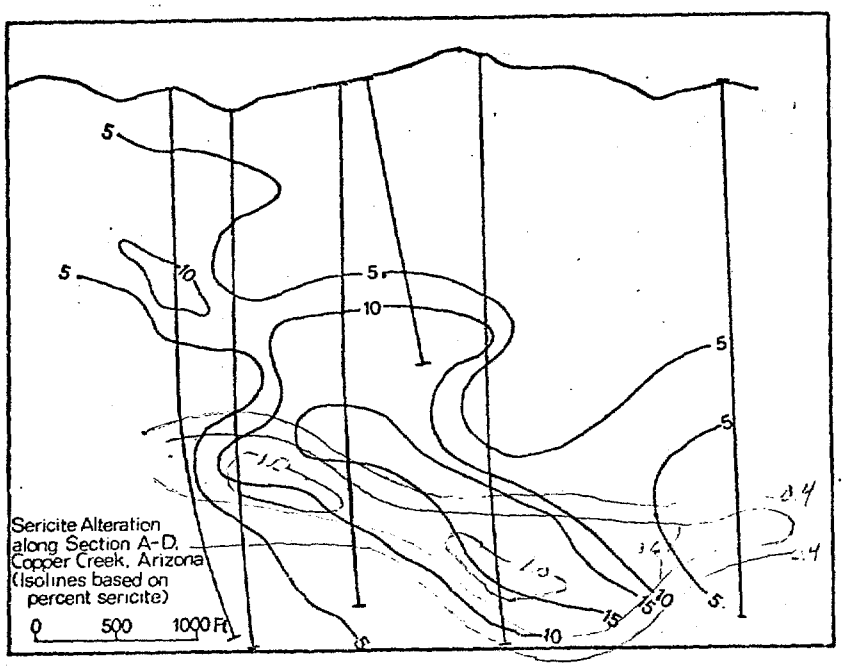
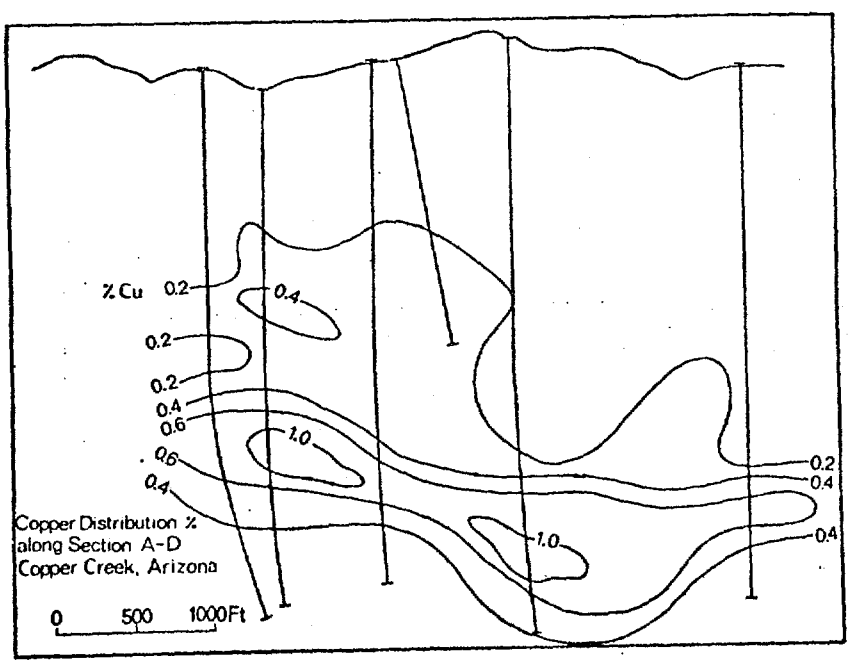


FIGURE 17



ASARCO

Southwestern Exploration Division

December 19, 1977

FILE MEMORANDUM

Kirby Coryell's
Mammoth-Copper Creek
Property, R17-18E, T8S
Pinal County, Arizona

Bob Crist had noted that EXXON had picked up or filed on the State Leases in the area where Coryell had drilled several deep holes (3605' and 2850').

H. Crittendon was in town last week and looking for an air-trac to do some work plus a rig to go below 6000 feet. (Howard is now a drilling supervisor for EXXON out of Denver.)

Jim Vroman, presently with Cities Service Company, will join the EXXON-Tucson exploration office on January 1, 1978.

James D. Sell

J. D. Sell

JDS:lb

JDS

ASARCO

Southwestern Exploration Division

September 10, 1991

W.L. Kurtz

D&G Mining Company
Copper Creek Area
Pinal County, AZ

When H.J. Downey was doing the Patagonia logging we talked about the Copper Creek area where Downey was familiar with the drilling and had the assay logs from the Newmont drilling on his property.

I asked him to put a report together and he has now submitted a copy (attached). The SWED drafting drafted his cross-section for the report.

Downey believes D&G Mining may have in excess of 20 million tons of 1-1½% copper, mainly as chalcopyrite, on their portion of the drilled Newmont deposit as outlined.

Downey reports that Magma presently has a diamond rig coring an angle hole beneath the Childs-Aldwinkle pipe, apparently for the 1991-1992 assessment years on their land position at Copper Creek.

No action on the property by SWED is advocated other than keeping in touch with the developments in the district.

James D. Sell

James D. Sell

JDS:mek
Attached Summary

cc: W.L. Kurtz (w/summary)
S.A. Anzalone (w/summary)

FILE

To: James D. Sell

From: Harold Downey

Date: September 1, 1991

Subject: Copper Creek, Arizona; A Summary of the Prospect, Its Potential, D&G Mining Company Holdings.

INTRODUCTION

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The joint venture continued to the late 1980's when EXXON decreased their minerals program and pulled out. When Newmont spun off Magma in 1987, majority interest in Copper Creek was transferred to Magma. At that time Magma elected to drop the lease with D&G which was in the 19th year of a 20 year term. Since 1988 the status has been dormant with Magma doing some rotary drilling for assessment work. D&G has done assessment work on its claims for 1989 and 1990 by percussion drilling and sampling for precious metals.

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Geology and mineralization of the district is well described by Guthrie and Moore (1978), a copy of which is attached hereto. My comments are summarized as follows:

LITHOLOGIES

The intrusive mass that hosts the main Cu/Mo deposit beneath the so-called American Eagle basin is classified as granodiorite by Newmont/Guthrie/Moore (1978). During my period with Bear Creek, we were using a quartz diorite (tonalite) classification and further broke it into three phases; #1 (the main body), a medium grained and medium grey in color; #2, a lighter pinkish colored rock, more felsic in composition which could easily be called a quartz monzonite; #3, a darker variety which contains more biotite (up to 15%) than the main body. It is interesting that Guthrie & Moore (1978, pps 26 & 27) describe a dacite porphyry group broken into three sub-groups, "pink, feldspar, and dark". These terms may have some general connection with the Bear Creek terminology. The only rock we called a porphyry is a dark purple dacite porphyry, having an aphanitic groundmass containing up to 20% plagioclase phenocrysts to 5mm diameter. This unit occurs as irregular dikes and plugs and is common throughout the American Eagle basin. We believed it to be the youngest intrusive inasmuch as it cut all other rock types.

ALTERATION

I concur with Guthrie & Moore (1978) in their descriptions of the alteration assemblages and mode of occurrence. I have not seen enough of the Newmont drilling to have an opinion on alteration at

depth but one most important item we noted in the Bear Creek period was the general lack of pervasive alteration except in and adjacent to the breccia masses. Alteration at the surface and in most of the core drilled by Bear Creek is confined to and associated with sulfide veinlets. Such veinlets are found throughout the district but in some locations in the American Eagle area they are more closely spaced (up to 12/ft.) so that in many cases alteration overlaps from vein to vein giving an appearance of pervasiveness. A typical veinlet will be arranged with pyrite/chalcopyrite innermost with a quartz sericite (sericite dominant) layer to each side and a chlorite layer further out. Total thickness of a typical veinlet with alteration included will usually amount to no more than one inch.

MINERALIZATION

Copper mineralization as chalcopyrite and minor bornite is found throughout the district occuring in fracture selvages, in veinlets, and disseminated throughout the stock. The best concentrations of sulfides are found in the pervasively altered zones (refer to above paragraph) and in the breccia pipes. Molybdenite is generally subordinate to chalcopyrite but is more prominent in the breccias where it occurs in matrices and cross-cutting veinlets.

At the American Eagle basin, pyrite is the dominant near-surface sulfide. In the Bear Creek drilling period we noted an increase in the cpy/py ratio with depth, generally becoming noticeable at about 1000 feet. Guthrie (pers. comm., 1988) says that the ratio becomes chalcopyrite dominant at depth (approx. 2500 ft.) where the veining attitude changes from nearly vertical to nearly horizontal.

DISCUSSION

The Newmont/EXXON exploration program has outlined a Cu/Mo deposit of about 100 million tons of approximately 0.75% Cu plus some Mo (pers. comm. Guthrie & others 1988-1990). Newmont presented a paper on this deposit at the 1988 AIME/SME convention in Phoenix but unfortunately did not publish a preprint. Several slides were shown at that presentation which depicted an elliptical body in plan, umbrella shaped at its top surface but somewhat irregular from top to bottom, about 2000 feet across and about 500 feet average vertical thickness. In vertical section, the outer portions of the deposit (both top & bottom) appear to drape downward in a jellyfish-like manner. These outer portions are areas that are only partially tested by drilling. One of the holes on this perimeter, D-5, bottomed at 3660 in 0.5% Cu.

The depth factor is the main reason the deposit has not become economic. The drilling by Newmont/EXXON was done with anticipation of locating another San Manuel/Kalamazoo class deposit and although there may be such tonnages at greater depths, the factors involving

exploration for and development of this target were no doubt discouraging to Newmont, particularly during the mid-1980's. None of the drilling, either by Bear Creek or Newmont/EXXON explored for high grade mineralization although the #2 hole by Bear Creek, a 60 degree angle hole, intercepted 180 feet of 1.13% Cu & 0.178% Mo at 1400 feet beneath the American Eagle workings. Hole D-5, a vertical hole by Newmont, cut 190 feet of 1.91% Cu from 3080 to 3270 depth. Guthrie (pers. comm., 1990) believes there could exist other high grade zones associated with steep structures (breccia pipes & vein systems) throughout the American Eagle area that have not been found because most of the drilling was done vertically. If such high grade zones are present, the overall character of the deposit should be considered in a different light than a typical porphyry deposit.

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It is well within the realm of possibility that the D&G group could cover 20% of the total deposit. The high grade mineralization found in D-5 could be better defined by drilling angle holes from north to south and possibly wedging off from existing vertical holes if they can be re-entered and if it is economically feasible to do so. In doing either of the above, the easterly high-angle fracture/vein system would be cross-cut providing more accurate samples. Although the Newmont drilling indicates a flat vein system at depth it does not necessarily follow that this is entirely so, i.e. several high angle veins or blind breccia pipes in any given zone could be missed by a vertical hole.

Harold J. Downey

Harold J. Downey

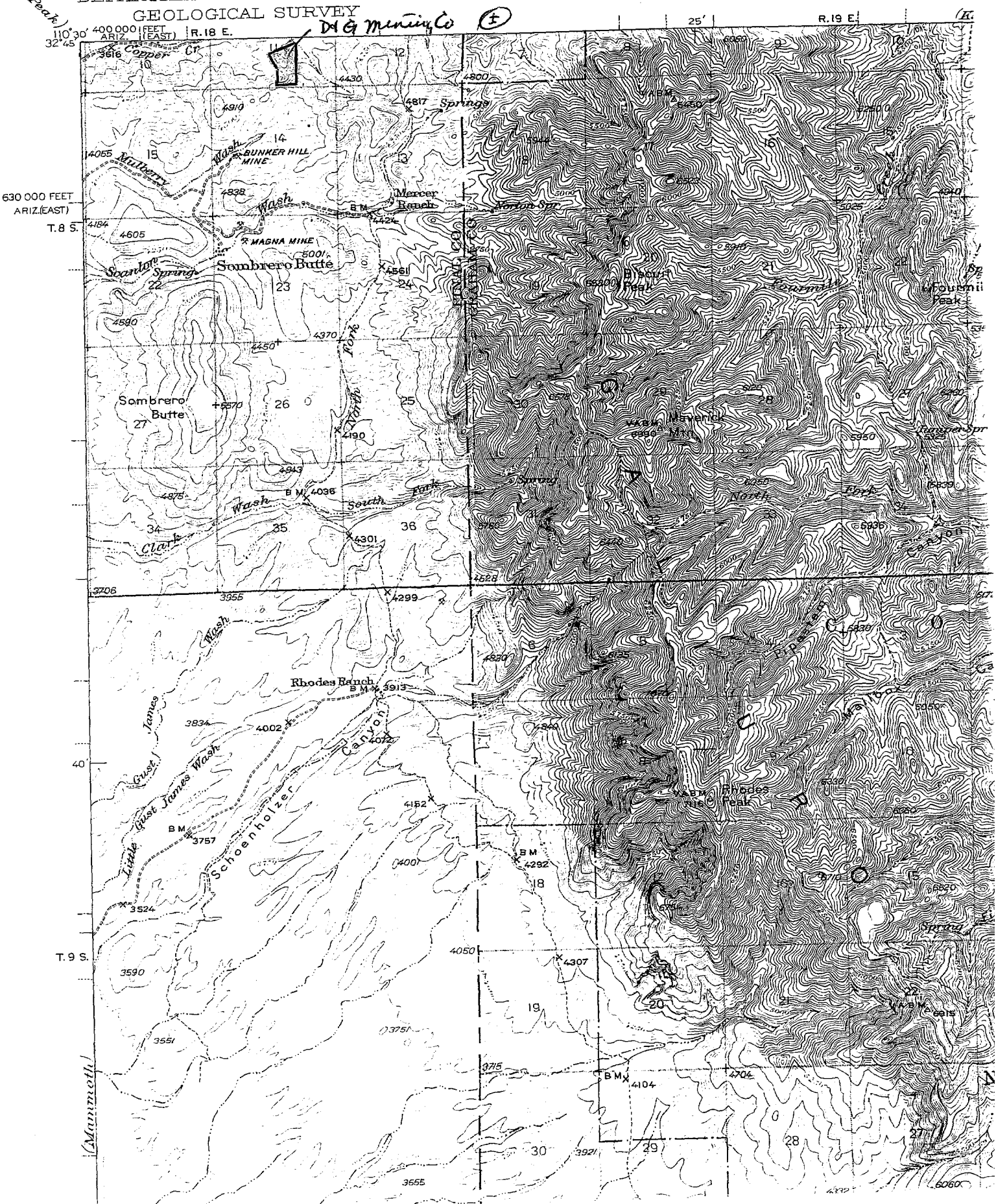
9/1/91

Date

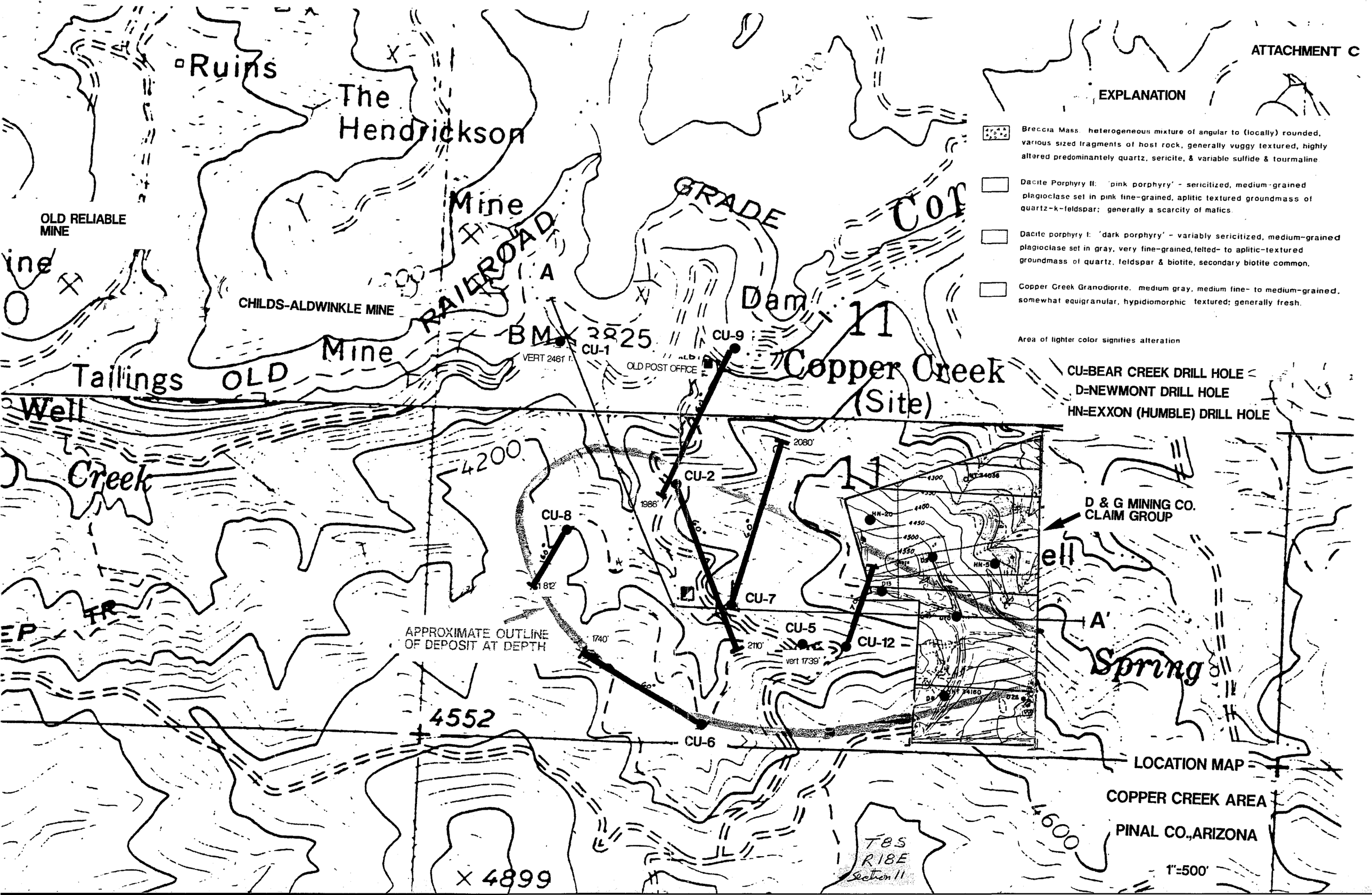
Galiuro Mtns 15' Quad

(Holy Joe Peak)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



ATTACHMENT C



Also see: H.J. Downey's Thoughts
S1/4, Sec. 5, T 8 S, R19E
Graham Co, AZ

memo (FILE NOTE) of Dec. 2, 1991.

KENNECOTT

GEOCHEMICAL SAMPLING

Ch-channel
C-chip
R-rock
F-float
T--talus
D-dump
RC- rotary chip
HG-high grade
S-soil
St-stream sed

PROJECT: COPPER CREEK EAST
GEOLOGIST: LARRY F. BARTH II
DATE: 2/10/92

QUAD: OAK GROVE RANCH 7½'
COUNTY: PINAL GALLIURO MTNS.
STATE: ARIZONA

Sample Number	Location Sec. T. R.	Rock Description Comments	Type	Au (ppb)	Ag	As	Hg	Sb	Cu	Mo	Pb	Zn
1141C	5, T8S, R19E	6" QTZ + CALCITE + CU OX VEIN	CH	698	>50.0	53.0	0.290	1150.0	>20,000	216	5958	292
1142C	5, T8S, R19E	VEIN MATERIAL W/COPPER OX.	D	356	>50.0	<310.0	0.185	>5000.0	>20,000	18	5059	1080
1143C	5, T8S, R19E	VEIN MATERIAL W/COPPER OX.	D	608	>50.0	46.0	0.267	142.0	>20,000	16	3271	85
1144C	5, T8S, R19E	VEIN MATERIAL W/COPPER OX.	D	856	32.8	79.0	0.237	>5000.0	>20,000	25	1849	1198

get copy of map from Harold

Tim Sell

University of Arizona
Isotope Geochemistry Laboratory
Date of Report: May 18, 1992

Project: Prospect Pit
Sampled by H J Downey

Sample Number
UAKA 91 097 Originator's - Downey

Sample Information
Submicron illitic clay fraction
Fault gouge in andesite, Prospect Pit

Location Information
Klondike area
Graham County, AZ

Analytical Data

Potassium Data	Potassium Mean	Radiogenic Ar pm/g Data	Radiogenic Ar pm/g Mean	% Atm. Ar Data	% Atm. Ar Mean	Reported Date +/- Err
3.224	3.270	151.1	150.7	31.5	33.0	26.4 +/- ~~4.4~~ 9.6
3.276		151.3		32.8		
3.335		151.3		32.8		
3.278		149.4		33.3		
3.270		150.9		32.6		
3.279		150.4		34.7		
3.246						
3.258						
3.264						

To: James D. Sell

From: Harold Downey

Date: April 1, 1991

Subject: Copper Creek, Arizona; A Summary of the Prospect, Its Potential, D&G Mining Company Holdings.

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Harold J. Downey

Harold J. Downey

4/1/91

Date

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"C" Location Map; scale: 1"=500 ft.; with approximate outline of deposit and D&G claim block overlain; Bear Creek drill holes and drill holes on D&G shown.

"D" Vertical Section A-A' from above map; scale: 1"=500 ft.

"E" Copper assay logs for Newmont holes D-5 and D-8.

Additional data available at H. J. Downey, Inc. office.

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LATITUDE 635737.12 ELEVATION 4490.00

DEPARTURE 406360.06 DEPTH TO BEDROCK 0.00

TOTAL DRILLED DISTANCE 3661.00

MAGNETIC DECLINATION 14.00

DISTANCE TO STATION	0.00	BEARING	0.00	INCLINATION	-90.00
DISTANCE TO STATION	1000.00	BEARING	0.00	INCLINATION	-90.00
DISTANCE TO STATION	2000.00	BEARING	63.00	INCLINATION	-87.00
DISTANCE TO STATION	2500.00	BEARING	123.00	INCLINATION	-87.00
DISTANCE TO STATION	3000.00	BEARING	109.00	INCLINATION	-87.00
DISTANCE TO STATION	3250.00	BEARING	121.00	INCLINATION	-86.00
DISTANCE TO STATION	3661.00	BEARING	121.00	INCLINATION	-86.00

INTERVAL NUMBER	INTERVAL FROM	TO	INTERVAL LENGTH	TOTAL CU
********	**********		********	********
1	0.0	450.0	450.0	******
2	450.0	490.0	40.0	******
3	490.0	500.0	10.0	0.040
4	500.0	540.0	40.0	******
5	540.0	550.0	10.0	0.040
6	550.0	590.0	40.0	******
7	590.0	600.0	10.0	0.060
8	600.0	640.0	40.0	******
9	640.0	650.0	10.0	0.070
10	650.0	680.0	30.0	******
11	680.0	690.0	10.0	0.050
12	690.0	740.0	50.0	******
13	740.0	750.0	10.0	0.060
14	750.0	790.0	40.0	******
15	790.0	800.0	10.0	0.050
16	800.0	840.0	40.0	******
17	840.0	850.0	10.0	0.070
18	850.0	890.0	40.0	******
19	890.0	900.0	10.0	0.060
20	900.0	910.0	10.0	0.040
21	910.0	920.0	10.0	0.040
22	920.0	930.0	10.0	0.030
23	930.0	940.0	10.0	0.050
24	940.0	950.0	10.0	0.050
25	950.0	960.0	10.0	0.040
26	960.0	970.0	10.0	0.060
27	970.0	980.0	10.0	0.060
28	980.0	990.0	10.0	0.050
29	990.0	1000.0	10.0	0.050
30	1000.0	1010.0	10.0	0.050
31	1010.0	1020.0	10.0	0.040
32	1020.0	1030.0	10.0	0.050
33	1030.0	1040.0	10.0	0.050
34	1040.0	1050.0	10.0	0.040
35	1050.0	1060.0	10.0	0.050
36	1060.0	1070.0	10.0	0.070
37	1070.0	1080.0	10.0	0.060
38	1080.0	1090.0	10.0	0.060

INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU
********	**********		********	********
40	1100.0	1110.0	10.0	0.060
41	1110.0	1120.0	10.0	0.050
42	1120.0	1130.0	10.0	0.040
43	1130.0	1140.0	10.0	0.040
44	1140.0	1150.0	10.0	0.050
45	1150.0	1160.0	10.0	0.050
46	1160.0	1170.0	10.0	0.050
47	1170.0	1180.0	10.0	0.040
48	1180.0	1190.0	10.0	0.050
49	1190.0	1200.0	10.0	0.060
50	1200.0	1210.0	10.0	0.060
51	1210.0	1220.0	10.0	0.120
52	1220.0	1230.0	10.0	0.070
53	1230.0	1240.0	10.0	0.060
54	1240.0	1250.0	10.0	0.050
55	1250.0	1260.0	10.0	0.050
56	1260.0	1270.0	10.0	0.070
57	1270.0	1280.0	10.0	0.050
58	1280.0	1290.0	10.0	0.070
59	1290.0	1300.0	10.0	0.060
60	1300.0	1310.0	10.0	0.040
61	1310.0	1320.0	10.0	0.040
62	1320.0	1330.0	10.0	0.060
63	1330.0	1340.0	10.0	0.040
64	1340.0	1350.0	10.0	0.050
65	1350.0	1360.0	10.0	0.030
66	1360.0	1370.0	10.0	0.020
67	1370.0	1380.0	10.0	0.020
68	1380.0	1390.0	10.0	0.020
69	1390.0	1400.0	10.0	0.030
70	1400.0	1410.0	10.0	0.040
71	1410.0	1420.0	10.0	0.070
72	1420.0	1430.0	10.0	0.050
73	1430.0	1440.0	10.0	0.040
74	1440.0	1450.0	10.0	0.080
75	1450.0	1460.0	10.0	0.040
76	1460.0	1470.0	10.0	0.030
77	1470.0	1480.0	10.0	0.030
78	1480.0	1490.0	10.0	0.020
79	1490.0	1500.0	10.0	0.030
80	1500.0	1510.0	10.0	0.060
81	1510.0	1520.0	10.0	0.060
82	1520.0	1530.0	10.0	0.070
83	1530.0	1540.0	10.0	0.090
84	1540.0	1550.0	10.0	0.070
85	1550.0	1560.0	10.0	0.080
86	1560.0	1570.0	10.0	0.090
87	1570.0	1580.0	10.0	0.070
88	1580.0	1590.0	10.0	0.110
89	1590.0	1600.0	10.0	0.070
90	1600.0	1610.0	10.0	0.080
91	1610.0	1620.0	10.0	0.120
92	1620.0	1630.0	10.0	0.040

INTERVAL NUMBER	INTERVAL FROM	TO	INTERVAL LENGTH	TOTAL CU
93	1630.0	1640.0	10.0	0.050
94	1640.0	1650.0	10.0	0.050
95	1650.0	1660.0	10.0	0.050
96	1660.0	1670.0	10.0	0.080
97	1670.0	1680.0	10.0	0.140
98	1680.0	1690.0	10.0	0.230
99	1690.0	1700.0	10.0	0.100
100	1700.0	1710.0	10.0	0.090
101	1710.0	1720.0	10.0	0.060
102	1720.0	1730.0	10.0	0.120
103	1730.0	1740.0	10.0	0.230
104	1740.0	1750.0	10.0	0.050
105	1750.0	1760.0	10.0	0.050
106	1760.0	1770.0	10.0	0.050
107	1770.0	1780.0	10.0	0.060
108	1780.0	1790.0	10.0	0.100
109	1790.0	1800.0	10.0	0.080
110	1800.0	1810.0	10.0	0.100
111	1810.0	1820.0	10.0	0.130
112	1820.0	1830.0	10.0	0.110
113	1830.0	1840.0	10.0	0.100
114	1840.0	1850.0	10.0	0.030
115	1850.0	1860.0	10.0	0.040
116	1860.0	1870.0	10.0	0.070
117	1870.0	1880.0	10.0	0.160
118	1880.0	1890.0	10.0	0.090
119	1890.0	1900.0	10.0	0.040
120	1900.0	1910.0	10.0	0.030
121	1910.0	1920.0	10.0	0.150
122	1920.0	1930.0	10.0	0.030
123	1930.0	1940.0	10.0	0.130
124	1940.0	1950.0	10.0	0.080
125	1950.0	1960.0	10.0	0.080
126	1960.0	1970.0	10.0	0.140
127	1970.0	1980.0	10.0	0.080
128	1980.0	1990.0	10.0	0.080
129	1990.0	2000.0	10.0	0.080
130	2000.0	2010.0	10.0	0.160
131	2010.0	2020.0	10.0	0.110
132	2020.0	2030.0	10.0	0.080
133	2030.0	2040.0	10.0	0.130
134	2040.0	2050.0	10.0	0.140
135	2050.0	2060.0	10.0	0.230
136	2060.0	2070.0	10.0	0.160
137	2070.0	2080.0	10.0	0.610
138	2080.0	2090.0	10.0	0.440
139	2090.0	2100.0	10.0	0.130
140	2100.0	2110.0	10.0	0.340
141	2110.0	2120.0	10.0	0.230
142	2120.0	2130.0	10.0	0.150
143	2130.0	2140.0	10.0	0.110
144	2140.0	2150.0	10.0	0.060
145	2150.0	2160.0	10.0	0.080

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INTERVAL NUMBER	INTERVAL FROM	TO	INTERVAL LENGTH	TOTAL CU	
146	2160.0	2170.0	10.0	0.050	
147	2170.0	2180.0	10.0	0.110	
148	2180.0	2190.0	10.0	0.110	
149	2190.0	2200.0	10.0	0.170	
150	2200.0	2210.0	10.0	0.260	
151	2210.0	2220.0	10.0	0.660	
152	2220.0	2230.0	10.0	0.530	
153	2230.0	2240.0	10.0	0.170	
154	2240.0	2250.0	10.0	0.080	
155	2250.0	2260.0	10.0	0.070	
156	2260.0	2270.0	10.0	0.040	
157	2270.0	2280.0	10.0	0.070	
158	2280.0	2290.0	10.0	0.080	
159	2290.0	2300.0	10.0	0.440	
160	2300.0	2310.0	10.0	0.160	
161	2310.0	2320.0	10.0	0.110	
162	2320.0	2330.0	10.0	0.170	
163	2330.0	2340.0	10.0	0.060	
164	2340.0	2350.0	10.0	0.090	
165	2350.0	2360.0	10.0	0.060	
166	2360.0	2370.0	10.0	0.060	
167	2370.0	2380.0	10.0	0.140	
168	2380.0	2390.0	10.0	0.170	
169	2390.0	2400.0	10.0	0.060	
170	2400.0	2410.0	10.0	0.080	
171	2410.0	2420.0	10.0	0.040	
172	2420.0	2430.0	10.0	0.050	
173	2430.0	2440.0	10.0	0.080	
174	2440.0	2450.0	10.0	0.120	
175	2450.0	2460.0	10.0	0.080	
176	2460.0	2470.0	10.0	0.140	
177	2470.0	2480.0	10.0	0.100	
178	2480.0	2490.0	10.0	0.120	
179	2490.0	2500.0	10.0	0.140	
180	2500.0	2510.0	10.0	0.240	
181	2510.0	2520.0	10.0	0.180	
182	2520.0	2530.0	10.0	0.210	
183	2530.0	2540.0	10.0	0.310	70'-0.24
184	2540.0	2550.0	10.0	0.210	
185	2550.0	2560.0	10.0	0.250	
186	2560.0	2570.0	10.0	0.250	
187	2570.0	2580.0	10.0	0.090	
188	2580.0	2590.0	10.0	0.090	
189	2590.0	2600.0	10.0	0.160	
190	2600.0	2610.0	10.0	0.150	
191	2610.0	2620.0	10.0	0.140	
192	2620.0	2630.0	10.0	0.110	
193	2630.0	2640.0	10.0	0.120	
194	2640.0	2650.0	10.0	0.440	
195	2650.0	2660.0	10.0	0.690	
196	2660.0	2670.0	10.0	0.540	60'-0.54
197	2670.0	2680.0	10.0	0.360	

EXTRA: 2640-3660' = 1020' - 0.92

INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU	
********	**********		********	********	
199	2690.0	2700.0	10.0	0.860	
200	2700.0	2710.0	10.0	0.350	
201	2710.0	2720.0	10.0	0.150	
202	2720.0	2730.0	10.0	0.330	
203	2730.0	2740.0	10.0	0.420	
204	2740.0	2750.0	10.0	0.400	190'-0.[illegible]
205	2750.0	2760.0	10.0	0.240	
206	2760.0	2770.0	10.0	0.690	
207	2770.0	2780.0	10.0	0.870	
208	2780.0	2790.0	10.0	0.640	
209	2790.0	2800.0	10.0	0.250	
210	2800.0	2810.0	10.0	0.180	
211	2810.0	2820.0	10.0	0.250	
212	2820.0	2830.0	10.0	0.440	
213	2830.0	2840.0	10.0	0.550	
214	2840.0	2850.0	10.0	0.400	
215	2850.0	2860.0	10.0	0.550	
216	2860.0	2870.0	10.0	1.430	
217	2870.0	2880.0	10.0	100-0.77 0.920	
218	2880.0	2890.0	10.0	0.700	
219	2890.0	2900.0	10.0	0.630	
220	2900.0	2910.0	10.0	0.460	
221	2910.0	2920.0	10.0	0.930	
222	2920.0	2930.0	10.0	0.800	
223	2930.0	2940.0	10.0	1.570	
224	2940.0	2950.0	10.0	1.050	
225	2950.0	2960.0	10.0	1.570	
226	2960.0	2970.0	10.0	1.240	
227	2970.0	2980.0	10.0	1.420	
228	2980.0	2990.0	10.0	1.470	
229	2990.0	3000.0	10.0	1.160	
230	3000.0	3010.0	10.0	0.940	
231	3010.0	3020.0	10.0	0.630	
232	3020.0	3030.0	10.0	0.540	
233	3030.0	3040.0	10.0	1.160	
234	3040.0	3050.0	10.0	550'-1.55% 1.460	550'-1.30
235	3050.0	3060.0	10.0	1.450	
236	3060.0	3070.0	10.0	1.000	
237	3070.0	3080.0	10.0	1.440	
238	3080.0	3090.0	10.0	1.860	
239	3090.0	3100.0	10.0	1.160	
240	3100.0	3110.0	10.0	1.760	
241	3110.0	3120.0	10.0	1.410	
242	3120.0	3130.0	10.0	1.740	
243	3130.0	3140.0	10.0	1.740	
244	3140.0	3150.0	10.0	1.500	
245	3150.0	3160.0	10.0	1.360	
246	3160.0	3170.0	10.0	1.210	
247	3170.0	3180.0	10.0	2.030	
248	3180.0	3190.0	10.0	1.460	
249	3190.0	3200.0	10.0	2.470	
250	3200.0	3210.0	10.0	1.660	
251	3210.0	3220.0	10.0	2.430	

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INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU	
252	3220.0	3230.0	10.0	5.900	
253	3230.0	3240.0	10.0	1.780	
254	3240.0	3250.0	10.0	1.400	
255	3250.0	3260.0	10.0	1.330	
256	3260.0	3270.0	10.0	2.180	
257	3270.0	3280.0	10.0	1.210	
258	3280.0	3290.0	10.0	0.700	
259	3290.0	3300.0	10.0	1.220	
260	3300.0	3310.0	10.0	1.360	
261	3310.0	3320.0	10.0	0.580	
262	3320.0	3330.0	10.0	1.570	
263	3330.0	3340.0	10.0	0.510	
264	3340.0	3350.0	10.0	0.390	
265	3350.0	3360.0	10.0	1.140	
266	3360.0	3370.0	10.0	0.510	
267	3370.0	3380.0	10.0	0.500	
268	3380.0	3390.0	10.0	0.270	
269	3390.0	3400.0	10.0	0.180	
270	3400.0	3410.0	10.0	0.370	
271	3410.0	3420.0	10.0	0.740	90' - 0.31'
272	3420.0	3430.0	10.0	0.260	
273	3430.0	3440.0	10.0	0.380	
274	3440.0	3450.0	10.0	0.240	
275	3450.0	3460.0	10.0	0.240	
276	3460.0	3470.0	10.0	0.130	
277	3470.0	3480.0	10.0	1.060	
278	3480.0	3490.0	10.0	0.580	
279	3490.0	3500.0	10.0	0.160	
280	3500.0	3510.0	10.0	0.260	
281	3510.0	3520.0	10.0	0.520	
282	3520.0	3530.0	10.0	1.160	
283	3530.0	3540.0	10.0	0.510	130' - 0.68'
284	3540.0	3550.0	10.0	1.080	
285	3550.0	3560.0	10.0	0.980	
286	3560.0	3570.0	10.0	0.830	
287	3570.0	3580.0	10.0	0.700	
288	3580.0	3590.0	10.0	0.290	
289	3590.0	3600.0	10.0	0.660	
290	3600.0	3610.0	10.0	0.430	
291	3610.0	3620.0	10.0	0.440	
292	3620.0	3630.0	10.0	0.280	41' - 0.41'
293	3630.0	3640.0	10.0	0.480	
294	3640.0	3650.0	10.0	0.340	
295	3650.0	3661.0	11.0	0.500	

3660'

END OF LOGD-5

LATITUDE 635267.12 ELEVATION 4512.00

DEPARTURE 406302.06 DEPTH TO BEDROCK 0.00

TOTAL DRILLED DISTANCE 3702.00

MAGNETIC DECLINATION 14.00

DISTANCE TO STATION	0.00	BEARING	0.00	INCLINATION	-90.00
DISTANCE TO STATION	500.00	BEARING	49.00	INCLINATION	-88.00
DISTANCE TO STATION	1000.00	BEARING	49.00	INCLINATION	-88.00
DISTANCE TO STATION	1500.00	BEARING	44.00	INCLINATION	-86.00
DISTANCE TO STATION	2000.00	BEARING	38.00	INCLINATION	-83.00
DISTANCE TO STATION	2500.00	BEARING	31.00	INCLINATION	-82.00
DISTANCE TO STATION	3000.00	BEARING	22.00	INCLINATION	-81.00
DISTANCE TO STATION	3150.00	BEARING	17.00	INCLINATION	-81.00
DISTANCE TO STATION	3702.00	BEARING	9.00	INCLINATION	-79.00

INTERVAL NUMBER	INTERVAL FROM	TO	INTERVAL LENGTH	TOTAL CU
********	**********		********	********
1	0.0	8.0	8.0	0.000
2	8.0	20.0	12.0	0.040
3	20.0	40.0	20.0	0.040
4	40.0	50.0	10.0	0.030
5	50.0	60.0	10.0	******
6	60.0	150.0	90.0	******
7	150.0	240.0	90.0	******
8	240.0	330.0	90.0	******
9	330.0	420.0	90.0	******
10	420.0	510.0	90.0	******
11	510.0	600.0	90.0	******
12	600.0	690.0	90.0	******
13	690.0	780.0	90.0	******
14	780.0	870.0	90.0	******
15	870.0	960.0	90.0	******
16	960.0	1050.0	90.0	******
17	1050.0	1140.0	90.0	******
18	1140.0	1230.0	90.0	******
19	1230.0	1320.0	90.0	******
20	1320.0	1410.0	90.0	******
21	1410.0	1500.0	90.0	******
22	1500.0	1590.0	90.0	******
23	1590.0	1680.0	90.0	******
24	1680.0	1770.0	90.0	******
25	1770.0	1860.0	90.0	******
26	1860.0	1950.0	90.0	******
27	1950.0	1960.0	10.0	0.050
28	1960.0	1970.0	10.0	0.050
29	1970.0	1980.0	10.0	0.090
30	1980.0	1990.0	10.0	0.070
31	1990.0	2000.0	10.0	0.060
32	2000.0	2010.0	10.0	0.040
33	2010.0	2020.0	10.0	0.040
34	2020.0	2030.0	10.0	0.030
35	2030.0	2040.0	10.0	0.030
36	2040.0	2050.0	10.0	0.040
37	2050.0	2060.0	10.0	[illegible]

INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU
********	**********		********	********
38	2060.0	2070.0	10.0	0.030
39	2070.0	2080.0	10.0	0.030
40	2080.0	2090.0	10.0	0.030
41	2090.0	2100.0	10.0	0.110
42	2100.0	2110.0	10.0	0.100
43	2110.0	2120.0	10.0	0.040
44	2120.0	2130.0	10.0	0.040
45	2130.0	2140.0	10.0	0.110
46	2140.0	2150.0	10.0	0.050
47	2150.0	2160.0	10.0	0.420
48	2160.0	2170.0	10.0	0.050
49	2170.0	2180.0	10.0	0.200
50	2180.0	2190.0	10.0	0.060
51	2190.0	2200.0	10.0	0.070
52	2200.0	2210.0	10.0	0.060
53	2210.0	2220.0	10.0	0.100
54	2220.0	2230.0	10.0	0.050
55	2230.0	2240.0	10.0	0.030
56	2240.0	2250.0	10.0	0.040
57	2250.0	2260.0	10.0	0.220
58	2260.0	2270.0	10.0	0.050
59	2270.0	2280.0	10.0	0.150
60	2280.0	2290.0	10.0	0.320
61	2290.0	2300.0	10.0	0.140
62	2300.0	2310.0	10.0	0.100
63	2310.0	2320.0	10.0	0.040
64	2320.0	2330.0	10.0	0.190
65	2330.0	2340.0	10.0	0.050
66	2340.0	2350.0	10.0	0.050
67	2350.0	2360.0	10.0	0.120
68	2360.0	2370.0	10.0	0.040
69	2370.0	2380.0	10.0	0.060
70	2380.0	2390.0	10.0	0.040
71	2390.0	2400.0	10.0	0.040
72	2400.0	2410.0	10.0	0.040
73	2410.0	2420.0	10.0	0.080
74	2420.0	2430.0	10.0	0.130
75	2430.0	2440.0	10.0	0.110
76	2440.0	2450.0	10.0	0.090
77	2450.0	2460.0	10.0	0.060
78	2460.0	2470.0	10.0	0.040
79	2470.0	2480.0	10.0	0.070
80	2480.0	2490.0	10.0	0.060
81	2490.0	2500.0	10.0	0.170
82	2500.0	2510.0	10.0	0.240
83	2510.0	2520.0	10.0	0.370
84	2520.0	2530.0	10.0	0.380
85	2530.0	2540.0	10.0	0.090
86	2540.0	2550.0	10.0	0.360
87	2550.0	2560.0	10.0	0.170
88	2560.0	2570.0	10.0	0.200
89	2570.0	2580.0	10.0	0.140
90	2580.0	2590.0	10.0	0.100

70'-0.26

INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU	
91	2590.0	2600.0	10.0	0.070	
92	2600.0	2610.0	10.0	0.130	
93	2610.0	2620.0	10.0	0.120	
94	2620.0	2630.0	10.0	0.130	
95	2630.0	2640.0	10.0	0.140	
96	2640.0	2650.0	10.0	0.080	
97	2650.0	2660.0	10.0	0.200	
98	2660.0	2670.0	10.0	0.070	
99	2670.0	2680.0	10.0	0.090	
100	2680.0	2690.0	10.0	0.250	
101	2690.0	2700.0	10.0	0.330	
102	2700.0	2710.0	10.0	0.080	
103	2710.0	2720.0	10.0	0.240	
104	2720.0	2730.0	10.0	0.400	
105	2730.0	2740.0	10.0	0.380	
106	2740.0	2750.0	10.0	0.420	
107	2750.0	2760.0	10.0	0.190	
108	2760.0	2770.0	10.0	0.520	170'-0.32
109	2770.0	2780.0	10.0	0.880	
110	2780.0	2790.0	10.0	0.160	
111	2790.0	2800.0	10.0	0.440	
112	2800.0	2810.0	10.0	0.140	
113	2810.0	2820.0	10.0	0.200	
114	2820.0	2830.0	10.0	0.090	
115	2830.0	2840.0	10.0	0.210	
116	2840.0	2850.0	10.0	0.480	
117	2850.0	2860.0	10.0	0.810	
118	2860.0	2870.0	10.0	0.780	
119	2870.0	2880.0	10.0	0.280	50'-0.69
120	2880.0	2890.0	10.0	0.610	
121	2890.0	2900.0	10.0	0.990	
122 EXXON:	2900.0	2910.0	10.0	0.200	
123 2850-3280'= 430'-0.50	2910.0	2920.0	10.0	0.400	
124	2920.0	2930.0	10.0	0.130	
125	2930.0	2940.0	10.0	0.140	
126	2940.0	2950.0	10.0	0.050	80'-0.15
127	2950.0	2960.0	10.0	0.150	
128	2960.0	2970.0	10.0	0.100	
129	2970.0	2980.0	10.0	0.060	
130	2980.0	2990.0	10.0	1.800	
131	2990.0	3000.0	10.0	0.340	
132	3000.0	3010.0	10.0	0.840	
133	3010.0	3020.0	10.0	0.230	
134	3020.0	3030.0	10.0	0.200	90'-0.68
135	3030.0	3040.0	10.0	0.110	
136	3040.0	3050.0	10.0	0.380	
137	3050.0	3060.0	10.0	1.530	
138	3060.0	3070.0	10.0	0.730	
139	3070.0	3080.0	10.0	0.120	
140	3080.0	3090.0	10.0	0.560	
141	3090.0	3100.0	10.0	0.080	
142	3100.0	3110.0	10.0	0.460	
143	3110.0	3120.0	10.0	0.170	

INTERVAL NUMBER ********	INTERVAL FROM - TO **********		INTERVAL LENGTH ********		TOTAL CU ********	
144	3120.0	3130.0	10.0		0.090	
145	3130.0	3140.0	10.0		0.390	
146	3140.0	3150.0	10.0		0.320	110'-0.30
147	3150.0	3160.0	10.0		0.380	
148	3160.0	3170.0	10.0		0.340	
149	3170.0	3180.0	10.0		0.360	
150	3180.0	3190.0	10.0		1.940	
151	3190.0	3200.0	10.0		0.380	
152	3200.0	3210.0	10.0		0.450	
153	3210.0	3220.0	10.0		0.350	
154	3220.0	3230.0	10.0		0.500	
155	3230.0	3240.0	10.0		1.190	100'-0.73
156	3240.0	3250.0	10.0		0.190	
157	3250.0	3260.0	10.0		0.880	
158	3260.0	3270.0	10.0		0.690	
159	3270.0	3280.0	10.0		0.740	
160	3280.0	3290.0	10.0		0.230	
161	3290.0	3300.0	10.0		0.400	
162	3300.0	3310.0	10.0		0.350	
163	3310.0	3320.0	10.0		0.200	
164	3320.0	3330.0	10.0	0.20	******	
165	3330.0	3340.0	10.0		0.210	
166	3340.0	3350.0	10.0		0.400	
167	3350.0	3360.0	10.0		0.370	
168	3360.0	3370.0	10.0		0.150	
169	3370.0	3380.0	10.0	ASSIGNED	0.240	
170	3380.0	3390.0	10.0		0.170	
171	3390.0	3400.0	10.0		0.220	
172	3400.0	3410.0	10.0		0.120	
173	3410.0	3420.0	10.0		0.270	
174	3420.0	3430.0	10.0		0.100	
175	3430.0	3440.0	10.0	0.19	******	
176	3440.0	3450.0	10.0		0.280	
177	3450.0	3460.0	10.0		0.150	
178	3460.0	3470.0	10.0		0.210	
179	3470.0	3480.0	10.0		0.320	
180	3480.0	3490.0	10.0		0.340	
181	3490.0	3500.0	10.0		0.430	410'-0.31
182	3500.0	3510.0	10.0		0.610	
183	3510.0	3520.0	10.0		0.290	
184	3520.0	3530.0	10.0		0.270	
185	3530.0	3540.0	10.0		0.190	
186	3540.0	3550.0	10.0		0.350	
187	3550.0	3560.0	10.0		0.230	
188	3560.0	3570.0	10.0		0.350	
189	3570.0	3580.0	10.0		0.460	
190	3580.0	3590.0	10.0		0.670	
191	3590.0	3600.0	10.0		0.190	
192	3600.0	3610.0	10.0		0.600	
193	3610.0	3620.0	10.0		0.370	
194	3620.0	3630.0	10.0		0.150	
195	3630.0	3640.0	10.0		0.120	
196	3640.0	3650.0	10.0		0.130	

INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU
********	**********		********	********
197	3650.0	3660.0	10.0	0.130
198	3660.0	3670.0	10.0	1.500
199	3670.0	3680.0	10.0	0.230
200	3680.0	3690.0	10.0	0.370
201	3690.0	3702.0	12.0	0.190

END OF LOGD-8

LATITUDE 635921.12 ELEVATION 4498.00

DEPARTURE 405898.06 DEPTH TO BEDROCK 0.00

TOTAL DRILLED DISTANCE - 3156.00

MAGNETIC DECLINATION 14.00

DISTANCE TO STATION 0.00	BEARING 0.00	INCLINATION -90.00
DISTANCE TO STATION 490.00	BEARING 110.00	INCLINATION -89.00
DISTANCE TO STATION 910.00	BEARING 110.00	INCLINATION -87.00
DISTANCE TO STATION 1960.00	BEARING 108.00	INCLINATION -83.00
DISTANCE TO STATION 2450.00	BEARING 93.00	INCLINATION -83.00
DISTANCE TO STATION 2940.00	BEARING 94.00	INCLINATION -83.00
DISTANCE TO STATION 3000.00	BEARING 83.00	INCLINATION -83.00
DISTANCE TO STATION 3100.00	BEARING 182.00	INCLINATION -85.00
DISTANCE TO STATION 3156.00	BEARING 182.00	INCLINATION -85.00

INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU
********	**********		********	********
1	0.0	190.0	190.0	******
2	190.0	200.0	10.0	0.040
3	200.0	210.0	10.0	0.030
4	210.0	220.0	10.0	0.060
5	220.0	230.0	10.0	0.060
6	230.0	240.0	10.0	0.060
7	240.0	250.0	10.0	0.030
8	250.0	260.0	10.0	0.030
9	260.0	270.0	10.0	0.030
10	270.0	280.0	10.0	0.040
11	280.0	290.0	10.0	0.020
12	290.0	300.0	10.0	0.060
13	300.0	310.0	10.0	0.040
14	310.0	320.0	10.0	0.040
15	320.0	330.0	10.0	0.050
16	330.0	340.0	10.0	0.040
17	340.0	350.0	10.0	0.160
18	350.0	360.0	10.0	0.120
19	360.0	370.0	10.0	0.080
20	370.0	380.0	10.0	0.100
21	380.0	390.0	10.0	0.070
22	390.0	400.0	10.0	0.050
23	400.0	410.0	10.0	0.040
24	410.0	420.0	10.0	0.030
25	420.0	430.0	10.0	0.030
26	430.0	440.0	10.0	0.030
27	440.0	450.0	10.0	0.030
28	450.0	460.0	10.0	0.040
29	460.0	470.0	10.0	0.030
30	470.0	480.0	10.0	0.040
31	480.0	490.0	10.0	0.040
32	490.0	500.0	10.0	0.040
33	500.0	510.0	10.0	0.060
34	510.0	520.0	10.0	0.050
35	520.0	530.0	10.0	0.040
36	530.0	540.0	10.0	0.040
37	540.0	550.0	10.0	0.050

INTERVAL NUMBER	INTERVAL FROM	TO	INTERVAL LENGTH	TOTAL CU
38	550.0	560.0	10.0	0.030
39	560.0	570.0	10.0	0.020
40	570.0	580.0	10.0	0.020
41	580.0	590.0	10.0	0.090
42	590.0	600.0	10.0	0.050
43	600.0	610.0	10.0	0.060
44	610.0	620.0	10.0	0.040
45	620.0	630.0	10.0	0.040
46	630.0	640.0	10.0	0.050
47	640.0	650.0	10.0	0.050
48	650.0	660.0	10.0	0.050
49	660.0	670.0	10.0	0.040
50	670.0	680.0	10.0	0.020
51	680.0	690.0	10.0	0.040
52	690.0	700.0	10.0	0.030
53	700.0	710.0	10.0	0.020
54	710.0	720.0	10.0	0.030
55	720.0	730.0	10.0	0.040
56	730.0	740.0	10.0	0.030
57	740.0	750.0	10.0	0.020
58	750.0	760.0	10.0	0.020
59	760.0	770.0	10.0	0.030
60	770.0	780.0	10.0	0.020
61	780.0	790.0	10.0	0.020
62	790.0	800.0	10.0	0.030
63	800.0	810.0	10.0	0.020
64	810.0	820.0	10.0	0.020
65	820.0	830.0	10.0	0.030
66	830.0	840.0	10.0	0.030
67	840.0	850.0	10.0	0.040
68	850.0	860.0	10.0	0.040
69	860.0	870.0	10.0	0.070
70	870.0	880.0	10.0	0.020
71	880.0	890.0	10.0	0.050
72	890.0	900.0	10.0	0.060
73	900.0	910.0	10.0	0.030
74	910.0	920.0	10.0	0.020
75	920.0	930.0	10.0	0.020
76	930.0	940.0	10.0	0.030
77	940.0	950.0	10.0	0.050
78	950.0	960.0	10.0	0.060
79	960.0	970.0	10.0	0.060
80	970.0	980.0	10.0	0.070
81	980.0	990.0	10.0	0.080
82	990.0	1000.0	10.0	0.060
83	1000.0	1010.0	10.0	0.060
84	1010.0	1020.0	10.0	0.060
85	1020.0	1030.0	10.0	0.140
86	1030.0	1040.0	10.0	0.090
87	1040.0	1050.0	10.0	0.050
88	1050.0	1060.0	10.0	0.050
89	1060.0	1070.0	10.0	0.040
90	1070.0	1080.0	10.0	0.060

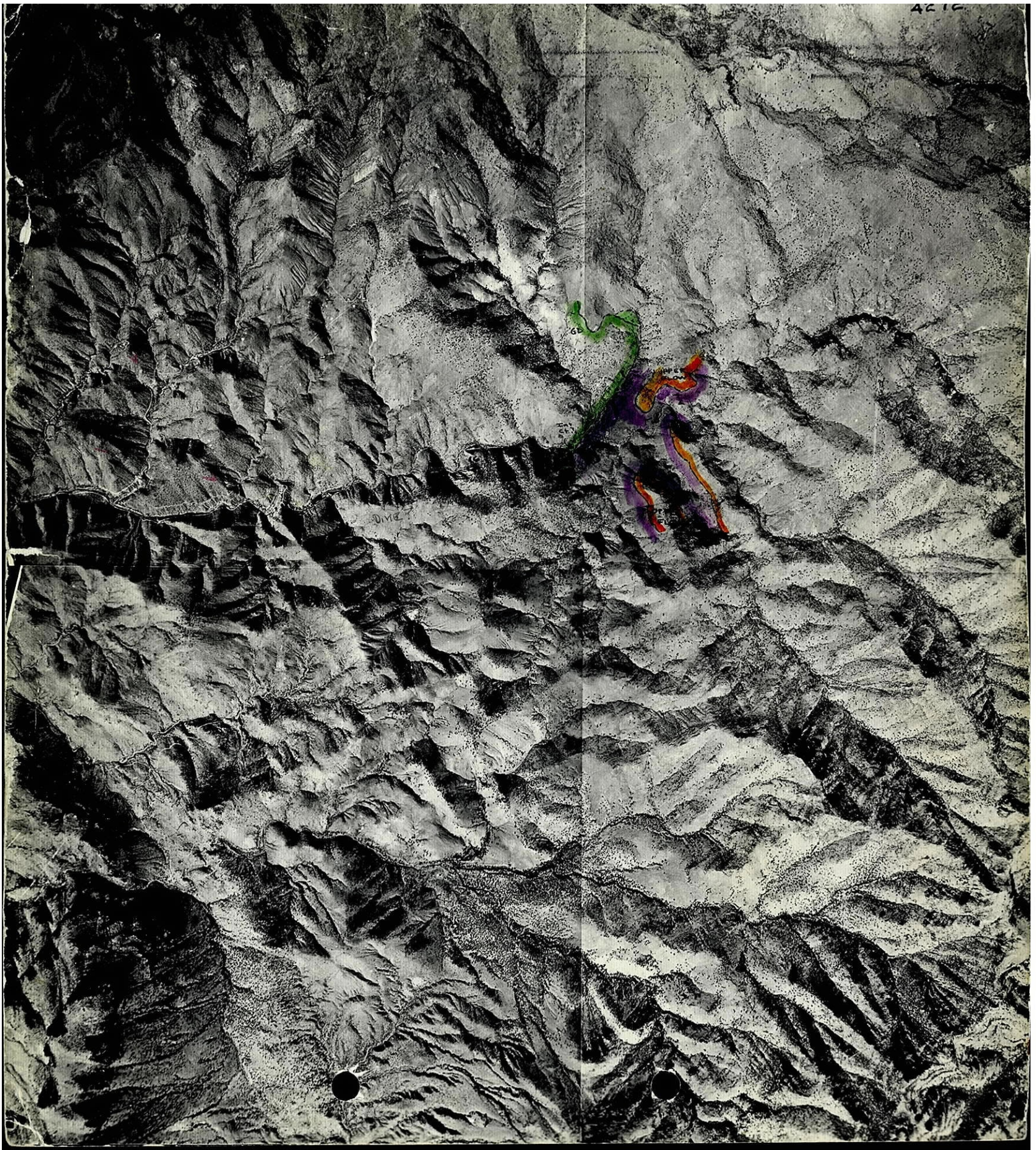
INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU
********	**********		********	********
91	1080.0	1090.0	10.0	0.060
92	1090.0	1100.0	10.0	0.060
93	1100.0	1110.0	10.0	0.180
94	1110.0	1120.0	10.0	0.160
95	1120.0	1130.0	10.0	0.140
96	1130.0	1140.0	10.0	0.220
97	1140.0	1150.0	10.0	0.200
98	1150.0	1160.0	10.0	0.220 50'-0.22'
99	1160.0	1170.0	10.0	0.240
100	1170.0	1180.0	10.0	0.220
101	1180.0	1190.0	10.0	0.120
102	1190.0	1200.0	10.0	0.130
103	1200.0	1210.0	10.0	0.130
104	1210.0	1220.0	10.0	0.100
105	1220.0	1230.0	10.0	0.120
106	1230.0	1240.0	10.0	0.040
107	1240.0	1250.0	10.0	0.060
108	1250.0	1260.0	10.0	0.030
109	1260.0	1270.0	10.0	0.040
110	1270.0	1280.0	10.0	0.040
111	1280.0	1290.0	10.0	0.030
112	1290.0	1300.0	10.0	0.050
113	1300.0	1310.0	10.0	0.080
114	1310.0	1320.0	10.0	0.060
115	1320.0	1330.0	10.0	0.040
116	1330.0	1340.0	10.0	0.040
117	1340.0	1350.0	10.0	0.070
118	1350.0	1360.0	10.0	0.080
119	1360.0	1370.0	10.0	0.080
120	1370.0	1380.0	10.0	0.030
121	1380.0	1390.0	10.0	0.050
122	1390.0	1395.0	5.0	******
123	1395.0	1400.0	5.0	0.060
124	1400.0	1410.0	10.0	0.120
125	1410.0	1420.0	10.0	0.180
126	1420.0	1430.0	10.0	0.080
127	1430.0	1440.0	10.0	0.080
128	1440.0	1450.0	10.0	0.100
129	1450.0	1460.0	10.0	0.060
130	1460.0	1470.0	10.0	0.050
131	1470.0	1480.0	10.0	0.040
132	1480.0	1490.0	10.0	0.090
133	1490.0	1500.0	10.0	0.120
134	1500.0	1510.0	10.0	0.070
135	1510.0	1520.0	10.0	0.050
136	1520.0	1530.0	10.0	0.070
137	1530.0	1540.0	10.0	0.060
138	1540.0	1550.0	10.0	0.030
139	1550.0	1560.0	10.0	0.180
140	1560.0	1570.0	10.0	0.040
141	1570.0	1580.0	10.0	0.040
142	1580.0	1590.0	10.0	0.030
143	1590.0	1600.0	10.0	0.040

INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU	
********	**********		********	********	
144	1600.0	1610.0	10.0	0.060	
145	1610.0	1620.0	10.0	0.050	
146	1620.0	1630.0	10.0	0.030	
147	1630.0	1640.0	10.0	0.050	
148	1640.0	1650.0	10.0	0.150	
149	1650.0	1660.0	10.0	0.070	
150	1660.0	1670.0	10.0	0.120	
151	1670.0	1680.0	10.0	0.110	
152	1680.0	1690.0	10.0	0.090	
153	1690.0	1700.0	10.0	0.140	
154	1700.0	1710.0	10.0	0.430	
155	1710.0	1720.0	10.0	0.880	
156	1720.0	1730.0	10.0	0.190	
157	1730.0	1740.0	10.0	0.080	
158	1740.0	1750.0	10.0	0.120	
159	1750.0	1760.0	10.0	0.040	
160	1760.0	1770.0	10.0	0.090	
161	1770.0	1780.0	10.0	0.090	
162	1780.0	1790.0	10.0	0.080	
163	1790.0	1800.0	10.0	0.080	
164	1800.0	1810.0	10.0	0.120	
165	1810.0	1820.0	10.0	0.070	
166	1820.0	1830.0	10.0	0.110	
167	1830.0	1840.0	10.0	0.160	
168	1840.0	1850.0	10.0	0.110	
169	1850.0	1860.0	10.0	0.220	
170	1860.0	1870.0	10.0	0.040	
171	1870.0	1880.0	10.0	0.060	
172	1880.0	1890.0	10.0	0.220	
173	1890.0	1900.0	10.0	0.560	
174	1900.0	1910.0	10.0	0.300	
175	1910.0	1920.0	10.0	0.230	
176	1920.0	1930.0	10.0	1.330	
177	1930.0	1940.0	10.0	0.910	
178	1940.0	1950.0	10.0	0.380	60'- 0.70"
179	1950.0	1960.0	10.0	0.620	
180	1960.0	1970.0	10.0	0.150	
181	1970.0	1980.0	10.0	0.830	
182	1980.0	1990.0	10.0	0.130	
183	1990.0	2000.0	10.0	0.150	
184	2000.0	2010.0	10.0	0.040	
185	2010.0	2020.0	10.0	0.060	
186	2020.0	2030.0	10.0	0.900	
187	2030.0	2040.0	10.0	0.200	
188	2040.0	2050.0	10.0	0.490	
189	2050.0	2060.0	10.0	0.230	60'-0.44"
190	2060.0	2070.0	10.0	0.150	
191	2070.0	2080.0	10.0	0.640	
192	2080.0	2090.0	10.0	0.080	
193	2090.0	2100.0	10.0	0.070	
194	2100.0	2110.0	10.0	0.200	
195	2110.0	2120.0	10.0	0.140	
196	2120.0	2130.0	10.0	0.120	

INTERVAL NUMBER	INTERVAL FROM	- TO	INTERVAL LENGTH	TOTAL CU	
********	**********		********	********	
197	2130.0	2140.0	10.0	0.130	
198	2140.0	2150.0	10.0	0.050	
199	2150.0	2160.0	10.0	0.110	
200	2160.0	2170.0	10.0	0.070	
201	2170.0	2180.0	10.0	0.140	
202	2180.0	2190.0	10.0	0.200	~ MOOS FRAC
203	2190.0	2200.0	10.0	0.210	
204	2200.0	2210.0	10.0	0.230	
205	2210.0	2220.0	10.0	0.460	
206	2220.0	2230.0	10.0	0.230	
207	2230.0	2240.0	10.0	0.210	
208	2240.0	2250.0	10.0	0.120	
209	2250.0	2260.0	10.0	0.160	
210	2260.0	2270.0	10.0	0.120	
211	2270.0	2280.0	10.0	0.130	
212	2280.0	2290.0	10.0	0.230	
213	2290.0	2300.0	10.0	0.210	
214	2300.0	2310.0	10.0	0.200	
215	2310.0	2320.0	10.0	0.130	
216	2320.0	2330.0	10.0	0.110	
217	2330.0	2340.0	10.0	0.180	
218	2340.0	2350.0	10.0	0.090	
219	2350.0	2360.0	10.0	0.410	
220	2360.0	2370.0	10.0	0.220	
221	2370.0	2380.0	10.0	0.610	
222	2380.0	2390.0	10.0	0.090	
223	2390.0	2400.0	10.0	0.230	
224	2400.0	2410.0	10.0	0.280	
225	2410.0	2420.0	10.0	0.280	
226	2420.0	2430.0	10.0	0.480	
227	2430.0	2440.0	10.0	0.640	560'-0.26
228	2440.0	2450.0	10.0	0.180	
229	2450.0	2460.0	10.0	0.100	
230	2460.0	2470.0	10.0	0.220	
231	2470.0	2480.0	10.0	0.100	
232	2480.0	2490.0	10.0	0.080	
233	2490.0	2500.0	10.0	0.340	
234	2500.0	2510.0	10.0	0.180	
235	2510.0	2520.0	10.0	0.300	
236	2520.0	2530.0	10.0	0.180	
237	2530.0	2540.0	10.0	0.380	
238	2540.0	2550.0	10.0	0.880	
239	2550.0	2560.0	10.0	0.430	
240	2560.0	2570.0	10.0	0.200	
241	2570.0	2580.0	10.0	0.130	
242	2580.0	2590.0	10.0	0.210	
243	2590.0	2600.0	10.0	0.370	
244	2600.0	2610.0	10.0	0.150	
245	2610.0	2620.0	10.0	0.100	
246	2620.0	2630.0	10.0	0.160	
247	2630.0	2640.0	10.0	0.170	
248	2640.0	2650.0	10.0	0.140	
249	2650.0	2660.0	10.0	0.490	

INTERVAL NUMBER ********	INTERVAL FROM	- TO **********	INTERVAL LENGTH ********	TOTAL CU ********
250	2660.0	2670.0	10.0	0.530
251	2670.0	2680.0	10.0	0.490
252	2680.0	2690.0	10.0	60'-0.40 0.190
253	2690.0	2700.0	10.0	0.280
254	2700.0	2710.0	10.0	0.400
255	2710.0	2720.0	10.0	0.160
256	2720.0	2730.0	10.0	0.330
257	2730.0	2740.0	10.0	0.280
258	2740.0	2750.0	10.0	0.970
259	2750.0	2760.0	10.0	0.380
260	2760.0	2770.0	10.0	0.540 60'-0.59'
261	2770.0	2780.0	10.0	0.400
262	2780.0	2790.0	10.0	0.690
263	2790.0	2800.0	10.0	0.560
264 Exxon:	2800.0	2810.0	10.0	0.340
265 2650-3150' = 500' - 0.30	2810.0	2820.0	10.0	0.240
266	2820.0	2830.0	10.0	0.180
267	2830.0	2840.0	10.0	0.300
268	2840.0	2850.0	10.0	0.230
269	2850.0	2860.0	10.0	0.110
270	2860.0	2870.0	10.0	0.220
271	2870.0	2880.0	10.0	0.280
272	2880.0	2890.0	10.0	0.220
273	2890.0	2900.0	10.0	0.350
274	2900.0	2910.0	10.0	0.330
275	2910.0	2920.0	10.0	0.410 230'-0.28'
276	2920.0	2930.0	10.0	0.250
277	2930.0	2940.0	10.0	0.200
278	2940.0	2950.0	10.0	0.330
279	2950.0	2960.0	10.0	0.350
280	2960.0	2970.0	10.0	0.130
281	2970.0	2980.0	10.0	0.380
282	2980.0	2990.0	10.0	0.450
283	2990.0	3000.0	10.0	0.330
284	3000.0	3010.0	10.0	0.310
285	3010.0	3020.0	10.0	0.160
286	3020.0	3030.0	10.0	0.270
287	3030.0	3040.0	10.0	0.160
288	3040.0	3050.0	10.0	0.130
289	3050.0	3060.0	10.0	0.130
290	3060.0	3070.0	10.0	0.180
291	3070.0	3080.0	10.0	0.190
292	3080.0	3090.0	10.0	0.100
293	3090.0	3100.0	10.0	0.220
294	3100.0	3110.0	10.0	0.150
295	3110.0	3120.0	10.0	0.160
296	3120.0	3130.0	10.0	0.160
297	3130.0	3140.0	10.0	0.120
298	3140.0	3150.0	10.0	0.120
299	3150.0	3156.0	6.0	0.230

END OF LOGD-13



DIP GD CT ?

PIPES
Nat. frog
% frog
mi
% MoS_2

± overlap with
3030

Copper Creek District
Pinal County, Ariz.
Scale 1" = 1/2 mile (±)

← file

Copper Creek, Arizona
Newmont Deposit

CONTENTS

Recent Advances of Quantitative Mineralogy in Exploration

Composite plots from 1000 to 1900 feet elevations show major east-west alteration trends for sericitization (Fig. 12) and k-feldspathization (Fig. 13). Alteration plots also correlate with composite plots of copper essays, (Fig. 14) as well as surface outcrop features of structure and alteration. Trends of alteration and bedrock geochemistry indicate two, possibly three, potentially open ends for future exploration. Consistency of alteration trends at different elevations suggests vertical structural control.

Cross sections along AD show vertical profiles of sericitization, (Fig. 16), and copper mineralization, (Fig. 17), of similar distribution and orientation. K-feldspathization shows a progressive increase with depth, (Fig. 15), as reported in many porphyry copper deposits.

Subsurface alteration trends are thus delineated from x-ray diffraction analysis of drill pulps, which correlate with distribution of copper values.

CONCLUSIONS

It has been demonstrated that quantitative mineralogy can be utilized in rock type identification and that monomineralic contouring can assist in correlating alteration anomalies with geochemical anomalies. "Semiquantitative" x-ray measurements for sericite, k-feldspar, and quartz have been applied successfully to the geochemical exploration of porphyry type occurences. Zones of alteration may occur as isolated patches, or concentric halos around central cores of pneumatolytically altered rock, but are often interconnected structually to form elongate trends along faults or shear systems, within which the probability of finding ore is greater than outside of these trends.

The distribution of alteration varies appreciably from locality

FIGURE 12

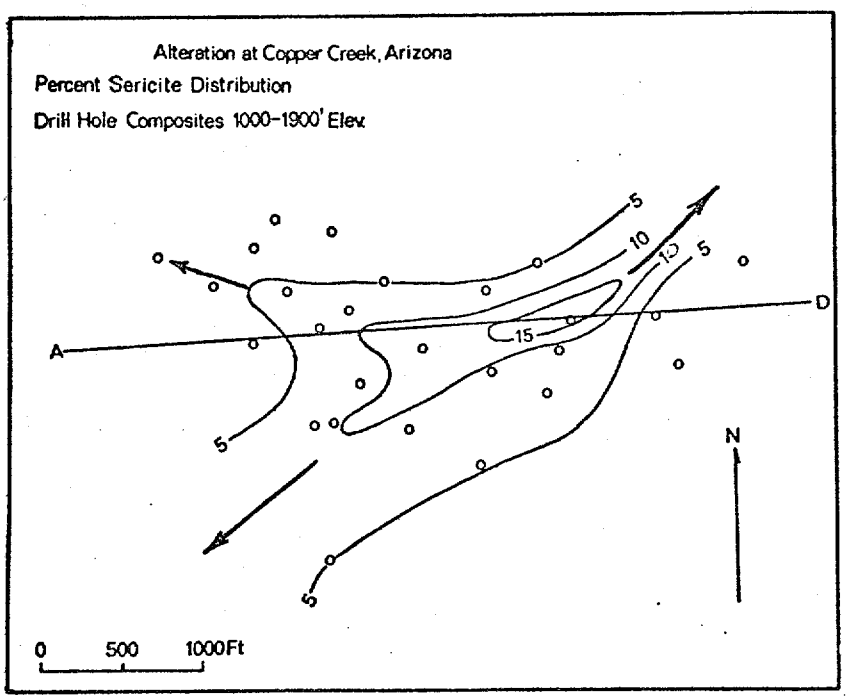


FIGURE 13

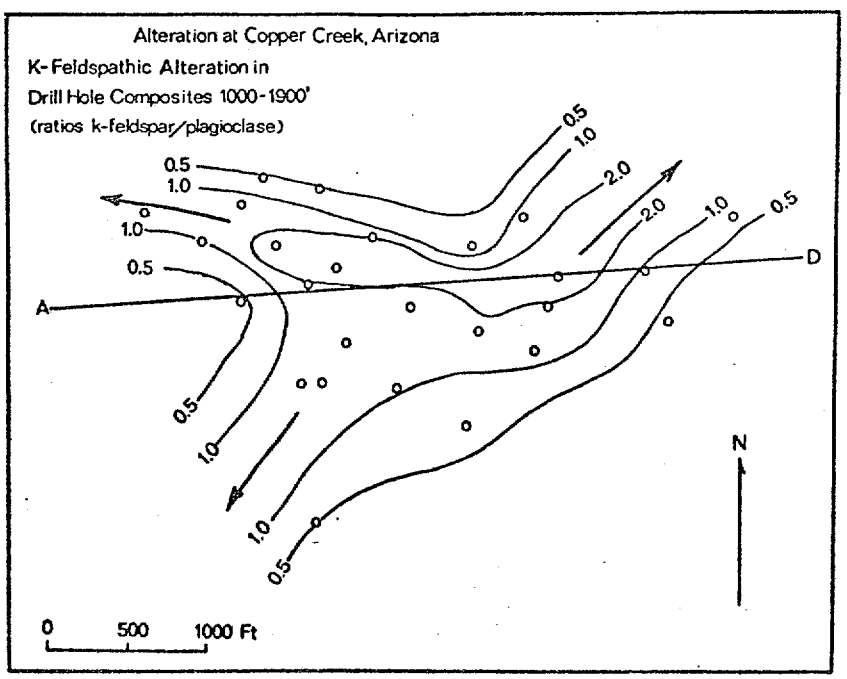


FIGURE 14

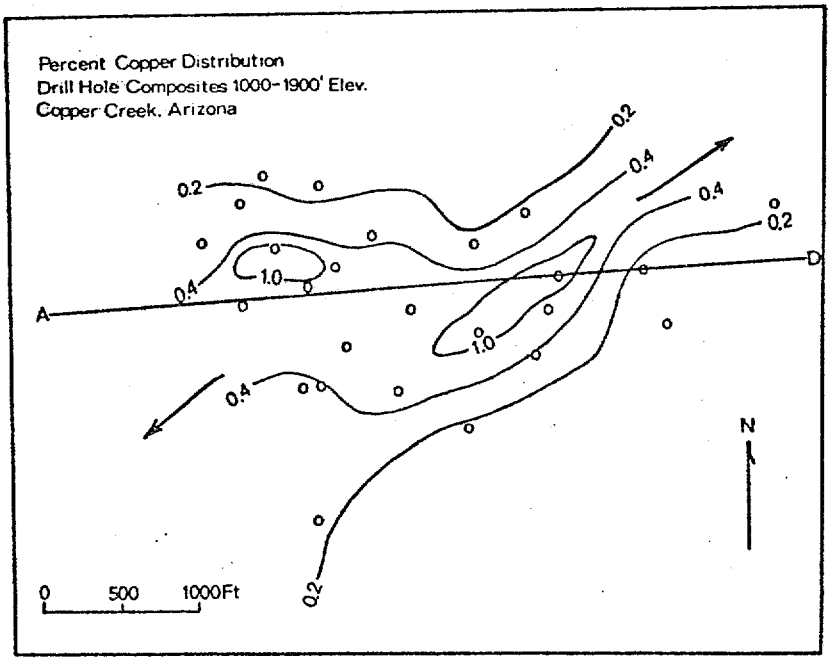


FIGURE 15

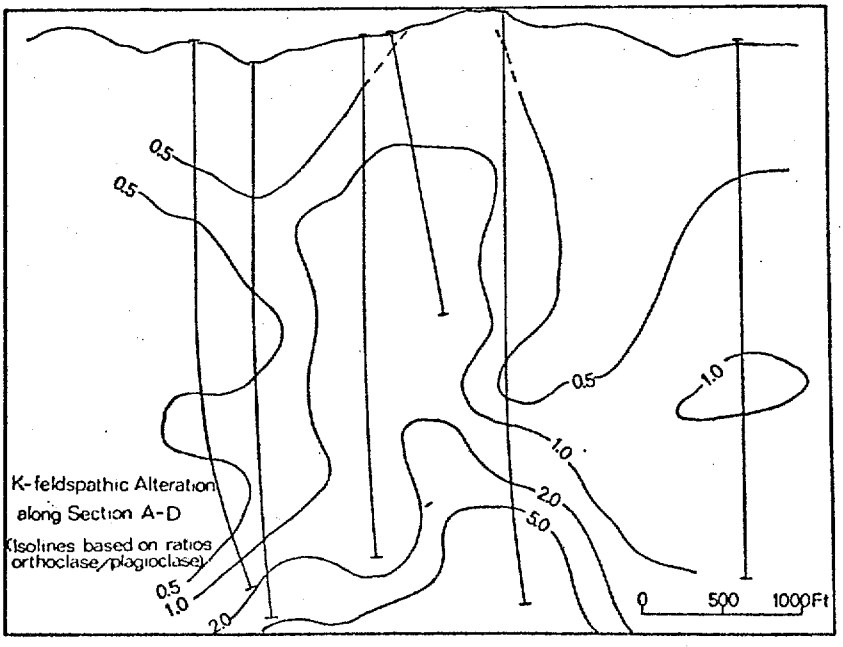


FIGURE 16

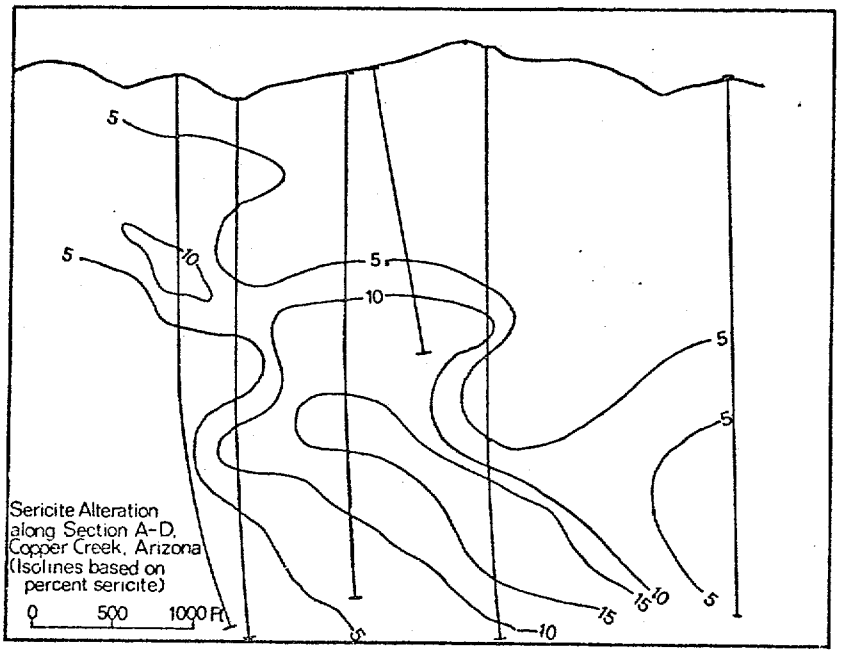
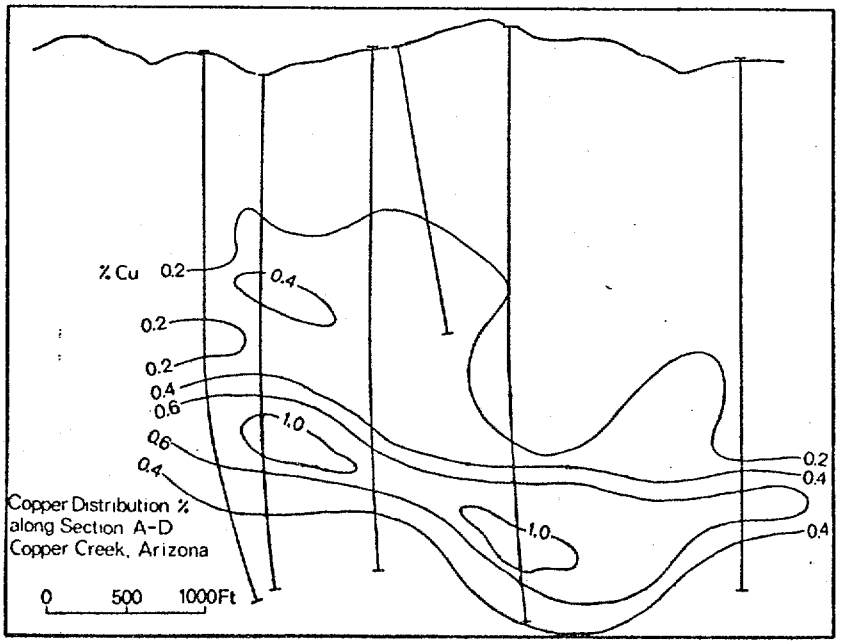


FIGURE 17



to locality, and within different rock types. Mineralization occurs mostly with sericitization or potassium silicate assemblages, and occasionally with argillic alteration. X-ray diffraction study of each occurrence is required along with close liaison between laboratory and field personnel.

Vectorial relationships of alteration to mineralization become apparent after plotting and contouring of x-ray diffraction data and metal values from grid rock samples.

Interpretation of alteration patterns permit refinement in projection of mineralization and inferred reserves along trends that might otherwise remain undetected.

Copper Creek
Pinal Co., AZ

Preliminary Prospectus dated October 27, 1995 № 1485

This prospectus constitutes a public offering of these securities only in those jurisdictions where they may be lawfully offered for sale and therein only by persons permitted to sell such securities. No securities commission or similar authority in Canada has in any way passed upon the merits of the securities offered hereunder and any representation to the contrary is an offence. These securities have not been and will not be registered under the United States Securities Act of 1933, as amended, and, except in limited circumstances, may not be offered or sold within the United States or to U.S. persons. See "Plan of Distribution".

Initial Public Offering

AMT INTERNATIONAL MINING CORPORATION

$ •

• Common Shares

• common shares (the "Common Shares") of AMT International Mining Corporation ("AMT" or the "Company") are being offered (the "Offering") at a price of $ • per Common Share pursuant to an underwriting agreement between the Company and Marleau, Lemire Securities Inc., First Marathon Securities Limited and Yorkton Securities Inc. (the "Underwriters"), dated • , 1995, (the "Underwriting Agreement"). The offering price of the Common Shares was determined by negotiation between the Company and the Underwriters.

Price: $ • per Common Share

	Price to Public	Underwriters' Fees	*Net Proceeds to the* Company (1)(2)(3)
Per Common Share	$ •	$ •	$ •
TOTAL OFFERING	$ •	$ •	$ •

(1) As additional compensation, the Company has agreed to grant to the Underwriters non-assignable options (the "Compensation Options") to purchase up to an aggregate number of Common Shares equal to 5% of the total number of Common Shares sold pursuant to this Offering. The Compensation Options will be exercisable, in whole or in part, at any time and from time to time, during the period commencing on the date of the closing of this Offering and ending on the date which is 24 months after the date of such closing, at an exercise price equal to the Offering price. See "Plan of Distribution". The Compensation Options and the Common Shares issuable on the exercise thereof are also being qualified for distribution by this prospectus.

(2) The Company has granted to the Underwriters non-assignable options (the "Over-Allotment Options"), exercisable up to 60 days following the date of closing of the Offering, to purchase, at the Offering price, up to an additional 15% of the Common Shares sold pursuant to this Offering, solely to cover over-allotments, if any. If the Over-Allotment Options are exercised in full, the total price to the public of this Offering will be $ • , the Underwriters' fees will be $ • and the net proceeds to the Company will be $ • . This prospectus also qualifies the distribution of the Over-Allotment Options. See "Plan of Distribution".

(3) Before deducting expenses of this Offering estimated to be $ • , payable by the Company, which, together with the Underwriters' fees, will be paid by the Company out of its general corporate funds.

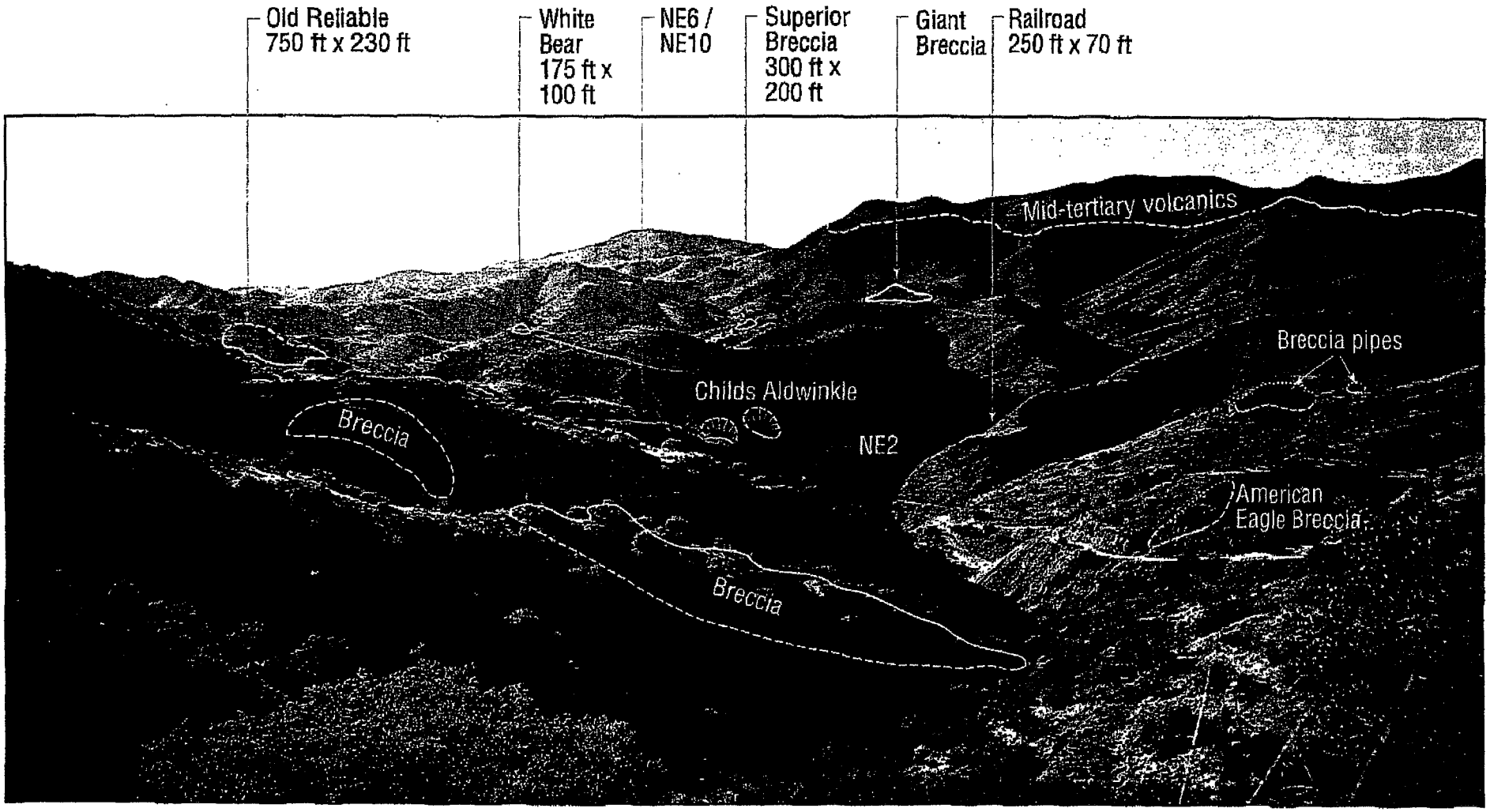
The offering price of the Common Shares exceeds the consolidated net tangible book value per Common Share as at • , 1995 by $ • after giving effect to this issue, which represents a dilution factor of • %. See "Dilution".

In the opinion of counsel, the Common Shares will qualify for investment under the specific statutes listed under "Eligibility for Investment". An investment in the Common Shares is subject to various risks. See "Risk Factors". There is currently no market for the Common Shares and there is no guarantee that an active trading market for the Common Shares will develop.

The Underwriters, as principals, conditionally offer the Common Shares, subject to prior sale, if, as and when issued by the Company and accepted by the Underwriters in accordance with the conditions contained in the Underwriting Agreement referred to under "Plan of Distribution" and subject to the approval of certain legal matters on behalf of the Company by Aird & Berlis and on behalf of the Underwriters by Cassels Brock & Blackwell.

Subscriptions for Common Shares will be received, subject to rejection or allotment in whole or in part, and the right is reserved to close the subscription books at any time without notice. It is expected that definitive share certificates for the Common Shares will be available for delivery at closing, which is expected to occur before • , or such later date as may be agreed between the Company and the Underwriters, but in any event, not later than •

This is a preliminary prospectus relating to these securities, a copy of which has been filed with the securities commissions in each of the provinces of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Nova Scotia, New Brunswick, Newfoundland and Prince Edward Island but which has not yet become final for the purpose of a distribution or a distribution to the public. Information contained herein is subject to completion or amendment. These securities may not be sold to, nor may offers to buy be accepted from, residents of each such jurisdictions prior to the time a receipt is obtained for the final prospectus from the appropriate securities commission or other regulatory authority of such province.



Looking northward from American Eagle Area across Copper Creek canyon. Most of foreground to mid-ground is comprised of Copper Creek granodiorite while much of the distance is comprised of Glory Hole volcanics. Childs-Aldwinkle glory holes are approximately 3,700 ft from where the photograph was taken. It is 5,600 ft to the Old Reliable, over 8,200 ft to the Superior Breccia and 1,350 ft to the American Eagle Breccia.

Copper Creek Project
Panoramic View of Site

SUMMARY OF THE PROSPECTUS

The following is a summary only and is qualified by the more detailed information appearing elsewhere in this prospectus. Capitalized terms used in this summary without definition are defined elsewhere in this prospectus.

AMT International Mining Corporation

AMT International Mining Corporation ("AMT" or the "Company") is a company in an advanced stage of mineral exploration that has focused its activity on earning an interest from Magma Copper Company ("Magma") in a copper property with additional recoverable molybdenum and precious metal values, located at Copper Creek, Pinal County, Arizona, and acquiring additional adjacent mineral tenements (the "Copper Creek Property"). The Copper Creek Property is ideally located close to three major copper smelter and refining complexes, including Magma's San Manuel facility which is 12 miles away. Magma, a major integrated copper producer, is the other participant with the Company in the development of the Copper Creek Property. The Copper Creek Property has the potential for the development of three stand-alone projects, all of which are low capital and operating cost projects. Current estimated proven and probable reserves, possible reserves and resources, grades and contained metal totals for the Copper Creek Property compiled by the Company are as follows:

SUMMARY OF ESTIMATED RESERVES AND RESOURCES[1]

	Million Tons				AVERAGE GRADES[2]				CONTAINED METALS			
	Proven	Prob.	Poss.	Total	Cu%	Mo%	Au opt	Ag opt	Cu (mil. lbs)	Mo (mil. lbs)	Au (thous. ozs)	Ag (thous. ozs)
Leachable Material: Old Reliable Pipe	--	2.10	0.33	2.43	0.76	--	--	--	37	--	--	--
Other Pipes	--	--	4.20	4.20	0.80	--	--	--	67	--	--	--
Shallow Sulphide	2.30	1.20	18.56	22.06	1.67	0.056	0.014	0.18	737	20.0	245[3]	3,150[3]
Deep Sulphide	--	76.60	--	76.60	0.80	0.0055	--	--	1,226	8.43	--	--
TOTAL	2.30	79.90	23.09	105.29	0.98				2,067	28.43	245	3,150

(1) Reserves in the Old Reliable pipe were estimated by Roscoe Postle Associates Inc. and are contained in the Roscoe Postle Report whereas the other resources have been estimated by James Guthrie and are contained in the Guthrie Report.

(2) These figures represent rounded average grades. See "The Copper Creek Property" for actual grades and a further description of the deposits and the reserves contained therein.

(3) From the proven and probable reserve or resource categories only.

The Copper Creek Property

The Copper Creek Property consists of two types of property interests. First, the Copper Creek Property consists of 481 acres of patented Federal mining claims and 1,200 acres of unpatented Federal mining claims which are subject to the earn-in from Magma. Secondly, the Company has staked additional unpatented Federal mining claims and has an option to acquire surface rights to the Ryland Ranch.

The Company's wholly owned subsidiary AMT (USA) Inc. ("AMT (USA)") has the right to earn-in from Magma an undivided 50% working interest in 481 acres of patented Federal mining claims and 1,200 acres of unpatented Federal mining claims, comprising that portion of the Copper Creek Property subject to an agreement with Magma, by making qualifying expenditures of U.S. $3.0 million, delivering a feasibility study and negotiating a joint venture agreement with Magma in a prescribed form for the future development and operation of the Copper Creek Property, all by February 1, 1998. Some of the substantive terms relating to the joint venture agreement have been agreed upon but the parties will have to negotiate and settle the final terms of such agreement in due course. During and subsequent to its earn-in, AMT (USA) will be the operator of the property. In addition, AMT (USA) has the exclusive option to purchase from Magma an additional undivided 25% working interest for a period of one year from the delivery to Magma of the feasibility study for U.S. $5.0 million or 25% of the net present value of the mineable ore reserves identified in the feasibility study, whichever amount is the greater. Magma has also retained a first right of refusal on the sale of any portion of AMT (USA)'s interest in the property and on the processing of concentrates produced therefrom.

Development Plan

Based on the recommendations of Kilborn Inc. ("Kilborn") contained in its report entitled "Copper Creek Project Development Plan, Pinal County, Arizona" dated October 2, 1995 (the "Kilborn Report"), the Company proposes a development plan (the "Development Plan") designed to advance the leachable and shallow sulphide deposits on the Copper Creek Property to a production decision stage. The Development Plan provides for in-fill and exploration drilling to extend the leachable reserves and upgrade the shallow sulphide reserves, preparation of feasibility studies based on those reserves, continuing environmental baseline work to facilitate permitting and hydrological studies followed by the construction of a water supply system. The Development Plan is based on the expectation that the results will provide the data necessary to undertake definitive feasibility studies justifying production decisions on both the leachable and shallow sulphide deposits. The Kilborn Report anticipates that by carrying out the recommended in-fill drilling, additional reserves will be delineated to more than double the life of the heap leach plant. The development of the shallow sulphides will also provide access for more economical underground exploration drilling of the much larger and deeper American Eagle sulphide deposit.

Environmental Permitting

It is anticipated that during the next 24 to 36 months, all of the Company's activities on the Copper Creek Property will be carried out on privately owned land. As a result, the environmental permitting process will be simplified in that no federal environmental impact statement will be required. The Company estimates that the permitting process will take six to 18 months as opposed to 36 to 48 months if a federal environmental impact statement was required. The Company has commenced the permitting process.

The Offering

Issue: ● Common Shares

Issue Price: $● per Common Share

Gross Proceeds: $●

Use of Proceeds: *The net proceeds of this Offering,* estimated to be $● after deduction of the expenses of the Offering (estimated to be $●) and the Underwriters' fees, will be used to carry out the Development Plan.

(1)	In-fill drilling on the leachable deposits, permitting, water studies, and update on feasibility study	$● U.S.	($● Cdn.)
(2)	Development drilling of at least two of the known shallow sulphide pipes, metallurgical testing, permitting and feasibility study	● U.S.	($● Cdn.)
(3)	General and administrative expenditures	● U.S.	(● Cdn.)
	Total	$● U.S.	($● Cdn.)

See "Copper Creek Property" *and "Use of Proceeds".*

Risk Factors: The securities offered hereby are speculative in nature and an investment in such securities is subject to considerable risks such as: (i) the absence of a market for the Common Shares; (ii) risks inherent in the mineral exploration and mining industries; (iii) mineral price fluctuations may make ore reserves of lower grade material uneconomical and may adversely affect the viability or profitability of the Copper Creek Property; (iv) the Company is in the early stages of development and has no history of operations; (v) the Company will need additional capital to continue its operations; (vi) mining operations and exploration activities are subject to numerous laws and regulations which are not only subject to change but in some cases require permitting by applicable regulatory agencies which may be more onerous and time consuming than originally anticipated by the Company; (vii) the potential for conflicts of interest as a result of some of the directors and officers of the Company also being directors and officers of other natural resource and base metal exploration and development companies; (viii) the Company may become liable for hazards, such as rock slides, rock bursts or mine accidents, or for the use of dangerous and hazardous substances, that cannot be insured against or against which the Company may choose not to insure because of high premium costs or for other reasons; (ix) there is no assurance that the joint venture agreement, referred to in the Magma Agreement, will be successfully negotiated and settled; (x) although the funds raised under this Offering are expected to be adequate to satisfy the earn-in conditions under the Magma Agreement, if such funds are insufficient or other conditions are not met the Company may not earn its interest, nor a proportionate interest; (xi) dependence on key personnel and lack of key person life insurance at the present time; (xii) purchasers of Common Shares will suffer immediate and substantial dilution; (xiii) the Company does not anticipate paying dividends in the immediate future; and (xiv) the Board of Directors of the Company can, under certain circumstances, issue preference shares with rights senior to those of the Common Shares, although none are expected to be issued in the foreseeable future. (See "Risk Factors".)

BUSINESS OF THE COMPANY

Unless the context otherwise requires, all references to the Company in this prospectus refer to AMT International Mining Corporation, together with AMT (USA) Inc.

General

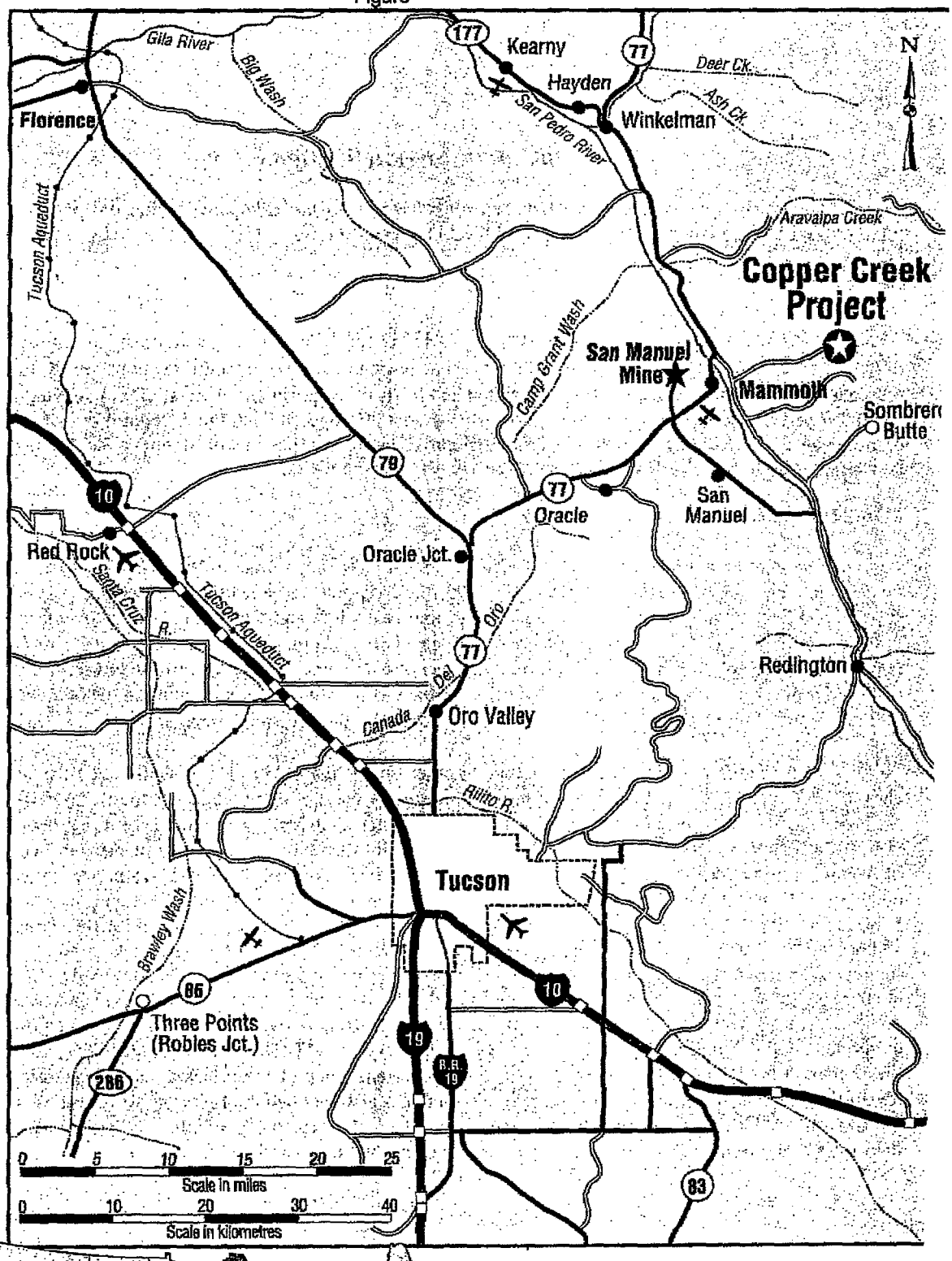
AMT International Mining Corporation ("AMT" or the "Company") is a company in the advanced stage of mineral exploration that has focused its attention on acquiring developed or semi-developed reserves of copper and precious metals. The Company has concentrated its efforts on acquiring an interest in and developing the Copper Creek Property, located at Copper Creek, Township 8 South, Range 18 East, Pinal County, Arizona, approximately 45 miles north-northeast of Tucson, Arizona and approximately 12 miles east of Magma's San Manuel mill, smelter and refining complex (the "Copper Creek Property"). See "Figure 1".

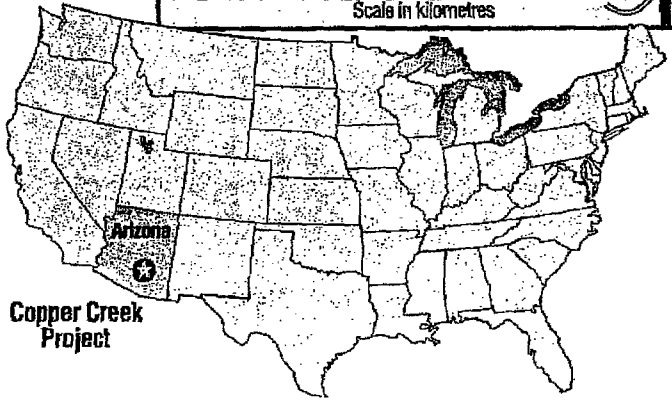
Magma Agreement

Pursuant to an agreement between Magma Copper Company ("Magma") and AMT (USA) Inc., the wholly owned subsidiary of AMT, dated October 17, 1995 (the "Magma Agreement"), AMT (USA) agreed with Magma for AMT (USA) to earn into and for the parties to jointly explore and develop the 481 acres of patented Federal mining claims and 1,200 acres of unpatented mining claims forming a part of the Copper Creek Property and contemplates the entering into of a definitive joint venture agreement once the earn-in and feasibility study phase of the Magma Agreement is completed. Until such time as a definitive joint venture is negotiated, the respective obligations of Magma and AMT (USA) shall be governed by the Magma Agreement.

The Magma Agreement provides, among other things, that AMT (USA) shall have the exclusive right to earn an undivided 50% working interest in the property by making exploration expenditures, performing certain engineering studies to determine feasibility and making other qualifying expenditures on the property aggregating U.S. $3,000,000 and culminating in the delivery of a feasibility study to Magma on or prior to February 1, 1998, of which amount approximately U.S. $600,000 has already been expended (the precise amount that will be credited under the Magma Agreement is being discussed with Magma). The Magma Agreement also provides that by February 1, 1998, AMT (USA) and Magma are to negotiate a joint venture agreement for the future development and operation of the property based on a prescribed form. While AMT (USA) is earning its undivided 50% working interest in the property, all exploration and development decisions are to be made solely by AMT (USA), who is the operator of the property. After earning its undivided 50% working interest, AMT (USA) shall have an exclusive one year option, commencing on the date the feasibility study is delivered to Magma, to purchase an additional undivided 25% working interest in the property (thereby giving AMT (USA) an undivided 75% working interest in the property) for U.S. $5,000,000 or 25% of the net present value of the mineable ore reserves identified in the feasibility study, whichever amount is greater. Magma has also retained the first right of refusal on the sale of any portion of AMT (USA)'s interest in the property and on the processing of all ores or concentrates produced therefrom. The terms of the right of first refusal have not yet been settled.

Figure





Copper Creek Pr
Location Ma

The Magma Agreement also provides that upon commencement of commercial production, the joint venture (or all joint venture participants pro rata to their respective interests) shall pay Magma a net smelter return royalty based on 100% of all ores mined from properties subject to the joint venture, according to the following schedule:

Comex Copper Price in U.S. $ Funds per pound	Royalty
$0.80 or less	1%
0.81 - 1.00	2%
1.01 - 1.10	3%
1.11 - 1.20	4%
1.21 or more	5%

Ryland Ranch Agreement

On October 17, 1995, AMT (USA) entered into an agreement (the "Ryland Ranch Agreement") whereby the Company acquired the sole and exclusive option to purchase the surface rights to a 780 acre property in Pinal County, Arizona (the "Ryland Ranch") which is adjacent to the portion of the Copper Creek Property being acquired from Magma. See "Figure 2". This option expires April 30, 1996. Of the total purchase price of U.S. $780,000, U.S. $20,000 was paid upon execution of the option agreement and, if the option is exercised by AMT (USA), the balance is payable in four equal instalments of U.S. $190,000, the first at the closing of the acquisition and the remaining three at the end of each of the next three years following closing of the acquisition. In addition, AMT (USA) is required to complete 1,000 feet of drilling on the property and a royalty of three percent of the net smelter returns from all gold, silver, copper and molybdenum produced and sold by AMT (USA) from the property shall be paid by AMT (USA).

THE COPPER CREEK PROPERTY

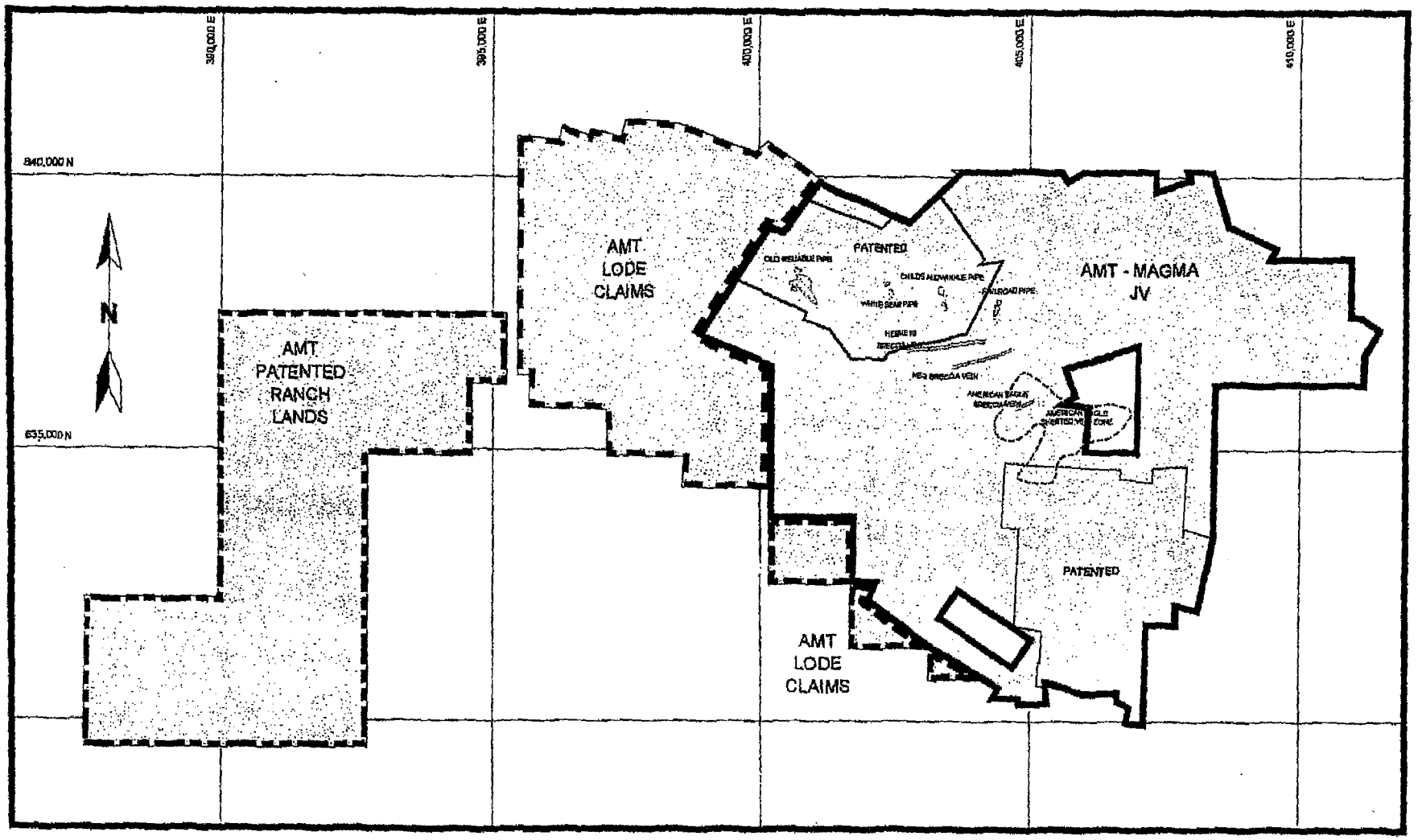
Description

The Copper Creek Property consists of two types of property interests. First, there are those interests which are subject to the earn-in from Magma pursuant to the Magma Agreement, which consist of 481 acres of patented Federal mining claims and 1,200 acres of unpatented Federal mining claims. Secondly, the Company has a 100% undivided working interest in 699.2 acres of recently staked Federal mining claims adjacent to the western edge of the property subject to the Magma Agreement as well as an option to acquire a 100% interest in the surface rights to the 780 acre Ryland Ranch under the Ryland Ranch Agreement. See "Figure 2".

The portion of the Copper Creek Property, comprised of the patented and unpatented Federal mining claims held under option from Magma pursuant to the Magma Agreement, is registered in Magma's name and will remain so until the Company exercises its option and a joint venture is created with Magma covering future operations thereon. The recently staked Federal mining claims are 100% owned by the Company and are registered in the Company's name. In addition, the Company has entered into the Ryland Ranch Agreement to purchase the surface rights to the Ryland Ranch, which is adjacent to the Copper Creek Property interest acquired from Magma, and which will be used to locate pads for heap leaching copper ores, locating plant and tailings storage areas and other infrastructure for the Project, as needed.

The Copper Creek Property lies along the western flank of the Galiuro Mountains, located just off Highway 77, approximately 45 miles north of Tucson, Arizona and 9 miles due east of Mammoth, Arizona and

Figure 2



AMT (USA) INC

COPPER CREEK PROJECT
PROPERTY MAP

2000 0 2000 4000 6000 Ft

Scale

approximately 14 miles east of Magma's San Manuel Mine and 12 miles northeast of Magma's San Manuel mill, smelter and refinery.

Consultants' Reports

The Company retained the following consultants for their specific knowledge and expertise to review and comment on the Copper Creek Property.

James O. Guthrie, M.S., an Arizona based professional geologist, was retained to prepare a report on the general and economic geology of the Copper Creek Property (the "Guthrie Report"). Subsequently, **Lewis B. Gustafson, Ph.D.**, an internationally recognized porphyry copper authority, was retained by the Company to review drilling data, particularly with respect to the deep sulphide deposit and to comment on the porphyry copper aspects of the Copper Creek Property (the "Gustafson Report"). **Roscoe Postle Associates Inc.**, a geological and mining consulting firm of Toronto, Ontario, was retained to do a reserve estimate and preliminary open pit design for the Old Reliable leachable copper deposit (the "Roscoe Postle Report") while **Mountain States R & D International Inc.**, a metallurgical process engineering firm of Vail, Arizona, was retained to carry out the metallurgical testing of the leachable oxides and supergene enriched zones of the Copper Creek Property (the "Mountain States Report"). Based on the foregoing reports, **Kilborn Inc.**, 2200 Lake Shore Boulevard West, Toronto, Ontario, M8V 1A4, an internationally recognized mining engineering and metallurgical consulting firm, was asked to review such reports and prepare a development plan (the "Development Plan") for the Copper Creek Property (the "Kilborn Report").

More specifically, Kilborn was asked to review all available data on the known copper, molybdenum, gold and silver deposits on the Copper Creek Property, evaluate from an engineering perspective those with quantified reserves and/or resources and prepare a Development Plan incorporating the reports of the Company's other consultants. The engagement also included recommending exploration and development work to upgrade reserves, acquire the necessary data required to complete feasibility studies on both the leachable surface oxide and supergene enriched zones and on the shallow sulphide breccia pipes. The Kilborn Report also includes a recommended exploration/development program for the balance of the Copper Creek Property. In preparing its report, Kilborn did not confirm the reserve or resource calculations of the Company's other geologic consultants but relied on such consultants' reports with respect to calculating the mineable reserves for the leachable deposits and the shallow and deep sulphide deposits.

The following technical sections of this prospectus were summarized from the Company's files, the Kilborn Report, the Guthrie Report, the Gustafson Report, the Roscoe Postle Report or the Mountain States Report, as applicable, which are attached as appendices to the Kilborn Report. See the "Appendix" for a listing of these reports.

History

Mining began in the Copper Creek Area in 1863 with the production of lead and silver from the Blue Bird mine located immediately to the north of the Copper Creek Property. This was followed in 1903 to 1919 with the production of copper from the Old Reliable mine and other adjacent breccia pipes. From 1933 to 1938, the Arizona Molybdenum Company operated the Childs-Aldwinkle Mine which was reopened between 1954 and 1956 by The Copper Creek Mines Inc. and again between 1959 and 1965 by D.M.B.D. Mining Company. A number of shallow breccia pipes located within the Project Area have been sporadically mined during the period from 1905 to 1980 with reported production of 23 million pounds of copper, 7 million pounds of molybdenum, 1,273 ounces of gold and 242,000 ounces of silver. During this period several breccia pipes were developed by underground workings and were sampled by underground rock chip sampling and diamond drilling.

Modern exploration of the Copper Creek Property began in the late 1950's and since that time at least U.S. $11.0 million has been expended on the property by Newmont Exploration Limited ("Newmont"), Magma and Exxon

Corporation ("Exxon") in an effort to identify a large tonnage porphyry copper deposit. During this period a total of 82 surface holes were drilled aggregating 210,532 feet.

Since acquiring the option from Magma in July, 1994, the Company has in addition expended approximately U.S. $600,000 on the Copper Creek Property by carrying out exploration, development, environmental and water studies, land and mineral rights acquisition as well as the drilling of nine reverse circulation holes aggregating approximately 3,600 feet.

Work by early operators, when combined with information from more recent drilling, including drilling by the Company, indicates that there are approximately 100 breccia pipes on the Copper Creek Property and that certain of these pipes have excellent potential to host mineable copper and molybdenum deposits with gold and silver credits. Exploration holes drilled by Newmont and Exxon during the 1960's resulted in the discovery of a deep copper deposit beneath the American Eagle basin that contains a mineable reserve of 76.6 million tons grading 0.8% copper and 0.0055% molybdenum and with precious metal credits in gold and silver.

The Company is now ready to carry out additional in-fill drilling on the near surface oxide and supergene enriched material located on the Old Reliable pipe and other leachable surface deposits, as well as on at least two of the shallow sulphide breccia pipes. The Company anticipates that the results of this program will provide the basic data for a feasibility study on placing the leachable and shallow sulphide reserves into commercial production and anticipates that the development of the shallow sulphide reserves will provide access for more economical exploration of the much larger and deeper American Eagle sulphide deposit. Subject to availability of funding, the Company intends to carry out additional exploration and drilling on other mineralized prospects on the Copper Creek Property in order to delineate additional reserves.

As circumstances permit, the Company may acquire other properties with potential for near-term copper or precious metal production.

Mineral Deposits

The mineral occurrences on the Copper Creek Property are typical of porphyry copper districts and, for ease of presentation, can be broken down into the following types:

1. Leachable Deposits - These leachable copper mineral accumulations are found in the oxidized and supergene enriched upper portions of several pipes on the Copper Creek Property and may extenc to or a short distance below the water table. A leachable copper reserve has been delineated at the Old Reliable pipe and surface exploration and diamond drilling has indicated that there is the potential to develop additional leachable copper resources at ten other breccia pipes on the Coppe Creek Property, of which the most prominent are the White Bear and Railroad pipes.

2. Shallow Sulphide Deposits - These primary copper sulphide accumulations are found in som breccia bodies beneath the near-surface oxidation and supergene sulphide enrichment zone: Typical shallow sulphide accumulations are hosted by breccias which outcrop or subcrop, such a the Childs-Aldwinkle pipe, the Old Reliable pipe, the White Bear pipe, the Railroad pipe and th NE6/NE10 pipe. Despite their classification as shallow, these deposits may extend many hundrec of feet below surface. In addition to excellent copper grades, these deposits also contain significar molybdenum values and gold and silver credits.

3. Deep Sulphide Deposits - A primary copper sulphide accumulation has been shown by drilling t be a generally sub-horizontal zone of early magmatic disseminated and veinlet copper sulphi minerals with locally superimposed sub-horizontal sheeted chalcopyrite veins. The deposit elongate and extends from the American Eagle basin area (from which it derives its nam

northwesterly at least as far as Copper Creek, a distance greater than 3,000 feet; its top is generally more than 2,000 feet below surface and it is several hundred feet thick in places. Based on recent property visits, a detailed re-examination of the drill core as well as petrological and mineralogical studies of the data by Dr. Lewis Gustafson (see "Copper Creek Porphyry Geology") and others, it appears probable that additions and extensions of this porphyry system will be found.

4. Silver Prospects - Silver and base metal veins have hosted small mines immediately to the north and the south of the Copper Creek Property. Adjacent areas, within the Copper Creek Property boundary will eventually be explored by the Company for silver deposits that may be amenable to exploitation under current economic conditions.

Reserves

The following table prepared by the Company provides a summary of proven and probable mineable reserves, possible mineable resources, grades and contained metal totals on the Copper Creek Property. This table is based on the calculations of mineable reserves and resources for the Old Reliable deposit contained in the Roscoe Postle Report. All other reserves and resources are based on the Guthrie Report.

***SUMMARY OF ESTIMATED RESERVES AND RESOURCES*[1]**

	Million Tons				AVERAGE GRADES[2]				CONTAINED METALS			
	Proven	**Prob.**	**Poss.**	**Total**	Cu%	Mo%	Au opt	Ag opt	Cu (mil. lbs.)	Mo (mil. lbs.)	Au (thous. ozs.)	Ag (thous. ozs.)
Leachable Material: Old Reliable Pipe	--	2.10	0.33	2.43	0.76	--	--	--	37	--	--	--
Other Pipes	--	--	4.20	4.20	0.80	--	--	--	67	--	--	--
Shallow Sulphide	2.30	1.20	18.56	22.06	1.67	0.056	0.014	0.18	737	20.0	245[3]	3,150[3]
Deep Sulphide	--	76.60	--	76.60	0.80	0.0055	--	--	1,226	8.43	--	--
TOTAL	2.30	79.90	23.09	105.29	0.98				2,067	28.43	245	3,150

(1) Reserves in the Old Reliable pipe were estimated by Roscoe Postle Associates Inc. and are contained in the Roscoe Postle Report whereas the other resources have been estimated by James Guthrie and are contained in the Guthrie Report.

(2) These figures represent rounded average grades.

(3) From the proven and probable reserve or resource categories only.

Leachable Deposits

Leachable Reserves

Copper oxide minerals outcrop at the surface of several breccia pipes on the Copper Creek Property. The depth of oxidation and supergene sulphide enrichment is generally estimated to be 50 to 400 feet below surface, depending on the depth of the water table.

The Old Reliable breccia pipe, which previously produced 11.7 million pounds of copper from small scale underground mining in the early 1900's and from in-situ leaching in the 1970's, was originally covered by a limonitic leached cap, which has been largely removed. Beneath this leached cap is a zone of irregularly distributed fine disseminated chalcocite with malachite and chrysocolla that grades abruptly downward into chalcocite-coated pyrite that extends to below the present water table. See "Figure 3". The elevation difference is over 400 feet.

The mineable probable and possible reserves of the Old Reliable leachable material are shown in the Roscoe Postle Report as 2.43 million tons at 0.76% copper, with a waste to ore stripping ratio of 5.1:1 at a cut-off grade of 0.19% total copper. These estimated mineable probable and possible reserves were relied upon by Kilborn to establish the Development Plan described in the Kilborn Report.

The following table prepared by the Company provides a summary of the probable estimated reserves, possible resources, grades and contained metal totals on the Copper Creek Property:

LEACHABLE DEPOSITS

Reserves and Resources	Tonnage (*mil. tons*)	Grade (% of total Cu)	Contained Metal Cu (mil. lbs.)
Mineable Reserves			
Old Reliable: (1)			
Probable	2.10	0.81	34
Possible	0.33	0.42	3
Total	2.43	0.76	37
Geologic Resource			
Other pipes: (2)			
Possible	4.20	0.803	67

(1) Derived from the Roscoe Postle Report.
(2) Derived from the Guthrie Report.

The Guthrie Report also contains a calculation of probable and possible reserves for the leachable deposit which show reserves greater than the amount shown in the Roscoe Postle Report. The Development Plan in the Kilborn Report has relied upon the reserve calculations in the Roscoe Postle Report which contains a block model for the pit design and contains information based on more definitive engineering parameters. The Guthrie Report

Figure 3

Copper Creek Project

Photograph of Old Reliable workings as they presently exist looking west from White Bear. It is approximately 2,500 ft to Old Reliable from where this photograph was taken.

suggests that there is potential for additional tonnage of shallow leachable material of economic value in the White Bear and the Railroad breccia pipes as well as in several other copper oxide-stained breccia outcrops at Copper Creek and notes that all of these require evaluation. The Guthrie Report states that the potential for additional leachable copper oxide-chalcocite ore is good in the upper 50 to 300 feet of these breccia pipes, depending on the assumed porosity of the breccia and the elevation differences between the surface exposure of the breccia and the bottom of the nearby drainage.

The Kilborn Report concludes that probable leachable mineable reserves, combined with the possible resource of leachable material and the potential resource of identified but not yet drilled leachable material on the Copper Creek Property, will improve the economics of the Copper Creek Property dramatically. The Kilborn Report states that there is potential to develop additional leachable oxide and supergene copper resources of similar economic value at ten other pipes on the Copper Creek Property. The Kilborn Report further states that at present the probable mineable leachable reserves are not sufficient to justify a production decision.

Leachable Development Plan

The first stage of the Kilborn Report's recommended Development Plan is to drill in-fill holes on the Old Reliable and other known leachable deposits in anticipation of increasing the ore reserves and providing a basis for a positive definitive feasibility study on production of the leachable reserves.

The Kilborn Report envisages the leachable resources of the Copper Creek Property being mined by way of an open pit, the construction of which will be contracted out to avoid the capital cost of the pit equipment. The mined material will be leached on leach pads and transported to a solvent extraction plant, located on the Ryland Ranch portion of the Copper Creek Property, constructed at a currently estimated pre-production capital cost, including infrastructure and pre-production waste stripping, of U.S. $10.1 million. The Company believes that this figure will be reduced by expenditures being incurred under the currently proposed Development Plan. It is presently proposed that the copper solution be sold to Magma for solvent extraction at their San Manuel electrowinning facility.

At metal prices in effect on the date of the Kilborn Report, the Kilborn Report estimates an operating profit of U.S. $15.42 million after mining known reserves which produces a modest discounted cash flow rate of return of 12.5%. The Kilborn Report also notes that the probable reserve estimates are considered conservative and anticipates that additional reserves within the Old Reliable pit outline can be upgraded by in-fill drilling. The Kilborn Report anticipates that additional reserves will be delineated to more than double the life of the leach plant and reduce the stripping ratio further. The Kilborn Report notes that this would significantly improve the rate of return. The Kilborn Report states that the estimated operating costs for the leaching project, based on current data, is U.S. $10.05 per ton processed or $0.78 per pound of copper produced, with the potential of lowering such cost if the pit stripping ratio is further reduced.

Initially, the leachable material of the Old Reliable deposit will be developed as an open pit supplying approximately 810,000 tons per year of ore for processing on the leach pads over an estimated three year period. It is envisaged that this plant life will more than double as other near surface leachable copper deposits on the Copper Creek Property are brought into commercial production. Mine production will be by standard open pit techniques.

The proposed Development Plan envisages pit rock being crushed to minus 2 inch material after which it will be moved to the leach pads where it will be leached using standard solvent extraction technology. Mountain States R&D International Inc. ("Mountain States") was retained by the Company as processing engineering consultants with respect to the Copper Creek Project generally and with respect to the leachable portion of the Old Reliable mine specifically, and carried out column leach testing which indicated overall recoveries of 85% could be obtained given sufficient time for leaching. Additional metallurgical testing will be done as part of the ongoing

feasibility study process. The Mountain States Report investigated three operational alternatives for treating leachable product. These alternatives were the heap leaching of the leachable material at Magma's leaching facility at San Manuel, heap leaching and producing a copper rich solution at a solvent extraction circuit at the Old Reliable site and shipping this solution to San Manuel for electrowinning, and heap leaching followed by solvent extraction/electrowinning to produce cathode copper at the Ryland Ranch site on the Copper Creek Property. Preliminary indications are that heap leaching and producing a high quality copper sulphate solution for shipment to San Manuel electrowinning facility appeared to be the most expeditious and cost effective of the three alternatives and this alternative has formed the basis on which Mountain States developed the operating and design parameters.

The Kilborn Report estimates that U.S. $10.1 million will be required to place the leachable deposits into commercial production. The Kilborn Report in its design plan for the mine assumes production of 11 million pounds of copper annually for the leachable deposit. However, the Company intends to build a leach plant to accommodate production of up to 18 to 20 million pounds of copper so as to accommodate expansion of existing mineable reserves.

Shallow Sulphide Deposits

Shallow Sulphide Reserves

The main known shallow sulphide breccia pipes on the Copper Creek Property are the Childs-Aldwinkle, the Old Reliable below the leachable material, the Railroad, NE-6/NE-10, White Bear and NE-2, all of which contain copper mineralization of ore grade having the status of at least a geologic resource.

Although more than 100 breccia pipes are known to exist on the Copper Creek Property, prior operators have carried out sufficient delineation work to enable an estimate of sulphide resource tonnage at only one, the Childs-Aldwinkle pipe. The Kilborn Report recommends significant additional work on the Childs-Aldwinkle pipe as well as additional work on the Old Reliable pipe, the White Bear pipe and the Railroad pipe, all of which are copper mineralized in outcrop, and on certain other pipes which are mineralized breccias that do not outcrop and have been seen only in drill core.

The Guthrie Report indicates the total shallow sulphide geologic reserves and resources of the six known pipes at 15.88 million tons having an average grade of 1.62% copper, at a cut-off grade of 0.8% copper equivalent. The Kilborn Report states that six pipe or dike type breccias have been sufficiently explored to define probable and possible geologic reserves and geologic resources totalling 15.88 million tons grading 1.62% copper above the 2,750 foot elevation and states that these deposits are near vertical with apparently strong, regular walls. The Kilborn Report converted the geological resources into mineable reserves and resources for these same six pipes, above the 2,750 foot elevation, at 14.85 million tons with an average grade of 1.47% copper, 0.043% molybdenum, 0.012 ounces per ton gold and 0.178 ounces per ton silver, assuming an 80% mining recovery by blasthole open stoping, including 10% dilution at zero grade. The 2,750 foot elevation was chosen as it represents the practical lower limit of decline access, is the bottom level of the current mine plan and limits the development time to production thereby lowering the Company's initial capital requirements. A recently completed analysis of the wall rock grades indicates that the dilution material is likely to contain 0.3% to 0.4% copper, in which case the economic grade of the deposits will be enhanced.

The following table prepared by the Company, derived from the Kilborn Report, provides a summary of the proven and probable mineable reserves, possible mineable resources, grades and contained metal totals on the Copper Creek Property above the 2,750 foot elevation.

SHALLOW SULPHIDE DEPOSITS

Mineable Resource Classification	Tonnage (mil. tons)	Grade Cu%	Contained Metals		
			Cu (mil. lbs.)	Au (thous. oz)	Ag (thous. oz)
Proven	2,151	1.36	58.5	13.10	455.40
Probable	318	1.36	8.7	5.85	61.88
Possible	12,379	1.48	366.4	--	--
TOTAL	14,848	1.47	433.6		

Shallow Sulphide Development Plan

The first stage of the proposed Development Plan is to drill in-fill holes on at least two of the shallow sulphide pipes in anticipation that the results will provide the basis for a positive feasibility study on production from the shallow sulphide reserves.

According to the Guthrie Report, work by prior operators and the Company has indicated that there is good potential for the discovery of additional shallow, high grade copper resources on the Copper Creek Property. Five drill holes in the American Eagle basin have intersections with grades ranging from 1.20% to 2.22% copper, all of which occur in breccia-like altered rock that appears to represent breccia pipe occurrences. There are twelve breccia pipes which have been identified in and north of the American Eagle basin which could also potentially contain copper mineralization. In addition to these breccias, the Guthrie Report states that there are other identified breccias that are prospective for copper resources of like grade.

The Kilborn Report notes that the proven and probable mineable shallow sulphide ore, combined with the possible resources and the potential resources on the Copper Creek Property, will improve the economics of the Copper Creek Property dramatically. Accordingly, the first stage of the proposed Kilborn Development Plan will be to drill in-fill holes on at least two of the shallow sulphide pipes in anticipation that the results will provide the basis for a positive feasibility study on production from shallow sulphide reserves. The Kilborn Report further states that the 2.323 million tons of proven and probable mineable shallow sulphide ore is not, on its own, sufficient to justify a production decision.

The Kilborn Report notes that the preliminary evaluation of the shallow sulphide portion of the Copper Creek Project indicates a discounted cash flow rate of return of 58.2% on an assumed production rate of 5,000 tons per day to give the necessary economies of scale over a projected mine life of 8.5 years for the known resources above the 2,750 foot level. Based on isolated deep drill intersections and the knowledge that the deposits are open to depth, there is a good possibility of finding ore in other known pipes which could be accessible from the planned 2,750 foot haulage level. The Kilborn Report acknowledges that the shallow sulphides will be a viable stand-alone project or a valuable contributor to the overall proposed Development Plan. This plan assumes truck haulage of sulphide ore to the San Manuel mill at an estimated cost of U.S. $1.50 per ton in the initial stages thereby minimizing capital requirements and avoiding potential delays for permitting of mill and tailing storage facilities at Copper Creek, but points out that in the long term this ore could be processed at a new combined shallow sulphides - American Eagle deep sulphide mill. The Kilborn Report's preliminary view is that there would be a pre-production

capital cost of U.S. $34.6 million for the shallow sulphide deposit project, mainly for underground exploration, development and equipment. This figure includes an allowance of U.S. $6.0 million for modifications to the San Manuel mill to process the additional copper - molybdenum ore. The Kilborn Report points out that at metal prices in effect on the date of the Kilborn Report, an operating profit from the total 14.8 million tons of copper-molybdenum reserves and resources is estimated to be U.S. $268.5 million. At a copper price of U.S.$1.30 per pound, the Kilborn Report estimates the discounted cash flow rate of return to be 58.2%. At a copper price of U.S. $1.00 per pound this return is reduced to 32.3%. The Kilborn Report estimates the capital cost of the shallow sulphide project at U.S. $34.6 million for pre-production plus U.S. $12.0 million for ongoing capital, excluding working capital, and that operating costs will be U.S. $15.78 per ton or U.S. $0.58 per pound of copper produced.

Specifically, the Kilborn Report envisages the shallow sulphide deposits being developed underground by a blasthole mining method designed to produce at a rate of 5,000 tons per day with levels spaced at 300 foot vertical intervals. Access would be provided by a conveyor decline for ore and limited waste rock and by the existing Childs-Aldwinkle adit and winze which needs to be deepened for the transport of men, materials and development waste rock. The conveyor decline would be collared at elevation 3,570 on the north side of Copper Creek where a bin would be constructed for loading into trucks for contract haulage to the San Manuel mill, a distance of 12 miles. The decline will be driven at -14 degrees to a point 180 feet below the 2,750 foot level to provide for 2,000 ton ore bin and 1,000 ton waste rock bin which may be used for additional ore storage when level development is completed. It is envisaged that mining would initially come from the Childs-Aldwinkle and the NE-6/NE-10 deposits, the latter of which would require the installation of ventilation raises. Preliminary scheduling indicates that total development from the conveyor ramp portal would take more than two years.

Current planning calls for a horizontal conveyor on the 2,750 foot level fed by short ore passes from each of the six known breccia pipes at the 2,800 foot grizzly level. This will require a grizzly and rock breaker at each ore pass.

Ore haulage to San Manuel is estimated to cost U.S. $0.10 per ton mile over a newly proposed 15 mile road which by-passes Mammoth and the public highways. The estimated custom milling charge by Magma's San Manuel facility assumes a small fee added to San Manuel's reported actual processing costs.

The Kilborn Report estimates that U.S. $34.6 million will be required to place the shallow sulphide deposits into commercial production.

The Kilborn Report also recommends that a Copper Creek Property wide mapping and sampling program be carried out when funds are available to determine whether the other breccia pipes on the Copper Creek Property contain copper and that all past drill intersections of high grade copper be reassessed for molybdenum and precious metals in order to more firmly establish the economic mineral content of the mineralized breccias.

Deep Copper Sulphides

Deep Copper Reserves

Deep drilling in the American Eagle basin during the 1960's and 1970's by Newmont, Magma and Exxon was initially interpreted as a flat-lying, blanket-like zone of bornite and chalcopyrite mineralization. As the result of on-going studies, the blanket-like zone is now interpreted to be the top or upper edge of a deep seated porphyry copper system. The upper limits of the blanket occur at a depth from 1,800 to 2,200 feet below the surface with the deposit itself lying 2,000 to 3,000 feet below surface between the 1,000 and 2,500 foot elevations. The deposit has been intersected by 37 drill holes and extends some 3,500 feet in a northeast-southwest direction and at its core is up to 1,200 feet thick. The deposit was the subject of an order-of-magnitude feasibility study in 1972 by prior operators.

The Guthrie Report states that the probable geologic ore reserves of the American Eagle sulphide deposit are 76.6 million tons at 0.80% copper and 0.0055% molybdenum with precious metal credits based on the 37 drill hole intersections. Some higher grade copper mineralization was noted which was postulated to reflect the deeper zones controlled by intrusive contacts, veins and/or breccia pipes.

In addition, the Guthrie Report states that an additional 25 million tons of similar grade material has been outlined in the nearby NE-5 breccia pipe. The Kilborn Report accepts the mineable tonnage and grade calculations but believes that the cost estimating is not yet sufficiently accurate to define the mineable reserve as "ore" and accordingly classifies it as a mineable resource. The Kilborn Report states that the grade of this resource compares favourably with that of the nearby San Manuel mine and the Kalimazoo deposit which is currently being put into production. Management and its consultants are optimistic that additional drilling will increase the tonnage of the present resource.

Deep Copper Development Plan

The Kilborn Report envisages the development of the shallow sulphide deposits will provide underground access for more economical exploration of the much larger and deeper American Eagle sulphide deposit. The proposed Development Plan for the American Eagle sulphide deposit assumes a production rate of 25,000 tons per day hoisted through a shaft to a processing plant constructed at an elevation of 3,700 feet on the valley floor near the Childs-Aldwinkle pipe, about one mile northeast of the core of the deposit. At a daily production rate of 25,000 tons, the Kilborn Report gives the current reserves a 13 year mine life. The Kilborn Report estimates the pre-production capital cost of placing the American Eagle sulphide deposit into production at U.S. $215 million but that at metal prices in effect on the date of the Kilborn Report, an operating profit of U.S. $660 million indicates that the American Eagle sulphide deposit should be developed but only after developing the shallow sulphide reserves, particularly since in-fill drilling can be carried out more economically from the underground shallow sulphide workings than from the surface. The Kilborn Report points out that the 14% discounted cash flow rate of return is modest based on existing reserves and that drilling should be carried out to increase the tonnage of known reserves and that innovative engineering techniques (such as the use of tunnel boring machines) should be applied to reduce costs prior to a production decision. The Kilborn Report notes that the estimated discounted cash flow rate of return for the American Eagle sulphide deposit, based on the existing tonnage, of 14.3% would provide on a stand-alone basis a 6.1 year pay back period which the Kilborn Report considers to be too long. However, the Kilborn Report also notes that the American Eagle sulphide deposit may be much larger than its currently estimated 76.6 million ton resource. On a preliminary estimate basis, the Kilborn Report states the presently envisaged operating costs for the American Eagle sulphide deposit, based on the current tonnage and grade will average U.S. $6.20 per ton or U.S. $0.43 per pound of copper produced. The Kilborn Report also suggests that ore haulage from the shallow sulphide conveyor decline directly to the San Manuel mill, a distance of approximately eight miles, should be reconsidered if the American Eagle sulphide deposit is brought into production.

The Kilborn Report concurs with the Company's view that block caving is the only viable mining method for the large tonnage, relatively low grade American Eagle sulphide deposit but notes that the reported grade of 0.80% copper is in fact higher than Magma's neighbouring San Manuel mine and the Kalimazoo deposit presently under development. The Kilborn Report initially envisages the construction of a mill on site for crushing, grinding and sulphide concentration and the hauling of the eventual concentrates to the San Manuel smelter for further processing.

The Company recognizes that the deep American Eagle sulphide deposit cannot be placed into commercial production for at least four or five years and that placing such deposit into commercial production is conditional upon first placing the leachable deposits and the shallow sulphide deposits into commercial production.

The Company has determined to expend optional funds, if available, to test the resource base for the deep copper sulphides. However, a major exploration program will be needed before the Company undertakes

development of the deep sulphide deposit. The Company also believes that the capital costs required for development of this deposit is not justified at the present time and proposes to develop this deposit once the leachable and shallow sulphide deposits have been developed. The Kilborn Report has relied upon information from prior operators to develop a mine plan for the American Eagle deep sulphide deposit, but additional exploration is needed to increase reserves before a development decision is undertaken.

Silver Prospects

The Company intends to carry out surface prospecting, exploration and eventually diamond drilling, if warranted, in the south-central portion of the Copper Creek Property in the area surrounding the old Bunker Hill mine workings, which are not on the Copper Creek Property, where high grade silver values were reported to have been mined. The northern portion of the Copper Creek Property will also be prospected for its silver potential in the area near the former Blue Bird mine, which lies immediately to the north of the Copper Creek Property and on which high grade silver veins were reportedly also mined. Although not much is known about the geology of those particular portions of the Copper Creek Property, these areas warrant a detailed exploration program based on their past production history and the general zonal pattern of porphyry copper deposits.

The Company intends to pursue prospecting, mapping and diamond drilling on the Copper Creek Property to enhance the quality of the geologic resources identified to date and to delineate additional mineable resources.

Kilborn's Conclusions

The Kilborn Report concluded that the Copper Creek Project of the Company has a high probability of success and that the Development Plan proposed by it warrants the immediate expenditure of U.S. $8.152 million. The Kilborn Report points out that the recommended work program in the Development Plan will provide for exploration and in-fill drilling to extend the leachable reserves, upgrade the shallow sulphide reserves, prepare feasibility studies based on those reserves, continue environmental base line work to facilitate the required permitting and carry out the required hydrological studies followed by the construction of a water supply system.

The Kilborn Report notes that the exploration of the shallow sulphides involves dewatering the Childes-Aldwinkle winze and 1,400 feet of development work on the 500 level to establish diamond drilling stations followed by a feasibility study and final commitment, at which time additional funds, currently estimated to be in the U.S. $35 - 40 million range, would be sought.

The Kilborn Report points out that the shallow sulphide project above the 2,750 foot elevation should proceed, subject to confirmation drilling, regardless of the outcome of the leachable deposit exploration and that the continuation of the development of the six shallow sulphide pipes below the 2,750 foot elevation might be profitably combined with the development of the deeper American Eagle sulphide deposit. The Kilborn Report notes that the American Eagle sulphide deposit may be very much larger than the estimated 76.6 million ton resource presently indicated and that this possibility should be explored as soon as the development of the leachable material and shallow sulphide deposits are firmly established.

The following table summarizes the proposed amounts required to be expended pursuant to the proposed Development Plan:

COPPER CREEK PROJECT DEVELOPMENT PLAN

DESCRIPTION	ESSENTIAL COST (U.S.$)	OPTIONAL COST (U.S.$)
LEACHABLE DEPOSITS		
Drilling	331,500	108,375
Regional exploration		113,750
Infrastructure preparation	411,000	
Permitting	250,000	
Feasibility study	100,000	
Sub-total	1,092,300	222,125
Contingency @ 20%	218,500	44,475
LEACHABLE TOTAL	1,310,800	266,600
SHALLOW SULPHIDE DEPOSITS		
Drilling	2,539,300	
Underground development	2,111,250	
Metallurgical testwork	200,000	
Permitting	100,000	
Final road	500,000	
Feasibility study	250,000	
SHALLOW SULPHIDE TOTAL	5,700,550	
DEEP SULPHIDE DEPOSIT		
Drilling	---	840,000
SULPHIDE TOTAL		
Contingency @ 20%	1,140,150	168,000
TOTAL	6,840,700	1,008,000
EXPLORATION/DEVELOPMENT PROGRAM TOTALS	8,151,700	1,274,600

Management has reviewed the Kilborn Report and concurs with it.

The expenditure of the U.S. $1,274,600 of Optional Costs referred to in the above table is not required to complete the Development Plan referred to in the Kilborn Report. In the event the Over-Allotment Options or outstanding stock options are exercised, or the Company acquires sufficient additional funding, the Company may

carry out the recommended additional regional exploration work and drilling referred to above. Should such work be successful, additional proven and probable reserves would be added, possible resources would be increased, or current ore classifications would be upgraded or any combination thereof.

The Kilborn Report envisages the future development of the leachable oxide and supergene enriched zones and the shallow sulphides resources being proceeded with simultaneously in the manner set out below, subject to variations resulting from detailed feasibility studies to be carried out at a later date.

Copper Creek Porphyry Geology

The Gustafson Report states that the system is a large, if somewhat unusual, porphyry copper system in that it is unlike other porphyry systems located within its geographical vicinity and more like porphyry systems in northern Mexico and elsewhere in the southwestern United States. The Copper Creek porphyry has not been severely eroded so that almost the entire system is still in place. Five former producing mines have proven the capacity of this complex porphyry system to produce high grade concentrations of copper with molybdenum and precious metal credits. The uniqueness of the Copper Creek porphyry is a result of the large number of breccia pipes (more than 100 breccia pipes) and their close association with porphyritic intrusives, all within a larger batholith, the association of the strongest copper mineralization with green sericite, which has only been recently recognized as important in porphyry coppers such as at Chuquicamata and El Teniente and the association of the strongest copper mineralization with potassium feldspar-biotite. The Gustafson Report states that timing is everything in porphyry systems and notes that at Copper Creek, the various porphyry phases all look strongly mineralizing and are associated with most of the known breccia pipes. He also notes that vertical zonation is evident at Copper Creek and is very important and that high copper grades with bornite can be hidden below low-grade pyrite-sericite in the upper parts of the breccia pipes and that molybdenum and gold values can be expected to be zoned similar to copper and are relatively immobile and very useful in forming low level anomalies over deeper buried targets. There is a real risk that small high-grade targets may take a lot of drilling to find and that a much larger disseminated body may be too low grade and too deep to mine economically. However, the Gustafson Report states that because of a greater understanding of this type of system in recent years and the changing economics of copper mining, there is a good chance that a commercial operation can be established at Copper Creek.

Regional Geology

Regionally, the most prominent topographic feature of the Copper Creek Property and surrounding area (the "Project Area") is the north-northwest trending Galiuro Mountain range which is a stack of andesitic to rhyolitic flows, tuffs and agglomerates. The mineralized rocks of the Project Area are exposed in an erosional basin surrounded by post-mineral Galiuro volcanics on the north, east and south sides, and by post-mineral basin-filled conglomerate on the west side. The volcanic rocks are andesitic to latitic tuffs, flow breccias and flows that have been intruded by the Copper Creek granodiorite stock and younger porphyrys. The granodiorite stock is exposed in three, northwesterly-aligned cupolas which represent high points of the magma chamber. Intruding the Copper Creek granodiorite and older rocks and plugs are dike-like bodies of dacite porphyry.

Field mapping and relationships of geologic units seen in drill cores suggest that the breccias formed when dacite porphyry forcefully intruded and shattered brittle wallrock. Similarly, breccias appear to have also formed along certain faults that became hydrothermal conduits. With a few notable exceptions there is little information about the depth continuity of most breccia bodies mapped at surface on the Copper Creek Property; however, certain deep holes have intersected mineralized breccia more than 3,000 feet below the surface.

According to the Guthrie Report, there are three major structural directions, each dominant during a different period in geologic time evident on the Copper Creek Property and surrounding area. The oldest structure is inferred from the northwesterly alignment of intrusive features, but the structures which controlled these intrusions are no longer visible. This northwesterly trend is reflected by the alignment of cupolas at the top of the granodiorite stock

and the northwest striking belts of intrusive porphyries with their associated breccia pipes. These features appea to reflect deep-seated basement structures. Laramide age faults and fracture zones that cut Laramide volcanics an intrusives are now marked by bands of alteration and/or vein filling along structures with east to northeast-trend Post Laramide range-front faults mark the western edge of the Galiuro Mountains block and trend north northwesterly.

Hydrothermal alteration minerals that have been described from other porphyry copper districts are als found at Copper Creek. It appears that there are at least two mineralization and alteration events: 1) an earl magmatic episode marked by anhydrite, hydrothermal biotite, secondary potassium-feldspar veinlets and rock matri flooding by potassium feldspar, with disseminated and veinlet chalcopyrite and bornite, largely confined to porphyr intrusions and altered granodiorite at least 2,000 feet below the present surface; and 2) a late phyllic episode marke by sub-horizontal sheeted chalcopyrite veins and veinlets which have selvages of chalcopyrite-rich sericite; these vei generally add copper tenor to the upper part of the deep American Eagle basin deposit and probably contribute mu of the chalcopyrite and sericite to the breccia pipe deposits.

Location and Access

The Copper Creek Property is readily accessible from Magma's San Manuel mine and/or smelter a refinery by vehicle along the Copper Creek gravel road which begins in the San Pedro Valley at an elevation nearly 2,400 feet. The Copper Creek Property consists of steep canyons and small drainage basins with elevatio ranging from approximately 3,600 feet in the canyons to over 5,200 feet in the mountains. The volcanic cover Galiuro Mountains to the east have peaks that range between 5,500 and 7,000 feet above sea level.

The region has a warm, semi-arid climate typical of southern Arizona with temperatures ranging from a hi of 100°+ Fahrenheit in the summer to moderate temperatures in the 40°-60° Fahrenheit range in the winter and t seldom drop below freezing. Precipitation, mainly as rain, ranges between 14 and 17 inches per year, most of whi occurs in the summer months of July, August and September and during the winter months of December, Janu and February. The area is known to have occasional strong thunderstorms during the summer months which cau brief, violent run-off and flooding in the canyons.

Infrastructure

Although there is no plant, machinery or equipment on the Copper Creek Property at the present time, fr an infrastructure perspective, the Copper Creek Property is ideally located within a reasonably accessible dista to the infrastructure, service, equipment and supplies necessary to place the property into commercial producti The high power electric line, which serviced the Old Reliable workings in the 1970's and was subseque abandoned, can be reinstated. Water, obtained during the 1970's from a well approximately seven miles to the v and delivered to the site by way of a pipeline, can also be reinstated or water can be obtained closer to the Co Creek Property by drilling a new well or wells. The neighbouring towns of Mammoth and Oracle, along Tucson, service the producing mining operations and copper smelter and refinery of Magma and have all neces supporting industry and supply sources for the Company's activities.

Environmental Permitting and Consultants

Permitting

Inasmuch as all of the Company's pre-production development and production activities on the Co Creek Property during the next 24 to 36 months will be carried out on privately owned land, the environm permitting process will be simplified in that no United States federal environmental impact statement is requ The principal environmental permit required to carry out development work on the Copper Creek Property and it into commercial production is the Arizona Aquifer Protection Permit which is granted by the Arizona Depart

1996 The Northern Miner June 24, 1996

WLK File : Copper Creek

File - Copper Creek - ariz

Recent Advances in Quantitative Mineralogy in Exploration

A SHORT COURSE

Sponsored by Western Connecticut State College
in Cooperation with Newmont Exploration Ltd.

1970 (?)

and granodiorites of the Boulder Batholith is provided by a grid study of outcrop samples from a Mo-Cu prospect in Jefferson County, Montana. Rock types show an overall systematic textural and compositional zoning from a granitic core through concentric outer envelopes of quartz monzonite and granodiorite. Pneumatolytic alteration has been widespread and locally intense, resulting in a concentric pattern of late magmatic gradational changes in rock composition.

Molybdenum mineralization (Fig. 8) is concentrated along the western fringe of a central core of quartz-orthoclase rock, where orthoclase/plagioclase ratios are in excess of 20 to 1. K-feldspathization decreases zonally outward from the central core, except to the south and east which remain essentially open, (Fig. 9).

A similar pattern is indicated by sericitic alteration (Fig. 10), which shows a gradational increase outward from the central orthoclase core. Sericitization is low in the vicinity of the geochemical molybdenum anomaly. Anomalous "lows" are also indicated for sericite to the south and east from the central core.

Quartz percentages are plotted in Figure 11, indicating a quartz "high" that overlaps the orthoclase rich core. The silicification anomaly is open to the east similar to those for sericite and K-feldspar.

Alteration Associated with Cu Mineralization in Drill Core From an Arizona Prospect

Core samples from drilling at a prospect near ~~Hagma~~ Copper Creek, Arizona have been analyzed for alteration minerals and correlated with copper assays. Core samples from 21 drill holes were composited every 100 feet from 1000 to 1900 feet in elevation. Alteration parameters were plotted on surfaces representing ten different elevations, and contoured.

FIGUIRE 8

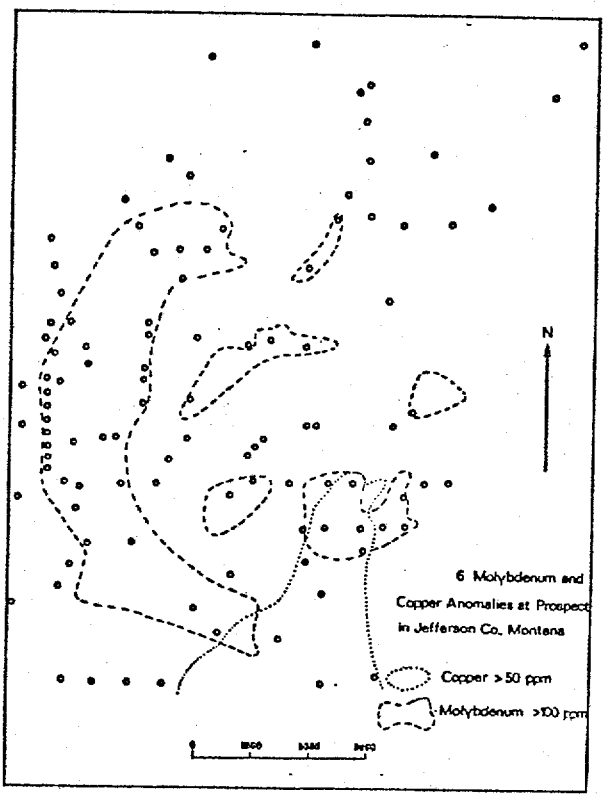
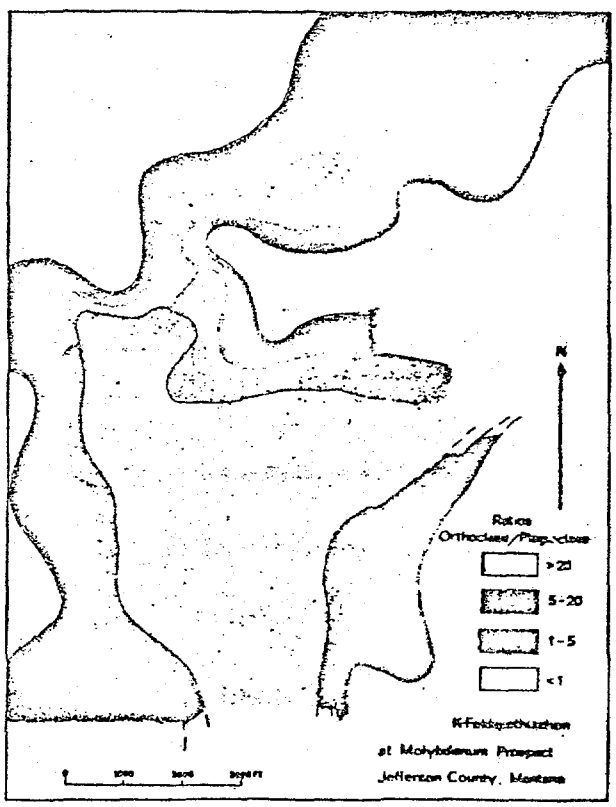

N
6 Molybdenum and
Copper Anomalies at Prospect
In Jefferson Co. Montana
Copper >50 ppm
Molybdenum >100 ppm

FIGURE 9


N
Ratios
Orthoclase/Plagioclase
>20
5-20
1-5
<1
at Molybdenum Prospect
Jefferson County, Montana

FIGUIRE 10

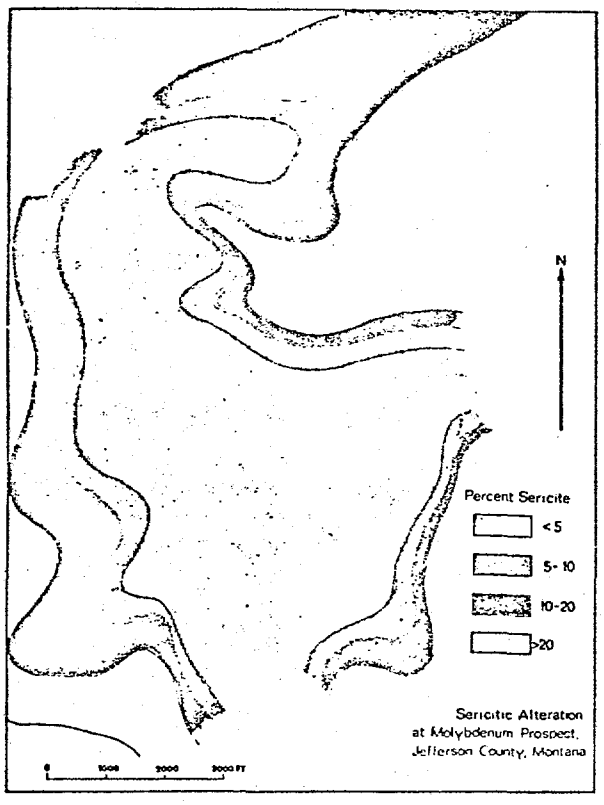
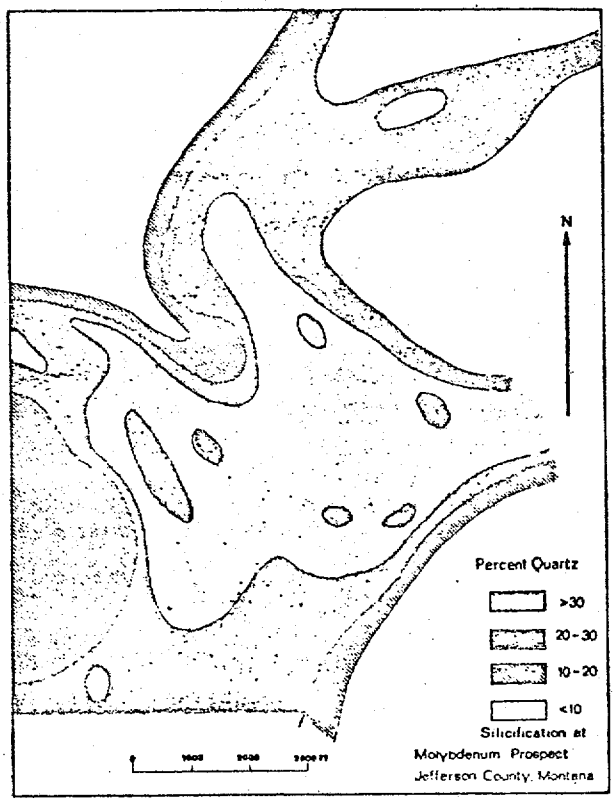

N
Percent Sericite
<5
5-10
10-20
>20
Sericitic Alteration
at Molybdenum Prospect,
Jefferson County, Montana
0
1000
2000
3000 FT

FIGURE 11


N
Percent Quartz
>30
20-30
10-20
<10
Silicification at
Molybdenum Prospect
Jefferson County, Montana

Composite plots from 1000 to 1900 feet elevations show major east-west alteration trends for sericitization (Fig. 12) and k-feldspathization (Fig. 13). Alteration plots also correlate with composite plots of copper essays, (Fig. 14) as well as surface outcrop features of structure and alteration. Trends of alteration and bedrock geochemistry indicate two, possibly three, potentially open ends for future exploration. Consistency of alteration trends at different elevations suggests vertical structural control.

Cross sections along AD show vertical profiles of sericitization, (Fig. 16), and copper mineralization, (Fig. 17), of similar distribution and orientation. K-feldspathization shows a progressive increase with depth, (Fig. 15), as reported in many porphyry copper deposits.

Subsurface alteration trends are thus delineated from x-ray diffraction analysis of drill pulps, which correlate with distribution of copper values.

CONCLUSIONS

It has been demonstrated that quantitative mineralogy can be utilized in rock type identification and that monomineralic contouring can assist in correlating alteration anomalies with geochemical anomalies. "Semiquantitative" x-ray measurements for sericite, k-feldspar, and quartz have been applied successfully to the geochemical exploration of porphyry type occurences. Zones of alteration may occur as isolated patches, or concentric halos around central cores of pneumatolytically altered rock, but are often interconnected structually to form elongate trends along faults or shear systems, within which the probability of finding ore is greater than outside of these trends.

The distribution of alteration varies appreciably from locality

FIGURE 12

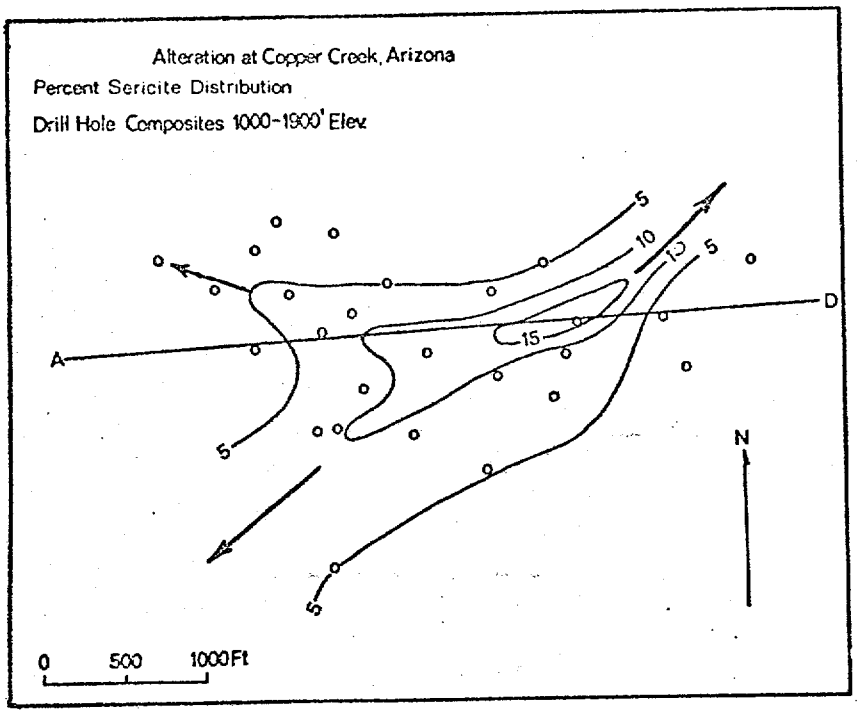


FIGURE 13

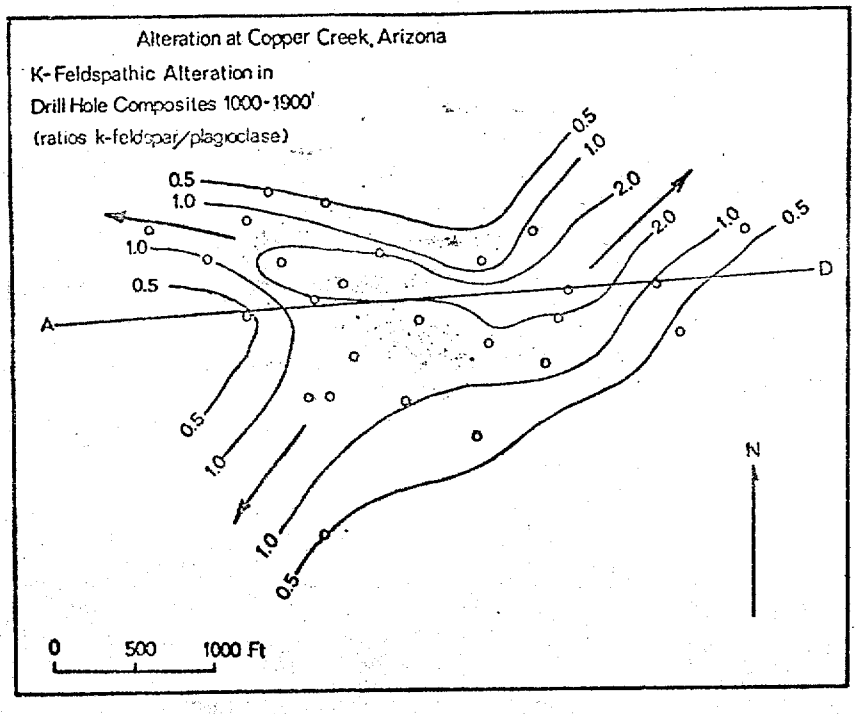


FIGURE 14

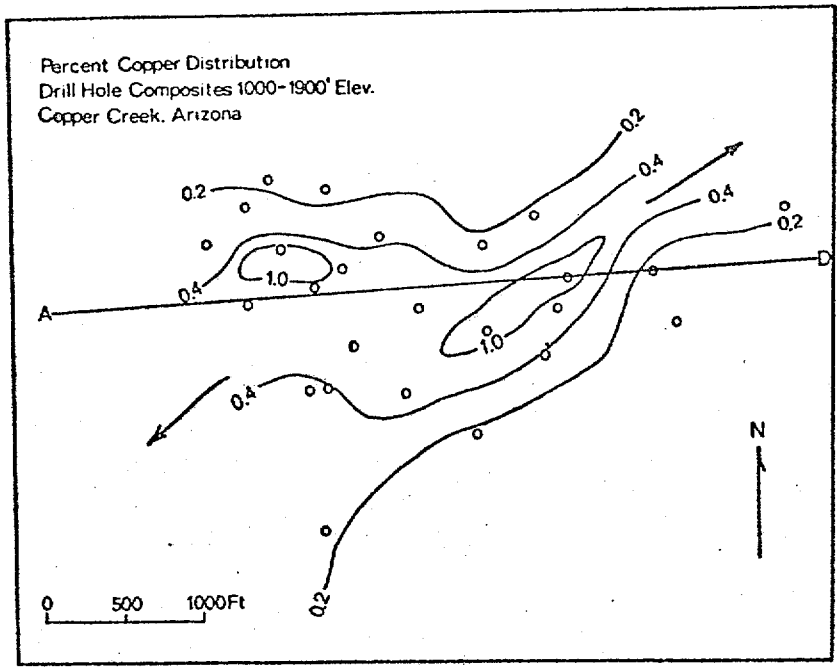


FIGURE 15

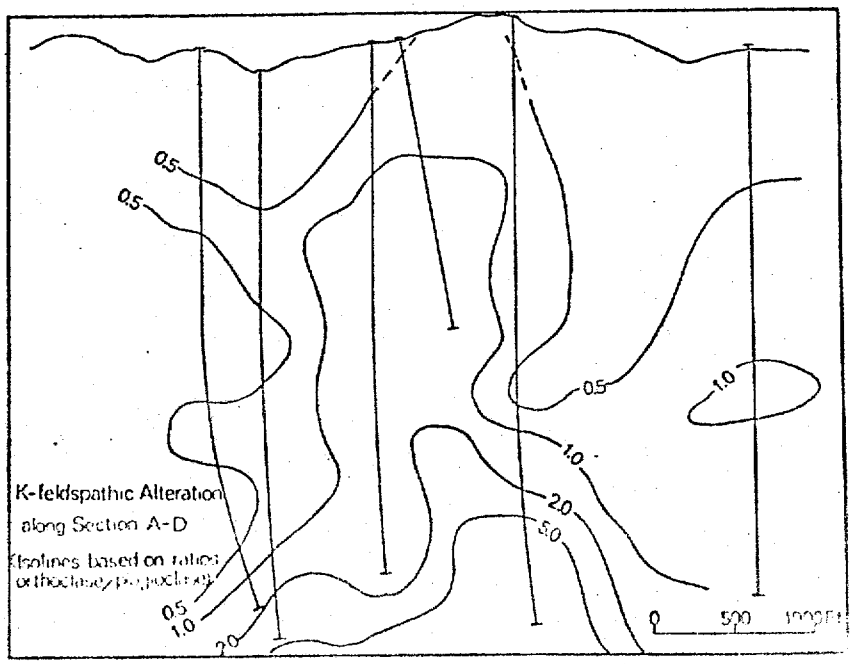


FIGURE 16

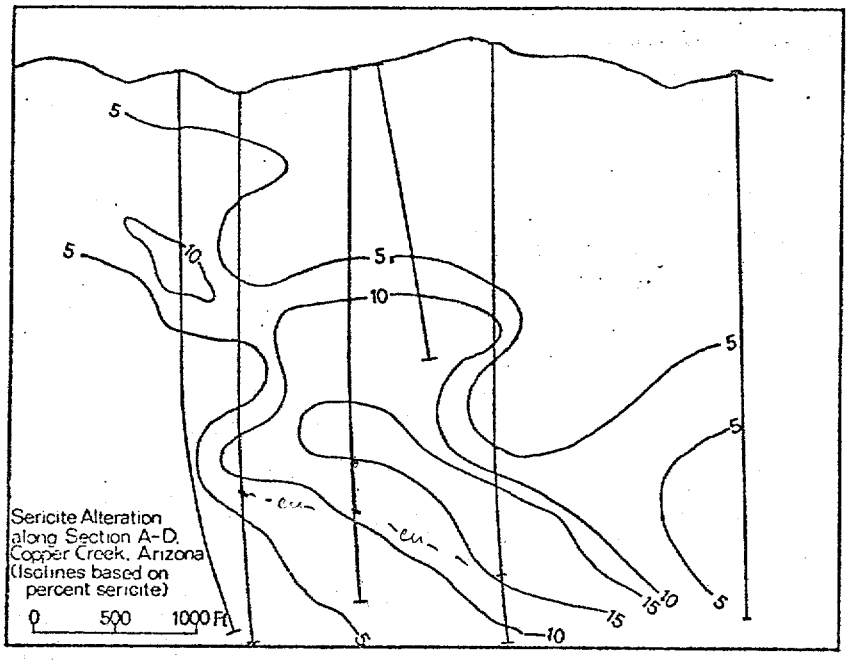
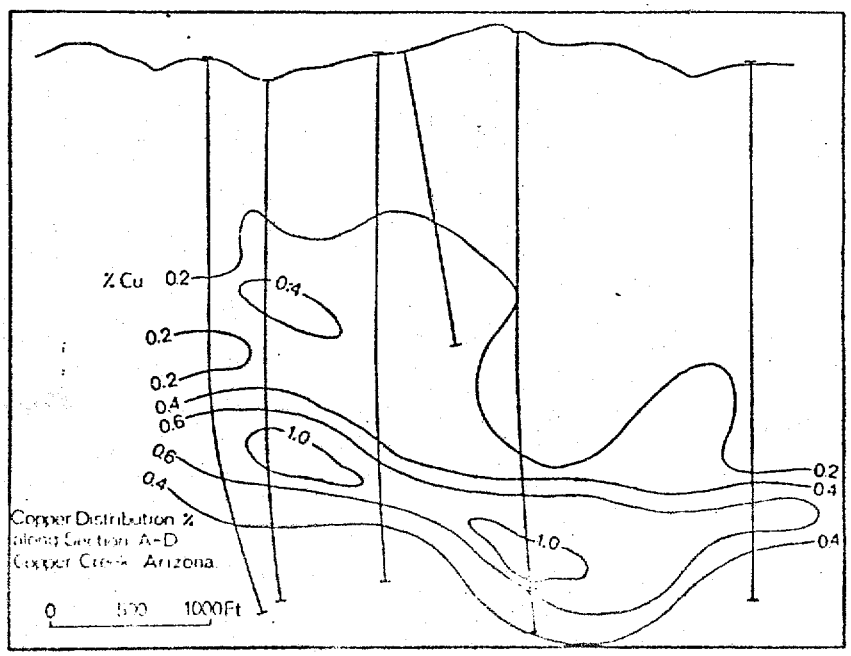


FIGURE 17



± 100 mil tons
@ .6-.7 cu

to locality, and within different rock types. Mineralization occurs mostly with sericitization or potassium silicate assemblages, and occasionally with argillic alteration. X-ray diffraction study of each occurrence is required along with close liaison between laboratory and field personnel.

Vectorial relationships of alteration to mineralization become apparent after plotting and contouring of x-ray diffraction data and metal values from grid rock samples.

Interpretation of alteration patterns permit refinement in projection of mineralization and inferred reserves along trends that might otherwise remain undetected.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 13, 1971

J. H. C.

JAN 15 1971

CONFIDENTIAL

TO: J. J. Collins
J. H. Courtright
W. L. Kurtz

FROM: W. E. Saegart

Re: Copper Creek Mining District
Pinal County, Arizona

This will serve to bring you up to date concerning recent developments and ASARCO's current status relative to the Copper Creek area.

Dave Beck of Duval Corporation indicated to me two weeks ago that he had heard a rumor to the effect that Newmont was abandoning their holdings at Copper Creek. He advised that Mr. William K. Richey, a local attorney, represented the property owners in the area and had copies of Newmont's drill logs.

I contacted Mr. Richey January 7, at which time he confirmed that he represents Bonbright, the owner of the Childs-Aldwinkle claim group and that Newmont has cancelled their option on that property. Mr. Richey loaned me copies of exploration reports covering previous work by Bear Creek and Newmont on the Childs-Aldwinkle property. A total of seven holes were drilled by these two companies and only very low grade Cu-Mo values were intersected. No further exploration opportunities are recognized within the limits of this property. These reports and assay logs were reproduced for our files and a reference made on a Research Porphyry Note File form. The reports were returned to Mr. Richey on January 11 with a letter informing him that ASARCO would not be interested in exploring that property.

On January 5, I telephoned Mr. Roy Butler, President of Samedan Oil Company in Ardmore, Oklahoma, telephone (405) 223-4110. Mr. Butler confirmed the following: Samedan has acquired Siskon Corporation which, along with Apco Oil Company, jointly own the large group of claims which include the Old Reliable mine and the area of important mineralization discovered by Newmont drilling in recent years. He further confirmed that Newmont has maintained their option on this property, their last payment being made in October, 1970. Annual pre-production royalty payments amount to $50,000. Mr. Butler referred me to Earl Smith, Chief Geologist of Samedan Oil Company and now President of Siskon Corporation.

I subsequently talked with Mr. Smith, who lives in Norman, Oklahoma, telephone (405) 321-8371. Mr. Smith indicated that as far as he knew, Newmont has no intention of abandoning control of the Old Reliable claim group but that it is seeking a joint venture partner for the development of the deep ore which has been discovered. On January 6, I talked to Robert Fulton of Newmont in New York and asked if it would be possible to arrange a visit to their Copper Creek property. Mr. Fulton advised me on his own volition that Newmont is seeking a joint venture partner to develop this property and pointedly asked me if ASARCO was interested in such an arrangement and if this subject was the motivation for my telephone call. I responded in the affirmative. Mr. Fulton then advised that Newmont is currently negotiating a joint venture agreement with another company and that he would be able to advise me by the end of January whether or not their current negotiations are successfully concluded or that Newmont would then be in a position to discuss the joint venture with ASARCO. In the event that their current negotiations are not successfully concluded, Newmont is agreeable to provide ASARCO with copies of all their exploration data on this property.

All information reported in this memo should, of course, be considered highly confidential.

W. E. Saegart

W. E. Saegart

WES:mw

Note: Newmont option terms on the Old Reliable property as reported by Bob Holt are as follows: $50,000 per year pre-production royalty (this has been negotiated downward from $100,000.) Upset price is between $4 and $4-1/2 million due in 1973 or as an alternative an upset price of $1/2 million plus an NSR royalty grading from 3% to 7% depending on production rate (7% royalty at 15,000 TPD production grading down to 3% royalty at 30,000 TPD production).

~~JDS~~, ~~JEC~~, ~~GES~~ Aa-16A,3.3

J.H.C.

DEC 20 1968

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

December 20, 1968

TO: J.H. Courtright

FROM: J.R. Wojcik

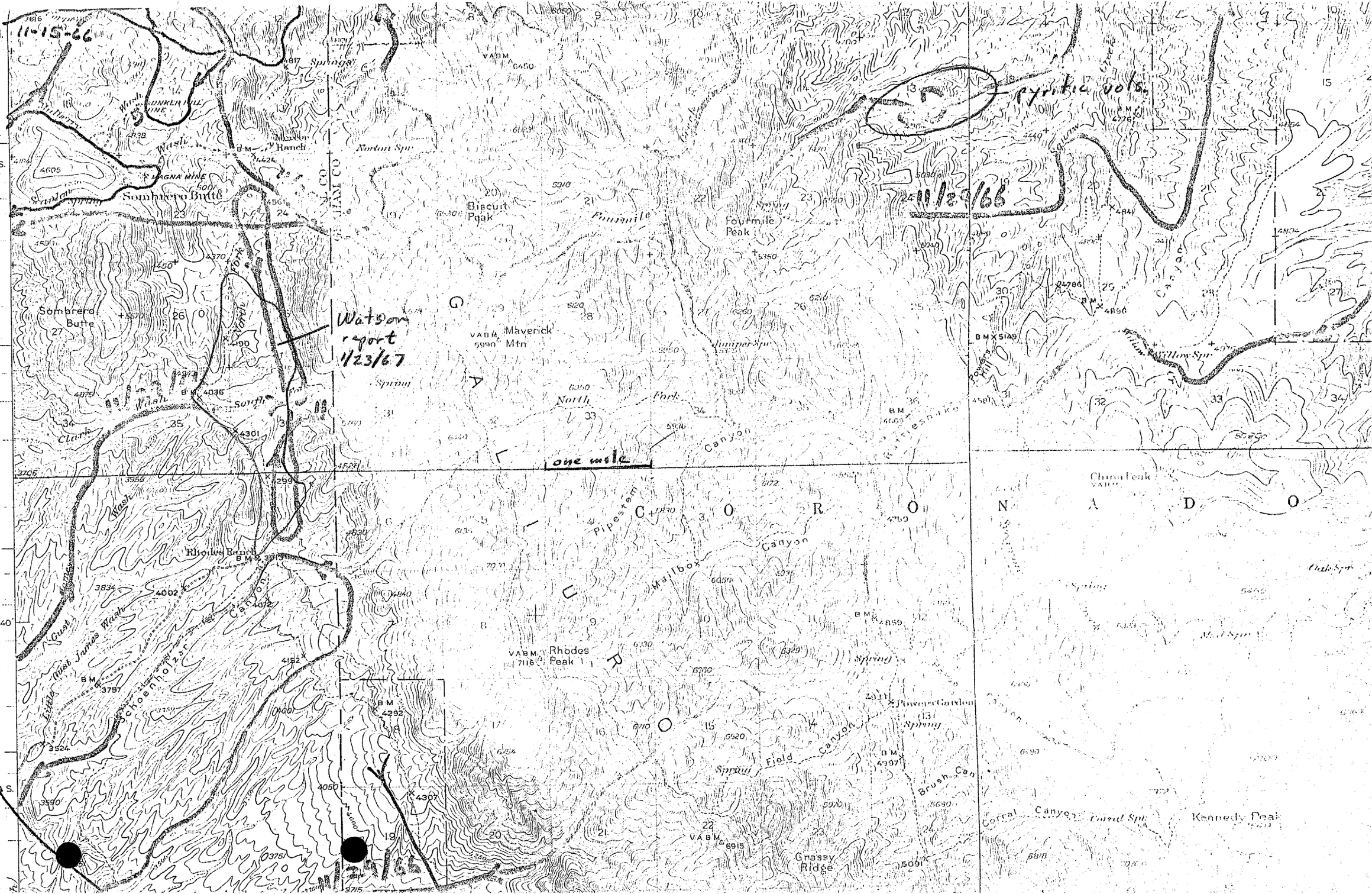
Possible Moly Prospect
South of Copper Creek
Pinal, Graham Counties

During the 1967 helicopter reconnaissance, Watson found an altered monzonite intrusive exposed on the edge of post-ore volcanics about 3 miles south of Copper Creek, Pinal County. A rapid ground survey found several small breccia pipes, two of which indicated molybdenum contents above background. On the east side of the Galiuro Mountains from this outcrop, is an area of pyritized volcanics.

After listening to the descriptions of the B.C. moly deposits and the Henderson deposit, I think the above area deserves a third look with some geochem sampling possibly including fluorine and tungsten in the analysis.

JR Wojcik
J.R. Wojcik

JRW:lzb
Encl.


3623000m N.
11-15-66
630 000 FEET
ARIZ. (EAST)
T. 8 S.
Sombrero Butte
Biscuit Peak
Fourmile Peak
Maverick Mtn
Watson report 1/23/67
one mile
Rhodes Ranch
Rhodes Peak
Grassy Ridge
Kennedy Peak
China Peak
pyritic vols.
11/29/66
11/29/66
T. 7 S.

Ge-160.3
J.H.C.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

JAN 24 1967

January 23, 1967

W.E.S.
FEB 14 1967

MR. [illegible], WES
READ AND RETURN
PREPARE ANSWERS HANDLE
FILE ✓ INITIALS

FILE MEMORANDUM

CLARK WASH HELICOPTER TARGET
COPPER CREEK MINING DISTRICT
PINAL COUNTY, ARIZONA

During helicopter reconnaissance on November 29, 1966, William Hoskins and Barry Watson spotted and landed upon an altered monzonite porphyry in the South Fork of Clark Wash about 4 miles south of Copper Creek. The area was inspected on the ground January 4-5, 1967, by J. R. Wojcik and B. Watson, and the following is the report on the subject area. Attachment A shows geochemical sample results; Attachment B is a geologic sketch of the area of interest.

Summary and Conclusions:

The Clark Wash helicopter target is on the west flank of the Galiuro Mountains in the southern portion of the Copper Creek Mining District, Pinal County. Precambrian Pinal schist and overlying early Laramide andesitic volcanics are intruded by several Laramide monzonite porphyry bodies. A thick sequence of mid-Tertiary rhyolites and associated volcanics cap the geologic column.

A series of rather small breccia pipes occur in monzonite porphyry, pre-mineral andesite, and schist along a general west-northwest trend. Moderate to intense quartz-sericite alteration is seen in all pipes, but evidence of mineralization is sparse. Only one geochemical sample showed significant molybdenum -- this from a small pipe composed of brecciated schist.

The South Fork monzonite porphyry intrusive shows locally moderate to intense sericite-clay alteration. Most of these local alteration "spots" are very small, but the largest patch of alteration leads under a thick stack of mid-Tertiary volcanics to the east. Geochemical results leave a faint ray of hope in this direction.

Further work is not recommended at this time. The alteration leading under volcanics, however, may constitute a future target if exploration continues to move toward examination of more and more remote prospects.

General:

The Clark Wash helicopter target lies in the southeast corner of T8S, R18E, and the northwest corner of T9S, R18E. It is on the Pinal side of the Pinal-Graham Counties boundary at the western base of the Galiuro Mountains. A poor Jeep trail runs from the Rhodes Ranch on the south end of the subject area to Mercer Ranch just north of the area. The Galiuro Mountains 15-minute Quadrangle sheet was used as a base map.

One discovery monument was seen in gravels in the north-central portion of the area. This claim, the Snow #3, was staked by a Bear Creek representative in late 1965 and does not seem to include any of the breccia pipes--but

it is not known where the other Snow claims lie. Corner monuments and flagging on bushes were seen around the breccia pipes in the northwest corner of the area mapped.

Geology (see Attachment B):

Pinal schist and early Laramide andesitic volcanics comprise the pre-mineral rocks in the area. The schist is principally metamorphosed volcanics; while the early Laramide volcanics -- found only as remnant patches -- contain an andesite breccia of the Silver Bell type.

Three bodies of Laramide monzonite porphyry crop out in the area as shown on the accompanying geologic sketch map and will be referred to herein as the south, east and northeast cupolas. The extent of the northwest intrusion was not determined, and it may be in aerial extent more truly a stock.

Nine fairly small breccia pipes were recognized, generally located along a west-northwest line which parallels the west-northwest trending Copper Creek alteration zone farther north. The two pipes located in Pinal schist are composed of schist fragments, the pipe in pre-mineral andesite is composed of andesite fragments, while the 7 pipes in monzonite porphyry contain shattered porphyry rock. Several of the pipes in monzonite on the northwest also contain schist fragments locally. The largest pipes are those on the northwest which are seemingly no more than 200 feet in diameter at maximum.

A large pile of mid-Tertiary volcanics constitute the Galiuro Mountains on the east, and these rhyolites and associated extrusives are found also in the central and southern portions of the area mapped. An andesite porphyry dike, probably associated with the later volcanics, strike north-northeast through the east monzonite porphyry cupola.

Quaternary gravels are spotty, becoming more prevalent northward.

Alteration and Mineralization:

All of the breccia pipes show moderate to intense quartz-sericite alteration; however only the pipe in the eastern monzonite cupola has associated copper stain -- and it is only along one shear exposed in an old digging. Live limonites are nowhere to be seen. Geochemical results show a molybdenum anomaly for only one pipe, the schist breccia of Sample 9. The pipe in pre-mineral andesite at sample sites 7 and 8 shows a very weak moly response. These two pipes plus the pipe at sample site 14 all register weak to moderate copper values.

The eastern monzonite cupola contains local patches of moderate to intense clay-sericite alteration associated with local structures. No live limonites were seen in the altered porphyry. The largest patch of alteration heads under the massive stack of Galiuro volcanics on the east, and the geochemical sample from the area (#3) shows 5 ppm Mo, 126 ppm Cu.

Outside of the breccia pipes, only one small area in the northwest monzonite cupola was altered to any extent. The geochemical sample from this altered spot gave discouraging results. The rock of the south monzonite

cupola is relatively fresh, although copper stain occurs in pits on the northeast contact with schist.

Recommendations:

At the present time no further work is recommended as the breccia pipes are too small, and, where grouped together, too void of mineral values. The alteration zone in the east monzonite cupola heading under volcanic cover is a longshot with a mighty thick overburden.

This area may become of interest in the future as exploration is forced to less favorable targets.

BARRY N. WATSON

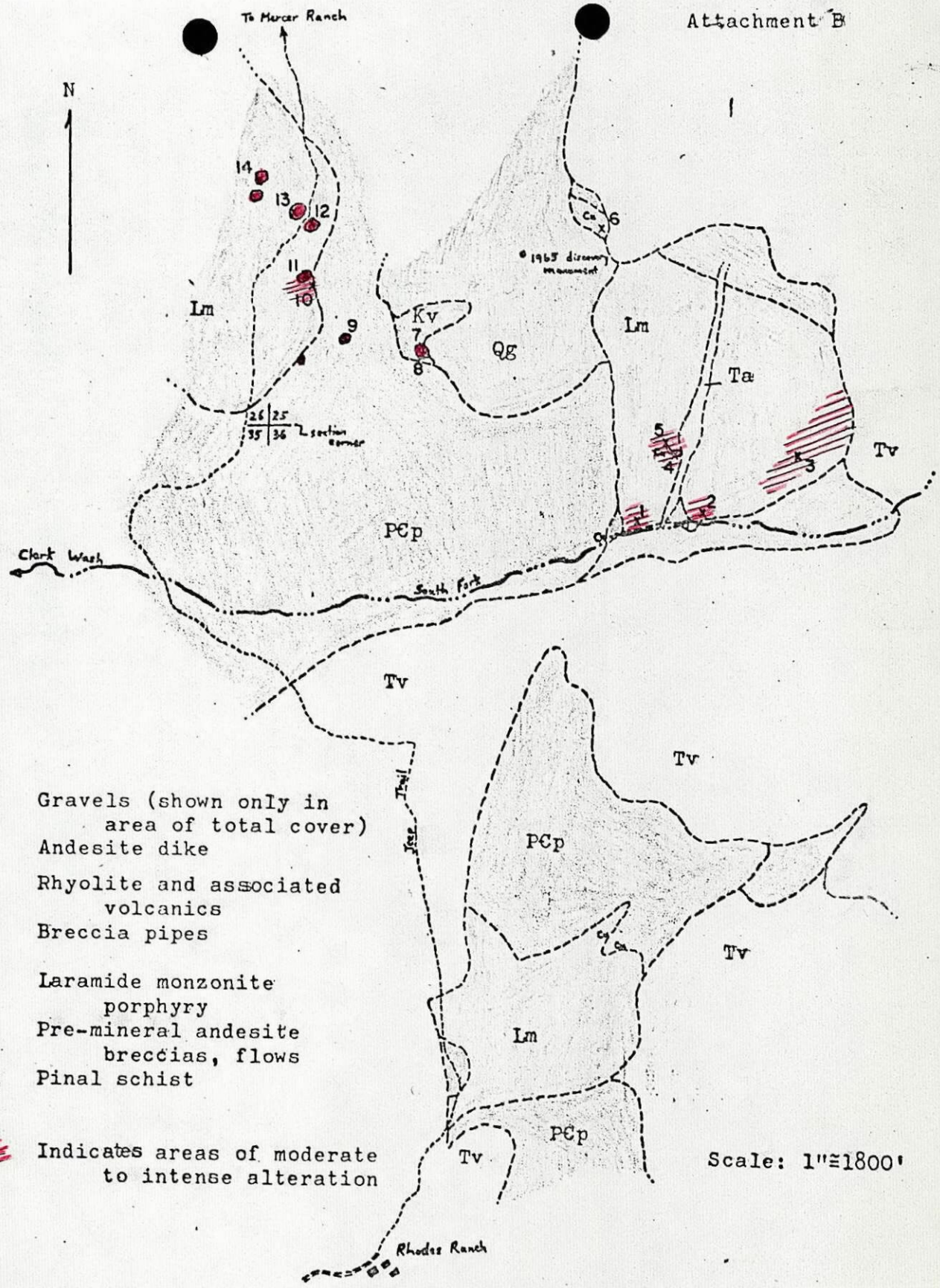
BNW/kw
Attachments A & B
cc: JRWojcik, w/atts.

Attachment A

GEOCHEMICAL RESULTS - CLARK WASH

Sample Number	ppm Cu	ppm Mo	Material Sampled
1	36	10	Monzonite porphyry
2	182	< 5	" "
3	126	5	" "
4	6	< 5	Monzonite breccia
5	12	< 5	" "
6	41	< 5	Pre-mineral andesite
7	45	5	Pipe in pre-min. andesite
8	112	5	" " " "
9	244	60	Schist breccia
10	34	< 5	Monzonite porphyry
11	60	< 5	Monzonite breccia
12	31	< 5	" "
13	15	< 5	" "
14	152	< 5	" "

Attachment B



Geology (with sample locations) of the Clark Wash monzonite porphyry intrusives and breccia pipes, T8S, R18E, Pinal County, Arizona. Sketch map by J. Wojcik and B. Watson, January 1967.

VHC [illegible]

MINING WORLD, December 1961

Regular and extensive pattern diamond drilling has been underway by Kennecott Copper Corporation's exploration subsidiary - Bear Creek Mining Company - at and surrounding the Old Reliable copper mine on Copper Creek, Pinal County, Arizona. Copper has been produced for many years at the Old Reliable from a stock like intrusive. So extensive and detailed has been Bear Creek's drilling that independent geologists believe that all possibilities for ore discovery have been checked.


UPPER ANDESITE TUFF
PHELPS-DODGE COMPANY
PRUDENTIAL PIPE
SUPERIOR PIPE
GLOBE PIPE
COPPER GIANT PIPE
COPPER PRINCE PIPE
BLUE BIRD MINE
CRETACEOUS
T 7 S
T 8 S
R 18 E
R 19 E
RHYOLITE
OLD RELIABLE GROUP
BORDER FACIES QUARTZ DIORITE
INTERNAL FACIES QUARTZ DIORITE
QUARTZ DIORITE
OLD RELIABLE PIPE
ARIZONA MOLYBDENUM CORPORATION
CHILDS ALDWINKLE MINE
COPPER STATE METALS CO.
VELASQUEZ PIPE
AMERICAN PIPE
QUARTZITE MARKER BED
GILA CONGLOMERATE
RANGE FRONT FAULT
LOWER ANDESITE TUFF
ALTERATION AREA
CRETACEOUS SHALE
SANDSTONE
FOUR METALS BASIN
BUNKER HILL MINE
MAGMA CHIEF MINE
A
A'
B
B'
1
2
3
4
6
7
9
10
11
12
14
15
16
LEGEND
SEDIMENTS
AGE
GILA CONGLOMERATE
TERTIARY
QUARTZITES, SHALES,
CRETACEOUS (?)
UPPER ANDESITE TUFF
QUARTZITE
LOWER ANDESITE TUFF
INTRUSIVES
QUARTZ DIORITE
RHYOLITE
Return to J.H.C.
GEOLOGIC MAP OF
COPPER CREEK AREA
COPPER STATE METALS COMPANY
BUNKER HILL MINING DISTRICT, PINAL COUNTY, ARIZONA
EXAMINED FOR AMERICAN SMELTING & REFINING COMPANY
TUCSON, ARIZONA
Scale 1" = 1000'
December 1947
Geology by:
C A Rasor & James Pollock
After: T H Kuhn
Figure 2
MAP No 718

NOTE FILE ON "PORPHYRX COPPER"

Copper Creek VMC

Location: Copper Creek area, Pi... County, Arizona

~~Property~~ District Bunker Hill (Copper ~~Mt.~~ Range Creek)

See Index Map (p. .....)

Source of Information	Explanation:
[X] Field Observations [ ] Publications [ ] Company Files [ ] Other	Notes on field reconnaissance (1950) by J. H. Courtright. Date 1/6/53
Recommended Company Interest Classification: [ ] Active [X] Possible [ ] None [ ] Scientific	**Qualifying Remarks:** (see p.....)

MINERALIZATION (See Sketch Map 2)

Alteration and Metallization:

Attached sketch shows (1)NW trend of breccia pipes, (2)area of strong alteration and disseminated pyrite in vicinity of Old Reliable pipe and (3)Cu-bearing fissures projecting westward beneath post-mineral Gila conglomerate. No specific exploration targets are apparent here, but brecciation, Cu mineralization and alteration may be the eastward extremity of an extensive zone of mineralization lying beneath the Gila cover on the west.

Leached Outcrops: (see p.....)

Enrichment: (see p.....)

Associated Metal Deposits: (see p.....)

(see p.....)

STRUCTURE (See Sketch Map p. ....)

Fissures:

DEVELOPMENT, PRODUCTION, ETC.:

(see p.....)

~~Unknown~~: (According to sources considered reliable by me, Kennecott will start drilling shortly on claims located along Copper Creek about 1½ miles downstream (west) of the last bedrock exposures — in an area of Gila conglomerate. Drilling is on strength of geophysical survey and is considered by them to be a long shot possibility. In addition, they hope to obtain information for future work in this area. They apparently plan to carry churn drilling to the base of the Gila and continue into bedrock by diamond drilling —K.G.P.)

(see p.....)

~~Breccia Pipes~~:

(see p.....)

~~Cover Rocks~~:

(see p.....)

DEVELOPMENT, PRODUCTION, FACILITIES, ECONOMIC POSITION, ETC.:

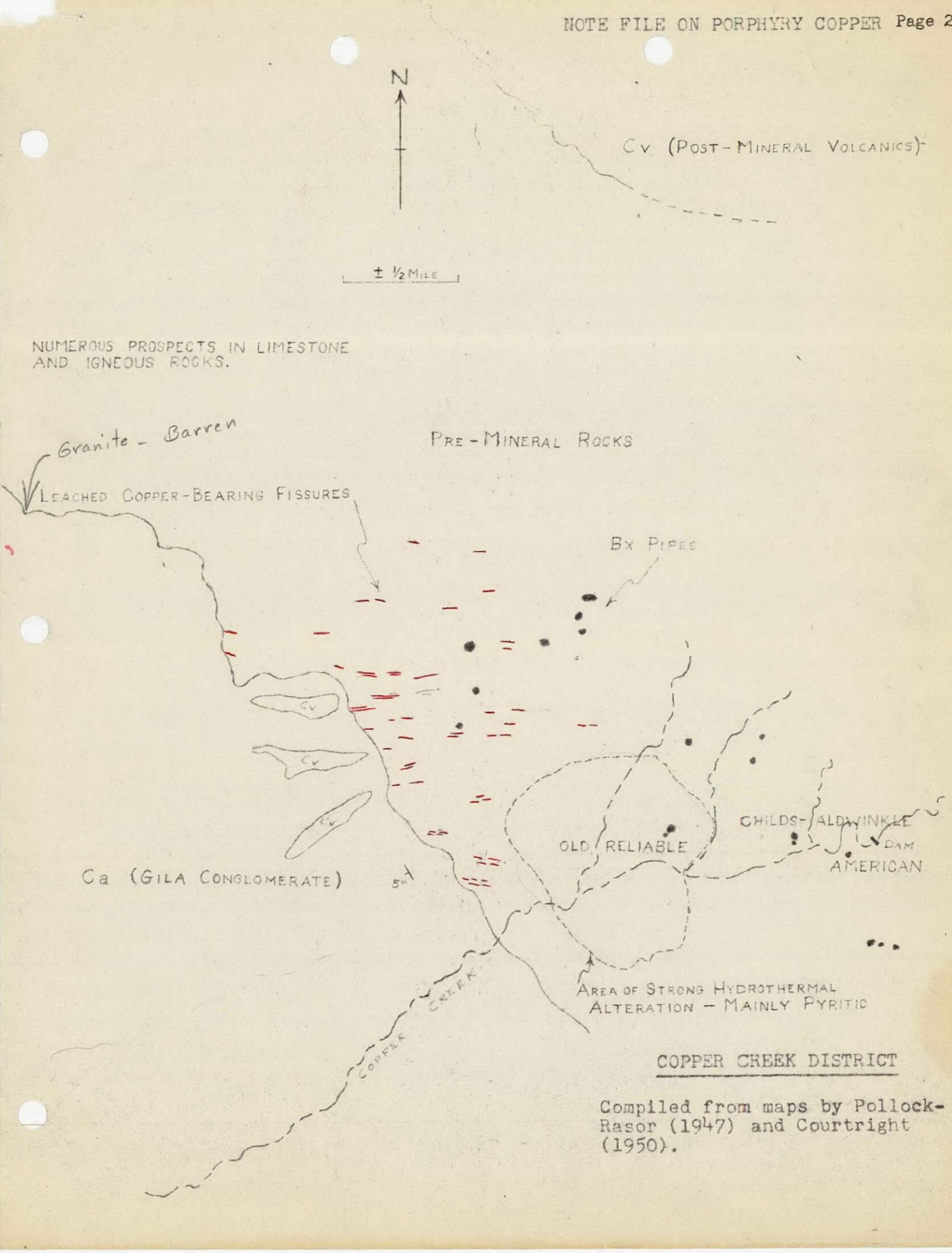
See K. G. Papke Note above.

(see p.....)

cc: WHL(2)-TAS-LKW-JHC-KR(2)

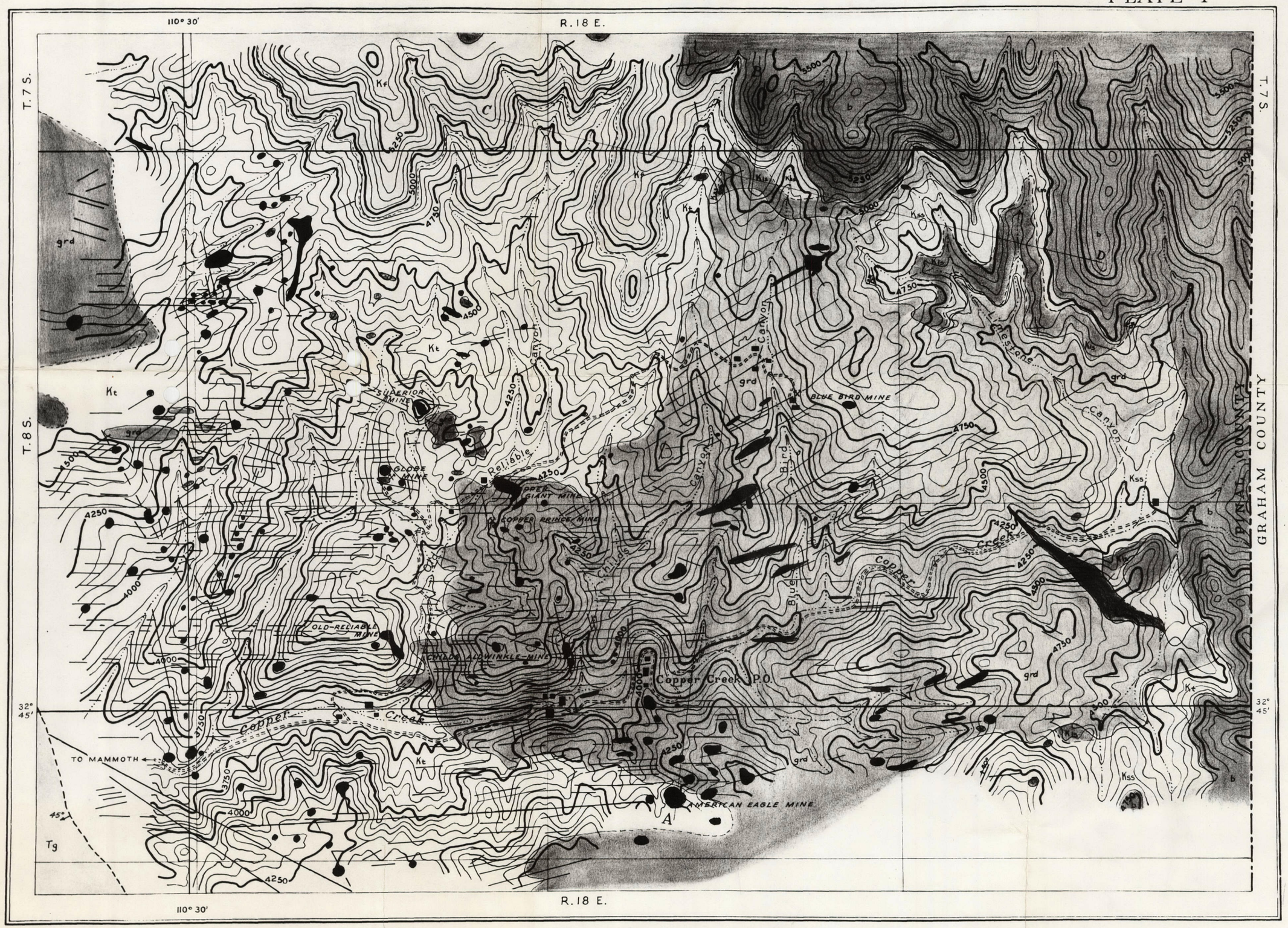
Date 1/6/53 By J. H. COURTRIGHT

2M-11-52-K



COPPER CREEK DISTRICT

Compiled from maps by Pollock-Rasor (1947) and Courtright (1950).



EXPLANATION

SEDIMENTARY AND BEDDED VOLCANIC ROCKS

TERTIARY — Pliocene

- **Tg** — Gila conglomerate

CRETACEOUS (?)

- **b** — Basalt
- **Kf** — Andesite flow
- **Kss / Kls** — Conglomerate (ss), sandstone (ss) quartzite (ss), shale (ss), limestone (ls)
- **Kt** — Andesite tuff

INTRUSIVE IGNEOUS ROCKS

- Andesite, dacite and rhyolite dikes
- **grd** — Granodiorite
- Breccia pipe
- Fault
- 40° — Dip and strike of beds
- Mine

TRUE NORTH — MAGNETIC NORTH 14°

GEOLOGIC MAP OF THE COPPER CREEK AREA

PINAL COUNTY, ARIZONA

Topography from United States Geological Survey by J. Mark Holmes, 1937.

Scale $\frac{1}{12000}$

1000 500 0 1000 2000 3000 4000 5000 Feet

Contour Interval 50 feet

Datum is mean sea level

Geology by Truman H. Kuhn, 1940

Return to J.H.C.