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James Doyle Sell Mining Collection

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4/10/87
Kourn

HGK, TDV, JDS, WLK
MEK-Fu/Lib

Hand-out from the Reno Conf. Field Trip.

COPPERSTONE
GEOLOGIC SUMMARY

The Copperstone gold deposit is located in an area of flat, dry, sandy terrain with several small knolls about 40 feet high and prominent longitudinal sand dunes. Only 17 outcrops with a total surface area of approximately one acre are exposed. At the southern end of the Copperstone claim block and beyond is exposed an igneous and metamorphic outlier of the Dome Rock Mountains. These rocks include granite, gneiss, schist, quartzite and amphibolite of uncertain age - Precambrian to Jurassic. A low angle fault (detachment?) separates these rocks from an upper plate consisting of a thick sequence of Jurassic age quartz latite welded tuffs (qlt). The upper plate sequence has been affected by weak green schist facics metamorphism in Cretaceous time. This fault probably extends beneath the Copperstone gold deposit, but drilling failed to confirm its presence.

No early prospect pits, shafts or adits were found at Copperstone. Prospecting began in 1968 with bulldozer trenching by a prospector to better expose weak copper mineralization. The property was submitted to Cyprus in 1980, and a lease was signed after initial field evaluation and sampling indicated 0.02 to 0.09 ounce per ton gold in a few small breccia outcrops. During 1981 through 1983 conventional percussion drilling in a 140 foot grid by Cyprus (Amoco Mineral Company) tested the limits of the Copperstone mineralization. Extensive induced polarization and ground magnetic surveys were run. Anomalous frequency effects outlined the gold deposit with considerable accuracy. Drilling from 1984 through 1986 further defined the deposit.

The Copperstone gold deposit is hosted by a thick sequence of foliated to massive and brecciated quartz latite tuffs. These rocks are correlated regionally with the Jurassic volcanics exposed in the Dome Rock Mountains to the south and throughout west-central Arizona. In the deposit area the quartz latite tuffs are at least 900 feet thick based on drilling formation. The tuffs are characterized by variable degrees of foliation defined by segregated bands of quartz - feldspar and sericite, probably developed along original primary laminations in the tuff. The foliations exposed in surface outcrops in the deposit area all dip 30-50° to the southwest. The indurated breccia dike that hosts the main gold zone within the deposit strikes approximately N45W and dips on an average of 30° to the northeast. These breccias continue along strike at least 2,500 feet and down-dip 1,500 feet. The breccias range in thickness from 50 to 200 feet and contain variably altered fragments of quartz latite in a hematite matrix. The main ore zone within the deposit generally occurs along the basal contact of these breccias with the underlying foliated quartz latite tuff. This mineralized zone is defined by an extensive multi-stage hydrothermal breccia zone. Fragments of quartz vein material, quartz latite tuff and earlier developed breccia are contained within a hematite - specularite matrix. Gold mineralization occurs primarily within this hydrothermal breccia zone and in quartz - amethyst veins cutting through the adjacent latite tuffs. Specular hematite, chrysocolla, minor malachite, and barite are the most common accessory minerals with lesser amounts of calcite, siderite, manganese oxide, flourite, adularia, magnetite,

chalcopyrite and pyrite. Multiple episodes of mineralizing hydrothermal events and brecciation occurred at Copperstone. *

Mineralizing solutions also formed local zones of alteration in and near the ore zones. Bleaching effects are caused by argillization and sericitization. Local secondary gray-green chlorite as wispy veining and minor chalcedonic silicification with small patches of chalcopyrite, pyrite and native gold have been seen. Microscopic examination of a gravity concentrate was made from a floatation concentrate of the ore. About 80 percent of the gold occurs in small flakes ranging between 4 and 40 microns. Coarse gold plates range from 50 to 150 microns. Most gold is free, but a small amount is locked within quartz and iron hydroxides.

The few mineralized outcrops at Copperstone contain highly anomalous gold, silver and copper. Initial sampling found subore and ore grade gold values that led directly to drilling. Several early core holes and a large suite of surface samples were analyzed for a broad spectrum of trace elements in an effort to characterize the deposit.

Copperstone is characterized by high barium, ~~manganese~~ >3000 ppm, uranium and low arsenic, antimony, thallium and mercury. Barite and flourite are most abundant in the extreme southeastern end of the deposit where they occur in massive 4-5 foot veins. Pb 540 ppm Cu 3000 ppm

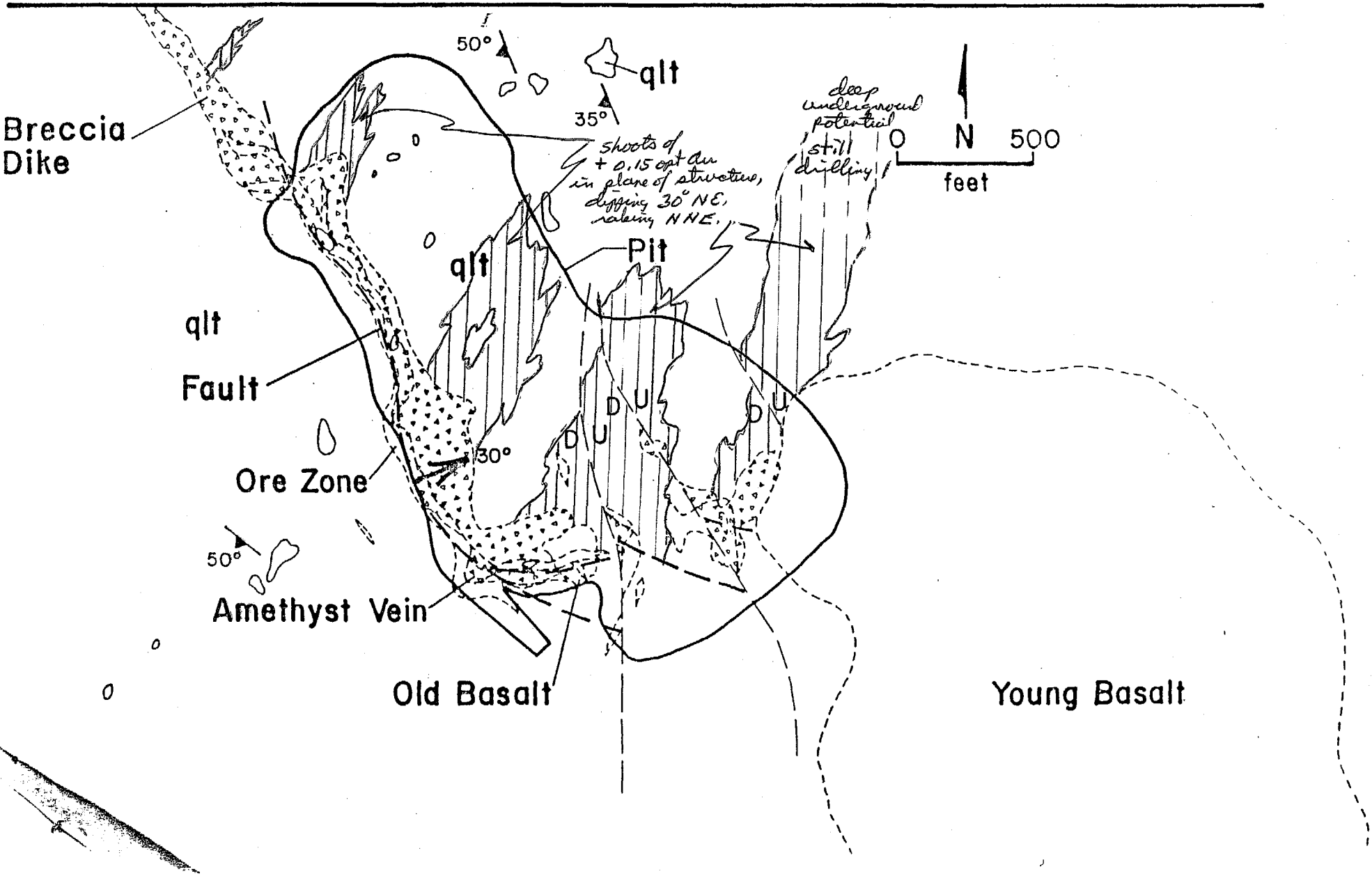
Generally, gold mineralization is sharply defined within the mineralized breccia zone. It markedly decreases over a few tens of feet into hanging wall and footwall rocks where often no gold is detected by atomic absorption analysis. In higher gold grade zones within the deposit, silver values are higher and may provide some recoverable value. Copper ranges up to several percent within the gold zone, mostly as chrysocolla.

* Barton 12/7/87

Stages of development of system

1. General cracking of the structural zones, with quartz-adularia, calcite, and hematite veins
2. Brecciation with abundant quartz, amethyst, and minor gold.
3. Rebrecciation by explosive hydrothermal fluids with quartz, pyrite, copper, fluorite, barite, silicification, and specularite with major gold pulse.

SUBSURFACE GEOLOGY



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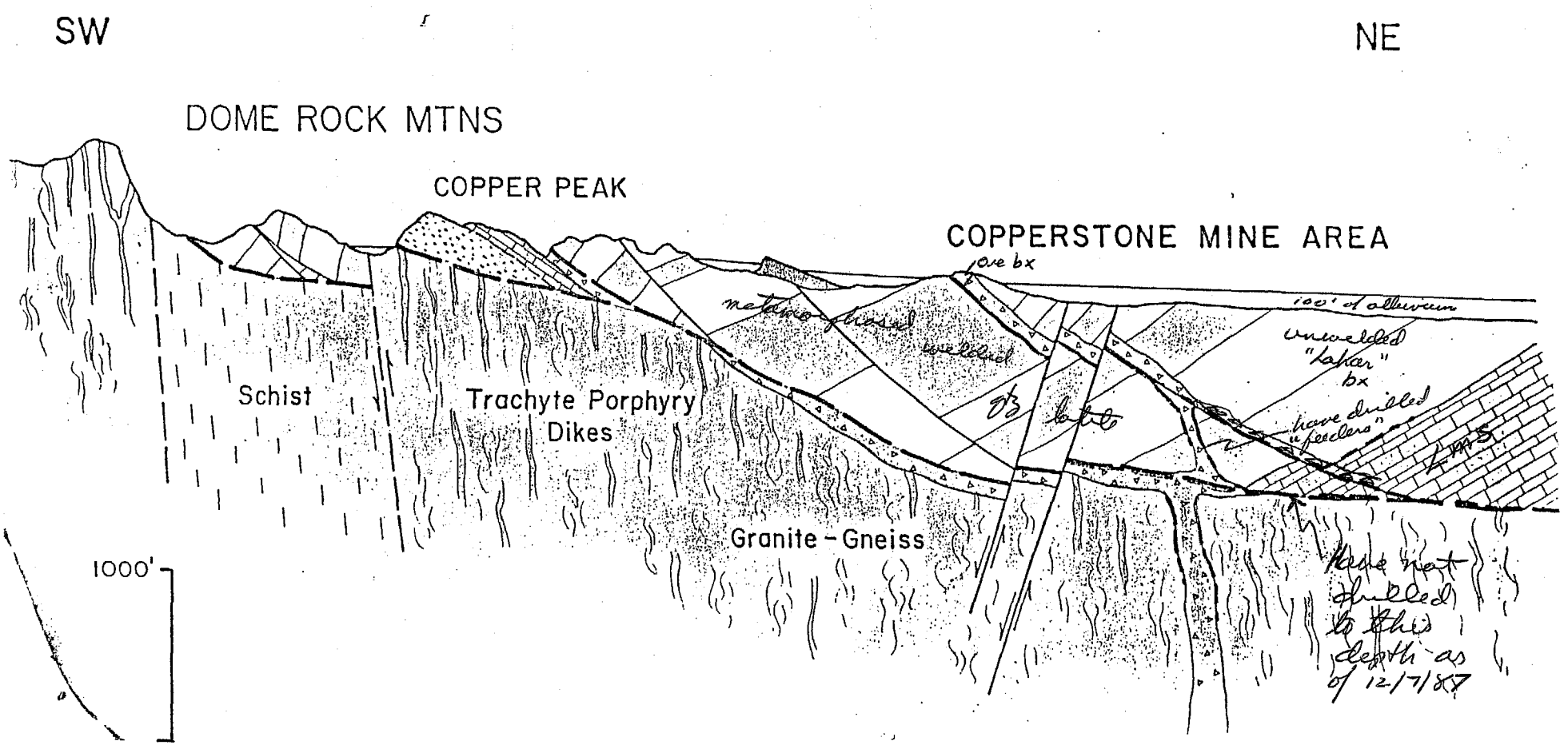

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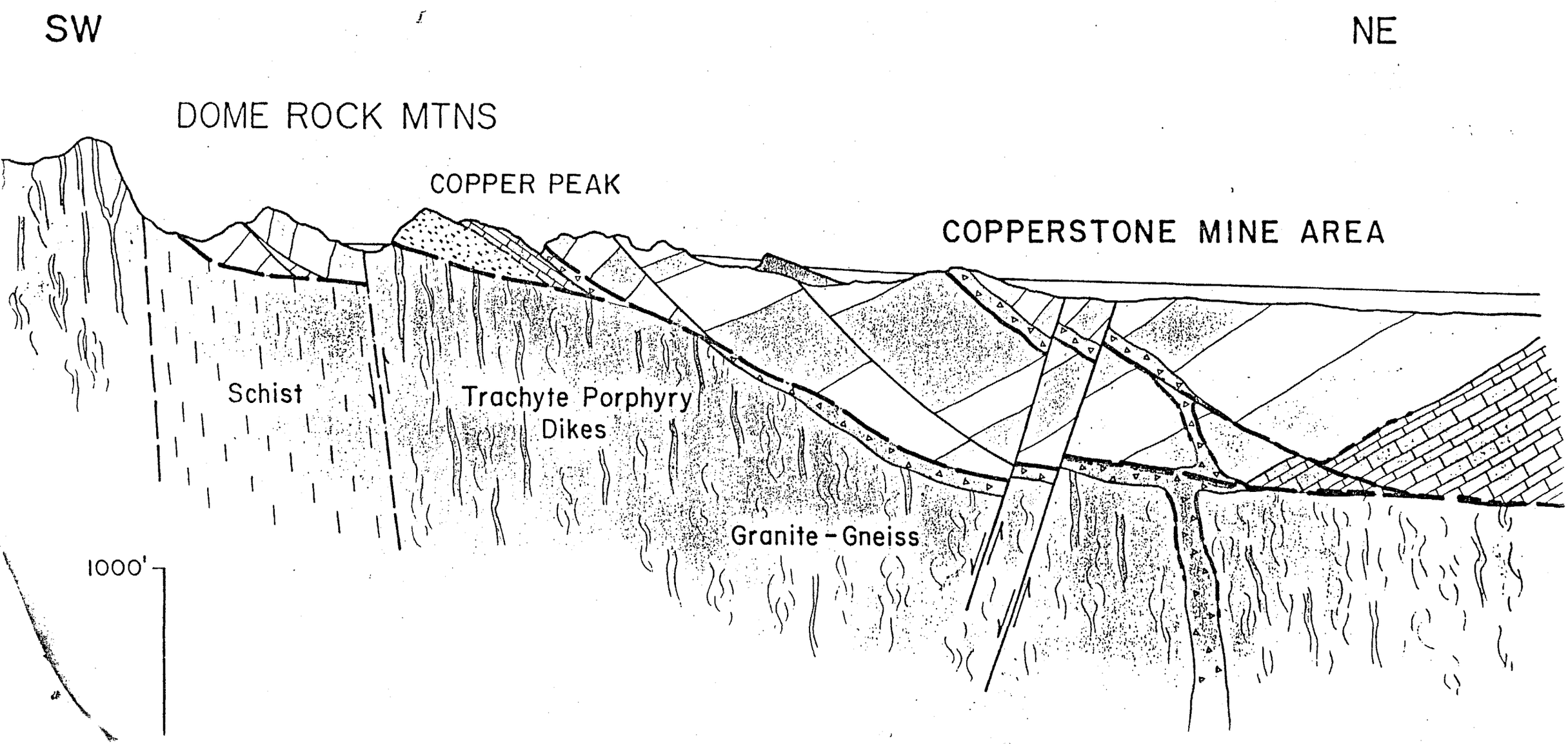

JDS

ASARCO

Southwestern Exploration Division

May 8, 1985

FILE NOTE

gp 11414

AMOCO's Copperstone Deposit
Sec. 14, 15, 20, 21, T6N, R20W
La Paz County, AZ

At the AGS meeting, May 7, 1985, Mr. Clancy Wendt mentioned that he had recently been in contact with Art Humphries of AMOCO and that AMOCO has decided to keep the property and has withdrawn their joint venture overtures.

Reserves are stated to be 4 million tons at 0.086 opt Au with a 7 to 1 stripping ratio. Cut-off grade was not mentioned and as drilling has apparently been sufficient to close off the mineralization, then the above reserve probably represents the maximum grade-tonnage. At a lesser grade there is undoubtedly a larger tonnage available.

James D. Sell

James D. Sell

JDS:mek

cc: F. T. Graybeal
W. L. Kurtz

ASARCO

Southwestern Exploration Division

VDS

December 10, 1987

File Note

Copperstone Gold Deposit
Cyprus Minerals
Sec. 11-14, T6N, R20W
La Paz County, AZ

During the December 7, 1987, AIME Arizona Conference Meeting, two papers were given on the Copperstone Gold deposit. One paper by S.W. Thomas at the open-pit session, and the other by Bill Burton at the geology session.

Much of what was said and shown in slides has been previously released and found in a hand-out during the UT-AZ field trip of the Reno Gold Conference (4/10/87) which F.R. Koutz attended, and in an article in Skillings of November 28, 1987. Copies of both are attached for clarity. Some notes have been added to the hand-out plan and section.

As noted, the 60,000 ounces of gold slated for 1988 production, will double the Arizona gold totals, making Copperstone the largest Arizona gold producer.

The drilled open-pit reserve is 6 million tons of ore grading 0.085 opt Au and 0.085 opt Ag (i.e., 1 to 1 ratio).

They have drilled some 405 holes totaling 144,000 feet of exploration. Of these, 300 holes are in the open-pit area and included 69 diamond drill holes for stratigraphic-structural control.

Although the to-be mine grade is 0.085 opt, one slide shows that higher grade shoots of plus 0.15 opt gold are found lying within the 50-200 foot thick hydrothermal breccia zone. (See subsurface geology map.)

The gold zone has been traced by drilling through the 100 ± feet of alluvium which covers the deposit. Along strike the zone has been traced for 3000 feet; and 1500 feet down-dip.

The open-pit reserves of 6 million tons is calculated to the 450 foot level (below the surface), but as drilling shows, good ore continuing down dip, and becoming thicker, the engineers may expand the pit based on continued improved economics and successful drilling. They do plan on underground mining of the plunging ore shoot(s).

They will strip some 39 million tons of waste for a 6/1 w./o. ratio for the open-pit. The contract mining by Morrison-Knudsen is for 2½ years at which time the economics will be reevaluated. The fast-trac mining and open-air construction techniques resulted in a gold pour 13 months after the Directors OK to proceed, with the plant construction taking only 8 months. They had a start-up on June 29, 1987; are now producing 4,000 tpd ore, and will produce 6,000 ounces of gold in 1987 from a carbon-in-leach circuit.

Barton noted several things in his talk:

1. They have not yet drilled to the basement fault under the ore zone area, but have no doubt that it exists.

2. They have not yet drilled the large mass of limestone shown on the right side of the schematic cross-section. They have drilled the "sliver" block below the ore zone. It is the limestone clasts which are found in the gold zone breccia, above (up-dip) from the latite-limestone contact, which convinced Barton that the limestone clasts were brought in by the up-flowing explosive hydrothermal breccia phase.

3. Hydrothermal breccia "feeder" dikes, with ore grades, have been drilled below the ore breccia structure, but it is still unknown if a second breccia ore zone will be found in the basal structure as shown in the cross-section.

The high specularite-copper matrix breccia contains the bulk of the gold values and highly resembles the hydrothermal breccias at the Chase Bagdad Mine in California, as well as similar breccias in the Planet-Swansea areas.

JDS:mek

James D. Sell

cc: F.T. Graybeal
W.L. Kurtz

Kou

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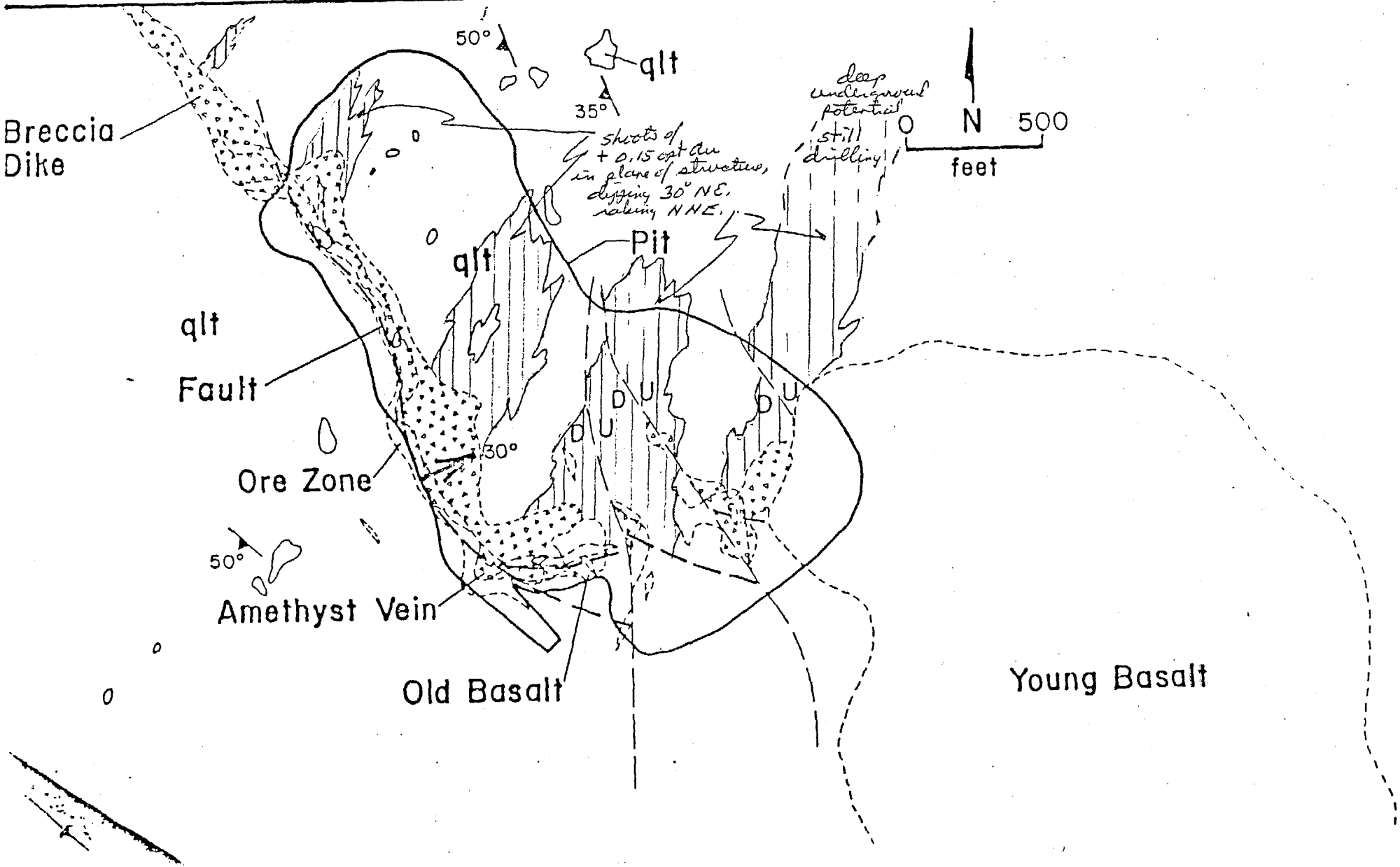

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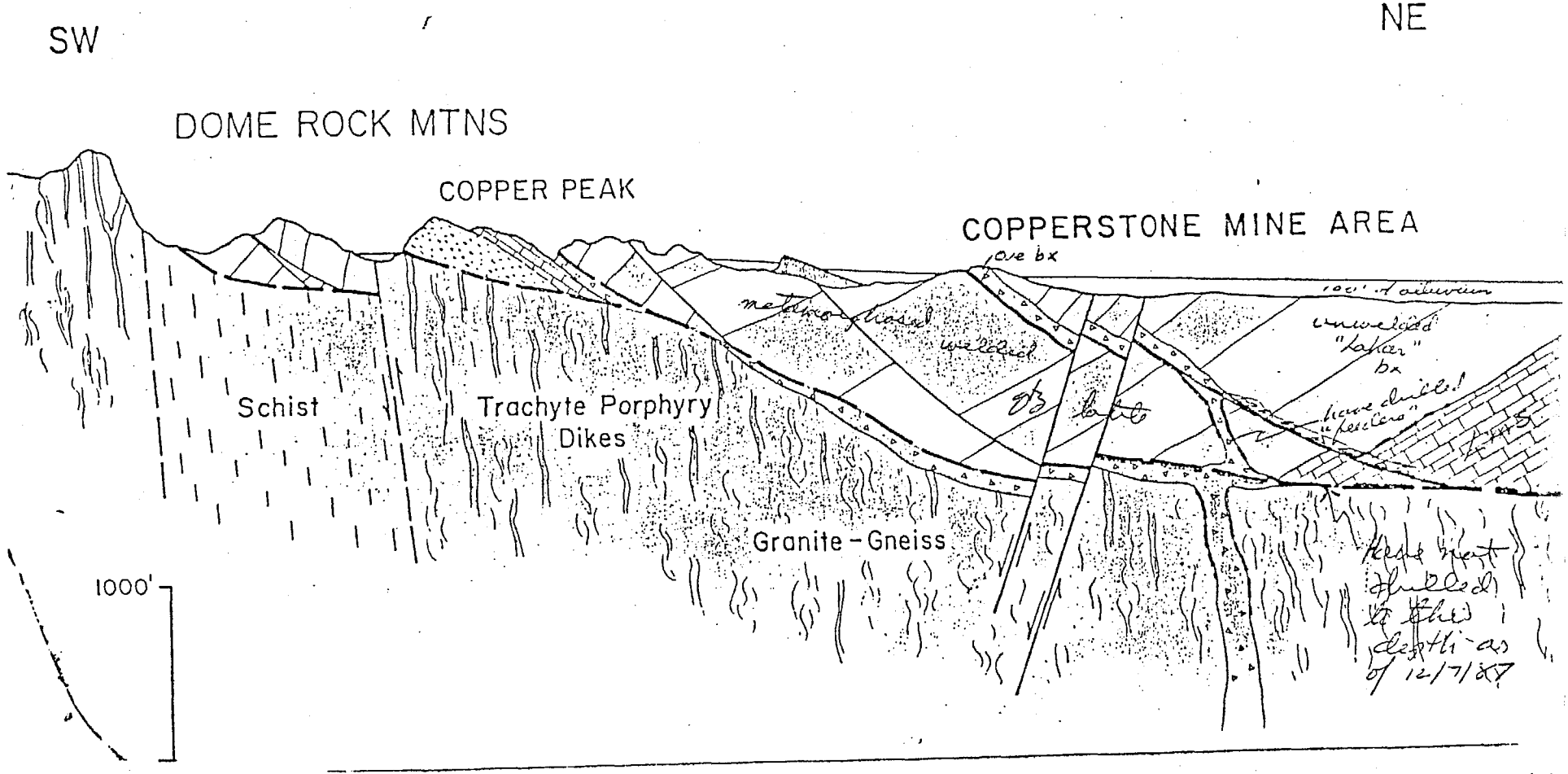


ASARCO

Southwestern Exploration Division

May 29, 1990

FILE NOTE

Copperstone Visit
AZ AIME Geology Section
La Paz County, Arizona

On Saturday, May 26, 1990, the Arizona AIME, Geology Section had their annual meeting at the Cyprus Copperstone mine. M.A. Miller, J.D. Rasmussen, J.J. Malusa, and J.D. Sell attended from Asarco.

Both the geologist and the mine manager talked openly on the problems and successes at Copperstone. Miller will be writing on his impressions.

Copperstone has about two years reserves left and intends to shut down quickly.

Several items that may be of interest and applied to the Yarnell Project.

1. The initial drill spacing was 140 feet along strike and 100 feet down dip. Although some surprises were found in mining -- such as, more offset faulting and misinterpretation of high-angled veins in rotary cuttings which happened to project along trend of their shallow dipping structure, but the overall grade wasn't there when they stripped down to it (the shallow-dipping structure had been offset into the hanging wall side), the staffs note of interest was that the down-dip side of the deposit, where the high-wall is slated to be, should be closely drilled so as to pin that high-wall down early on for pit configuration. They have left some mineral that should have been taken, but the high-wall is 50 feet short and present economics says they can't move that 50' slot now.

2. They have spent in excess of $700,000 in mesh, etc., to cover their leach pads for protection against the loss of bird life. The end result for best results was a grid of steel cables 16' x 24' over the pond, with 16' x 2000' mesh strips clipped to the cables. This arrangement was simple, and easily repairable. Cost of 27 cents per ton of pond material. They would probably place the cables on floating barrels, rather than posts, on any new pond.

3. On the waste dumps, they have put them at various final elevations to break-up the skyline effect. Also, they are loose dumping the last lift and not leveling this out (they rip the next to last surface first). They have found that these bumpy and loose piles are capable of handling a 100-year flood input, whereas on the leveled surface, such a rain would run off and have to be contained outside the dump area.

4. Another item was the final detoxification and cover on the leach ponds. Originally, they were going to dry them, then cover with waste rock. The time element and cost is no small item. Now their plans are to run sand and chlorine through the mill and place on the leach ponds. The chlorine will kill the cyanide, and the sand will cover the ponds. They believe they'll have the ponds EPA clean in two or three months of such activity -- some years time saved.

A 1989 Annual Report was all they handed out.

James D. Sell

JDS:mek

cc: W.L. Kurtz
S.L. Lakosky
D.E. Crowell
M.A. Miller

JDS

ASARCO

Southwestern Exploration Division

June 15, 1990

J.D. Sell

Copperstone Visit
AIME Geology Section
La Paz County, Arizona

On Saturday, May 26, 1990 we visited the Copperstone Mine of Cyprus Gold. The visit started with a talk about the property from the Mine Manager. This was followed by a talk from the mine geologist, Graham Kelsey. The talks were very informative and candid with the company's representatives very open to all questions.

The current mine life is projected to be 1.5-2 years at a current mining rate of 3-4000 tpd. Projected gold production is 80-100,000 oz. per year. Additional reserves are poor as the stripping is too high for the open pittable ore and the underground drive had encountered bad ground before reaching its objective. Underground reserves were quoted as being in the 100-200,000 T range at .15-0.2 opt gold. The quoted reserves seem to be rather low grade for an underground operation. There are a million tons of .1 opt Au which is located NE of the present pit, but is too deep, and therefore is uneconomic. At the time of the field trip Cyprus was stockpiling their gold production and had 30,000 ounces of gold waiting for better prices.

The deposit is being mined with twenty foot benches and ore/waste is determined by 10 foot composite assays from the blast holes. The entire bench is blasted and then the top 10 feet is mucked accordingly. Grade flags are then surveyed in and the bottom ten feet of the bench is mucked accordingly. Average stripping for life of the deposit will be 7-8:1; however, some of the pushbacks for the pit had stripping as high as 18-22:1. The deposit has been drilled out on 100 x 140' grid which has resulted in geologic interpretation problems and resultant mining problems (high stripping) due to the wide spacing on the holes.

Recoveries through the mill are in the 80-92% range for mine run ore (+.04 opt Au) and 60% for leach ore (.02-.04 opt) (although they are not presently heap leaching).

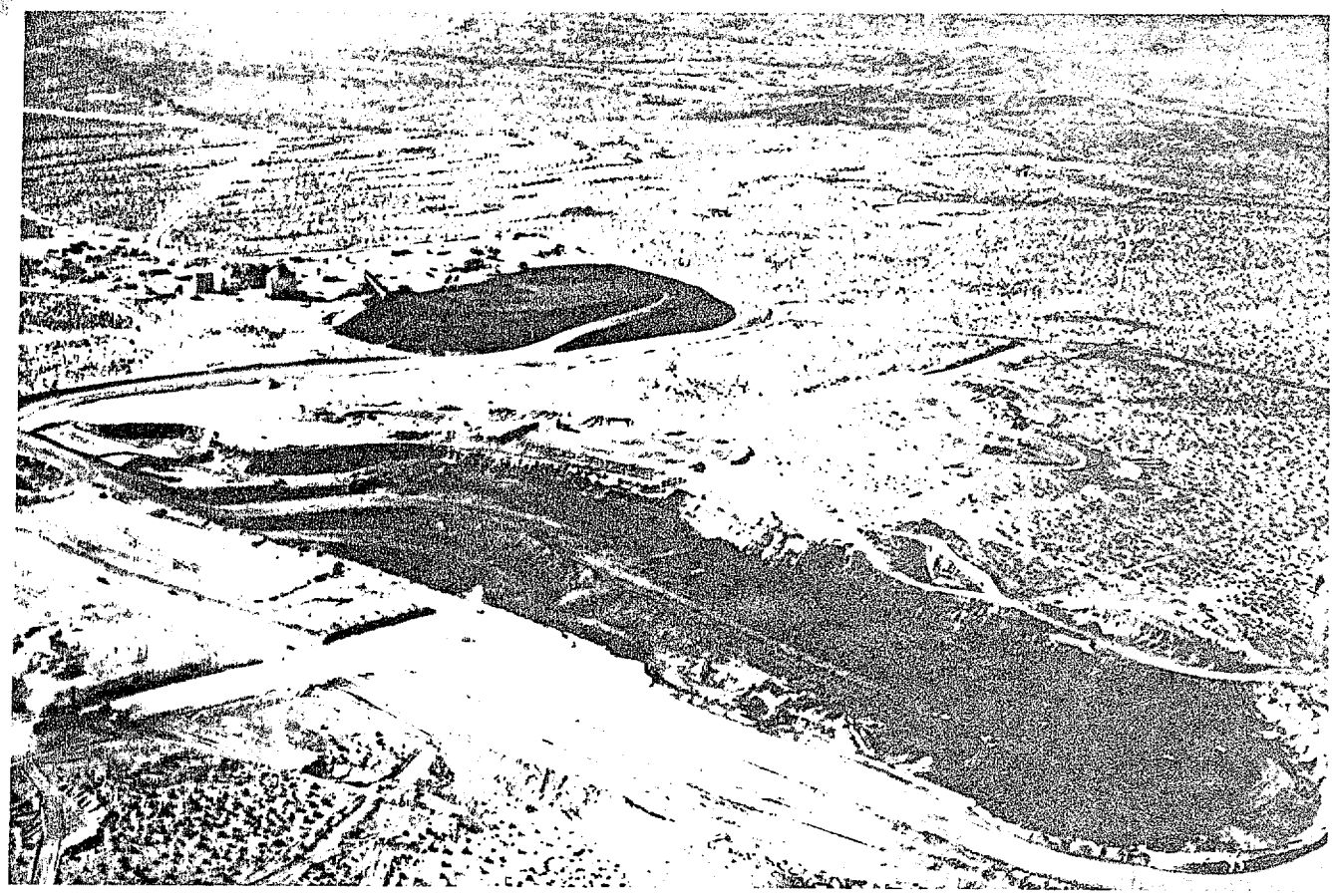
The deposit is hosted in a series of quartz latite volcanics which has been cut by the Copperstone Fault, a low angle structure which has been interpreted to be a listric fault from a deeper detachment fault structure. The fault zone is from several feet up to +100' in thickness and strikes N35°W and dips 35°NE. Rocks in the hanging wall are mostly composed of monolithic quartz latite breccias which have a hematite, sericite/clay matrix. This breccia is mineralized with gold only when cut by the Copperstone fault, and therefore suggests that the breccia is pre-mineral and unrelated to the gold event. Age of the host rocks are thought to be Jurassic, with the age of the mineralization probably

Tertiary. All of the rocks in the pit are flooded with hematite; however, the mineralized zone appears to contain more quartz as stockwork veins, amethyst, chrysocolla, and manganese. It is difficult in places to determine the actual location of the fault structure as the deposit has undergone several pre and post episodes of faulting, and therefore, has confused the main structure. From an exploration perspective, an occurrence such as Copperstone would definitely be worth sampling; the problem might be as to what was significant within this "sea" of hematization, since rocks that look well altered are unmineralized with respect to gold.

MAM:mek

Mark A. Miller

cc: W.L. Kurtz



Copperstone gold mine, La Paz County, Ariz. The photograph faces south toward the main ranges of the Dome Rock Mountains, which are on the skyline. The low foothills in the upper right-hand part of the photograph are called the Moon Mountains by some but referred to as the Dome Rock Mountains at the mine. A large detachment fault that strikes northwest-southeast daylights in these foothills and dips to the northeast (for example, toward the lower left corner of the photograph) under the orebody. The ore at the mine is in the Copperstone fault that dips to the northeast at about 30° and is exposed in the pit. The pit parallels the strike of this fault. The dark dump between the pit and the office-plant complex is ore. The access road to the property can be seen at the upper left edge of the photograph. (Caption courtesy of Hugo Dummett, Arizona Geological Society. Photograph courtesy of Cyprus Minerals Company, Denver, Colo. Photographer is Mickey Prim, Manley-Prim Photography, Inc.)

bodies. Hydrothermal systems commonly developed where these magmas vented as domes or tuff cones. Other epithermal deposits, formed at this time and localized along or adjacent to caldera structures, include the McDermitt and Cordero mercury deposits, Hog Ranch gold deposit, and numerous undeveloped prospects such as at Red Butte and Grassy Mountain, Oreg. The level of erosion in these volcanic and epithermal systems is slight, and so only the uppermost parts of the hydrothermal systems are exposed. Hot-spring sinter and hydrothermal explosion craters, such as at Red Butte, are well preserved.

After the peralkaline volcanic event, the locus of volcanism moved northwest through the province with the emplacement of small volume domes and lavas until 10 Ma when major peralkaline ash-flow tuffs were erupted from the Harney basin caldera complex. The locus of dome emplacement continued to move to the northwest; most recent activity was near Newberry caldera. Epithermal systems, such as the Quartz Mountain gold and mercury deposits, are closely associated with rhyolite domes emplaced along northwest-trending zones of extensional faulting. Basin-and-range-type extension responsible for much of the present topography began at about 8 Ma, just after the last voluminous ash-flow eruptions from Harney basin. The basins are relatively shallow and consist of numerous horst and graben structures. Active geothermal systems are localized along basin margins and horsts within the basins. Northwest-trending zones of extension, such as the Brothers fault zone and the Honey Lakes zone, cut across the northeast basin-and-range trend and developed concurrently with extension. The youngest tectonic feature in the province is a large east-west-trending graben (150 km strike length) associated with Holocene basaltic volcanism.

FILE

Dan Patch
Arizona Gold Mines Inc.
Scottsdale, AZ
ph. 602 / 483-8367

Patch of ~~Copperstone~~ discovery - seller.

Wishes to liquidate his holdings:
Call & set up appointment - also has house in Yuma.

1) La Paz District Gold.
Shear zone up to 40' wide, Goodman Mine on it. See AZ Bur Bull 137, p. 136, & Bull 192, p. 159. Lots of visible gold — does have to sample & know what you have. Jim Guthrie spent much time on property. Haber's ballyhoo, (but didn't do any work so was kicked off — see Payout article). Some drilling. Perhaps ½ mill tons of 0.075 + 2 million of lesser grade. Needs Sampling Plant &/or screen tests for reliable assays. Some water (800 ppm) in shear zone.
2) Southern Cross Lucky Lead w/ Zn, Cu, Ag, Au. (Shipped to ASARCO El Paso). One 3022' drill + others.
3) Bauxite in same area 200,000 tons drilled out.
4) Au, several holes on dioritic contact, near Regnet (Superior)

ASARCO

Southwestern Exploration Division

JDS

December 10, 1987

File Note

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Cyprus Minerals
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COPPERSTONE
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Hand-out from the Reno Conf. Field Trip.

The Copperstone gold deposit is located in an area of flat, dry, sandy terrain with several small knolls about 40 feet high and prominent longitudinal sand dunes. Only 17 outcrops with a total surface area of approximately one acre are exposed. At the southern end of the Copperstone claim block and beyond is exposed an igneous and metamorphic outlier of the Dome Rock Mountains. These rocks include granite, gneiss, schist, quartzite and amphibolite of uncertain age - Precambrian to Jurassic. A low angle fault (detachment?) separates these rocks from an upper plate consisting of a thick sequence of Jurassic age quartz latite welded tuffs (qlt). The upper plate sequence has been affected by weak green schist facics metamorphism in Cretaceous time. This fault probably extends beneath the Copperstone gold deposit, but drilling failed to confirm its presence.

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chalcopyrite and pyrite. Multiple episodes of mineralizing hydrothermal events and brecciation occurred at Copperstone. *

Mineralizing solutions also formed local zones of alteration in and near the ore zones. Bleaching effects are caused by argillization and sericitization. Local secondary gray-green chlorite as wispy veining and minor chalcedonic silicification with small patches of chalcopyrite, pyrite and native gold have been seen. Microscopic examination of a gravity concentrate was made from a floatation concentrate of the ore. About 80 percent of the gold occurs in small flakes ranging between 4 and 40 microns. Coarse gold plates range from 50 to 150 microns. Most gold is free, but a small amount is locked within quartz and iron hydroxides.

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Copperstone is characterized by high barium (×3000 ppm), manganese, uranium and low arsenic, antimony, thallium and mercury. Barite and flourite are most abundant in the extreme southeastern end of the deposit where they occur in massive 4-5 foot veins. Fl 540 ppm Cu 3000 ppm

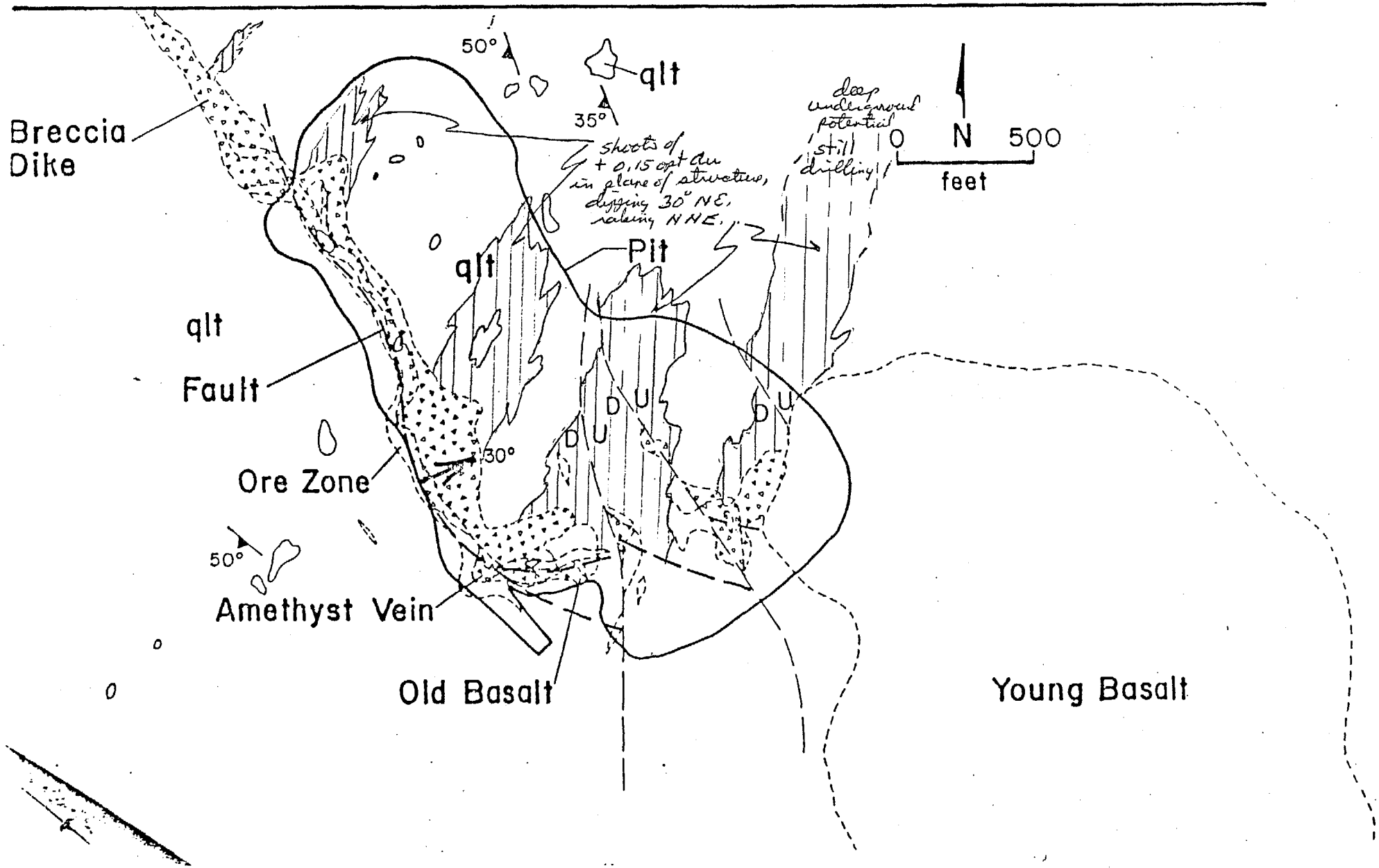
Generally, gold mineralization is sharply defined within the mineralized breccia zone. It markedly decreases over a few tens of feet into hanging wall and footwall rocks where often no gold is detected by atomic absorption analysis. In higher gold grade zones within the deposit, silver values are higher and may provide some recoverable value. Copper ranges up to several percent within the gold zone, mostly as chrysocolla.

* Barton 12/7/87

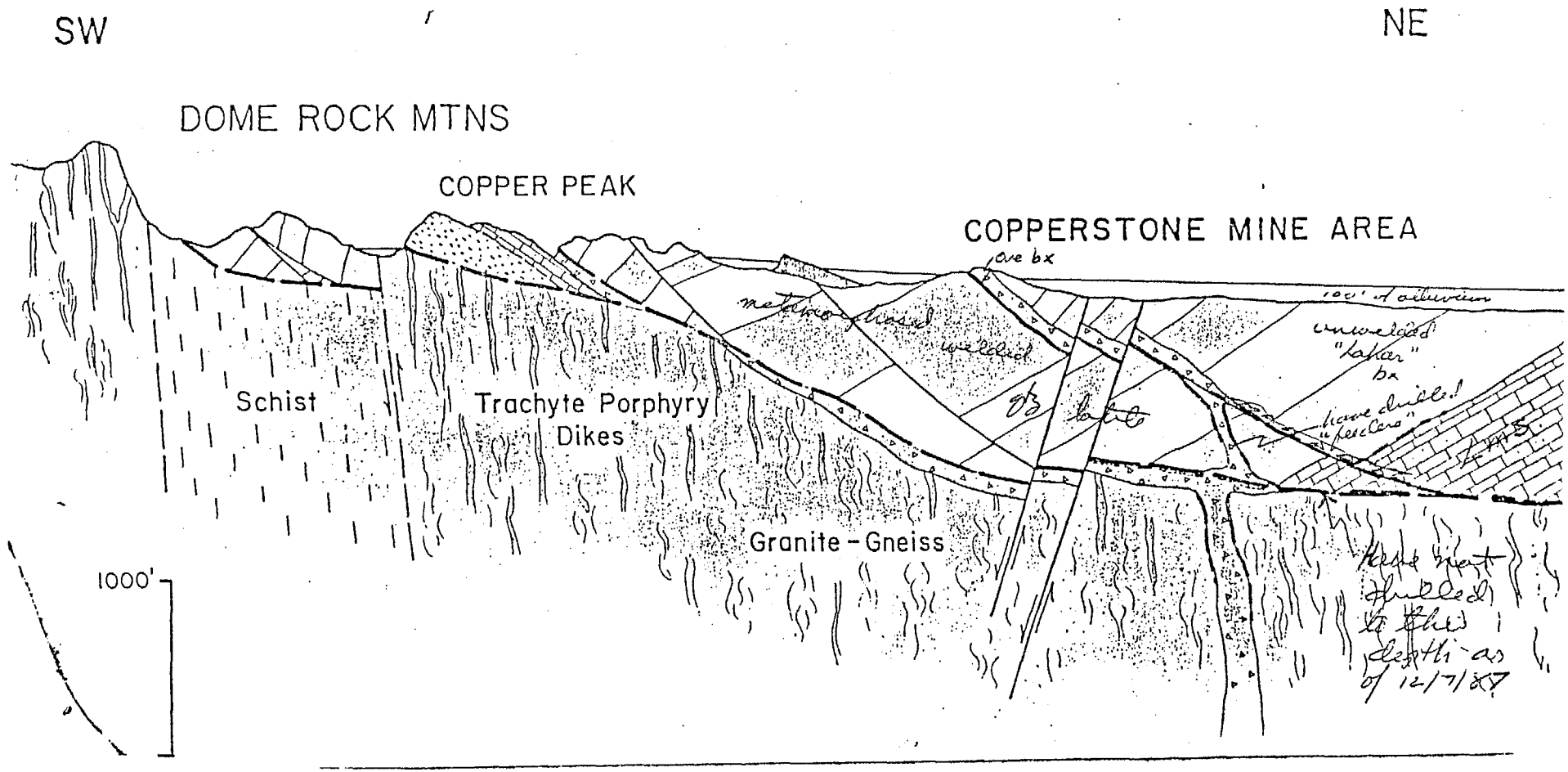
Stages of development of system

1. General cracking of the structural zones, with quartz-adularia, calcite, and hematite veins
2. Brecciation with abundant quartz, amethyst, and minor gold.
3. Rebrecciation by explosive hydrothermal fluids with quartz, pyrite, copper, fluorite, barite, silicification, and specularite with major gold pulse.

SUBSURFACE GEOLOGY



SCHEMATIC GEOLOGIC SECTION



COPPER

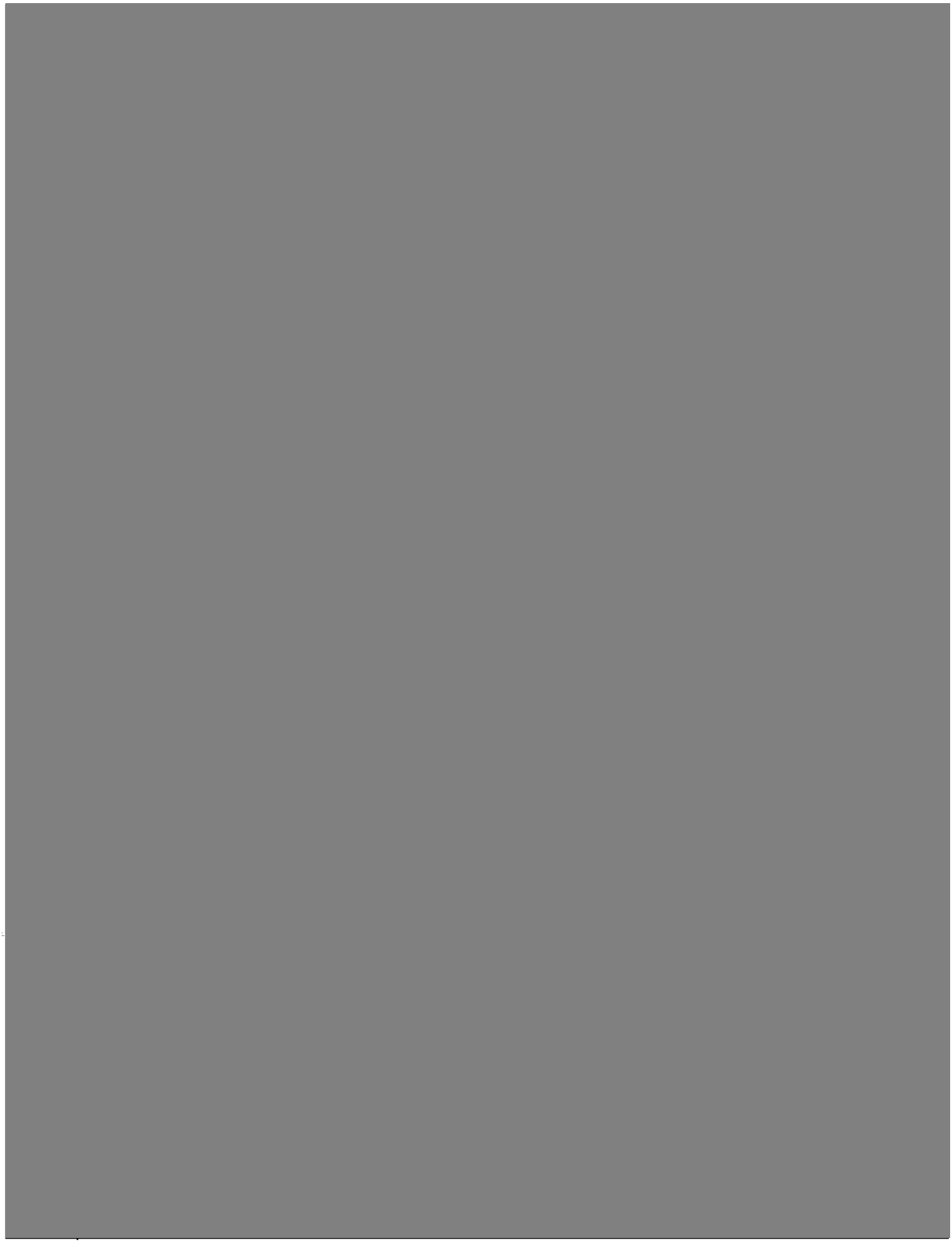
Chino Mining Co.	Smelter, Hurley, NM.	Announced closure of up to 5 weeks beginning in August for a major furnace overhaul as part of a $14 million program to upgrade the 120,000-mt/yr smelter. During the shutdown, concentrates will be sold or stockpiled for treatment when the smelter reopens.
Cox Creek Refining Co.	Refinery and rod mill, Baltimore, MD.	Fired up its wire rod mill in July in a test run. Full production at the 200,000-mt/yr plant is scheduled for September Mitsubishi Metal Corp. of Japan recently purchased a 20% share in the newly formed company by exercising an option held by Southwire Corp., Carollton, GA, a 20% owner of Cox Creek.
Cyprus Minerals Co.	Sierrita Mines, Sahaurita, AZ.	On July 10, revealed plans to increase copper production at its Sierrita Mine by another 15,000 st/yr beginning in September. Currently operating at an annual rate of 80,000 st/yr, the rated capacity of the Sierrita operation is about 110,000 st/yr.
Kennecott Copper Corp. Subsidiary of Standard Oil Co. (Ohio)	Flambeau Deposit, Ladysmith, WI.	On July 20, filed with the Wisconsin Dept. of Natural Resources a notice of intent to mine the Flambeau copper deposit. Plans call for a $15 to $20 million open pit mine that would employ about 35 persons and have a production life of about 5 yr with about 1,000 to 1,500 st/d of ore being shipped to existing concentrators. Grade is estimated to be 3.5% - 4% copper, with some gold and silver values. Kennecott hopes to have the mine operational in 2 yr.

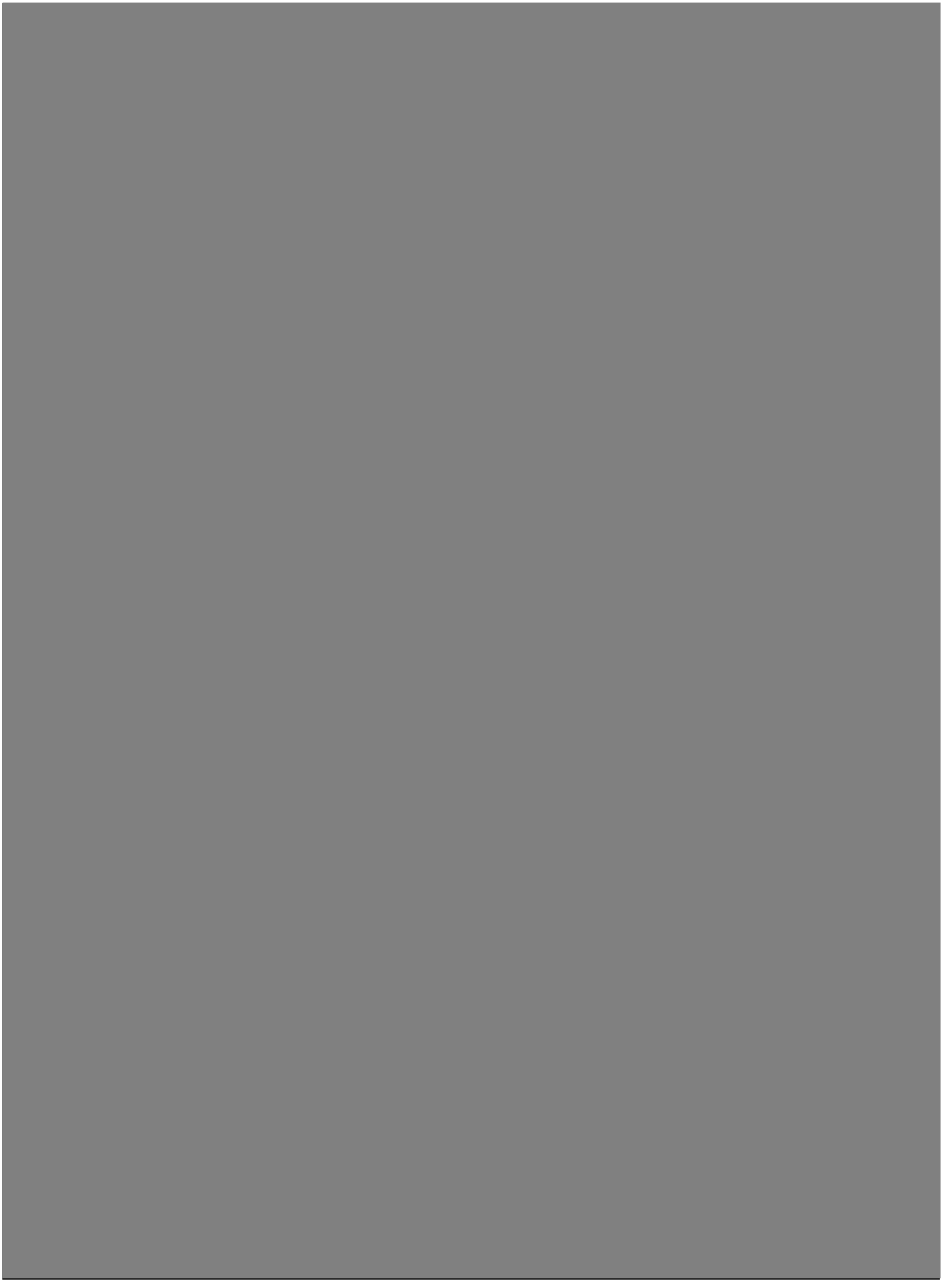
CRUSHED STONE

USX Corp.	Calcite Quarry, Rogers City, MI, Cedarville Quarry Cedarville, MI.	Agreed to sell its Michigan limestone operations to Michigan Mineral Associates, whose principals include 2 former USX employees with extensive knowledge of the operations. Michigan Mineral Associates intends to continue business at the same levels of output with commercial sales under a long-term agreement to USS (USX's steelmaking arm) and other customers. The Calcite Quarry is the 3d largest operation in the U.S. Together, the Calcite Quarry and the Cedarville Quarry operations produce about 10 million st/yr of stone and employ about 350 workers.

GOLD

Amselco Minerals Inc. and Nerco Minerals Co.	Alligator Ridge Mine, White Pine Co., NV.	Partners announced plans to construct a new carbon-in-leach processing plant. The new 1,000 st/d plant, scheduled to begin operation in October 1987, will process carbon-bearing ore for an expected total yield of 70,000 tr oz of gold over the next 3 yr. The mine's existing open pit reserves of oxide ore are expected to be exhausted prior to completion of the new plant built to utilize existing and stockpiled carbonaceous ores.
Cyprus Minerals Co.	Quartzsite, AZ.	Signed a 2½ yr, $18 million contract with Morrison-Knudson Co. Inc. to mine gold ore at its new Cyprus Copperstone Mine. Using a fine grind and agitation leach process, Cyprus Minerals plans to start gold extraction in September. Projected annual output is 60,000 tr oz/yr for 6 yr. Reserves are estimated to be 4.4 million st averaging 0.077 tr oz/st of gold. About 52 contract workers and 36 employees are expected to operate the open pit mine and processing plant.
First Mississippi Corp.	Getchell Mine, Humboldt Co., NV.	Announced plans to proceed with a $70 million program to construct a major open pit gold mine and mill at the Getchell Mine near Winnemucca. The expansion will complement the existing heap leaching operation at the site. Following completion of construction in 1989, annual gold production is expected to be about 170,000 tr oz.
FMC Corp.	Paradise Peak mine, Gabbs, NV and Jerritt Canyon joint venture, Elko Co., NV.	The Chicago-based FMC Corp. spun off its gold producing operations in June, forming a new public company, FMC Gold Co. The parent company is expected to retain a majority of the shares outstanding. FMC Gold Co. produces gold and silver at its new Paradise Peak mine near Gabbs, NV, and the Jerritt Canyon joint venture in Elko County, NV.





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From: John C. Balla June 27

To: Jim Sell

The attached for your general interest and file

John

ARCO Incorporated

JUN 30 1988

SW Exploration

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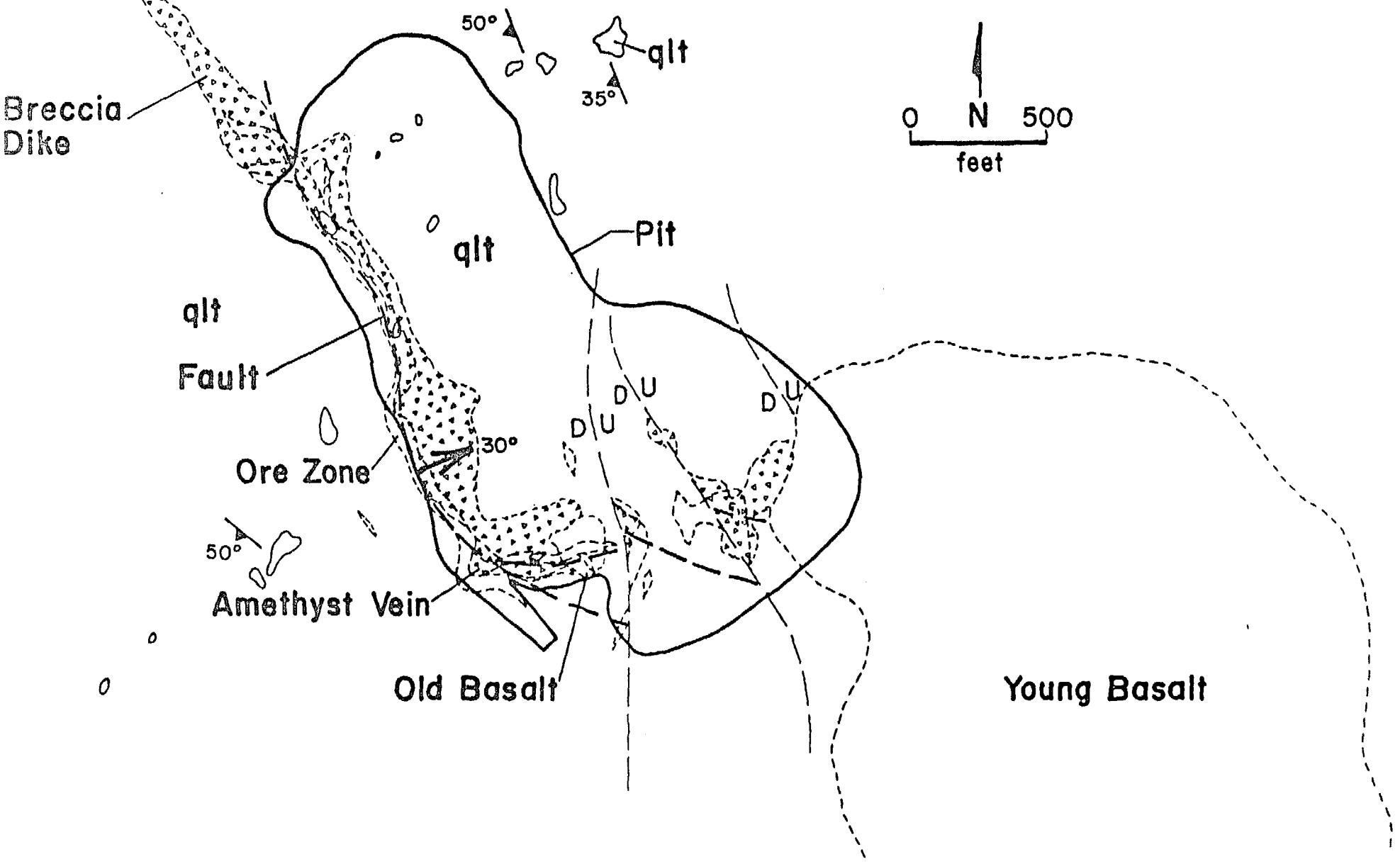

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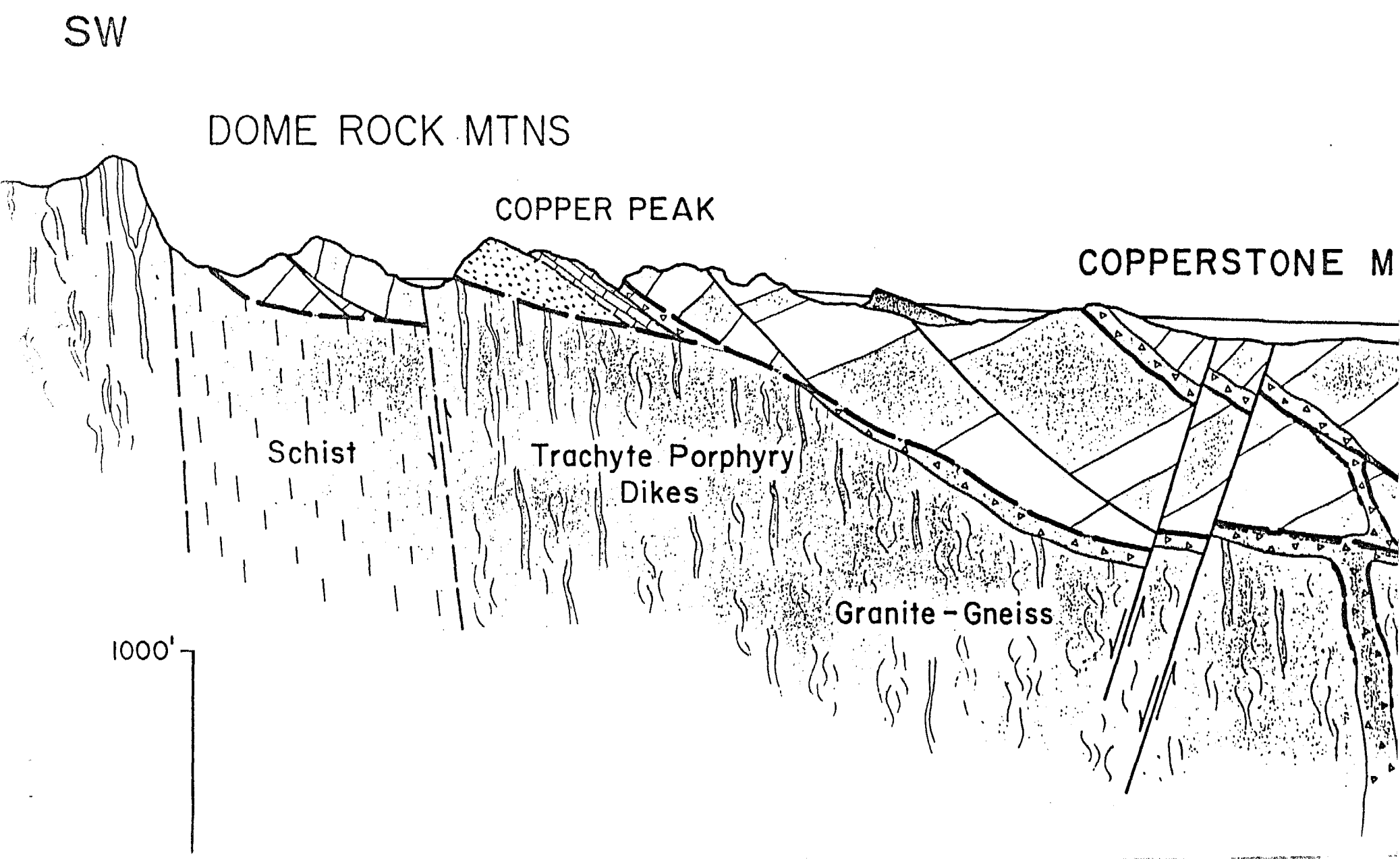

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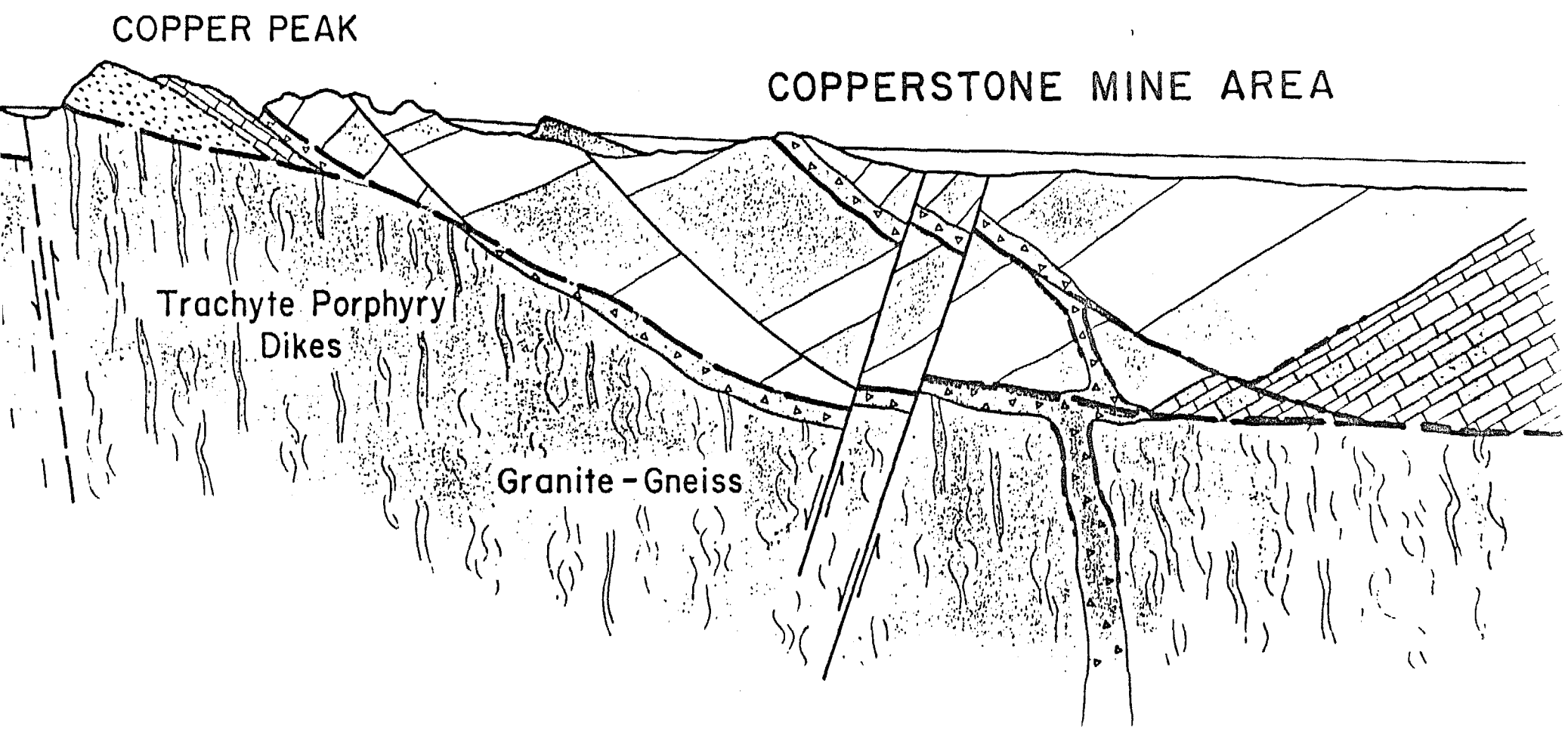


ASARCO

Southwestern Exploration Division

JDS

April 18, 1988

FILE NOTE

AGS 1988 Spring Field Trip
Bighorn, Socorro and
Copperstone Mines
La Paz County, Arizona

An excellent field trip was conducted among the rain squalls on April 17-18, 1988. The trip covered the geology between Wickenburg and Parker, Arizona, with special stops at the Bighorn Mine of Roddy Resources, the Socorro Mine (under option to Can-Ex Resources), and the Copperstone Mine of Cyprus Gold.

Roddy Resources has recently sold out, transferred?, changed their Bighorn property to Belmoral Mines Ltd. The new resident metallurgist (4 months on the job) led the tour and told all on the problems, perhaps unresolvable, for the present tonnage-grade at the Bighorn.

Perry Willard of Can-Ex says that at his BigHorn, i.e., El Tigre, etc. to the west, that Billiton has completed their first round of drilling and was disappointed in that they could not expand the Can-Ex reserves.

Can-Ex is now over at the Socorro Mine looking at the specimen gold in the carbonate section. Still looks iffy for any production. Stan Keith held forth and handed out additional data for his Socorro anomaly.

Copperstone now has a resident geologist and they are down 100 feet and have about half the open-pit ore gone, so are presently detailing for the UG production for continuation.

The inch thick guidebook and the Socorro hand-out by S. Keith are in the library.

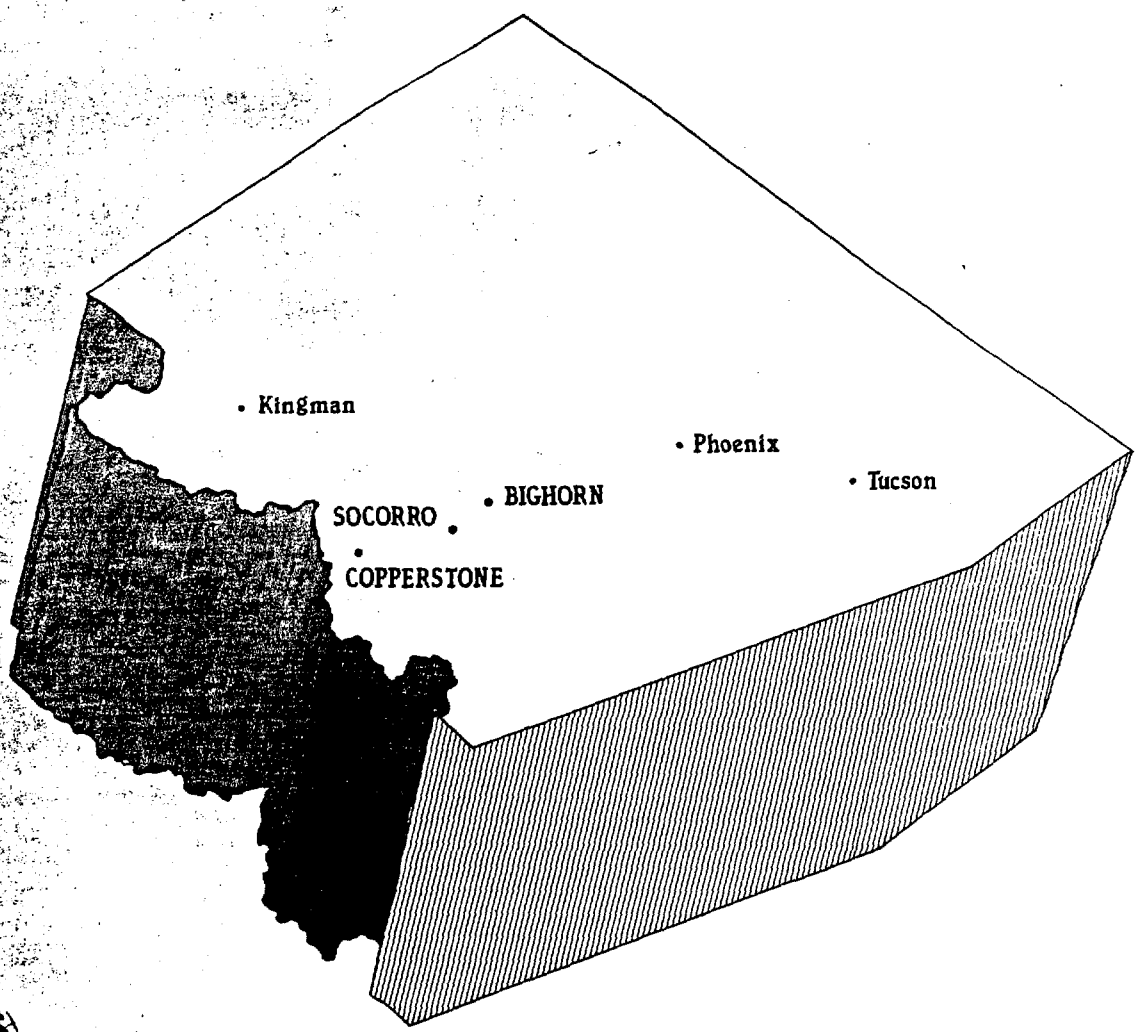
The cover and excerpts are included here for your information.

James D. Sell

JDS:mek
Atts.

cc: F.T. Graybeal
W.L. Kurtz
Staff
Bighorn File
Socorro Mine File
Copperstone Mine File

ARIZONA GEOLOGICAL SOCIETY
SPRING FIELD TRIP 1988



Field Trip to Bighorn Mine, Socorro Mine, and Copperstone Mine, Arizona

Led by, Hugo Dummett and Nora Colburn

ARIZONA
GEOLOGICAL
SOCIETY

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2) AMBROSIA MILL TO SOCORRO MINE.

3) PARKER TO COPPERSTONE MINE.

GUIDEBOOK PAPERS: *

BACKGROUND MATERIALS: *

MAPS:

LIST OF PARTICIPANTS:

* See typed attachment

LIST OF PAPERS

Guidebook Articles

1. A General Comment on FeOx-Gold Deposits and Gold Solubility. (4p.)

2. Conditions of Gold Mineralization in the Detachment Fault Environment, by R. Beane & J. Wilkins, Jr. (7p.)

3. Detailed Geological and Geochemical Investigations of the Socorro Reef Gold Anomaly, by S. Keith. (42p.) plus 12 page handout and geology map.

4. Geology of the Copperstone Gold Deposit, AZ, by G.L. Kelsey (new resident geologist), K. L. Hardy, and W.D. Gurton. (4p.)

Background Material

1. Control of Mineralization by Mesozoic and Cenozoic Low-Angle Structures in West-Central Arizona, by J.E. Spencer and S.J. Reynolds. (4p.)

2. The Crustal Heritage of Silver and Gold Ratios in AZ Ores, by S.R. Titley. (reprint of GSA Bull. v. 99, p. 814-826, 1987, 12 pages)

3. Geology of the Vulture Mine, AZ, by D.C. White. (reprint AIME Preprint 88-44, 6 p.)

4. The Tonopah-Belmont Mine, Maricopa County, AZ, by G.B. Allen & W. Hunt. (Galley Proof of paper in press, 7 p.)

5. Economic Geology of the Big Horn Mountains of West-Central Arizona, by G.B. Allen. (reprint of ABG&MT open-file report 85-17, 140 p.)

INTRODUCTION

On behalf of the Arizona Geological Society, we would like to welcome you to the 1988 Spring Field trip. As most of you know, the trip will include visits to two new gold mines at Bighorn and Copperstone, as well as a visit to the Socorro Mine, which is an important gold prospect.

The selection of Bighorn and Copperstone as two of the mine sites for this field trip has much to do with the fact that they are two of Arizona's newest gold mines - Bighorn will go into production this year, whereas Copperstone went into production late in 1987. They also represent a type of ore deposit and style of mineralization that appears, thus far, to be restricted to western Arizona, southeastern California and northwestern Sonora. In particular, the gold ± silver mineralization is hydrothermal, and is primarily associated with hypogene specularite ± hematite + silica in association with base metals (copper ±zinc ± lead).

The zones of mineralization are hosted by normal faults which may be listric in character, and which appear to be subordinate to larger, regional structures. In some instances the larger structures can be identified as detachments, whereas in some examples such a structural association is difficult to establish.

Two of the papers written for this guidebook by Dick Beane and Tony Kuehn review and discuss the geochemistry of the fluids that may be responsible for emplacing this type of gold mineralization. It is suggested, for example, that these particular fluids are moderately saline and that gold may be transported as a chloride complex. These two characteristics explain why iron is present as an oxide and why the associated minerals are base metals.

By way of contrast, it should be remembered that many of the volcanic-hosted and sediment-hosted gold deposits of Nevada and California are associated with iron sulfides and a suite of elements that commonly include antimony, arsenic and mercury. The fluids associated with these particular deposits are proposed to be dilute with respect to salinity and include gold complexed with sulfur.

These "Sonora-type" deposits then appear to be a distinctive class of gold deposit that exhibit a very strong structural control at their sites of emplacement and mineralization that has been accomplished by fluids that have a restricted and somewhat unique geochemistry.

We hope you all find the mines exciting and enjoy the opportunity to meet with other members of the AGS in a very informal setting.

ACKNOWLEDGEMENTS

As is the case with all functions of the Arizona Geological Society, a great many people have contributed their time and efforts to assist Nora Colburn and myself in our preparations for the field trip.

Firstly, we would like to thank the individuals, that represent the mines that we will be visiting, for making it possible for us to visit their properties;

- at Bighorn, Walter Cullum of Roddy Resources Inc. and Steven Harapiak of Belmoral Mines Ltd;

- at Socorro, Parry Willard of Tri-Con;

- at Copperstone, Bill Burton, Exploration Manager for Cyprus, as well as George Steffens, Mine Manager.

We would also like to thank:

George Allen of Alma American, for his comments and notes, and many discussions about the mineralization at the Bighorn Project, as well as in the Big Horn Mountains;

Stan Keith of Magmachem, for allowing us to use part of his very comprehensive data on, and description of, the mineralization at the Socorro Mine;

Graham Kelsey, Leon Hardy and Bill Burton of Cyprus for their description of the deposit, as well as Graham's willingness to be our tour guide for part of the trip;

Pat Palmer, Ron Palmer and Nora Dummett of Tucson, for arranging the catering of the BBQ at River Island State Park; and also to Pat for assistance with the typing of the drafts of the field trip logs;

Steve Reynolds and Jon Spencer of the Arizona Geological Survey, for maps and a wealth of data on the areas that we will be visiting as part of the trip;

Michael Rounds, with Cyprus' Corporate Communications Group, for making the magnificent color photograph of Copperstone available to the guidebook, and for paying for its duplication;

Jim Sammons of Tucson, for his super art work for the cover of the guidebook;

Don White of Prescott, for his comments and assistance with the description of the Vulture Mine.