CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

PRINTED: 07/30/2001

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: GOODENOUGH

ALTERNATE NAMES:

YAVAPAI COUNTY MILS NUMBER: 139

LOCATION: TOWNSHIP 15 N RANGE 9 W SECTION 20 QUARTER SE
LATITUDE: N 34DEG 37MIN 30SEC LONGITUDE: W 113DEG 13MIN 32SEC
TOPO MAP NAME: BAGDAD - 15 MIN

CURRENT STATUS: DEVEL DEPOSIT

COMMODITY:

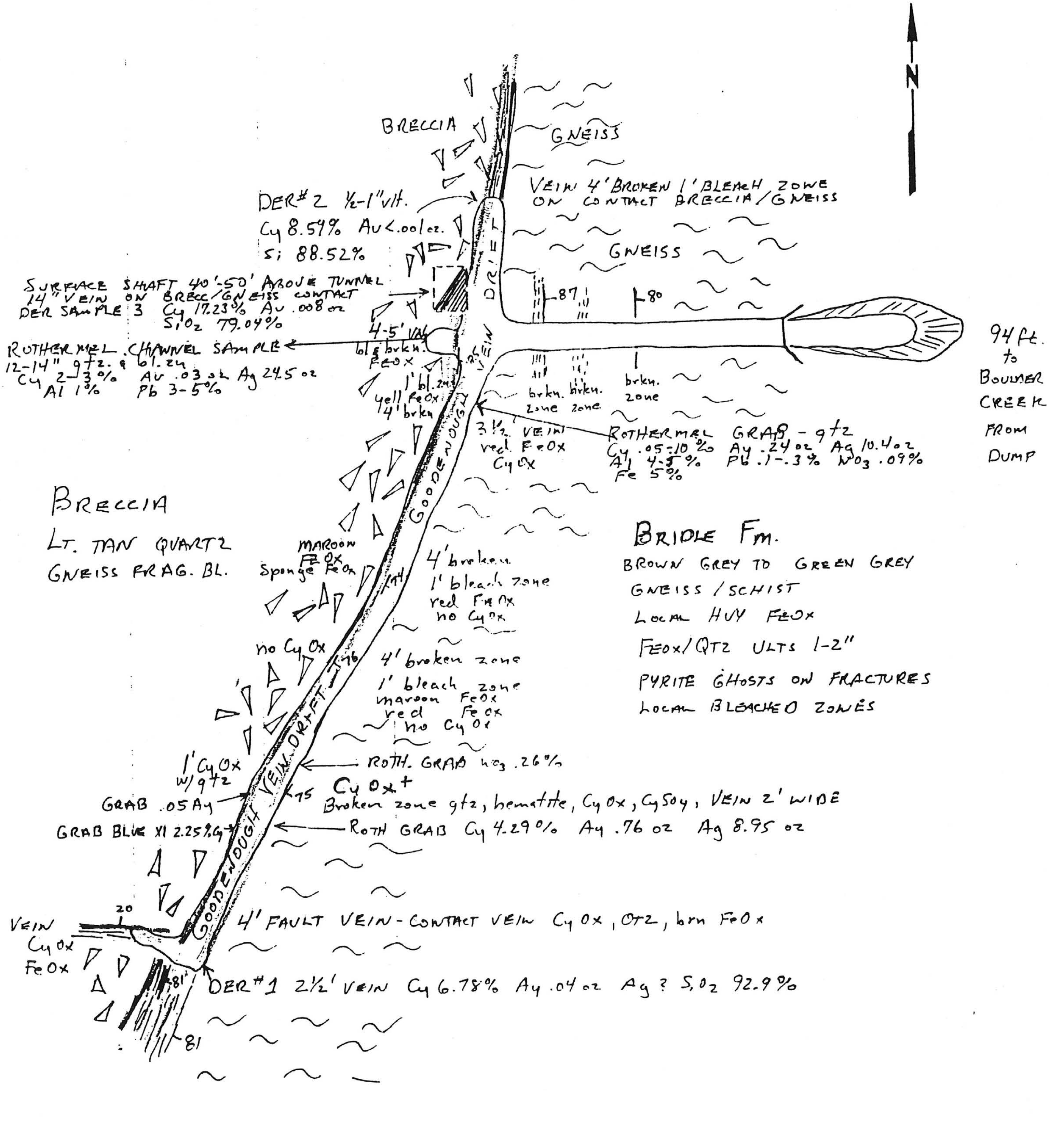
COPPER SULFIDE
COPPER OXIDE
LEAD
ZINC
GOLD
SILVER
ARSENIC

BIBLIOGRAPHY:

ANDERSON, C.A. ETAL. GEOLOGY AND ORE DPSTS OF THE BAGDAD AREA USGS PP 278 1955 P 96
ADMMR GOODENOUGH FILE

BY D.E. Ross DATE 5/4/96 SUBJECT Goodenough Mine SHEET NO. .... OF ....

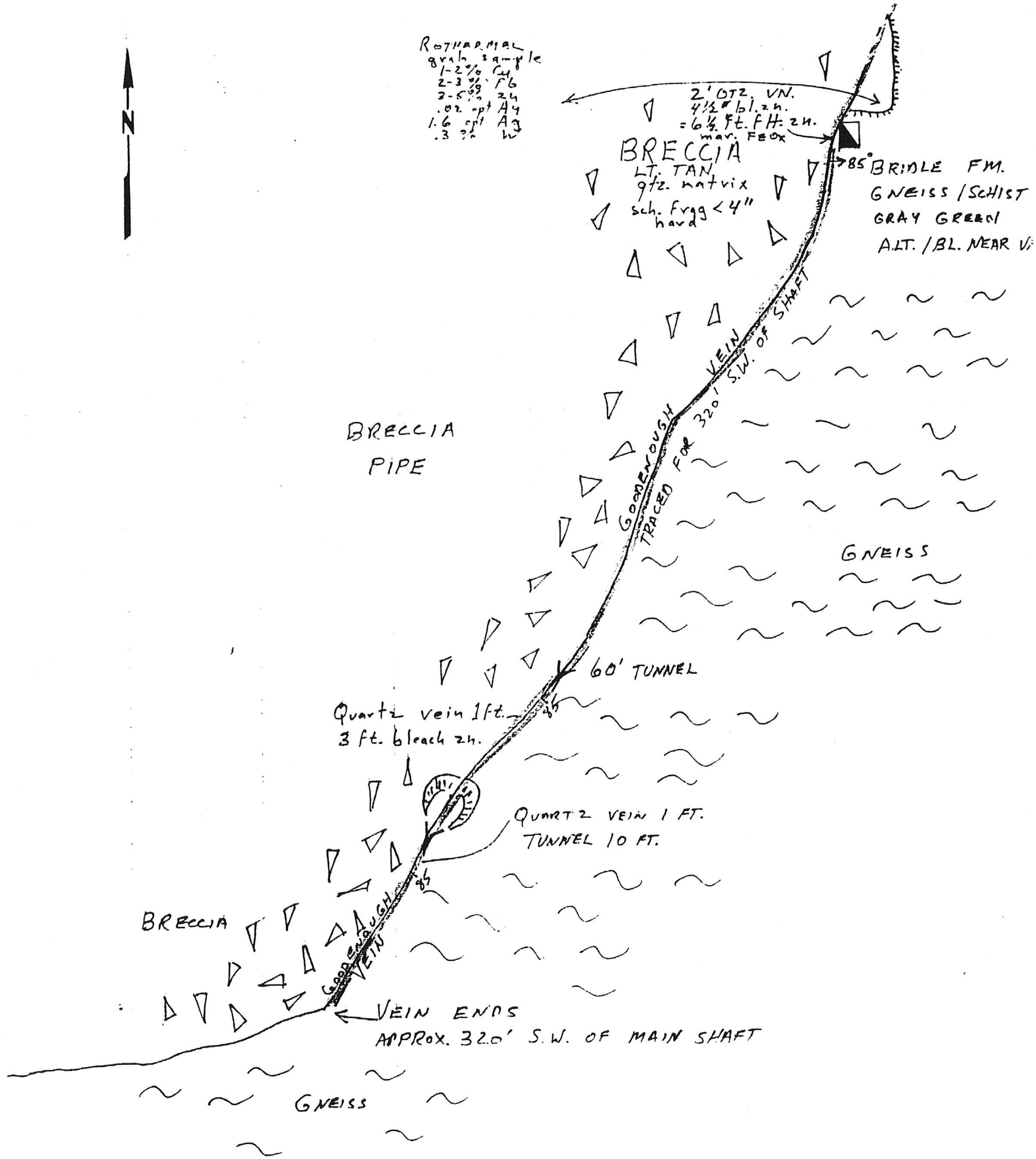
CHKD. BY .... DATE .... Scale 1" = 20' JOB NO. .... Underground Workings



BY D.E. Ross DATE 3/4/96 SUBJECT GOODENOUGH MINE SHEET NO. .... OF ....

CHKD. BY .... DATE .... JOB NO. ....

SCALE 1" = 40' SURFACE WORKINGS



GEOLOGY AND ORE DEPOSITS OF THE BAGDAD AREA, YAVAPAI COUNTY, ARIZONA

By C. A. Anderson, E. A. Scholz, and J. D. Strobell, Jr.

ABSTRACT

The Bagdad area covers 38 square miles in the mountainous region of west-central Arizona. The topography is that of a combination of lava mesas and mountains cut by the deep canyons of Boulder and Copper Creeks.

The oldest rocks in the area have been correlated with the Yavapai series of pre-Cambrian age, which has been subdivided into three formations. One, the Bridle formation, consists of metamorphosed andesitic and basaltic lava flows and intercalated water-deposited tuffaceous beds and terrigenous sediments; the total thickness is more than 3,000 feet. The Bridle formation probably is older than a second formation, the Butte Falls tuff, because rhyolite tuff beds occurring near the base of the Butte Falls tuff are similar to some near the top of the Bridle formation. The Butte Falls tuff is composed of water-deposited sediments of volcanic source, and some beds probably represent accumulations of pyroclastic material; its total thickness is about 2,500 feet. The Butte Falls tuff grades upward into the Hillside mica schist, a unit consisting of metamorphosed sandstone and shale; its total thickness is 3,000 to 4,000 feet.

The three formations of the Yavapai series are intruded by pre-Cambrian igneous rocks of diverse composition. The oldest of the igneous rocks is rhyolite; there are two facies: one, the King Peak rhyolite, is nonporphyritic in texture, whereas the other, the Dick rhyolite, contains quartz phenocrysts. The Dick rhyolite probably is the younger. The rhyolite and the rocks of the Yavapai series are intruded by widespread masses of gabbro and related quartz diorite and diabase. Large masses of alaskite porphyry intrude the gabbro and older rocks in the western half of the Bagdad area. Two facies of alaskite porphyry have been distinguished: one contains a microcrystalline, and the other, a finely phanerocrystalline groundmass. Two belts of rocks adjacent to the Bridle formation have characters which indicate that they are intrusive masses of alaskite porphyry contaminated by partly assimilated rock material derived from the neighboring Bridle formation. The adjacent lava of this formation shows evidence of soaking by alaskitic material but retains some of its volcanic structures, such as amygdules. Small intrusive masses of granular alaskite appear next to one of the gabbro bodies, and some mixed alaskite-gabbro rocks have been formed. Granodiorite gneiss crops out in the northern and eastern parts of the area, and evidence suggests that the gneiss is younger than the gabbro.

The closing episode of pre-Cambrian intrusive activity was marked by the intrusion of granite. Two facies have been distinguished in the Bagdad area. The most widespread, the porphyritic Lawler Peak granite, contains large orthoclase phenocrysts. In the northwest corner of the area these phenocrysts generally show some orientation, which indicates that the partly crystallized magma was subjected to east-west compression, probably regional. The Lawler Peak granite has intimately intruded and soaked many of the older rocks and formed masses of mixed rocks. In local facies of this granite, muscovite is the only mica. The other granite, the fine-grained Cheney Gulch granite, occurs in the southern half of the area as small masses intrusive into the Lawler Peak granite. Both granites are intruded by dikes and masses of aplite-pegmatite. One of the larger masses is exposed for nearly a square mile.

The Grayback Mountain rhyolite tuff rests on an eroded surface of alaskite porphyry and about 500 feet of tuff are exposed. By analogy to the age of similar rocks elsewhere in Arizona, the age of this tuff is probably Late Cretaceous or early Tertiary. The tuff is intruded by rhyolite dikes that are in turn, intruded by quartz monzonite, probably of Late Cretaceous or early Tertiary age. The quartz monzonite crops out in a series of stocks and plugs; the largest stock at Bagdad is mineralized with copper and contains the ore body of the Bagdad mine. The dikes of diorite porphyry and quartz monzonite porphyry are younger than the quartz monzonite.

During the Pliocene and Pleistocene, a surface of considerable relief was partly buried by the Gila(?) conglomerate and intercalated basalt flows. These flows have been divided into two formations. The older is the Wilder formation that includes some volcanic cones, intrusive plugs, and basaltic tuff, and the younger is the Sanders basalt that caps the present mesas; to the south the basalt is separated from much of the underlying Gila(?) conglomerate by a bed of rhyolite tuff.

The structure of the rocks of the Yavapai series is interpreted as a syncline, and in the southern part of the area the western limb is overturned. The folded structures were faulted and igneous rocks were intruded along the faults, indicating that folding and faulting of the Yavapai series took place before the pre-Cambrian igneous intrusive activity.

The effect of thermal metamorphism is found in rocks adjacent to the Lawler Peak granite, whereas dynamic metamorphism locally has caused foliation of all the pre-Cambrian rocks except the Cheney Gulch granite and the aplite-pegmatite. The history of metamorphism was long and varied, although most of the effects of metamorphism that were observed probably originated during the emplacement of the Lawler Peak granite. Foliation is generally parallel to the bedding in the rocks of the Yavapai series. Lineation was observed, but the relationship of lineation to the major fold axes is in doubt. The grade of metamorphism ranges from the low-grade chlorite zone to the high-grade sillimanite zone.

One or possibly two periods of faulting preceded the intrusion of the pre-Cambrian igneous rocks. Two or probably three periods of faulting succeeded the emplacement of the pre-Cambrian Lawler Peak granite. The faults younger than this granite

in crossing the mesas; the other possibility is that a tributary of Copper Creek by headward erosion captured the headwaters of Butte Creek, and faulting of the mesa started this rapid headward erosion. Boulder Creek in its west course in the northern part of the area may have had its course determined by the southern margin of the lava flows and sediments along the older valley wall. The southern course between the Bozarth and Hillside faults may have been determined by the zone of faulting; a graben was formed and Boulder Creek cut down through the block west of the Bozarth fault as rapidly as faulting occurred. The western course of Boulder Creek could have been superimposed from the sedimentary cover on the Sanders basalt.

The tributaries to these major streams have steep gradients where they flow in deep canyons in their lower courses, but the gradients and the relief are lower in their headwaters. The same statement is true for the headwaters of Copper and Bridle Creeks; but rejuvenation of the upper courses will occur in future geologic time.

Terrace remnants and boxlike inner gorges, 40 to 50 feet deep, show that there has been recent rejuvenation along the major canyons except along the lower course of Boulder Creek, which has temporarily reached grade and is filled with alluvial material for a maximum width of 1,200 feet. Possibly graded condition has been reached here, because Boulder Creek is crossing an old canyon filled with soft sediments.

ORE DEPOSITS

HISTORY AND PRODUCTION

The name of John Lawler is closely associated with the early history of mining in the Bagdad area. Mr. Lawler started locating claims in 1880 and, either through location or purchase, acquired complete or part ownership of most of the favorable mineralized ground. He was one of the organizers of the Eureka Mining district, formed August 16, 1884; the Bagdad area is a part of this district.

The earliest mining operations were confined to the Hillside mine, located on March 11, 1887 by John Lawler and B. T. Riggs, who shipped oxidized gold-silver-lead ore on June 29, 1887 by pack train to Wilders Camp, 18 miles distant, and from there by wagons to Prescott, Ariz., where it was sold to the Arizona Sampling Works. The ore was then shipped to El Paso, Tex., for smelting. The first shipment, of 4,006 pounds, contained 3.15 ounces of gold per ton, 193.35 ounces of silver per ton, and 11.7 percent of lead and yielded a net return of $408.49 or $203.94 per ton.[2] By the end of October, 1887, 38 tons of ore had been shipped for a net profit of $4,214.53 or $110.90 per ton. A road was built to Camp Wood, where a sawmill was constructed to obtain mine timber. Beginning on November 26, 1887, the ore was hauled by wagon via Camp Wood to Garland, 84 miles from the mine. Garland was a shipping point on the Prescott and Arizona Central Railroad that formerly connected Prescott with Seligman, Ariz. This railroad, long since abandoned, connected with the Atlantic and Pacific Railroad at Seligman. Beginning November 15, 1888, the ore was shipped by way of Seligman to many smelters in the Western States.

The Atcheson, Topeka, and Santa Fe Railway Co., successors to the Atlantic and Pacific Railroad, constructed a branch line from Ash Fork to Phoenix, and, by 1896, a road was built from the Hillside mine to Hillside station on this branch line, a distance of only 34 miles. The first shipment of ore from the Hillside mine via Hillside station was made on March 26, 1896, and all subsequent shipments from all the mines in the area have been made via Hillside Station.

The Comstock claims (fig. 7) south of the Hillside mine, was located in 1892, and the adjacent Dexter claim was located in 1896. Oxidized gold and silver ore was mined from the two claims before 1901, and a small stamp mill was operated until sulfide ore was reached on lower levels.

Until 1917, the only metals mined in the Bagdad area were gold and silver and associated lead and copper. The Hillside mine had produced most of the ore, and the records are incomplete for other sources of ore, except for small shipments from the Cowboy mine, starting in 1911, and from the Stukey claims in 1916. During this period of gold mining the Old Camp Mining and Milling Co. in 1907 started an extensive exploration for gold in the area where small quartz veins crop out east of King Peak. The company drove 3 adits and patented 13 claims, but no ore was shipped, and title to the claims eventually passed to the State of Arizona, because of delinquent taxes.

The copper minerals on the Bagdad and adjacent claims were recognized as early as 1882, when the first claims were located, but little exploration for copper was done until 1906, when the E. M. Bray Trust Co. purchased 8 patented and 12 unpatented claims. This company and its successors carried on an exploration program that continued intermittently until 1929, when the first copper ore was mined. The first exploration, started in 1906, consisted of driving a number of adits and demonstrated that the copper deposit is of the disseminated type. In 1909 churn drilling was begun and was carried on intermittently until 1928.

During World War I, mining activity was largely limited to the Copper King mine, which became an

[2] For information on the early history of the Hillside mine, the writers are indebted to Homer R. Wood of Prescott, Ariz.

ıat formed channels for the introduction of the hy-rothermal solutions. The intimate association of the ılfides pyrite and chalcopyrite with the other hydro-ıermal minerals is proof enough that the metallization f the quartz monzonite stock was done by the hydro ıermal solutions rising from an underlying magmatic eservoir. As to the time of metallization (and altera-on) in relation to the time of intrusion of the satel-te dikes of diorite porphyry and quartz monzonite orphyry, no direct evidence is available, because none f these dikes cut the metallized quartz monzonite in ıe Bagdad mine where direct observation can be made. ı the southwestern exposures of the quartz monzonite est of the confluence of Mineral and Copper Creeks ocal intense alteration of the several quartz monzonite orphyry dikes suggests at least part of the hydro-ıermal activity occurred after intrusion of the dikes f quartz monzonite porphyry.

South of the Bagdad mine, particularly in the region f the Stukey mine, quartz veins bearing galena, phalerite, and chalcopyrite cut dikes of quartz monzo-ite porphyry. Locally these veins parallel the dikes, rossing from one margin to the other, which suggests ıat the forces that opened the fractures occupied by ıe dikes continued to operate, forming new openings ıat are occupied by the veins.

In the Copper King mine a dike of diorite porphyry ccurs in one of the massive-sulfide lenses in the orthern part of the mine. Scholz made many observa-ons on new faces of workings during the mining of this re body and found conclusive evidence that the ıassive-sulfide lens is younger than the dike of diorite orphyry, and in places, the dike has been partly re-laced by sulfide. Clear-cut veinlike bodies of massive ılfide penetrate the dike, locally grading into the dike. yrite bands in the ore are common adjacent to the ike and parallel the contact of the dike and sulfide lens. imilar relations are present where inclusions of the ridle formation are left in the ore. Chilled selvages ı the dike rock are absent adjacent to the massive-ılfide, whereas chilled selvages are common where the ikes intrude older rocks. This age relationship of ıe Copper King massive-sulfide to the diorite porphyry ike of Late Cretaceous(?) or early Tertiary(?) age is nportant because the massive-sulfide deposits in the erome area [3] are undoubtedly pre-Cambrian.

The breccia pipes, in part, are younger than the quartz ıonzonite, particularly the Black Mesa pipe, which ıows the best sulfide mineralization; this would imply ıat the metallization in the breccia pipes is, generally elated to solutions younger than the quartz monzonite.

The Goodenough vein, cutting the rhyolite breccia plug on the west side of Boulder Creek, south of the Hillside mine, is similar to the Hillside vein, and is definitely younger than the rhyolite. On underground maps of the Hillside mine a "rhyolite" dike is shown on the north end of the 900-foot level, filled with water in 1945, and the Hillside vein is shown definitely cutting the dike. Quartz monzonite porphyry dikes crop out to the north of the Hillside mine, which implies that the "rhyolite" dike on the 900-foot level is, in reality, one of the quartz monzonite porphyry dikes dating the Hillside vein as younger than the quartz monzonite porphyry.

Some of this evidence may not be conclusive but the sum total of the evidence amounts to geologic proof that all the copper-lead-zinc mineralization is related and younger than the quartz monzonite. The deposi-tion of the metals probably took place shortly after the intrusion of the quartz monzonite, for no other igneous bodies are present that could have been sources of the hydrothermal solutions bearing metals; this last fact would date the mineralization as Cretaceous or early Tertiary, if the tentative assignment of the Grayback Mountain rhyolite tuff to this interval of geologic time is accepted. Certainly this mineralization is younger than pre-Cambrian.

The Bagdad mineralization is similar to the Bingham Canyon mineralization, where copper ore was deposited in the stock and silver, lead, and zinc were deposited in the intruded rock. Butler (1920, p. 361) has sug-gested that highly heated solutions deposited the copper and that less highly heated solutions deposited the silver, lead, and zinc. On this assumption, the sphaler-ite and galena occurrences in the Bagdad mine may have been deposited later than most of the copper minerals.

The wolframite-bearing veins along Boulder Creek undoubtedly are associated with intrusion of the Lawler Peak granite for traces of wolframite are found in quartz-rich facies of the pegmatites and beryl is a common accessory mineral in many of the pegmatites. Furthermore no beryl or wolframite have been found in any of the other mineral deposits of the area. The wolframite mineralization is concluded to be pre-Cambrian. Several barren quartz veins 2–3 feet wide and striking east crop out south of Sanders Mesa, cutting the pre-Cambrian complex and one of these veins is cut by a dike of quartz monzonite porphyry. Southwest of the Copper King mine, small quartz-tourmaline veins are found, particularly in the alaskite. These nonmetallized veins may also be pre-Cambrian and related to the Lawler Peak granite or alaskite porphyry.

[3] Anderson, C. A., and Creasey, S. C.: Geology and ore deposits of the Jerome area, avapai County, Arizona: (In preparation.)

west ore body and the block to the northeast (fig. 22). A study of the sections through the ore body (figs. 17, 18, 19, 20) indicates that the marked irregularities in the thickness of the chalcocite zone demand close spacing of churn-drill holes or other exploratory openings before an accurate estimate can be made as to tonnage and grade. A considerable part of the original reserve of 6,000,000 tons as estimated by Whitaker and Schlereth was mined by 1946, and also some ore around the glory hole that was not included in their estimate. Considerable diamond drilling has been done since 1945 to block out ore for the open-pit operations, and Dickie and others (1953, p. 89) reported that the reserves total 30,000,000 tons of sulfide ore, averaging 0.754 percent total copper, and 30,000,000 tons of oxide copper ore, averaging 0.435 percent copper.

Based on the data from the many exploratory churn-drill holes and from several adits, appreciable tonnages of indicated and inferred ore are estimated to be present and are of sufficient copper content that continued mining can be predicted if prices for copper are favorable.

HILLSIDE MINE

The Hillside mine is a gold-silver-zinc-lead vein deposit located on Boulder Creek a little more than 3 miles north of Bagdad and east of Bozarth Mesa. The vein is a typical fissure vein, and, considering its narrow width, has remarkable continuity.

The Hillside mine started producing ore in 1887, after the location of the Hillside and Seven Stars claims by John Lawler and B. T. Riggs on March 11, 1887. Later that same spring, they located 4 adjacent claims and they were granted a patent on the 6 claims, February 6, 1892.

The Hillside mine was sold in June 1890, for $450,000 to H. H. Warner, who organized the Seven Stars Mining Co. During the next 2 years more than $100,000 worth of ore was mined and shipped. In 1892, the Seven Stars Mining Co. became delinquent in their payments, only $100,000 having been advanced on the purchase price, and after a long period of litigation, the title was restored to John Lawler and his partners in 1904.

From 1904 to 1914 lessees worked the Hillside mine, concentrating on development work so that 11,000 feet of workings had been driven when the mine was purchased in 1934 by the Hillside Mines, Inc. A concentrator with a capacity of 125 tons per day was built to mill the sulfide ores, and in 1937 additions to the flotation section of the mill provided for the separation of zinc and lead. In 1940 the Boulder Mining Co. took over from the Hillside Mines, Inc., on lease and option to purchase and operated the mine and mill until January 1942, when the mine closed because of financial difficulties.

The ownership reverted to the State of Arizona until it was purchased in 1944 by the East Vulture Mining Co. at a tax sale and transferred to the Hillside Mining and Milling Co., the present owners and operators. The mine was dewatered, the shaft rehabilitated, and the lower levels of the mine were opened in 1946 and 1947. From 1948 to 1950, ore from the lower levels was mined and milled, and production ranged from 500 to 1,800 tons per month. Mining stopped in 1951, owing in part to the difficulties in mining the heavy wet ore on the lower levels.

A 100-ton flotation mill was built on the property in 1946 to treat custom ore as well as ore from the Hillside mine. After the closing of the mine in 1951, the mill continued to operate as a custom mill. Water is stored in the Hillside mine for mill use in dry seasons when Boulder Creek is dry. In 1951, a 300-ton gravity concentrator unit was added to the mill to handle custom tungsten ore.

Total production to the end of 1951 (table 8) had a value of $3,541,440; about half of the value is in gold, and a quarter of the value in silver. Lead is an important recoverable metal, and zinc has become of considerable importance since 1937 when a unit was installed in the mill for its recovery. Table 8 shows that copper has been a relatively minor metal; only 398,813 pounds were recovered, having a value of $46,614.

More than 16,000 feet of underground workings have been driven along the vein at different levels; a composite map showing the underground workings as of 1942 and a longitudinal projection are shown on plate 6. The shaft connects with the 200-foot level at the surface and is 765 feet deep to the 1000-foot level. The vein was worked for 2,400 feet along the strike and stoped almost solidly above the 700-foot level for an average length of 2,000 feet. Cut-and-fill stoping methods were used in mining the ore on the lower levels, but shrinkage-stoping methods were used above the water level.

The main Hillside vein has a N. 10° W. strike at the south end of the mine and changes to a N. 25° E. strike at the north end. The dip is not uniform but averages between 75°–80° in a westerly direction. Faulting before and after mineralization has been important. The main vein and several branches occupy a zone of faults antedating the veins, and sufficient movement along the faults occurred after mineralization to form a 3-foot zone of gouge and fault breccia in which unbrecciated vein material is found as irregular veinlets. Branching veins appear on both sides of the main vein and those to the east in general dip west

AMC
↓
Mine
File

ASA AIPG AIME AZ CA ID

(602) 992-0758
FAX (602) 482-3220

Donald E. Ross, R.P.G., A.S.A.

REGISTERED PROFESSIONAL GEOLOGIST
CERTIFIED SENIOR PROFESSIONAL APPRAISER

Mine Appraisal Expert Testimony

2226 E. Sunnyside Drive • Phoenix, AZ 85028

PRELIMINARY GEOLOGIC INVESTIGATION - GOODENOUGH MINE

by
Donald E. Ross

for
John Rothermel

Scope

John Rothermel requested that I inspect the Goodenough mine for the purpose of determining if profitable mining was possible on this small vein deposit. Specifically, the assignment was to map the vein to the south and to sample the vein in the main underground workings.

Introduction

The Goodenough mine main workings consist of a tunnel and shaft about 100 feet west of the thalweg of Boulder Creek. The workings are not accessible by road; they are reached by hiking up Boulder Creek for about one-half mile. The closest access by vehicle is directly below the "Blue Palace" or the Bagdad mine shops building via a road into Boulder Creek. Probably the best road route to the Goodeneough mine would be down Butte Creek from the Hillside mine road into Boulder Creek. Boulder Creek Canyon is formidable, it is about 1000 feet deep. The best possible road route is from the southeast side of Boulder Canyon where the slope is more gradual.

This claim was worked by John Lawler who hauled the ore out by mule. The patented Goodenough claim was sold to John Rothermel by the Lawler family after the death of John Lawler.

The high silica content of the mineralization indicated that this material might be suitable for flux in the copper smelters.

General Geology

The most prominent geologic feature in the area is a breccia pipe that is resistant to weathering and forms a prominent plug standing 200-300 feet above Boulder Creek. The host rock is the Bridle formation which is a member of the Precambrian Yavapai schist. The Bridle formation in the area of the mine is a green gray or brownish gray gneiss - schist unit. The Goodenough vein is on a fault contact between the light colored breccia pipe and the dark colored Brindle formation.

Mineralization

The mineralized vein is located on the contact of the breccia and gneiss and it pinches and swells from 1 foot to 4 feet wide. It is a quartz flooded bleachead zone contained in a broken fault zone. The fault zone measures 4 to 6 feet in width. At the end of the south drift of the main underground workings the vein intersects another structure and copper values increase dramatically from 2% to 7%. A 2.5 foot channel sample at the end of the south drift ran 6.78% copper, .04oz. gold and 92.9% silica; this is the best exposure of copper mineralization on the property. Chalcanthite bloom can be seen on the walls of the south end drift.

A 14 inch wide surface channel sample of the vein near the main shaft, located about 40-50 feet above the main underground workings, ran 17.23% copper, .008 oz. gold and 79.04% silica. This outcrop is about 100 feet north and 50 feet above the 2 1/2 feet wide exposure at the end of the south drift that ran 6.78% copper and 92.9% silica. Also, additional copper mineralization at the end of the south drift indicated an area of about 10 feet wide that was rich in silica and copper. Correlating the outcrop of the vein at the shaft of 14 inches with the mineral at the end of the south drift yields an area over 100 feet long, a vein width of 14 inches to 10 feet and a depth of over 50 feet. This material could be mined from the surface and the cost of mining would be proportional to the amount of ore relative the amount of waste or the stripping ratio. If 6 feet of vein can be mined, the stripping ratio would be about 5:1 using a depth of 55 feet. If 25 feet depth were used the stripping ratio would be 2:1, waste to ore. The determination of ore depends on profitability and that depends on grade, tonnage and access.

Conclusions/Recommendations

1) Construct a dozer road from the Hillside road or from the Bagdad mine shop building down the east side of Butte Creek to Boulder Creek across from the Goodenough main tunnel. A pad should be made on the east side of Boulder

Creek to store coarse ore. A road exists on the east side of Butte Creek but it was washed out where it joined the Boulder Creek road; to prevent this from happening in the future the road should stay east of Butte Creek.

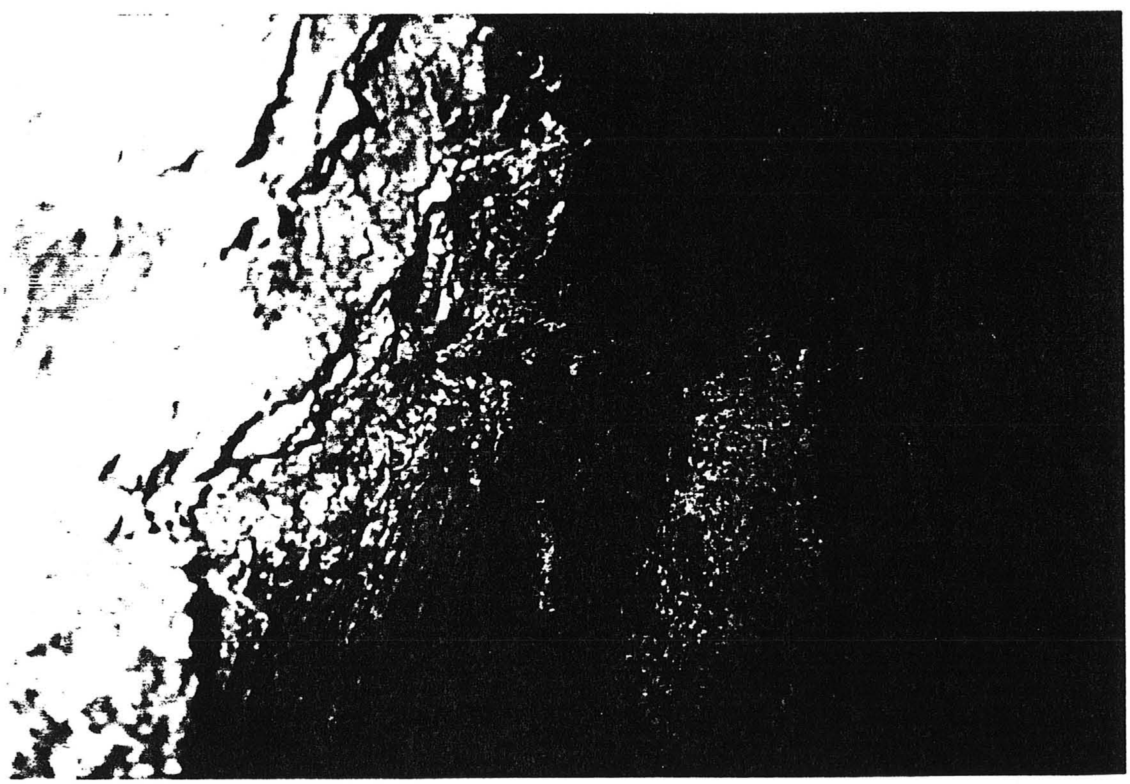
2) Create a pad on the west side of Boulder Creek near the main workings to provide a working area.

3) Drill and sample the south and north legs of the vein and assay for copper, gold, silver and silica content. The goal would be to maintain a minimum grade of 5% copper, .04% gold and 85% to 90% silica.

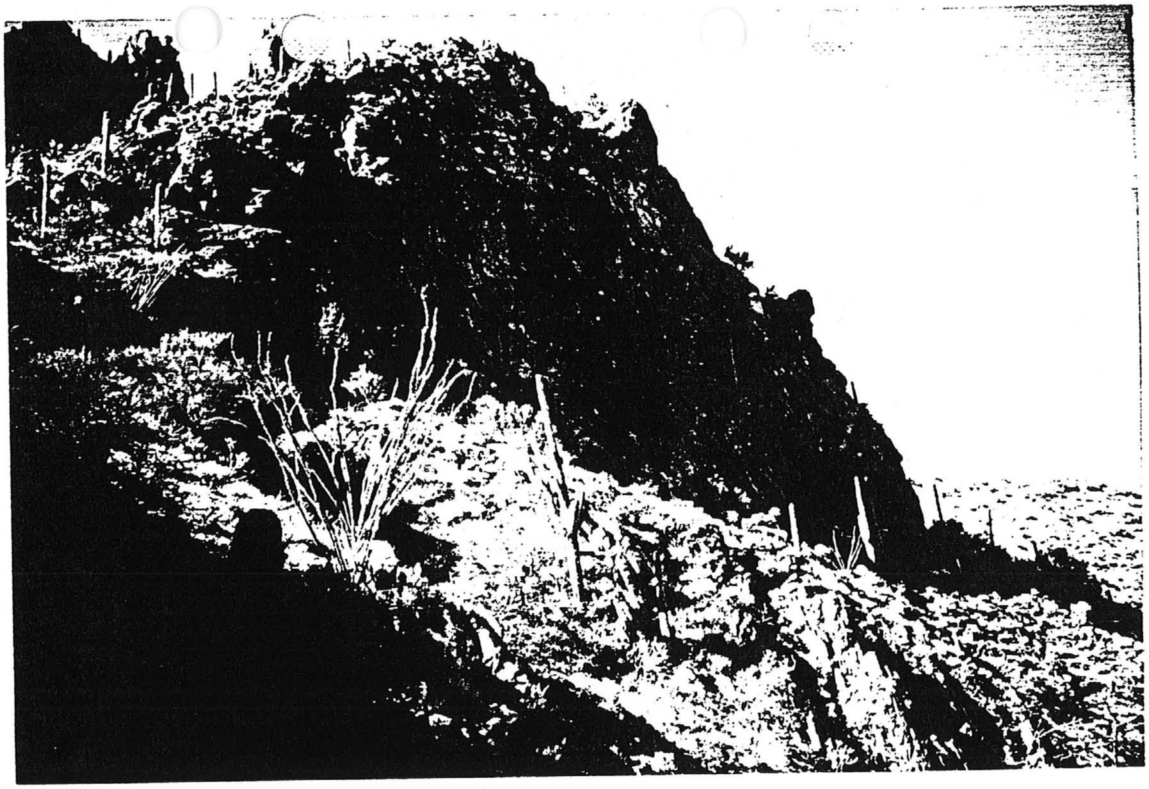
4) Investigate trucking costs to the copper smelters in terms of cost per ton or cost per ton per mile.

Remember! the smelter will refuse to accept material if it does not meet their specifications of 85% to 90% silica. They will make you remove it from their premises at your cost if it is not up to par.

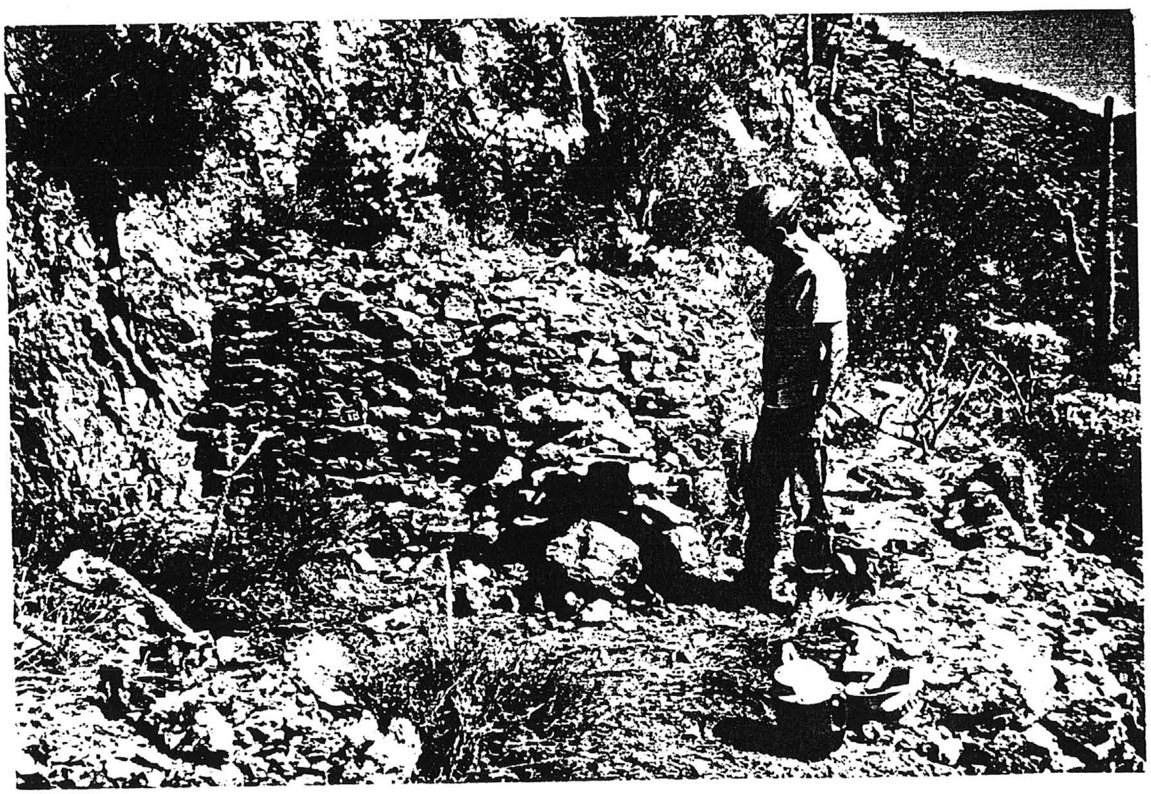
LOOKING SOUTH TOWARD THE END OF THE SOUTH DRIFT



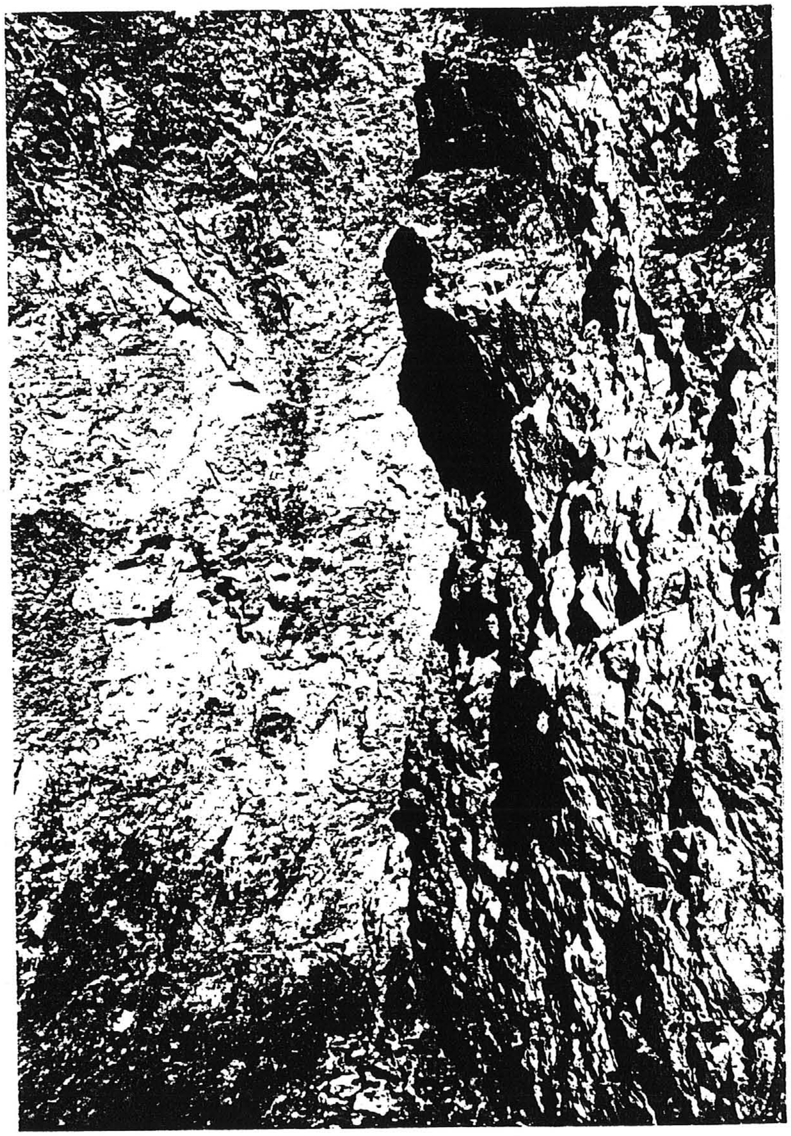
CHALCANTHITE BLOOM IN THE SOUTH DRIFT



THE BRECCIA PIPE NEAR THE GOODENOUGH MINE
FORMING A WEATHER RESISTENT KNOB



THE "ORE" PILE NEAR THE SHAFT ABOVE THE MAIN TUNNEL



THE 14 INCH VEIN NEAR THE SHAFT BETWEEN BRECCIA ON THE LEFT
AND BRIDLE FORMATION ON THE RIGHT

D:\FILES\WP51\GOOD3-96