



## **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](mailto:inquiries@azgs.az.gov)

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PRINTED: 11/21/2002

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: ANITA

ALTERNATE NAMES:

RUBY  
ANITA COPPER  
EMERALD  
TEL STAR  
ARIZ. GRANT

COCONINO COUNTY MILS NUMBER: 4

LOCATION: TOWNSHIP 29 N RANGE 2 E SECTION 29 QUARTER NW  
LATITUDE: N 35DEG 52MIN 28SEC LONGITUDE: W 112DEG 12MIN 05SEC  
TOPO MAP NAME: RED BUTTE SW - 7.5 MIN

CURRENT STATUS: PAST PRODUCER

COMMODITY:

COPPER OXIDE  
IRON HEMATITE  
IRON GOETHITE  
CALCIUM DOLOMITE  
GERMANIUM

BIBLIOGRAPHY:

ADMMR ANITA MINE FILE  
US-AEC PRELIM. RPT. 172-479, P. 58  
WAESCHE, H.H., GRAND CANYON NATURE NOTES,  
VOL. 7, NO. 11, P. 108  
US-AEC RPT HAS WRONG LOCATION - 7-T29N-R1E  
SOME PROSPECTS IN SEC.20 SW ALSO

07/31/87

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES FILE DATA

PRIMARY NAME: ANITA

ALTERNATE NAMES:

RUBY  
ANITA COPPER  
EMERALD  
TEL STAR  
ARIZ. GRANT

COCONINO COUNTY MILS NUMBER: 4

LOCATION: TOWNSHIP 29 N RANGE 2 E SECTION 29 QUARTER NW  
LATITUDE: N 35DEG 51MIN 40SEC LONGITUDE: W 112DEG 12MIN 59SEC  
TOPO MAP NAME: TUSAYAN WEST/RED BUTTE SW -7.5

CURRENT STATUS: PAST PRODUCER

COMMODITY:

COPPER OXIDE  
IRON HEMATITE  
IRON GOETHITE  
CALCIUM DOLOMITE  
GERMANIUM

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ANITA MINE

REFERENCES

COCONINO COUNTY  
FRANCIS DIST.  
T29N R2E Sec. 20, 29

Coconino County MILS index #4

AKA: Ruby, Anita Copper, Emerald, Tel Star, Ariz. Grant

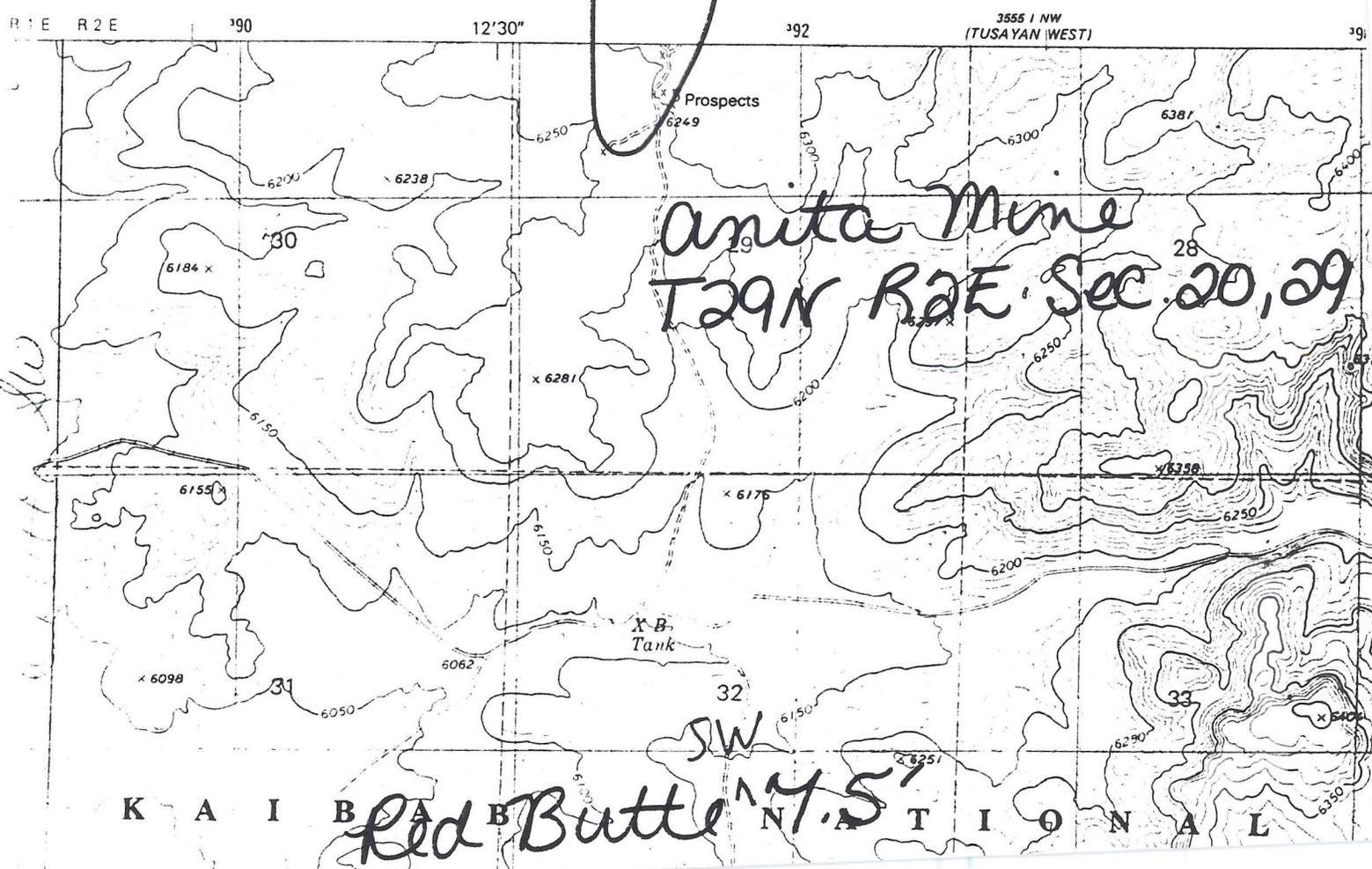
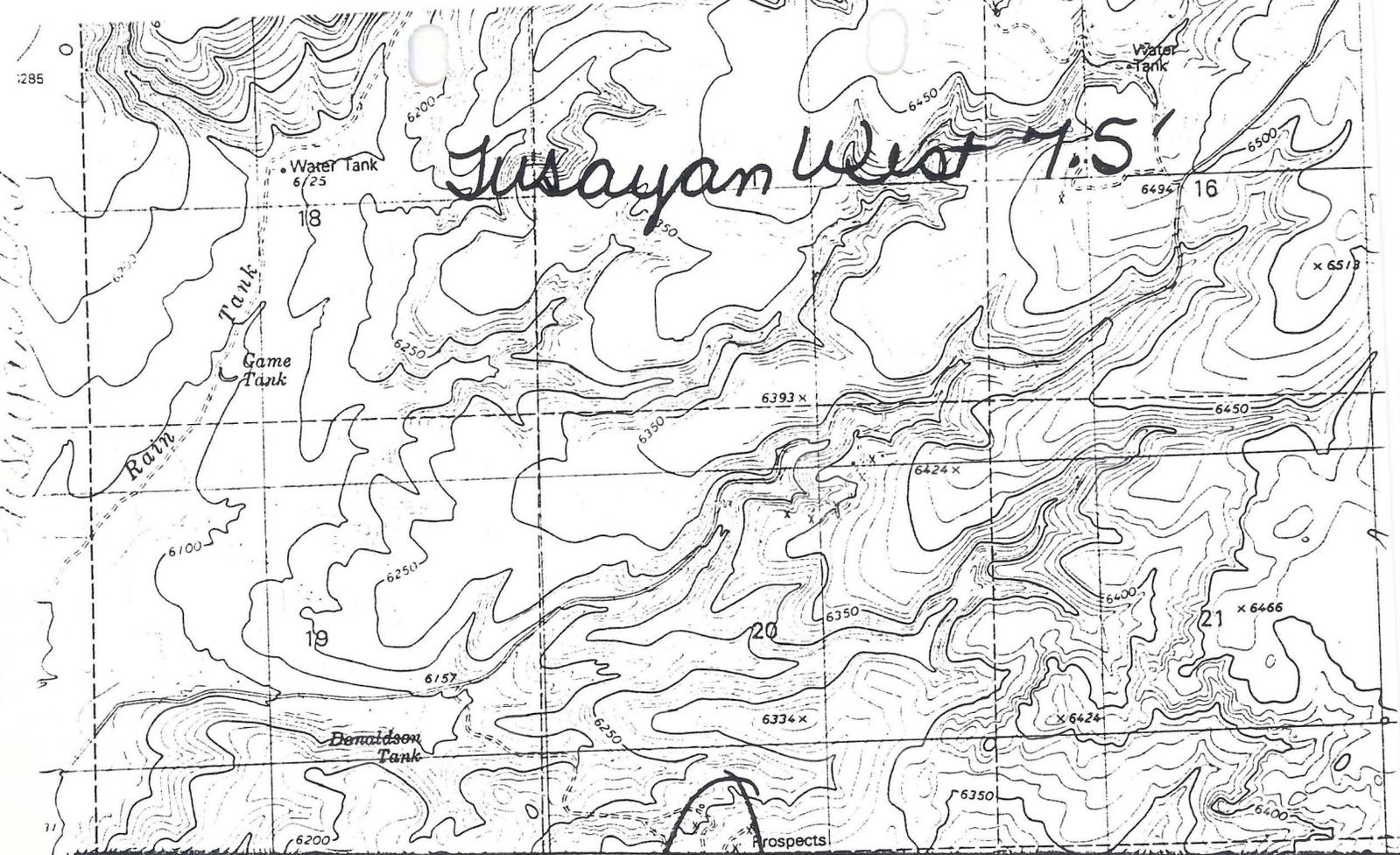
US-AEC Prelim Rpt 172-479, p. 58

Waesche, H.H., Grand Canyon Nature Notes, Vol. 7, No. 11, p. 108

~~Emerald & Ruby Claims (file)~~

Anita Queen in Eagle-Picher "A" Confidential files

Tusayan West 7.5' Topo & Red Butte SW 7.5' Topo (included in file)



RECNO M002913  
 REC\_TYPE S  
 REP\_DATE 79 07  
 REP BRIGHT, DANIEL; CREASEY, S. C.  
 REP\_AFF USGS  
 SYN RUDY, EMERALD, BLUE BONNET  
 DIST FRANCIS DISTRICT  
 COUNTY COCONINO  
 STATE\_CODE AZ  
 CTRY\_CODE US  
 PHYS 11  
 DRAIN 15010004  
 QUAD1 WILLIAMS ( 1956 )  
 Q1\_SCALE 250000  
 ELEV 6000 FT  
 UTM\_N 3970400  
 UTM\_E 386800  
 UTM\_Z +12  
 TOWNSHIP 029N  
 RANGE 001E; 002E;  
 MERIDIAN G & SR  
 POSITION 8 MILES NORTH WILLAHA  
 LOCATION NO TOPOGRAPHIC QUADRANGLE PRINTED FOR MINE AREA  
 SITE ANITA COPPER DEPOSIT  
 LAT 35.8731  
 LONG -112.2539  
 CTRY\_NAME UNITED STATES  
 COMMOD CU U FE AG  
 ORE\_MAT MALACHITE, AZURITE; LIMONITE  
 GAD ORE ASSAYED IN 1923 AS 25 % CU AND 3 OZ. AG PER TON.  
 COMMOD\_COM VERY WEAK RADIOACTIVITY NOTED  
 MAJOR CU  
 TRACE U FE AG  
 PROD S  
 LOC\_STRUCT NW TRENDING FAULT WITH VERTICAL DIP CUTS MINERALIZEDAREA.  
 STATUS 6  
 YRFST\_PROD 1907  
 YRLST\_PROD 1956  
 EXPL\_COM OPERATORS INCLUDED WILLIAM H LOCKRIDGE, ANITA COPPERCOMPANT,  
 CONSOLIDATED ARIZONA CO, ARIZONA GIANT MINING CO.  
 DEP\_TYPE DISSEMINATED REPLACEMENT  
 DEP\_SIZE S  
 QUAD250 WILLIAMS  
 DWORK\_COM OLD COPPER WORKINGS WITH SOME OPEN CUTS  
 MIN\_AGE JUR-CRET  
 ORE\_CNTL COPPER CARBONATES CONCENTRATED ALONG JOINTS OF HOST ROCK  
 ALTER LIMONITE IS PSEUDOMORPHED AFTER PYRITE  
 HRU\_NAME HOST ROCK IS REFERRED TO AS KAIBAB LIMESTONE.  
 NAME BRIGHT, DANIEL; CREASEY, S. C.  
 DATE 07/01/79  
 CONT\_CODE NA  
 GEN\_COM INFO.SRC : 1 PUB LIT  
 REF GIBSON, R., 1951 , PRELIMINARY RECONNAISSANCE REPORT RG - 34  
 ; USAEC RME-155 , P. 68 .|PIERCE, WESLEY H., 1970 , COAL,  
 OIL, NATURAL GAS, HELIUM AND URANIUM IN ARIZONA: ABM BULL.  
 182 , P. 250 .|USGS MINERALS YEARBOOK 1902 - 1967 .  
 CONT\_NAME NORTH AMERICA  
 STATE\_NAME ARIZONA  
 WORK\_TYPE B  
 AP\_ITEM ORE CU|ORE CU AG

AP\_ACC EST|ACC  
AP\_AMT 0.00200|0.39000  
AP\_U LOTS|TONS  
AP\_YEAR 1926|1911  
AP\_SOURCE REF. #3  
AP\_COM ITEM #2 : 390 TONS OF ORE CONTAINING AG AND CU.  
COMMOD\_TYP M  
DATE\_ISSUE 95/5/18  
PROF\_ID 100  
PROF\_LOC 100  
PF\_COMMOD 66  
PROF\_EXPL 75  
PFDESC\_DEP 25  
PFDESC\_WRK 100  
PROF\_GEOL 50  
PROF\_REF 100  
PPROD\_RESV 13  
PROF\_ALL 69  
HR\_AGE\_MV PERM  
HR\_TYPE\_MV LIMESTONE  
TYPE R  
AFFIL USGS  
DEP\_CODE 10100  
HUC 15010004

ANITA MINE

COCONINO COUNTY

During the year the Kennedy Oil Co., of Oklahoma City, Oklahoma drilled several holes and did considerable trenching at the Anita Copper Mine six miles south of Grand Canyon Airport. When the property was visited in April activity had ceased. FTJ Annual Report 6-30-6

---

Interview with Clyde Hutchison, agent for Kennedy Oil. Said Kennedy was still interested in the Anita Copper Mine, south of Grand Canyon Airport. Four holes drilled last year - deepest 400'. Some ore reported in all holes, no values disclosed. FTJ WR 9-15-67

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Called Clyde Hutchison who was not in but Mrs. Hutchison said there was no activity on the Anita claims. FTJ WR 4-11-69

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Called Mr. Hutchison re claims at Anita. No activity. FTJ WR 9-12-69

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Called Clyde Hutchison regarding the copper claims near Grand Canyon Airport - idle and no activity in the area. FTJ WR 5-14-71

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Visited with Clyde Hutchinson. He said no activity for some time at the Anita properties south of Grand Canyon. He said some activity during the spring in strip area near Grand Wash Cliffs. FTJ WR 8/16/72

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NJN WR 11/27/87: Waynce Seick, Energy Fuels Inc (file) reports that they have drilled in the area of the Anita (file) Coconino County and have never found any breccia pipes nor have they gotten any ore grade germanium or gallium in their samples. They believe the copper in the area occurs in channels in the top portion of the Kaibab Limestone.

---

ANITA CLAIMS

COCONINO COUNTY

Interviewed Rudolph Gracey (Flagstaff Chemica & Minerals Co.) re Arizona Giant mine and others. He advises that the Arizona Giant operations ceased in 1956 and the property reverted to the owner, Mrs. Lockridge of Flagstaff.

Some 25 cars of closely sorted 4-5% oxidized copper ore were shipped in early 1956. The country rock is dolomite and the ore shipped had a high magnesite content. The mine is located 13 miles west of Anita Siding on the Santa Fe RR between Flagstaff and Grand Canyon. Interviewed a Mr. Stevens, Attorney for Lockridge, who verified in general the information from Gracey. I was not able to contact Mrs. Lockridge in Flagstaff. TPL WR 4-20-59

---

Called Clyde Hutchison re his claims east of Anita. Kennedy Oil Co. of Oklahoma City had relinquished their option after drilling several holes on the claims. A preliminary report will be issued. Rudy Gracey, 1008 Hazelwood Way, Flagstaff, was the drill contractor. FTJ WR 5-12-67

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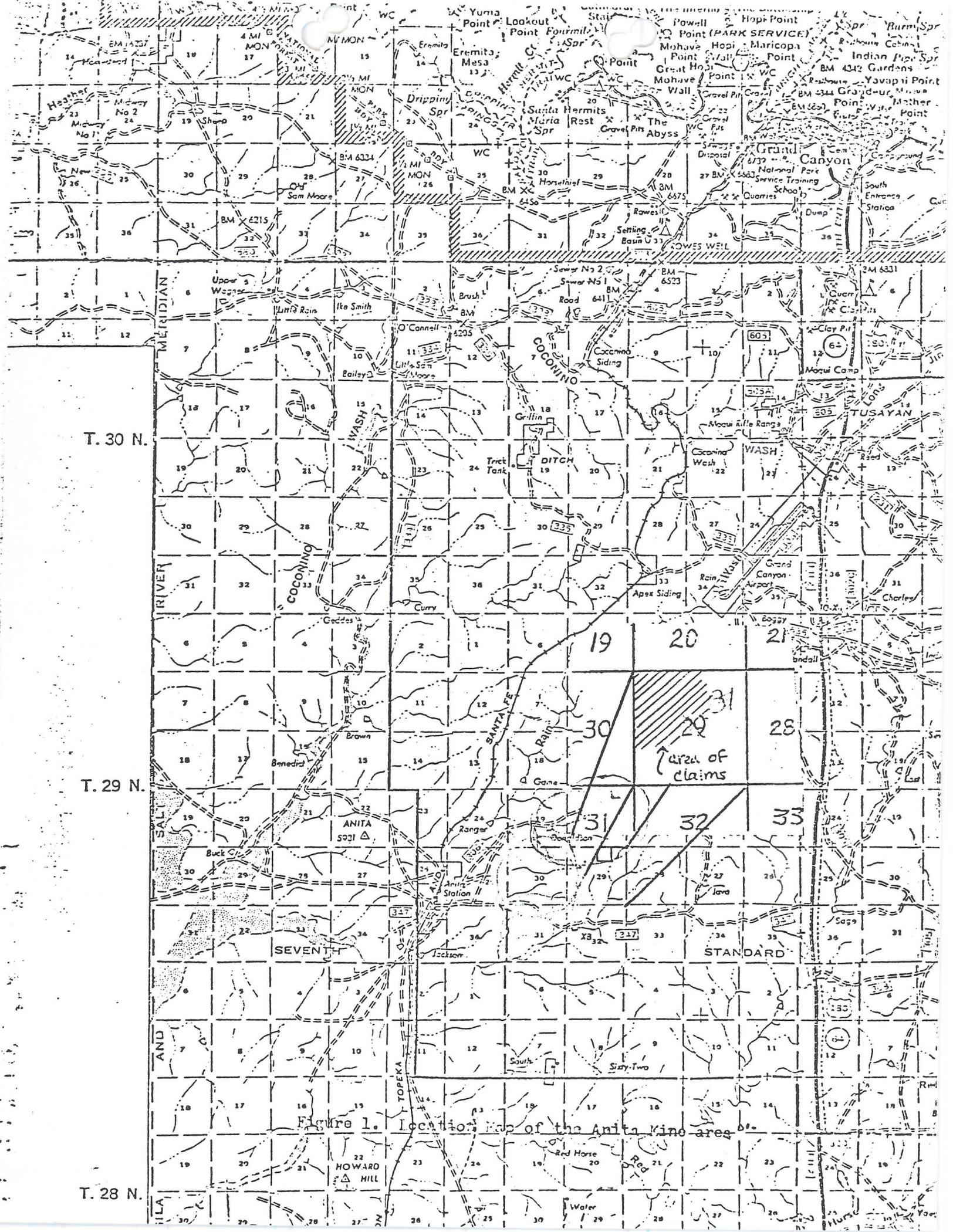


Figure 1. Location map of the Anita Kino area

T. 30 N.

T. 29 N.

T. 28 N.

BETTY DEE NOS 1-9 CLAIMS

Coconino County  
Francis District

Sec. 20 & 29, T29N, R2E.

Owner: Jack Vercamp, P.O. Box 96, Grand Canyon, Arizona 85023. (602) 638-2242

---

CH WR 7/26/79: Quincy Coatney holds the claims (all 1500'x600' lode) in the SE1/4, Sec. 29, T29N, R2E, Coconino County. This area is unsurveyed. As he was uncertain as to the location of these claims in the Section and is anxious to get them on the BLM register with a high degree of accuracy (they were once jumped -- Al MacKenzie was his lawyer), recommended having them surveyed. He agreeded.

---

KAP WR 10/15/79: BLM filing regulations were discussed with .

---

KAP WR 10/15/79: BLM filing regulations were discussed with Jack Vercamp, P.O. Box 96, Grand Canyon, Arizona 85023, phone 638-2242. He has 9 claims, the BETTY DEE 1-9 in Sec. 20 & 29, T29N, R2E, Francis District, Coconino County. The claims are on deposits on copper and uranium.

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June 18, 1976

Ms. Shirley DeWitt  
c/o Atlantic LaSalle Co.  
150 S. Wacker Dr.  
Chicago, Ill.  
60606

Dear Ms. DeWitt,

Please excuse the delay in submitting this report. It seems my schedule has really been shot through with unexpected things these last two weeks.

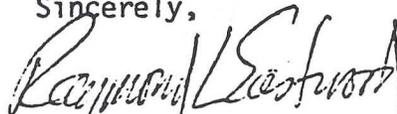
Enclosed is the report on the claims of Jack Verkamp and Quincey Coatney. It pretty much follows what I had reported to you by telephone. Its heartening to note that the regional geologic picture makes further investigations more attractive than what you find at the surface. It is a bit discouraging to realize that people can scratch around on the surface forever and produce very little and that further exploration will be fairly expensive.

It seems to me that the course you take from here depends on how much money you are willing to risk. Although I have no specific figures on costs, I estimate that the next level of investigation will cost approximately \$2000. The investigation at that level ought to be a scintillometer survey to try to assess the potential for uranium. It seems to me that its an uphill battle trying to persuade a copper-mining company to take the claims on the basis of the copper mineralization there. However, in this time of energy limitations and development; I think it would be more profitable to examine the uranium potential. This view is supported by the production history of the Orphan Mine at Grand Canyon that was profitable for its uranium rather than copper.

I expect that the most inexpensive way of doing a scintillometer survey is to rent an instrument and do it ourselves. There are surveying companys that would do the whole project; I suspect that the area is so small and remote that their expense would be large. If you would like, I will inquire about the various options available and get some cost estimates.

Attached is an itemization of costs for this project. If I can be of further assistance, please ask.

Sincerely,



Raymond L. Eastwood

A PRELIMINARY EVALUATION  
OF THE MINERAL POTENTIAL OF MINING CLAIMS  
OF THE ANITA MINE AREA  
COCONINO COUNTY, ARIZONA

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## INTRODUCTION

The study herein described was undertaken for the purpose of making a preliminary evaluation of the mineral potential of mining claims of the Anita Mine area, near Grand Canyon, Arizona. The area has been the subject of prospecting and minor mining activities intermittently since the 1890's. These activities are noted by Waesche (1933) who indicates the mine has been at best marginally economic. The claims examined are currently held by Messers Jack Verkamp and Quincey Coatney. I visited the area twice; first, the actual claims in the company of Messers Verkamp and Coatney when I collected samples for mineral identification and later the area surrounding the claims was examined to gain insight into their regional geologic setting.

## LOCATION

The claims are not located precisely because of the absence of surveyed markers. Neither Messers Verkamp or Coatney were certain of the section in which their nine claims are located. *Dissect this*  
My best estimate is that the nine claims are most likely located in the western or northwestern part of Sec. <sup>31</sup>~~29~~, T. 29 N., R. 2 E. (relative to Gila and Salt River Meridian), Coconino County, Arizona (see Figure 1). As can be seen from the location map (Figure 1) the claims are located within the Kaibab National Forest.

## GEOLOGY OF THE MINING CLAIMS

The Anita Copper Mine (also referred to as the Emerald Mine) has been mentioned only briefly in the geological literature (see Waesche, 1933; and Billingsley, 1974, 1976). The most informative is that of H. H. Waesche (1933) which describes the general geology of the deposits and the area. Many of the observations of Waesche and myself are the same; I offer the following remarks to elucidate the details and provide added perspective on the deposit.

As indicated by Waesche (1933), the Kaibab limestone crops out in the low hills and valleys of the area where the claims are located. In the region of the Grand Canyon, the Kaibab limestone is best described as a sandy limestone and is as thick as 500 feet. This limestone may be thinner than that in the Anita area due to erosion.

In addition to the minerals indicated by Waesche as the primary copper minerals (azurite and malachite), I found significant amounts of chrysocolla, a silicate of copper, and one sample containing turquoise. Many of the mineral specimens that contain copper mineralization also contain iron-bearing minerals of limonite, hematite, and goethite. All of these iron minerals are oxides and/or hydroxides; I found two specimens that also contain a small amount of cuprite, a copper oxide. At no time did I observe any copper sulfide minerals as Waesche implies in his discussion.

Copper sulfide minerals, particularly chalcopyrite, are found elsewhere on the Colorado Plateau and are considered as "lode" minerals. Thus, there is ample evidence for copper mineralization of potential commercial value; however, the lack of copper sulfide minerals and the disseminated nature of the surficial mineralization presently detract from this potential.

As indicated by Waesche, most of the copper mineralization occurs in veinlets and is located along joint (fracture) surfaces and bedding planes of the Kaibab limestone. More of the copper mineralization seems to occur along the jointing surfaces than bedding planes. This attests to the fact that the mineralization occurred much later than the deposition of the Kaibab limestone in which the deposit occurs. I measured the directional trend of several of these veinlets and found them to be preferentially oriented to N. 45° E., N. 10° E., and N. 55° W. These three directions are the same as the jointing directions of the regional joint pattern in the area (Kelley and Clinton, 1960) and suggests a rather passive response of the Kaibab limestone during emplacement of the mineralization.

One of the most interesting characteristics is the brecciated (fragmented) nature of the Kaibab limestone. Waesche (1933) notes the fragmented nature and the absence of faults in the area; which my brief study supports. Several of the adits that Messers Verkamp and Coatney and I visited contained boulders composed of breccia (in this case, fragments of Kaibab Limestone) or were dug into tabular dike-like masses of brecciated rock. Invariably, these breccias are mineralized

with one or more copper minerals and iron oxides. Sketches of these two types are shown in Figures 2 and 3. This characteristic of brecciation is important when viewed in the regional geologic context.

I found also that the copper mineralization is spread rather continuously over the claims; a feature that presently is a deterrent to the further surficial mining of the area. Waesche (1933) indicates that the zone trends northeast-southwest; I have no evidence to the contrary and suspect the claims to lie in this zone.

Another feature of the Kaibab limestone that is common and significant is the occurrence of subsidence blocks. Where I was able to observe them, these areas of subsidence are more or less semicircular and between about 25 to 150 feet across. In most cases, the vertical movement has been less than 2 to 5 feet. However, near the old mine shaft and head frame, there is an area that has subsided about 10 feet. These areas of subsidence may be caused by 1) collapse of Kaibab limestone into an underlying cavern formed by groundwater solution of the limestone or 2) by collapse during the same process of emplacement responsible for the breccias and copper mineralization.

Mr. Coatney shared with me an analysis obtained on a composite sample and made by Mariposa Spectrographic Lab. Of concern is an unusually high concentration of germanium, about 0.10 and 0.20%.

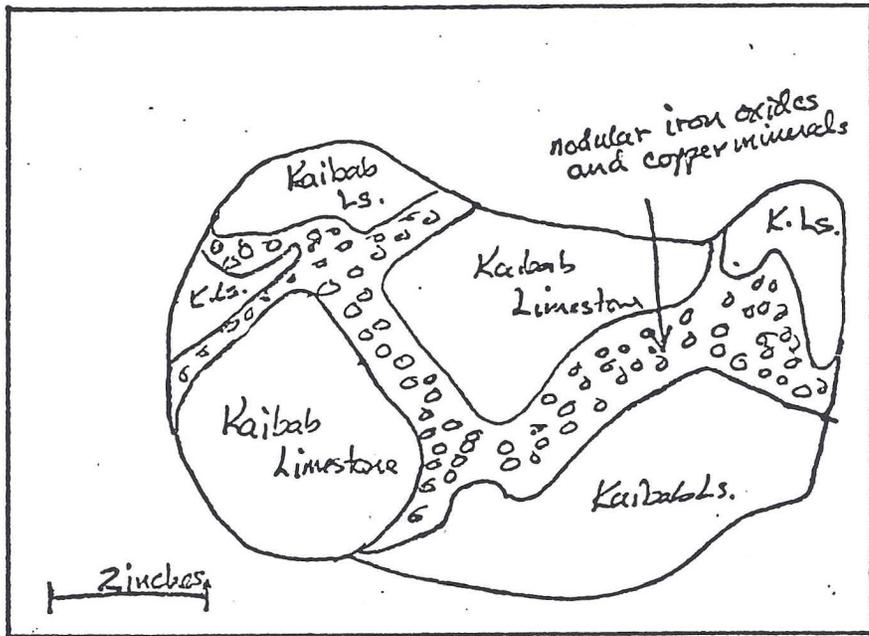


Figure 2. Sketch of a fragment of breccia.

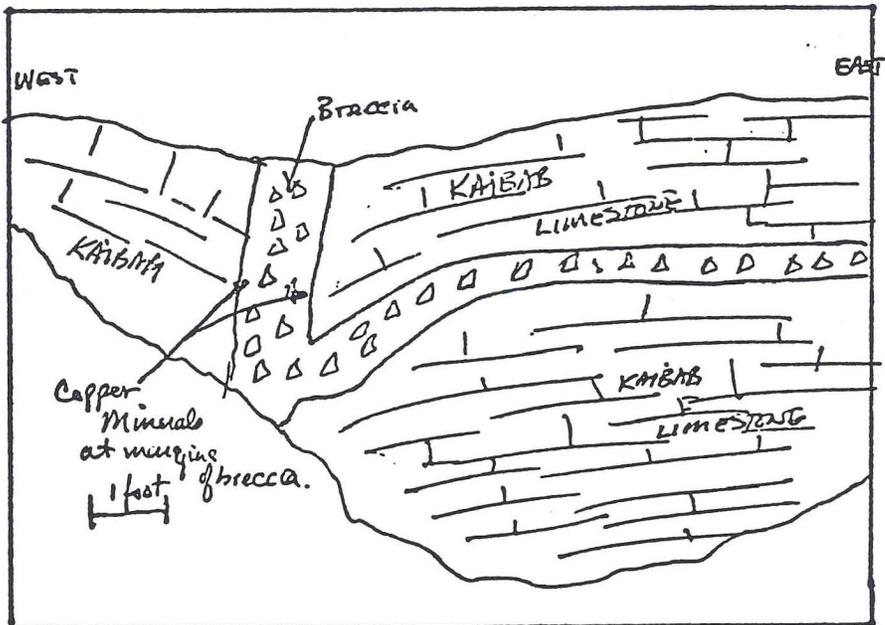


Figure 3. Sketch of breccia dikes through the Kaibab limestone.

Relatively little is known about the geochemistry of germanium; except that germanium minerals are rare or nonexistent because germanium can readily be incorporated into minerals that contain silicon. Silicon is one of the most abundant and ubiquitous elements so germanium is often present in ordinary rocks up to about 0.05%. The data is incomplete as to which mineral contains germanium.

In summary, the copper mineralization at Anita Mines is mainly malachite, azurite, and chrysocolla with traces of turquoise and cuprite. These copper minerals are associated with abundant iron oxides. This mineralization occurs in veinlets that cut through the Kaibab limestone and along bedding planes in this formation. The veinlets are scattered over a northeast-southwest trending zone and many are found with breccia.

#### THE ANITA MINE IN REGIONAL GEOLOGIC CONTEXT

Consideration of the Anita Mine in regional geologic context greatly improves the prospects for finding minerals of commercial value. This view is based on my interpretation of the Anita Mine as a surface expression of a breccia pipe. Breccia pipes are common in the region of the Grand Canyon and have been mined commercially. In addition, the Anita Mine area is located in a structurally favorable position relative to the Orphan Mine at the Grand Canyon.

There are three characteristics about the Anita Mine area that suggests to me that it is the surface expression of a breccia pipe. First the copper mineralization occurs in veinlets that cut through the Kaibab limestone. This is not a condition that proves that a breccia pipe exists at depth but is necessary if one does. Second, the Kaibab limestone exhibits semicircular areas of subsidence. Again, this condition does not prove that a breccia pipe exists at depth because the Kaibab limestone is notable in other areas on the Colorado Plateau for this type of subsidence. The best evidence in my opinion that a breccia pipe exists at depth is that the copper mineralization is often associated with either breccia dikes or with blocks of brecciated Kaibab. The suggestion is that since conditions were favorable for the formation of breccia dikes at the surface, the conditions must also have been favorable for the formation of breccia at depth.

The best and closest example of a breccia pipe that produced minerals is the Orphan Mine at Grand Canyon. This mine is described by Kofford (1969) as a more or less cylindrical body of brecciated Paleozoic sedimentary rock, mostly Coconino sandstone, Hermit Shale, and Supai sandstone and siltstone, about 500 feet in diameter that extends vertically from the Coconino sandstone to the Redwall limestone (about 2000 feet). Although the Orphan Mine had a very mediocre history of copper and metal exploration, it was actively

mined during the 1950's because it was very rich in uranium (Kofford, 1969; Billingsley, 1974). In addition, there are nine more such breccia pipes in the Grand Canyon area where copper and/or uranium mineralization is found. Some of these are shown in Figure 5.

The Orphan Mine at the Grand Canyon occurs very close to the Bright Angel fault as shown in Figure 5. Other breccia pipes also occur along or near large faults in the Grand Canyon area. The Anita Mine is no exception as it occurs near the Vishnu fault as shown in Figure 5. Although the precise cause for breccia pipe formation is not known, the occurrence of breccia pipes in the Grand Canyon area along large faults may be explained in that these faults may provide a route of easy access for the mineralizing fluids toward the surface.

#### SUMMARIZING REMARKS AND FURTHER POSSIBLE EXPLORATION

From this analysis it seems to me that continuing surficial mining operations as they have been practiced will go nowhere. The copper mineralization is too scattered and disseminated in spite of very favorable appearances. At the same time, I do feel that the potential of significant mineralization at depth is high. It therefore, seems to me that there may be the following possible routes for further exploration: 1) A determination as to the possible occurrence of uranium, 2) Geophysical surveys, principally gravity and magnetic surveys, and 3) Detailed surficial mapping from aerial photographs.

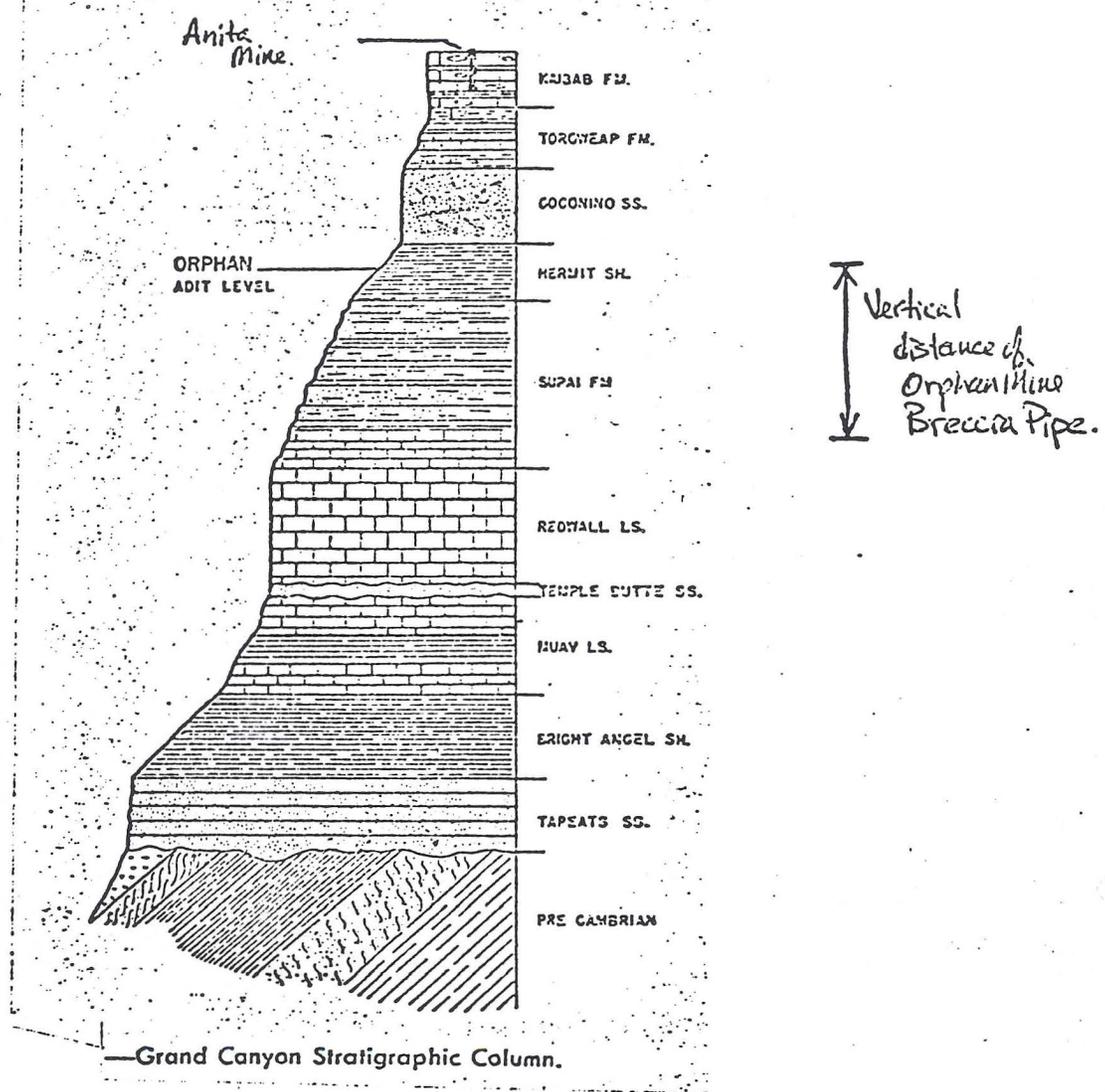
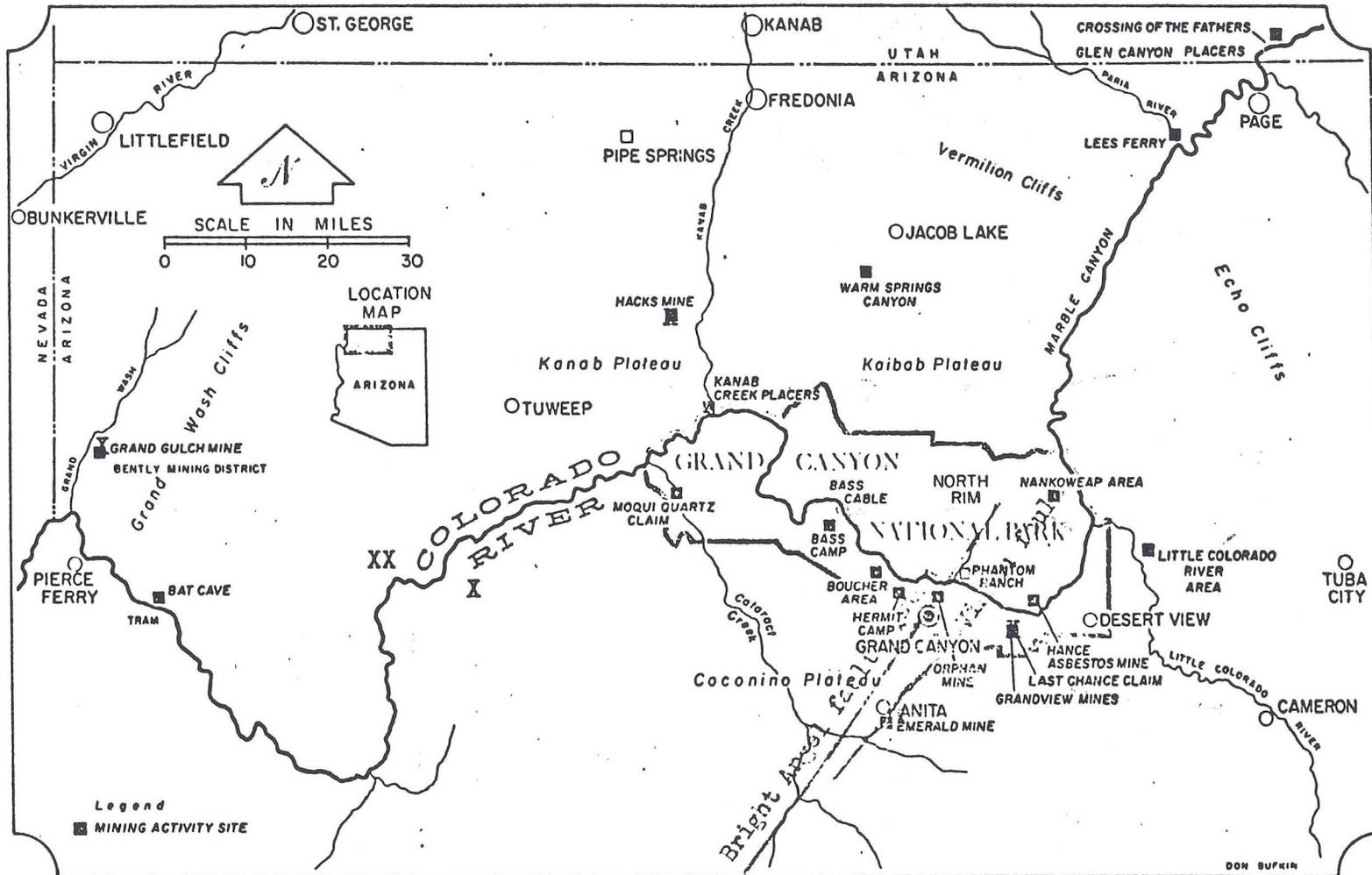


Figure 4. Mining Levels Located Relative to the Grand Canyon Stratigraphic Column.

As mentioned above, the principal reason for the commercial production of the Orphan Mine was the occurrence of uranium. Thus, if the Anita Mine is at all like the Orphan Mine; uranium ought to be present. This can be accomplished by a scintillometer survey over the area to locate zones of high radioactivity. A commercial survey company could be hired to do this, probably at a fairly high cost. Or, the potential exists to rent a scintillometer and run the survey ourselves. I would guess that a scintillometer survey would cost \$500 to \$1500, depending on who does it.

The principal reason for the geophysical surveys, gravity and magnetics, is to locate more precisely the subsurface position of the proposed breccia pipe. Of these two surveys; magnetics is the easiest and most inexpensive but may be the least informative. I could probably contract it out locally here for under \$500. A gravity survey would be the best in that it would indicate an area of low gravitational attraction (a breccia pipe) fairly easily. The problem that exists is that one needs a rather precise elevation control in order to make the data reduction calculations. This means that the claims would have to be surveyed and elevations determined prior to the gravity survey. I judge that the cost of a gravity survey would cost more than \$1500, depending on the cost of the topographic survey.

If these surveys are run, I think that a detailed map of the exact locations of all mineralization shown at the surface ought to be made. Again, the cost of this mapping would be less than \$500 as it would require mapping a rather small area.



X - Location of Mines in Breccia Pipes

Figure 5. Location Map of the Anita Mine Relative to Other Breccia Pipes and Faults of the Grand Canyon Area.

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# GRAND CANYON NATURE NOTES

Volume 7, Number 11  
February 1933

National Park Service  
Grand Canyon National Park

Grand Canyon Natural  
History Association

This publication is issued monthly for the purpose of recording observations and of making known the results of research and scientific investigation in the Grand Canyon region in the fields of natural history, history and related subjects. It is published by the Natural History Association for the Grand Canyon National Park. Membership in this Association is \$1.00 per year and includes a subscription to Nature Notes. Additional copies of Nature Notes may be obtained at 10¢ each by addressing The Grand Canyon Natural History Association, Grand Canyon, Arizona.

M. R. Tillotson,  
Superintendent.

Edwin D. McKee,  
Park Naturalist

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Illustrations by Barbara H. McKee

February, 1933

## THE ANITA COPPER MINE

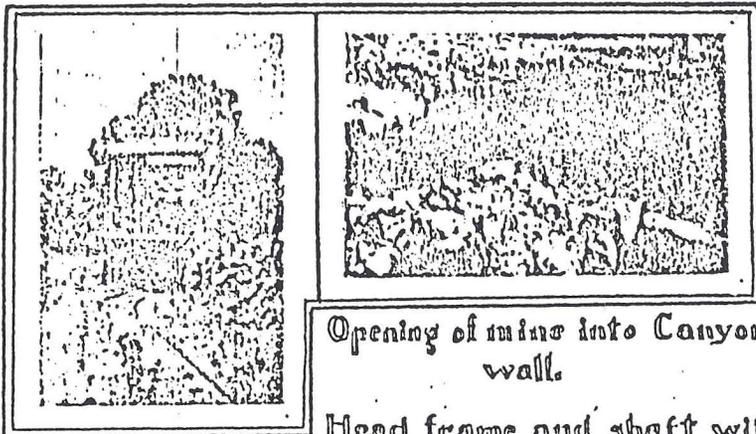
By H. H. Waesche, Ranger Naturalist

A NUMBER OF COPPER deposits have been discovered in the vicinity of the Grand Canyon. Several of these are located below the rim, others are found on the surfaces of the Kaibab and Coconino plateaus. Mining operations on a small scale have been attempted at not less than five different localities.

Much of the copper ore of Grand Canyon -- including that discussed in this article -- occurs in the Kaibab limestone of Permian Age which composes the surfaces of the plateaus. This is the same formation seen as the topmost stratum in the Grand Canyon. It is a comparatively sandy limestone about five hundred and fifty feet thick. The Kaibab as well as the other Paleozoic sediments in the Grand Canyon are nearly flat-lying, showing only rarely indications of dynamic disturbance. Evidence of such disturbance is seen in the existence of several faults which cut across the plateau in a north-south direction. Besides the faulting, there has been slight folding in some places as may be readily seen at Grand View. It is quite likely that both the faulting and folding have a direct bearing on the origin of the copper ores.

The ore minerals are almost exclusively the carbonates, azurite and malachite. Some sulfide, chalcopyrite, has been noted by E. P. Jennings\* in the plateau copper deposits. Associated with the copper carbonates is brown limonite which colors most of the rock not stained by the blue and green copper. Dendrites of manganese oxide are plentiful. Traces of gold are said to be present in siliceous materials. The ore minerals are found disseminated in the limestone and in a sandy phase of the same horizon, thus they are of two types, calcareous and siliceous.

One of the most accessible and interesting deposits of copper in the Grand Canyon area is at the Anita mine, near Anita, Arizona. This place is a water station on the Santa Fe



Opening of mine into Canyon wall.

Head frame and shaft with hand operated skip, Emerald Mine, Anita.

railroad, about fifteen miles south of Grand Canyon. The mine is located about two miles from the station, on the south rim of a small canyon through which winds the old highway to Grand Canyon.

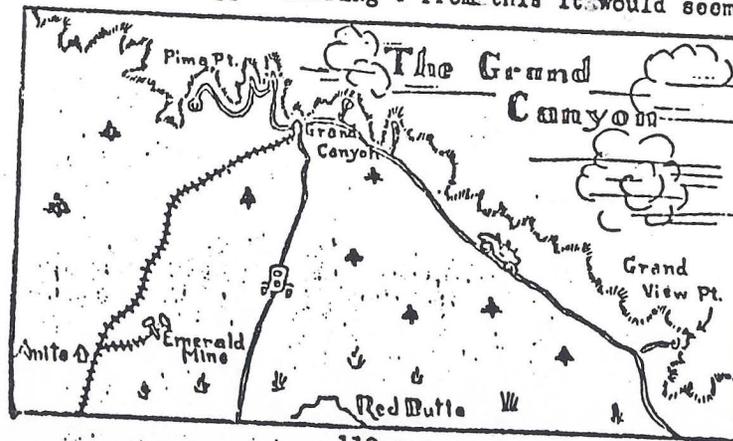
The Kaibab limestone in the vicinity of Anita is very much brecciated but no definite fault has been observed. The brecciation occurs in a zone running northeast-southwest, an undetermined distance, probably not great, and having a width of several hundred feet with concentration of ore minerals greatest near the center of the zone. Other zones are said to parallel this one in the same region. It is likely that the disturbance here is related to the faulting and folding of the plateau previously mentioned. The sandy, brecciated material, southwest of the lime area, contains definite sand grains and rounded pebbles which may indicate a previously existing stream bed. There is room for speculation as to just what the source of these pebbles may have been.

It seems quite likely that the copper may have gained access to the Kaibab limestone along the channels created by the jointing and brecciation of the sediments. The copper-bearing solutions have replaced the more soluble parts of the limestone, leaving small lenses and stringers of carbonate ore. The ore is richest along those fracture lines. Certain beds seem to have been affected more than others and in some cases the replacement has followed bedding planes. According

February, 1933

to the owner, Mr. Lookridge, the mineralization extends to a depth of one hundred and sixty feet below the surface. The source of this ore is doubtful. It is hardly possible that it could have been derived directly from igneous materials. The pre-Cambrian granite intrusion of the Vishnu schist and the forming of diabase sills in the Algonkian rocks occurred long before the Paleozoic sediments were deposited and no later igneous activity is known in the immediate vicinity. The minerals themselves indicate that the ore is not related to igneous activity. No gangue minerals such as fluorite, tourmaline, or apatite, which are commonly associated with ores of igneous origin, have been observed. Chalcopyrite is the only sulfide found and since it is often present in rocks not associated with igneous activity, it indicates nothing. No arsenic or antimony compounds are found, suggesting further that the ores are not of magmatic origin.

Chalcopyrite, which is found in surface deposits of the plateau, may have been derived from oxidized sulfate solutions brought down from overlying strata or it may have been derived from concentration of copper present in the Kaibab itself. It is possible that chalcopyrite was the original copper mineral present and was later oxidized to form the existing ores. The distribution of the replacements suggest that they were deposited in the limestone by descending meteoric waters. The veins of copper follow brecciation zones which are vertical or steeply inclined above but which branch and assume a more horizontal position as they descend. The idea of deposition by descending waters is supported by the fact that Triassic sediments present to the north of the Grand Canyon and which at one time extended over the Kaibab are known to be copper-bearing\*. From this it would seem that



at some time after the Triassic sediments had been deposited above the Kaibab, the region was subjected to deformation resulting in the dome shape of the plateau as well as the faulting and folding evidenced. The fracture zones which resulted from this disturbance could have offered easy access to meteoric waters carrying the copper from the Triassic sandstones to the Paleozoic strata below.

The Anita copper deposit was discovered by Bucky O'Neill, one of the earlier settlers of the Grand Canyon region. The exact date of discovery is unknown but the property was in the possession of a Mr. Nellis in 1890. Mr. Nellis was a pioneer in the town of Williams. The property then passed into the hands of William Nesmith of New York and in 1912 the present owner, Mr. W. H. Lookridge of Anita, came into possession.

The Anita mine is a small one consisting only of one level, the main part of which is a tunnel driven south about eight hundred feet from the edge of the small canyon on the rim of which the operation is located. Little or no development work has been done. Apparently the ore was removed as discovered. Several very short crosscuts have been driven at intervals along the main drift. The surface is honeycombed by holes sunk to the various crosscuts and to the main tunnel. A timbered shaft, six feet square and thirty-five feet deep, has been sunk to the working level about four hundred feet south of the tunnel entrance. This shaft is the deepest hole associated with the workings. The ore was brought to the surface in a bucket by a hand-operated hoist. At a number of places not supported by props, the brecciated material of the unsound roof has caved, partially filling the tunnel and crosscuts.

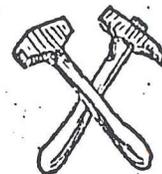
In the early history of the mine a smelter was constructed at Williams to handle the ore but this was never operated. The ore was hauled in a small car from the face of the workings to the original tunnel opening. The tracks for this car have since been pulled up and removed from the mine. After being brought to the surface the ore was placed in a series of trailers, attached to a tractor, and hauled to Williams, Arizona. The tractor was powered with steam generated by a wood fire. Wood was piled at intervals along the road to

Williams for fuel purposes. A railroad spur was later constructed from the Grand Canyon branch of the Santa Fe railroad but was used little or none. All that now remains of the spur is the grade as the rails have been removed.

Mining methods were quite simple and on a small scale. Stoping was in evidence, but none of the stopes were greater than twenty feet across or ten feet in height. The ore was shot down with forty per cent dynamite and then removed with pick and shovel. Drilling was done by hand. In recent operations most of the work was done by Mr. Lookridge and his family, employing around two or three people altogether. The material was removed from the face to the shaft in wheelbarrows and from there, after being sorted by hand, it was transferred to trucks and hauled to the railroad spur at Anita. Ore has also been shipped to smelters at El Paso, Texas, and to Hayden, Arizona. At times it was hauled by truck two hundred miles to Kingman, Arizona. The last shipment was made three years ago, to Hayden.

In 1914 Mr. Lookridge had a contract for thirty tons of ore per day. The mine was operated to this extent for ninety days, during which time fifteen to twenty men were employed. This is the most extensive work done at any time. At no time has the mine been what would be called a paying proposition and, as is usual with such ventures, law suits have been common. In a recent suit the present owner obtained \$2100.00 for thirty tons of ore. He has also won several first prizes at the Northern Arizona State Fair for his exhibition of copper minerals.

- \* Copper Deposits of the Kaibab Plateau, Arizona, by E. P. Jennings, Salt Lake City, Utah. Transactions of the American Institute of Mining Engineers, New York Meeting, October, 1903.



*in 1904 reports*

July 14, 1976

Ms. Shirley DeWitt  
Atlanta Lasalle Corp.  
150 S. Wacker Dri., Suite 595  
Chicago, Ill 60606

Dear Shirley:

I have received your letter and the geology report made by Dr. Eastwood dated July 28, 1976.

First we want to thank you again for your interest and efforts to promote a lease or sale of this property

After reading the report several times and having a mining engineer study it with me we decided the report on the geology of the terrain was probably fair. However we both feel that he is basing his theory on reports that can be obtained from the United States Mineralogy Agencies which, being a teacher, he has access to all publications of the subject. As he seems not to have had any assays or analysis made and without them no one is qualified to say that a mineral is not worth mining. Several points of his report are completely wrong. He stated that there is no sulfides present. We have several assays that were taken from these claims that will prove him wrong there. It seems he concentrated on copper and uranium alone. The only other mineral mentioned was iron. We had known even before we acquired the claims all three of these minerals were present. Uranium has been detected in various places on the claims with both Geiger counters and Scintillators. There are also various other minerals present in the ore. He was also wrong about the copper content from the ore out of the Orphan Mine in Grand Canyon. I worked for this company for several months doing their construction and was well acquainted with the Supervisory personnel. Assays from the Orphan showed as high as 30% copper and high in silver.. This is in the slag dump at Tuba City, Arizona. The dump is too radioactive to reclaim it.

Mr. Herman Ray, retired mining engineer from Glendale, Arizona, who has been working with me as an advisor does not agree nor do Mr. Verkamp or I that a mining operation on the surface showing would not be profitable. Mr. Ray has had many years experience in such operations. He says it is a perfect setting for strip mining and the type of ore that is easy to process. The average strip mine in

Arizona is less than 1% copper and this ore will average 3% or 4% copper alone.

So it seems to us that he either discounted all other minerals except copper and uranium or was not aware they were present. He also stressed the point the land claimed was too small in area. There are several more claims adjoining these claims that can be claimed. But it has been quite an expense to Mr. Verkamp and me to claim and keep these claims legal and we feel that until we get this property to paying we are not interested in more. However, if some one wished to develop a mine there we will get all the land available around there for them.

For the plans in the future, we expect to do some development ourselves, doing our assessment work this or next month. As of now Mr. Ray's former employer has our spectrographic analysis and some assay reports. They have also Dr. Eastwood's report. They are evaluating them and seem to be very interested. I asked Mr. Ray what he thought of Dr. Eastwood's report. He said "it appears the doctor is looking for summer employment and if the company I am presenting the papers to wants to do business with you they have their own Geologist". So I guess Mr. Verkamp and I have no need for his services at this time.

We are going to try and get out some turquoise while doing our assessment work. I am going to uncover the vein I have hidden all these years. So if you are interested I will send you a sample. Maybe you can find a market there that will make both you and us some money.

In the meantime we will appreciate any suggestions you might have and if you could steer us into a deal on the property will be happy to compensate you well for your time and trouble.

If you get to Phoenix be sure and let us know as we would like very much to have you at our home for a nice visit.

Thank you again for your efforts and trouble.

We remain your friends,

Mr. and Mrs. Quincy Coatney  
2532 W. Mulberry Drive  
Phoenix, Ariz. 85017

# Mariposa Spectrographic Laboratory

MARIPOSA, CALIFORNIA 95338

L. L. HOFFITT  
7923 N. 61 Ave.  
Glendale, Arizona 85101

November 29<sup>th</sup>, 1975

Dear Mr. Hoffitt:

Enclosed, find our spectrographic analysis report covering your sample as submitted, unmarked.

Note that we detected up to 0.20% Germanium in the sample as submitted. On the basis of our March 1975 price of \$295.0 per kilo, this could possibly be valued at up to \$133.0 per pound and since 0.20% equals 4.0 pounds, you can see that the Germanium in your material submitted could have a value of up to \$532.0 per ton.

We are not certain of the present status of Germanium, Mr. Hoffitt, it is used in the semiconductor field. It is also employed in certain varieties of glass with certain properties. The element also has many other uses in industry.

If Uranium is present in the sample submitted, it is below 0.01% which is the lower detection limit. We also scanned the material with our Geiger counter. We did detect a faint background increase in gamma radiation.

It would appear to us that Copper and Germanium are the most valuable elements in the sample submitted, Mr. Hoffitt. We have enclosed a photocopy of the list of Germanium buyers or processors. However, your material should be of interest to a Copper producer that also produces Germanium.

Sorry to be so late with this report, Mr. Hoffitt, our work load has been very heavy, but is lessening with the winter approaching and we should be more current for some time now.

Again, our thanks to you, Mr. Hoffitt.

Sincerely,

*George R. Graves*  
George R. Graves

1cc

*From the Betty Oel mining claims  
units mining District Grand Canyon area  
owned by Quincy Coatsney and Jack  
C. Claims Verkamp*

# Mariposa Spectrographic Laboratory

5029 FOURNIER ROAD, MARIPOSA, CALIFORNIA 95338

Telephone (209) 966-2591

Date 11/20/75

CHARGES: \$9.00

LAB NO. 25716

SUBMITTED BY:

## Qualitative Spectrographic Analysis

J. M. Hoffitt  
7623 N. G1 Ave.  
Glendale, Arizona 85301

ELEMENTS FOUND  
AND ESTIMATED PERCENTAGE RANGE  
OF CONCENTRATION

SAMPLE MARK

No mark

ELEMENT	Not Less Than %	Not More Than %	ELEMENT	Not Less Than %	Not More Than %	ELEMENT	Not Less Than %	Not More Than %
Aluminum $Al_2O_3$	0.5	1.0	Lithium	0.01	0.02	Thallium		
Antimony	---	.005	Magnesium $MgO$	5.0	10.0	Thorium		
Arsenic	0.05	0.15	Manganese	0.03	0.10	Tin		
Barium	0.01	0.06	Mercury			Titanium	.0007	.002
Beryllium			Molybdenum	0.15	0.30	Tungsten		
Bismuth			Nickel	.0007	.003	Uranium Not detected in sample		
Boron			Osmium			Vanadium	.005	.01
Calcium $CaO$	10.0	20.0	Palladium			Zinc	0.10	0.20
Cadmium			Phosphorus			Zirconium		
Cesium			Platinum Not detected in sample			RARE EARTHS:		
Chromium	.001	.006	Potassium	0.03	0.10	Cerium	---	.005
Cobalt	.001	.006	Rhenium			Dysprosium		
Columbium			Rhodium			Erbium		
Copper	4.0	8.0	Rubidium			Europium		
Gallium	---	.005	Ruthenium			Gadolinium		
Germanium	0.10	0.20	Scandium			Holmium		
Gold	---	.0015	Silicon (as $SiO_2$ )	20.0	40.0	Lanthanum	---	.01
Hafnium			Silver	.002	.006	Neodymium	---	.005
Indium			Sodium	0.05	0.15	Praseodymium		
Iridium			Strontium	.002	.008	Samarium		
Iron	0.20	10.0	Tantalum			Ytterbium		
Lead	0.20	0.40	Tellurium			Yttrium	---	.002

Remarks: *this is from the Betty O'Leary estate due to*  
*Mineral District Grand Canyon owned by*  
*Quincy O'Leary and Jack W. Papp*  
 Respectfully Submitted  
*[Signature]* (Spectrographer)

MARIPOSA SPECTROGRAPHIC LABORATORY

percent to ton (2000 lbs.)  
 1.0% = 20.0 Lbs. AVOIR.  
 0.10% = 2.0 Lbs. AVOIR.  
 0.01% = 0.2 oz. AVOIR.  
 0.001% = 0.02 oz. AVOIR.

*J. (Mike) O'Leary*

ARIZONA GIANT COPPER  
COCONINO COUNTY, ARIZONA

INTRODUCTION

Mr. Edward Wolf of 308 Trinity Building, 111 Broadway, New York 6, New York, offered the Arizona Giant Copper properties to the Shattuck Dam Mining Corporation. Arrangements were made for a field examination with the Shattuck Dam exploration personnel in the West during the week of March 4 to 8, 1957.

Mr. Wolf outlined the copper occurrence at length in Albuquerque on March 5, and explained the details on the property on March 6 and 7.

The copper oxide mineralization occurs in the upper Kaibab (Permian) formation, and is directly associated with local fractures as fracture filling, with a minor amount of limestone replacement. Little or no sulfides were noted in the field specimen study. All the observable mineralization occurs in a constant lithological dolomitic limestone horizon. No float nor outcrops of copper were noted in the canyons below the main horizon.

It was strongly suggested that the regional West Kaibab fault was the mineral solution feeder in the vicinity and that the mineralization found in the Orphan breccia pipe was related to that in the Anita District. This argument was refuted by observation during an airplane flight over the vicinity, as the fault trends to the west several miles from the District.

Although considerable work has been done in the district by sinking shafts, test pits, and open pit, hand-sorting mining, no ore body of

consequence has been developed. Drilling by the Arizona Giant people delineated an area of hand-sorting type ore reserve. The company mined the Blue Bonnet claims, removing an estimated 9,000 tons of mineralized rock, from which they hand-sorted about 1,300 tons of ore. The smelter returns indicate the average to be slightly over 3 per cent, with no precious metals. This venture failed, as has all the other organized ventures in the district. Apparently the Lockridge family hand-cobbed the major portion of the ore from the district, presumably at a profit, as evidence of their work is found everywhere.

#### CONCLUSION

Because of the lack of continuity and homogeneity of the copper ore, all the organized ventures throughout the years have failed; and it is extremely doubtful that any new venturor can turn the tables.

The presently known ore reserves are too small and discontinuous to warrant corporate-type mining operations. It is doubtful that the mineralization at depth has any better continuity than those observed on the surface. The possibility that the company might find the feeder zone, thus making a successful mine, is indeed a wildcat.

#### HISTORY

Before the turn of the century, copper ore was found on the crest of the Kaibab Monocline. Extensive prospecting by various stock companies and numerous prospectors tested an area some 15 miles long by about one-half mile wide throughout the intervening years.

The Anita Mining Company appears to have prospected the vicinity at depth, having sunk a shaft some 514 feet deep. Their shaft log indicates

numerous copper-stained zones. Evidence of a wood-burning smelter remains near the shaft. This undoubtedly was a test unit, as only a small amount of slag is present.

An extensive railroad system traversed the vicinity in the early days, as roadbeds and ties can be seen to the Anita Shaft, the Emerald and other workings. The railroads have long since been abandoned.

Mr. George Warner and Mr. Lindholm visited the vicinity in 1937 for the Phelps Dodge Corporation, and subsequently turned it down.

Mr. Fred Gibbs has been working for years trying to devise a method for winning the copper from the rock. His reports, along with those of others are at the Iron King Mine, according to Mr. Warner.

The Evans Construction Company, from Kansas City, had Mr. James A. Watson and a field crew study the area for nearly two months in 1952. The area was turned down.

Undoubtedly, many other mining companies have studied the vicinity from time to time, with the same results.

During the uranium boom, several radioactive airborne anomalies were found in the vicinity, thus prompting the newly formed Arizona Giant Company interest in the area. Copper was observed in their uranium drilling; and with the price over 40 cents per pound, they became a copper mining concern. A lease previously obtained from the Lockridge estate became the scene of an open pit copper mine, with a hand-sorting unit. Some 23 railroad carloads of ore were shipped to the smelters, which ran slightly over 3 per cent copper. It was estimated that about 9,000 tons of rock was mined and processed. For various reasons, the operation was closed; and remains so to date.

## GEOLOGY

Copper mineralization occurs in the upper Kaibab limestone of the Permian formation. This dolomitic limestone is harder than the members below, and has formed small hills or mesas along the crest of the Kaibab Monocline. Extensive fracturing along the crest apparently became conduits to copper-bearing solutions that attacked the vicinity. Fracture filling and some replacement into the limestone beds caused the selective deposition of the copper. All the mineralization in the vicinity is directly associated with a definite bleaching effect of the surface rocks.

Regional geological data are included.

  
\_\_\_\_\_  
Carl W. Appelin

CWA/hjl-March, 1957(3)

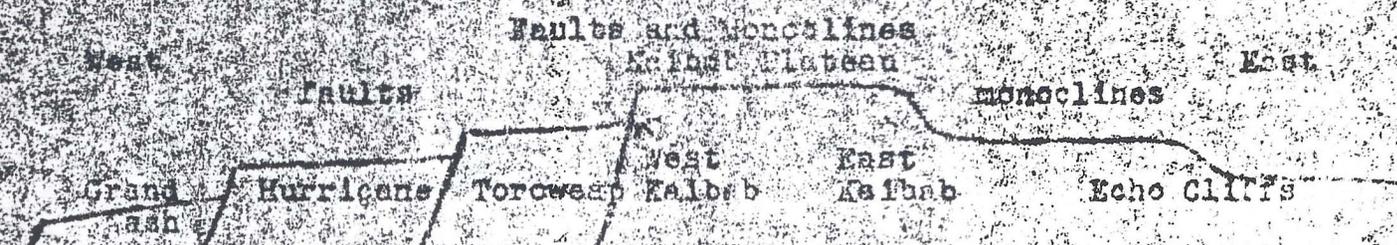
Reference 1: Mineral Resources of the States & Territories West of the Rocky Mountains by Rossiter W. Raymond (15,000 printed) Government Printing Office, Washington, 1869.

Reference 2: Article by J. B. Hundy in Engineering & Mining Journal, 1897, page 97, Volume LKIV.

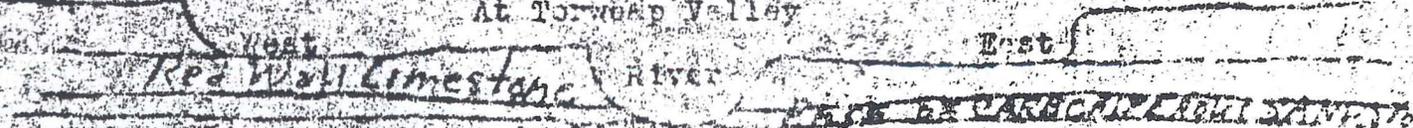
Reference 3: Dept. of the Interior Monographs of the U. S. Geol. Survey, Volume 11, Gov't Printing Office, 1882. In particular, the monographs by Capt. C. E. Dutton, dated 1879-1880 entitled the Tertiary History of the Grand Canyon District. The following are quotes: "Red Butte, with its salt cap is all Permian strata lying like a cap over carboniferous beds. The San Francisco Mountains are all volcanoes."



Starting with the western limits of the Grand Canyon, there are four major faults. The first to the west, delineating the western edge of the Grand Canyon is the Grand Wash fault, with a displacement of about 1800 feet at the river. It runs 30 miles north of the river and an undetermined length to the south. The western and eastern Kaibab displacements join at the north end of the Kaibab plateau and fade out gently to the south of the river. The eastern most part is the Echo Cliff flexure.



This faulting did not injure strata appreciable. No shattering, crumbling or mashing of beds. At Torowap Valley



All faults have slight inclination to the west. At Torowap, however, the basalt and lava dikes are parallel to the river.

In 1880, the various horizons and strata starting at the top of the canyon rim north of Lino were named as follows, with the names to the right of the list.

*Handwritten notes:*  
 1. ...  
 2. ...  
 3. ...  
 4. ...  
 5. ...  
 6. ...  
 7. ...  
 8. ...  
 9. ...  
 10. ...

1.	Upper Miocene sandstones	250'	Coconino
2.	Lower Miocene sandstones	250'	Supai
3.	Water Red Hill	400'	
4.	Red Hill limestone	1500'	Muav
	(Bright Angel Shale)		
5.	Lower Carboniferous sandstones	550'	Tapeats (sulphate of lime throughout a zone)
6.	Quartzite at base of carboniferous	180'	iferous)
7.	Archaean		

The West Kaibab fault reverses its throw slightly on south side of river and appears to increase.

The drainage in the area is much older than the structural features, and the structural features are older than pliocene.

-end-

----- 14.9  
Average Copper Prices: 1903-14 - 14.9¢; 1915-18 - 24.0¢; 1919-30 - 1x.  
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Reference 4: "The Environment & History of the Toroweap and Kaibab Formations of Northern Arizona & Southern Utah" by Edwin D. McKee. Published by Carnegie Institution of Washington, D. C. 1938, Publication No. 492.

Reference 5: U.S.G.S. Bulletin 749 of 1914 by L. F. Noble entitled the Shinumo Quadrangle-Grand Canyon District. The following is copied from this bulletin:

Copper Deposits of the Shinumo Quadrangle, Coconino and Mohave Counties, Arizona: With an exception all of the copper deposits in the quadrangle are found in the Archaean and Algonkian rocks in the depths of the canyon.  
History: The discovery and exploitation of the deposits is the work of Mr. W. W. Bass and Mr. John Walthenberg. A large amount of prospecting has been done and claims have been located in Copper Canyon, Bass Canyon, Granite Gorge near Cable Crossing, Shinumo Canyon between White Creek and Flint Creek, along the line of the West Kaibab fault, and on Muav Saddle.

The most valuable bodies of ore so far found ~~in~~ are in Copper Canyon, from which about 25 tons of ore were taken in ~~1911~~ 1908. The ore was carried to the rim of the Grand Canyon on burros and hauled there 20 miles by wagon to Grand Canyon, a station on the Grand Canyon Railway of the Santa Fe system. Some exploratory work has been done at other localities, but so far no attempt has been made to take out ore for shipment. (Note: Apex & Anita are out of quadrangle)

Geology: The claim in the Muav Saddle is the only one in the Pliocene rocks. It is just at the point where the trail up Muav Canyon enters the saddle at an elevation of 6700 feet. Some mineralization occurs along the contact of the Supai formation and Coconino sandstone where the beds are shattered by the West Kaibab fault, and this mineralized zone is now being explored by an open cut. The copper here is doubtless of the same age and origin as that of the deposits found on the surface of Kaibab and Coconino plateau in other parts of the Grand Canyon district.

-more-

page 3  
The deposits in Copper Canyon are, in method of occurrence, a fair type of all the deposits in the Archean and Algonkian rocks in the quadrangle. As they are the only ones now accessible to underground study, a description of them will also serve as in a general way for those at other localities.

The country rock of the interior of Copper Canyon beneath the paleozoic, is the Vishnu Schist of the Archean system. At the end of the great Pre-Cambrian erosion, the basal strata of the Unkar group of the Algonkian extended part way across the Granite Gorge of Copper Canyon, terminating there as the apex of the Algonkian wedge. Only a few layers of these strata in that locality, however, have escaped the present cycle of erosion. These lie high under the cliffs of the Tapeats sandstone in the eastern wall of the Granite Gorge of Copper Canyon.

The ore bodies in Copper Canyon all lie in the rocks of the Vishnu schist which in this locality are quartz-mica schists and pegmatites. The ores are found in two main veins, which will be described.

The outcrop of the first vein runs northwestward across the Granite Gorge of Copper Canyon. The vein is almost vertical, dipping slightly southwestward. On the east side of the canyon, the bottom of the canyon, a tunnel has been driven in quartzite for over 100 feet along the strike of the vein. The tunnel is about half a mile from the lower end of the river at an elevation of about 2500'. A vertical shaft has also been sunk 50 feet on the vein which is followed down the dip from the surface outcrop. This shaft intersects the tunnel at a point 15 feet below the surface of the ground and 25 feet from the mouth of the tunnel. All the ore that has been taken from Copper Canyon for shipment has come from these workings.

The ore minerals of the vein in this locality are cuprite, bornite and chalcocite. The first two minerals make by far the greater proportion of the ore mined. The chalcocite has come from the most recent workings at the bottom of the shaft. The gangue of the vein is chiefly brecciated mica schist cemented by milky quartz and some calcite. The vein shows the usual pinches and swells, and averages about one to two feet in width. The minerals on the outcrop of the vein are considerably weathered, making incrustations of malachite and green silicate of copper.

The second vein crosses the creek bed a few hundred feet north of the first vein. Its strike is nearly east and west and its dip is about 60 degrees north. About 200 feet above the level of the bed of the creek where it is crossed by the vein a tunnel, known as the Hakataia tunnel, has been driven westward along the strike of the vein for 75 feet. The vein at the tunnel is about a foot wide. The ore minerals taken from the tunnel include cuprite, bornite, chalcopyrite, and argentiferous galena. The gangue is quartz. Near the surface the ores are leached of their values by weathering, but grow richer underground.

The two veins converge toward the west in the western wall of Copper Canyon. Their inclined dip would also cause them to converge upward on the eastern side of the canyon, but this part of their apex has been removed by erosion.

The second vein was traced upward in the eastern wall of Copper Canyon to the base of the Unkar strata and was found to be

on the prolongation downward into the Archean rocks of one of the Algonkian faults. (West Kaibab). It is therefore a simple mineralized fault fissure. The first vein was similarly traced upward but was found to be truncated by the pre-Tonto unconformity just beyond the apex of the Algonkian faulting wedge, so that its relation to the Algonkian faulting could not be positively determined. It represents, however, a filled fissure produced by a normal fault of small throw, the evidence of which is found in the off-set of certain pegmatite veins that are sheared by the fault. The fissure is doubtless the downward prolongation of ~~the~~ an Algonkian fault like that on which the other vein is located.

All the other deposits in the Archean and Algonkian rocks occur either in similar fissure veins, which represent the mineralized fault planes of normal Algonkian faults, or in the zone of shearing along the line of the Algonkian displacement of the West Kaibab fault. All the faults belong to the same period of disturbance, the one in which the great mountain making movement came at the end of the Algonkian time.

Age: The primary ore deposition undoubtedly occurred in Algonkian time, as all the ore-bearing fissures are truncated by the unconformity at the base of the Paleozoic.

Origin: The origin of the primary ore deposition is not clear. The event with which it is obviously connected is the Algonkian mountain-making movement, but the specific causes that set-up the circulation of the mineral bearing solutions are a matter of speculation. It is possible that some sort of genetic connection may have existed between the mineral bearing solutions and the igneous activity manifested by intrusions of diorite in the Unkar strata of the Shinumo region, although it is clear that the intrusions in this locality were earlier than the faulting that gave rise to the mineral bearing fissures.

Value: The deposits in Corner Canyon are locally high grade, but not enough work has been done to give an accurate idea of their extent and quantity.

-----and-----

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Reference 6: U. S. Dept. of Interior, Geol. Survey Professional Paper No. 164. "The Kaiparowits Region - A geographic and geologic reconnaissance of parts of Utah and Arizona."

ARIZONA DEPARTMENT OF MINES & RESOURCES  
Mineral Building, Fairgrounds  
Phoenix, Arizona

1. Information from: Personal examination; Mrs Hutchison; John Challinor  
Address: Clyde Hutchison, 3338-N 4 Flagstaff, Ariz
2. Mine: 'Tel Star (Antar: Ariz Giant: Ruby) 3. No. of Claims - Patented —  
Other names. Unpatented 70 (reported)
4. Location: 6.6 mi from Grand Canyon Airport office. Road follows runway south.
5. Sec. ? Tp. 29+30N Range 2 E 6. Mining District Francis.
7. Owner: Claim notice indicates Clyde Hutchison
8. Address: 3338 - N 4 Flagstaff
9. Operating Co.: Glover, Hettner & Kennedy Oil Co
10. Address: 1108 Westbrook Terrace, Norman, OK 10.
11. President: ? 12. Gen. Mgr.: Earl W. Smith
13. Principal Metals: Copper 14. No. Employed: Idle
15. Mill, Type & Capacity: None
16. Present Operations: (a) Down  (b) Assessment work  (c) Exploration  (completed)  
(d) Production  (e) Rate — tpd.
17. New Work Planned: Not known. Kennedy Oil et al dropped option.  
Others have expressed interest in the deposit.
18. Misc. Notes: The above company drilled at least 6 holes, depth  
unknown. Several surface cuts from 10' to 100' and 3' wide  
were dug in all directions. Some old short tunnels were caved.  
Copper oxides occur as replacement lenses (small) and pods in  
a dolomitic limestone, in silt stone and sandstone (?) Work appears  
to have been concentrated around a locus of the outcrops, cover-  
ing an area 400' x 400'. There appears to be some chance that  
an intrusive may be found at depth. About 100-150 tons  
of ore was stock piled that is estimated to carry 2-4%  
Cu. The past production said to be 25-50 tons at 4-5% Cu ore.

Date: May 10, 1967

F. T. Johnson  
(Signature)

(Field Engineer)

## COCONINO COPPER

### LOCATION:

Anita Mining District, Coconino County, Arizona, between Williams and the south rim of the Grand Canyon. Mining activity has been principally in Township 28, 29 and 30 North, Ranges 1 and 2 East. The exposed mineralization is in a 2-to 4-mile strip about 17 miles long bearing a few degrees east of north from Willaha to Coconino adjacent to the A.T. & S.P. Grand Canyon spur from Williams, roughly paralleling and 3 to 7 miles west of highway 64 connecting Williams and the south rim Grand Canyon National Park installation.

### SALIENT FEATURES:

The mineral deposits were localized from solutions of magmatic origin from below the Permian series. The known deposits are exposed or under less than 5 feet of detrital material in the Kaibab limestone and mudstone formation.

Minerals are principally Chalcocite, Bornite, Tetrahedrite, Azurite, Malachite and Chrysocolla.

Mineralizing solutions advanced in narrow vertical fissures and spread out in horizontal bedding planes and other zones of structural weakness.

Hundreds of prospect pits and trenches dot the area while a few excavations attained some depth, including a 583-foot vertical shaft of early origin which stands open today. Copper mineralization is persistent throughout this shaft.

The entire district is accessible by mine roads over the gently rolling, heavily-wooded terrain.

Material from the narrow veins is high in grade whereas assays for mineable tonnage are low. It is indicated that, from exploration results available, a grade of plus 2% copper can be maintained on large tonnages extracted by selective mining with power shovel.

### HISTORY:

There are records of copper mining activity in the District back to 1904 and some recorded production during World War I.

During 1955 and 1956 the Arizona Giant Mining Corporation (Exec. Vice Pres. R. S. Butler and exploration geologist

COCONINO COPPER - 2

D. O. McGoon, Jr.) was active in the District. This firm did some rotary-air drilling to block out 843,000 tons of .80% copper ore from which it mined selectively by power shovel and shipped 22 cars of 3% plus ore to smelters at El Paso, Hayden and Miami. Estimates on inferred ore run to 50,000,000 tons for the District.

OWNERSHIP:

H. Edward Wolf, New York corporate consultant and geologist, claims ownership by option or directly of approximately 170 claims in the District, which claims cover all the holdings of Arizona Giant and all other attractive exposures. Mr. Wolf submitted this property for our consideration on February 18, 1957.

J. C. P. (2/20/57)

gmc

District	Property	Location	Owners & Operators	Date Visited	Notes
Anita, Grand Canyon, Arizona.	<u>Anita Queen</u>	2-3/4 mi. E. Anita Siding. 18 mi. S. Bright Angel Camp. Elevation 5600 ft.	W. H. Lockridge & L. F. Kormedy, Grand Canyon. One man (Pepin) working.	1917 May 10th.	One claim unpatented. Formation Kaibab limestone of carboniferous age in which the upper layer, up to 40' thick in this neighborhood, contains siliceous pebbles and fragments, overlying softer limestone, less siliceous. Copper occurs in both layers, as carbonates and oxides in irregular masses, partly as replacement of the limestone, and partly in crevices and fracture planes. In places, the upper, more siliceous, material has been eroded, exposing the softer limestone on the surface. The surface indication of underlying ore appears to be a light brown stain of iron in the limestone. In all, about 300' of work has been done, mostly in shallow tunnels and open cuts, indicating that the mineralized zone is about 200' wide. According to Lockridge, the ore mined was fairly high grade for a thickness of about 10 feet, and similar ore is still showing in the floors in places. There are now on the dumps three to five carloads of material, part of which has been screened. My sample of the fines assayed (H-89) 3.68% Cu; 20% CaO; 6% Fe and 11% Insol. Pieces broken off coarse chunks assayed (H-90); trace gold and silver; 4.20% Cu; 23.25% CaO; 3.8% Fe; and 8.7% Insol. Lockridge estimates that after some development work has been done ore can be put on the cars at Anita for a total cost of \$3.50 per ton, but not at the present time. Hauling alone now costs \$1.50 per ton by teams. It is proposed to use a Ford truck. Lockridge hopes to produce ultimately about 30 tons per day.
				1917 July 11th	One man (Pepin) working. Four carloads recently shipped to Humboldt by Kennedy, obtained by screening and sorting old dumps. Approximate average 3.17% Cu; 26% CaO and Fe; 15.5% Insol. Hauling to railroad costs \$2.00 per ton. Freight to Humboldt \$1.25. Sample of ten foot face of limestone in open cut assayed (H-118) Au. Trace; Ag. 0.88 oz; Cu. 4.08%; CaO 27.7%; Insol. 8.8%. Sample across four feet of ore said to be rich in silver assayed

A

9mc.

District	Property	Location	Owners & Operators	Date Visited	Notes
Anita, Grand Canyon, Arizona. (Cont'd)	Anita Queen (Cont'd)				(H-117) Au. Tr; Ag. 1.32 oz; Cu. 1.66%. Kennedy informed me that he did not think he could break even with a \$5.50 smelter treatment charge.
	<u>Emerald</u>	3 mi. N. Anita Siding	W. H. Lockridge, Custodian Hermit Trail, Grand Canyon. Idle at present.	1917 May 10th	Two claims, unpatented. Formation similar to Anita Queen. In all about 250' workings, mostly shallow tunnels. Two pits 40' deep through limestone, containing siliceous pebbles and fragments and penetrating the lower less siliceous limestone. A sample of the upper (siliceous) ore representing a thickness of 10' assayed (H-87) 18.48% Cu; 2.4% CaO; and 59.6% Insol. A sample of the lower less siliceous ore representing a thickness of 30" assayed (H-88) 9.28% Cu; 18% CaO; and 2% Insol. A possible producer.
				1917 July 11th	Claims have been jumped by E. M. Isbell and renamed "Three Fiddlers". Lockridge also still claims ownership. Nobody working.
	<u>H. P.</u>	Adjoins Anita Queen on the West, 2-3/4 mi. from Anita Siding.	H. H. Pitkin, Mgr. Bright Angel Camp, Grand Canyon. Idle Prospect.	1917 May 10th	One claim unpatented. Formation similar to adjoining Anita Queen. Only workings 30' open cut in brecciated line with replacements of iron and copper carbonates. A sample of the brecciated lime representing a width of four feet assayed (H-91), Gold, a trace; Silver 0.20 oz; 2.78% Cu; 28.6% CaO; 4% Fe; 4.5% Insol. Undeveloped prospect. A possible producer.
				1917 July 11th	Chas. A. Green only man working. Sampled width 3' across face at N. end of open cut which assayed (H-119) Cu. 1.72%; CaO 36.6%; Insol. 6.8%. S. end across 2-1/2' assayed (H-120) Cu. 2.84%; CaO 30.7%; Insol. 12.8%.

DEPARTMENT OF MINERAL RESOURCES  
STATE OF ARIZONA  
OWNERS MINE REPORT

ME 72  
MAY-LTVEY

Date June 1, 1940

1. Mine Emerald and Ruby Claims
2. Mining District & County Francis  
Coconino County
3. Former name
4. Location 45 miles from Williams
5. Owner W. H. and Grace Lockridge ✓ 20163
6. Address (Owner) Grand Canyon, Ariz.
7. Operator
8. Address (Operator)
9. President
10. Gen. Mgr.
11. Mine Supt.
12. Mill Supt.
13. Principal Metals Copper
14. Men Employed
15. Production Rate
16. Mill: Type & Cap.
17. Power: Amt. & Type
18. Operations: Present
19. Operations Planned
20. Number Claims, Title, etc. 2 claims, Emerald and Ruby
21. Description: Topography & Geography On top of hill on old county road. Good dirt road. A little steep and rough going up the hill. It is 4 miles down grade to Anita Station R. R. and then 6 miles to State highway.
22. Mine Workings: Amt. & Condition The deepest shaft is about 30 foot . We have owned and worked these claims for a number of years, but owing to the very low price of copper for the last 8 to 10 years have let them get in bad shape only taking out some ore and shipping or hauling to sampler. When doing our assessments, any one wishing to see sample of the ores can inquire at Vaughn's Curio Shop right on highway in Williams, Ariz.

23. Geology & Mineralization contains copper, some silver. Trace of gold.

24. Ore: Positive & Probable, Ore Dumps, Tailings

24-A Vein Width, Length, Value, etc.

25. Mine, Mill Equipment & Flow Sheet

26. Road Conditions, Route  
4 miles to Anita Station to R.R. 6 miles to highway, 18 miles to Grand Canyon, 45 miles from Williams, Ariz.

27. Water Supply Galvanized tanks for drinking water

28. Brief History We located these claims a number of years ago and they helped with making a living for 7 children until they were through grade school. We are both getting old and no money to go on to work these ourselves.

29. Special Problems, Reports Filed

30. Remarks

31. If property for sale: Price, terms and address to negotiate.

Thirty Thousand, One-halld  
Cash, balance terms.

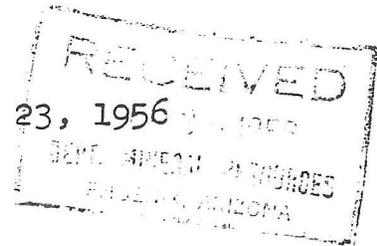
32. Signed..... Grace E. Lockridge  
P.O. Grand Canyon, Ariz.

33. Use additional sheets if necessary.

Inquire for Sherman or Grace Moore at Post Office for information for getting in here.

EDWARD WOLF

308 TRINITY BLDG.  
111 BROADWAY - NEW YORK 6, N. Y.



April 23, 1956

State of Arizona  
Dept. or Bureau of Mines  
Phoenix, Arizona

Gentlemen:

We have just purchased 76 copper claims running North and South in Sections 29 and 32, T. 30 N., R. 2 E. and Sections 5,8,17,20,21,29, T.29 N., R. 2 E. in Coconino County, Arizona 34 miles North of Williams. Our claims are in part new filings over old properties. Old mines indicated on one map we have are the Apex Mine one mile West of the Apex Siding; the Emerald Mine slightly South, and the Anita Mine in Section 29 of T. 29 N., R. 2 E. Any information or history you may have on these properties will be greatly appreciated. Geological data would also be very helpful.

This area was controlled, we understand, by a man named Lockridge for a number of years, who mined there at intervals. Lockridge is now deceased, but his wife has leased the property due South of our claims to a New York group who are now in production. They call the operation the "Arizona Giant". Any data on this would be appreciated greatly.

We are planning to start a strip mining operation on the claims within the next 30 days. Because we are unfamiliar with Arizona laws and regulations in regard to mining in your state, your assistance will be appreciated. Please send us data on safety laws, workmen's insurance and compensation requirements, required reports or permits, etc. We will be operating as a Delaware corporation in Arizona.

Aside from the reports and assays obtained by the geologist and engineer which we hired, we know very little of the area. No doubt there are publications issued by Arizona covering studies or investigations of copper properties in Coconino County or Northwestern Arizona. If these exist, please forward them along with an invoice for their cost.

Thank you.

Yours very truly,

*Edward Wolf*  
Edward Wolf

*Mrs. Hazel Lockridge*  
*Commercial Metal*  
*Finest*  
*Daughter*  
*James Moore*  
*621 N. Newton*  
*202 E*

*9000 40M*  
*HIT part*  
*2 miles*  
*EW/me*  
*R*

April 27, 1956

Mr. Edward Wolf  
308 Trinity Bldg  
111 Broadway  
New York 6, N. Y.

Dear Mr. Wolf:

Our files contains little if any information on the copper deposits located in T. 29 and 30 N., R. 3 E., however, I have been informed that the mineralisation on the area in question is rather limited and occurs in thin streaks in limestone beds.

Prospecting has been carried on for a number of years by Mr. Lockridge, now deceased and one of his sons who also passed away two months ago. Various properties are now owned by Mrs. Havel Lockridge, Commercial Hotel, Flagstaff, Arizona and Frank Lockridge, and Mrs. Sherman Moore, 621 North Newton Street, Williams, Arizona.

It is my understanding that approximately 30 carloads of material were shipped from one group of claims to the American Smelting and Refining Company of Hayden, Arizona during the past year, but at the present time all operations have ceased.

In regard to laws and regulations pertaining to mining, I suggest you write direct to Mr. Ed Massey, Mine Inspector, Capitol Building, Phoenix. Workmen's insurance and compensation requirements can be furnished you by the Arizona Industrial Commission, Capitol Annex, Phoenix and information regarding taxes should be sought from the Arizona Tax Commission, Capitol Building, Phoenix.

If we can be of further service, please feel free to call on us.

Very truly yours,

R.I.C. Manning,  
Director.

RICM:lp

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DEPARTMENT OF MINERAL RESOURCES  
STATE OF ARIZONA  
MINE OWNER'S REPORT

Date June 1 - 1940

1. Mine Emerald & Ruby Claims  
2. Location 45 miles from Williams  
3. Mining District & County Francisco, Coconino County  
4. Former name  
5. Owner W. H. & Grace Lockridge ✓  
6. Address (Owner) Grand Canyon Cu  
7. Operator  
8. Address (Operator)  
9. President, Owning Co.  
9A. President, Operating Co.  
10. Gen. Mgr.  
14. Principal Minerals Copper ✓  
11. Mine Supt.  
15. Production Rate  
12. Mill Supt.  
16. Mill: Type & Cap.  
13. Men Employed  
17. Power: Amt. & Type  
18. Operations: Present

19. Operations: Planned

20. Number Claims, Title, etc. 2 Claims Emerald & Ruby

21. Description: Topography & Geography On top of hill on old county road, good dirt-road, a little steep and rough going up the hill. It is 4 miles down grade to Anita Station, R.R. and then 6 miles to state highway.  
22. Mine Workings: Amt. & Condition

The deepest shaft is about 30 feet. We have owned and worked these claims for a number of years, but owing to the <sup>(over)</sup> very low price of copper for the last 8 or 10 years

23. Geology & Mineralization

Quartz Calcifer, some silver. trace of gold

24. Ore: Positive & Probable, Ore Dumps, Tailings

24A. Dimensions and Value of Ore body

25. Mine, Mill Equipment & Flow-Sheet

26. Road Conditions, Route

4 miles to Anita Station to RR.  
6 miles to Highway. 18 miles to Grand  
Canyon. 45 miles from Williams Army.

27. Water Supply

Galvanized tanks for drinking water

28. Brief History

The locator there claims a number of  
years ago and they helped with making

29. Special Problems, Reports Filed

a lining for 7 children. which  
they were through grade school.

30. Remarks

We are both getting to old and no  
money to go on, to work them over.

31. If property for sale: Price, terms and address to negotiate.

Quinty thousand, 1/2 cash.

bal teams.

32. Signature

Grace E Lockridge, PO Grand Canyon  
Ariz

33. Use additional sheets if necessary.

Inquire for Sherman or Grace  
Moore, at Post Office, for information for  
getting in here.

22 May 1940

Mrs. Grace E. Lockridge,  
Grand Canyon,  
Arizona.

Dear Mrs. Lockridge:

I thank you for your letter of May 20.

I am enclosing herewith a blank Mine Owners Report, which I should suggest that you fill out in detail and return to us as early as possible so that we may have information available regarding your copper property.

I shall be glad to refer anyone to you desiring a copper property as soon as I have the information.

Yours very truly,

J. S. Coupal  
Director

JSC-jrf  
encl.

Santa Arroyo  
May 20 - 1940

J. S. Campbell,  
Phoenix, Ariz.

Dear Sir:

We have 2 mining claims  
Copper, which we would like to  
find a buyer. Any one wishing  
to know about them. Or passing  
through Williams, Ariz. our stop at  
Yous. Conio Shop. on the highway and  
he will show them specimen of the  
ores. and blue ribbon. for 2 years.  
Any one wishing to find us will  
go to Grand Canyon. and get in touch  
with Mrs Grace Moon. at the P.O. she  
will bring them down or give them  
the correct direction.

Yours Truly  
Grace E. Lockwood  
P.O. Grand Canyon  
Ariz