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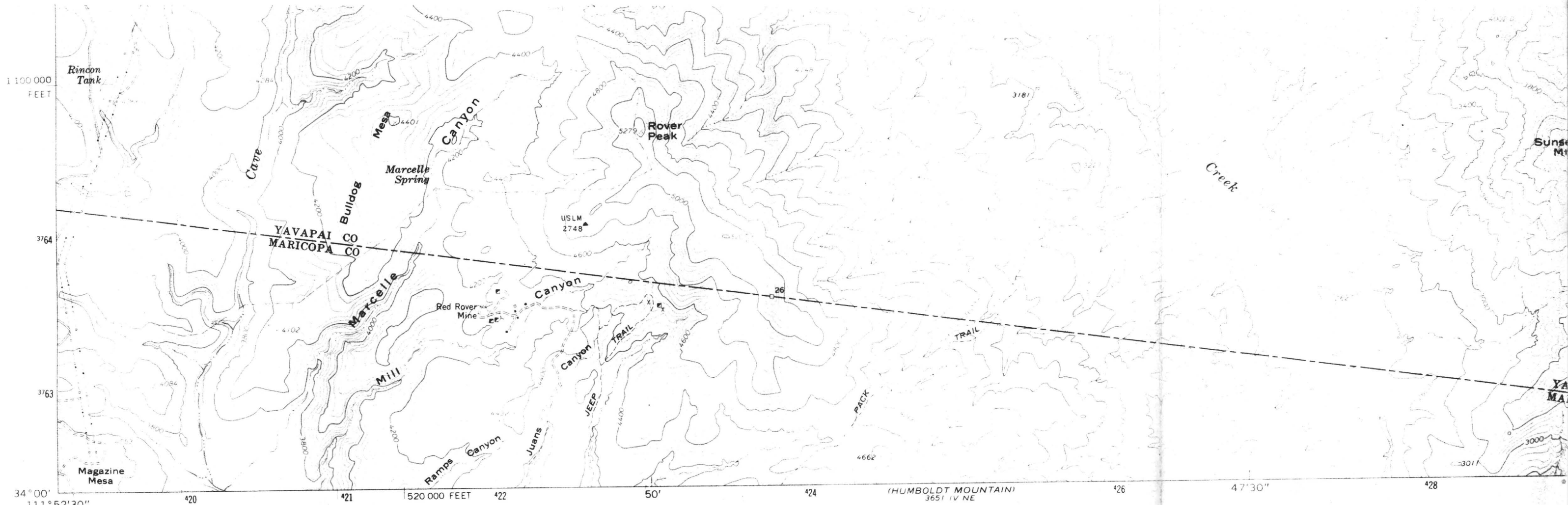
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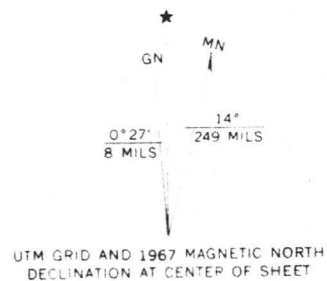
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Topography by photogrammetric methods from aerial photographs taken 1965. Field checked 1967

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

Fine red dashed lines indicate selected fence lines

Where omitted, land lines have not been established



CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

ROVER PEAK, ARIZ
1967

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



(COPY)

REPORT

on the

RED ROVER COPPER COMPANY

Magazine Mining District

Maricopa County, Arizona

THE PROPERTY

and

THE LOCATION

The Red Rover Copper Company comprises a group of 37 patented mining claims all situated in the northeast corner of Maricopa County, Arizona, about midway between the Agua Fria and Verde Rivers. The mining claims are located between Cave Creek and Lime Creek, normally dry creek beds which drain the high lands in this section. Lime Creek empties into the Verde River while Cave Creek outlets into the Salt River.

The altitude at the mining property varies from 3,900 to 4,300 feet above sea level.

Wood is reported to have been abundant in the early days of mining operation. At this time the hills show only a scant growth of cacti and an occasional mesquite bush.

Water is scarce, although a sufficient supply for mining operations and domestic use has been developed in the mine workings. The available water supply is said to be approximately 100 gallons per minute.

ACCESSIBILITY

The property is reached by an automobile highway which runs northeast of Phoenix, following northward through Paradise Valley then along Cave Creek to Cave Creek Station, then a winding narrow road northeast to the property. The total distance from Phoenix is 54 miles. All of the distance except the last 8 miles is a state highway of good width and is well maintained. The remaining 8 miles is kept in repair by the mining company, and is passable but is not well laid out.

Fuel oil, also, all mining and camp supplies are trucked from Phoenix to the property. Ore shipments from the mine to the railroad at Phoenix are handled under contract for \$9.00 per ton. Automobile trucks of six-ton capacity are used. One round trip is made daily. Trucking service is easily maintained on this schedule in the normally dry climate of the district.

HISTORY

The first mining locations were made in 1883. From the time of the original discovery small tonnages of rich copper, silver ores were made. These irregular shipments continued during the next twenty years. Transportation difficulties prevented extensive operations. The properties were allowed to lapse in 1903, but were relocated in 1906. In 1916 the

*From Ariz. Dept. of Geol. & Min.
"Colva Cores" files 1406*

mining claims were sold to the Gillespie interests, oil developer and operators, of Tulsa, Oklahoma. The new owners organized the Red Rover Copper Company to develop and operate the property. An extensive campaign was undertaken and several shafts were sunk. From the shafts approximately 12,000 feet of development work was prosecuted on various levels of the property.

The property was equipped with good machinery so that development work was carried out in a creditable manner.

A vertical shaft ($2\frac{1}{2}$) compartment, was sunk to a depth of 860 feet. Levels were run from this shaft on the 200, 300, 500, 600, and 800. On the 200, 300 and 500 levels connections were made with the old irregular drifts run from an inclined shaft sunk on the surface outcrops of good ores found near the discovery locations.

The incline shaft reached a depth of 380 feet. The workings around this shaft indicated a good tonnage of low grade oxidized copper ores, silicates, oxide and carbonate of copper carrying 3% copper and 8 to 12 ounces silver per ton. The ores are found in an altered silicious limestone.

Selected and sorted high grade ores were shipped direct to smelters. For ores of less value than could be shipped to smelters, a leaching plant was installed. The lixiviant was to be ferrous sulphate followed by electrolytic precipitation of the dissolved copper. The installation was unsuccessfully operated. This plant was abandoned. The latest effort to mill the ores was by means of a combined gravity concentration and flotation plant. This operation was also a failure. In recent months the entire property has been in the hands of lessors.

The entire property was leased for a five year period, to A. N. Moores & Son, freighting contractors of Phoenix, Arizona. A. N. Moores is manager of operations, assisted by A. C. Simpkins, who is directing the technical end. Lease operations began in August, 1929. Ore shipments under the lease started in December, 1929.

A total of 2,000 tons of first class ore has been shipped to smelters during the past four months. The ore shipments to date returned an average value of approximately 6% copper, and 40 ounces of silver per ton. The gross net smelter returns of shipments from the lease has been nearly \$45,000.00 after deducting railroad freight, smelter deductions and charges.

Royalty deductions of 25% of the net smelter returns, trucking and mining costs nearly absorb the net smelter returns. A small profit per ton is being made on an output of 20 tons daily of first class ore.

Most of this production is coming from an ore shoot now being mined between the 400 and 500 foot levels.

The ores now being shipped are rough sorted on surface. The values occur as carbonates, silicates and oxides of copper, mixed with copper glance and occasional specs of tetrahedrite. The glance and tetrahedrite ores assay high in silver values. The ores carry 35%-40% insoluble; 15 - 20 CaO; and less than 5% Fe.

GEOLOGY

Copper mineralization is found in a vein striking N 50° E cutting through limestone. The vein dips to the northwest at an average of 55 degrees. The vein is well marked along the surface for a distance of slightly more than 500 feet, and then disappears under a surface capping of andesite flows.

The surface outcrops are marked by silicious copper-stained croppings in altered limestone. Holes sunk by prospectors and miners for high grade disclose the evidence that diabase cutting into the limestone are responsible for the mineralization. The vein or fissure formed subsequent to the diabase intrusion into the limestone. Faulting accompanied the vein fissure and along fault fractures channels formed which permitted free circulation of mineral solutions and downward leaching, oxidation and concentration of values into lenses and ore pockets of enriched ore.

Near surface very rich silver ores were found in small kidneys, but typical leached ground showing manganese and oxides of iron indicated concentration into secondary ores rich in copper and silver.

The vein material varies in width from 2 feet to more than 30 feet wide. Copper stains indicate values and justify prospecting for the enriched lense of high grade ore.

The main shaft has been unwatered to 20 feet below the 500 foot level. From surface down to the 500' level, two lenses of rich ore have been found and recent prospecting indicates a third ore pocket.

However, the enriched ore shoots are surrounded by leached and oxidized ores, therefore, there may be reasonable expectation that concentration will continue to greater depths.

The limestone is exposed in a narrow belt on surface, but is capped or covered by an andesite lava flow to the north, east and west of the mineral outcrops. On the south the immediate contact with limestone is a rhyolite intrusive about 1,000 feet wide, and this rhyolite contacts with granite farther southward.

Onyx has been quarried from an extension of the limestone area about one mile west of the main shaft.

The extent of the diabase intrusive cannot be determined at this time, it is certain that fingers of diabase penetrate the lime stone at various horizons and the main mass of diabase will be found northeast of the main shaft.

The diabase when unaltered shows pyritic primary minerals, pyrite and chalcopyrite. The primary chalcopyrite assays 2 to 4 ounces silver and it is reasonable to assure commercial copper ores will be found in the main diabase intrusive.

From surface to the 500 foot level and the lenses of enriched ores have been proven for a length of 500 feet. The average width is approximately 8 feet.

DEVELOPMENT WORK - BELOW WATER LEVEL:

The main shaft at this date has been unwatered to the 520 foot level. On the 500 foot level about 130 feet southwest of the shaft, a wide body of low grade ore is exposed in the main drift for a length of 50 feet, averaging about 30 feet wide. This ore shoot has been square setted and carefully sampled in the bottom of each set with individual sets 5 feet square assaying sufficient values to permit of direct shipment to the smelt.

It is proposed to unwater the shaft to the 700 foot level and do further prospecting and raising from the 700 ~~foot~~ to the 500 to block out this ore body.

Drifting on the 700 level had not progressed far enough to the southwest to encounter the downward continuation of the 500 orebody.

The maps of the 700 level show a south drift for 50 feet. At the 75 foot point in the north drift a crosscut was advanced 140 feet northwest. This crosscut is reported to have cut several feet in width of copper bearing ledge matter assaying from 1 to 3% copper and 4 to 11 ounces silver per ton. Spots of glance ore are reported from this ore showing.

In the face of the northwest drift, a diamond drill hole tested formations by a flat hole and did not disclose any new ore showings. Cores from this hole show andesite.

From the face of the north drift in which is 155 feet north of the shaft a flat diamond drill hole was bored. The core from this hole now stored at the mine appears to confirm the reports that a good showing of oxidized ores was encountered for a length of about 50 feet. This showing begins after 40 feet of drilling continues to the 92 foot point.

The cores show good hematite, copper stained ledge matter or leached ground showing an abundance of metallic copper, also occasional seams and spots of copper glance. A paper note in the box mentions the shipment of important pieces of core to the company directors in Los Angeles and Tulsa. The good mineral showing is further corroborated by the diamond drill operators.

The drill data, together with the showing in drill cores now stored indicates that the 700 level north drift will within 50 feet encounter an important new ore horizon.

The 800 level development is said to have confirmed to cutting a station

The vertical shaft was bottomed at 860 feet, but no record obtainable by persons now living at the mine as to what was encountered in sinking below the 700 level.

On the 500 level, vertically above the showing encountered by drilling on the 700 level, there was found small bunches and spots of primary sulphide ores in disbase. The mineralized cores from the 700 level are mineralized ledge material in limestone.

CONCLUSION

Without question, the Red Rover Copper Company property has a reasonable chance to develop a small tonnage of rich copper-silver ores. In my opinion, there will be found between the 500 and 700 levels more than 20,000 tons of ores sufficiently rich in copper and silver to permit of direct shipment to the smelters. This indicated tonnage is not sufficient to justify an option to purchase the property for a price commensurate with the expenditure already made for purchase and development by the Red Rover Company.

Without considering royalty payment, it is probably that ore tonnage in sight above the 500, and probably between the 500 and 700 level could be mined, shipped and smelted to produce a profit of \$7.00 per ton with copper metal selling at 14 cents per pound, and silver at 42 cents per ounce.

Under present royalty terms, payable to owners by the lessors, of 25% net smelter returns after payment of railroad freight and smelter charges, the probable profit would be cut to \$2.67 per ton.

It is estimated that the ores can be mined and rough sorted for \$6.00 per ton.

The profit margin is too small under present lease terms to warrant operation and unwatering the shaft below the 500 level.

It is probable that a modification of royalty payments can be obtained together with an option to purchase the property during the lease period. If modified terms can be secured, I recommend that the purchase of the lease and further exploration of the 700 and 800 levels with reasonable assurance that the cost of undertaking this development will be returned in profit for ores to be obtained in the development work.

The chances for developing a small high grade property at a reasonable cost is indicated and worthy of the capital expenditure upwards of \$100,000 to prove the property.

The property is sufficiently equipped to carry out this development campaign when and if the lease terms are modified and a reasonable option to purchase is obtained from the Red Rover Copper Company.

Respectfully submitted,

Arthur Houle, (Signed)
E.M.

Dept Min Res. files

Red Rover

4/27/84 Allan Fecht Reports he bought the

Red Rover Mine, Cove Creek Dist, Maricopa Co,
 (12 patented claims) for \$1000/Acre. He reports
 vein widths of 30 feet:

Southern Cross Co.
 Allan Fecht
 8035 West R.L. Thornton
 Dallas Texas FWY

2/13/81 Mr Tozier reported he is again moving the
 Red Rover into Escrow. This time with a Corp.
 planning a subdivision. Indicated he was
 not hopeful of this deal closing any more than
 previous ones.

4/30/82 Mr. Charles Tyner, 6638 E Earle Dr.,
 Scottsdale, AZ 85251 (949-0448) reports he
 has invested in Red Rover and is looking for
 other investors.

8/13/82 Mr Tozier reported that he has leased the
 Red Rover on a month by month basis.

Apr, 85 Robert Hale purchased $1\frac{1}{2}$ claim
 (E $\frac{1}{2}$ Red Rover lapper No 14
 and all Red Rover Copper No 2)

May
 →

Allan Fecht & Dave Fisher

Turnion lbl 6125 E Indian School Rd #139
 Scottsdale 85251
 990-8956

Using a "MAP" Silver probe for assaying
 - Map and development of Cathod Ray tubes
 etc.

Jim Bropleman - geologist - July - Copied files

Dec 84 - Scottsdale purchased part of Red Rover for water rights

See above -
 Southern Cross
 Address

ARIZ Burr Mines Bull 129 J. B. Tenney
2nd Report of the Mineral Industries of Ariz 1930

P 74 "
Camp Creep, Maricopa Co — In this district,
lessees operated the Red Rover mine and shipped
a small tonnage of high grade copper-silver ore."

Mineral Industries of Ariz - 1928

No Mention —

ARIZ Burr Mines Bull 140
Ariz Metal production, 1936

P 94 Magazine Dist.
Red Rover 1882-1917 800,000 lbs Cu
\$ 75000 Ag

JEK Calculation - This ~~early~~ production
was both before and after 1900
about equally — probably.

Using 85¢/oz as Ag Average, then:

* If copper recovered averaged 10%, from 4000 tons

$$\text{then, } \frac{\$75000}{85¢} = 88000 \text{ oz Ag} \\ \frac{88000 \text{ oz Ag}}{4000 \text{ Tons}} = 22 \text{ oz Ag/Ton Ore} \\ \text{(Recovered. Recovery would be 95% plus at smelter.)}$$

$$\text{Revenue} = 20 \times 10 = 200 \text{ }^{\text{H}}\text{Cu} \times 10¢ \text{ smelter payment} \\ = \$20/\text{ton Cu}$$

$$22 \text{ oz} \times 85¢ = \$18.70$$

$$\text{Total } \begin{array}{r} 20.70 \\ + 18.70 \\ \hline \$38.70 \end{array} = \$40.00/\text{ton Round figures.}$$

The above amounts sound reasonable
for the early direct shipments; ~~and~~
Maybe higher grade w/ less tonnage.

Shipments

1929, Moore & Pickett, 92 lots 55 tons to the car - 5060 tons

7/7/34 to Oct 9, 1935. Dry tons 1830

145,665 # Cu - \$ 9,140.84 = 3.98% Cu

34,947 oz Ag $\frac{36,049.67}{\$ 45,190.51} = 19.10 \text{ oz/T Ag}$

Actual Returns \$ 25,832.67 (Smelter charge less freight)

^{of direct shipments}
Lot by lot list_{ings} are in the Dept MR files, indicating

a range in Cu of 3-4% on the low end and 6-7 on the upper end, most being in between; with silver ave maybe 20 oz. The list is unsorted, and I did not copy it. Ave lot was ± 45 tons.

1/22/63 Interview w/ L. M. Tozier.

He purchased 300 oz patented and 600 oz unpatented from Barry Gillespie. "Mr. Tozier had been informed the mine water ran 11 ounces of silver to the gallon"

location Sec 21, 22, 27, 28 Tp 8N R 5E

1941 Application for loan, (Prob RFL) in 1941 -

Att "A"

mining started May 19 1940, Stopped Feb 18, 1941

Att "B"

pg 4 -

List of Assays given as follows -

No	width	Cu	Ag	Descr.
1	3'	.61%	4.803	Partly Ox
2	3'	1.50	20.2	" "
3	4'	1.12	4.4	Oxid.
4	12 1/2'	1.22	3.6	"
5	8'	2.94	19.8	"
6	—	8.8	20.1	" (hand sorting ore)

Samples 3 and 4 will run together making 30' width, interior can't be sampled owing to a cave.

Magma Copper Co Shipments

	Ore	Conc	Ag (O ₂)	Ag (O ₃)
1939				
Gillespie hand & irrigation Co.	Ore 353.2	44,713	11,400.77	8.842
" " "	Conc 203.2	64,732	19,237.17	4.078
1940				
Gillespie L. & I Co	Ore 165.1	13,656	3,426.75	3.441
	Conc 533.3	100,015	24,319.54	9.221
Red Rover Cop. Co	Conc 78.1	10,374	2,680.48	.787
1941				
Red Rover Cop Co.	Conc 287.9	56,508	11,392.40	5.759
Total	1621.4	289,998	72,457.11	32.128

~~14~~ 14500 Tons Cu
1621
= 8.94 % Cu Ave
ore & Conc combined

$\frac{72,457.11}{1621.4} = 44.4 \text{ oz/Ton Ag Average}$
ore and Conc. combined

Pencil Notes From Files of Ariz Bur of Mines & unassigned -- Same handwriting appears in numerous files and similar field exams. Apparently done by Bureau personell for the Mineral Industries Series.

Red Rock Mine

Camp Creek

Maricopa County.

Owned by Gillespie (Gillespie Dam)

Leased for 5 years to J.M. Pickett
and E.M. Moore.

Mine Visited Nov 2nd 1929.

Mine is 50 miles from Phoenix the nearest rail point. Cost of haul given by Moore who is a hauling contractor, at \$9 a ton. Ore occurs accompanying quartz croppings cutting schist(?). Occurs as irregular bodies with no definite walls, and consist of chrysocolla, malachite ^{glauconite} and hematite in a siliceous matrix on upper levels with very little limonite stain. Ore said to be changing to chalcopryite & bornite on 700 and 800 foot levels. Limits of oxidation not reached with 800 foot shaft. Croppings found for a length of 480 feet in spots and "blow outs".

Present operators figure on shipping direct as siliceous ore. One car shipped ran 20% Cu 200 oz Silver.

Gill. True leaching but it proves

a failure

Mine equiped with 200 HP Fairbanks, Morse
Diesel engine, ~~mining dynamo~~, compressor
and miscellaneous camp equipment.

15 men (white) Employed.

Has not the earmarks of a big mine, but
may be profitable as a small rich
producer.

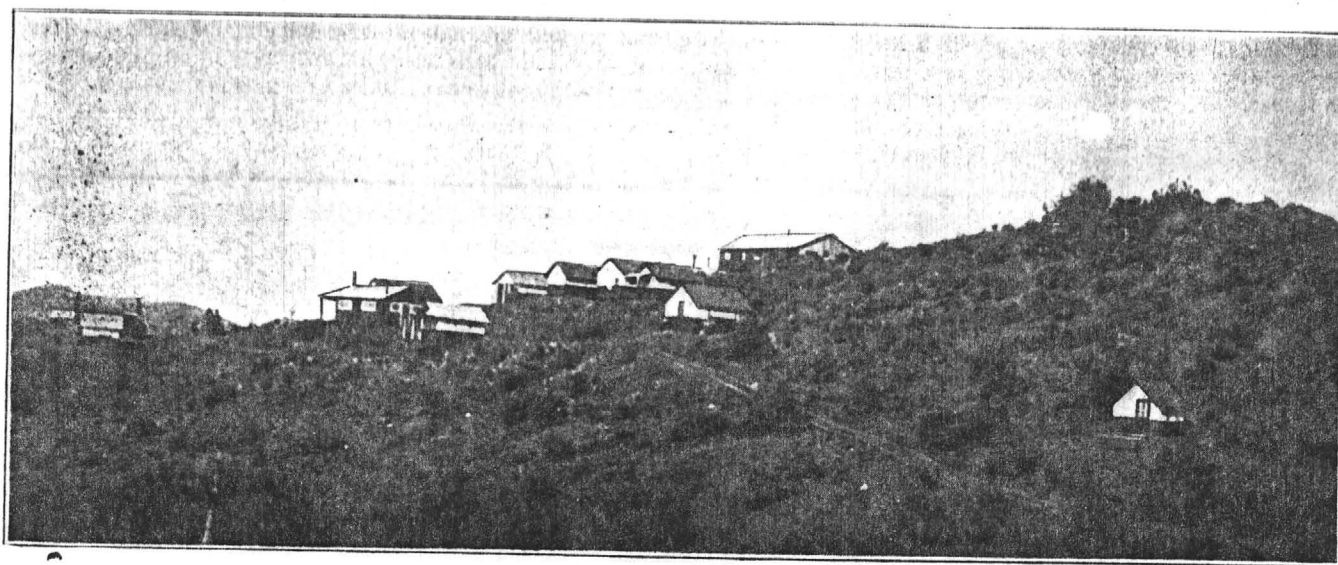
Potable production for near future
of 2 car loads (100 tons) a month (Picket)

Limestone breccia occurs near one
outcrop, and diatase(?) at depth carrying
disseminated clpy and bornite and
bornite scintils.

Good potable water obtained from mine ample
~~enough~~ for camp use, and said to have
been enough to run leaching plant.

Mining ground 2-15-41

Gen. World
Jan. 1952



CAMP AT RED ROVER MINE, CAVE CREEK DISTRICT

Ore Deposits of Cave Creek District, in Arizona

Geology of Area Twenty-eight Miles North of Phoenix Described—Only Deposit Developed of Present Importance That of Red Rover Mine—Characteristics of Principal Type of Outcrops Discussed

BY ALFRED STRONG LEWIS
Written for *Engineering and Mining Journal*

WITHIN the last two years I have made several professional trips to the Cave Creek mining district, in Maricopa County, Ariz., for Eastern clients holding mining interests therein. In passing over and through the district, and in connection with my examination of certain specific properties, I was greatly impressed by the appearance of the general surface conditions, and therefore determined to make a careful examination, with the purpose of preparing a geological map of the district. This article is based on such survey and examination.

First I made a thorough search of all possible sources for information relating to the district, but found nothing except that its northeast corner was included in the quadrangle covered by the Bradshaw folio of the U. S. Geological Survey. Careful study was made of the Government geological maps and other data relating to the developed districts both north and south of the Cave Creek district, in which the same surface conditions are disclosed as I found to exist in the latter.

MAPPING THE DISTRICT

Having completed the study of the adjoining territory I proceeded to examine the Cave Creek district about July 1, 1919, and by Oct. 1, 1919, I had gone over all of the country which had exposures of the older pre-Cambrian formation. I found large areas within the district to be covered by volcanic agglomerate, which was not mineralized and was therefore of no economic importance. These areas I simply sketched in and did not attempt to differentiate. The final results of my work are embodied in the geological map on page 714.

The Cave Creek district is twenty-eight miles due north of Phoenix, Ariz. The road leading out of Phoenix is paved for the first eight miles and from that point passes through the Paradise Valley with

slight grades. The elevation of the district varies from 2,100 ft. in the lowest part of the basin to a maximum of 5,000 ft. at the higher peaks. The main outlet for the drainage of the entire district is Cave Creek, which has an average fall of 200 ft. to the mile. At its headwaters near the Red Rover mine it has an elevation of about 4,000 ft. and twenty miles from here it emerges into the desert at an elevation of 2,000 ft.

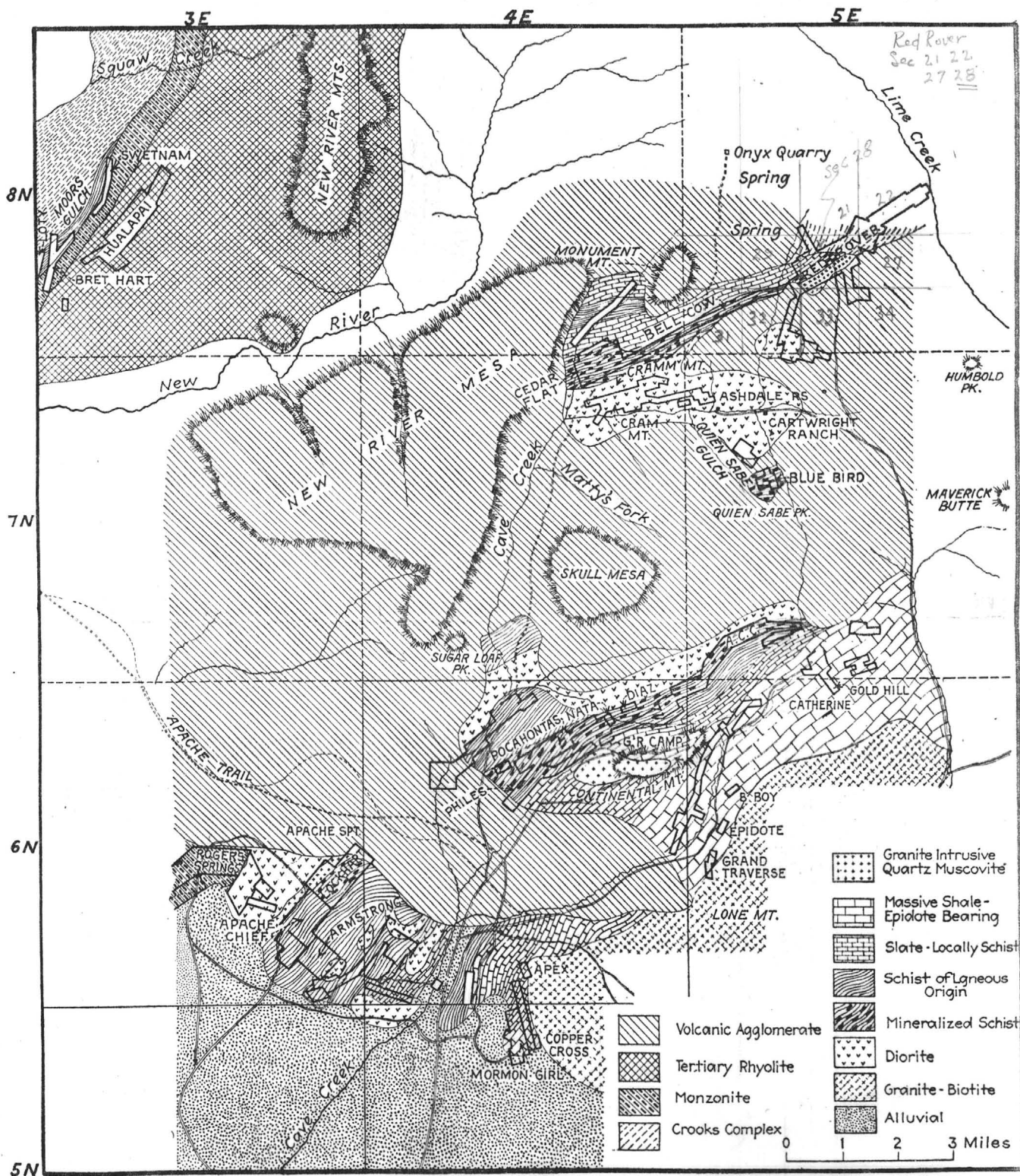
EVIDENCES OF GREAT EROSION APPARENT

Following up Cave Creek, a rim of low mountains is first encountered through which the stream has cut its course. This rim forms the southern boundary of the district. These mountains are abruptly covered at the base of their southern slope by the alluvial material of Paradise Valley. At the foot of the northern slope they are covered by volcanic agglomerate, which covers a basin-like area about three miles wide, feathering out to the east, but widening to the west. High ridges and mesas then succeed one another for several miles. Cave Creek has cut a deep gorge in this part of its course. The ridges and mesas finally give place to open country with an average elevation of about 3,500 ft. and the creek branches out into numerous small washes and ravines. Erosion has been very great, as evidenced by the great depth of the fill in Paradise and Salt River valleys. These hills, which now stand out alone and disconnected, were once part of an enormous mountain system extending from the interior of Mexico diagonally across Arizona and continuing through Nevada. Many thousands of feet have been torn from this mountain system by powerful forces of nature operating through millions of years. This material has been washed down into the great chasms at their feet. The chasms have been filled and leveled into broad valleys of great agricultural activity, and the once lofty peaks have been

dwarfed and diminished into low hills of insignificant size. These tremendous destructive natural agencies have finally exposed at the surface mineralized zones which were originally conceived at profound depth.

The geological ages represented in the district by

agglomerate, are for the most part in their original position and are non-mineral bearing as far as known. The Paleozoic beds elsewhere developed in Arizona are entirely absent here. Rocks of igneous origin, however, represent volcanic activity in many geologic periods.



RECONNAISSANCE MAP OF AREAL GEOLOGY OF CAVE CREEK MINING DISTRICT, MARICOPA COUNTY, ARIZ.

sedimentary deposits are confined to the oldest and the youngest of all exposures in Arizona. The pre-Cambrian sediments, which have been highly altered, metamorphosed, folded and finally compressed into shales, slates, and schists, are mineral bearing, but the Tertiary (or Quaternary) deposits, composed of volcanic

Granites of Algonkian age are present; siliceous porphyries originally bedded in pre-Cambrian oceanic sediments, and now forming nearly vertical zones of schist; later granite intrusions in the schists diagonal to its strike; greenstone bedded with the schists and diorites in large marginal masses as well as small and

large dikes irregularly intruded into the schists; and narrow granite porphyry dikes developed for miles in length and running with the strike of the schists, some highly sericitized, some highly siliceous.¹ At certain points as many as six of these dikes running remarkably parallel and spaced from 300 to 600 ft. apart are exposed.

Upon the southeastern margin of the districts is exposed a coarse-grained biotite granite batholith which covers an area of about 2,000 square miles. The granite weathers into peculiar shaped boulders which have almost the identical appearance of the boulder batholith granite exposures of Butte, Mont. The batholith, if of post-Paleozoic age, may have doomed and broken up the Paleozoic beds, rendering them easy prey to the erosive action of the Verde and Salt rivers. Deformation is evidenced by highly contorted rocks in many localities, as well as the change in the strike of the schist zones. There is a remarkable persistency in this strike. The normal strike seems to be N 42° E, and the deformed strike in almost all cases is N 60° E.

QUARTZ LENSES AND STRINGERS PROMINENT IN SCHISTS

At certain points the schists contain large and small lenses, stringers, and bands of jasper and quartz. Some of these lenses are prominently developed. They are usually from 10 to 50 ft. wide and from 200 to 500 ft. long. They do not occur in straight lines, but are offset in a somewhat regular manner and occur in the softer, more highly sericitized and bleached zones of schist and usually in proximity to the acid-porphyry dikes. Throughout these mineralized zones are distributed many small outcroppings of copper, silver, and gold minerals.

The exposures in the Cave Creek district are similar to those found at the surface in the proven districts of Arizona. An examination of the ore outcrops throughout the district discloses clearly the fact that, in the main, the gold, copper, and silver have been leached, leaving occasional shoots or kidneys of ore which have escaped leaching by reason of some topographical or other condition unfavorable to leaching. Such residual oreshoots are found to carry values in gold, silver, and copper running from \$10 to \$60 per ton.

RED ROVER DEPOSIT ONLY ONE OF IMPORTANCE TO DATE

There is only one property in the district which has done sufficient development work to uncover anything worthy of the term "ore deposit." This property, known as the Red Rover mine, is in the schist zone. The deposit at the surface is in an irregular inclined seam and shows copper carbonates carrying as high as 2,000 oz. of silver per ton. The ore occurs as lenses in the schist and has been developed so far to a depth of 500 ft. A very interesting occurrence is to be seen in the shaft which passes through about 30 ft. of schist impregnated with native copper in the form of thin scales, bright and wonderfully distinct until tarnished by exposure to the air. The principal deposit opened up on the 300- and 500-ft. level shows masses 3 to 4 ft. wide, of copper glance carrying 400 to 700 oz. silver

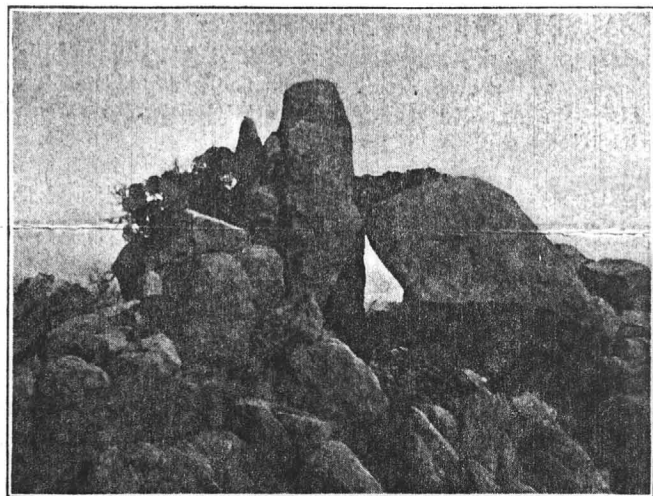
per ton. The other properties in the district have nothing but outcrops to recommend them.

It has been stated many times in recent mining literature that the mines of the future must be found by the application of geological deduction based upon surface and other data available. It therefore seems proper to describe the general characteristics of the principal types of outcrops exposed in this district. For convenient description the district can be divided into three zones.

COPPER CARBONATES FREQUENT ALONG BATHOLITH CONTACT

The first zone is from one mile to two miles wide and borders the northwestern contact of the granite batholith. It is composed of highly metamorphosed banded shales. Blocky epidote rock is extensively developed in this zone, and in places there are ledges composed of epidote, quartz, and dolomite intimately mixed. This zone gives place to slates along its western margin. Copper carbonates carrying several dollars per ton in gold and silver outcrop at many points within this zone, always in association with quartz or epidote.

The Mormon Girl deposit, in this zone, is formed in contact with and just above an inclined foot wall of



GRANITE POINT—A PREHISTORIC "LOOKOUT" IN THE CAVE CREEK DISTRICT

barren quartz. This quartz is 6 to 8 ft. thick and represents two generations of silicification, one of white quartz, which has been crushed into angular fragments, and the other a dark quartz, which has been deposited around the irregular fragments of the white quartz making the present hard compact foot wall. This foot wall is smooth, continuous, and unbroken. On top of it has been deposited copper-gold-silver-bearing quartz of an average value of \$40 per ton and from 4 to 5 ft. thick. A few hundred feet below this the ore disappears.

LITTLE COPPER IN SECOND ZONE

The second zone begins at the edge or border of the slates and extends to the contact of diorite and igneous complex. It is several miles wide and is all schist. Within this belt is a narrow, highly mineralized area that is exposed for about fifteen miles and is 600 to 1,200 ft. wide. It consists of highly altered soft sericitized schist in places highly twisted and contorted. In coloring it ranges from pearly white through the various shades of yellow and occasionally is deep red. In

¹The Pre-Cambrian rocks are designated on the accompanying map as "Schist of Igneous Origin," "Mineralized Schist" and "Crooks Complex." The latter formation, shown in the northwestern corner of the map, is the equivalent of the formation so named by the U. S. Geological Survey, in the Folio of the Bradshaw Mountain Quadrangle. It comprises irregular bands of diorite, granite, aplite and schist, with some breccia.—Editor.

other places, it is bleached or gray and full of innumerable quartz stringers. Very little copper is in evidence in the outcrops, but several location cuts exposed copper stain a few feet beneath the surface.

Elsewhere in this area many huge silicified outcrops occur, showing jasper and siliceous hematite. In connection with these there are innumerable outcroppings of carbonate, oxide, and some sulphide of copper occurring in patches or irregular impregnations.

The third zone lies along the contact of the schist and the diorite and other igneous intrusions and is the western part of the mineralized section of the district. There are several brecciated siliceous zones, from 50 to 300 ft. wide and of undetermined extent, which contain ore averaging \$2 to \$5 in gold per ton. Ore averaging as high as \$12 per ton has been taken from narrower enriched channels within the main low-grade orebodies.

In the diorite there are many outcrops showing strong shearing action. In these zones impregnations of copper carbonates are common. One of these at a depth of 225 ft. was crosscut for 30 ft., showing chalcopryrite and bornite disseminated in a hard greenish diorite which carried 1 to 3 per cent copper.

Dimensions and Area of the United States

The gross area of the United States is 3,026,789 square miles. The land area amounts to 2,973,774 square miles, and the water area—exclusive of the area in the Great Lakes, the Atlantic, the Pacific, and the Gulf of Mexico within the three-mile limit—amounts to 53,015 square miles. These and other data determined or compiled by the U. S. Geological Survey, to show the limits of the continental United States, contain some interesting facts.

The southernmost point of the mainland is Cape Sable, Fla., which is in latitude 25° 07' and longitude 81° 05'. The extreme southern point of Texas is in latitude 25° 50' and longitude 97° 24'. Cape Sable is therefore forty-nine miles farther south than the most southern point in Texas.

A small detached land area of northern Minnesota at longitude 95° 09' extends northward to latitude 49° 23'.

The easternmost point of the United States is West Quoddy Head, near Eastport, Me., in longitude 66° 57' and latitude 44° 49'; the westernmost point is Cape Alva, Wash., in latitude 48° 10', which extends into the Pacific Ocean to longitude 124° 45'.

From the southernmost point in Texas due north to the forty-ninth parallel, the boundary between the United States and Canada, the distance is 1,598 miles. From West Quoddy Head due west to the Pacific Ocean the distance is 2,807 miles. The shortest distance from the Atlantic to the Pacific across the United States is between points near Charleston, S. C., and San Diego, Cal., and is 2,152 miles.

The length of the Canadian boundary line from the Atlantic to the Pacific is 3,898 miles. The length of the Mexican boundary from the Gulf to the Pacific is 1,744 miles. The length of the Atlantic coast line is 5,560 miles and that of the Pacific coast line is 2,730 miles. The Gulf of Mexico borders the United States for 3,640 miles.

Nearly all maps of the United States show the parallels of latitude as curved lines and are likely to lead the ordinary observer to believe that certain eastern or western states are farther north than some of the

central states that are actually in the same latitude. For this reason, one who is asked which extends farther south, Florida or Texas, is very likely to say "Texas," but, as stated, the mainland of Florida is nearly fifty miles farther south than the southernmost point in Texas. For the same reason errors are likely to be made in estimating position or extent in longitude. Few realize that the island of Cuba, for example, if transposed directly north, would extend from New York City to Indiana, or that Havana is farther west than Cleveland, Ohio, or that the Panama Canal is due south of Pittsburgh, Pa., or that Nome, Alaska, is farther west than Hawaii.

Ontario's Metalliferous Production Increasing

Returns received by the Ontario Department of Mines for the six months ending June 30, 1920, are tabulated below, and for purposes of comparison the quantities and values are given for the corresponding period in 1919. Tons throughout are short tons of 2,000 lb.

Product	Quality		Value	
	1920	1919	1920	1919
Gold, oz.	277,656	231,729	\$5,690,504	\$4,666,759
Silver, oz.	4,474,322	5,744,172	5,077,028	5,951,362
Platinum metals, oz.	184.45	30.08	12,443	1,805
Cobalt (metallic), lb.	113,239	59,337	266,045	93,157
Nickel (metallic) lb.	4,854,979	5,147,745	1,696,687	1,825,347
Nickel oxide, lb.	3,491,544	5,503	814,070	1,567
Cobalt oxide, lb.	388,318	202,912	645,783	301,791
Other cobalt compounds, lb.	1,417	26,289	1,029	16,164
Nickel sulphate and carbonate, lb.	159,183	133,732	15,308	15,531
Lead, pig, lb.	749,820	1,481,204	71,006	54,802
Copper sulphate, lb.	89,939		4,497	
Copper, blister, lb.	2,918,153	3,080,492	470,949	452,055
Nickel in matte exported tons	9,527	7,072	5,338,120	3,535,915
Copper in matte exported (a) tons.	4,434	4,341	1,241,520	1,128,753
Iron ore, exported (b) tons.	2,189	5,804	18,512	44,309
Iron, pig (c) tons.	28,771	24,095	738,079	670,512
Totals			22,101,580	18,759,829

(a) Copper in matte was valued at 13c. and nickel at 25c. per lb. in 1919. For 1920 the values have been placed at 14 and 28c. per lb. respectively. The total matte produced contained 15,030 tons of nickel and 7,705 tons of copper.

(b) Total shipments of iron ore were 13,962 short tons, worth \$74,073.

(c) Total output of pig iron was 321,826 tons, valued at \$8,255,916. Figures in the table represent proportional product from Ontario ore.

The aggregate output from metalliferous mines, smelters, and refining works of the Province of Ontario for the six months ended June 30 shows a considerable increase in value over the 1919 figures. For the first time since 1903, when the Cobalt silver camp was discovered, the output of gold exceeds that of silver in value. The new electrolytic refinery of the British America Nickel Corporation is now in operation at Deschenes, near Ottawa.

Japan's Mining Industry Slack

Japanese mining industry, in which more American capital is invested than in any other line of business activity in Chosen, experienced an unusual slackness during 1919. The Mitsubishi Iron Foundry, at Kyomipo, was forced to reduce its output, as was also the Suan mine, worked by the Seoul Mining Co., and the Kapsan copper mine, worked by the Kuhara Mining Co. The reasons for this were difficulties experienced in the matter of transportation through the outbreak of rinderpest among the cattle and which totally stopped all transport, and the heavy death rate among the miners from cholera. The continual rise in the cost of supplies and living expenses gave added cause for the reduced output.

G. M. Colvocoresses - Recent Notes

RED ROVER MINE

(last visited November 30th, 1934)

December 3, 1934.

Distance from Phoenix 51 miles, last $4\frac{1}{2}$ miles very rough and slow going, Driving time about $2\frac{1}{2}$ hours.

Mine is now operating, but work is confined to extending the drift on the 700 ft. level in an effort to pick up a shoot of ore which Gillispie reported having found with a diamond drill. Bernard Gillispie is paying for this and the drift has now been advanced over 60 ft. but no vein has been encountered. The drift will probably be extended about 40 feet further and will then be topped if nothing has been found. The present face of the drift shows nothing more than decomposed rock with no stains of copper.

On this level there is another drift running to the left from the main heading in which a number of stringers of ore were encountered, and at one point a little shoot of ore was found, but this pinched out about 20 ft. above the level.

At several points the drifts appeared to pass through the apex of small shoots of ore which might be further developed by winzes or from a lower level, but no real ore body has been found on the 700 ft. level and no work was done previously on the 350 except to cut a station from the shaft.

They are working also above the 500' level in an old stope which extended up to the 380 and in which some ore was left. The filling from this old stope is now being drawn and some ore is sorted out and Moeres hopes to find and to mine a small quantity of high grade ore which he thinks was left behind but the chances are that this will not represent any large tonnage.

The equipment of the mine is all in good shape and the pumps are easily handling the water. The upper portion of the shaft was re-timbered and all of the shaft is now good and the skip works very well. Everything is in condition to carry on a small operation and produce ore under favorable conditions, but there is really no ore developed and available for stoping except the ends of some of the old shoots, and

the pillars. It is therefore necessary to undertake additional development or exploration in the hope of finding new bunches of ore or otherwise it would be necessary to thoroughly measure and sample the low-grade ore which was left in the upper workings, especially the workings from the incline shaft and if a sufficient tonnage of satisfactory grade material is actually found to exist, then a mill would have to be provided.

I estimate that an accurate measurement and sampling of all low grade ore indicated in the upper workings would probably involve an expense of \$1200 to \$1500 and if it were found possible to operate for the treatment of this ore on the basis of about 50 tons per day the cost of the necessary repairs to the mine and of a proper concentrating mill will probably be close to \$20,000.

The working cost for mining, milling royalty, marketing might be figured at approximately \$10.00 per ton, and if the average grade of the mill ore was sufficient to provide a net recovery of \$15.00 per ton, the above expense would only be justified in case it were possible to estimate at least 10,000 tons of developed ore and preferably a larger quantity.

The ore is in the form of carbonate and silicate of copper from which it is not possible to make a very good recovery by flotation, but the tests conducted by the Mineral Separation Company and elsewhere indicate that approximately 85% of the copper and silver values can be recovered in concentrates.

In the old workings the content of the ore was quite uniformly about 6 oz. of silver for each per cent of copper, except in the high grade shoots where the silver ran up.

Ore of a similar character to that which has so far been developed could undoubtedly be treated with advantage by the C. V. process, but the installation would involve a heavy expense.

Arthur Houle and also an engineer named Schmidt, have recently examined the mine and Houle appears to have been disappointed in not finding the 20,000 tons of high-grade ore which he previously thought existed between the 500' and the 700' levels. Houle has now

developed a theory that all of the workings in which the ore is found in kidneys or bunches represent a leached zone in or along the contact with the limestone. He believes that below this there should be found an extensive area of secondary enrichment above the primary ore.

This theory could probably be verified or refuted by a careful petrographic investigation involving the preparation of microscopic slides and a study of these at some university. The total cost of such an examination would be considerable but much less than the expense of attempting to prove Houle's theory by drilling or further development at greater depth.

I do not altogether agree with Houle since it appears to me that the lime should have neutralized the acids in the leaching solutions and precipitated the metals in the upper portion of the mineralized zone, and I am inclined to think that the present conditions of ore occurrence will be found to continue downward until the primary ore is actually reached. The depth at which the primary ore may be found is uncertain but probably will not be more than 1000' below the surface, but the quantity and quality of primary ore is very problematical.

The present operators have a five year lease dated Nov. 13, 1934 but there is no option to purchase except at an exorbitant figure. Recent shipments have amounted to only four or five cars and the grade was not good since considerable waste was mixed with the ore.

I did not see Maguire, who has financed the recent operations, since he was away from the property. Maguire has spent about \$25,000 during the past six or eight months and has probably reached the end of his rope and is about ready to quit. Satisfactory terms could be made with Maguire and Moore for taking over the present lease, but it is obvious that no one would wish to continue operations at the Red Rover unless they were prepared to spend some \$25,000 for the equipment necessary and the treatment of the low grade mill ore. Before any conclusion could be reached as to the advisability of taking this gamble a thorough examination and sampling of the low-grade ore should be conducted and this should be paid for by the present operators.

GMC:

(Note - October 1937 by G. M. Colvocoresses)

Operations ceased in 1936 by which date Maguire had lost about \$40,000 and all developments had proved disappointing. They confined their efforts to a search for high grade ore while in my opinion there is still a fair chance to develop a considerable tonnage of the low grade ore which is indicated near the surface and to work this out with some profit. In spite of the record of repeated failure in attempting to work this mine, I am of the opinion that it still has worthwhile possibilities and consider that a further investigation would be well justified if reasonable terms could now be secured from the owner.

The Blue Bird Mine to which reference is made in the statements should also be considered along with the Red Rover.

G. M. C.

RED ROVER and BLUE BIRD MINES

(Tentative statement by G. M. Colvocoresses)

The Red Rover Property consists of 22 or 26 patented claims - the Blue Bird 17 unpatented claims. Both are located near Camp Creek about 50 miles north of Phoenix. Owned by F. A. Gillespie, P. O. Box #1925, Tulsa, Oklahoma. Gillespie asks \$700,000 for the property but will agree to a five year bond and lease on the basis of a 15% royalty, which will apply on the purchase price.

DEVELOPMENT

Property is partially developed by a shaft and drifts to the 850' level but only a small amount of work is done below the 500 from which level the ore has recently been mined. The orebody has not been found on the 700' level but a diamond drill is said to have cut it and passed through about 60' of well mineralized ground, of which 12 to 15' might be considered as good grade ore. A crosscut has been run out to within 40' of this ore and could readily be extended to prove up the ore, and could readily be extended to prove up the ore.

Mining in the upper workings was carried on at intervals for a number of years, the ore being largely oxidized, consisting of copper carbonates carrying a high percentage of silver. Below the 300' level sulphide ore made its appearance principally chalcopyrite and some bornite and recent shipments of ore from the 500 level contained on the average better than 30 oz. silver per ton and over 4% copper. This shipping ore was about 8 or 10 feet wide but in many places there is a width of 35 feet which should average about 10 oz. silver and 2½% copper, and would be suitable for milling. There is no large tonnage of ore blocked out but the main vein is very strong and gives promise of developing into a large orebody, and other parallel veins have shown good ore in the upper workings and should be developed with depth. The bulk of the ore will no doubt be sulphide and even though some carbonates are present, it is probable that the run of mine could be treated in a concentrator with good recovery of values and because of the distance of the mine from any railroad it is essential that this ore should be concentrated on the spot.

The property is well equipped with oil engines and a good mining plant sufficient to permit current development and the hoisting of about 100 tons of ore per day. Some years ago a mill was erected, designed to treat the ore by the SO_2 Leaching Process, which, however, proved entirely unsuitable and new equipment would have to be installed. If this property were leased, an initial expenditure of \$25,000 should immediately be made for development, and the equipment in the mill would cost in addition \$25,000.

The mining costs during the last operation (1929) were as follows:

Mining.....	\$5.00
Hauling ore to Railroad.....	9.00
Freight to Hayden	1.50
Smelter charge	3.00
Total	<u>\$18.00</u>

The average return on the ore shipped was about \$23.00 per ton.

Resuming operations with a properly equipped concentrator, the following costs are estimated.

Mining and development	\$4.00
Concentration (5 to 1)	2.00
Hauling concentrates	1.50
Freight.....	.30
Smelting charge.....	.60
Royalty.....	1.60
Total.....	<u>\$10.00</u>

It should be possible to mine an average grade of ore with a net recoverable value as paid for by the smelter of about \$12.00 per ton, thus yielding a profit of \$2.00 to the mining operations. The freight rate from Phoenix to Humboldt is about the same as to Hayden, but the concentrates would be a very desirable charge for the Humboldt Smelter and every effort should be made to secure this property which in itself gives promise of becoming a very valuable mine, although it falls far short of justifying the purchase price now asked.

The Blue Bird Property contains a large deposit of low grade basic copper sulphide mixed with iron. Unless there are high grade strongers in this deposit or better gold values than appear in most of the ore, this mine could not be operated with profit under present

conditions but if improved transportation facilities were later provided this character of material would be very advantageous for treatment at Humboldt and might perhaps be shipped largely as a flux with very small margin of profit to operators and to the smelter. The property may have a considerable value at some future date and should therefore be acquired along with the Red Rover but probably no work other than a small amount of development will be justified at present.

*From Colvocoresses Files
Dept. of Mineral Resources*

(C O P Y)

RED ROVER MINE

LOUIS I. REHFUSS

Mining Geologist
Phoenix, Arizona

July 26, 1937

Mr. B. A. Gillespie,
Los Angeles, California

Dear Sir:

The report which I hereby submit is only a discussion of the geologic conditions noted during my recent studies in and around the Main Underground Workings, known as the Red Rover Mine, together with eleven maps listed below giving the geologic facts as noted. These will give a much better idea as to the conditions as they exist than any worded description might convey.

Map No. 1	Topographic and Geologic
Map No. 2	Composite Map of Underground Workings.
Map No. 3	Composite Map showing Topography & Underground Workings.
Map No. 4	Cross-section along Line A-A on Map 1.
Map No. 5	Plan Tunnel Level & 50 and 60-foot levels.
Map No. 6	Plan 180 and 200-foot levels.
Map No. 7	Plan 240 and 300-foot levels.
Map No. 8	Plan 360 and 380-foot levels.
Map No. 9	Plan 500-foot level.
Map No. 10	Plan 700-foot level.
Map No. 11	Plan 850-foot level.

In my study of the Red Rover Workings I have confined my efforts to noting such geologic conditions as would have future commercial value. Copper stained rocks with high silver values near the surface and in major faults and minor breaks in the formations in depth have no great commercial significance in themselves, because they are not the ore channels along which the ore solutions rose and deposited the values in the form of copper and silver sulphides.

These ore channels, otherwise called veins, are the things that must be located and developed before you can ever hope to make a mine of the Red Rover. You must stop chasing copper stained crushed rock along faults as you have in the past and confine your efforts to either showings with copper sulphides (chalcopyrite or bornite) or the gossan showings which represent the oxidized residues of the above sulphides.

This I would say is my major conclusion:

You have one such sulphide showing in the 500 North Ore-body. This apparently was cut again in the Diamond Drill Hole No. 3 on the 700-foot level, more oxidized, but showing strong gossan with considerable native copper. The mineralization on the 500-foot level appears to stand nearly vertical, and as the showing on the 700-foot level appeared nearly vertically below in the drill hole, the natural assumption is that the ore channel stands approximately vertical.

In view of the above and in view of the fact that you do not feel prepared to do a great amount of development work in the near future my only recommendation can be that you run a crosscut due north west from the present face on the 850-foot level, your lowest level, thereby giving you your best chance to encounter the vein in the zone of permanent sulphides. This will cut the mineralized showing encountered on the 500 and 700-foot levels at about 150 feet from the present face of the 850-foot level. Further work would have to be guided entirely by what was found.

If sulphides were encountered drifting both ways would be advisable. It might also be advisable to extend the crosscut farther to the northwest to cut the other mineralized showings noted in the drill cores and shown on Maps 4 and 11.

If a strong vein, but still highly oxidized was encountered diamond drilling from the 850-foot level would be advisable to cut the vein at deeper levels where the permanent sulphides will eventually be found.

The gossan showings on the 360-foot level (see Map No. 9) from the inclined shaft has some significance, but from the way it is cut by the fault along which the 260-foot level was run little can be said as to its importance. They appear to stand vertical in the footwall of the fault and to have been cut off by it.

This should be followed far enough to see whether it is a definite ore channel or not. Sulphides may be found on this level, but even if the gossan should prove to be continuous in the footwall block of the Footwall fault another ore channel will have been located and definitely established and the future potential value of the property

increased. Again further work will have to be done based on what is found.

All future work should be done under much closer technical supervision than in the past.

The fact that you have a well defined ore channel in the 500 North orebody showing, together with the strong possibility of a second in the gossan showing on the 360-foot level gives the property merit. What the grade of ore will be in these ore channels can only be determined by future work but the high grade of the oxidized ores indicates that the sulphides will be of sufficient grade to fully justify the money spent in their development.

Respectfully submitted,

(Signed) Louis U. Rehfuess

RED ROVER

ROCK FORMATIONS:-

The sedimentary rocks in the vicinity of the Red Rover underground workings consist of a series of reddish, brownish, and greenish colored sandstones and shales with some recrystallized limestone. These formations are of the very oldest known sedimentary rocks of pre-Cambrian age, and they have therefore in the past been subjected many times to great compressive forces which developed their schistosity obliterating the previous bedded structure.

Into this sedimentary series was intruded the great masses of diabase which tore off from them great blocks of limestone together with some of the sandstone and shales. In places the diabase was intruded more or less parallel to the strike of the formation in the form of a sill and roughly following the old bed of limestone. The diabase in and around the old inclined shaft and extending northeast thru Camp shows it in many small sills, dikes and irregular masses. Behind the Mess House a well defined block of limestone is found entirely engulfed in diabase. Other such occurrences are to be seen in the Old Tunnel (See Map No. 5).

Such an occurrence of the rocks as above described does not give a normal sedimentary succession where the various beds, or horizons, can be used as markers to trace out the faulting, and a glance at the various level maps will show at once that any regularity of succession of the different strata is not to be looked for. In a general way, though, the limestone with the intruded diabase underlies the series of sandstone and shales also cut and intruded with diabase.

From the above facts, it can be seen that it will be difficult to trace the various dislocations of the veins with any degree of accuracy.

To the south of this sedimentary series with their intruded diabase occurs a formation composed of schists and volcanic material. It lies in fault contact with the above series, but as the workings in the old Incline Shaft so closely followed this fault it cannot be stated definitely whether or not this fault did not follow more ore

less closely the stratigraphic contact between the limestone and the now schisted formation forming the hill on which the Gillespie bungalow is located. It lies as a bed against the schists and volcanic material farther to the south.

This formation in the vicinity of the Gillespie bungalow has aroused considerable discussion as to what it really is. There is no question but that it is a schist and that it is a safe classification, but a schist is any rock, volcanic or sedimentary, that has taken on a schistosity due to great compressive forces. Whether it is a sedimentary schist or a volcanic schist, that is, a rhyolite or granite schist, as it has been classified, could only be determined by a close microscopic examination, possibly with many other expensive tests.

If one scans thru the literature of the geologic studies of these old pre-Cambrian rocks, one will find many discussions as to whether this or that rock is a schist of volcanic or sedimentary origin and the various ways and tests whereby one can be determined from the other. Oftentimes the definite knowledge that it is one or the other has great commercial significance, and this fact alone should be the deciding factor whether or not it is worth while taking the time or spending the necessary money to make a definite classification.

In this case, I would say no, as this formation has taken mineralization at several places, as shown at the cut on the trail to the Gillespie bungalow and to the east of Triangulation Point 'E'. Therefore in due time it must be prospected along with the other formations to see if the veins in it carry commercial values. Whether it is schist of volcanic or sedimentary origin does not enter into the question. Because of the complicated nature of the formation and because its prospecting will be left to the more distant future

I have mapped the whole as Undifferentiated Schists and Volcanic Material.

All of the above formations have a northeasterly strike and a dip usually about 45° to the northwest, but at various places underground this does not hold true because of the above mentioned irregularity of intrusion to faulting.

Overlying all of the above mentioned formations are to be found basalt and rhyolite flows. They are much younger geologically than any other of the other formations described and were lava flows which flowed out and filled the valleys and capped the hills formed in the other formations. They have not taken part in any of the major fault movements noted in the other formations and hence are not schisted and faulted to any great extent. These formations are not vein bearing but merely cap and mask the underlying formations, and in that way make a geological study still more difficult. For example, the position of the rhyolite around the collar of the Main Shaft makes the outcropping of the 500 North Orebody impossible.

Faulting:-

While the maps of the various underground workings show up a host of faults, all but two, as far as can be determined from their position with respect to the underground workings have little or no significance. These have been called the Footwall and the Apfield Faults.

The so-called Footwall Fault was followed in nearly all of the workings down thru the Old Inclined Shaft. It outcrops in the gully in front of the hill on which the Gillespie bungalow is located. This fault undoubtedly cut some ore bearing channel for in nearly every foot of the work done along it, some copper stained rock was found, but as nearly all of the work so closely followed the fault and is now timbered, nothing but crushed copper stained rock can be noted, and no definite ore channel showing either copper sulphides or the gossan residues of the former could be located.

The fact that this fault has a similar strike and dip to that of the main formations leads one to believe that this fault

follows very closely the stratigraphic contact between the limestone with its intruded diabase and schist underlying formation.

The Apfield Fault shown on Map One courses thru what is known as the Fault Shaft in a north 20° east direction and is followed almost continuously in the Main Shaft from immediately below the rhyolite capping. Neither from the surface croppings of the two faults or from points where they were cut in the underground workings could it be determined which fault is the older, in other words which one cuts and moves the other. This point is a very important one, as it will have a great bearing on locating the ore channels in the different faults blocks.

The position of what is taken to be the Apfield Fault on the 300, 500 and 700 foot levels is shown on Maps 8, 9 and 10 respectively.

Looking at the map of the 500-foot level (Map #9) it is seen that all of the work done to the north of the shaft lies to the west of this fault, while that to the south lies to the east of it, giving one no definite way to determine either the direction or amount of throw along this fault. The surface is our only guide and altho we have no perfect matching of identical beds on either side of the fault it is seen that limestone with the diabase lies much farther to the north on the west side of the fault than on the east side, showing that the block to the east of this fault has moved down and to the south.

The ore channel, known as the 500 north Orebody lies to the west of this fault and was cut off by it when it was drifted onto the northeast from a point where it was first cut by the drill hole and later by the crosscut. It also lies well up in the hanging wall block of the Footwall Fault with not much danger of being cut off above the 1200 or 1300 foot level. This will give one of this ore channel a great distance to the west prospect and also in depth well within the zone of permanent sulphides. Therefore this 500 North Orebody showing should be thoroughly tested both laterally and in depth, to see if the permanent sulphides have commercial value.

Later, if on development this segment of the 500 North Orebody Vein proved of commercial value, it can be drifted on to the

points where it is cut by either of the two faults above mentioned. Work on the other side of these faults could best be done by diamond drilling until the direction and amount of throw was accurately determined by picking up the vein on the other side of the fault in question. As the stratigraphic contacts are unreliable, for this purpose, as above explained, the veins become your only markers for determining fault movements. This work would undoubtedly give one the data for determining the relative ages of the two faults also, which would be valuable in all further work in developing the mine.

ORE OCCURRENCES:-

Oxidized Ores - The high grade oxidized ores consisting of the carbonates or copper (malachite and azurite), oxide of copper (cuprite), secondary sulphide of copper (chalcocite) together with some scloride of silver constitute the chief and most ore in very crack and crevice that the major efforts in the past were directed.

This occurred mainly along the Footwall Fault and made especially large where the Apfield Fault or some other minor cross fault joined it. The showing on the 300 and 500-foot levels are such especially large masses of copper stained rock.

These showings in no wise represent an ore channel or vein and the copper and silver values will no doubt decrease in depth. The primary copper values in the veins were either chalcopyrite or bornite both copper-iron-sulphides. During the process of oxidization and leaching the copper is taken out leaving behind the red oxide of iron which is insoluble in underground waters and constitutes the gossan residue so often spoke of in relation to copper deposits. In these showings very little or no gossan is to be noted, therefore, these oxidized copper values have been leached from some vein which was cut by the faults and the copper deposited in the open spaces along the crushed zone of the faults. This copper staining can be carried anywhere by downward moving underground waters into every minute space between rock fragments and in every slip and fault, and therefore will be encountered anywhere in the underground workings.

The only significant showings like these can have, lies in the fact that they indicate the presence of some copper-bearing veins which were oxidized and leached and the values carried and deposited in the crushed zone along the faults. I do not hesitate to say the ores of this type will never in themselves pay any dividends to the stockholders of the Red Rover Copper Company, and therefore they should be ignored in the future until the commercial value of the copper sulphides in the true veins has been determined.

GOSSAN SHOWINGS:-

In the Old Tunnel about 225 feet from the portal occurs a zone of mineralized, altered and leached diabase showing heavy zones up to 30 inches of good gossan or iron oxide material, in places still showing faint copper stains. This showing lies to the east of the Apfield Fault which was cut a short distance to the north. It has a north 25° east strike and stands vertical.

This showing would be immediately cut off in depth by the Footwall Fault and to the north it probably lies some distance to the west of any of the workings on the 500 and 700 foot levels. This showing must be kept in mind in any future work, for it must be determined whether the 500 North Crebody Vein joins it or cuts in its westward continuation.

On the 360-foot level near the winze to the 380 foot-level one can see distinctly three zones of good gossan material standing vertical apparently in the footwall block of the Footwall Fault, and cut off by it, as none of it is to be seen on the north side of the drift. These are shown on the map of the 360 and 380-foot levels (See Map #8)

The middle of these zones should be drifted on far enough to determine definitely whether it is a well defined vein extending into the footwall block of the Footwall Fault, closely watching it and keeping the gossan always in the face of the drift. There is a possibility, if this proves to be another channel, of drifting out of gossan into sulphides as a greater distance from the Footwall Fault is obtained. (Maps which accompanied this report were never given me.)

G. M. C.