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REPORT ON

RECONNAISSANCE EXAMINATION OF

KATHERINE GOLD DISTRICT

MOHAVE COUNTY, ARIZONA

BY

ROLAND B. MULCHAY

JUNE 1935

RECONNAISSANCE EXAMINATION OF  
KATHERINE DISTRICT  
MOHAVE COUNTY, ARIZONA.

INTRODUCTION

During the course of a short reconnaissance examination of mining districts in Mohave County, Arizona, in the latter part of June 1935, four days were spent in the Union Pass or Katherine gold district. The strength of the mineralized structures, which appear in large and persistent outcrops, the fact that several of them are known to contain appreciable gold values, and the fact that power costs in the region will be materially lowered upon completion of the Boulder Dam, combined to suggest that the Katherine district may prove a future source for a large scale mining operation. The recent revaluation of the price of gold to \$35.00 per ounce has caused considerable activity in the area. From information gained at operating properties, in old reports, and in publications of the U. S. G. S. and Arizona Bureau of Mines, it appears that there is a distinct possibility that several million tons of low grade gold ore exist in the Katherine section. The grade of this ore as a definite quantity is unknown, but from the evidence at hand it would possibly carry from \$3.50 to \$4.00 in gold at the new price, and a fraction of an ounce in silver.

Present activity in the district is centered around the operation of the Gold Standard Mill located on the old Katherine property. The Gold Standard Company is milling custom ore and ore from the Arabian, Roadside, Minnie and



Sheeptrail mines held by that company under lease. The Tyro Mine is shipping about one hundred tons per day to the mill and preparations to ship from fifty to one hundred tons per day are being made at the Portland mine.

In addition to the operating properties, several inactive mines such as the Gold Chain, Black Dike and the Adams appear to closely resemble the veins mined at the active properties. The Oatman Federal, Mohawk, Frisco and two others unnamed are reported to be of the same general type.

#### HISTORY AND GENERAL CONSIDERATIONS

The history of the Katherine district is not impressive. The old Katherine mine, last operated in 1932-1933 and owned by the Sutro Estate, has been the only important producer. It has an appreciable production record, and is reported to have been developed to a depth of 900 feet. Sporadic activity at other properties since 1915 did not develop any considerable amount of material which could be considered commercial under the old price of gold. There was some activity in the area in 1915 and in the early 1920's, but the district was again dormant until just before the present gold price was established.

The consideration of the district as a possible source for low grade ore must depend upon favorable physical possibilities for low cost mining and milling. From a mining standpoint the large size of the outcrops and the number of them within a relatively small area, would provide a considerable tonnage of ore which could be mined by quarrying or modified open cut methods. From the milling side,



the ore is very amenable to treatment by the cyanide process, and it is probable that the present reported milling costs of a little less than two dollars per ton can be materially bettered through large scale operation with Boulder Dam power. Present power costs vary from 1.7 to 2.3 cents per kilowatt hour; a price of under one cent per kilowatt hour is probable when Boulder Dam power is available.

If it is assumed that costs for mining and milling of about \$2.00 per ton can be made, it appears that a complete investigation of the possible tonnages and grade which might be expected in the Katherine area is warranted.

#### LOCATION AND PHYSICAL FEATURES

The center of the Katherine area lies about thirty miles by good graded road west of Kingman, Arizona, a station on the main line of the Santa Fe Railroad. The district lies upon the western slope of the Black Range Mountains, and upon the gravel mesas which extend westerly from the mountains to the Colorado River, a distance of five to six miles. The famous Oatman district is located about eighteen miles to the south. Water is scarce and for a milling operation would be obtained from the Colorado River. No timber is available in the region. Electric power lines from the Kingman power plant extend into the area, but within a period of about eighteen months power from Boulder Dam will be available.

#### GENERAL GEOLOGY

All of the deposits in the immediate area are

found in a coarse-grained granite porphyry which does not show any large amount of alteration close to the veins. At the Portland mine, some fourteen miles to the north by road, the desposit is in andesitic rocks.

The mineralized structures are remarkable for their large size and strength of mineralization. The Tyro vein can be traced for over three thousand feet and in one place is over a hundred feet in width. The Arabian vein can be traced for more than two thousand feet and has a width of over thirty feet for a length of fifteen hundred feet. The Gold Chain, Adams and Black Dike show similar strong veins which can be traced along the surface for 500 to 1500 feet over wide widths. The outcrops of these veins project well above the surface; the outcrop of the Arabian vein reaches a height of 125-150 feet above the arroyo which parallels it.

The mineralization in these veins is of the same general type. It is composed of quartz and calcite of several ages with minor amounts of fluorite, iron oxide and occasional specks of pyrite in the country rock close to the veins. The vein structures are composed of bands and stringers of quartz and calcite with local areas where the granite has been intimately broken and recemented with the mineralization products. The Tyro and probably the Adams, are steep dipping structures while the others have a flat dip around 50 degrees and a general northeast strike. Faulting has had some influence upon the surface exposures and the abrupt ending of several of the outcrops may be attributed to this cause.



## TYRO MINE

The Tyro Mine was visited on June 26 with Charles Brinckerhoff of Inspiration, Arizona. Several hours were spent underground, on the surface and in reviewing assay maps made by the operators. During May and June of 1935 the Tyro was held under option by Mr. T. H. O'Brien of Inspiration. The option was allowed to lapse because the price asked for a fifty percent interest did not appear attractive. As considered at that time, the property was calculated to contain approximately 90,000 tons of about \$8.00 gold ore with gold at \$35.00 per ounce. If the property is considered as a possible source of a large tonnage of lower grade ore, it would probably be feasible to work out a suitable deal with the present lessees.

The Tyro is located about seven miles east of the Colorado River, at an elevation of about 2500 feet, or some 1500 feet above the level of the river. It is in the lower portion of the Black Range Mountains, and is connected with the Kingman-Katherine road by a fair graded road. C. F. Weeks and Wm. Whalley are operating the property under lease and bond from Kingman people for a reported amount of \$50,000. Approximately 100 tons per day of ore averaging about 0.24 oz. in gold, with 0.33 oz. per ton in silver, is being produced and shipped to the Katherine mill by truck. The custom milling cost to the mine is \$3.50, trucking \$0.50, mining \$0.75, development \$0.40. The ore is broken in an open cut and trammed through a main haulage drift about 160 feet below the surface.

The Tyro vein strikes about N 35° E and has a dip of 80-85° to the southeast. It can be traced for a length of over three thousand feet, and 300 feet west of the open cut shows a width on the surface of over one hundred feet, where the vein cuts through a pre-mineral quartz porphyry dike. The average width is between twenty and thirty feet for a length of over two thousand feet. The topography is such that another hundred feet of depth on the vein could be obtained below the present tunnel level through a drift tunnel.

Development at the Tyro consists of a vertical shaft 500 feet deep with short crosscuts from this shaft reported but no drifting. This work was done in 1915, and no reliable reports as to the vein strength or values found are to be had. It may be assumed from negative information locally heard that the grade was much too low to be attractive at that time. Two crosscut tunnels were driven through the vein, one about 250 feet north of the shaft and the other about a thousand feet south. During the present operation a crosscut was driven through the vein from the north side about 200 feet south of the shaft, and a drift driven along the east or hanging wall part of the vein to a point about 175 feet north of the shaft. This work is at an elevation of about 160 feet below the shaft collar and is about thirty-five feet above the water level in the shaft. The open cut from which ore is now being broken was started around the collar of the old shaft, and the shaft has been destroyed to the haulage level elevation.



The present operation is based upon extensive surface sampling of the outcrop of the Tyro vein by C. F. Weeks. This sampling outlined a shoot of ore which would average just under ten dollars at \$35 per ounce gold, and about 20,000 tons of this ore has been extracted and shipped in 1934 and 1935. The sampling done by Weeks was roughly checked by R. A. Elgin in an examination made for the Tom Reed Gold Mining Co., and the shipments made from the Tyro appear to indicate that Weeks' sampling may be accepted as correct. No sampling was done by Brinckerhoff when the option on the property was taken by Mr. O'Brien.

From a brief inspection of the assay maps at the property, it appears that a very large tonnage of vein material which will average about \$4.00 in gold at the new price may be reasonably expected from the Tyro. Above the present tunnel level and upon the White Spar claim, approximately 620,000 tons can be calculated. Assuming this ore to extend another hundred feet in depth, some 480,000 tons additional ore may be calculated on this claim; this tonnage could be mined from a tunnel operation. Extending to the southwest on the Decimal claim, the vein continues as a strong mineralized structure though it has not been sampled. If a grade of \$3.00-4.00 is assumed in this area, another half million tons may possibly be present above the lower tunnel level.

THE ARABIAN MINE

This property is located slightly more than two

miles south of the Tyro and is being operated by the Gold Standard Company, under lease. The Kingman-Katherine highway crosses the property. The operation has been continued for the past two years, and mining activity is now confined to the 200 level where shrinkage stopes on a vein about 50 feet wide are producing ore, from selected parts of the vein, which will assay around 0.14 oz. per ton in gold. The outcrop of the structure occurs along the west side of an arroyo and can be traced for over 2000 feet. About 1000 feet south of the present operating shaft an open cut along a cliff face, which reaches a height of over 125 feet above the arroyo floor, has produced about 35,000 tons of ore which gave assays of 0.10 to 0.12 oz. per ton in gold, by blasting the rock off the cliff. A crosscut tunnel about 200 feet north of this cut shows a vein 35 feet wide of solid quartz and calcite with very little iron oxide. The open cut operation was abandoned, according to the mine foreman, because the low grade material was not as profitable under the present set-up as ore obtained from other leases and as custom ore. Where seen on the 200 level, the Arabian vein has a northeast strike and dips about 50 degrees to the southeast, and contains considerable iron oxide.

The arroyo which cuts along the vein would be unlikely to provide a serious mining problem as the country is arid and the runoff through the arroyo could probably be diverted unless a flow of cloudburst proportions were encountered.

From open cut operations above the arroyo level



some 250,000 tons of \$3.50 plus ore may be expected.

### GOLD CHAIN

The Gold Chain mine is inactive at present. It is located about three miles northwest of the Tyro and is about five miles east of the river. The vein outcrop projects above the wash for over a hundred feet, and in a crosscut near the east end of the outcrop it has a true width of over fifty feet. The outcrop has a general strike of E-W and dips flatly at about 50 degrees to the north. On the west end of the outcrop there is an offset by a northwest striking fault which displaces the vein about 75 feet. The total length of the outcrop is between 600 and 700 feet. On the east end an acid dike appears to cut the vein off, and offset it toward the north.

Development on the Gold Chain is composed of a crosscut tunnel near the east end of the outcrop and about fifty feet above the wash; a second tunnel which follows some northwest striking slips was run near the center of the outcrop and about 25 feet above the wash. From this tunnel level a shaft was sunk from the surface to a level 100 feet lower, and the vein crosscut for a true width of 31 feet. Drifting for a length of about 300 feet along the footwall is reported to have developed some half ounce ore. The reports of this underground development are taken from a memorandum made by C. L. Beckwith of the Inspiration Company in 1921.

The mineralization of the Gold Chain is composed of calcite and quartz cementing brecciated granite, and con-

taining considerable iron oxide. As in other parts of the district, the mineralization is of several ages, and banding of the quartz and calcite is common.

By open cut methods some 250,000 tons may be mined from the Gold Chain outcrop before underground mining is necessary.

#### ADAMS

The Adams mine is located about five miles northwest of the Tyro, or about a mile and a half west of the Gold Chain. It outcrops for a distance of over 500 feet and will average well over thirty feet wide. It projects between 50 and 75 feet above the surface. The mineralization appears to contain a larger amount of quartz than the other mines with the exception of the Tyro. It has a shaft reported to be 200 feet plus in depth located on the east end of the outcrop. No work is being prosecuted at present. By quarrying at least 100,000 tons could be mined from the Adams vein outcrop. No assay information was obtained.

#### BLACK DIKE

The Black dike is located about two miles west of the Tyro and about one mile south of the Gold Chain. It outcrops for a length of 1500 feet and is probably 50 feet in width near the shaft. Extending to the northeast it becomes progressively narrower, but will probably average over thirty feet in width for a length of 1000 feet. It dips flatly to the south and has a curving outcrop that is nearly E-W because of the dip. A shallow incline about 50 feet



deep on the hanging wall side of the vein is the deepest development. The mineralization contains a relatively large amount of calcite in proportion to the quartz. About 200,000 tons might be mined from this outcrop by open cut methods. No assay information was obtained.

#### THE PORTLAND

This property is now being exploited by oil interests of Dallas, Texas. The mineralization at the Portland is contained in andesitic rocks, and is offset considerably by faulting. At the south end of the property there is a small vein with a generally E-W course and flat north dip. This vein is exposed for a length of about 200 feet and will average three to four feet in width. The grade of this outcrop is reported to be about one-half ounce in gold. At the north end of the property there is a massive outcrop of quartz and calcite which underground appears as a vein over fifty feet in width that strikes northeasterly and dips from 35 to 40 degrees to the southeast. It is partially developed by tunnels, and extends for at least 1000 feet, though the outcrop is apparently cut off on both ends by faulting. The grade of the material cut underground, according to samples posted upon maps being used at the property, will average better than \$4.00 and in places is said to average better than \$6.00 over thirty feet in width. On the surface, grab sampling from holes blasted on 25 foot centers is said to have developed a small area which will average \$14.00 in gold at the new price and supply about ten thousand tons. A new road fourteen miles in length is being built from the mine to the

Katherine mill, and as soon as completed, ore will be trucked from the south vein and the higher grade portion of the north vein. The property is distant about six miles from the river. By open cut methods about 250,000 tons could be mined.

#### OTHER PROPERTIES

There are reported in addition to the mines above discussed, several other properties of the same general type in this area or tributary to it. In the Katherine district itself are the Oatman Federal, the Sheeptrail, which may contain the extension of the Tyro vein, the Minnie and the Mohawk, the Frisco, and two others unnamed.

The Moss mine, about 10 miles to the south, is of the same general type; sufficient sampling has been done at the Moss to definitely indicate that a grade of plus three dollars may be expected for a considerable tonnage.

Further south, in the Oatman district, the Pioneer is described as a very large vein, and at present some twenty leasers are working along the outcrop and were shipping ore to the Tom Reed mill up to the time of the strike shut-down on July 1, 1935. In the southern part of the Oatman district, the Nellie or Black Range structure is described as a very strong large vein carrying low grade values.

#### SUMMARY

The foregoing discussion of the properties in the immediate Katherine area indicates that there exists a large tonnage of doubtful grade gold ore in the district



which could be mined by low cost methods. With the Tyro as the chief source of supply, and the Arabian, Gold Chain, Adams and Black Dike, between two and three million tons could be expected to be produced by quarrying and open cut methods, and low cost tunnel operations. It appears fair to assume that from these properties an additional similar tonnage might be expected which could be mined by underground methods. From the other properties mentioned but not discussed, a large additional tonnage could possibly be mined. Outside the immediate Katherine area, the Portland, the Moss, the Pioneer and the Black Range might prove other possible low grade operations.

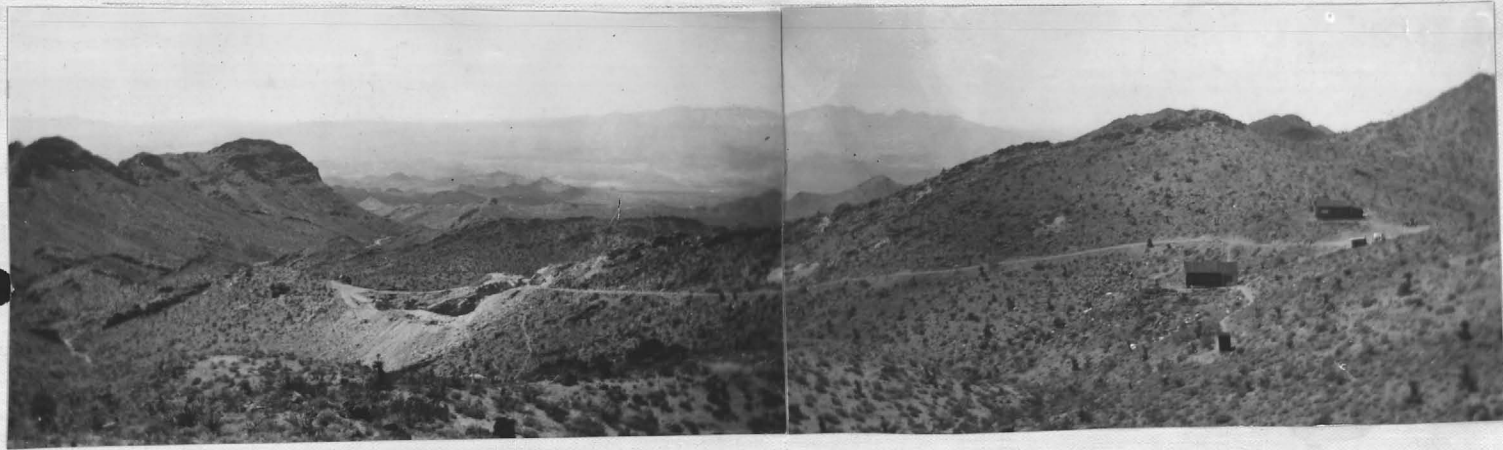
Extended examination of the Black Range area, and the Katherine district in particular, to determine the probable tonnages and grade of the deposits mentioned, is warranted provided such an operation would be attractive.

Respectfully submitted,

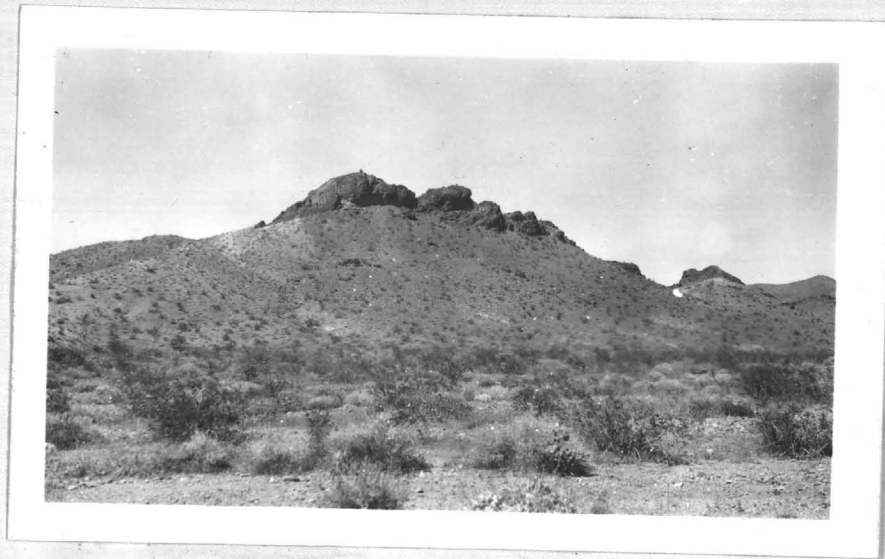
*Robert B. Mulebay*

RBM/G

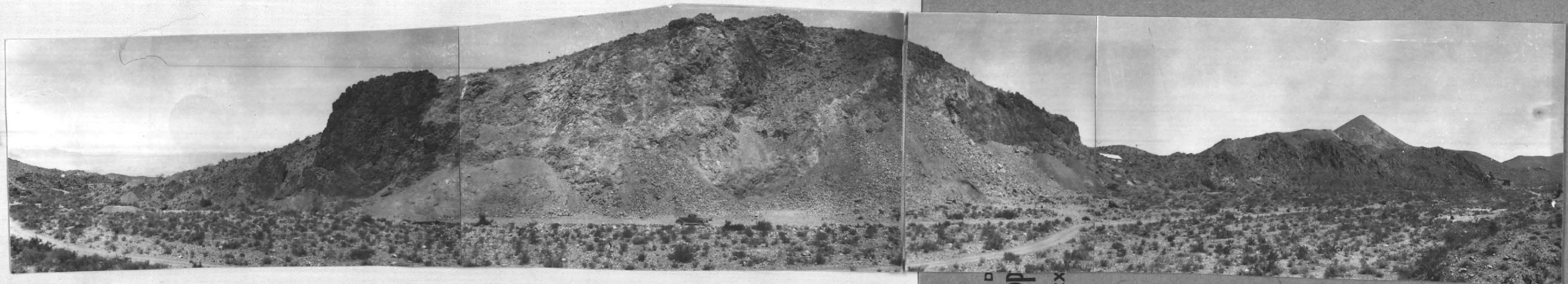




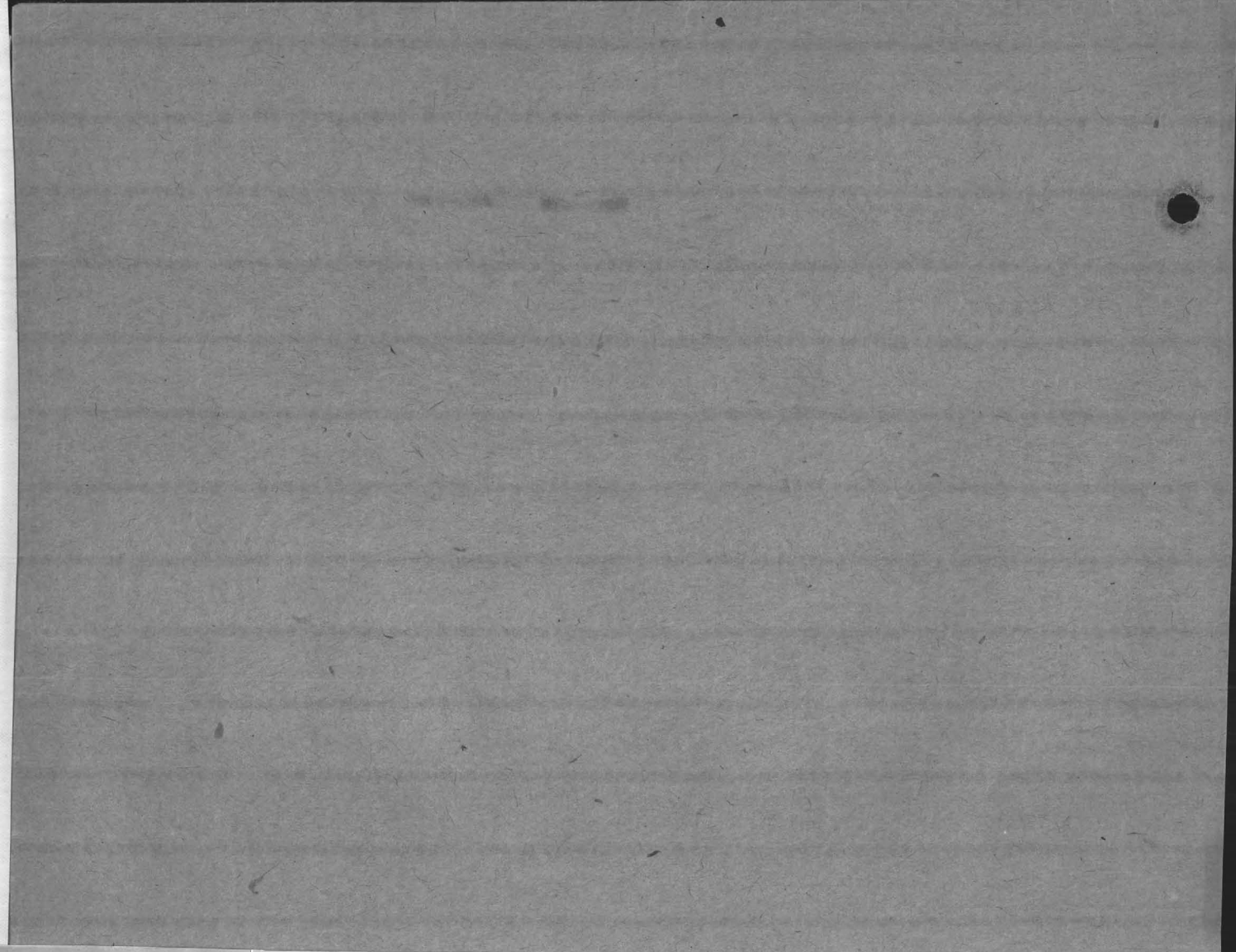
TYRO



GOLD CHAIN



ARABIAN



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ED COPP  
RA, MEX

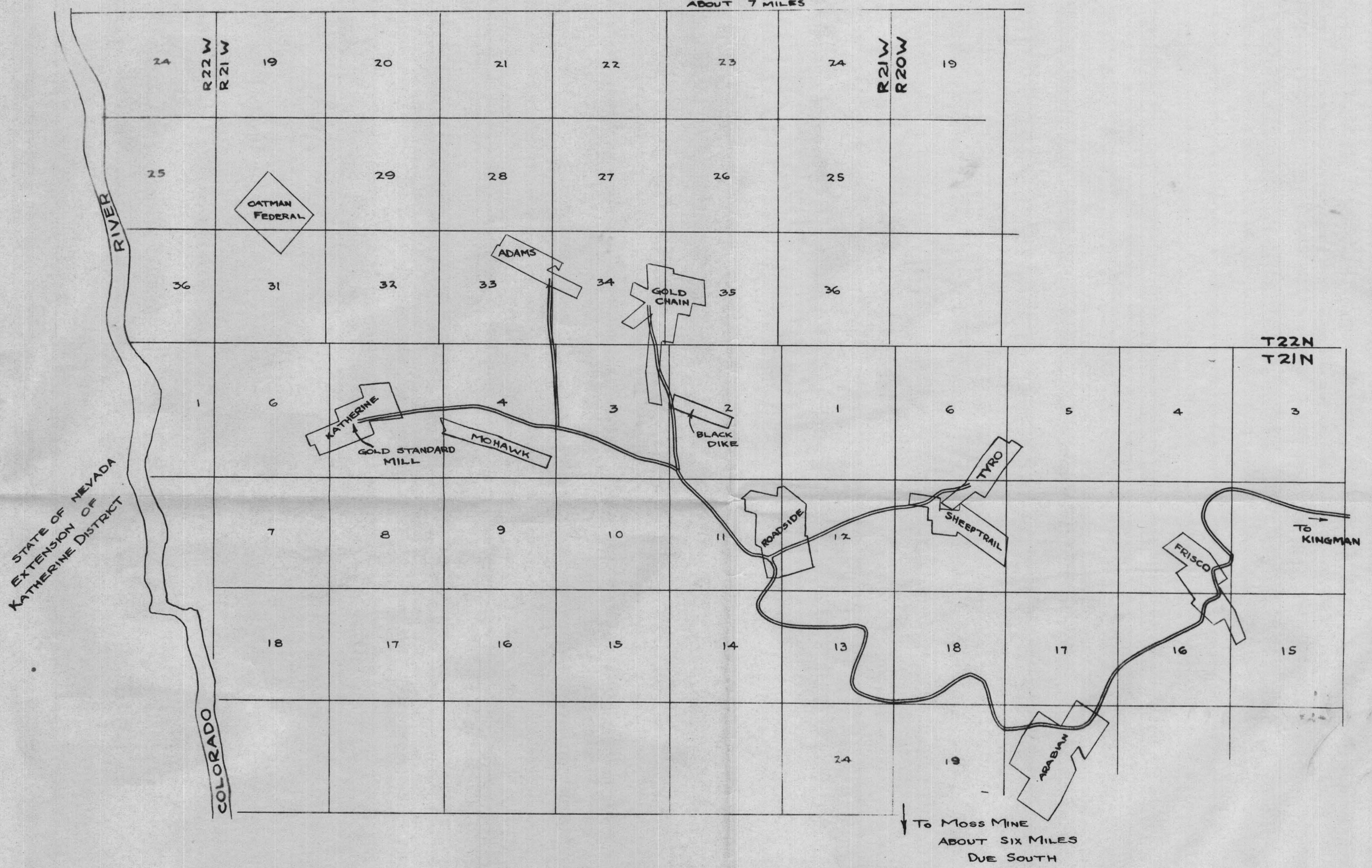
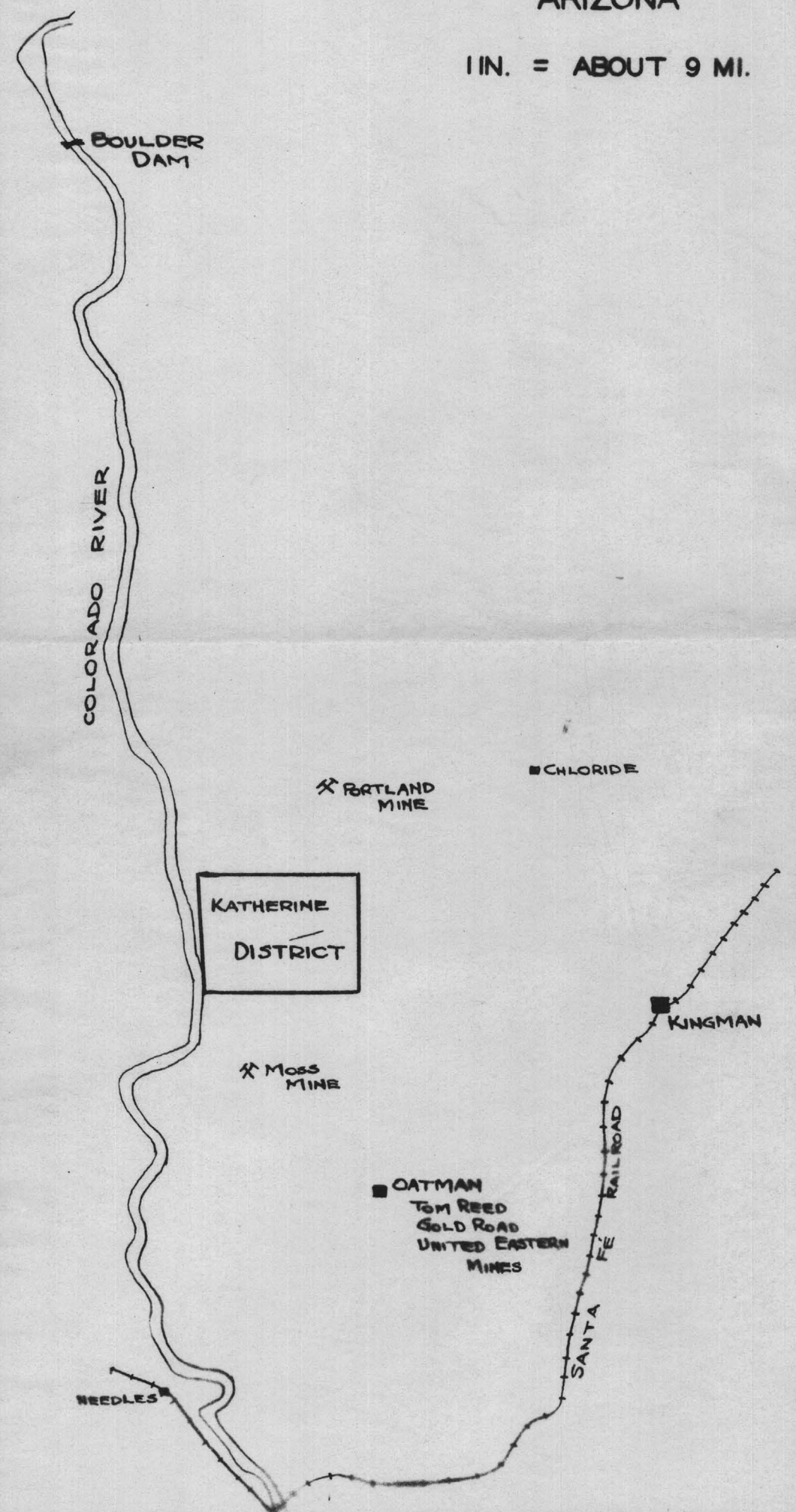


TURN IN 5 DAYS TO  
ED COPPER CO., S. A.  
RA, MEXICO.



INDEX MAP  
PORTION OF MOHAVE CO.  
ARIZONA

1 IN. = ABOUT 9 MI.



**KATHERINE DISTRICT**  
MOHAVE COUNTY ARIZ.  
1 IN. = ABOUT 4200 FT.  
SHOWING PROPERTIES NAMED IN REPORT BY R.B. MULCHAY

FROM MAP PUBLISHED BY KINGMAN CHAMBER OF COMMERCE.