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ELGIN BRYCE HOLT CONSULTING MINING ENGINEER P. O. BOX 783 PHOENIX, ARIZONA

Subject: RED CLOUD MINE

Penn Metals, Inc., Penn Building, Erie, Pennsylvania.

Gentlemen:

I am submitting for your consideration a report concerning the RED CLOUD MINE. Also, mention will be made of the other properties in this area controlled by yourselves, to-wit: Black Rock, Pacific, Silver Glance, Mendivil, and the Neal Mining Company group of 55 claims.

It is my desire to give you an outline of the outstanding features of these properties, especially Red Cloud, including my views as to what should be done in the way of financing, developing and equipping the same in order to put your holdings on a paying basis. This task is not going to be easy due to the meager data at my disposal concering these properties, excepting Black Rock and Red Cloud. Fortunately, we have an assay map of the latter property, a copy of which is submitted herewith. Also, you have in your files considerable data concerning your recent milling operations, at Red Cloud, to which interested parties may be referred; said data consisting of assays, smelter returns from concentrate shipments, etc.

LOCATION:

The Red Cloud mine is located in the Silver Mining District, in Yuma County, Arizona, about 40 miles north of Yuma and four miles east of the Colorado River. It is reached by turning off the Yuma-Quartzite highway about six miles northeasterly from a suspension bridge across the Gila River, located around four miles westerly from Dome, a station on the Southern Pacific R. R., and then traveling 28 miles to property over a fair desert road, over which trucks can operate.

HISTORICAL:

The property was discovered in 1879. In 1881, it was purchased by the Red Cloud Mining Company, controlled by Knapp and Horton of New York. This company worked the mine profitably until 1892, when operations ceased due to the low price of silver. There is no accurate record of the production, but from the best authorities available, the production of this property ran well over a million dollars. During this eal_y period, there was a town and Post Office adjacent to Red Cloud, known as Silent, said to have contained a population of two or three thousand people, at its peak. Prior to the time when the Southern Pacific R. R. was completed through Yuma, during 1881 or 1882, communication between this area and the outside world was largely by means of steamboats, which plied up and down the Colorado River to points above Needles; and these steamers brought in all kinds of supplies and machinery needed by the miners and transported out ores which were shipped to either Swansea, Wales, or to Selby, California, for treatment at smelters located at those distant points

In 1917, a syndicate headed by myself, purchased the Red Cloud mine, and resold it to E. S. Curtis and James A. Moore, of Seattle, Washington. These people installed Stebbins dry concentrators and endeavored to work the dump. The effort proved a failure and they abandoned the property.

During 1926, while I was operating mines in Mexico, my associates gave a lease and option to the Primos Chemical Company. This company drove a 335-foot cross-cut into the hanging wall on the 500-foot level. At the end of the cross-cut a station was cut and two diamond drill holes were bored, directed in such manner as to intersect the vein at considerable greater depth. At this juncture a payment was about to fall due. The company wanted an extension. The owners refused to grant it, notwithstanding the low price of silver at that time. Thereupon, the Primos people abandoned the property and refused to give the logs of the drill holes to owners.

In 1928, the Neal Mining Company acquired control of Red Cloud, and located 55 other claims in the district. This company drove two drifts on the 500-foot level, one northwesterly and the other southeasterly of the shaft, each about 180 feet, both drifts following the hanging wall vein, which was found to be leached and carrying low values, on this level, which is five feet above water level in the mine.

During 1940, I regained control of property, and in December of that year, I arranged the execution to your company of a lease and option on the same.

GEOLOGY:

Here tuffs and lavas of Tertiary flows, floor a valley that is bordered on the east by andesite ridges and on the west by a sodic granite ridge which in turn is in contact with a high ridge of schist. The entire area of the Silver Mining District is traversed by a number of huge veins and veinlets from which silver-lead ores have been mined and shipped at a profit from superficial workings. It is believed that deeper and intelligently directed work will result in the uncovering of vast ore reserves, concerning which nothing at all is known at the present time. In the past, only outcropping ore shoots have been worked.

RED CLOUD VEIN AND WORKINGS:

The following is quoted from Bulletin No. 134, of the University of Arizona, by Eldred D. Wilson:

"The Red Cloud vein occurs within a fault zone of somewhat irregular strike and dip, separating the volcanic rocks on the east from the granite on the west. At the mine, this zone strikes about north 15 degrees west and dips from 45 to 60 degrees easterly. The vein is made up chiefly of limonite, hematite, quartz, fluorspar and calcite, together with considerable amounts of gouge and brecciated wall rocks, all more or less stained by pyrolusite. The quartz forms irregular, faintly crystalline, vuggy, masses, which in places are cut by veinlets of coarsergrained quartz. Generally it is interbanded with gray to purple fluorite which ranges in texture from dense to crystals 1/8-inch in diameter. The calcite is mostly a coarse crystalline, dark gray, manganiferous variety, but some later white calcite also occurs. The limonite and hematite, which occupy cavities and vugs within the other gangue materials, are locally intermingled with irregular cellular masses and vuglings of cerussite, smithsonite, pyrolusite, vanadinite, wulfenite, and very minor malachite. In places, nodules of argentiferous galena, partly altered to blackish anglesite and pale-yellowish cerussite, occur. The silver of this galena is probably present in minute inclusions of argentite. No other sulphides occur in the mine. Cerargyrite, present as small disseminated masses and streaks within the oxidized minerals, constitutes the principal silver mineral.

"On the surface, the unmined portions of the Red Cloud vein are largely covered by dumps and hillside talus. Underground, the irregular shafts, drifts and stopes, indicated by Figure 2, have followed for a length of 560 feet and an inclined depth of 535 feet (519 feet), which is the water level. Most of the upper workings were made half a century ago, when the ore was sorted and screened underground and dragged up the incline in rawhide buckets. The stopes were supported by pillars, dry-wall fills, cottonwood timbers, willow laggings, which are fairly intact. A more recent vertical shaft, approximately 200 feet deep, intersects the vein at a depth of 290 feet on the incline."

A fact of considerable importance at this time, when our country is in need of strategic metals, that is shown in the above quotation, is the presence of wulfenite (lead molybdate) and vanadinite, which occur throughout the entire workings. They are found across the whole width of the vein and in the foot wall granite. Both of these metals can be recovered by ordinary oredressing methods, or by means of jigs and tables, etc. As a matter of fact, Red Cloud ores contain four strategic metals: lead, zinc and the two just mentioned.

The Red Cloud vein is from 35 to 40 feet wide, and occurs between granite on the foot and andesite on the hanging wall. The high grade silver-lead ore was mined out years ago, at varying widths from four to 12 feet, from the hanging wall vein. There are now 40,000 tons of ore blocked out in the mine, along said vein, from the surface down to the 430-foot level. Some 460 assays, shown on the mine map, show the ore to average around 9 ounces silver per ton and five per cent lead, and a fair showing of wulfenite and vanadinite; also a little zinc.

FOOT WALL VEIN:

This vein is exposed on the surface, showing a goodly grade of milling ore, and has an indicated width of from 8 to 12 feet. But this vein has never been prospected by cross-cutting anywhere in the various levels of the mine, except in two places and these cross-cuts did not reach the foot wall granite. The middle portion of the 40-foot vein is mainly calcite, with low metal values. Hence, if the foot wall vein extends to depth, a large tonnage of milling ore could be picked up easily by means of short cross-cuts at the various levels of the mine. By all means this work should be done.

OXIDIZED ORE:

All ore so far exposed in the mine to the 500-foot level, is oxidized material, with residual bunches of galena, carrying values in silver up to 400 ounces per ton.

SULPHIDE ORE:

Most of the engineers and geologists who have examined the property, agree that below the water level in the mine, extensive bodies of sulphide ore should exist, carrying excellent values in silver, lead and zinc. This is attested by the fact that the oxidized ore zone above water level shows extensive leaching action caused by the rise and fall of the water level in the mine through the ages. In this way, the lower portion of the oxidized ore zone was robbed of its values which migrated downward and no doubt deposited as enriched sulphides below the original water level, wherever that may be. Anyhow, it is my firm opinion and belief that deeper work on vein, should result in uncovering sulphide ores of great importance, in which event both shipping, as well as milling ores may be expected.

As indicated above, the mine is dry and open, and for this reason it can be inspected and sampled. A few check samples against the assay map, we have on file, will prove the sampling of the entire mine. However, we must bear in mind the important fact that such ores as are now available for sampling are merely the second grade ores that were left in place by the old-timers because such ores could not then be mined profitably.

200-TON FLOTATION PLANT:

During the Spring months of 1941, your representatives erected at the Red Cloud mine a 200-ton flotation plant, which proved to be unsuited to recovery of the silver-lead values in the oxidized ore. Also, an attempt was made to work a limited tonnage of low grade dump ore instead of opening up the mines, controlled by yourselves, that would have afforded ample ore of much better grade, especially below water level, where higher grade sulphide ores in quantity may be expected, as above set forth.

As your engineer, Mr. Lloyd C. White stated:

"To give you a true picture of the situation, the main problem at these properties is to develop an underground ore supply. This was the case when I sampled the Red Cloud mine in 1925 and my firm recommended to the Primos company of Philadelphia that they search for the high grade Red Cloud ore shoot below the water level. The problem remains the same to day, except that the Black Rock properties have been included in the options. These two properties present a potential ore supply which make them large and profitable mines. During past years, many top rank mining engineers have recommended these properties."

The mill referred to above is described as follows:

In the first place the mill was poorly designed and was erected on flat ground adjacent to the mine dump, whereas it should have been built on an adjacent hillside so that ore and pulp feed could have been attained by gravity, or largely so, all the way from the crushing plant to the tailings pond. As the mill is now erected, there is no room at all for even the disposal of tailings - a most unsatisfactory arrangement indeed.

The various units of the mill consist of: Ore bin, large Blake-type jaw crusher, two gyratory crushers, 5' by 10' ball mill in closed circuit with rake classifier, one 8-cell, No. 21, 38" by 38" Denver Sub-A Fahrenwald Flotation Machine, followed by one small Southwestern Air Flotation Machine for cleaning concentrates, one 43,000 gallon metal water tank, conditioning tank, conveyors, ore feeders, etc.

Power plant consists of two Diesel engines, 150-H. P. each; these being directly connected to two generators. All units of the mill are powered by individual motors.

An adequate water supply was obtained from a 30-foot sump located on the 500-foot level of the mine; the pumps consisting of one Pomona turbine, set near water level and run by a 5-H. P. motor. This pump boosted the water to a 25-H. P. centrifugal pump above, and this latter pump lifted the water to the mill tank. These pumps handled about 250 gallons of water per minute.

A fairly complete inventory of the machinery and equipment in the said mill, including mining and other equipment, follows:

MILL:

1 - 43,000 gallon metal water tank 1 - 200-ton ore chute 1 - 15" by 36" jaw crusher 1 - 25-H. P. F. M. motor 6 - V-belts for crusher 1 - starting switch 1 - 50' conveyor complete 1 - 3-H. P. motor 2 - V-belts for above 2 - Gyratory crushers - TELSMITH. 2 - 20-H. P. motors & belts for gyratories 1 - 300-ton iron ore bin 1 - Mill ore feeder - Denver 1 - 12-H. P. motor for feeder 1 - 5' by 10' ball mill, with 125-H. P. motor 1 - Reagent feeder 1 - Rake classifier, with 5-H. P. motor 1 - 3" concentrate pump 1 - Simplicity screen 1 - Small conveyor 2 - Reagent feeders 1 - Pair platform scales 1 - 3' circular saw 1 - GE electric welder 1 - 50-foot bucket elevator, with 10-H. P. motor 1 - 6' conditioner, with motor 1 - 8-cell, No. 21, 38" by 38" Denver Sub-A Fahrenwald machine, with 4 motors complete 1 - Kimball-Krogh pump, with 5-H. P. motor 1 - 2" pump, with 5-H. P. motor, Jack shaft & pullies 1 - Air compressor, with $7\frac{1}{2}$ -H. P. motor 1 - 3-H. P. motor & blower 1 - motor, Western Electric 1 - 3-H. P. motor & pump for filter 2 - Pressure tanks 2 - Rubber tired wheel-barrows 1 - Vertical sand pump, Denver, new and not installed 2 - Diesel 150-H. P. engines, with generators & cooling devices 2 - Large transformers 1 - Large switch board, with 10 gauges, Electric 1 - Oxy-set welder complete 34 - Starter switches 3 - Dozen 100-W. globes 1 - Lot misc. copper wire 5 - 32-V globes 1 - New push button 4 - Insulators 1 - Motor and fan blades 1 - Pc. 50' 1" hose 200 - Feet of V-belting 1 - Gasoline motor & emery wheel

Mill inventory continued:

- 1 Large jack
- 1 Ton chain block
- 1 5-H. P. motor, Western Electric
- 1 5-H. P. motor, U. S.
- 7 Large wrenches for Diesels
- 1 Diesel thermometer
- 1 Mill building
- 1 Oliver-type filter to dewater concentrates

Note: The entire inventory, which I have on file, also contains a long list of tools, mill supplies, reagents, lubricating oils, greases, etc., which I have omitted from this list.

PUMPING PLANT:

- 1 Pomona turbine pump, with 5-H. P. motor
- 1 2-stage centrifugal pump, with 25-H. P. motor
- 1 4" pipe line, about 500 feet in length; also

1,000 feet of small water pipe for general camp use

MISCELLANEOUS:

- 1 1,000 gallon water tank
- 1 Assay office complete with assay balances, furnace, chemicals, etc.
- 1 Cle-track catapillar & bulldozer complete
- 1 Blacksmith shop complete with equipment and tools
- 1 Old Franklin auto
- 1 Ramp for loading at Blaisdell Station
- 1 Set Allis Chalmers rolls, not installed
- 1 Wagon drill outfit complete
- 1 Small gas engine and blower
- 1 Vacuum tank
- $1 7\frac{1}{2}$ -H. P. motor & blower

BUILDINGS:

Office and officers' bunk house, containing spring cots, bedding, two desert coolers, office fixtures, drafting board, files, tables, etc.

Tent house containing spring bed and bedding, etc.

Boarding house and kitchen, well stocked with stove, kitchen fixtures, furniture, desert coolers, etc., etc.

Bunk house for six to 10 men, with cots, bedding, air coolers, etc.

MILL RESULTS:

I have made a tabulation from your assay records of a two weeks mill run, in June of 1941, on oxidized Red Cloud dump ores, showing that mill heads averaged 8.90 ounces silver, and tails 5.95 ounces silver, per ton of ore treated during that period. As for lead, heads averaged 4.01 per cent, tails 1.85 per cent. Hence, silver recovery equalled 33.1 per cent, and lead recovery 54.1 per cent.

During the said period, concentrates shipped by yourselves to the El Paso Smelting Works, averaged: silver, 87.63 ounces per ton; lead, 50.45 per cent.

Therefore, at the time you were operating your mill at the rate of 200 tons daily, you were discharging into the tailings pond about 1,090 ounces silver per day, with a gross value of \$773.90, of which it is believed around 90 per cent could have been recovered by cyanidation, provided a properly constructed cyanide plant had been installed at the beginning, in addition to the flotation unit.

Also, no attempt at all was made to recover the wulfenite and vanadinite, a large part of which could have been isolated as a marketable concentrate, by proper plant installation.

In my opinion, there is no use at all to waste further time and money in the attempt to better the above very poor results obtained in treating the oxidized ores of these mines by flotation alone. However, good results should be realized on such ores by using a combination of gravity concentration, flotation and cyanidation.

As to the wulfenite (lead molybdate) and vanadinite, these occur as coarse crystals in which the two are closely combined. Hence, the same would have to be recovered together by means of jigs, and possibly tables, from a coarse pulp feed, approximating 16-mesh. But also, by this method, some "free lead" minerals would be present in the resulting concentrate, which, however, could be removed by using a small flotation machine, after regrinding the said concentrates.

As to the amount of these minerals in oxidized Red Cloud ores, per incomplete sampling I have done on dump material, I would say the same should average about 0.44 per cent combined wulfenite and vanadinite (or MoO3, 0.26% - V2O5, 0.18%), or 8.8 pounds per ton of mill heads.

I understand, on good authority, that an ore buyer located in Tucson, Arizona, will pay 30¢ per pound for concentrates running from 20 to 25 per cent combined MoO3 and V205. Hence, 8.8 pounds at 30¢ would equal \$2.64, of which we should recover at least 60 per cent, or a net of around \$1.58 for these minerals, per ton of ore treated, less transportation costs to Tucson. All in all, let us assume that the said minerals would net only \$1.00 per ton of ore treated, this item alone would yield a net profit of \$200.00 daily, when and if the mill could be reconstructed, which would mean moving it to a new site on the adjacent hillside, adding gravity concentration, selective flotation devices, in the event appreciable zinc should be found in the sulphide ores, and cyanidation, or broadly, whatever processes that may be found necessary, after proper metallurgical tests shall have been made.

However, in assuming that a net profit of \$1.00 per ton of ore treated can be made on the wulfenite and vanadinite minerals, we must take into consideration that all mining, milling and other costs would be charged against the silver, lead and probable zinc contents in the ore; also that a profit can be made on these metals. These matters will be discussed later in this report.

REMARKS:

During the interim while exploratory work is being carried out, as hereinafter outlined, I would not recommend that any attempt be made to operate your present flotation plant, due to reasons cited. Neither would I recommend that this plant be remodeled or changed in any way whatever, until a considerable underground ore supply is fairly well blocked out. The reason for this statement is that until the sulphide ores are exposed, and until proper metallurgical tests have been made thereon, no one could determine, with any degree of certainty, what kind of a plant to install, in order to recover the various metals in the ore.

I would say, however, that the final mill at Red Cloud, which would also treat ores from your other mines, should be so designed as to handle both oxidized and sulphide ores, for in all your main holdings, Red Cloud, Black Rock, Pacific and Silver Glance, large amounts of oxidized ores will be uncovered, without any question of doubt in my mind, provided only that ample money can be found with which to carry out intelligently directed exploratory work.

Red Cloud now has around 40,000 tons of oxidized ore, of milling grade, now ready to be stoped in the old mine workings, as above set forth, with excellent possibilities that new ores will be found by extending some of the levels in the mine on vein each way from the shaft, or into areas that have never been explored at all. Also, such work should result in the discovery of high grade shoots of ore, of the same tenor as were formerly found and mined out.

The Red Cloud vein is traceable on the surface, at intervals, in a northwesterly direction, from the Red Cloud workings, for a distance approximating 10,500 feet; said vein traversing the following mining claims: Red Cloud, Red Rock, Amanda, Black Eagle, Cochise, South Geronimo, North Geronimo and Hardscrabble.

The Hardscrabble claim, belonging to Mr. E. E. Mills and others of Yuma, has a goodly showing of milling ore in an 85-foot inclined shaft on vein, which is from 8 to 10 feet wide. The said ore carries silver and lead and much better grade wulfenite and vanadinite than Red Cloud. I believe this mine to be one of merit and I recommend that you investigate it carefully.

Also on the Geronimo claims there are huge vein outcrops, around 40 feet wide, developed superficially only and showing low values in lead, silver, wulfenite and vanadinite. It is believed deeper work on these two claims should result in the discovery of workable ore bodies of importance. These claims also should be investigated carefully, with a view to developing them at a later time.

The Mendivil claim was surveyed for patent in 1887 for Mr. S. S. Draper, but so far as is known, has never produced any ore. It now belongs to Mr. W. D. Riley, of Yuma, who states that certain portions of it contain five per cent lead and 15 ounces silver per ton. I have walked over this vein, which is large and prominent; but took no samples.

As to the Neal Mining Company group of 55 claims, these mostly cover unexplored ground, in the vicinity around Red Cloud and Black Rock. At a later time these 55 claims should be investigated carefully with a view to retaining only such of the said claims as may appear to have potential value.

BLACK ROCK:

The only data at my disposal concerning the Black Rock mine is contained in the bulletin referred to, by Eldred D. Wilson. A copy of this report follows:

"The Black Rock mine is in the southern portion of the area mapped on Plate 5, immediately north of the Silver District road at a point about 36 miles from Dome.

"This claim was one of the early locations in the district, but very little of its history or production is known. By 1881, according to Hamilton, the mine had been sold for \$135,000 and some rich ore was produced from a 100-foot shaft. Prior to 1884, the owners sank this shaft to a depth of 420 feet and erected a small furnace at the Colorado River. How long this furnace operated is not recorded, but it is reported as turning out a ton of base bullion per day in June, 1883. So far as known, the mine has not produced since 1887. The Black Rock claim was patented during the early eighties and is now owned by Mr. C. E. Batton.

"In this vicinity, low steep-sided, hilly ridges have been carved out by the drainage system of Black Rock wash which drains westward to the Colorado River. These ridges rise to elevations of approximately 1,200 feet above sea level, or 400 to 500 feet above the bed of the wash.

"The prevailing rock on the Black Rock claim is schist which, in the southeastern portion, underlies the Tertiary volcanic series. This schist consists of fine-grained quartz and sericitized feldspar, alternating with bands of partly chloritized biotite. It weathers to blacky, moderately fissile, dark gray surfaces. On the Black Rock claim, its principal lamination strikes northwest and dips steeply northeast. Complex faulting and fracturing have affected this schist. Black Rock wash appears to follow a fault zone.

"The Black Rock vein occurs within a fault zone that strikes N. 65 deg. W. and dips 40 deg. N. E. The vein which consists mainly of manganese-stained calcite together with less amounts of silicified breccia, is traceable on the surface for a length of more than 600 feet and a maximum width of about 18 feet. Particularly near the hanging wall, it contains honeycombed and vuggy masses of fine-grained, brownish-gray quartz, fine-grained fluorite, and later vitreous quartz. Occupying vugs and fissures are irreg-ular masses of limonite, calcite, pyrolusite, smithsonite, cerussite, and minor galena altering to anglesite, cerussite, and yellow lead oxide. This mineralized portion of the vein has been followed underground for a maximum length of 175 feet and a depth, on the incline, of 270 feet. Its richer portion ranges from thin streaks to a width of probably not more than ten feet, but some silverlead-zinc mineralization is traceable throughout the width of the vein. Several quartz-fluorite stringers occur near and parallel to the large vein, and are cut by branching veinlets of later calcite. For some 50 feet on each side of the main vein, the schist shows pronounced silicification, chloritization, and carbonatization.

"THE principal workings of the Black Rock claim include a 420-foot inclined shaft and more than 900 feet of drifts and tunnels connected with it, as shown by Figure 3. The vein, as exposed above the 270-foot level in these workings, has been sampled by Mr. F. W. Giroux. According to Mr. Batton, these samples contained an average of 4.87 per cent lead, 9.8 per cent zinc, and 6.7 ounces silver per ton."

SILVER GLANCE CLAIM:

The Silver Glance claim, north of the Black Rock and east of the Pacific, was surveyed for patent in 1881 for Mr. A. H. Cargill, and is now held by Mr. Walter D. Riley, of Yuma. Very little is known of its production except in the early days exceedingly high grade silver glance ore (argentite) was mined from surface trenches on the vein, which intersects the Black Rock vein. Development work was badly carried out. A 250-foot cross-cut tunnel was run through a ridge to an old shaft, which was sunk to a depth of around 200 feet on one wall of the vein, into which no cross-cuts were run. By referring to the claim map, which accompanies this report, it will be seen that the Black Rock and Silver Glance properties should be worked together as one unit. By properly directed exploratory work, both above and below water level in these mines, it is believed that large reserves of oxidized and sulphide ores will be found, out of which a great deal of money should be made. Both of these mines, as well as Red Cloud, have all the ear-marks that they will develop into large tonnage properties that can be depended upon to supply a goodly grade of milling ore over a long period of time.

Also, once the sulphide ores are found and blocked out in all your principal mines now being discussed, the zinc content in the same can be recovered as a by-product by selective flotation. This item alone will be an important factor in putting these properties on a paying basis, for once the sulphide ores are reached and milling started in a large way, two marketable products can be made, to-wit:

- 1. A lead-silver concentrate, low in zinc, which can be marketed to the El Paso Smelting Works; and
- 2. A zinc concentrate, low in silver and lead, which can be sold to the Amarilla zinc refinery.

As to wulfenite and vanadinite, as these are low temperature ores, or secondary minerals found in the oxidized ores, I do not anticipate the same will be found in the sulphide ores below water level

FINAL MILLING PLANT DISCUSSED

As above stated, during the time when exploratory work is progressing, no attempt should be made to operate your present flotation plant. Neither should the same be remodeled in any manner until a considerable underground ore supply can be uncovered; and until proper metallurgical tests have been made.

However, as we already know something about the metallurgy of these ores, due to your own operation of the flotation mill, as well as to certain cyanidation tests I had made, I think it would be a good idea at this time to give a general outline of the milling plant that later may be installed in order to recover the various metals in the ore.

The plant I have in mind would be so designed as to handle both oxidized and sulphide ores.

Mainly this discussion will serve the purpose of giving yourselves some idea as to what the total costs of such a plant will be.

During 1940, I had cyanidation tests run at the Producers mill on Red Cloud dump ore. These tests showed that 71 per cent of the silver values could be recovered as silver bullion, with a low lime and cyanide consumption. But the said tests were conducted according to the cyanidation set up of the mill mentioned, which treats gold ores only. Hence, our tests were not conclusive by any means, for in the first place, the cyanide solution used was entirely too weak, and, secondly, in the agitation of the samples, insufficient aeration was employed, inasmuch as leaching was done in bottles placed on a revolving shaft. Therefore, it is believed when proper tests are made on this ore by metallurgists who know how to treat silver ore by this method, a goodly recovery of silver can be made, up to around 90 per cent.

The new plant should be located on the hill-side adjacent to the Red Cloud mine. In erecting this plant, I would suggest that procedure be as follows:

It is my idea to dismantle your present mill entirely, except the Diesel power plant, which could remain at its present location; and then use such of your milling, flotation and other equipment as would fit into the flow-sheet of the new mill.

Your present crushing plant would be moved to the top of the hill and there reinstalled, with minor changes only.

The design and flow sheet of the new mill, which would be built on the hill-side below the crushing unit, would be, more or less, as follows:

Ore would be hoisted up an inclined track from the mine to a head frame on top of the hill and dumped into a small bin located above the feed floor, which would be flush with the top of the large jaw crusher.

After the ore passes through the primary jaw crusher and then through the two gyratories, it would go to a Symons cone crusher, in which it would be reduced to say 100 per cent minus 3/8-inch mesh. Then it would be discharged into two iron ore bins, standing side by side, with capacities of 300 tons each one for the oxide and the other for the sulphide ore. One of these can be obtained from the present mill and the other would have to be purchased. The Symons cone crusher mentioned would have to be purchased also.

From the oxide ore bin, the crushed material would pass by gravity over a 16-mesh impact screen, which would have to be provided also.

The fines from the impact screen would contain most of the wulfenite and vanadinite, due to the brittle character of these minerals. Hence, the said fines would go to a 16" by 24" Denver Mineral Jig, which would recover, as a rougher concentrate, a large part of these minerals. The jig concentrate also would contain some "free lead" minerals, which later could be removed in the laboratory in a diminutive mill, consisting of a small ball mill, classifier and flotation machine. The final product should contain wulfenite and vanadinite of marketable grade.

SELECTIVE FLOTATION PLANT INTRODUCED HERE:

Following immediately after and below the said crushing and jigging operations, I now suggest that we introduce into the flow-sheet your 200-ton flotation unit, described above, with such necessary changes as will provide a selective flotation plant, by which a lead-silver product can be made, on the one hand, and a zinc product on the other.

The principal new equipment needed for the above purpose, would be, more or less, as follows:

- 1 6' by 6' conditioner for zinc section
- 1 6' by 6' Oliver filter for zinc section
- 2 8' by 8' thickening tanks, one for the silver-lead and the other for the zinc section

1 - 8-cell, No. 21, 38" by 38", Denver Sub-A Flot. machine

This plant would be so arranged that the zinc would be dropped with the tails from the lead-silver flotation section. Then the tails would pass through another 8-cell, Denver Sub-A machine, where the zinc would be activated, floated and recovered as a separate concentrate.

200-TON CYANIDATION U. I TO TREAT TAILS:

For reasons above cited, I have presumed that the jig tails, as well as the oversize from the impact screen, will pass through the above flotation unit along with the crushed sulphide ores, later to be developed, after these are ground in the ball mill mentioned.

I now propose to install, following and below the said flotation unit, a standard counter-current cyanidation plant, with a capacity of 200 tons daily. The design of this plant will be, more or less, as follows:

The tailings (from flotation would have to be reground to around 100 per cent 200-mesh before going to cyanidation. This could be done by installing about a 5' by 8' ball mill in closed circuit with a rake classifier, into which flotation tails would flow by gravity through a launder. Here an automatic sampling device would be provided. The final discharges from classifier would then enter a launder which would deliver the pulp to a 10 by 50-foot primary thickner.

The cyanidation plant, in addition to the primary thickner just mentioned, would consist of three 30 by 24-foot agitators, followed by five 10 by 40-foot decantation thickners, arranged for gravity solution flow. The pulp to be handled by Eimco duplex diaphragm pumps. Tailings from the final thickner would be automatically sampled and then piped to the tailings pond.

Precipitation solution would be taken by overflow from the primary thickner and would flow by gravity to the precipitation plant, consisting of a standard Merrill-Crowe simultaneous clarification and precipitation equipment for zinc-dust precipitation. Barren solution from precipitation would be returned to the circuit in the decantation plant. Precipitates would be melted in an ordinary tilting furnace at the plant; and resulting bullion would be shipped to the U. S. Mint at San Francisco.

The above plant, if necessary, would handle around 230 tons of pulp each 24 hours.

REMARKS:

One item I have failed to mention is that in the cyanidation tests made at Producers, some gold, amounting to 35 cents per ton of ore tested, was also recovered with the silver. Small as this item seems, it would add around \$70.00 per day to the cash returns from the operation of this plant.

In the above discussion, it has been my idea solely to bring into the open metallurgical problems "to shoot at", or problems to be explored in great detail, prior to the erection of any plant at all.

Briefly, when and if adequate capital can be raised for mine development and plant equipment, the first matter of consideration, as outlined, will be to develop a large underground ore supply. After this is done, exhaustive tests should be made, in order to work out the metallurgy of the ores, and the final plant designed and erected accordingly.

EXPLORATORY WORK:

I recommend that exploratory work be carried out in the Red Cloud mine, along the following lines, to-wit: (a) work to develop new ore in the oxidized zone; and (b) that deeper mine development be carried out below water level, in search for sulphide ores.

Work in the oxidized zone, in the first place, would consist of driving three cross-cuts from the 278, 430 and 500-foot levels toward the foot wall in order to hunt for the foot wall vein at these levels, and to demonstrate whether this vein goes down or not. These cross-cuts will be around 50 feet in length each, or a total of 150 feet, costing \$12.00 per foot, and approximating \$1,800. Secondly, I recommend that the 278-foot level of the mine be extended, north-westerly, on the hanging wall vein, for a distance of 500 feet, in order to open up additional oxidized ore reserves in an unexplored area of this vein where the high grade shoots have not been mined out. This drift extension, 500 feet, will cost around \$6,000; totaling \$7,800 of work in the oxidized zone, as a starter. Additional work should be done in this area later on, after the mill, or the proposed new mill, has been put into operation.

Following is an outline of the work I have in mind in order to uncover sulphide ore below water level.

I will preface my remarks by saying, this task may or may not be a most difficult one to carry out. It all depends on how one goes about it.

As you know, the volume of water now encountered in the 30foot sump, on the 500-foot level, amounts to 250 gallons per minute. Hence, should an attempt be made to sink the present inclined shaft from the 500-foot level to the proposed 800-foot level, or around 300 feet deeper on the hanging wall vein, a much heavier pumping plant than the one now installed would have to be provided.

Sinking a wet shaft is always slow work, as well as uncertain and expensive. Again, at 50 or 100 feet deeper, so much water may be encountered that still heavier pumps might have to be installed, with the possibility that still deeper, more and still more water would come in. All this means expense and delay, with no certainty at all that the shaft could be sunk to any great depth without the expenditure of a vast amount of money.

To obviate the difficulties outlined, I recommend the following procedure:

That a contract be let to sink a 12-inch drill hole from the surface in such a way that it will intersect the inclined Red Cloud vein at an approximate depth of 900 feet, measuring on dip of vein. This drill hole will pass well through the vein and will have a depth, vertically, of 700 feet. In this way it will cross all water-bearing fractures. It can be contracted at \$5.00 per foot and will cost completed around \$3,500. (See map). This 12-inch drill hole will serve the purpose of unwatering the mine to deeper levels, and also, in a limited manner, to prospect the vein for sulphide ores far below the present water level.

It is believed after the drill hole is completed, arrangements would have to be made to handle around 1,000 gallons of water per minute, in order to lower the same to some point well below the proposed 800-foot level.

In order to get some idea of the cost of equipment necessary to pump 1,000 gallons of water per minute, with a maximum 700-foot lift, I called at the Arizona Iron Works, at Phoenix, where the following rough estimate was furnished me:

It was proposed to install: One Arizona pump, deep well turbine type, ll1-inch bowls, lO-stage No. 12 pump unit; 700 feet of pump column, consisting of 700 feet of standard lO-inch pipe, 4-inch tubing, 2-3/16-inch shafting; No. 12 heavy-duty discharge head; also bronze bearing and oil lubricated line shaft. Total cost of this equipment would approximate \$5,000.

It would require around 175-H. P. to run the above pumping unit, at its peak load for that depth. Hence, as our present power plant will not be needed to run the mill, as the same will stand idle during this development period, I recommend that it be used not only to run the pumping plant just described, but the air compressor, for mining work, or for other minor uses that may arise. Therefore, it would be necessary to purchase a 175-H. P. motor to run the pumping plant in question. We should be able to pick up such a motor, second hand, for about \$800.

Therefore, the total cost of completing the 12-inch drill hole, as outlined, plus the motor-powered pumping plant complete, would be around \$9,300.

Again, just as soon as the above pumping plant can be put into constant operation, the present water level would gradually go down and would finally be held at some point below the proposed 800-foot level. (See map). Then and in that event, sinking could be started on the inclined shaft in dry ground, below the 500-foot level of the mine; and thereby the hunt for sulphide ore could be carried out at a constant and moderate cost, with no water to hamper the work, which could then progress at a rapid rate.

WORK PROPOSED BELOW THE 500-FOOT LEVEL:

In considering how to go about sinking below the 500foot level, we again run into a difficult problem to be decided upon. The short sided way to look at this matter would be to recommend using the old 200-foot vertical shaft, which intersects the vein at the 278-foot level and then follows it down, at an inclination of 45 degrees, to the 500-foot level. The vertical snaft, just mentioned, has only one compartment and is in rather bad condition. It would make a very poor working shaft, even if money should be spent in reconditioning it; and I hardly think the Arizona State Mine Inspector would allow this shaft to be used in order to sink below the 500-foot level.

Be all this as it may, I recommend that the old inclined shaft, now used as a ladder-way, and sunk on vein from the surface to the 278-foot level, be squared up and enlarged to a two-compartment shaft and sunk on down on the hanging wall vein to the 500foot level. That on reaching the 500-foot level, this shaft be continued on the said vein to the proposed 800-foot level.

The cost of enlarging and lining up the said inclined shaft to the 278-foot level, including light timbering and car track, would be about \$12.00 per foot, or a total of \$3,336.

The cost of sinking this shaft from the 278 to the 519-foot level, known as the 500-foot level, a distance of 241 feet, would be around \$40.00 per foot, including light timbering and car track, or a total of \$9,640.

Hence, it would cost about \$12,976 to complete a two-compartment inclined shaft from the surface down to the so-called 500-foot level.

Also, at the collar of the said inclined shaft, the car track should be continued to the top of the hill, or to a headframe to be erected thereon, where mine ores would be dumped directly into a feed-bin above the crushing plant of the mill, as above set forth. The cost of the work indicated in this paragraph would be around \$1,500.

The cost of sinking the said inclined two-compartment shaft, including car track and standard heavy mine timbers, from the 519-foot level to the proposed 800-foot level, or 281 feet, would be around \$50.00 per foot, or a total of \$14,050.

On the proposed 600-foot level, around 400 feet of drifting should be run on vein, or 200 feet each way from shaft. Also the same amount of drifting should be carried out on the proposed 700 and 800-foot levels, or 1,200 feet in all, which, at \$15.00 per foot, would amount to around \$18,000.

In order to comply with the safety regulations of the Arizona mining laws, governing deep mining methods, which require that at least two getaways be provided for the workmen, raises would have to be run connecting the proposed 800-foot level with the 500-foot level. This would mean around 260 feet of raises altogether, after deducting heights of intervening drifts; and the cost of same at \$17.00 per foot, including ladder-way and light timbering where necessary, would approximate \$4,420.

MINING EQUIPMENT, TOOLS, ETC.:

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Furthermore, in order to carry out the above exploratory work in the Red Cloud mine, it will be necessary to purchase certain machinery, equipment, tools, etc., an approximate list of which follows:

1 -	500-foot air compressor, to be run by 125-HP motor from mill \$	3,000.00
1	25-HP gas hoist, for shaft	800.00
1 -	175-HP motor, for pumping plant	800.00
1 -	5/8-inch wire cable, 1,000 ft. long, for mine hoist	110.00
1 -	1,000-pound mine skip	175.00
6 -	1,200-pound mine cars, \$100.00 each	600.00
4 -	Tons 12-pound mine rails, at \$40.00	160.00
2 -	Mounted Jack-hammer drills, with air and water hose	600.00
2 -	Unmounted Jack-hammer drills	500.00
l -	Stoping drill	300.00
	Machine drill steel, mine tools, etc	900.00
	Housing, none during development period	
	Overhead, including management, bookkeeping, incidentals, etc., during 7 months develop- ment period, or until shaft is completed to proposed 800-foot level and lower drifts	
	well under way	7,000.00
	Assaying, to be done in Los Angeles, dur- ing this period	700.00
×	TOTAL\$1	5,645.00

SUMMARY:

Hence, the total costs, more or less, covering the above exploratory work in Red Cloud, with the end in view of exposing sufficient ore so the mill could be started, would be as follows:

Exploratory work in the oxidized ore zone	\$ 7,800.00
Cost of 700-foot drill hole, complete, with pumping equipment	9,300.00
Completing two-compartment inclined shaft, from surface to 500-foot level	12,976.00
Cost of inclined skip track on side- hill, including head-frame above	1,500.00
Completing said shaft from 519 to the proposed 800-foot level	14,050.00
Cost of 1,200 feet of drifts on the 600, 700 and 800-foot levels of the mine	18,000.00
Completing 260 feet of raises, as outlined	4,420.00
Cost of equipment, tools, etc., during first 7 months development period, dur- ing which time it is assumed enough ore should be developed to start the new mill, as soon as the same can be reconstructed.	
including overhead, etc	15,645.00

\$83,691.00

NOTE:

It is believed the above costs have been estimated high enough to cover all the above work, which should be carried out by contract exclusively, including mine timbering and timbers, car track and rails, powder, caps, fuse, lights, lubricating and fuel oils, operation of power plants, which would be for account of contractors, kitchen and trucking expenses, etc., which would also be for account of contractors. Also, the superintendent, or engineer in charge of operations, could board with contractors, thus avoiding hiring a cook.

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CAPITAL REQUIREMENTS:

The above estimate concerning costs of carrying out exploratory work, is confined to the Red Cloud mine alone.

While this work is progressing, it would be splendid business also to provide money with which to develop the Black Rock mine, more or less, along the lines recommended for Red Cloud. More particularly, the 420-foot inclined Black Rock shaft should be reconditioned and sunk 300 feet deeper, in search of sulphide ore. Also around 2,000 feet of underground work should be done on vein, in order to block out new ore reserves, both in the oxidized and sulphide ore zones. The work and equipment incident thereto, in opening up this property, would cost around \$75,000.

However, if the amount just mentioned cannot be arranged, such work in Black Rock can wait, until when and if Red Cloud can be put on a paying basis, in which event a part of Red Cloud profits could be used to develop Black Rock.

INITIAL CASH NEEDED:

The initial money needed by your company, broadly speaking, is as follows:

To cover costs of exploratory work, equip- ments, etc., as above set forth	\$ 83,691.00
To cover urgent indebtedness	25,000.00
To purchase Red Cloud, Black Rock, & W. D. Riley properties outright	50,000.00
TOTAL	\$158, 691.00

MONEY NEEDED TO COMPLETE PROPOSED MILL:

Regarding this item, I have been in conference with Mr. L. C. Penhoel, a very able engineer and metallurgist, of Los Angeles. He has kindly agreed to collaborate with me in the matter of estimating the cost of the proposed mill completed, as outlined. Hence, as soon as this estimate is available, I will be pleased to mail it to yourselves, as supplementary to this report.

A SAVING FACTOR:

In the event large and important bodies of sulphide ores should be uncovered, in the process of developing Red Cloud, which is more than likely to take place, such ores could be treated, temporarily, in your present mill without moving it at all, badly as this plant is now arranged, excepting the addition of the selective flotation equipment outlined, and a sand pump to boost the tailings to a new location. However, should the zinc content in the sulphide ores prove to be extremely low, then and in that event, the present mill could be run as it now is built with no alterations at all, except the installation of the sand pump mentioned.

That is to say, your present mill is quite all right for recovering silver-lead values in sulphide ores, in the absence of zinc, and should such ores be encountered, a high recovery, up to 90 per cent of these two metals, could be attained by the present mill.

But granting the above possibility, eventually the proposed new mill would have to be built, with necessary changes, for otherwise no profit at all can be realized from the oxidized ores in your various mines. Unquestionably, all indications point to the fact that possibly hundreds of thousands of tons of commercial oxidized ores remain to be developed in these mines. This statement also applies to the fine possibility that large amounts of sulphide ores will be found in the deeper levels, as above discussed.

All of your principal mines under discussion, are large potential properties; but they will remain a long time yet in this category, unless ample venture money can be found to pay the heavy costs of necessary dead work, in order to open up these properties in a large way.

For no money can be made in the Silver Mining District by people who go in there for the sole purpose of making an immediate profit from depleted surface ore shoots, or with a view to working old dumps. The bonanza outcropping ore shoots were removed over 60 years ago. That kind of ore is gone. New work is now required to uncover the better grade ores again.

Yes; fortunes will be made out of these mines; but only when and if skilled mining men with both vision and plenty of money become actively interested in this area.

PROFITS:

As will be noted, the only positive ores now available in your holdings of which we have dependable assay records, consist of the 40,000 tons in Red Cloud, as set forth in the McDougall assay map, submitted herewith.

This block of ore is composed of second grade material, left by the 1880 operators, assaying around 9 ounces silver and 35 cents gold per ton, plus five per cent lead, zinc content not tested, and approximately 0.44 per cent combined MoO3 and V205.

I have roughly estimated, for your consideration, what profits might be made, treating this grade of ore, which is oxidized material, in the proposed mill, using gravity and flotation concentration, followed by cyanidation, as follows:

Mill heads:

	Silver, 9.0 ounces per ton, at 70 cents Less 10% tails loss	\$6.30 .63
	Tend 5 0% and 100 lbs of #5 85	5.67
	Lead, 5.0%, eq. 100 158, at \$5.05 per 100 1bs., eq \$5.85 Less 46% tails loss, eq 2.69	3.16
	Recoverable value of lead & silver	8.83
	Less marketing charges per ton of ore treated in mill, incl. truck haul to R. R., R. R. freight to El Paso, Sm- elter charges and all smelter deduc- tions, estimated at 20% of net mill	
	head values, or 20% of \$8.83, eq	1.76
	Less: All milling costs, per ton of ore	7.07
	treated \$2.00	
	All mining costs, ditto 2.50	4.50
	Credit per ton of ore tr.: differ- ential on marketing costs of 2/3 of recoverable silver extracted	2.57
	by cyanidation, as bullion 0.74	
	Credit, net gold recovery 0.35	
X	Credit, net Mo03 & V205 1.00	2.09
	Net profit per ton of ore treated	\$4.66

COLLABORATION:

I am indebted to Mr. L. C. Penhoel, 1919 South Santa Fe Avenue, Los Angeles, for his assistance and helpful suggestions regarding the details of the proposed new mill at Red Cloud. Mr. Penhoel is a Mining and Metallurgical Engineer who has been engaged in the design and erection of milling plants, over a long period of years, in both the United States and Mexico. I value his opinion highly.

I am also indebted to Mr. J. S. Coupal, Director of the Arizona State Department of Mineral Resources, for his offer to write yourselves commenting on both this report as well as your properties.

To Mr. Roy Williams, of Kingman, Arizona, for his suggestions concerning ore dressing methods necessary to recover wulfenite and vanadinite values from Red Cloud ores. He has worked for the Molybdenum Corporation of America, and has had experience in treating such ores.

Mr. Walter D. Riley, of Yuma, also assisted me in many ways. He furnished me with an inventory of your milling and other equipment at Red Cloud; also data concerning your milling operations.

CONCLUSION:

From facts herein given, it is my honest opinion and belief that your mines located in the Silver Mining District, Yuma County, Arizona, are properties of more than usual value. Furthermore, I believe these mines can be put on a paying basis, providing your proposed new operations are adequately financed and expertly managed.

Very sincerely yours,

Elgin Bryce Holt.

January 20, 1942.



ARIZONA METAL FRODUCTION - 1

1858-1940 ----- \$2,762,555,000 Copper, 1858-1940 ------Gold, 236, 431,000 1858-1940 ------Silver. 193,032,000 1858-1940 Lead, 30,688,000 1858-1940 Zinc. 16,725,000 Molybdemum, through 1939 5,000,000 - 2 through 1939 Tungsten, 2,500,000 - 2 Manganese, 1915-1931 -----1,380,000 Quicksilver, through 1939 -----400,000 - 2 Vanadium, through 1939 300,000 - 2

3,249,011,000

1 - After M. J. Elsing & R. E. S. Heineman, Arizona Bureau of Mines Bulletin 140, 1936, and U. S. Bureau of Mines Mineral Year Books.

2 - Estimated.



The Red Cloud Mine is world famous for its Wulfenite. When the name is mentioned, one immediately conjures up images of specimens from the Ed Over pocket. Well, another pocket was just hit that will rival anything produced from this mine. We did not get any 2.5 inch single crystals, but there are 10" X 10" cabinet specimens consisting entirely of 3/4 to one inch crystals.

In 1994 the Red Cloud Mine was purchased at a court approved auction by a group of investors headed by Wayne Thompson of Phoenix, Arizona. It is patented property and had been placed into receivership for workmen's claims arising from the mining and milling operation that had gone on in the early 1980's.

After developing a mining plan and securing financing, current mining began at the beginning of this year. Due to the condition of the underground and the fact that fine Wulfenite specimens have been collected on the surface, the decision was made to start with an open pit operation. The vein is approximately 250 feet long, 20 feet thick, and dips at 45 degrees. The first pass removed about 10 feet of overburden, resulting in a trench and exposing about 15 feet of vein.

The overburden mining was completed by the end of January, and work has concentrated on the vein since that time. A small pocket was hit just before the Tucson Show, and that material was in Wayne Thompson's room at the Executive Inn.

The mining phase will remove the bulk of the vein to the bottom of the trench. Once that is complete, the second phase will begin. This will entail mining approximately 15 feet of overburden in order to expose the next 20-25 feet of vein.

Almost all of the vein material is moved by hand. This includes the use of jack hammers in the less rich portions, chipping hammers in the better portions, drilling holes to use feathers and wedges, and, of course, a myriad of hand tools.

The pocket referred to earlier was hit on April 1--quite an April Fool's present! But this is no joke. Bob Johnson, a collector from Phoenix, and one of the field collectors on this project, opened up the seam and retrieved most of the specimens over the next five days. Part of that was due to the fine job he was doing extracting the specimens. It was also due to the fact he is bigger and stronger than the rest of us, and it was tough to get him out of the pocket.

Arizona Mining & Mineral Museum News



EDUCATORS "EDUCATED"

This summer the Museum formally hosted approximately 125 teachers. Activities that have generated tours of teacher groups are: Minerals in Society, Mineral Educators Conference, Urban Systemic Initiative, and a Chapman University summer course. The latter involved a full morning with workshops that included gold panning and demonstrations of mineral properties and lapidary uses (wire trees, faceting, cabachoning), products and the minerals in them, and mineral identification. Special thanks go to Charlie Connell, Shirley Cote, Doug Duffy, Russ Osterhaut, Phil Sparks, and Brenda Stephens for preparation materials and demonstrating during the tours.

Memorial

On June 10, 1996, a beloved volunteer for the Museum lapidary shop died. Harold Hill succumbed to emphysema and pneumonia at age 82. A retired carpenter, he was a lapidary craftsman with a penchant for perfection. His specialty--shield bola ties-were always popular items in the Museum gift shop.

Harold and his late wife, Marie, were charter members of the Arizona Leaverite Gem & Mineral Society. He was also a member of the Maricopa Lapidary Society, an instructor at the Glendale Community Center, and shop monitor at the Museum shop. Forays into the field to collect gave him great joy.

Harold Hill was a sweet, talented, generous man who will be very much missed by those who knew him.

HELP WANTED!!!

Volunteers are an invaluable part of the effective outreach of the Arizona Mining & Mineral Museum's programs. We are VERY grateful for the contributions of all the people who have volunteered here over the years. Those efforts have enabled the Museum to become a valuable community asset.

NOW, contemplating we are some enhancements to increase the enjoyment and relevancy of our programs. FIRST, we are considering the possibility of increasing our demonstrations to daily. School children (and adults, too!) enjoy watching someone polish a stone, seeing crystals grow, looking at crystals or sand through a microscope, or testing the conductivity of minerals. Staffing has been so short that we have had very few demonstrations during the past year.

SECOND, we would like to offer a half day, once a month junior high program. In order to do this, we <u>must</u> recruit more volunteers to act as monitors, demonstrators, and even actors.

If you would like to contribute to these innovations--EVEN FOR ONE DAY OR MORNING PER MONTH!--contact Glenn Miller, Susan Celestian, or any staff member for a Volunteer Application Form. (If 20 people donated one half day per month, the programming at the Museum would be dramatically improved--without imposing much inconvenience on the volunteers!)

Of course, there are other continuing needs that you might be able to address: Computer Programmer, Carpenter/Cabinet Maker, Gluer, Front Contact, and Jewelry Making.

YOUR MUSEUM NEEDS YOUR HELP!

Anthony Lane & Associates

Mining Consultants P.O. Box 5843 Tucson, AZ 85703 Phone (602) 888-5248 June 27, 1983

Don McDaniel Red Cloud Mining & Milling 7010 South Deleware Place Tulsa, Oklahoma 74136

Re: Red Cloud Mine Yuma County, AZ.

Dear Mr. McDaniel:

This letter is a summary of our conclusions and observations of our brief examination of the Red Cloud Mine, conducted on June 23rd, 1983.

The Red Cloud Mine is a well known historical producer of lead and silver, The mine has been developed by an incline shaft to depth of in excess of 500 feet. Two major production levels have been developed at 270 foot and 320 foot levels.

The operation is fully equipped with hoist, head frame, chuted and conveyed crushing system, to a full flotation mill. Mine and mill capacities are presently in excess of 100 tons per day.

The present operation consists of pulling back filled ("gob") stopes. The "gob" was the lower grade ore from previous operations. It is reported that there is from 32,000 to 40,000 tons of this material. No immediate development program'is scheduled for this operation until the first phase of immediate program is completed.

The ore is non-sulfide generally and metallurgy has been developed to meet the specific extraction of the lead-silve complex. Recoveries are reported at 70% of the silver and 90% of the lead.

The strike length of the system is not known to the writer, but is reported to be several thousand feet in length. The depth of the ore Red Cloud Mine Cont.

zone is not fully determined, however, drilling results, as reported, indicate vein systems extended to below the 700 foot level.

Positive ore reserves are not stated, however, probable and inferred reserves indicate an excess of 300,000 tons.

The present facilities have been constructed in a very professional manner and are fully operational.

Full production is scheduled with sale of concentrate to Canadian smelters. It is reported that a market exists for non-sulfide zinc con-

Based on this brief examination, the writer is impressed with the overall operations and subject to confirmation of reserves and grades, the economic potential of this property is significant.

Respectfully submitted,

Anthony Lane

AL/tis

Anthony Liane & Associates

Mining Consultants PO Box 5843 Tucson, AZ 85703 Phone (602) 888-524õ

June 25, 1983

OPERATIONAL REVIÈW & COST ANALYSIS RED CLOUD MINE Yuma County, Arizona

SUMMARY

The Red Cloud Mine and Milling Operations were examined on June 23rd, 1983. The operations consist of a lead-silver-zinc mine, which has been developed by a 45° incline shaft, with operational levels at the 270 foot and 320 foot levels.

It is reported that some 38,000 tons to 40,000 tons of ore is <u>broken</u> in various stopes above the haulage levels, approximately 80% above the 270 foot level, with 20% above the 320 foot level.

The mine is equipped with hoist, however no man-way exists in the main shaft. State and Federal Regulations are reported waived while stope areas are being cleaned to allow a man-way exit away from the shaft.

The mining plan calls for dropping the ore to the haulage levels, slushed to a grizzly capped compartment, conveyed to a skip pocket and hoisted. No direct mining is scheduled in the immediate program, except directing stope chutes to allow ore flows to haulage level.

The hoist is equipped with a tipple, which dumps to either waste chute or to crushing circuit bin and conveyor. The ore is crushed to minus 1/4 inch through primary and secondary crusher. The crushed ore is ground to minus 200 mesh, conditioned and floated throug 6 cell Denver Flotation Unit. A single lead-silver product is made after thickening and filtering. Mill capacity is 100 tons per day, plus.

Reporting recovery through this plant is up to 70% of the silver and 90% of the fead. No attempt is made at this time to recover the zinc, however, it is reported that a market is available and

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a zinc circuit planned.

The entire operation is electic powered with a 270 k.w. generator. Water is available from the mine. The operation includes camp facilities, together with offices and assay facilities at site.

The mining plan calls for two alternative programs.

1) 33 Tons per Day - 8 Hrs.

2) 100 Tons per Day - 24 Hrs.

Based on direct costs, not inclusive of depreciation, amortization or depletion and not including other overhead, our estimates for operations are:

 1) 33 t.p.d.
 \$54.29 per ton - Appendix II

 2) 100 t.p.d.
 \$39.78 per ton - Appendix I

These costs can be directly reduced after operations are stabilized by elimination of living and boarding facilities at the mine. These savings represent approximately \$2.00 per ton on 100 t.p.d. and \$3.00 per ton on 33 t.p.d.

Other additional costs can be saved by volume purchase of fuels, material and supplies, representing a savings of at least 10%.

Additional savings can be made by incoporating a bonus system to the entire operation, which practice has resulted in a 10% plus saving in labor costs.

A achievable operational cost should not exceed:

1)	33	t.p.d.	\$45.00	per	tor

2) 100 t.p.d. \$32.50 per ton

Direct administrative overhead should not exceed 10% of mining and milling costs.

Plant, equipment and devleopment investments should be amortized over the positive and probable ore reserve. This is reported at 100,000 to 500,000 tons.

The reported broken ore is stated at 32,000 - 40,000 tons. Assuming an average of 36,000 tons, projected life of this program is 1) 33 t.p.d. - 49.5 months (based on 22 working days per month) and 2) 100 t.p.d. - 16.36 months (as before).

Respectful

y submitted

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APPENDIX I

7

100 Tons Per Day (3 Shifts)

Mill

Labor

NO.	Title	Hourly Rate	Daily Rate	Cost Per Ton
1	Supervisor (1/2)	\$15.00	\$60.00	\$.60
1	Assayer (1/2)	7.00	28.00	. 28
1	Mech- Elect. (1/2)	8.00	32.00	. 32
9	Crusher Operators	6.00	432.00	4.32
3	Laborers	5.00	120.00	1.20
3	Mill Operators	8.00	192.00	1.92
6	Laborers	5.00	240.00	2.40
1	Assayer Helper (1/2) 5.00	20.00	. 20
1	Mech. Helper (1/2)	5.00	20.00	. 20
1	Cook (1/2)	6.00	24.00	. 24
Total	Direct	×	\$1,168.00	\$11.68
Insura	ance - 13%		151.84	1.52
Per Di	uem – 27 @ \$7.00		189.00	1.89
	ì		\$1,508.84	\$15:09

Material & Supplies						
Reagents						
Grinding Media						
Fuel - <u>100</u> Gallons @ \$1.50	, ,					
Total						
25% Contingency						

\$2.40 1.05 1.00 \$5.45 \$20.54 \$5.14 \$25.68

APPENDIX I

100 Tons Per Day (1 Shift)

Material & Supplies

10

Mine

Labor

No.	Title	Hourly Rate	Daily Rate	Cost Per Ton
1	Supervisor (1/2)	\$15.00	\$ 60.00	\$.60
1	Assayer (1/2)	7.00	28.00	. 28
1	Mech Elec. (1/2)	8.00	32.00	. 3 2
1	Hoist Man	8.00	64.00	.64
2	Miners	8.00 .	128.00	1.28
4	Helpers	5.00	160.00	1.60
1	Slusher Operator	7.00	56.00	.56
1	Assayer Helper (1/2)	5.00	20.00	. 20
1 .	Mech. Helper (1/2)	5.00	20.00	. 20
1	Cook (1/2)	6.00	24.00	. 24
Total	Direct		\$592.00	\$5.92
Insura	ance - 22%		130.24	1.30
Per Di	uem – 11 @ \$8.00		88.00	. 88
	1		\$810.24	\$8.10

Explosives	\$200.00	\$2.00
Oil - Grease	30.00	. 30
Timber	40.00	.40
Fuel - $\frac{100}{3}$ = 33 x 1.50	49.50	. 50
Total	\$319.50	\$3.20
Total Combined	\$1,129.74	\$11.30
25% Contingency	282.44	2.82
	\$1,412.18	\$14.12

APPENDIX II

33 Tons Per Day (1 Shift)

Mill.

Labor

<u>No.</u>	Title	Hourly Rate	Daily Rate	Cost Per Ton
1	Supervisor (1/2)	\$15.00	\$60.00	\$ 1.81
1	Assayer (1/2)	7.00	28.00	.84
1	Mech Elect. $(1/2)$	8.00	64.00	1.93
2	Crusher Operators	6.00	96.00	2.90
2	Laborers Prep.	5.00	80.00	2.42
1	Mill Operator	8.00	64.00	1.93
1	Mill Laborer	5.00	40.00	1.21
1	Cook (1/2)	6.00	24.00	.77
Total	Labor		\$456.00	\$13.81
Insur	ance - 13%		59.28	1.80
Per D	1em - 10 @ \$7.00		70.00	2.12
			\$585.28	\$17.73
Mater	ial & Supplies		·	,
Reagen	nts			\$ 2.40
Grind	ing Media			1.05
Fuel	@ \$1.50		\$32.67	1.00
Oil 6	Greases			1.00
2	. •	,		\$5.45
Total	Cost			\$23.18
25% Co	ontingency			5.80
				\$28.98

APPENDIX II .

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33 Tons Per Day (1 Shift)

C

Mine

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Labor

No.	Title	Hourly Rate	Daily Rate	Cost Per Ton
1	Supervisor (1/2)	S 15 00		
1	Assaver $(1/2)$	J 13.00	\$ 80.00	\$ 1.81
1	Mech. = Elect $(1/2)$	7.00	28.00	. 84
-	Hoigh Man	8.00	32.00	.96
	HOISE MAN	8.00	64.00	1.93
1	Miner	8.00	64.00	1.93
2	Helpers	5.00	80.00	2.42
1	Slusher Operator	7.00	56.00	1.69
1	Cook (1/2)	6.00	24.00	.72
Total	Direct	X	\$408.00	\$12.30
Insura	ance - 22%		89.76	2.71
Per Di	lem - 9 @ \$7.00		63.00	1.91
			\$560.76	\$16.92
Materi	al & Supplies			
Explos	ives		\$ 67.00	\$ 2.02
Oil an	d Grease		10.00	.30
Timber			15.00	.50
Fuel	$\frac{33}{3}$ x \$1.50		16.50	.50
			\$108.50	\$3.32
Total	Combined		\$669.26	\$20.24
25% Co	ntingency		167.33	5.06
			\$536.59	\$25.30
APPENDIX III

Average ore values supported by 460 assays, 10.15 oz. of silver, 6.7% lead at 100 ton mineral value. 10.15 oz. silver x 100 = 1052 oz. x 70% recovery = 710.5 oz. x 13 =\$ 9,236 6.7% lead 134 lb. x 100 = 13,400 lbs x 90% recovery = 12,060 lbs. x 20c =2,412 \$11,648 Yearly gross smelter concentrate value based on 2,083.25 ton of concentrate at \$1397.76 per ton net after smelter cost with 83-1/3 shipments a year. \$2,911,883 Royalty (Yuma Metals, Inc.) 20% 582,377 2,329,506 Overriding Royalty (Nevada Natural, Inc.) 5% 145,594 2,183,912 2.5% 72,797 2,111,115 Taxes 5% 105,555 2,005,560 Management Fee Red Cloud Mills Limited 20% 401,112 1,604,448 TOTAL REVENUE for \$1,604,448 Operational Management Services, Inc. 849,479 Mining & Milling Cost 754,969 250,000 599,479 Estimated Transportation Cost 60,000 559,479 General Superintendent Mining and Milling of Operational Management Services, Inc.

NET PROFIT for \$ 559,479 Operational Management Services, Inc.

Above figures do not take into consideration any income that will be derived from gold or zinc recovery, present mill modification should recover additional important value in both of these metals.

CERTIFICATION

I hereby certify that

That I am a Mining Engineer and Geologist, holding B.Sc.
 degrees in both diciplines.

2. That I have practiced my profession for 32 years on a continuous basis.

3. That I am the principal of Anthony Lane & Associates, Consultants, and the Executive Vice President of Alanco ltd.

4. That I made an examination of the Red Cloud Mining Properties, Yuma County, Arizona, on June 22, 1983, and prepared my reports based upon this examination.

5. That I have no interest in the property or any of the companies involved in the operations there.

I hereby certify that the above statements and facts are true to the best of my knowledge and belief.

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Anthony Lane

RESUME

Anthony Lane 1302 West Mohave Tucson, Arizona 85705

Born - July 14, 1929 at Ealing Middlesex, England

Education

B. Sc. - Geology
B. Sc. - Mining Engineering Business Law - Minor Loughborough college Royal School of Mines

Professional Experience

1950-1951	British National Coal Board
Duties	Supervision 17 coal mines near Coalville, Leicestershire
1951-1953	Anglo-Iranian Oil Company
Duties	Staff Engineer - Aide to V.P. Administration
1954	Immigration to U.S.A.
1954-1955	Dean Roland - Geologists, Denver, Colorado
Duties	Field Geologist - Uranium Exploration
1955-1957	Geophysical Engineering Co., Colorado Springs, Colorado
Dyties .	Field Manager - Petroleum and Mineral Geophysics South-West
1957-1959	Yucca Mining Co. & Florida Manganese Co., Deming, New Mexico
Duties	General Manager - 500 t.p.d. Manganese

Resume - Anthor Lane cont.

1959-1961

Mining & Milling Operation Carl M. Loeb, Jr. New York, New York (Owner of Yucca Mining & Florida Manganese)

Duties

Special Consultant

1961 to Present 1961

Mining Consultant

Organized Anthony Lane & Associates

Associates & Consultants

Edwin Stone - Geologist Thorpe D. Sawyer - Mining Engineer

1970-1980

Organized ALANCO LTD. (An Arizona Corporation) Mining Claim Service

Clientele

The Anaconda Company American Metals (Then Climax Molybdenum) Utah International Union Oil Company Western Minerals Corporation Venture Drilling Company Knox-Arizona Corporation B.S. & K. Mining Co. Anamax Mining Company International Minerals & Metals, Inc. Houston Mining & Resources, Inc. Newbery Energy Co.

Special Projects

Exploration & Mine & Mill Development--Manganese, Lead, Copper & Fluorspar - New Mexico Exploration - Copper - souther New Mexico Exploration & Mine & Mill Development --Gold, Silver, Lead & Zinc - Arizona Exploration - Gold - Wyoming & Nevada Exploration & Mine Development --Tungsten & Gold, Utah Metallurgy - Precious Metal Extraction Land Management - Contractual Claim Patenting - Federal

Resume - Anthon, Lane cont.

1980

Reorganization and Expansion of ALANCO LTD. Mining Claim Services - Specializing in Mineral Claim Insurance

References

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Robert C. Flowers - Counsel Texas Attorney General Office Austin, Texas

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John Lacey Attorney at Law Tucson, Arizona 602-623-6961

Abe Kalaf B.S. & K. Mining Company Venture Drilling Tucson, Arizona 602-623-2211

John Jett Director Arizona Mineral Resources Phoenix, Arizona

Robert O'Brien Mining Engineer U.S. Park Service San Francisco, California

Wayne Winters Publisher Tombstone , Arizona

Philip M. Lynch

Resume - Anthony Lane Cont.

Banking References

Donald DeGrood First National Bank of Arizona Southgate Branch Tucson, Arizona

Valley National Bank Oracle-Grant Office Tucson, Arizona

The above is a true and accurate account of my education and experience to the best of my knowledge and understanding.

Anthony Lane P.O. Box 5843 Tucson, Arizona 85703

Telephone: Business - 602-888-5248 Home - 602-888-8274





ASSAY Certificate UNION ASSAY OFFICE INC. Salt Lake City, Utah Molybdenum Ussay as of Jeb. 28, 1938 SAMPLE WIDTH Mo03 NO. IN FEET PERCENT 1.60 2.12 0.21 1.57 0.75 5 2.79 0.78 0.18 0.16 5 10 1.00 11 0.47 12 1.09 6.45 5 14 0.25 15 0.93 16 0.84 17 8.72 18 3.08 19 3.93 7.37 10 21 0.70 22 23 0.63 0.77 24 0.51 25 5 0.99 26 2.69 2.83 27 28 5.02 3 29 7.72 30 0.59 31 0.80 2.69 32 6 33 0.54 5 0.21 34 5 0.58 35 5 0.33 36 37 38 0.39 1.93 39 2.22 40 2.57 3.22 41 1.42 42 43 0.56 44 0.42 45 0.54 46 3.97 47 4.35 48 3.50 1.88 49 50 1.47 51 2.35 AVERAGE ASSAY VALUE 1.79% MoO3 (Molybdenum trioxide)

MINES IN SILVER DISTRICT YUMA COUNTY

MILL ON COLORADO HEAD OF MARTINEZ LAKE

Yuma Metals, Inc.

LLOYD C. WHITE, GEN. MGR.

D. L. MCDANIEL, PRES. OTTO MOTEJL, VICE PRES. CHAIRMAN OF BOARD LUKE WALKER SECY. & TREAS.

YUMA, ARIZONA

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To Our Stockholders:

This paper was prepared by order of your board of directors; for the purpose of better acquainting you with the properties, future plans, and etc..

We suggest that you retain this paper in your files, as from time to time you will receive additional information that will refer to the maps, cuts and information herein contained.

Respectfully Submitted YUMA METALS, INC.

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RED CLOUD MINE PROPERTIES

One of the Early Important Mineral Discoveries in Arizona

The Red Cloud was primitively mined by "single jack" method in the 1870's and the ore was sorted and hi-graded underground. The selected ore was carried to the surface on human backs or drawn up to the surface in rawhide buckets, transported by burros to the Colorado River. On the return trip, the burros packed badly needed water.

The ore, on reaching the river, was carried by boats to the Gulf of California; finally transferred to ocean sailing vessels that conveyed the ore to Wales. Later, some ore was shipped by boat to Selby, California.

Practically no ore has been mined since 1889, but there has been a great deal of development work done. The work was done, both for the purpose of blocking out ore and for the search for a water supply that was essential for modern milling processes at the mine site, most of which has been done since 1924.

As above stated, very little ore has been taken since 1889, but the development work, consisting of deepening the mine from 270 feet to a 500 foot level and several drifts added, as shown on mine map. This work today would cost over \$100,000.00. The greatest value of all was the development of a good water supply. Besides this, there is the 335 foot drift away from the vein to a diamond drill room which is essential to explore the vein to depth. During this development work, a large amount of good milling ore was raised to the surface and placed on the old dump that had been left by the early miners.

The Red Cloud Mine has practically all the ore left in it by the old-timers, and there are from 30,000 to 40,000 tons blocked out and a large amount mined and stored in the stopes. Seventy percent of the dump is still intact. Meager operations have taken the other thirty percent of dump ore in recent years. According to University or Arizona Bulletin No. 158, \$1,587.00 in value was removed in 1934-37; \$37,714.00 in 1941; \$20,052.00 in 1947-49. These amounts were on a recovery of less than one-half of assay values and the price of lead was much lower than now.

In 1924, at the time development work was planned, the price of silver and lead was the second highest in history, before the development work was completed in 1925 the price of silver had dropped from \$1.32 an ounce to 70 cents an ounce.

Due to the break in the silver market the operations were suspended and during the following eight year period to 1933, silver continued downward to 25.01 cents per ounce and lead to 2.747 cents per pound, the lowest price for both minerals in 85 years. The operators of the mine at the time were working under bond and lease agreement and were unable to meet lease obligations so were forced to return the property to the owners.

Another asset of the Red Cloud Mine, which is essential to economic modern milling, is that it has a fine mill site with plenty of elevation and large tailing space adjacent to the opening of the shaft.

OTHER PROPERTIES OWNED BY YUMA METALS INC.

THE DIVES MINE has high grade milling ore; is accessible and will easily develop into not only a large mine but a profitable mine.

THE RIHO MINES have both sulphide and oxidized ore, there being more galena in them than any other of the properties. While the veins are much narrower, running from 24 inches to four feet, the ore runs higher in value per ton.

THE NEW NORTH GERONIMO and NEW SOUTH GERONIMO and NEW HAMBURG Mines have less development work, but from the assays and wide width of the veins could easily be mines of some consequence.

The other claims have outcropping assays showing they all carry values that might well develop into several good mines. However, they need more exploration work to prove their real value.

The district is accessible by fair dirt roads which have been developed in the past few years.

RECENT OWNERSHIP HISTORY

D. L. McDaniel, Otto Motejl and Luke Walker, under the name of RED CLOUD MILL and MINING COMPANY, purchased the Red Cloud Mine in 1949, and since have acquired the other properties. In November, 1951, all these properties were incorporated as YUMA METALS, Inc.

Lloyd C. White has been General Manager since late 1950. Mr. White was outstanding as a Consulting Mining Engineer, with offices in San Francisco, associated with Hershey and Berch, and his wide experience as a Consulting Mining Engineer on many prominent properties in Canada and Mexico, as well as the United States, and as General Manager for many years of the Bradley's Yellow Pine Mines and Mills at Stibnite, Idaho. Having Mr. White as General Manager assures us of competent engineering, mill designing and the best of management.

Mr. White has outlined a comprehensive program of further mine development and deep diamond drilling as well as an operating program.

For the past three years extensive metalurgical work, engineering and geological study have been carried on. Information and ore tests from the United States Bureau of Mines, the Arizona Bureau of Mines, Denver Equipment Company, Cyanide Corporation of America, Mr. L. C. Penhoel, Mr. A. L. Poarch, Mr. Edward Eisenhauser, Jr., and others in this field, have been very helpful. On account of laboratory work and many ore tests, the recovery has been nearly doubled. This, of course, more than doubles the net ore value as the mining and milling costs are the same no matter what the recovery.

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FROM REPORT OF ROBERT MORGAN

Mining Engineer

SUBJECT: Silver District

September 18, 1940

The History of the Silver District dates back to the early Seventies prior to the building of the railroad, when this section of Arizona was served by steamboats on the Colorado River. The bigher grade ores near the surface were mined and hand sorted to give a product as bigh in Silver as possible as the miners were not paid for the lead or zinc in those days. These sorted ores were shipped by river boats down the Colorado River to the Gulf of California where they were re-shipped to San Francisco for treatment. A small experimental smelter was erected on the Red Cloud mill site on the river but proved unsuccessful due to lack of proper fuel and insufficient knowledge of smelter practice, and for some years the mines reverted back to the Shipping basis conducted almost entirely by Mexicans who mined the surface ores by crude methods, but made no attempts to develop the properties as a whole.

The building of the Southern Pacific Railroad and the Subsequent discontinuation of river transportation isolated the District and followed a few years later by the demonitization of Silver caused the District to lapse into inactivity ubich has been broken but sporadically in the intervening years. Ore sorting of past operations has produced surface dumps on the various properties of some thousands of tons which later sampling has proven to be milling grade.

The Geology of the Silver District has been designated by the United States Geological Survey and the Arizona Bureau of Mines as a Pre-Cambrian Basal Complex, consisting of Schist, Altered Granite, Andesite Tuffs and Breccias capped by flows of Andesite and Rhyolite Porphyry.

Shafts, open cuts and tunnels ranging from a few feet to around 60 to 100 feet in depth are scattered over the properties at various places and are almost invariably in live vein matter of substantial width, either of positive commercial values as they stand, or sufficiently enriched and so located geologically as to be attractively indicative of the probability of developing commercial milling ore in appreciable tonnages at reasonable cost.

RED CLOUD MINE

On the easterly side of the valley and with an approximately similar strike lies another range of steep hills flanked for some thousands of feet by a very strongly out cropping vein system known locally as the Dives Princess Vein, productive of moderate quantities of high grade ore on the surface at different locations in former days, but as yet undeveloped. The two vein systems differ in their characteristics, the Red Cloud dipping 45 degrees to the east, while the Dives dips 55 degrees to the west in the northern portion and to the east in the southern sections. Minor bills and a pronounced flow of rhyolitic and andisitic tuffs occupy much of the basin separating the two ranges of bills, the tuffs forming the banging wall of the Red Cloud vein, the foot wall being the hills of granitic material against which it rests.

Granites, rhyolites, tuffs, schists, and dikes of the older porphyries are the most noticeable feature of the vicinity geologically. Gross fractures extending into the footwall are occasiFrom Report of Robert Morgan con't.

onally noticeable at the Red Cloud, with an attendant widening of the vein to a thickness of 35 to 50 feet. Nodules of granite enclosed in the ore, which is deposited in a distinct banded formation, point to the probable replacement of the foot wall and the possible passing of several periods of fracturing and fissuring with attendant mineralization.

The Red Cloud ore shoot so far as developed to the present time covers a strike of between 300 and 400 feeton the vein where it out-cropped to heighth of some 30 to 50 feet above the surface in the northern end of the claim. This out-crop for a width of 20 to 30 feet and a length in excess of 300 feet was shot down, sorted and the higher grades shipped. In the open pit there is additional ore on the foot wall to a distance of several feet, explored but slightly and of undetermined extent and value.

From the bottom of this open cut, inclined shafts were sunk in the ore on the banging wall, some thousands of tons of which were mined out on an average thickness of four feet, occasionally twice that, over a strike of about 300 feet. There remains in this banging wall section probably one half to two thirds of the original pay streak, and several thousand tons of broken ore backfilled into stopes and raises from underground sorting. Whatever ores of milling values may have existed between this particular streak and the footwall remain in their entirety.

When the presence of values to the depth of about 300 feet on the incline had been established, a vertical shaft was sunk to cut the vein at this depth, which became the main level of the mine. Drifts were run 160 feet south from the bottom of this shaft and 270 feet north, the latter reaching approximately the north end line of the claim.

From this level an inclined shaft in line with the vertical shaft was sunk an additional 240 feet in an effort to penetrate the sulphides, water was encountered at a total depth of about 540 feet on the incline. From this lower shaft but little actual mining was done, as the upper level ores apparently had not been depleted beyond the point of profitable sorting up to the time when conditions previously described led to the general shutting down of the District. Such ores as were extracted below the main level in the stopes to the north of the shaft were evidently of excellent grade.

Opening of the ores other than shown in the sample map is confined to a few short cross cuts toward the foot wall in various parts of the workings, insufficient to be of conclusive value, and the drifts just above water level, approximately 150 - 175 feet each way from the shaft, driven under Mr. Boerickes's tenancy of the property. Cross cuts show the ore body at this depth to be over 35 feet in width with the true foot wall not yet reached, in the writer's opinion. Owing to the present lack of ventilation at this depth, these water level drifts and cross cuts are not yet systematically sampled by the writer but appear persistently in ore, some of which at least is of excellent grade.

The Red Cloud property has been thoroughly sampled by Mr. B. W. W. McDougal E. M. and by Burch Hersbey and White. I also check sampled the mine myself several years ago and estimated that there is left in the banging wall section some 32,000 tons of ore baving a metal content of 6% lead, 10 ounces silver and ½% Molybdenum. Past mining and sorting operations have produced material tonnages of dumps which are scattered over considerable area and are very difficult to measure, but have been estimated by different engineers at from 12,000 to 30,000 tons. Sampling of these dumps indicate a mineral content of 4.5% lead and 8 oz. silver and ½% Molybdenum.

From Report of Robert Morgan con't.

The Red Cloud shaft baving a total depth of 340 feet on the incline is the deepest working the District and the only one to reach water, this water supply was estimated by Mr. Hershey, consulting Geologist for the Primes Chemical Co. at from 75 to 100 gallons a minute. If this is correct it is a valuable asset as it would be sufficient water for a 125 ton mill.

The Geronimo Group consists of 6 claims and is a continuation of the Red Cloud Vein. Such work as has been done on this group is confined to the extreme north end on the Geronimo claims. The Geronimo is located on a cross fracture which strikes off of the main vein North 60 degrees West. Here a massive out crop of iron stained quartz calcite vein material ranging in width from 30 to 100 feet cuts through the mountain and crops on the surface for a distance of 1,200 feet. On the south end of this out crop is an inclined shaft 125 feet deep, no drifting has been done from this shaft. Other work consists of cross cut tunnels, open cuts and shallow pits. Such samples as I have taken from these openings while spaced at too irregular intervals to be conclusive as to the average grade of the ore does indicate the probable existence of an enormous tonnage of low grade ore.

This ore deposit should be drilled and thoroughly sampled, for if it or any considerable part of it should prove to be of commercial grade, it could be mined cheaply by open pit methods to considerable depth without stripping. About 600 feet north of this deposit on the North Geronimo claim is another out crop with a length of several hundred feet and a surface width of 20 to 80 feet. The only work to date on this claim is an incline shaft sunk in the hanging wall of the vein on the south end of the ore shoot 85 feet deep with a short drift each way from the shaft at the bottom. The general character and mineral content of the ore exposed is about the same as the Red Cloud.

The Dives Group consists of 15 claims which completely cover the outcrop of the central vein system from end to end, a distance of about 18,000 feet. The property is traversed by a strong highly mineralized vein 10 to 50 feet in width. In the center of this group on the Dives claim there is exposed in the surface a showing of ore that appears worthy of further development. There is a shaft 40 feet deep and a drift north about 45 feet, all in ore of excellent grade, also a vertical working shaft at a lower elevation has been sunk 100 feet. From the bottom of this shaft a cross cut has been started which when completed should cut this ore shoot 180 feet below the out crop. According to my calculations this cross cut has about 30 feet to go to reach its objective. This property is favorably located to the more developed portions of the District, being about three fourths mile from the Red Cloud and should be sampled by drilling. It is my belief that this would add material tonnages of commercial ore to the known reserves at moderate cost.

The Mandarin Chloride Group consists of 18 claims, occupies the extreme east side of the District is undeveloped and their chief value lies in the future. The veins are strong, well mineralized and of generous widths and form a valuable reserve for future development and subsequent large scale operations.

In summing up the future possibilities of the Silver District as a whole these points seem to stand out. There are two wide ore bodies about a mile apart which are partly developed, the Black Rock and Red Cloud. These have produced considerable amounts of high grade ore from streaks along their walls. There are three others available equally wide and 'conveniently located for development. In addition, within the District there are approximately 60,000 lineal feet of out croppings, which represent potential ore reserves for many years to come. From Report of Robert morgan con't.

All of the development so far has been in the oxidized zone. All geologic evidence points to the fact that it is very probable that there will be a zone of secondary enrichment at or near water level, also primary sulphides below the secondary zone, this point is economically very important. Intelligent exploration by drilling and underground work is essential to determine the location, size, shape and mineral content of these ore bodies. The results of which willmake it possible to plan the most economic scale of operations, as well as the particular mining methods most adaptable to the individual properties. Without the accurate data which will be yielded by the exploratory program it is difficult to predict the scale of operations or their probable results.

The ideal method of attack on a proposition of this magnitude by a large and well financed mining company would be to drill the entire District and block out a huge tonnage of ore, then start with a large plant, dependent in size on the results obtained. This would require an enormous investment as well as several years time. To my mind such method of operation is neither necessary or desirable, as this property is so situated as to lend itself admirably to a step by step plan of operation and development with a moderate investment and a minimum of risk.

At the time of my first visit into the Silver District in 1924, I was immediately and favorably impressed with the possibilities for successful development which I deemed to be strikingly evident. These impressions were largely offset from the view point of practicability of early operations by a study of the transportation situation, but I recommend to certain persons the gradual acquisition of selective portions of the District. With the construction by Yuma County of a bridge across the Gila River in 1920, removed what I considered to be the sole remaining barrier to the practicable and profitable development of the District. The data of various descriptions upon which the within statements are based has been the results of my own work and observations aided by consultation with such engineers as Mr. Walter G. Swart, Messrs. Burch, Hersbey and White, Mr. Harlan H. Bradt, Mr. Thomas Baines, Jr., Mr. Edmond Newton and other engineers of recognized competence and ability who have from time to time made examinations of the different properties.

> Original Report Signed Robert Morgan Mining Engineer

FROM REPORT OF ELGIN BRYCE HOLT

Consulting Mining Engineer

SUBJECT: Red Cloud Mine

January 20, 1942

LOCATION:

The Red Cloud Mine is located in the Silver Mining District in Yuma County, Arizona, about 40 miles north of Yuma and four miles east of the Colorado River. It is reached by turning off the Yuma-Quartzite highway about six miles northeasterly from a suspension bridge across the Gila River, located around four miles westerly from Dome, a station on the Southern Pacific Railroad and then traveling 28 miles to property over a fair desert road, over which trucks can operate.

HISTORICAL:

The property was discovered in 1879. In 1881, it was purchased by the Red Cloud Mining Company, controlled by Knapp and Norton of New York. This company worked the mine profitably until 1892, when operations ceased due to the low price of silver. There is no accurate record of the production, but from the best authorities available the production of this property ran well over a million dollars.

During this early period, there was a town and Post Office adjacent to Red Cloud, known as Silent, said to have contained a population of two or three thousand people at its peak. Prior to the time when the Southern Pacific Railroad was completed through Yuma, during 1881 or 1882, communication between this area and the outside world was largely by means of steamboats, which plied up and down the Colorado River to points above Needles; and these steamers brought in all kinds of supplies and machinery needed by the miners and transported out ores which were shipped to either Swanson, Wales, or to Selby, California, for treatment at smelters located at those distant points.

GEOLOGY:

Here tuffs and lavas of Tertiary flows, floor a valley that is bordered on the east by andesite ridges and on the west by a sodic granite ridge which in turn is in contact with a high ridge of schist. The entire area of the Silver Mining District is traversed by a number of huge veins and veinlets from which silver-lead ores have been mined and shipped at a profit from superficial workings. It is believed that deeper and intelligently directed work will result in the uncovering of vast ore reserves, concerning which nothing at all is known at the present time. In the past, only outcropping ore shoots have been worked.

The Red Cloud vein is from 35 to 40 feet wide, and occurs between granite on the foot and andesite on the hanging wall. The high grade silver-lead ore was mined out years ago, at varying widths from four to twelve feet from the hanging wall vein. There are now 40,000 tons of ore blocked out in the mine, along said vein, from the surface down to the 430 foot level. Some 460 assays, shown on the mine map, show the ore to average around 10 ounces of silver per ton and six per cent lead and a showing of wulvenite and vanadinite; also zinc. From Report of Elgin Bryce Holt con't.

FOOT WALL VEIN:

This vein is exposed on the surface, showing a goodly grade of milling ore and has an indicated width of from 8 to 12 feet. But this vein has never been prospected by cross-cutting anywhere in the various levels of the mine, except in two places and these cross-cuts did not reach the foot wall granite. The middle portion of the 40 foot vein is mainly calcite. Hence, if the foot wall vein extends to depths, a large tonnage of milling ore could be picked up easily by means of short cross-cuts at the various levels of the mine. By all means this work should be done.

OXIDIZED ORE:

All ore so far exposed in the mine to the 500 foot level, is oxidized material, with residual bunches of galena, carrying values in silver up to 400 ounces per ton.

SULPHIDE ORE:

Engineers and geologists who have examined this property, agree that below the water level in the mine extensive bodies of sulphide ore should exist, carrying excellent values in silver, lead and zinc. This is attested by the fact that the oxidized ore zone above water level shows extensive leaching action caused by the rise and fall of the water level in the mine through the ages. In this way, the lower portion of the oxidized ore zone was robbed of its values which migrated downward and no doubt deposited as enriched sulphides below the original water level, wherever that may be. Anybow, it is my firm opinion and belief that deeper work on vein should result in uncovering sulphide ore of great importance, in which event both shipping as well as milling ores may be expected.

However, we must bear in mind the important fact that such ores as are now available for sampling are merely the second grade ores that were left in place by the old-timers because such ores could not then be mined profitably.

Red Cloud now has 40,000 tons of oxidized ore, of milling grade, now ready to be stoped in the old mine workings, as above set forth, with excellent possibilities that new ores will be found by extending some of the levels in the mine on vein each way from the shaft, or into areas that have never been explored at all. Also such work should result in the discovery of high grade shoots of ore of the same tenor as were formerly found and mined out.

The Red Cloud vein is traceable on the surface, at intervals, in a northwesterly directtion, from the Red Cloud workings, for a distance of approximately 10,500 feet; said vein transversing the following mining claims: Red Cloud, Gladys, M. J. B., New Black Eagle, New Cochise, New South Geronimo, New North Geronimo.

A fact of considerable importance at this time, when our country is in need of strategic metals is the presence of wulfenite (lead molybdate) and vandinite, which occur throughout the entire workings. They are found across the whole width of the vein and in the foot wall granite. Both of these metals can be recovered by ordinary ore dressing methods. As a matter of fact, Red Cloud ores contain four strategic metals: lead, zinc and the two just mentioned.

> Original Report Signed Elgin Bryce Holt

SUMMARY OF REPORT OF HERSEY & WHITE

Consulting Engineers

Crocker Building October 27, 1938 San Francisco BY: Oscar H. Hersbey, Geologist.

SUBJECT: <u>Red</u> <u>Cloud Mine</u>

From a study of the formation at the surface, I am of the opinion that the throw on the Red Cloud fault has been about 500 feet. The portion of the vein east of the fault immediately under the tuffs represents a higher portion than that in the mine workings. The predominant strike on the Red Cloud Fault gouge rake northward 65° . It is probable that the movement has been downward and northward. For this reason plenty of ground should be secured in a northward direction for the vein may extend much beyond the present workings on it.

Now, as I have analyzed the showing on the Red Cloud claim, it ought to be clear that what is in sight may be a very small part of the ore that the mine under further development may be made to produce. Certainly a lot of good ore has been cut off and dragged down by the Red Cloud fault. It is not beyond reach. It probably largely remains below the zone of oxidation and should be easily concentrated lead-silver ore. It should make high-grade concentrate. I took a specimen of galena for assay. It ran 75.4% lead and 237.3 ozs. silver per ton.

The vein is so strong where much of its width remains under the fault that it is likely that it runs a long distance under the Tertiary tuffs and may have many more shoots of ore than those in sight in the mine or may have continuous ore for hundreds of feet. Perhaps I am drawing too strongly on my imagination, but I can see a chance of developing one of the important leadsilver mines of the United States.

> Original Report Signed Oscar H. Hersbey



GEOLOGY AND MINERAL DEPOSITS OF SOUTHERN YUMA COUNTY ARIZONA

By Eldred D. Wilson

STRUCTURE

In the Silver district, the lamination of the schists strikes generally northward and dips at various angles. The granite has been broken along several systems of joints, the major ones of which trend parallel to the ridges. The volcanic rocks generally strike north-northwest and dip at low angles.

Faults of considerable magnitude have affected all of the formations, and in places separate the volcanic rocks from the granite and schists. As indicated by Plate 5, the principal faults strike north-northwest, dip steeply, and are grouped into three roughly parallel zones. Thus, the ridge of pre-Cambrian and Tertiary rocks that separates the Dives from the Mendevil claim is a horst, and the lower, valley-like area of volcanic tuffs and flows that separates the Dives from the Red Cloud claim is a graben. Several systems of minor faults and fractures are present.

DIVES OR SAXON MINE

The Dives claim, formerly known as the Saxon and now held by the Neal Mining Company, is about 1½ miles northeast of the Red Cloud mine. This claim has produced one or two car loads of high-grade silver ore.

In this vicinity, a fault zone separates andesitic and rhyolitic lavas, breccias, and tuffs on the west from schist and granite on the east. The main fault, which strikes N. 20° W. and dips 60° SW., is joined near the center of the claim by a branch fault that strikes N. 10° W. These faults contain veins of similar character, but the main one is wider, longer, and more strongly mineralized. This vein, which is traceable southward for some 2,000 feet, is about ten feet wide in the vicinity of the intersecting vein, but narrows southward. It is a few feet from the schist and granite in tuff and breccia which show considerable chloritization and carbonatization. The vein consists mainly of limonite, hematite, pyrolusite, barite, manganiferous calcite, and finely crystalline quartz, together with minor amounts of gypsum. Crystalline to sandy cerussite and smithsonite, locally with yellow lead oxide, occur in vugs and irregular masses. The richer portion, which is some 300 feet long and from a few inches to 11/2 feet wide, occurs near the hanging wall of the wider portions of the vein. It is notably limonitic at the surface, and the mined portions of it were probably rich in silver chloride.

Workings on the Dives claim consist of an 86-foot vertical shaft with a 45-foot crosscut and several pits and short tunnels. The shaft and crosscut did not reach the main vein. All of the ore mined was from shallow surface cuts.

HAMBURG CLAIMS

The Hamburg claim, held by the Neal Mining Company, joins the Princess on the south. During 1880-81, it was held by Mr. Wm. P. Blake "' and associates who sank a sixty-foot inclined shaft on the vein, but, so far as known, mined no ore from it.

The geology and ore occurrences on this claim are similar to those of the Princess, and the vein occurs within the same fault zone. At the surface, this vein consists of dark-gray, ferruginous

calcite, up to about eight feet thick, containing irregular bunches of hematite and coarse-grained, vitreous quartz. The dump shows masses of hematite and limonite, with smaller bodies of crystalline cerussite partly altered to yellow lead oxide. Some red lead oxide occupies vugs. Blake ⁹² mentions also the occurrence of vanadinite and wulfenite in this vein.

On the Hamburg No. 2 claim, which joins the Hamburg on the south, the fault zone contains several baritic veins up to ten inches thick. Near the southern end of the claim, one of these veins is six feet wide. It is about 75 percent barite, and the remainder consists of calcite, a little limonite, and a few scattered crystals of wulfenite.

F GERONIMO CLAIMS

The South Geronimo and North Geronimo claims, held by the Neal Mining Company, are about 1¼ miles northwest of the Red Cloud mine, west of the road to the Clip mine.

On the South Geronimo claim, bedded rhyolite tuffs and andesitic flows are faulted against granite, as indicated by Plate 5. Two veins, one a few feet and the other about fifty feet wide, occur within this fault zone which here strikes N. 27° W. and dips 65° NE. A tunnel on the wider vein shows it to contain abundant hematite, together with manganiferous calcite, flinty quartz, and irregular bunches of smithsonite, cerussite, yellow lead oxide, wulfenite, and vanadinite. A few hundred feet farther northwest, in the vicinity of a transverse fault, an old shaft, perhaps 100 feet deep, was sunk on the vein. Farther south, a tunnel and a winze in the granite showed comparatively little mineralization, except for manganese stain.

The North Geronimo claim is on rhyolite tuffs and andesitic flows, cut by a northward-trending fault zone that dips 35° E. An irregular vein, up to a few feet in maximum width, occurs

[&]quot; Work cited, p. 25.

within this fault zone. Near the northern end of the claim, it has been prospected by an eighty-foot shaft with two short drifts on the 25-foot level. These workings show the vein to consist of hematite and limonite together with finely crystalline fluorite which is coated with vuggy manganiferous calcite and coarsely crystalline quartz. The vugs contain abundant crystals of wulfenite and vanadinite. A few streaks and bunches of galena, partly altered to anglesite, cerussite, and yellow oxide, occur near the footwall.

According to Mr. Robert Morgan,⁰³ the vein, as exposed by these workings, contains an average of six percent lead and eight ounces of silver per ton.

RED CLOUD MINE

Situation: The Red Cloud mine is in the northeastern portion of the Red Cloud claim, about a mile northwest of the Black Rock shaft.

History and production: This claim was one of the earliest locations in the district. According to Hamilton,⁹⁴ the early operators took more than \$30,000 worth of silver ore from the croppings. Hamilton ⁹⁵ also states that, prior to 1881, the mine was purchased by the Red Cloud Mining Company, of New York, which sank an incline following the dip of the vein for 274 feet and erected a twenty-ton furnace at the Colorado River. This smelter was operated intermittently for about three years, but without great success. In 1885, the claim was surveyed for patent for Messrs. Horton and Knapp. Later, it was acquired by Messrs. Hubbard and Bowers who, in 1889, shipped \$32,850 worth of dry concentrates.

After 1899, the mine was practically idle until 1917 when the Red Cloud Consolidated Mines Company acquired it and installed a small dry-concentrator. This mill burned down before making more than a few test runs. Several years later, the E. R. Boericke Company obtained a short option on the claim, ran some drifts, sank several drill holes, and installed the present surface equipment, but attempted no production. In 1928, the Neal Mining Company acquired control of the Red Cloud and 45 other claims in the district.

Local geology: Here, the Tertiary tuffs and lavas floor a flatbottomed valley that is bordered by ridges of lava, tuff, and sodic granite. The northwestward-trending channel of Red Cloud Wash dissects this area, and, some 1¼ miles farther downstream, cuts southwestward through the ridges toward the Colorado River. The Red Cloud mine is approximately 1,070 feet above sea level, and the granite ridge westward rises to a maximum of some 800 feet higher.

" Oral communication.

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"Hamilton, P., Resources of Arizona, 1884 ed., p. 238.

"Hamilton, P., Resources of Arizona, 1881 ed., p. 73.

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Although the principal lead production of the Silver and Eureka districts has come from the Red Cloud and Black Rock mines, lead mineralization occurs also in most of the other mines and prospects of the area, as described in Arizona Bureau of Mines Bulletin No. 134.'

Nonsulfide zinc appears to be more abundant than lead in some of the deposits.

RED CLOUD MINE

History and production: The Red Cloud claim was one of the earliest locations in the Silver district. According to Hamilton,⁴ early operators took more than \$30,000 worth of silver ore from the croppings. Hamilton⁵ also states that prior to 1881 the mine was purchased by Red Cloud Mining Company, of New York, which sank an incline following the dip of the vein for 274 feet and erected a furnace of 20 tons daily capacity at the Colorado River. This plant was operated intermittently for about three years. In 1885 the claim was surveyed for patent for Horton and Knapp. Later it was acquired by Hubbard and Bowers who in 1889 shipped dry concentrates which yielded 300,000 pounds of lead and 22,500 ounces of silver, valued at \$32,850.

As indicated in the table on page 88, most of the production from this mine was made during 1879-89, but the amount is not known.

In 1917 the Red Cloud Consolidated Mines Company acquired the property and installed a small dry concentrator. This mill burned down before making more than a few test runs.

During 1925-26, E. R. Boericke (Primos) Company ran exploration workings on the 500 level and diamond drilled at least two holes from that level, but attempted no production.

In 1928, Neal Mining Company acquired control of the Red Cloud, together with forty-five other claims in the district, and carried on extensive sampling.

For a few months during 1941, Penn Metals, Inc., operated a newly constructed flotation plant at the mine. It treated approximately 3,300 tons of dump material which yielded 27,786 ounces of silver, 315,000 pounds of lead, 9 ounces of gold, and 500 pounds of copper, in all valued at \$38,088.6

During 1948, George Holmes and Walter Riley diamond drilled a hole from the 500 level.

In 1950 the Red Cloud and numerous other claims in the district were acquired by Red Cloud Mining and Milling Company.

Vein and workings: The Red Cloud mine is at an altitude of approximately 750 feet. Its vein occurs within a fault zone which here strikes about N. 15 degrees W. and dips 35 to 60 degrees E. Irregular shafts, drifts, and stopes have followed it for a length of some 560 feet and to a depth of approximately 535 feet on the incline, as shown by Figure 20. Most of the upper workings were run before 1885 by hand drilling; the ore was sorted and screened underground and dragged up inclines with rawhide buckets. Stopes were supported by pillars, dry-wall backfills, cottonwood timbers, and willow laggings which are still fairly intact. A more vertical shaft approximately 200 feet deep reached the vein at the

ward from this stope, for a length of about fifty feet, with a width of from four to six feet and a depth of from five to twenty feet.

A few hundred feet west of these workings, a similar vein occurs within a fracture zone that strikes northwest and dips 50° NE. It has been prospected by a short tunnel connecting with a shallow winze, and a surface stope that is up to thirty feet long, six or eight feet wide, and 35 feet deep. This vein is more extensively iron stained than the other vein.

REVELATION CLAIM

The Revelation No. 2 claim, held by Mr. H. L. Duty, of Yuma, joins the Amelia on the south.

Here, andesitic and trachytic lavas are separated from granite and schist on the west by a fault zone that strikes north-northwest and dips about 80° E. A vein, with a width of from twenty to forty feet, occupies this fault zone for a length of some 500 feet. It consists mainly of manganiferous calcite, barite, vuggy quartz, and brecciated wall rock, together with irregular masses of hematite and small, cellular bodies of cerussite and smithsonite. The vein walls show considerable chloritization.

Workings on this claim consist of a few shallow cuts.

MENDEVIL CLAIM

The Mendevil claim, 3,000 feet south-southeast from the Revelation No. 2 claim, was surveyed for patent in 1887 for Mr. S. S. Draper, but, so far as is known, has never produced any ore. It is now held by Messrs. W. D. Riley, A. B. Ming, and R. A. Mc-Pherson, of Yuma.

Here, as shown by Plate 5, a fault zone continues from the Revelation claims and separates lavas and tuffs from granite and schist on the west. Microscopic examination of the lava at this point shows it to be andesite and to consist of zoned phenocrysts of plagioclase, up to 0.15 inch in diameter, set in a dense, feldspathic groundmass. The fault zone, which strikes N. 10° W. and dips steeply northeast, contains veins, up to several feet wide, of manganiferous calcite, barite, and quartz. In places, the barite forms veins up to two feet wide. Certain vugs within the calcite contain cerussite and yellow lead oxide. The vein walls are somewhat chloritized.

This vein zone continues for some 1,600 feet south and 2,000 feet north of the Mendevil claim. Workings on it consist of a few shallow cuts. According to Mr. W. D. Riley,89 certain portions of it contain five percent lead and fifteen ounces of silver per ton.

CHLORIDE, MANDARIN, AND CASH ENTRY CLAIMS

The Chloride, Mandarin, and Cash Entry claims, held in 1930 by the Neal Mining Company, are in the southeastern portion of

the area mapped on Plate 5. Considerable prospecting has been done on these claims, but, so far as known, no ore has been produced from them.



Plate 6.-Banded quartz-fluorite-barite vein in fault fissure on Chloride claims.

In this vicinity, trachytic to andesitic lavas, tuffs, and breccias and the underlying granite have been eroded into rugged, steepsided ridges. These rocks have been extensively faulted and fractured. The major faults, as indicated by Plate 5, strike northward and northwestward, but many unmapped, minor faults strike in other directions. The principal jointing in the granite strikes S. 70° W. and dips steeply southeast.

On the Chloride No. 1 claim, the principal fault strikes N. 10° W., dips from 60° to 70° SW., and appears to have a throw of from 35 to 55 feet. It contains a vein (see Plate 6) that is from

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^{*} Personal communication.



Figure 20.—Red Cloud mine, longitudinal section on vein, looking west. (Location of workings in part from map by B. McDougall, 1918.)

270 level of the incline. The 500 level, immediately above the present water table, is reported to have been run about 1925.

The vein is made up chiefly of limonite, hematite, quartz, fluorite, and calcite, together with considerable amounts of gouge and brecciated wall rocks, all more or less stained by pyrolusite. The quartz forms irregular, finely crystalline, vuggy masses which in places are cut by veinlets or coarser-grained quartz. Commonly the quartz is interbanded with gray to purple fluorite which ranges in texture from dense to crystals 1/8 inch in diameter. The calcite is mostly a coarsely crystalline, dark-gray manganiferous variety, but some later white calcite also occurs. The limonite and hematite, which occupy cavities and vugs within the other gangue minerals, are locally intermingled with irregular, cellular masses and vug-linings of cerussite, smithsonite, willemite, pyrolusite, vanadinite, wulfenite, and malachite. In places there are nodules of argentiferous galena, partly altered to black anglesite and pale-yellowish cerussite. Cerargyrite is present as small disseminated masses and streaks within the oxidized minerals.

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Figure 21.—Cross section through Red Cloud mine, looking north. (Data for workings and drill holls furnished by L. C. White, 1951.)

Except in the 500-level crosscuts, the vein walls are largely concealed behind fault gouge and breccia. The limited exposures indicate that the hanging wall from the surface down to approximately 360 feet on the incline is andesitic breccia and tuff. From there to the 500 level, the hanging wall consists largely of brecciated granitic and volcanic material, and in the 503 cross-cut it is granite with faulted volcanics locally above (Fig. 21).

The footwall consists of the "granite" described on previous pages. Here this rock is brecciated and faulted for widths ranging from a few feet to 100 feet or more. Where exposed on the surface immediately west of the mine workings, the breccia is largely cemented by calcite and quartz, together with other vein minerals.

As indicated by stoping, the vein contained two principal ore shoots, each from $1\frac{1}{2}$ to 6 feet wide, near or adjacent to the hanging wall. The northern shoot was from 25 to 100 feet long by 410 feet deep, and the southern from 35 to 110 feet long by 300 feet deep (Fig. 20). In the vicinity of these ore shoots, the vein shows relatively more iron and manganese mineralization, and its walls are intersected by northeast fissures.

According to Robert Morgan⁷, sampling by the Neal Mining Company indicated that the unmined portions of the vein exposed in the workings above a depth of 360 feet on the incline contained an average of approximately 6 per cent lead and 10 ounces of silver per ton, but below that level the lead and silver contents were somewhat less.

It is estimated that the unmined material exposed in the workings contains more zinc than lead. This zinc, however, is in nonsufide minerals.

The portion of the vein between the stopes and the footwall seems to be relatively low in lead and silver, but it has not been sufficiently explored to determine its over-all grade. Strong nonsulfide zinc mineralization is apparent near the footwall in the 500-level crosscuts.

Oxidation extends for an unknown distance below the present water level and was present in the Holmes-Riley drill core for more than 200 feet below the 500-level (Fig. 21).

An interesting possibility regarding the Red Cloud vein structure was suggested by Hershey.^{*} He postulated that a post-mineral fault. coinciding in places with the hanging wall, displaced portions of the vein laterally and downward.

RIHO VEIN

The Riho vein is south of the Papago mine, as indicated on Figure 19.

This ground, formerly known as the Pecheco, was worked during the early days but has remained essentially idle for several decades. A few years ago, George Holmes and Walter Riley relocated three claims on the vein and built two access roads leading from Black Wash. In 1951 the property was held by Red Cloud Mining and Milling Company.

· Here the prevailing rock is deformed schist, intruded by dikes of acidic to basic composition and invaded on the west by granite.

On the south claim, the vein strikes N. 30 to 40 degrees west and dips almost vertically. Northward it pinches out and branches but is traceable intermittently into the north claim where it strikes N. 15 degrees W. and dips 45 to 60 degrees east.

The vein material consists largely of calcite and white quartz, together with a little barite and nodular masses of cerussite and galena. The calcite is mainly massive and white, but in part gray and manganiferous. The quartz is fine-grained and banded to vuggy. In places the vein shows iron and copper stains.

Workings on the south claim include several pits, open cuts, shafts, and stopes. Apparently the shafts do not exceed 50 feet in depth, and the visible stopes are 2 to 4 feet wide.

At the north claim the vein has been stoped from several adits throughout a vertical range of approximately 75 feet on the north side of a deep, narrow ravine. These workings are now largely caved or filled but apparently extended for about 150 feet horizontally, to where the vein terminates at a steeply northeastwarddipping fault that strikes N. 65 degrees W. The stopes along the outcrop are 2 to 4 feet wide.

CHAPTER IX.—SILVER AND EUREKA DISTRICTS

By Eldred D. Wilson

INTRODUCTION

The foregoing description has been modified from material published in Arizona Bureau of Mines Bulletin 134.¹ During early 1951, several of the mines were revisited, and some additional structural features of the area were mapped.

Useful information was supplied by L. C. White, George Holmes, Kenneth Holmes, Walter Riley, and Lincoln A. Stewart. George H. Roseveare, Metallurgist of the Arizona Bureau of Mines, cooperated in part of the field work. Acknowledgements are due Luke Walker and associates, of Red Cloud Mining and Milling Company, for accommodations and data.

PHYSICAL FEATURES

The Silver and Eureka districts of southwestern Yuma County are in T.3 and 4.S., R. 22 and 23 W., within the southern part of the

Trigo Mountains. The area is bounded on the east by Yuma Wash and on the west and south by a bend in the Colorado River.

Water has been found in only one of the mines, the Red Cloud, where it stands at a depth of about 400 feet below the surface. Near the river, water is obtainable from shallow wells.

By road, the Silver district is some 58 miles from Yuma or 36 miles from Dome, a station on the Southern Pacific railway.

REFERENCES, SILVER AND EUREKA DISTRICTS

- 1. Eldred D. Wilson, Geology and mineral deposits of southern Yuma County, Arizona: Univ. Ariz., Ariz. Bur. Mines Bull. 134, pp. 50-72 (1933).
- 2. Based partly on unpublished notes of J. B. Tenney.
- 3. R. W. Raymond, Statistics of mines and mining in the States and Territories west of the Rocky Mountains. Washington (1872).
- 4. P. Hamilton, Resources of Arizona, 1884 ed., San Francisco.
- 5. P. Hamilton, Resources of Arizona, 1881 ed., p. 73.
- 6. U.S. Bur. Mines, Minerals Yearbook for 1941.
- 7. Oral communication (1930).
- 8. Oscar H. Hershey, Private report to O. C. Chase (Oct. 27, 1938).



OF DISTRICT, ARIZONA, By Eldred D. Wilson SILVER

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DIVISION

30 ROCKEFELLER PLAZA NEW YORK 20, NEW YORK



TELEPHONE CIRCLE 7-0100 CABLE ADDRESS LIMENITRO

7.16 % ZN

Willemite

limonite

chlorite

biotite

Portion of the sample was subjected to a combined Superpanner test and heavy liquid separation. The products from this test were assayed for lead, zinc and silver.

The remainder of the submitted sample was examined under a Greenough binocular microscope and a petrographic microscope in order to identify the mineral constituents.

Head Sample Assays:

The results of the head sample assays of the submitted tailing are given in Table I.

Table I
AssaysSilver5.85 Ag oz/Ton
0.56 % PB

Mineralogy:

The following mineral constituents were identified in the sand tailing:

Zinc

Quarts cargonate (Calcite or dolomite) Hematite fluorite barite crocoite

Argentojarosite

Summary:

1. The following mineral constituents were identified in the submitted sand tailing: quartz, carbonate (Calcite or dolomite), hematite, fluroite, barite, crocoite, willemite, argentojarosite, limonite, chlorite, and biotite.

2. The silver-bearing minerals identified in the sample were argentojarosite, crocoite, and willemite. Small amounts of crocoite and willemite, removed from the samples with a needle, each gave positive microchemical tests for silver. The bulk of each of the silver-bearing minerals occurred as apparently-free grains.

3. In the combined Superpanner and heavy liquid separation, the panner concentrate, comprising about 4% of the sample, contained about 15% of the silver and 55% of the lead. The heavy liquid concentrate, which composed approximately 41% of the sample, carried about 71% of the total silver and 97% of the zinc. The tailing, composing 54% of the sample, contained only 13% of the total silver, 20% of the lead and nearly 3% of the zinc.

AMERICAN CYANAMID COMPANY

/s/W.D.Davis Microscopical Department



PHONE: VANDIKE 9328

EISENHAUER LABORATORIES

ENGINEERING DIVISION 316 SOUTH SAN PEDRO STREET LOS ANGELES 13. CALIFORNIA

ED. EISENHAUER, JR. L. C. PENMOEL

Subject: Mill test of ore from Red Cloud Mine, Yuma Arizona

Flotation Tests

Gold				Silver		
Marked	Ozs.	Value '	Ozs.	Value	%	Lead Distrib. by weight
Heads Concentrates Middlings Tailings	Trace .02 .005 Trace	\$.70 .18	7.20 41.20 23.00 2.12	\$5.11 29.24 16.35 1.51	4.30 34.35 13.72 .25	100.00% 8.80% 7.80% 83.40%
Ph Concent W/S Ratio	ration 8.9 3 to 1			Ratio (of Concen 11.4 to 1	tration

Indicated Extraction

Silver	70.4%
Lead	94.2%

Distribution by Value

Total Value Distribution:

Concentrates	Silver 50.44%	Lead 70,28%	44 4107
Middlings Tailings	24.96% 24.60%	24.88% 4.84%	00.00% 31.48% 1.86%

Reagents Used:

lbs per ton ore

.. ..

,, ...

....

.....

Sodium Sulphide	14	lb
Sodium Acid Sulphate	12	,,
Aerofloat # 31	1/20	,,
Ethyl Xanthat	1/20	,,,
Jupont Frother	1/10	"

The ore was milled in a ball mill for twenty-five (25) minutes with the addition of the sodium sulphide, sodiumacid, sulphate and one-half the amount of the Aerofloat, the pulp then being - 80 mesh. At the end of this period the ore was then floated in a Denver Sub-A Flotation cells The concentrates were pulled after seven minutes and the middlings after an additional ten minutes.. The froth was good although the concentrates were slightly dirty. However, the concentrates could be very easily cleaned and the grade could easily be brought to 60%. A screen analysis of the tailings showed that 67% of the total silver values were in the plus 100 mesh

material. It is therefore suggested that the ore be milled to 120 mesh before flotation.

Respectfully submitted, Signed:

> Ed Eisenhauer, Jr. Metallurgist.

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UNIVERSITY OF ARIZONA

ARIZONA BUREAU OF MINES

ORE TESTING SERVICE

Ore No. 1130

Test No....2

Conditions and Reagents

				[Reag	ents Pou	inds Per	Ton	 r	T
	(Condition	ıs									
Point of Addition	Time Mins.	% Solids	pH	Soda Ash	A-31	Z- 5	MIBL	425	Na2S	Cysy	 	1
Ball mill	25	60		5.0	0.05						 1	1
Conditioner	5	25	8.4			0.1	0.08				 	1
Rougher #1	6										 	\top
Conditioner	2				0.1	0.5	·	1.0	1 0	0.1	 	1
Rougher #2	12								1.0	0.1		
Cleaner	6						+					
		,					+					
								1				

Remarks:

Metallurgical Products

									% of	Total		
	Tons in	oz, p	er ton	Ass	ays				3			
Product	100 Tons Feed	Silver	Lead			 	Silve	<u>r Lea</u>	<u>a</u>			Γ
	100 0	16.48*	4.29*			 	100.0	100.	0			T
Heads	100.0	240.4	16.8	a 1717		 	35.1	6.7				t
#1	1.1	540.4	10.4				24.0	81.7	1			+
#2	7.1	55.8	49.4				7.2	4.	1			4
Cleaner Tailing	8.4	14.4	2.0				33.	6.	9			
Tailing	82.8	6.7	0.36			 		. 00				
Combined	8.8	109.9	* 42.6	•		 	59.	00.	<u></u>			
concentrat						 		+				
		-									1	-

Remarks: *calculated

METALLURGICAL RESULTS OBTAINED ABOVE SHOULD BE CONSIDERED AS ONLY APPLICABLE TO MATERIAL CONFORMING TO THE CHARACTER OF THE SAMPLE UPON WHICH THE TESTS WERE MADE.

SAN	MPLE Head)re c	4 rushed	mir	us 10 m	DE	NVER	EQU	IPMENT	COM	PANY —	ORE TESTING	G DIVISIO	N DEI	NVER, CO	LORAD
	PRODUCT		Pe	rcent	Oz./ton	%		ASS	AYS				PERCENT RECOVERY			
			W	eight	Ag	Pb		Zn				Ag	Fb	Zn	÷	
	Head Assay				8.2	5.2	4	65	•							
	Calculated Assay		10	0.0	7.73	5.1	7 4	. J.				100.0	100.0	100.0		
1	Rgr. Flot. Conc't	. #1		7•4	57•3	56.2	2	•2				54.5	80.5	4.0		
2	9 7 97 77	<i></i> //2	2	.20	37.1	17.5	5	.8		-		10.5	7.3	3.1		
3	Scavenger Conc't.		1	•34	17.3	10.3	5	•5				3.0	2.7	1.8		
4	Flotation Tailing	5	89	.06	2.8	0.5	5 4	.19				32.0	9•5	91.1		
		8														
			L			I		-	I		L	L				
1	Grinding and Tr	eatme	nt		Reagents: Pounds per ton heads—(2)					NOTES:	NOTES: Flotation performed in Denver "Sub-A					
Op	peration	Time Min.	Percent Solids	pH	I IIa3	MIS	A 31	z8				(1 01116	iiwala) he	iborator y	I lotation	Machin
Gri	inding (1)	25	67		14,0	1.20	•05					Scree	n Analys	sis - Fl	ot. Tail	ing
R	gr. Flot. Conc't."1	12	25					.05				Mesh	75	Wt.	% Fb.	_
1	in in "2	12	25	9•7	7		.05	.05				+100		.2	0.62	
S	cavenger Conc't.	5	22.5	9.3	3		•05	•04				▲ 150 ▲ 200		3.0 5.0	0.49 0.53	
													Average	.× _	•59	
Gri 1 C	inding (1) Time, minutes 25 Classification, mesh none Sands reground, minutes –			(2) I Nas NHS A31 78	Reagent S - Sod - Sod - Aer	ymbols lium S lium A ofloa	: ulphi cid S t #31	de Sulpha	ate						•	

PAGE NO.D-7

•

SUMMARY OF RESULTS Test 5

DENVER EQUIPMENT COMPANY - ORE TESTING DIVISION - DENVER, COLORADO

SAMPLE REPORT NO. 1097-T IDENTIFICATION • ASSAYS PERCENT RECOVERY Percent bz./ton. ¢, PRODUCT Weight Pb Ag Zn Âŝ Fb Ξn 7.78 Calculated Head Assay 5.17 4.1 100.0 100.0 100.0 65.0 87.8 24 minute Egr. Conc't.) 9.6 52.7 47.1 3.0 7.1 1 and 2 combined 24 minute Rgr. Tailing). .694 90.4 3.0 12.2 1.2 35.0 92.9 3 and 4 combined . 68.0 10.94 48.4 42.8 8.9 Total Flot. Conc't. 3.3 90.5 1, 2, and 3 combined •... 89.06 2.8 9.5 Final Flot. Tailing .55 4.10 32.0 91.1

REMARKS:

28

The above tables show the products reported on page D-7

combined according to stage of removal as shown.

To Yuma Metals, Inc. Yuma, Arizona c/o Luke Walker 798 Hope Ave. Santa Barbara, California From: A. L. Poarch P. O. Box 1950 Prescott, Arizona June 11, 1952

Dear Sir:

In view of concentrated and vast work that is being carried on by U. S. Bureau of Mines and nearly all Schools of Mines, as well as individual mining companies, to perfect the leaching and the Electrolytic process of recovering zinc from oxidized ore, I suggest that your mill be designed to store the zinc values in the tails.

This I think is advisable, especially in your case, because:

1. You have already worked out the metalurgy so that the zinc can be depressed to a point ubere practically all zinc will go to the tails.

2. You have an exceptionally good place to store the tails with ample capacity.

3. Your Company is financially able to stockpile the zinc values until such time as the above mentioned processes have been entirely perfected. This will enable you to realize much more from your zinc and within a reasonably short time.

After studying your many ore tests covering all methods of recovery, they disclose that Selective Floatation is the most effective and economical method. In my opinion there is no use to waste further time and money in the attempt to better your very good lead and silver recoveries It can be safe to assume that the following economies can be realized from these ores, based on previous recoveries made by this writer and others, using present market prices and costs.

"A" Projection: Using the Basic recoveries as made by Denver Engineering Co. of 90.5% of the lead and 68% of the silver; Ed Eisenhauer, Jr. 94.2% of the lead, 70.4% of the silver; University of Arizona, (G. H. Rosevere), 88.4% of the lead and 59.1% of the silver, and this writer's recovery of 88% of the lead and 78% of the silver.

The above recoveries give an average of 90% plus, of the lead and 68% plus of the silver.

The various ratios of concentration have been from 8 to 12 to 1. For the purpose of this writing the figure 8:1 will be used, along with the corresponding grades of concentrates. AVERAGE OF ORES AS INDICATED: by 460 Assays on MAP

Lead per cent, per ton Silver ozs. Gold Ozs.	6.07 10.15 .02
Gross value of ores:	
Lead; 6.07%=121.4#/T x 16¢	19,424
Silver 10.15 ozs. x.905	9.185
Gold .02 ozs. x \$35.00	. 70
Total, lead, silver, gold	29.315

"B" Basic Recoveries Lead:

121.4 #/Ton recoverable -- 6.07% Recovery 5.463%--109.26#90% recovered. Distribution: 43.7% in lead concentrate -- 874.08# (8.1 concentration)

Silver:

10.15 ozs. recoverable in ore Recovery: 6.90 oz / T - 68% recovered Distribution: 55.2 oz in concentrate

Gold:

.02 ozs. recoverable in ore Recovery: .0166 ozs. /T-83% recovered Distribution: .1328 ozs. in concentrates

"C" Payment Schedule

Concentrates to lead smelter (dry weight) Deduct from wet lead assay 1.5 units (30[#]) and pay for 90% of the remaining lead at market price quotation (16¢) less a deduction of .02¢ per pound accounted for.

Lead payment: 43.7% -- 874.08 # pay for 90%; 786.672 # at 16¢ \$125.867 Less 02¢ per pound of payable lead 15.73 110.137 110.137 Total payable lead Silver schedule: Pay for 95% at market price (.905¢ oz) less .015¢ per oz of payable silver Silver Payment: 55.2 oz / T pay for 95% -- 52.44 ozs. @ .89¢ \$46.6716 Gold Schedule: Of /03 ozs or over, pay for 92.57% at net realized 4.2918 price or equivalent of paying for 100% at \$32.3185 \$161.10 Total gross value of concentrates Less U. S. Tax on Bullion (.02%) 3.21 \$157.89 Less the following deductible charges: Base charge on concentrates \$11.00 12.38 \$23.38

Freight from Blaisdelle to A.S. & R. Ry.12.38\$23.38Final net to shipper (1 ton of concentrates)\$134.51

Mill to be located at Red Cloud Mine.

1. Operating costs T/Day for concentrate Plant (100 ton Minimum)

Plant designed and in accordance with results of laboratory work and duplicating conditions as nearly as possible.

	Grinding-crusher jaws, rolls, balls and liners		\$.40
	Reagents total used		. 885
	Labor. (min) 6 @ 14.00 (incl. Insurance)		.84
	Power, Diesel or Gasoline @.30¢ kwb gen.		. 60
	Depreciation, Taxes, and etc.		. 28
	Misc. Assav and etc.		. 40
	Total T/Treated		\$3.405
	These costs will decrease in proportion as tonnages are increased,		
	as same labor can be used up to approximately 100 T/Day and other		
	costs will be averaged in direct percentages.		
2	Other charges to be used as a basis for determining an eventual		
2.	net worth of these ores:		
	Mining, including labor, supplies and equipment depreciation, as		
	well as chargeable development based on 100 T/Day minimum,		
	mined and boisted	\$4.25	
	Hauling concentrates to R. R. (Using 8.1 concentration ratio)	10	
	crude tons charge	.40	
	Contingency \$25.00 per day, per ton	.25	<u>\$4.90</u>
	Total estimated costs		\$8.305
	Realized net on crude ore Ration 8.1 per ton		16.81
	Less total operating costs and other expenses as attached (next page)		8.305
	Final net profit per ton of crude ore from recovery of lead and silver.		
	Zinc to be stored in tailings.		\$8. 505

Signed

ARCHIE L. POARCH

AMERICAN SMELTING AND REFINING COMPANY

SOUTHWESTERN ORE PURCHASING OFFICE 810 VALLEY BANK BUILDING TUCSON, ARIZONA

May 22, 1952

REED F. WELCH MANAGER

> Mr. Luke Walker, Secy.-Treas. Yuma Metals, Inc. c/o Hotel Adams Phoenix, Arizona

Dear Sir:

In response to your telephone call this morning from Phoenix I show below the per ton outcome in carlots, based on present 15-cent lead price, for concentrates with assays shown below. Your letter to me under date April 30th indicates you expect to produce such concentrates by treating ore from the Red Cloud Mine, Silver Mining District, Yuma County, with head assays: Silver 10.15 ozs., Lead 6%, Gold .02 oz.

	Gold-oz	Silver-oz	Le	ad-%
Assays-Concts.	0.1328	55.2	4	3.7
Payments: Gold .] Silver Lead 90 Total p	.328 oz. @ 3 95%= 52.44 0% dry = 759 payments	\$32.3185 oz @ .885 9.6 lb.@ .1	3	\$ 4.29 46.41 98.75 149.45
Deductions: Base 1 Bullic	ess lead confreight	redit tax	9.78 .27	10.05
F.o.b. El Paso Pla Less Freight, tax,	nt switch, es	st.10% H20		139.40 12.38
Net per ton concer "" crude	ntrates, Bla ore (ratio	aisdell 8 to 1)		127.02 15.88



Yours very truly,

REED F. WE By
ESTIMATED VALUE OF RED CLOUD MINE. (Other Mines and Claims Not Considered)

In the Red Cloud Mine there are 30,000 to 40,000 tons of ore blocked out from 10,000 to 20,000 in the dump. Using 50,000 tons total and \$8.505 net profit on lead and silver as per Poarch's statement, pages 29-30-31, this would be a net profit from lead and silver of \$425,250.00 from the now blocked out ore.

The assay value of the zinc is 10% or 200 # per ton, or gross value of \$27.00. Using Denver Equipment Ore Test No. 5, pages 27 and 28, 91.1% at $13\frac{1}{2}$ ¢ per lb. is \$24.59 per ton will be depressed in floatation and go in the tails to be stored for later processing. All mining and grinding expense have been charged to lead and silver. Therefore, zinc should net \$12.00 per ton or \$600,000 from now blocked out ore.

A 100 mill would handle about 50,000 tons of ore in 500 working days, netting each day from lead and silver \$850.50 and storing \$2459.00 gross value of zinc each day.

It is expected our exploration program will find 200,000 to 500,000 tons of new ore. If only 300,000 tons are found, the above profit figures would be seven times as large. Making a profit on lead and silver of \$2,976,750 less\$200,000.00 exploration work and \$100,000 development work, \$100,000 to complete and install mill and \$100,000 contingent on these three items, leaving a net profit of \$2,576,750.00 on lead and silver. 300,000 tons of ore would store in the tails 54,600,000 pounds of zinc, a fair recovery less expense would amount to 3,000,000.00.

The assay map back of book shows 1.79% Molybdenum Trioxide or 1.2% Molydbenum or a gross value of \$24.00 per ton. The process for recovering this Molydbenum (which we have) from Wulfenite has been worked out, and was used by St. Anthony Mine at Tiger, Arizona for years. This item could well be quite profitable as all mining cost and most of mill cost has been charged to the lead and silver.

If 500,000 tons of ore are found, the net amount would probably double because in this calculation we are using the average value, as per assay map enclosed, which is 6.07% lead and 10.15 ozs. of silver. These assays were taken after the old-timers had mined out all of the higher grade ore and left this value ore as not profitable for them to mine by their hand methods. New ore found, therefore, should be a higher grade.

Above figures are based on one claim (Red Cloud) Yuma Metals, Inc. owns 61 other claims. The values of the Yuma Metals, Inc. properties are assured by modern economical methods with up-to-date machinery and the latest recovery technique on their ores which carry high values per tons, plus the present price of metals. Lead and zinc are a good price and about in line with other prices. Price of Molybdenum ore, (90% per M.O.S. 2) is \$1.00 per pound F.O.B. Climax, Colorado. Silver is \$.905 per oz paid by U.S.A.for newly mined silver.

Previously, only three ore veins in Silver District have been mentioned. There are really five. The Riho vein was undiscovered when Holt's and Morgan's reports were written. The fifth vein, according to Mr. Hershey, is the Papago vein which is west and parallels the Red Cloud vein probably merging somewhere one-halfmile or more north of the Red Cloud Claim. This vein out crops just west of Red Cloud and north in several places. SUMMARIZING: Mines in the Silver District from discovery (1870's) were very profitable (despite the hand methods) until isolated in 1889. They were then considered only Silver producers.

After 1889 only feeble attempts were made to operate any of the mines until in the 1920's when the District was again accessible over a bad road. About this time, lead became important in the ore.

In 1924, a program for development was started and considerable work done before closing down when lead and silver prices declined.

During this time, it was learned there was Molybdenum, vanadinite and zinc in the ore. However, not until 1938 was it determined the amount of Molybdenum when 51 samples were taken averaging 1.79% or 35.8# per ton. Not until 1950 was the zinc considered important or the value estimated. This was when the U. S. Bureau of Mines made an examination of Red Cloud and surrounding properties, taking many samples and assaying them for zinc.

Besides the low price and inaccessibility, there were two other important reasons why the silver District has not sooner taken its place among the important mines of Arizona.

First, until not too long ago, there was no water in the district. Dry methods obtain poor recoveries. (Only water now in Red Cloud Mine)

Second, metallurgy to recover the value have only recently been worked out. The present owners have worked constantly for three years on this problem. First, to find out the best method then to perfect the method which is floatation. Our recovery on the lead and silver is now very good as shown on pages 25-26-27-28. These two reasons are also why the oldtimers only took the very high grade ore.

<u>A COMPARISON:</u> Red Cloud ore to a now profitable mine (that was sold for afew hundred dollars at tax sale in 1936) is the Iron King Mine owned by Shattuck-Denn Mining Corporation, Vavapai County, Ariz.

The standing of this mine among Arizona mines in 1948 was:

Second in zinc production

Third in Lead production

Fourth in Silver production

From 1938 to 1948 inclusive, the mine produced and milled 1,080,853 tons of ore. The average assay value of Iron King Ore in 1948 was:

	Gold	Silver	Lead	Zinc	Molybdenum
IRON KING MINE	.128 oz.	3.98 oz.	2.076%	6.2%	none
RED CLOUD MINE	.027 "	10.15 "	6.07%	10.0%	1.2%
CASELTON MINE .	.06 "	4.00 "	4.00%	10.0%	none

Above is the average assay value of Caselton Mine, November, 1950.

Production from Combined Metals Caselton Mine has been continuous since 1923, and the mill has a record of uninterrupted operation since 1941. It is estimated that 1,925,000 tons of ore has been mined since operations began, of which 900,000 tons was treated in the Caselton Mill. In addition an estimated 700,000 tons of custom ore has been milled.

Information on Iron King Mine taken from U. S. Bureau of Mines Information Circular #7539, dated January, 1950.

Caselton Mine from U. S. Bureau of Mines Inform. Cir. #7586, Nov. 1950.

Gross ore value of Mines above is: (using 90.5¢ per oz. for silver, 16¢ for lead and 15¢ for zinc.)

	Gold	Silver	Lead	Zinc	Molybdenum
IRON KING MINE	\$4.48	\$3.60	\$ 6.63	\$18.60	none
RED CLOUD MINE	.94	\$9.18	\$20.16	\$30.00	\$24.00
CASELTON MINE	\$2.10	\$3.62	\$12.80	\$30.00	none

The information herein contained is so technical that we do not guarantee it. However, we have used most reliable sources and believe same to be authentic.

The sources which we appreciate using are:

Robert Morgan Elgin Bryce Holt Oscar H. Hershey University of Arizona (Eldred D. Wilson) University of Arizona (G. H. Roseveare) U. S. Bureau of Mines U. S. Bureau of Mines American Smelter & Refining Co. American Cyamimid Co. Ed Eisenhauer, Jr. A. L. Poarch A. W. McDougal Will M. Neil Mining Engineer Mining Engineer Geologist Geological Division Ore Dressing Division Boulder City Pittsburg, Pa. El Paso, Texas New York, New York Los Angeles, California Prescott, Arizona

YUMA METALS, INC.

Dated June 25, 1952.

FUTURE PLANS

We have purchased a good portion of a 100 Ton Floatation Mill to be erected at the Red Cloud Mine, when same is advisable. This Mill will serve as a pilot Mill and be so placed that an additional mill can be built along side if and when it is necessary.

We also have an exploration program that is outlined on the following pages. We have asked for help on this from D.M.E.A., U.S. Department of Interior.

This program is quite small considering all the properties we own, and is only to explore the Red Cloud Mine. However, it will be a start and the results will undoubtly justify us building the Mill.

At present we will proceed on a step by step basis as suggested on page 6 by Robert Morgan, which will take only a moderate investment.

EXPLORATION PROGRAM

The proposed work is as follows:

Item 3. Construct camp and mine buildings.

Rehabilitate headframe, 200 ft. vertical shaft, and connecting 250 ft. inclined shaft, to make accesible the workings of the mine for the following exploratory work:

Maximum of 6,000 feet of diamond drill holes from the hanging wall crosscut on the 500 ft. level, to explore the vein below this bottom level;

Maximum of 1,650 feet of drifiting on various levels of the mine to explore extensions of the mine.

The total cost of this exploratory work is estimated at \$171,000.00.

The work can be started 30 days after notification to proceed and will be completed within 1 year after starting date.

DRIFTING

Explora	tory drif	fting to be done, location, and footage as follow	s (see fig)	
-			Estimated f	ootag	e
160-ft.	level	North from stope face	150		
270-ft.	level	North from end of drift	50		
270-ft.	level	South from end of drift	200	•	
420-ft.	level	South from shaft	300		
500-ft.	level	North from end of drift	200		
500-ft.	level	South from end of drift	500		
	Explorat 160-ft. 270-ft. 270-ft. 420-ft. 500-ft. 500-ft.	Exploratory drift 160-ft. level 270-ft. level 270-ft. level 420-ft. level 500-ft. level 500-ft. level	Exploratory drifting to be done, location, and footage as follow 160-ft. level North from stope face 270-ft. level North from end of drift 270-ft. level South from end of drift 420-ft. level South from shaft 500-ft. level North from end of drift 500-ft. level South from end of drift	Exploratory drifting to be done, location, and footage as follows (see fig. <u>Estimated fe</u> 160-ft. levelNorth from stope face270-ft. levelNorth from end of drift270-ft. levelSouth from end of drift200420-ft. levelSouth from shaft300500-ft. levelNorth from end of drift500-ft. levelSouth from end of drift500-ft. levelSouth from end of drift500-ft. levelSouth from end of drift	Exploratory drifting to be done, location, and footage as follows (see fig)Estimated footage160-ft. levelNorth from stope face270-ft. levelNorth from end of drift270-ft. levelSouth from end of drift200-ft. levelSouth from shaft300300500-ft. levelNorth from end of drift500-ft. levelSouth from end of drift500-ft. levelSouth from end of drift500-ft. levelSouth from end of drift

Crosscuts

Drive crosscuts through the vein to the footwall as needed, to determine thickness and value.

500-ft.	level	Total	100
270-ft.	level		100
160-ft.	level		50_
		Total drifting	1,650
		1 $(/(1 - 1)^{-1}) = -1$	6 dave

Time required at average advance of 4 ft. per shift $1,650 + (4 \times 2) = 206$ days

Calculation of direct cost of drifting:

Work to be conducted 6 days per week.

Wages based on average days pay including overtime.

Assume 25 working days per month, 2 shifts per day, and 4 feet advance per foot.

		Per shift	Per foot
Labor	l miner	\$16.25	Provide State State State
	1 mucker	13.00	
	1 top lander	14.00	
	$\frac{1}{2}$ hoist-compressor man 360 + 50	7.20	
	$\frac{1}{2}$ assayer-sampler 350 + (50 x 2)	3.50	
	Payroll taxes	8.10	
		\$62.05	\$15.51
	$\frac{1}{2}$ compressor rental 125 + (2 x 50)	1.25	.31
	¹ / ₂ Diesel fuel 4.00 + 2 Explosives	2.00	.50
	Mine track, splice bars, bolts, spikes Ties Pipe, air and water		1.00 .25 .43
	Pipe, ventilating		.90
	Drill steel and bits		.55
	Air & water hose, fittings, repair parts, e	tc.	.60
			22.55
	Contingency		4.45
		Cost per foot	\$27.00

Exploratory diamond drilling to be done to cut the vein in various planes below the 500 ft. level (See Fig. _____)

From Astation 100 ft. east of shaft	Estimated footage
1 hole inclined at 60° at right angle to vein	150
2 holes, fanned 45° right and left at -55°	350
1 hole vertical	250
2 holes, fanned 45 ° right and left at - 50 °	700

From station at end of crosscut

1 hole inclined at 70 $^{\circ}$ at right angles to vein	450
1 hole pointing southwest at -50°	550
Deepen Riley hole, if possible	150
1 hole, vertical (1 to duplicate Primos hole)	800
2 holes, fanned right and left if above hole is successful	2,000
	5,400
Add for contingency	600
Total	6,000

Calculated cost of diamond drillin	g, 6,000 feet	:	
Assume 15 ft. advance/shift. 6,000 + 15 = -	400 @1 shift	/day	
Work 2 shifts per day =:	200 days		
Work 25 days per month, 200 + 25 =	8 months t	o complete	
Drillers aver. daily (Inc. overtime)) 20.30 x 25	= 507.50/mo.	
Helpers " " " "	13.00 x 25	= 325.00/mo.	
	Cost for 8 r	nonths	
Rental of drill @425/mo			\$3,400.00
Labor 2 drillers @507.50	\$8,120		
2 helpers @325.00	5,200		
1/2 of 2 hoist-compressor	•		
men @ 360/mo	2,880	· · · · · · · · · · · · · · · ·	
$\frac{1}{2}$ of Assay-sampler @ 350/m	no 1,400		
	17,600		
Payroll taxes 15%	2,640		20,240.00
Core boxes & splitter			400.00
Replacement parts, bits, casing, Cement, e	tc.		5,000.00
1/2 Diesel fuel oil for compressor			800.00
Contingency (18.6%)			5.660.00
		Total drilling cost	36,000.00
·		Cost per foot	\$6.00/foot

Item 5. Rehabilitation of working shaft (including labor)	
Install footing and repair headframe\$1,000	
Timber and install guides in 200-ft. vertical shaft @\$25/ft 5,000	
Repair timbers, ladders, and skidway in 250-ft. inclined	
shaft @\$14/ft 3,500	
Recondition and enlarge 250-ft. level station 250	
Retimber 500-ft. shaft section 250	
	\$10,000
Install 300 ft. of 3-inch airline in shaft $ -$	500
Move assay office from river camp to mine site	300
TOTAL	\$10,800

Item 6. Construct light frame buildings (includes labor)
Combination boarding and bunk house \$9,000
Combination office and ware house 3,600
Furnishings, plumbing, etc. for avove 2 buildings 5,000
Compressor and generator shed 1,800
Hoist house 600

\$20,000

Item 7 (a). Operating equipment to be rented. Underground diamond drill machine \$425/mo. Calculated in cost per foot of drilling

<u>7 (b)</u>	To be purchased.		
	40 H. P. electric hoist		\$5,000
	Bucket, cable and crosshead		500
	Mine pump and pipe installation in shaft		1,600
	Telephones, hoist house to mine levels		275
	Ventilating fan with motor		500
	60-KW Diesel generator (2nd hand) installed		4.500
	Diesel oil storage tank, installed		1,500
	Water storage tank, installed		1,100
	Arc welder and accessories		600
	2 jackhammer type machines and pneumatic push Bit grinder and spare grinding wheel	ers	1,000
	Miscellaneous small tools, hardware and repair n	arts	5 000
	3 mine cars		5,000
			\$22.575.0
The fo	llowing items calculated in cost per foot of drifting.	or job work:	\$22,979.0
	Mine rail, plates, bolts, spikes	\$1 600	
	Drill steel with attached bits	900	
	Ventilating pipe and tubing	1,500	
	Water and air pipe 2", 1" & 3/4"	700	
	Mine Timber & ties	700	
	Air & water hose, couplings, oil, repair parts, etc	c. 1,000	
		,	
7 (c)	To be furnished by applicant.		
		Mo	nthly depreciation
	Chevrolet truck, 4 x 4, equipped with boon and he	Dist	\$100
	Army jeep		50
	Conpressor, Sullivan 310 cfm portable Diesel pov	wered \$125	·
	Depreciation for 12 months		\$1,800
Calcula	ated in cost per foot of drifting and drilling		
Q	Schedule of Jahor		
	Schedule of Tabol.	Rase Day	Per day
	2 miners	\$15 00	Aver. with overtime
	2 mickers	\$13.00 12.00	\$10.25
25	2 diamond drillers	12.00	13.00
	2 diamond drillers Helpers	12.00	13 00
	2 top landers	13.00	14.00
	1 surface utility man	14.00	15.15
	1 general surface laborer	12.00	13.00
	0	Per month	For 12 months
	1 Cook	\$300	<u>1 of 12 monurs</u>
	1 truck driver-mechanic	360	
	2 hoist-compressor men	360	
	1 assaver-sampler	350	
	1 Part time bookkeeper	100	
	1 Engineer-manager	600	
	Calculated in cost per foot of drifting, drilling, or	job.	an a
tem 9.	Assay supplies, reagents, etc.	,	\$2 000
	Road repairs Rental of dozer and necessary hand	labor	2,000
	Gas, diesel fuel, repair parts, etc. for equipment	not used in cost	per foot basis 5 000
	Recondition and rehabilitate mine levels, exclusiv	ve of shaft work	1 250
ummar	y of estimated costs.		1,000
	Construct mine and camp buildings	\$20.000 incl.	labor
	P P P P P P P P P P P P P P P P P P P	#20,000 Incli	

Summary of estimated costs.

Construct mine and camp buildings	\$20,000	incl.	labor
Rehabilitate shaft	\$10,000	,,	••
Move Assay Office	300	"	"
Purchase and install 3 inch air line	500	,,	"
Drifting	45,000	,,	,,
Drilling	36,000	,,	••
Road repairs	2,000	"	"
Clean out mine levels	1,350	,,	"
Purchase equipment	23,575	"	,,
Assay supplies and reagents	2,000	,,	,,
Gas, diesel fuel, oil, repair parts	5,000	"	,,
Rental (depreciation)	1,800	,,	,,
Supervision 600/mo x 12 , 7,200			

Cook, 300/mo x 12 3,600

Truck driver-machanic 600/mox12 4,320

Part time bookkeeper 100/ mo x 12 1,200

Surface labor - Utility man (14.00/day)

15.15 x 200 days	3,030
Laborer (12.00/day)	
13.00 x 200 days	2,600
Payroll taxes: Sup. @15%	
Remainder @7% Total labor	2.112

<u>24,062</u> \$171,587





13 K093 specimen now catalogued in the ADMR Museum (see K number) lond MINE! SPECIMEN FOR DEPARTMENT OF LIBRARY AND ARCHIVES (Do not write (Wrap each specimen separately, or place it in a substantial in this space) bag, by itself, with a number attached, identical with the number on this card.) Ore Cabinet Elain Specimen No. collected by Field Engineer No. Wulfenite Vone Operator Name Mine active or inactive Minerals contai 8 If inactive, when operated 9 Gangue Ca 0 Specimen presented by 100 Depth at which taken Date Notes (Any general information regarding Approximate mineral content (in terms of the history of the property.) average per ton) 003=1.5 0.59 90100 = 7 025, Name of mine or claim CI ed 041 Group 15 una District Location (distance and direction by highway from what town If more space is desired for notes, use Owner of property_? cminator other side. 13,0× 4,0×7,0 80 115

OFFICE INTERVIEW

Mine - Red Cloud, Yuma County

Date - December 30, 1981

Nyal J. Niemuth, Mineral Resources Specialist

Bob McCoy, an underground miner employed by Red Cloud Mining and Milling at the Red Cloud Mine, Yuma County visited to examine the file. He reported the underground workings have been cleaned out to the north and work is proceeding on those to the south. Five hundred tons have been mined and stockpiled so far. There is a crew of ten currently on the property. The flotation mill has a capacity of 125 ton/day, and is now finished and operating one shift a day. Present mining rate is 40 ton/day (1 shift) using a two ton skip for hoisting. In a couple of months, he thinks they'll be up to three shifts a day. The material mined so far has been running between 12 and 20 oz/ton Ag and there is another 10,000 tons of similar material blocked out.

He also reported that Wayne Thompson of Southwest Mineral Associates, Phoenix, will handle any wulfenite mineral specimens discovered during mining.

destracted 10/21/50

DEPARTMENT OF MINERAL RESOURCES STATE OF ARIZONA FIELD ENGINEERS REPORT

Mine	RED CLOUD (gues)	Date	October 7, 1980
District	Eureka (Silver) - Yuma County	Engineer	John H. Jett
Subject:	Red Cloud Mining Co. Mailing Address: 1502 Kuns Court Yuma, Arizona 85364		
	Office Phone: 344-4729 Mine ": 782-9224 Mobile ": 2174	^	
On the She is Mine, a are ins of mill wright a millw	night of October 7, 1980, Mrs. Kay Hessan t the daughter of Don McDaniel of Tulsa, Okla according to Mrs. Hessan. She is acting as stalling a hoist, headframe and flotation mi erection but he left the property not to r to set the rest of the machinery. No drawi wright and requested we assist them in locat	telephoned ahoma, and Manager of ill. Mr. return. Th ings are av ting proper	me requesting assistance. present owner of Red Bird f Red Cloud Mining Co. They Jack Hamilton was in charge ney are looking for a mill- vailable. They cannot locate r personnel.
Mr. Jer Mr He Si Co De Ba Co Ne Di 27 (Si	ry Irvin and I visited the property on Octo . Jay Fair, Foreman Mr. Glenn Madframe erected, small 25 h.p. chain driven imary crusher, secondary crusher and convey x foot (?) Marcy mill installed. ncrete pad poured. ck erected above pad. nk of DECO cells (8) set on decking, 5 h.p. nditioner tank set. ed a second set of sitts. $CELLS$ sC (2) filter - tank thickener on site. 5 k.w. generating plant on site (will supply haft being de-watered now)	y all need	980. General Duties 40 hoist installed - on 270 ft shaft. rame installed. 1s, being cleaned.
+ 2000	are the project needs a mine manager to tak	a abawaa a	nd oppudingly wing daws 7 an

It appears the project needs a mine manager to take charge and coordinate mine development with mill erection. Rate of production is anticipated at 150 TPD. Heavy duty crane, 6-yard front end loader, travel drill and compressor, one small spiral classifier, miscellaneous pumps, noted.

JHJ:mw

cc: DMR Tucson

DEPARTMENT OF MINERAL RESOURCES STATE OF ARIZONA FIELD ENGINEERS REPORT

MineRED CLOUDDateMarch 30, 1953DistrictEngineerGEO. F. REED

Subject: In reporting on Yuma county trip

I saw Mr. Otto Motejl (pronounced Motel) at the mine. They have about eight men cleaning up and getting ready to diamond drill and drift under their \$75,000 matching loan. Am sending a copy of their prospectus which explains the property. Their gravity mill (crusher, rolls, screen, tables, spiral, etc) at the river is shut down, of course, just now. They get mail % San Carlos Hotel, Yuma. ELGIN BRYCE HOLT Consulting Mining Engineer P. O. Box 783 Phoenix, Arizona

Subject: RED CLOUD MINE

Penn Metals, Inc., Penn Building, Erie, Pennsylvania.

Gentlemen:

I am submitting for your consideration a report concerning the RED CLOUD MINE. Also, mention will be made of the other properties in this area controlled by yourselves, to-wit: Black Rock, Pacific, Silver Glauce, Mendivil, and the Neal Mining Company group of 55 claims.

It is my desire to give you an outline of the outstanding features of these properties, especially Hed Cloud, including my views as to what should be done in the way of financing, developing and equipping the same in order to put your holdings on a paying basis. This task is not going to be easy due to the meager data at my disposal concerning these properties, excepting Black Rock and Hed Cloud. Fortunately, we have an assay map of the latter property, a copy of which is submitted herewith. Also, you have in your files considerable data concerning your recent milling operations, at Red Cloud, to which interested parties may be referred; said data consisting of assays, smelter returns from concentrate shipments, etc.

LOCATION:

The Red Cloud mine is located in the Silver Mining District, in Yuma County, Arizona, about 40 miles north of Yuma and four miles east of the Colorado River. It is reached by turning off the Yuma-Quartzite highway about six miles northeasterly from a suspension bridge across the Gila River, located around four miles westerly from Dome, a station on the Southern Pacific R. R., and then traveling 28 miles to property over a fair desert road, over which trucks can operate.

HISTORICAL:

The property was discovered in 1879. In 1881, it was purchased by the Red Cloud Mining Company, controlled by Knápp and Horton of New York. This company worked the mine profitably until 1892, when operations ceased due to the low price of silver. There is no accurate record of the production, but from the best authorities available, the production of this property ran well over a million dollars. During this early period, there was a town and Post Office adjacent to Red Cloud, known as Silent, said to have contained a population of two or three thousand people, at its peak. Prior to the time when the Southern Pacific R. R. was completed through Yuma, during 1831 or 1832, communication between this area and the outside world was largely by means of steamboats, which plied up and down the Colorado River to points above Needles; and these steamers brought in all kinds of supplies and machinery needed by the miners and transported out ores which were shipped to either Swansea, Wales, or to Selby, California, for treatment at smelters located at those distant points.

In 1917, a syndicate headed by myself, purchased the Red Cloud mine, and resold it to E. S. Curtis and James A. Moore, of Seattle, Washington. These people installed Stebbins dry concentrators and endeavored to work the dump. The effort proved a failure and they abandoned the property.

During 1926, while I was operating mines in Mexico, my associates gave a lease and option to the Primos Chemical Company. This company drove a 335-foot cross-cut into the hanging wall on the 500-foot level. At the end of the cross-cut a station was cut and two diamond drill holes were bored, directed in such manner as to intersect the vein at considerable greater depth. At this juncture a payment was about to fall due. The company wanted an extension. The owners refused to grant it, notwithstanding the low price of silver at that time. Thereupon, the Primos people abandoned the property and refused to give the logs of the drill holes to owners.

In 1928, the Neal Mining Company acquired control of Red Cloud, and located 55 other claims in the district. This company drove two drifts on the 500-foot level, one northwesterly and the other southeasterly of the shaft, each about 180 feet, both drifts following the hanging wall vein, which was found to be leached and carrying low values, on this level, which is five feet above water level in the mine.

During 1940, I regained control of property, and in December of that year, I arranged the execution to your company of a lease and option on the same.

GEOLOGY:

Here tuffs and lavas of Tertiary flows, floor a valley that is bordered on the east by andesite ridges and on the west by a sodic granite ridge which in turn is in contact with a high ridge of schist. The entire area of the Silver Mining District is traversed by a number of huge veins and veinlets from which silver-lead ores have been mined and shipped at a profit from superficial workings. It is believed that deeper and intelligently directed work will result in the uncovering of vast ore reserves, concerning which nothing at all is known at the present time. In the past, only outcropping ore shoots have been worked.

RED CLOUD VEIN AND WORKINGS:

The following is quoted from Bulletin No. 134, of the University of Arizona, by Eldred D. Wilson:

"The Red Cloud vein occurs within a fault zone of somewhat irregular strike and dip, separating the volcanic rocks on the east from the granite on the west. At the mine, this zone strikes about north 15 degrees west and dips from 45 to 60 degrees easterly. The vein is made up chiefly of limonite, hematite, quartz, flourspar and calcite, together with considerable amounts of gouge and brecciated wall rocks, all more or less stained by pyrolusite. The quartz forms irregular, faintly crystalline, vuggy, masses, which in places are cut by veinlets of coarsergrained quarts. Generally it is interbanded with gray to purple fluorite which ranges in texture from dense to crystals 1/8-inch in diameter. The calcite is mostly a coarse crystalline, dark gray, manganiferous variety, but some later white calcite also occurs. The limonite and hematite, which occupy cavities and vugs within the other gangue materials, are locally intermin-gled with irregular cellular masses and vuglings of cerussite, smithsonite, pyrolusite, vanadinite, wulfenite, and very minor malachite. In places, nodules of argentiferous galena, partly altered to blackish anglesite and pale-yellowish cerussite, occur. The silver of this galena is probably present in minute inclusions of argentite. No other sulphides occur in the mine. Cerargyrite, present as small disseminated masses and streaks within the oxidized minerals, constitutes the principal silver mineral.

"On the surface, the unmined portions of the Red Cloud vein are largely covered by dumps and hillside talus. Underground, the irregular shafts, drifts and stopes, indicated by Figure 2, have followed for a length of 560 feet and an inclined depth of 535 feet (519) feet), which is the water level. Most of the upper workings were made half a century ago, when the ore was sorted and screened underground and dragged up the incline in rawhide buckets. The stopes were supported by pillars, dry-wall fills, cottonwood timbers, willow laggings, which are fairly intact. A more recent vertical shaft, approximately 200 feet deep, intersects the vein at a depth of 290 feet on the incline."

A fact of considerable importance at this time, when our country is in need of strategic metals, that is shown in the above quotation, is the presence of wulfenite (lead molybdate) and vanadinite, which occur throughout the entire workings. They are found across the whole width of the vein and in the foot wall granite. Both of these metals can be recovered by ordinary oredressing methods, or by means of jigs and tables, etc. As a matter of fact, Red Cloud ores contain four strategic metals: lead, zinc and the two just mentioned. The Red Cloud vein is from 35 to 40 feet wide, and occurs between granite on the foot and andesite on the hanging wall. The high grade silver-lead ore was mined out years ago, at varying widths from four to 12 feet, from the hanging wall vein. There are now 40,000 tons of ore blocked out in the mine, along said vein, from the surface down to the 430-foot level. Some 460 assays, shown on the mine map, show the ore to average around 9 ounces silver per ton and five per cent lead, and a fair showing of wulfenite and vanadinite; also a little zinc.

FOOT WALL VEIN:

This vein is exposed on the surface, showing a goodly grade of milling ore, and has an indicated width of from 8 to 12 feet. But this vein has never been prospected by cross-cutting anywhere in the various levels of the mine, except in two places and these cross-cuts did not reach the foot wall granite. The middle portion of the 40-foot vein is mainly calcite, with low metal values. Hence, if the foot wall vein extends to depth, a large tonnage of milling ore could be picked up easily by means of short cross-cuts at the various levels of the mine. By all means this work should be done.

OXIDIZED ORE:

All ore so far exposed in the mine to the 500-foot level, is oxidized material, with residual bunches of galena, carrying values in silver up to 400 ounces per ton.

SULPHIDE ORE:

Nost of the engineers and geologists who have examined the property, agree that below the water level in the mine, extensive bodies of sulphide ore should exist, carrying excellent values in silver, lead and zinc. This is attested by the fact that the oxidized ore zone above water level shows extensive leaching action caused by the rise and fall of the water level in the mine through the ages. In this way, the lower portion of the oxidized ore zone was robbed of its values which migrated downward and no doubt deposited as enriched sulphides below the original water level, wherever that may be. Anyhow, it is my firm opinion and belief that deeper work on vein, should result in uncovering sulphide ores of great importance, in which event both shipping, as well as milling ores may be expected.

As indicated above, the mine is dry and open, and for this reason it can be inspected and sampled. A few check samples against the assay map, we have on file, will prove the sampling of the entire mine. However, we must bear in mind the important fact that such ores as are now available for sampling are merely the second grade ores that were left in place by the old-timers because such ores could not then be mined profitably.

200-TON FLOTATION PLANT:

During the Spring months of 1941, your representatives erected at the Red Cloud mine a 200-ton flotation plant, which proved to be unsuited to recovery of the silver-lead values in the oxidized ore. Also, an attempt was made to work a limited tonnage of low grade dump ore instead of opening up the mines, controlled by yourselves, that would have afforded ample ore of much better grade, especially below water level, where higher grade sulphide ores in quantity may be expected, as above set forth.

As your engineer, Mr. Lloyd G. White stated:

"To give you a true picture of the situation, the main problem at these properties is to develop an underground ore supply. This was the case when I sampled the Red Cloud mine in 1925, and my firm recommended to the Primos company of Philadelphia that they search for the high grade Red Cloud ore shoot below the water level. The problem remains the same today, except that the Block Rock properties have been included in the options. These two properties present a potential ore supply which make them large and profitable mines. During past years, many top rank mining engineers have recommended these properties."

The mill referred to above is described as follows:

In the first place the mill was poorly designed and was erected on flat ground adjacent to the mine dump, whereas it should have been built on an adjacent hillside so that ore and pump feed could have been attained by gravity, or largely so, all the way from the crushing plant to the tailings pond. As the mill is now erected, there is no room at all for even the disposal of tailings - a most unsatisfactory arrangement indeed.

The various units of the mill consist of: Ore bin, large Blake-type jaw crusher, two gyratory crushers, 5' by 10' ball mill in closed circuit with rake classifier, one 8-cell, No. 21, 38" by 38" Denver Sub-A Fahrenwald Flotation Machine, followed by one small Southwestern Air Flotation Machine for cleaning concentrates, one 43,000 gallon metal water tank, conditioning tank, conveyors, ore feeders, etc.

Power plant consists of two Diesel engines, 150-H. P. each; these being directly connected to two generators. All units of the mill are powered by individual motors.

An adequate water supply was obtained from a 30-foot sump located on the 500-foot level of the mine; the pumps consisting of one Pomona turbine, set near water level and run by a 5-H. P. motor. This pump boosted the water to a 25-H. P. centrifugal pump above, and this latter pump lifted the water to the mill tank. These pumps handled about 250 gallons of water per minute. A fairly complete inventory of the machinery and equipment in the said mill, including mining and other equipment, follows:

MILL:

1 - 43,000 gallon metal water tank 1 - 200-ton ore chute 1 - 15" by 36" jew crusher 1 - 25-H. P. F. N. motor 6 - V-belts for crusher 1 - starting switch 1 - 50' conveyor complete 1 - 3-H. P. motor 2 - V-belts for above 2 - Gyratory crushers - TELSMITH. 2 - 20-H. P. motors & belts for gyratories 1 - 300-ton iron ore bin 1 - Mill ore feeder - Denver 1 - 12-H. P. motor for feeder 1 - 5" by 10' ball mill, with 125-H. P. motor 1 - Roagent feeder 1 - Rake classifier, with 5-H. P. motor 1 - 3" concentrate pump 1 - Simplicaty screen 1 - Small conveyor 2 - Reagent feeders 1 - Pair platform scales 1 - 3' circular sow 1 - GE electric welder 1 - 50-foot bucket elevator, with 10-H. P. motor 1 - 6' conditioner, with motor 1 - 8-cell, No. 21, 38" by 38" Denver Sub-A Fahrenwald machine, with 4 motors complete 1 - Kimball-Krogh pump, with 5-H. P. motor 1 - 2" pump, with 5-H. P. motor, Jack shaft & pullies 1 - Air compressor, with 72-H. P. motor 1 - 3-H. P. motor & blower 1 - motor, Western Electric 1 - 3-H. P. motor & pump for filter 2 - Pressure tanks 2 - Rubber tired wheel-barrows 1 - Vertical sand pump, Denver, new and not installed 2 - Diesel 150-H. P. engines, with generators & cooling devices 2 - Large transformers 1 - Large switch board, with 10 gauges, Electric 1 - Oxy-set welder complete 34 - Starter switches 3 - Dozen 100-W. globes - Lot misc. copper wire 5 - 32-V globes 1 - New push button 4 - Insulators 1 - Notor and fan blades 1 - Pc. 50' 1" hose 200 - Feet of V-belting 1 - Gasoline motor & emery wheel

Mill inventory continued:

- 1 Large jack
- 1 Ton chain block
- 1 5-H. P. motor, Western Electric 1 5-H. P. motor, U. S.
- 7 Large wrenches for Diesels
- 1 Diesel thermometer
- 1 Mill building
- 1 Oliver-type filter to dewster concentrates

Note: The entire inventory, which I have on file, also contains a long list of tools. mill supplies, reagents, lubricating oils, greases, etc., which I have omitted from this list.

PUMPING PLANT:

- 1 Pomona turbine pump, with 5-H. P. motor
- 1 2-stage centrifugal pump, with 25-H. P. motor
- 1 4" pipe line, about 500 feet in length; also
 - 1.000 feet of small water pipe for general camp use

MISCELLANEOUS:

- 1 1,000 gallon water tank
- 1 Assay office complete with assay balances, furnace, chemicals. etc.
- 1 Cle-track catapillar & bulldozer complete
- 1 Blacksmith shop complete with equipment and tools
- 1 Old Franklin auto
- 1 Ramp for loading at Blaisdell Station
- 1 Set Allis Chalmers rolls, not installed
- 1 Wagon drill outfit complete
- 1 Small gas engine and blower
- 1 Vacuum tank
- 1 71-H. P. motor & blower

BUILDINGS:

Office and officers' bunk house, containing spring cots, bedding, two desert coolers, office fixtures, drafting board, files, tables, etc.

Tent house containing spring bed and bedding, etc.

Boarding house and kitchen, well stocked with stove, kitchen fixtures, furniture, desert coolers, etc., etc.

Bunk house for six to 10 men, with cots, bedding, air coolers. etc.

MILL RESULTS:

I have made a tabulation from your assay records of a two weeks mill run, in June of 1941, on oxidized Red Cloud dump ores, showing that mill heads averaged 8.90 ounces silver, and tails 5.95 ounces silver, per ton of ore treated during that period. As for lead, heads averaged 4.01 per cent, tails 1.85 per cent. Hence, silver recovery equalled 33.1 per cent, and lead recovery 54.1 per cent.

During the said period, concentrates shipped by your selves to the El Paso Smelting Works, averaged: silver, 87.63 ounces per ton; lead, 50.45 per cent.

Therefore, at the time you were operating your mill at the rate of 200 tons daily, you were discharging into the tailings pond about 1,090 ounces silver per day, with a gross value of \$773.90, of which it is believed around 90 per cent could have been recovered by cyanidation, provided a properly constructed cyanide plant had been installed at the beginning, in addition to the flotation unit.

Also, no attempt at all was made to recover the wulfenite and vanadinite, a large part of which could have been isolated as a marketable concentrate, by proper plant installation.

In my opinion, there is no use at all to waste further time and money in the attempt to better the above very poor results obtained in treating the oxidized ores of these mines by flotation alone. However, good results should be realized on such ores by using a combination of gravity concentration, flotation and cyanidation.

As to the wulfenite (lead molybdate) and vanadinite, these occur as coarse crystals in which the two are closely combined. Hence, the same would have to be recovered together by means of jigs, and possibly tables, from a coarse pulp feed, approximating ló-mesh. But also, by this method, some "free lead" minerals would be present in the resulting concentrate, which, however, could be removed by using a small flotation machine, after regrinding the said concentrates.

As to the amount of these minerals in oxidized Red Cloud ores, per incomplete sampling I have done on dump material, I would say the same should average about 0.44 per cent combined wulfenite and vanadinite (or Mo)3, 0.26% - V205, 0.18%), or 8.8 pounds per ton of mill heads.

I understand, on good authority, that an ore buyer located in Tucson, Arizona, will pay 30¢ per pound for concentrates running from 20 to 25 per cent combined MoO3 and V205. Hence, 8.8 pounds at 30¢ would equal \$2.64, of which we should recover at least 60 per cent, or a net of around \$1.58 for these minerals, per ton of ore treated, less transportation costs to Tucson. All in all, let us assume that the said minerals would not only \$1.00 per ton of ore treated, this item alone would yield a net profit of \$200.00 daily, when and if the mill could be reconstructed, which would mean moving it to a new site on the adjacent hillside, adding gravity concentration, selective flotation devices, in the event appreciable zinc should be found in the sulphide ores, and cyanidation, or broadly, whatever processes that may be found necessary, after proper metallurgical tests shall have been made.

However, in assuming that a net profit of \$1.00 per ton of ore treated can be made on the wulfenite and vanadinite minerals, we must take into consideration that all mining, milling, and other costs would be charged against the silver, lead and probably zinc contents in the ore; also that a profit can be made on these metals. These matters will be discussed later in this report.

REMARKS:

During the interim while exploratory work is being carried out, as hereinafter outlined, I would not recommend that any attempt be made to operate your present flotation plant, due to reasons cited. Neither would I recommend that this plant be remodeled or changed in any way whatever, until a considerable underground ore supply is fairly well blocked out. The reason for this statement is that until the sulphide ores are exposed, and until proper metallurgical tests have been made thereon, no one could determine, with any degree of certainty, what kind of a plant to install, in order to recover the various metals in the ore.

I would say, however, that the final mill at Red Cloud, which would also treat ores from your other mines, should be so designed as to handle both oxidized and sulphide ores, for in all your main holdings, Red Cloud, Black Rock, Pacific and Silver Glance, large amounts of oxidized ores will be uncovered, without any question of doubt in my mind, provided only that ample money can be found with which to carry out intelligently directed exploratory work.

Red Cloud now has around 40,000 tons of oxidized ore, of milling grade, now ready to be stoped in the old mine workings, as above set forth, with excellent possibilities that new ores will be found by extending some of the levels in the mine on vein each way from the shaft, or into areas that have never been explored at all. Also, such work should result in the discovery of high grade shoots of ore, of the same tenor as were formerly found and mined out.

The Red Cloud vein is traceable on the surface, at intervals, in a northwesterly direction, from the Red Cloud workings, for a distance approximating 10,500 feet; said vein traversing the following mining claims: Red Cloud, Red Rock, Amanda, Black Eagle, Cochise, South Geronimo, North Geronimo and Hardscrabble.

The Hardstrabble claim, belonging to Mr. M. E. Mills and others of Yuma, has a goodly showing of milling ore in an 85-foot inclined shaft on vien, which is from 3 to 10 feet wide. The said ore carries silver and lead and much better grade wulfenite and vanadinite than Red Cloud. I believe this mine to be one of merit and I recommend that you investigate it carefully.

dr er

Also on the Geronimo claims there are huge vein outcrops, around 40 feet wide, developed superficially only and showing low values in lead, silver, wulfenite and vanadinite. It is believed deeper work on these two claims should result in the discovery of workable ore bodies of importance. These claims also should be investigated carefully, with a view to developing them at a later time.

The Mendivil claim was surveyed for patent in 1887 for Mr. S. S. Draper, but so far as is known, has never produced any ore. It now belongs to Mr. W. D. Riley, of Yuma, who states that certain portions of it contain five per cent lead and 15 ounces silver per ton. I have walked over this wein, which is large and prominent; but took no samples.

As to the Neal Mining Company group of 55 claims, these mostly cover unexplored ground, in the vicinity around Red Cloud and Block Rock. At a later time these 55 claims should be investigated carefully with a view to retaining only such of the said claims as may appear to have potential value.

BLACK ROCK: 1. 50

The only data at my disposal concerning the Black Rock mine is contained in the bulletin referred to, by Eldred D. Wilson. A copy of this report follows:

"The Black Rock mine is in the southern portion of the area mapped on Plate 5, immediately north of the Silver District road at a point about 36 miles from Dome.

"This claim was one of the early locations in the district, but very little of its history or production is known. By 1881, according to Hamilton, the mine had been sold for \$135,000 and some rich ore was produced from a 100 foot shaft. Prior to 1884 the owners sank this shaft to a depth of 420 feet and erected a small furnace at the Colorado River. How long this furnace operated is not recorded, but it is reported as turning out a ton of base bullion per day in June 1883. So far as known, the mine has not produced since 1887. The Black Rock claim was patented during the early eighties and is now owned by Mr. C. E.

"In this vicinity, low steep-sided, hilly ridges have been carved out by the drainage system of Black Rock wash which drains westward to the Colorado River. These ridges rise to elevations of approximately 1,200.feet above sea level, or 400 to 500 feet above the bed of the wash.

"The prevailing rock on the Black Rock claim is schist which, in the southeastern portion, underlies the Tertiary volcanic series. This schist consists of fine-grained quartz and sericitized feldspar, alternating with bands of partly chloritized biotite. It weathers to blacky, moderately fissile, dark gray surfaces. On the Black Rock claim, its principal lamination strikes northwest and dips steeply northeast. Complex faulting and fracturing have affected this schist. Black Rock wash appears to follow a fault zone.

"The Black Rock vein occurs within a fault zone that strikes N. 55 deg. W. and dips 40 deg. N. E. The vein which consists mainly of manganese-stained calcite together with less amounts of silicified breccia, is traceable on the surface for a length of more than 600 feet and a maximum width of about 13 feet. Particularly near the hanging wall. it contains honeycombed and vuggy masses of fine-grained, brownish-gray quartz, fine-grained fluorite, and later vitreous quartz. Occupying vugs and fissures are irregular masses of limonite, calcite, pyrolusite, smithsonite, cerussite, and minor galena altering to anglesite, cerussite, and yellow lead oxide. This mineralized portion of the vein has been followed underground for a maximum length of 175 feet and a depth, on the incline. of 270 feet. Its richer portion ranges from thin streaks to a width of probably not more than ten feet, but some silverlead-zinc mineralization is traceable throughout the width of the vein. Several quartz-fluorite stringers occur near and parallel to the large voin, and are cut by branching veinlets of later calcite. For some 50 feet on each side of the main vein, the schist shows pronounced silicification, chloritization, and carbonatization.

"THE principal workings of the Block Rock claim include a 420-foot inclined shaft and more than 900 feet of drifts and tunnels connected with it, as shown by Figure 3. The vein, as exposed above the 270-foot level in these workings, has been sampled by Mr. F. W. Giroux. According to Mr. Batton, these samples contained an average of 4.37 per cent lead, 9.8 per cent zinc, and 6.7 ounces silver per ton."

SILVER GLANCE CLAIM:

The Silver Glance claim, north of the Black Rock and east of the Pacific, was surveyed for patent in 1381 for Mr. A. H. Cargill, and is now held by Mr. Walter D. Riley, of Yuma. Very little is known of its production except in the early days exceedingly high grade silver glance ore (argentite) was mined from surface trenches on the vein, which intersects the Black Rock vein. Development work was badly carried out. A 250-foot cross-cut tunnel was run through a ridge to an old shaft, which was sunk to a depth of around 200 feet on one wall of the vein, into which no cross-cuts were run. By referring to the claim map, which accompanies this report, it will be seen that the Black Rock and Silver Glance properties should be worked together as one unit. By properly directed exploratory work, both above and brlow water level in these mines, it is believed that large reserves of oxidized and sulphide ores will be found, out of which a great deal of money should be made. Both of these mines, as well as Red Cloud, have all the ear-marks that they will develop into large tonnage properties that can be depended upon to supply a goodly grade of milling ore over a long period of time.

Also, once the sulphide ores are found and blocked out in all your principal mines now being discussed, the zinc content in the same can be recovered as a by-product by selective flotation. This item alone will be an important factor in putting these properties on a paying basis, for once the sulphide ores are reached and milling started in a large way, two marketable products can be made, to-wit:

- 1. A lead-silver concentrate, low in zinc, which can be marketed to the El Paso Smelting Works; and
- 2. A zinc concentrate, low in silver and lead, which can be sold to the Amarilla zinc refinery.

As to wulfenite and vanadinite, as these are low temperature ores, or secondary minerals found in the oxidized ores, I do not anticipate the same will be found in the sulphide ores below water level

FINAL MILLING PLANT DISCUSSED

As above stated, during the time when exploratory work is progressing, no attempt should be made to operate your present flotation plant. Neither should the same be remodeled in any manner until a considerable underground ore supply can be uncovered; and until proper metallurgical tests have been made.

However, as we already know something about the metallurgy of these ores, due to your own operation of the flotation mill, as well as to certain cyanidation tests I had made, I think it would be a good idea at this time to give a general outline of the milling plant that later may be installed in order to recover the various metals in the ore.

The plant I have in mind would be so designed as to handle both oxidized and sulphide ores.

Mainly this discussion will serve the purpose of giving yourselves some idea as to what the total costs of such a plant will be.

During 1940, I had cyanidation tests run at the Producers mill on Red Cloud dump ore. These tests showed that 71 per cent of the silver values could be recovered as silver bullion, with a low lime and cyanide consumption. But the said tests were conducted according to the cyanidation set up of the mill mentioned, which treats gold ores only. Hence, our tests were not conclusive by any means, for in the first place, the cyanide solution used was entirely too weak, and, secondly, in the agitation of the sampleas, insufficient aeration was employed, inasmuch as leaching was done in bottles placed on a revolving shaft. Therefore, it is believed when proper tests are made on this ore by metallurgists who know hot to treat silver ore by this method, a moodly recovery of silver can be made, up to around 90 per cent.

The new plant should be located on the hill-side adjacent to the Red Cloud mine. In erecting this plant, I would suggest that procedure be as follows:

It is my idea to dismantle your present mill entirely, except the Diesel power plant, which could remain at its present location; and then use such of your milling, flotation and other equipment as would fit into the flow-sheet of the new mill.

Your present crushing plant would be moved to the top of the hill and there reinstalled, with minor changes only.

The design and flow sheet of the new mill, which would be built on the hill-side below the crushing unit, would be, more or less, as follows:

Ore would be hoisted up an inclined tract from the mine to a head frame on top of the hill and dumped into a small bin located above the feed floor, which would be flush with the top of the large jaw crusher

After the ore passes through the primary jaw crusher and then through the two gyratories, it would go to a Symons cone crusher, in which it would be reduced to say 100 per cent minus 3/8-inch mesh. Then it would be discharged into two iron ore bins, standing side by side, with capacities of 300 tons each one for the oxice and the other for the sulphide ore. One of these can be obtained from the present mill and the other would have to be purchased. The Symons cone crusher mentioned would have to be purchased also.

From the oxide ore bin, the crushed material would pass by gravity over a 15-mesh impact screen, which would have to be provided also.

The fines from the impact screen would contain most of the wulfenite and vanadinite, due to the brittle character of these minerals. Hence, the said fines would go to a 16" by 2h" Denver Minerel Jig, which would recover, as a rougher concentrate, a large part of these minerals. The jig concentrate also would contain some "free lead" minerals, which later could be removed in the laboratory in a diminutive mill, consisting of a small ball mill, classifier and flotation machine. The final product should contain wulfenite and vanadinite of marketable grade.

SELECTIVE PLOTATION PLANT INTRODUCED HERE:

Following immediately after and below the said crushing and jigging operations, I now suggest that we introduce into the flow-sheet your 200-ton flotation unit, described above, with such necessary changes as will provide a selective flotation plant, by which a lead-silver product can be made, on the one hand, and a zinc product on the other.

The principal new equipment needed for the above purpose, would be, more or less, as follows:

1 - 6' by 5' conditioner for zinc section

1 - 5' by 5' Oliver filter for zinc section

2 - 8' by 8' thickening tanks, one for the silver-lead and the other for the zinc section

1 - 3-cell, No. 21, 38" by 38", Denv r Sub-A Flot. machine

This plant would be so arranged that the zinc would be dropped with the tails from the lead-silver flotation section. Then the tails would pass through another 3-cell, Denver Sub-A machine, where the zinc would be activated, floated and recovered as a separate concentrate.

200-TON CYANIDATION UNIT TO TREAT TAILS:

For reasons above cited, I have presumed that the jig tails, as well as the oversize from the impact screen, will pass through the above flotation unit along with the crushed sulphide ores, later to be developed, after these are ground in the ball mill mentioned.

I now propose to install, following and below the said flotation unit, a standard counter-current cyanidation plant, with a capacity of 200 tons daily. The design of this plant will be, more or less, as follows:

The tailings from flotation would have to be reground to around 100 per cent minus 200-mesh before going to cyanidation. This could be done by installing about a 5' by 8' ball mill in closed circuit with a rake classified, into which flotation tails would flow by gravity through a launder. Here an automatic sampling device would be provided. The final discharges from classifier would then enter a launder which would deliver the pulp to a 10 by 50-foot primary thickner.

The cyanidation plant, in addition to the primary thickner just mentioned, would consist of three 30 by 24-foot agitators, followed by five 10 by 40-foot decantation thickners, arranged for gravity solution flow. The pulp to be handled by Eimco duplex diaphragm pumps. Tailings from the final thickner would be automatically sampled and then piped to the tailings pond.

Precipitation solution would be taken by overflow from the primary thickner and would flow by gravity to the precipitation plant, consisting of a standard Merrill-Crowe simultaneous clarification and precipitation equipment for zinc-dust precipitation. Barren solution from precipitation would be returned to the circuit in the decantation plant. Precipitates would be melted in an ordinary tilting furnace at the plant; and resulting bullion would be shipped to the U.S. Mint at San Francisco.

The above plant, if necessary, would handle around 230 tons of pulp each 24 hours.

REMARKS:

One item I have failed to mention is that in the cyanidation tests made at Producers, some gold, amounting to 35 cents per ton of ore tested, was also recovered with the silver. Small as this item seems, it would add around \$70.00 per day to the cash returns from the operating of this plant.

In the above discussion, it has been my idea solely to bring into the open metallurgical problems "to shoot at", or problems to be explored in great detail, prior to the erection of any plant at all.

Briefly, when and if adequate capital can be raised for mine development and plant equipment, the first matter of consideration, as outlined, will be to develop a large underground ore supply. After this is done, exhaustive tests should be made, in order to work out the metallurgy of the ores, and the final plant designed and erected accordingly. I recommend that exploratory work be carried out in the Red Cloud mine, along the following lines, to-wit: (a) work to develop new ore in the exidized zone; and (b) that deeper mine development be carried out below water level, in search for sulphide ores.

Work in the oxidized zone, in the first place, would consist of driving three cross-cuts from the 273, 430 and 500-foot levels toward the foot wall in order to hunt for the foot wall vein at these levels, and to demonstrate whether this vein goes down or not. These corss-cuts will be around 50 feet in length each, or a total of 150 feet, costing \$12.00 per foot, and approximating \$1,800. Secondly, I recommend that the 278-foot level of the mine be extended, north-westerly, on the hanging wall vein, for a distance of 500 feet, in order to open up additional oxidized ore reserves in an unexplored area of this vein where the high grade shoots have not been mined out. This drift extension, 500 feet, will cost around \$6,000; totaling \$7,800 of work in the oxidized zone as a starter. Additional work should be done in this area later on, after the mill, or the proposed new mill, has been put

Following is an outline of the work I have in mind in order to uncover sulphide ore below water level.

I will preface my remarks by saying, this task may or may not be a most difficult one to carry out. It all depends on how one goes about it.

As you know, the volume of water now encountered in the 30foot sump, on the 500-foot level, amounts to 250 gallons per minute. Hence, should an attempt be made to sink the present inclined shaft from the 500-foot level to the proposed 300-foot level, or around 300 feet deeper on the hanging wall vein, a much heavier pumping plant than the one now installed would have to be provided.

Sinking a wet shaft is always slow work, as well as uncertain and expensive. Again, at 50 or 100 feet deeper, so much water may be encountered that still heavier pumps might have to be installed, with the possibility that still deeper, more and till more water would come in. All this means expense and delay, with no certainty at all that the shaft could be sunk to any great depth without the expenditure of a wast amount of money.

To obviate the difficulties outlined, I recommend the following procedure:

That a contract be let to sink a 12-inch drill hold from the surface in such a way that it will intersect the inclined Red Cloud vein at an approximate depth of 900 feet, measuring on dip of vein. This drill hole will pass well through the vein and will have a depth, vertically, of 700 feet. In this way it will cross all water-bearing fractures. It can be contracted at \$5.00 per foot and will cost completed around \$3,500. (See map).

This 12-inch drill hole will serve the purpose of unwatering the mine to deeper levels, and also, in a limited manner, to prospect the vein for sulphide ores far below the present water level.

It is believed after the drill hole is completed, arrangements would have to be made to handle around 1,000 gallons of water per minute, in order to lower the same to some point well below the proposed 800-foot level.

In order to get some idea of the cost of equipment necessary to pump 1,000 gallons of water per minute, with a maximum 700-foot lift, I called at the Arizona Iron Works, at Phoenix, where the following rough estimate was furnished me:

It was proposed to install: One Arizona pump, deep well turbine type, ll1-inch bowls, 10-stage No. 12 pump unit; 700 feet of pump column, consisting of 700 feet of standard 10-inch pipe, 4-inch tubing, 2-3/16-inch shafting; No. 12 heavy-duty discharge head; also bronze bearing and oil lubricated line shaft. Total cost of this equipment would approximate \$5,000.

It would require around 175-H. P. to run the above pumping unit, at its peak load for that depth. Hence, as our present power plant will not be needed to run the mill, as the same will stand idle during this development period, I recommend that it be used not only to run the pumping plant just described, but the air compressor, for mining work, or for other minor uses that may arise. Therefore, it would be necessary to purchase a 175-H. P. motor to run the pumping plant in question. We should be able to pick up such a motor, second hand, for about \$200.00.

Therefore, the total cost of completing the 12-inch drill hole, as outlined, plus the motor-powered pumping plant complete, would be around \$9,300.

Again, just as soon as the above pumping plant can be put into constant operation, the present water level would gradually go down and would finally be held at some point below the proposed 800-foot level. (See map). Then and in that event, sinking could be started on the inclined shaft in dry ground, below the 500-foot level of the mine; and thereby the hunt for sulphide ore could be carried out at a constant and moderate cost, with no water to hamper the work, which could then progress at a rapid rate.

WORK PROPOSED BELOW THE 500-FOOT LEVEL:

In considering how to go about sinking below the 500foot level, we again run into a difficult problem to be decided upon. The short sided way to look at this matter would be to recommend using the old 200-foot vertical shaft, which intersects the vain at the 278-foot level and then follows it down, at an inclination of 45 degrees, to the 500 foot level. The vertic 2 shaft, just mentioned, he sonly one compartment and is in rather bad condition. It would make a very poor working shaft, even if money should be spent in reconditioning it; and I hardly think the Arizona State Mine Inspector would allow this shaft to be used in order to sink below the 500-foot level.

Be all this as it may, I recommend that the old inclined shaft, now used as a ladder-way, and sunk on vein from the surface to the 278-foot level, be squared up and enlarged to a two-compartment shaft and sunk on down on the hanging wall vein to the 500foot level. That on reaching the 500-foot level, this shaft be continued on the said vein to the proposed 800-foot level.

The cost of enlarging and lining up the said inclined shaft to the 278-foot level, including light timbering and car track, would be ab ut \$12.00 per foot, or a total of \$3,336.

The cost of sinking this shaft from 278 to the 519-foot level, known as the 500-foot level, a distance of 241 feet, would be around \$40.00 per foot, including light timbering and car track, or a total of \$9,640.

Hence, it would cost about \$12,976 to complete a two-compartment inclined shaft from the surface down to the so-called 500-foot level.

Also, at the collar of the said inclined shaft, the car track should be continued to the top of the hill, or to a headframe to be erected thereon, where mine ores would be dumped directly into a feed-bin above the crushing plant of the mill, as above set forth. The cost of the work indicated in this paragraph would be around \$1,500.00

The cost of sinking the said inclined two-compartment shaft, including car track and standard heavy mine timbers, from the 519-foot level to the proposed 800-foot level, or 281 feet, would be around \$50:00 per foot, or a total of \$14,050.

On the proposed 600-foot level, around 400 feet of drifting should be run on vein, or 200 feet each way from shaft. Also the same amount of drifting should be carried out on the proposed 700 and 800-foot levels, or 1,200 feet in all, which, at \$15.00 per foot, would amount to around \$13,000.

In order to comply with the safety regulations of the Arizona mining laws, governing deep mining methods, which require that at least two getaways be provided for the workmen, raises would have to be run connecting the proposed 800-foot level with the 500-foot level. This would mean around 260 feet of raises altogether, after deducting heigh's of intervening drifts; and the cost of same at \$17.00 per foot, including ladder-way and light timbring where necessary, would approximate \$4,420.

MINING EQUIPMENT, TOOLS, ETC.:

Furthermore, in order to carry out the above exploratory work in the Red Cloud mine, it will be necessary to purchase certain machinery, equipment, tools, etc., an approximate list of which follows:

1	-	500-foot air compressor, to be run by 125-HP motor from mill	\$3,000.00
1	-	25-HP gas hoist, for shaft	800.00
1	-	175-HP motor, for pumping plant	800.00
1		5/8-inch wire cable, 1,000 ft. long, for mine hoist	110.00
1	•	1,000-pound mine skip	175.00
6	-	1,200-pound mine cars, \$100.00 each	600.00
4	-	Tons 12-pound mine rails, at \$40.00	160.00
2	-	Mounted Jack-hammer drills, with air and water hose	600.00
2	-	Unmounted Jack-hammer drills	500.00
1	-	Stoping drill	300.00
		Machine Irill steel, mine tools, etc	900.00
		Housing, none during development period	
		Overhead, including management, bookkeeping, incidentals, etc., during 7 months develop- ment period, or until shaft is completed to proposed 800-foot level, and lower drifts well under way	7.000.00
		Assaying, to be done in Los Angeles, dur-	
		ing this period	700.00
		TOTAL \$1	15,645.00

SUMMARY:

Hence, the total costs, more or less, covering t exploratory work in Red Cloud, with the end in view of sufficient ore so the mill could be started, would be a	the above exposing s follows:
Exploratory work in the oxidized ore zone	\$ 7,800.00
Cost of 700-foot drill hole, complete, with pumping equipment	9,300.00
Completing two-compartment inclined shaft, from surface to 500-foot level	12,976.00
Cost of inclined skip track on side- hill, including head-frame above	1,500.00
Completing said shaft from 519 to the proposed 800-foot level	14,050.00
Cost of 1,200 feet of drifts on the 600, 700 and 800-foot levels of the mine	18,000.00
Completing 200 feet of raises, as outlined	4,420.00
Cost of equipment, tools, etc., during first 7 months development period, dur- ing which time ti is assumed enough ore should be developed to start the new mill, as soon as the same can be reconstructed, including overhead, etc.	15.645.00
	17,045.00

\$83,691.00

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NOTE:

It is believed the above costs have been estimated high enough to cover all the above work, which should be carried out by contract exclusively, including mine timbering and timbers, car track and rails, powder, caps, fuse, lights, lubricating and fuel oils, operation of power plants, which would be for account of contractors, kitchen and trucking expenses, etc., which would also be for account of contractors. Also, the superintendent, or engineer in charge of operations, could board with contractors, thus avoiding hiring a cook.

CAPITAL REQUIREMENTS:

The above estimate concerning costs of carrying out exploratory work, is confined to the Red Cloud mine alone.

While this work is progressing, it would be splendid business also to provide money with which to develop the Black Rock mine, more or less, along the lines recommended for Red Cloud. More particularly, the 420-foot inclined Black Rock shaft should be reconditioned and sunk 300 feet deeper, in search of sulphide ore. Also around 2,000 feet of underground work should be done on vein, in order to block out new ore reserves, both in the oxidized and sulphide ore zones. The work and equipment incident thereto, in opening up this property, would cost around \$75,000.

However, if the amount just mentioned cannot be arranged, such work in Black Rock can wait, until when and if Red Cloud can be put on a paying basis, in which event a part of Red Cloud profits could be used to develop Black Rock

INITIAL CASH NEEDED:

The initial money needed by your company, broadly speaking, is as follows:

To cover costs of exploratory work, equip- ments, etc., as above set for	83,691.00
To cover urgent indebtedness	25,000.00
To purchase Red Cloud, Black Rock & W. D. Riley properties outright	50,000.00

TOTAL ----- \$158,691.00

MONEY NEEDED TO COMPLETE PROPOSED MILL:

Regarding this item, I have been in conference with Mr. L. C. Penhoel, a very able engineer and metallurgist, of Los Angeles. He has kindly agreed to collaborate with me in the matter of estimating the cost of the proposed mill completed, as outlined. Hence, as soon as this estimate is available, I will be pleased to mail it to yourselves, as supplementary to this report.

A SAVING FACTOR:

In the event large and important bodies of sulphide ores should be uncovered, in the process of developing Red Cloud, which is more than likely to take place, such ores could be treated, temporarily, in your present mill without moving it at all, badly as this plant is now arranged, excepting the addition of the selective flotation equipment outlined, and a sand pump to boost the tailings to a new location. However, should the zinc content in the sulphide ores prove to be extremely low, then and in that event, the present mill could be run as it now is built with no alterations at all, except the installation of the sand pump mentioned.

That is to say, your present mill is quite all right for recovering silver-lead values in sulphide ores, in the absence of zinc, and should such ores be encountered, a high recovery, up to 90 per cent of these two metals, could be attained by the present mill.

But granting the above possibility, eventually the proposed new mill would have to be built, with necessary changes, for otherwise no profit at all can be realized from the oxidized ores in your various mines. Unquestionably, all indications point to the fact that possibly hundreds of thousand of tons of commercial oxidized ores remain to be developed in these mines. This statement also applies to the fine possibility that large amounts of sulphide ores will be found in the deeper levels, as above discussed.

All of your principal mines under discussion, are large potential properties; but they will remain a long time yet in this category, unless ample venture money can be found to pay the heavy costs of necessary dead work, in order to open up these properties in a large way.

For no money can be made in the Silver Mining District by people who go in there for the sole purpose of making an immediate profit from depleted surface ore shoots, or with a view to working old dumps. The bonanza outcropping ore shoots were removed over 60 years ago. That kind of ore is some. New work is now required to uncover the better grade ores again.

Yes; fortunes will be made out of these mines; but only when and if skilled mining men with both vision and plenty of money become actively interested in this area.

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PROFITS:

As will be noted, the only positive ores now available in your holdings of which we have dependable assay records, consist of the 10,000 tons in Red Cloud, as set forth in the McDougall assay map, submitted herewith.

This block of ore is composed of second grade material, left by the 1880 operators, assaying around 9 ounces silver and 35 cents gold per ton, plus five per cent lead, zinc content not tested, and approximately 0.44 per cent combined MoO3 and V205.

I have roughly estimated, for your consideration, what profits might be made, treating this grade of ore, which is oxidized material, in the proposed mill, using gravity and flotation concentration, followed by cyanidation, as follows:

Mill heads:

Silver, 9.0 ounces per ton, at 70 cents Less 10% tails loss	- \$6.30 .63
Tand I 00	5.67
Lead, 5.0% eq. 100 155, at \$5.05 per 100 lbs., eq \$5.85 Less h6% tails loss. eq 2.69	3.16
Recoverable value of lead & silver	8.83
Less marketing charges per ton of ore treated in mill, incl. truck haul to R. R., R. R. freight to El Paso, Sm- elter charges and all smelter deduc-	
head values, or 20% of \$8.83, eq	1.76
Less: All milling costs, per ton or ore treated	
All mining costs, ditto \$2.50	4.50
Gredit per ton of ore tr.: liffer- ential on marketing costs of 2/3 of recoverable silver extracted	2.57
by cyanidation, as bullion 0.74	
Credit, net gold recovery 0.35	
Credit, net Mo03 & V205 1.00	2.09
Net profit per ton of ore treated	\$4.66

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COLLABORATION:

I am indebted to Mr. L. C. Penhoel, 1919 South Santa Fe Avenue, Los Angeles, for his assistance and helpful suggestions regarding the details of the proposed new mill at Red Cloud. Mr. Penhoel is a Mining and Metallurgical Engineer who has been enga ed in the design and erection of milling plants, over a long period of years, in both the United States and Mexico. I value his opinion highly.

I am also indebted to Mr. J. S. Coupal, Director of the Arizona State Department of Mineral Resources, for his offer to write yourselves commenting on both this report as well as your properties.

To Mr. Roy Williams, of Kingman, Arizona, for his suggestions concerning ore dressing methods necessary to recover wulfenite and vanadinite values from Red Cloud ores. He has worked for the Molybdenum Corporation of America, and has had experience in treating such ores.

Mr. Walter D. Riley, of Yuma, also assisted m e in many ways. He furnished me with an inventory of your milling and other equipment at Red Cloud; also data concerning your milling operations.

CONCLUSION:

From facts herein given, it is my honest opinion and belief that your mines located in the Silver Mining District, Yuma County, Arizona, are properties of more than usual value. Furthermore, I believe these mines can be put on a paying basis, providing your proposed new operations are adequately financed and expertly managed.

Very Sincerely yours,

/s/ Elgin B. Holt /t/ Elgin Bryce Holt

January 20, 19/12.

(SEAL) Registered Mining Engineer

DEPARTMENT OF MINERAL RESOURCES State of Arizona MINE OWNER'S REPORT AUG 22 1946 AUG 22 1946 AUG 22 1946 Date Predug 21at,1945 1. Mine: RED CLOUD Location: Sec. Twp. Range. Nearest Town. Distance. 50 miles. Distance. 50 miles. Distert & County. Silver Mining District, Yuma County, Arizona. 5. Owner: June R.Remington 2. Address: 924. 16th Ave, Seattle, Washington. 5. Owner: June R.Remington Address: 924. 16th Ave, Seattle, Washington. 5. Owner: June R.Remington 4. Former Name of Mine 5. Owner: June R.Remington 4. Former Name of Mine 5. Owner: June R.Remington 4. Operator: 924. 16th Ave, Seattle, Washington. 5. Operator: 924. 16th Ave, Seattle, Washington. 5. Operator: 924. 16th Ave, Seattle, Washington. 6. Operator: 924. 16th Ave, Seattle, Washington. 7. Principal Minerals: 1. Jead and Silver 925. 1. Unpatented 926. 927. 928. 928. 929. 929. 929. 929. 929. 929. 929. 929. 929. 929. 929. 929. 929. 929. 929. 929. 929. 920. 921. 922. 923. 924. 924. 924. 924. 924. 924. 924. 925. 924. 926. 927. 928. 927. 928. 928. 929. 920. 92		
State of Arizona MINE OWNER'S REPORT MINE OWNER'S REPORT Date FFT. WHEPAL REAL AUG 22 1946 AUG 20 1946		DEPARTMENT OF MINERAL RESOURCES
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AUG 22 1940 Date. Product State S		MINE OWNER'S REPORT
Date Product, 21st, 1945 1. Mine: RED CLOUD unsurveyed (patented) 2. Location: Sec. Twp. NE Distance. 50 miles Direction NE Bad at present 3. Mining District & County: Silver Mining District, Yuma County, Arizona. 4. Former Name of Mine: 5. Owner: June R. Remington 22 Address: 924. 16th Ave, Seattle, Washington. 6. Operator: W.D.Riley, option to purchase. Address: Yuma, Arizona. 7. Principal Minerals: Lead and Silver 8. Number of Claims: One 9. Type of Surrounding Terrain: Bountainous, but mine is in rolling hills 0. Geology & Mineralization: Shaft is down about 500' on incline to the east about 700' 1. Dimension & Value or Ore Body: \$5. lead and 8. oz silver if Yanadium and # Wulfinite, with about 30,000, tons insite, oxidized ore, the bottom the shaft is in water, the suply of water is sufficient to offerat a 200 ton floatation plant and for camp use, .		AUG 22 1940
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i	LOCATION:	Sil	uer_	Dist	riet) Such	•
	OWNER AND	OF HEIGHT:	Luke.	Walke	N- Q1101	Moley	-Don M-Dai	ueli
	ADDRESS:	798	Hope	Que	Santa	æ Ba	rbara Cal	g.
	APPROXIMAT	TE PRODUCTIO	N (Year of L	945):	none.			
	NY ROMAN CONTRACTOR	COPFER		Lbs.	LEAD		Lbs.	
		ZINC		Lbs.	(OTHER)			
- S	CHECK THE	CHIEF CAUSE	OF YOUR DIS	CONTINUED	PRODUCTION:			
		(A) Easily (B) Increa (C) Too cl (D)	evailable o sed costs, b ose a margin	ore worked out have qu i to develo	out. antity simila p more ore.	r to past	grade of ore.	
		in the second	alaya yakan tahun manga dan karang karda manga dalaya dan dan	90-114-10-6-07-00-14-7-09-00-0-0		and the state of the	ĸĸĸĸĸĸĸĸĸĸŢġĸĊĸĊĸĊĸĊĸĊĸĊĸĊĸĊĸĊĸĊĸĊĸĊĸĊĸĊ	
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1455	If you do	not have or	re ready to m	nine please	discuss the	following		
		(A) Do you a just	think a rea	isonable de	velopment pro	above mine	l produce e?	
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		Can	dealo	Les No	everal I	million	, Pous.	
			and the second	A Statement of the second second				

v

(C) If you could not do this yourself, would a quick drilling program by some government agency (at government expense) be sufficient?

and if proved, at all possible tart operations within 30 days.

allo would help.

(D) Or would you prefer a loan plan similar to the arrangements during World War II?

How about a combination plan in two stages such as follows?

his

- Stage 1: Government engineers review project and, if a little drilling appears to be justified and a preliminary key to the situation, such drilling program to be agreed upon by owner and government engineer, paid for by the government, but let by contract.
- Stage 2: If results of drilling (or without drilling) justify underground development and/or production equipment, same to be obtainable via a mortgage loan on property.

Please discuss the above: engineers did exam propertie ave on 000 rual SUGGESTIONS: when down here Luke de SIGNATURE (

ARIZONA METAL PRODUCTION - 1

-75

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Copper, 1858-1940	\$ 2,762,555,000
Gold, 1858-1940	236,431,000
Silver, 1858-1940	193,032,000
Lead, 1853-1940	30,688,000
Zinc, 1858-1940	16,725,000
Molybdenum, through 1939	5,000,000 - 2
Tungsten through 1939	2,500,000 - 2
Manganese, 1915-1931	1,380,000
Quicksilver, through 1939	.400,000 - 2
Vanadium, through 1939	300,000 - 2

\$3,249,011,000

1 - After M. J. Elgins & R. E. S. Heineman, Arizona Bureau of Mines Bulletin 140, 1936, and U. S. Bureau of Mines Mineral Year Books.

2 - Estimated.

February 6, 1944

DEPT. MINERAL RESOURCES

RECEIVED

FEB

PHOENIX,

1944

ANICONA

MEMORANDUM

To:J. S. CoupalFrom:Elgin B. HoltSubject:Red Cloud Road - Yuma County

I am herewith inclosing cc of a letter from Mr. L. J. Foster, construction engineer of the Bureau of Reclamation, to the Board of Supervisors of Yuma County, Arizona, concerning the Red Cloud road which has become impassible due to backwater from the Imperial Dam.

You will note that Mr. Foster says: "An examination of therecords indicates that theright of way for theroad in question has not been dedicated for such use. The land on which the road is located is withdrawn under the Reclamation Act. This Bureau under the circumstances, is not responsible for keeping theroad in a passable condition."

Mr. Foster's opinion in this matter is very strange indeed, taking in consideration the history of this road, which since about 1880 has served not only the Red Cloud mine, but the whole Silver Mining District, in which there are seven patented mines and two patented mill sites.

The Silver Mining District has produced, during its history, in excess of \$4,000,000 in silver and lead values. Also during the year 1940 a 200-ton flotation mill was erected at the Red Cloud mine, and although this mill is closed at the present time, interested parties have been negotiating for sometime to finance new mine development at this and other adjacent nines with a view to resuming operations.

While it is true the Red Cloud road was never dedicated, it would seem that continued use of this road by the people of Yuma County for nearly 70 years should by all means validate their rights to this road. Also it would appear to any reasonable organization that constant use of this road should be equal to a dedication thereof.

I am herewith inclosing a map of Yuma County, with the road in question traced thereon, showing that the Red Cloud road is now covered by backwater from Imperial Dam at the mouth of Yuma Wash. More exactly, the bed of the Colorado River has been raised above the said dam by deposition of silt, which has raised the water level of the river causing the road to be inundated at the place mentioned.

Elgin B.d

Elgin B. Holt, Field Engineer.

cc - Board of Supervisors, Yuma County, Arizona.

TYPE NO. 1

DEPARTMENT OF MINERAL RESOURCES STATE OF ARIZONA

FIELD ENGINEERS REPORT

PRODUCTION POSSI-BILITY SURVEY

Sept. 25, 1942 RED CLOUD Date Mine Engineer Elgin B. Holt Silver Mining D., Yuma Co. District Subject:

PRODUCTION POSSIBILITY

OWNERS: Mrs. June R. Remington, et al, 924 - 16th Ave., Seattle, Washington.

LESSEE: PENN METALS, INC., D. G. Curtis, President, Wm. A. Middleton, Treasurer, Penn Building, Erie, Pennsylvania. Walter D. Rily, Agent, Yuma, Arizona.

LOCATION

The Red Cloud mine is located in the Silver Mining District, in Yuma County, Arizona, about 40 miles north of Yuma and four miles east of the Colorado River. It is reached by turning off the Yuma-Quartzite highway about six miles north of the McPhaul bridge across the Gila River, and then traveling 28 miles to property over a very poor sandy desert road, which would cost around \$25,000 to put it in shape for use by trucks.

HISTORICAL

The property was discovered in 1879. In 1881, it was purchased by Knapp and Horton of New York, who organized the Red Cloud Mining Company, which took title to property. This company worked the mine profitably until 1892, when work ceased due to the drop in the market price for silver; metals in the ore being mainly silver and lead, though small amounts of wulfenite and vanadinite are present. There is no accurate record of the production, but from the best authorities available, the production of this propert ran well over a million dollars.

-1-

In 1917, a syndicate headed by Elgin B. Holt, purchased the Red Cloud mine and resold it to a company which installed Stebbins dry concentrators and endeavored to work the dumps. The effort proved a failure and they abandoned the property. During 1940, the property was leased to the Penn Metals, Inc., above referred to.

VEIN & WORKINGS - ORE RESERVES

The Red Cloud vein is from 35 to 40 feet wide, and occurs between granite on the foot wall and andesite on the hanging wall. Strike of vein is northwesterly and southeasterly and its dip is 45 degrees N. E. Therexarexandex +0x000x tonexof xorexof ocked xout xinx the xuinexxxx x On the surface, the unmined portions of the Red Cloud vein are largely covered by dumps and hillside talus. Underground, the irregular shafts, drifts and stopes, indicated by maps I have on file, have the hanging wall vein followed/for a length of 560 feet and an inclined depth of 519 feet, which is the water level. A more recent vertical shaft, approximately 200 feet deep, intersects the vein, which dips at 45 degrees, at a depth of 290 feet on the incline. In other words, thened Gloud roin 18 from 35 to 40 feet vice, and accurs between granite on the fact wall and anderite on the hanging wall. The high grade lead-silver ore was mined out years ago, at varying widths from 4 to 12 feet, from the hanging wall vein. There are now 40,000 tons of oxidized ore blocked out in the mine, along said vein, from the surface down to the 430-foot level. Some 460 assays, shown on the mineassay map, of which I have a copy, show theore to assay around 5 per cent lead and 9 ounces silver per ton, plus a fair showing of wulfenite and vanadinite; also a little zinc.

OXIDIZED ORE

All ore so far exposed in the mine to the 5/9-foot level, is oxidized material, with residual bunches of galena, carrying values in silver up to 400 ounces per ton.

-2-

Red Cloud

SULPHIDE ORE

Engineers and geologists who have examined the mine; agree that below the water level in the mine, which stands 5 feet below the 5/9-foot level, extensive bodies of sulphide ore should exist, carrying excellent values in lead, zinc and silver. This is attested by the fact that the oxidized ore zone above water level shows extensive leaching action caused by the rise and fall of the water level in the mine through the ages. In this way, the lower portion of the oxidized ore zone was robbed of its values which migrated downward and no doubt was redeposited as enriched sulphides below the original water level, wherever that may be. Anyhow, it is my firm opinion and belief that deeper work on the vein, should result in uncovering sulphide ores of great importance, in which both shipping, as well as milling ores may be expected. The main problem in this property, and this holds for the Black Rock and other mines in this immediate vicinity, is to develop a new underground ore supply. The Red Cloud and Black Rock properties present a potential ore supply which will make them large and profitable mines. During past years, many top rank mining engineers have recommended these properties. Also, within a radius of three miles from Red Cloud are a score of old lead-silver mines, in various stages of development. It is an important lead-silver area in which the mines have only been surfaced.

200-TON FLOTATION PLANT

During the Spring months of 1941, Penn Metals, Inc., erected at the Red Cloud mine a 200-ton flotation plant. After this plant was completed, an attempt was made to work a limited tonnage of low grade dump ore instead of opening up both the Red Cloud and Black Rocks mines, both of which were under lease to Penn Metals, Inc. If these mines had been opened up they would have furnished ample

Red Cloud

ore of much better grade, especially below water level, where higher grade sulphide ores in quantity may be expected, as outlined above.

The various units of the mill consist of: Ore bin; large Blaketype jaw crusher; two gyratory crushers; 50-foot conveyor; 200-ton fine ore bin; 5' by 10' ball mill in closed circuit with rake classifier; one 8-cell, No. 21, 38" by 38" Denver Sub-A Fahrenwald flotation machine, followed by one Southwestern air flotation machine for cleaning concentrates; one 43,000 gallon water storage tank, conditioning tank, conveyors, pumps, ore and reagent feeders. Pumping plant in mine, on 5/9-foot level, which delivers 250 gallons of water per minute to the storage tank mentioned.

The power plant consists of two Diesel engines, 150-HP each; these being directly connected to two generators, and including transformers, switchboard, etc.

I have a complete inventory of this mill on file; the total factory costs of the various units of which approximates \$58,226.00. Transportation and erection costs of this milling plant will may be estimated at \$25,000.00, making total cost of the said 200-ton flotation plant around \$83,226.00.

MILL RESULTS

The said mill was operated by Penn Metals on Red Cloud and Black Rock dump ores, all of which was oxidized material, from around May 1, 1941, to the first week in September, 1941. During this period Red Cloud mill heads averaged about 8.9 ounces silver, and tails 5.95 ounces silver, per ton of ore treated. As for lead, heads averaged 4.01 per cent, tails 1.85 per cent. Hence, silver recovery equalled 33.1 per cent and lead recovery 54.1 per cent.

-4-

During the said period, concentrates marketed, from treating Red Cloud dump ores in the said mill, amounted to 427.95 tons, averaging: silver, 58.37 ounces per ton; gold, .02 ounces; lead, 34.6%; zinc, 5.9%; net smelter returns being \$23,791.79.

Also, during this period, concentrates marketed, from treating Black Rock ores, amounted to 63.82 tons, averaging: silver, 47.45 ounces; gold, 0,017 ounce\$; lead, 27.8%; zinc, 4.2%; net smelter returns being \$2,630.76.

MILL CLOSED DOWN

During the month of September, 1941, Penn Metals, Inc., closed the mill down, as no profit was being made. This was due to various causes, to-wit: Poor recovery of both lead and silver values, which could have been improved by finer grinding and better management, and possibly by the addition of jigs and tables. Another contributing factor was the low price of lead. Still another factor consisted of mechanical defects in the crushing unit which caused frequent shut-downs for repairs and adjustments.

PRESENT STATUS OF MINE AND MILL

Owners of Penn Metals, Inc., have no intention of resuming operations. They now have a watchman employed to look after the mill in order to prevent theft. Also, the said owners are now offering to sell the mill outright for the sum of \$40,000.00, out of which the company will pay certain debts, amounting to around \$13,500.00. The said company also offers to assign its lease and option on Red Cloud, free of charge, to anyone who will purchase the mill. The purchase price of Red Cloud is \$30,000.00, with certain purchase payments overdue; but reasonable terms can be arranged with owners of this property by responsible parties, in the event a new deal can be arranged.

-5-

Also, should a new deal be arranged before the Red Cloud mill is sold and dismantled, the succeeding operators by all means should take over the Black Rock mine, on which Penn Metals, Inc., has lapsed its option. Also, a reasonable deal can be made with the owner of this property, Mr. C. E. Batton. Black Rock, which is located around a mile southeast of Red Cloud, has been developed to a depth of 420 feet and has large reserves of ore assaying about as follows: lead, 4.87%; zinc, 9.8%; and silver 6.7 ounces per ton; per Batton. Deeper work on this property should also result in the uncovering of large reserves of sulphide ore, carrying goodly values in lead, zinc and silver. (See my report on Black Rock, herewith attached). NEW SET UP PROPOSED

Under date of January 20, 1942, I completed a detailed report on the Red Cloud mine, including an assay map, claim map, cross-section map, and also a detailed plan to carry out deeper exploratory work in the mine in order to open up and block out new reserves of ore, especially in the sulphide zone. Without going into great detail, the new work I have recommended consists of: Enlarging and lining up the inclined shaft at property to the 278-foot level; sinking this shaft from the 278-foot level to the 5/9-foot level; sinking the said inclined shaft on vein from the 519-foot level to the proposed 800foot level, including 1,200 feet of drifting and 260 feet of raises on vein. Also, this work would include a 700-foot 12-inch drill hole and pumping equipment to unwater mine to the 800-foot level, as well as tools, hoist, air compressor and a multitudeeof other I have estimated that all this exploratory work, and which items. should be completed before milling is resumed, would cost \$83,691.00.

-6-

Red Cloud

COST OF REMODELING MILL, MINE EQUIPMENT, ETC.

The present 200-ton bulk flotation plant should be removed to a nearby hillside, as at present it is situated on level ground with no means of tailings disposal, except by means of a sand pump. The cost of removing the said mill to the proposed new location above the inclined shaft, including construction costs and the addition of a crushing, screening and jigging plant, new equipment for selective flotation, in order to recover the zinc in the sulphide ore, also additional mining equipment, such as a large capacity air compressor, etc., would be around \$26,242.00, per my report. Also, in the event the Black Rock mine should be included in the proposed new operation, at least \$75,000.00 should be descended with which to develop new ore reserves in this property.

TOTAL CAPITAL NEEDS

Hence, broadly, the total capital needs to put this operation on a paying basis, including the purchase of and moving, as well as remodeling the said mill, would be about as follows:

To cover purchase price of present 200-ton mill	\$ 40,000.00
Cost of exploratory work in Red Cloud, outlined	83,691.00
Cost of remodeling mill, incl. additional min- ing equipment, etc	26,242.00
One additional 150-HP Diesel engine, incl. generator, transformer, etc	12,000.00
Additional housing	10,000.00
Initial operating fund	15,000.00
Development fund for Black Rock mine	75,000.00
Cost of improving 28 miles of road	25,000.00
Total	\$286 , 933.00

CONCLUS ION

I believe these mines can be put on a paying basis, provided the above set up can be financed and carried out.

Elgin B. Holt

-7-

TYPE NO. 1

RED CLOUD

PRODUCTION POSSI-BILITY SURVEY

Sept. 25, 1942

Elgin 3, Holt

Silver Mining D., Yume Co.

PRODUCTION POSSIBILITY

GANERS: Mrs. June R. Hemington, et al., 924 - 16th Ave., Souttle, Mashington.

LESSEE: FEAN METALS, INC., D. G. Curtis, President, Mm. A. Middloton, Treasurer, Feam Building, Eric, Pennsylvania, Walter D. Riley, Agent, Yuzz, Arizona.

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HISTORICAL

The property was discovered in 1879. In 1881, it was purchased by Knapp and Horton of New York, who organized the Red Cloud Mining Company, which took title to property. This company worked the mine profitably until 1892, when work ceased due to the drop in the market price for allowr; metals in the ore being mainly silver and lead, though small amounts of wulfenite and vanadinite are present. There is no accurate record of the production, but from the best authorities available, the production of this property ran well over a million dollars.

In 1917, a syndicate headed by Elgin B. Holt, purchased the Red Cloud mine and resold it to a company which installed Stebbins dry concentrators and endeavored to work the dumps. The effort proved a failure and they abandoned the property. During 1940, the property was leased to the Fenn Metals, Inc., above referred to.

VEIN & WORKINGS - ORE RESERVES

The Red Cloud wein is from 35 to 40 feet wide, and occurs between granite on the foot wall and andesite on the hanging wall. Strike of vein is northwesterly and southeasterly and its dip is 45 degrees N. E. On the surface, the unmined portions of the Red Cloud vein are largely covered by dumps and hillside talus. Underground, the irregular shafts, drifts and stopes, indicated by maps I have on file, have followed the hanging wall vein for a length of 560 feet and an inclined depth of 519 feet, which is the water leval. A more recent vertical shaft, approximately 200 feet deep, intersects the vein, which dips at 45 degrees, at a depth of 290 feet on the incline. The high grade lead-silver ore was mined out years ago, at varying widths from 4 to 12 feet, from the hanging wall vein. There are now 40,000 tons of oridized ore blocked out in the mine, along said vein, from the surface down to the 430-foot level. Some 460 assays, shown on the mine assay map, of which I have a copy, show the ore to assay around 5 per cent lead and 9 ounces silver per ton, plus a fair showing of wulfemite and vanadinite; also a little zinc.

OXIDIZED ONE

All ore so far exposed in the mine to the 519-feet level, is exidized material, with residual bunches of galena, carrying values in silver up to 400 ounces per tone

SULPHIDE ORE

Engineers and geologists who have examined this property agree that below the water level in the mine, which stands 5 feet below the 519 foot level, extensive bodies of sulphide one should exist, carrying excellent values in lead, zinc and silver. This is attested by the fact that the oxidized ore zone above water level shows extensive leaching action caused by the rise and fall of the water level in the mine through the ages. In this way, the lower portion of the oxidized ore zone was robbed of its values which migrated downward and no doubt was redeposited as enriched sulphides below the original water level, wherever that may be. Anyhow, it is my firm opinion and belief that deeper work on the vain, should result in uncovering sulphide ores of great importance, in which both shipping, as well as milling ores may be expected. The main problem in this property, and this holds for the Black Rock and other mines in this immediate vicinity, is to develop a new underground ore supply. The Red Cloud and Black Rock properties present a potential ore supply which will make them large and profitable mines. During past years, many top rank mining engineers have recommended these properties. Also, within a radius of three miles from Red Cloud are a score of old lead-silver mines, in various stages of development. It is/important lead-silver area in which the mines have only been surfaced.

200-TON FLOTATION FLANT

During the Spring months of 1941, Pann Metals, Inc., erocted at the Red Cloud mins a 200-ton flotation plant. After this plant was completed, an attempt was made to work a limited tonnage of low grade dump ore instead of opening up both the Red Cloud and Black Rock mines, both of which were under lease to Pann Metals, Inc. If these mines had been opened up they would have furnished ample one of much better grade, especially below water level, where higher grade sulphide ores in quantity may be expected, as outlined above.

The various units of the mill consist of: Ore bin; large Blakstype jaw crusher; two gyratory erushers; 50-foot conveyor; 200-ton fine ore bin; 5° by 10° bell mill in closed circuit with rake classifier; one 3-cell, No. 21, 38" Denver Sub-A Fahrenmald flotation machine, followed by one Southwestern air flotation machine for cleaning concentrates; one 43,000 gallen water storage tank, conditioning tank, conveyors, pumps, ore and reagent feeders. Pumping plant in mine, on 519-foot level, which delivers 250 gallons of water per minute to the storage tank mentioned. The power plant consists of two Diesel engines, 150-HP each; these being directly connected to two generators, and including transformers, switchboard, etc.

I have a complete inventory of this mill on file; the total factory costs of the various units of which approximates \$58,226.00. Transportation and erection costs of this milling plant may be estimated at \$25,000.00, making total cost of the said 200-ton flotation plant around \$83,226.00.

MILL RESULTS

The said mill was operated by Penn Metals on Red Cloud and Black Rock dump ores, all of which was oxidized material, from around May 1, 1941, to the first week in September, 1941. During this period Red Cloud mill heads averaged about 8.9 ounces silver, and tails 5.95 cunces silver, per tom of ore treated. As for lead, heads averaged 4.01 per cent, tails 1.65 per cent. Hence, silver recovery equalled 33.1 per cent and lead recovery 54.1 per cent. During the said period, concentrates marketed, from treating Red Cloud dump ores in the said mill, amounted to 427.95 tons, averaging: silver, 58.37 cunces per ton; gold, .02 cunces; lead, 34.6%; zinc, 5.9%; net smelter returns being \$23,791.79.

Also, during this period, concentrates marketed, from treating Black Rock ores, amounted to 63.82 tons, averaging: silver, 47.45 sunces; gold, 0.017 sunce; lead, 27.8%; zinc, 4.2%; net smelter returns being \$2,630.76.

MILL CLOSED DOWN

During the month of September, 1941, Penn Matals, Inc., closed the mill down, as no profit was being made. This was due to various causes, to-wit: Four recovery of both lead and silver values, which could have been improved by finer grinding and better management, and possibly by the addition of jigs and tables. Another contributing factor was the low price of lead. Still another factor consisted of mechanical defects in the crushing unit which caused frequent shut-downs for repairs and adjustments.

PRESENT STATUS OF MINE AND MILL

Owners of Penn Matals, Inc., have no intention of resuming operations. They now have a watchman employed to look after the mill in order to prevent theft. Also, the said owners are now offering to sell the mill outright for the sum of \$40,000.00, out of which the company will pay certain debts, amounting to around \$13,500.00. The said company also offers to assign its lease and option on Red Cloud, free of charge, to enyone who will purchase the mill. The purchase price of Red Cloud is \$30,000.00, with certain purchase payments overdue; but reasonable terms can be arranged with owners of this property by responsible parties, in the event a new deal can be arranged.

Alson should a new deal be arranged before the Red Cloud mill is sold and dismantled, the succeeding operators by all means should take over the Black Rock mine, on which Penn Metals, Inc., has lapsed its option. Also, a reasonable deal can be made with the owner of this property, Mr. C. E. Batton. Black Rock, which is located around a mile southeast of Red Cloud, has been developed to a depth of 420 feet and has large reserves of ore assaying about as follows: lead, 4.37%; zinc, 9.8%; and silver 6.7 ounces per ton, per Batton. Deeper work on

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this property should also result in the uncovering of large reserves of sulphide ore, carrying goodly values in lead, zinc and silvor. (See my report on Block Rock, herewith attached).

HEN SET UP PROPOSED

Under date of January 20, 1942, I completed a detailed report on the Red Cloud mine, including an assay map, claim map, cross-section map, and also a detailed plan to carry out deeper exploratory work in the mine in order to open up and block out new reserves of ore, especially in the sulphide zone. Without going into great detail, the new work I have recommended consists of: Enlarging and lining up the inclined shaft at property to the 278-foot level; sinking this shaft from the 278-foot level to the 519-foot level; sinking the said inclined shaft on vain from the 519-foot level to the proposed 800-foot level, including 1,200 feet of drifting and 260 feet of raises on veine Also, this work would include a 700-foot 13-inch drill hole and purping equipment to unwater mine to the 800-fost level, as well as tools, hoist, air compressor and a multitude of other itens. I have estimated that all this exploratory work, and which should be completed before milling is resumed, would cost \$83,691.00

COST OF REMODELING MILL, MINE EQUIPMENT, STC.

The present 200-ton bulk flotation plant should be removed to a nearby hillside, as at present it is situated on lovel ground with no means of tailings disposal, except by means of a send pump. The cost of removing the said mill to the proposed new location above the inclined shaft, including construction costs and the addition of a crushing, screening and jigging plant, new equipment for selective flotation, in order to recover the zinc in the sulphide ore, also additional mining equipment, such as a large capacity air compressor, etc., would be around \$26,243.00, per my report. Also, in the event the Black Rock mine should be included in the proposed new operation, at least \$75,000.00 should be provided with which to develop new ore reserves in this property.

TOTAL CAPITAL NEEDS

Hance, broadly, the total capital needs to put this operation on a paying basis, including the purchase of and moving, as well as remodeling the said mill, would be about as follows:

To cover nurchase price of present 200-ton mill	40,000,00
Cost of exploratory work in Fed Cloud, outlined	83,691.00
Cost of remodeling mill, incl. additional min-	
ing equipment, etc.	25,242,00
One additional 150-HP Diesel engine, incl.	
manerator, transformer, etc.	12,000,00
Additional Housing	10,000,00
Twitted anothing Mind	15,000.00
Demalarment fund for Black Rock mine	75,000.00
Cost of improving 28 miles of road	25,000,00

- \$285,933.00 Total ----

CONCLUSION

I believe these mines can be put on a paying basis, provided the above set up can be financed and carried out. Migin B. Holt

HERSEEY & WHITE Consulting Engineers Crocker Building San Francisco, Cal.

REPORT ON

RED CLOUD MINE

BY OSCAR H. HERSHEY

San Francisco, California, October 27th, 1938.

Mr. Ogden C. Chase, Del Sol Hotel, Yuma, Arizona.

Dear Sir:

My first visit to the Red Cloud mine in the Silver Mining District of Yuma County, Arizona was made in February, 1923. In May, 1925, I spent 3 1/2 days in the district and mapped the surfaces geology, on a scale of 200 feet to the inch, of the southern portion of the district in an area 6000 feet long and 1500 to 3500 feet wide. This was for the Primos'Company who had an option on the Red Cloud group. My final visit was in February, 1926. I assume that practically no work has since been done in the mine and will write this report from my old observations. Also, I will try to keep it within reasonable limits.

FORMATIONS.

There are three series of rock formations as follows: lst. Archean schists extensively intruded by irregular bodies of monsonite and more basic crystallines. These rocks may be referred to collectively as the Archean Complex or crystalline basement series. They extend to an indefinate depth so far as mining is concerned.

2nd. A series of older Tertiary lavas and tuffs of rhyolite and more basic composition. They are hard and form rugged outcrops. The veins are younger than this series and penetrate from it into the basement crystallines.

3rd. A younger series of Tertiary volcanic rocks, mostly andesitic and rhyolitic tuffs. They are relatively soft and have eroded into basin-like areas of rounded hills. It appears that in the vicinity of the Red Cloud mine, after the veins were formed, erosion largely cut away the earlier volcanic rocks and exposed the veins in the basement crystallines. Then the later volcanic rocks were deposited across the veins and buried them throughout the district. Subsequent erosion has moved the later tuffs and exposed the veins except in certain areas where faults so depressed the rocks that a portion of the tuffs has remained.

FAULTS.

There is a series of post-mineral faults of relatively small displacement that have east to southeast courses. Then followed

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extensive faulting in a north to northeast system. There are three main fauts of this system, the Red Cloud, McNeal and Ming. From your standpoint the Red Cloud is the important fault. It is somewhat serpentine but has a general course about N. 15° W. It dips eastward 40° to 60°. In the Red Cloud mine, near the surface there is from 3 to 6 inches of red and green fault gouge that dips eastward 50° then 6 inches to a foot of somewhat reddened but not silicified material which in places may be seen to be broken monzonite. Then comes the barren and not silicified andesite tuff generally lavender in color though somewhat bleached white near the fault. At one place over the ore there is a 12-inch fault breccia with rounded fragments of vein quartz along with the monzonite fragments in it. A small red gouge separates the breccia from the barren tuff. The post-mineral age of the fault is quite clear as will be shown later. It is a strike fault that has followed the general course of theorignal fissure and brought the Tertiary tuffs down over the Red Cloud vein. As a matter of fact the vein has largely been cut away and thrown down by the fault so that it remains buried under the tuffs for thousand of feet north and south from the mine. At the Red Cloud mine a downward curve in the vein and an upward curve in the fault permitted a lenticular body of vein to remain against the monzonite under the fault.

RED CLOUD VEIN.

The Red Cloud vein seems to have consisted orignally of three bands, a footwall calcite-quartz band, a central ore band and a hanging-Wall quartz-calcite band. The ore band has a strongly banded and crustified structure and considerable barite in irregular seams along with calcite and quartz. Locally there is some fluorspar. There are some chalcedony layers and the yellowish oily appearance of some of the quartz suggests the presence of adularia as in the veins at Oatman, Arizona. Thus the vein has the characteristics of Tertiary veins. The ore band is very prous, probably from the leaching of calcite and oxidation of sulphides that included galens and probably a little molybdenite. The visible lead minerals are chiefly the carbonate, cerussite and the molydate, wulenite. Kernals of galena remain sparingly near the bottom of the mine. It is in irregular seams 1/2 to 1 inch thick in small pockets scattered through the ore Iron oxide stain is widely distributed in the vein, but I do not know whether it came from the oxidation of pyrite or a carbonate. band. A characteristic of the ore band is the presence of considerable quantities of wulfenite crystals in holes and cracks. They are clearly secondary, occur only in the oxidized zone and the question is whether they mark an important secondary enrichment of the ore. Very little wulfenite can be seen outside of the original ore band, although the underlying porous quartz of the low-grade footwall band would seem to have been favorable for the depostion of the crystals. From this fact I deduce that there was comparatively little migration in the change from galena to wulfenite and probably not much secondary enrichment even in the ore band. this was considered very favorable to the future of the mine as what we wanted to find was a band of primary sylphide ore of good size and grade. I believe it could be found.

ORE.

At the top of the Red Cloud mine there is a large surface cut