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TO: Mr. H. E. Harper

FROM: J Douglas Bell

SUBJECT: Siskon Copper Creek Properties, Pinal County, Arizona

DATE: 25 January 1964

General

On December 6, Mr. E. N. Pennebaker forwarded to me an offering paper on the above named property, which had been referred to him by Attorney W. T. Elsing, Arizona Bank Building, Phoenix 3, Arizona. The properties are owned and leased by Siskon Corporation, Mr. H. B. Chessher, President, P. O. Box 889, Reno, Nevada. The offering presentation was sufficiently interesting to warrant the seeking of further information, and I subsequently obtained from Mr. Chessher copies of reports on the properties by Ira Joralemon (November 2, 1951), Morris J. Elsing (November, 1951, July 28, 1953, and March 22, 1955), and Carl Trischka, former Chief Geologist for Phelps Dodge, dated February 23, 1935.

The area is of additional interest as it has been under active exploration by Bear Creek Mining Company for the past several years, and their interest is continuing.

On January 9-10, I visited the area, examined the accessible underground workings, and made a brief surface reconnaissance of the immediate vicinity of the Old Reliable Mine. Numerous old maps are present at the mine, and at Mr. Chessher's office, including detailed assay maps of the levels in the Old Reliable, Copper Prince, and Globe mines, and much time could be spent in reviewing this information; however, both Joralemon and Elsing have condensed the data, and for the purpose of this report, I believe their summaries may be accepted. Sufficient map information for compilation of the attached 100-scale map was obtained during the visit.

Interest in the Siskon properties hinges on the answers to two questions: One, can a fairly sizable quantity of low grade copper ore, which is relatively well blocked out, be mined at a profit? and two, is there enough evidence of a disseminated ore body to warrant some drilling exploration? The economics of low cost mining methods are often a subject of debate; I will present the available information, and if profitable operation appears possible, a more exhaustive investigation can be made.

Property and Ownership

Siskon Corporation owns a total of 20 patented and 40 unpatented lode mining claims, located in the Bunker Hill Mining District, Pinal County, Arizona. The group, known as the Old Reliable property, was purchased from Lewis Douglas in 1956. Siskon's cash investment in the claims is reportedly in excess of $200,000. In addition, Siskon has leased six claims (dashed red outline on property map) adjoining the Old Reliable claims from Phelps Dodge Corporation. Terms of this lease are as follows: 7 years, dating from November 1, 1963. Maximum tonnage, 300,000 tons, to be mined above 500-foot level (3550' Fl.?). No ore to be leached in place. $500 per month minimum royalty now effective. Royalty schedule as follows:

Cu Ore, monthly average	Royalty-net smelter return
Less than 1.5% Cu	5% NSR less trucking
1.5% - 1.99% Cu	6.5% " "
1.99% - 2.49% Cu	7.5% " "
2.5% - 2.99% Cu	10.0% " "
3.00% - 3.99% Cu	15.0% " "

At the Old Reliable Mine, there is a 150 ton flotation mill in poor condition. A small office, change room, assay laboratory, and caretaker's house at the 100 Level portal are in fair condition, and a small camp of 4 buildings, also in fair condition, is located near the 300 Level portal. A caretaker lives at the property.

High-line power is installed at the 100 Level portal. Some water is available, but the constant supply is uncertain. Some may be obtained from the shafts of the Globe and Prince mines; sufficient supply has been obtained in the past to operate a 300 ton mill at the Childs Aldwinkle mine (1936).

Siskon also owns 160 acres of fee land in the San Pedro River Valley at Mammoth, about 10 miles distant, which is available as a mill site; ample water could be developed at shallow depth here.

Location

The Siskon property is located largely in Secs. 10, 11, and 14, T 8 S, R 18 E, in Pinal County, Arizona. Access is via U. S. 80-89 N'ly from Tucson for 24 miles, thence NE'ly on State 77 for 23 miles to Mammoth, thence 10 miles E'ly on a county road which is in good condition except for the last 2 miles. The San Manuel mine lies 14 miles to the west; AS&R's smelter at Hayden is 33 miles by road to the north.

The property is near the crest of the Galiuro Mountains, part of the NNW'ly striking belt of mountains which contains the mines at Ray, Christmas, and Superior. Elevations in the district range from 3000 to 5000 feet; the main drainage is Copper Creek, which flows W'ly to the San Pedro. The area is fairly rugged, with deeply incised draws and steep slopes, although it is a somewhat more rolling upland in the vicinity of the Copper Prince and Globe mines. Fair mine roads provide access to most of the area.

History

In company with many of the districts in Arizona, minor prospecting and mining operations were in progress in the Copper Creek area as early as 1863, although the productive period did not commence until about 1905. In that year the principal property divisions, shown on the property map, were generally delineated, with Clark-Scanlon acquisition of the ground now held by Phelps Dodge, acquisition of the present Siskon holdings by Copper State Mining Company, delineation of the Childs-Aldwinkle group, and presence of the already existing Bluebird lead-silver property, the earliest in the area.

In 1907, Calumet and Arizona acquired the Clark-Scanlon property, and with Joralemon in charge, explored, by means of shafts, drifts, and diamond drilling, the Copper Prince, Superior, Globe, and Copper Giant showings. Detailed assay maps were made, and furnish much of the information available today concerning these properties. A minor production is reported for the period, but the low grade for those times apparently discouraged any major production.

In 1931, Phelps Dodge acquired Calumet and Arizona, including that company's holdings in the Copper Creek area. Phelps Dodge has continued to hold the claims to the present, although it has not actively worked the property. In 1935, Carl Trischka, P-D Chief Geologist, examined the group for its molybdenum potential; his brief report indicates that molybdenite appears lacking in the group. Copper content and reserves were not discussed; the earlier diamond drilling is described as consisting of 14 holes, totalling 5,850 feet, put down in and close to the various siliceous breccia outcrops. Development of the various showings by Calumet and Arizona during the earlier period had consisted of a 415-foot shaft and 4 levels on the Copper Prince, a 400-foot shaft and 3 levels on the Globe, a 200-foot shaft and 2 levels on the Copper Giant, an adit on the Superior, and a 90-foot shaft on the Gertrude.

In 1937, Arizona Molybdenum Company, then operating the Childs-Aldwinkle mine and mill, leased the Copper Prince, and produced 1,227,667 lbs. of copper, approximately 27,000 tons, from the upper levels.

In 1963, Siskon obtained the lease previously discussed on the 6 claims covering the Prince, Globe, Giant, and Superior showings. No work is presently being done.

The Childs-Aldwinkle mine has yielded the largest production from the district, and the only molybdenum production. The molybdenum was first noted in 1915 in an adit driven beneath the copper-stained outcrop, but the productive period was during 1933-1939, when 329,000 tons of ore were milled, yielding 6,946,782 lbs. of MoS_2, 5,859,035 lbs. Cu, 723 oz. Au, and 26,938 oz. Ag. The ore pipe was developed to a depth of 850 feet; molybdenite content is reported as fairly constant between 1 and 2 per cent from surface to 800 foot depth, while the copper varied from 1% near surface to 6-8% at 800 feet (mostly bornite), and about 2% at the bottom of the mine. Production was at the rate of 300 tons per day, with the mill located near the portal at Copper Creek.

In 1962-1963, the property was leased to a small company, Brittain-Hendrickson, of Tucson, and 50-55 tons per day of low grade copper ore were mined from a small pit, trucked to Mammoth, and processed in a small mill. The operation failed, and the mine equipment has been seized by the Department of Internal Revenue. In December, 1963, W. T. Elsing informed me that Bear Creek had acquired the Childs-Aldwinkle group, and was negotiating with Siskon to lease claims adjoining that group.

The large block of claims now held by Siskon was originally acquired by Copper Creek Mining Company in 1903, held briefly by Minnesota-Arizona Mining Company, which constructed a mill, power plant, and railroad from the Old Reliable to the millsite in Copper Creek canyon near the American

Eagle workings, and in 1910, passed into the hands of Copper State Mining Company. Some production occurred during World War I. At some later date, title passed to Copper Creek Consolidated Mining Company (L. W. Douglas), and a mill was constructed at the Old Reliable portal. Ore had been developed at the Old Reliable and American Eagle pipes; Trischka, in his 1935 report, mentions that 600,000 tons of 1.75% Cu were ascribed to the Old Reliable, and 1,000,000 tons of similar grade to the American Eagle.

In 1955-1956, Siskon acquired the claims group. In a prior report, Ira Joralemon (Nov. 2, 1951), had estimated approximately 840,000 tons of 1.4% Cu ore above the 200 Level of the Old Reliable, plus 22,000 tons of 2.63% Cu ore remaining broken in the stopes. His review of stope maps and sections indicated that 48,000 tons had been mined and removed. In a somewhat less conservative estimate restricted to a lesser area, M. J. Elsing at about the same time estimated 325,000 tons of 2.46% Cu above the 200 Level, with 25,000 tons extracted from the drifts and stopes. Under recommendations of Joralemon and H. L. Hazen, Siskon made an experimental attempt to leach the Old Reliable breccia ore in place, but was unsuccessful in attaining any constant percolation. No further effort has been made to mine the Old Reliable body, although metallurgical tests have been conducted, indicating that the LPF leach-precip-flotation process is the most suitable method of milling the mixed oxide-sulfide ore.

Bear Creek, in 1961-1962, leased the Siskon property at Copper Creek, also leased the Bluebird property, and staked or otherwise acquired considerable additional adjacent ground (property map). Contractor E. J. Longyear Company drilled twelve holes on Siskon property, shown on the property map; other holes may have been drilled elsewhere, but no information is available concerning them. It may be noted that two holes were drilled in the vicinity of the Old Reliable pipe, and ten near the American Eagle pipe. Significant mineralization is described by Siskon in only two of the holes, as follows:

DDH No. 1	Vertical	1660'-2150'	490'	0.477% Cu	
DDH No. 2	-60°	1520'- ?	180'	1.13% Cu	0.178% Mo

In the summer of 1962, with approach of a $25,000 payment, Bear Creek surrendered its lease-option, and started negotiations for a lesser group of 12 claims generally bordering the Childs Aldwinkle group. In a letter dated Dec. 13, 1963, Dr. Thomas Walthier, Bear Creek District Geologist at Tucson, wrote Chessher, offering to lease again all of the Siskon claims as held under the prior lease, terms to be an end price of $450,000, with $5000 down and $20,000 in 6 months. In an answer on Dec. 16, Chessher refused this offer, and counter-offered to lease-option the twelve claims of particular interest (hachured red on property map) to Bear Creek for $1,000,000 end price with $25,000 down. I have not heard of any later negotiations.

The Bluebird mine is a small vein-type lead-silver producer located in the northeastern part of the Copper Creek area. Responsible for the majority of the lead and silver production attributed to the district, it does not have a significant role in a discussion of the copper-molybdenum properties.

Approximate production figures from the properties are tabulated as follows:

Production, Copper Creek Area, Pinal County, Arizona

Mine	Date	Tons	Au, oz.	Ag, oz.	Cu, lbs	Pb, lbs	MoS_2 lbs.
Childs-Aldwinkle	1933-1939	329,000	723	26,938	5,859,033	---	6,946,782
	1962-1963	?	---	---	?	---	---
Phelps Dodge							
Various	1905-1930	?	---	15,000	200,000	---	---
Copper Prince	1937	40,000	---	---	1,227,667	---	---
Siskon Corp.							
Old Reliable	1905-1918	±40,000	---	---	700,000	---	---
American Eagle	1905-1918	?	---	---	?	---	?
Blue Bird Mine	1863-1920	$150,000	---	?	---	?	---
	1926-1939	?	?	119,000	200,000	4,000,000	---
	1947	598	3.0	1,085	---	31,200	---
	1948	7	?	?	---	?	---

Including one or two small mines to the south of those listed, the Bunker Hill District has a history of production valued at approximately $5 million.

District Geology

Kuhn (Pennebaker copy enclosed) has written a Doctor's thesis on the Copper Creek area, and is the main source of information pertaining to it.

In the NE'ly corner of the area, NE of the Bluebird Mine, a thin belt of Cretaceous limestones and shales outcrops, overlain by flows of andesite and basalt. The western half of the surface area is composed almost entirely of andesite tuff of probable Cretaceous age. Intruding the Cretaceous sediments and flows, and comprising almost the entire eastern half of the area is a stock of medium grained gray granodiorite; small plugs of the intrusive are mapped intruding the andesite tuff, and a larger mass is noted in the NW corner of the area.

Close-spaced fracturing is wide-spread within the area, but there are few major faults. Fractures, with near vertical dips, trend E-W in the southwestern quarter of the area, have a N 65 E trend in the northeasterly quarter in the vicinity of the Bluebird Mine, and show diverse trends in the northwesterly quarter. A line of fracturing trending N 20 E and marked by several breccia pipes lies to the west of the Old Reliable Mine; stream drainages in this area also show a N 20 E alignment. Intersecting this trend of fracturing is a N 35 W trending fracture zone, also marked by alignment of breccia pipes.

Scattered irregularly throughout the district, but largely within the western half, are a series of breccia pipes of varying sizes. Kuhn states that they are closely related to the faulting, usually showing strong E-W fracturing although the longitudinal direction is often related to more obscure fractures of N 10 E trend. Brecciation is attributed to the effect of alteration by solutions rising through the fractured rocks.

Some 125 such pipes have been mapped within the Copper Creek area, although only a few have been found to be mineralized to an economic extent. The Childs-Aldwinkle pipe is the only one in which a major amount of molybdenum has been mined, although Bear Creek's D.D.H. No. 2, cutting the American Eagle pipe at depth, contains an appreciable quantity through a thickness of 180 feet. The breccia pipes consist of angular blocks of the host rock, granodiorite or andesite tuff, cemented by ore and gangue minerals. The central portions are often entirely replaced by sericite and quartz, grading outward to a more chloritic alteration phase. Most exhibit resistant iron-stained outcrops rising 5 to 50 feet above the adjacent host; however, the molybdenum-bearing Childs-Aldwinkle pipe was less resistant, with no prominent outcrop. The Childs-Aldwinkle pipe occurs well within the main granodiorite mass, while the other ore-bearing pipes, including the American Eagle, Old Reliable, Copper Prince, and Copper Giant, are located closely adjacent to the granodiorite-tuff contact.

Local Geology

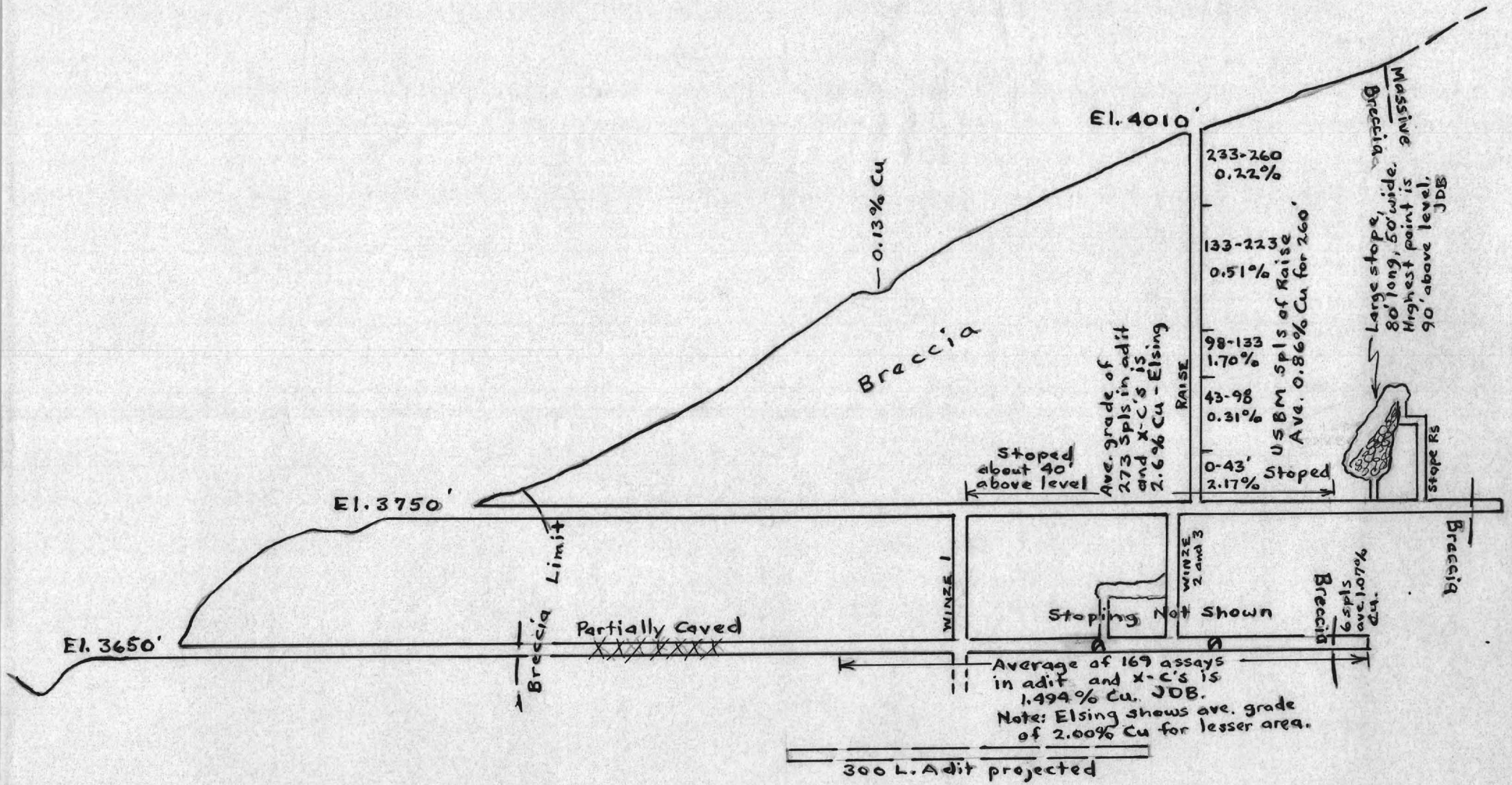
The Joralemon and Elsing reports are largely confined to economic details; however, Joralemon is quoted as stating that the iron-stained andesite band outcropping on the ridge running WNW'ly from the Old Reliable pipe may be a leached outcrop overlying a disseminated and chalcocite-enriched ore body in the magnitude of 30 to 50 million tons, and involving an area of 3 million square feet.

In my examination, I visited the 100 and 200 Levels of the Old Reliable, the accessible portion of the 100 Level in the Copper Prince, the accessible adit level of the Globe, and the surface of the ridge on the Old Reliable claim.

Surface outcroppings on the ridge I found to consist of parallel, low, resistant, fractured outcrops of andesite tuff, trending generally E-W in the western part near Bear Creek Triangulation CC-1, and bending SE'ly toward the Old Reliable pipe in the easterly part. The tuff is a porous, bleached light tan rock, exhibiting considerable quartz and sericite wherever it is broken. Yellow-orange iron oxide staining is prevalent, but occasional red limonite on fracture planes is evident. I did not detect any amount of chalcopyrite boxwork, although a little indigenous limonite is present. The quartz-sericite alteration is present over a broad area, and may not be a significant feature; outcrops on the ridge west of Dark Canyon appear similar at a distance to those on the Old Reliable ridge.

Near the water tank, a small mass of gray-green medium grained porphyritic intrusive outcrops, probably a small plug of diorite. Three small breccia masses were found within the andesite tuff on the ridge, but none exhibit any copper staining.

The breccia of the Old Reliable pipe outcrops on the eastern nose of the ridge; it occurs as small knobs and humps of iron-stained ragged appearing rock, with occasional small splashes of copper stain. Flanking the breccia zone on the NE side is a resistant silicified and sericitic mass



VERTICAL SECTION THROUGH OLD RELIABLE MINE, LOOKING SOUTHWEST

SCALE: 1" = 100'

of unbrecciated andesite tuff which forms a cliff-like outcrop. The surface limits of the breccia are shown on the map; within the limiting line are several large unbrecciated blocks of tuff. Surface assays range from 0.09% Cu to 1.2% Cu.

The underground development and breccia limits on the 100 and 200 Levels are shown on the 100-scale map. It is evident that the NE'ly limit of the breccia (hypotenuse of the triangular-shaped mass) pitches well to the SW from the surface to the 100 Level, and then steepens downward. The SW'ly limit is steep to the 100 Level, and then seems to flatten SW'ly to the 200 Level, suggesting an hour-glass configuration of the mass. Only the higher grade portion has been developed, and the SW'ly portion requires additional exploration.

On the 100 and 200 Levels, the iron-stained breccia contrasts sharply with blocky gray-green unbrecciated porphyritic andesite on the flanks. Most of the 100 Level drift is in breccia, with only a few small unbroken blocks. Copper sulfate is wide-spread, and oxidized copper minerals with considerable chalcocite are present. Kuhn describes the mineralization as hypogene chalcopyrite in a gangue of quartz and sericite, with tourmaline, chlorite, apatite, and borite, and with chalcocite commonly present. Joralemon describes the upper lean part of the pipe as oxidized and leached, the ore in the vicinity of the 100 Level as partly enriched, with chalcopyrite, bornite, chalcocite, and a little malochite, and the 200 Level as largely in primary sulfide.

Bureau of Mines sampling of the raise from the 100 Level to the surface shows the upper 127 feet to average 0.4% Cu, and the lower 133 feet to average 1.28% Cu, including 43 feet immediately above the 100 Level which averaged 2.17% Cu. Stoping on the 100 Level was accomplished by shrinkage stoping to a height of 30-40 feet, drawing to close parallel cross-cuts. Only two cross-cuts were driven on the 200 Level.

On the 100 Level, Elsing's report shows that 273 samples within an area of 36,488 sq. ft. averaged 2.73% Cu, or balanced (?), 2.60% Cu. Joralemon states that Bureau of Mines samples on the 100 Level averaged 2.06% Cu, with high grade assays thrown out. On the 200 Level (see Assay Plan, attached), 169 samples through 380 feet of length and 230 feet of width (87,400 sq. ft.) averaged 1.494% Cu, while Elsing's report shows a much more restricted area of 19,536 sq. ft. to average 2.19% Cu, or balanced (?) 2.00% Cu.

The 300 Level, 80 feet below the 200 Level, may have been started to come under the ore body, but did not reach its objective. I did not examine this adit.

Assay plans for the levels in the Copper Prince and Globe mines show the same close spaced sampling as that on the 100 and 200 Levels of the Old Reliable. In the Copper Prince and Globe, however, the assay grade shows a sharp cut-off from ore of 1-2% Cu grade to material assaying 0.3-0.4% Cu, while in the Old Reliable, grades beyond the higher grade limits continue to show 0.7 to 1.0% Cu assays.

Drill-hole information in the Old Reliable was lacking at the mine office, although Chessher may have some data at Reno. Maps indicate that two holes, Swede No. 1 and No. 2 were drilled to test the area north and northwest of the pipe, but no assay data was found. In addition, cuttings samples labeled Acker D.D.H. No. 1 are stored at the mine; but the hole was not located. Metallurgical tests were made by American Cyanamid on a composite drill hole sample of Old Reliable ore, and the Acker samples may have been the source; the composite assayed 1.75% Cu.

In traversing the ridge NW of the Old Reliable, three drill-hole collars, vertical and 10" in diameter, were found. One is marked "Swope-Staggs, 6-15-50"; it may be recalled that Swope also drilled some early holes on Stovall's Bluebird property near Miami. These holes were apparently drilled to test the N 20 E alignment of fracturing and breccia pipes that includes the Globe and Superior pipes to the north. No data was found concerning the holes.

No data was found showing that any holes have been drilled to test downward extension of the mineralization in the Old Reliable below the 200 Level. With the fairly strong mineralization on that level, it would seem that reserves might be projected to 50 feet below the level.

Reserves

Various estimates of the reserves at the Old Reliable have been made; these are tabulated below:

	Vertical above 200 Level.	Ave. Area Sq. Ft.	Tons	Grade, Cu
Elsing, Nov. 1951	143'	28,012	325,000	2.46%
Elsing, 7-28-53	143'	(34,550)	399,000	2.5%
Plus low grade above:	?		1,000,000	0.6%
Total			1,399,000	1.14%
Joralemon, 9-8-50	150'	43,500	372,000	2.41%
Including l.g. areas	150'	55,500	512,000	1.93%
Including l.g. above:	233'		900,000	1.40%
Joralemon, 11-2-51	233'		862,000	1.435%
Trischka Rpt, 2-23-35			600,000	1.75%

Analyzing Joralemon's estimate of 9-8-50, and assuming he used a tonnage factor of 15 (indicated by tonnages given for reserve areas in Copper Prince and Globe), it is calculated that his reserve area on the Old Reliable 200 Level was 60,000 sq. ft., and on the 100 Level, 54,000 sq. ft. Using these figures, but with a tonnage factor of 14, I would estimate the following possible reserve for the Old Reliable breccia ore:

Interval	Vertical	Area	Tons	% Cu	
250 L to 200 L	50'	60,000	214,500	1.43	Ave. BM Spls and Assay Plan
200 L to 100 L	100'	57,000	407,000	1.80	Joralemon
100 L + 133'	133'	54,000	513,000	1.28	BM Spls, Raise
Total Mill ore	283'		1,134,500	1.5%	Mill ore
133' to surface	127'	54,000	490,000	0.4%	Leach Ore

Reserves at the Copper Prince mine (see 100-scale map) have been estimated by Joralemon and Elsing, and are said to total 272,000 tons of 2.4% Cu in the two pipes shown, all lying above 3750-foot elevation, and allowing a deduction of 50,000 tons for ore mined in 1937. The areas used in calculating these reserves fall well within the boundaries of better ore defined by the development and shown on the assay plans, and I believe this is a good conservative estimate.

At the Globe Mine, 236,000 tons of 1.87% Cu have been estimated in a compact group of three pipes, the reserves being developed above the 2nd Level (3945-foot elevation). The ore boundaries shown on the assay plans of the Globe Mine indicate that the area used in calculating the main shaft ore body, 1st level, is conservative in size, while that used in calculating the SE Chimney ore, 2nd Level, is much too large. I would estimate Globe mine reserves at approximately 165,300 tons of 1.96% Cu.

The Globe and Prince reserves, by themselves, do not appear large enough to stand the necessary development costs, but if the Old Reliable ore can be proved economic, calculation may show that these bodies could be mined in conjunction with it. It would require approximately 2400 feet of development drifting to reach the Prince zone, or 4000 feet to reach both zones, plus the preparatory development necessary for mining. It should be remembered that the Siskon lease allows the mining of only 300,000 tons from the Phelps Dodge property.

Metallurgy

No recoverable molybdenum, silver, or gold have been found in the Old Reliable ore; therefore, the metallurgy involves only the recovery of a mixed oxide-sulfide copper content. Although considerable thought has been given to the possibility of mining and heap-leaching, followed by scavenger leaching in place, the many and indefinite variables seem to negate this approach.

American Cyanamid and Arizona Bureau of Mines have conducted tests on a composite drill-hole sample of Old Reliable ore to determine its amenability to the LPF process, in which the ore is ground sufficiently to release the sulfide minerals, the ground ore is leached with acid under controlled conditions, the copper is precipitated on scrap iron in drum agitators, and then a combined cement copper-sulfide float is made. The process, as used by Miami, is fully described in Mining Engineering, Dec. 1960. In the laboratory, the LPF tests indicate a 90% recovery from Old Reliable ore assaying 1.72% Cu, with an acid consumption of 1.16 lb. per lb. of copper, and an iron consumption of 0.57 lb. per lb. of copper.

In Miami's 1957 operation, 1,105,600 tons of ore assaying 0.877% Cu (0.500% ox. Cu and 0.377% sul. Cu) were treated in the LPF mill. A 77% recovery was made, with consumption of 2.19 lb. acid, 0.76 lb. Fe, and 0.165 lb. lime plus minor amounts of flotation reagents per over-all pound of copper recovered.

In the light of American Cyanamid's tests and the Miami operation, I believe an 80% recovery of copper might be made by LPF concentration of Old Relisble ore, with a consumption of 2.0 lbs. acid, 0.75 lbs. Fe, and 0.165 lbs. lime per pound of recovered copper. On this basis, milling costs may be estimated as follows:

Feed 1.5% Cu or 30 lbs/ton.	Recovery 80%, or 24 lbs/ton.		
Per ton feed:	Acid, 48 lbs. @ 1.5¢		$0.72
	Iron, 18 lbs. @ 2.5¢		$0.45
	Lime, 4 lbs. @ 1.5¢		$0.06
	Labor		$0.70
	Power		$0.60
	Miscellaneous, incl. maint.		$0.85
			$3.38/ton
		Per lb. Cu	$0.155

Mining

A few trial sections through the Old Reliable ore body indicate that surface stripping with benches at 45° would require the moving of 6,700,000 tons of waste and low grade to mine 1,188,000 tons (the block from the 250 Level to the 100 Level + 133'), a waste: ore ratio of 5.65 to 1. The stripped rock would include some 670,000 tons of low grade containing perhaps 4 million pounds of copper recoverable by leaching, but mining cost for the mill ore would be approximately $5.32 per ton, too much for the ore body to stand.

With a fairly sharp contact between the blocky to massive tuff and the breccia ore mass, and a fairly high column, the ore body would appear to be amenable to mining by the block-caving method. This would be accomplished by widening and extending the 300 Level adit on a slight decline to reach beneath the ore body at a depth of about 60 feet (El. 3540'), and establishing a trackless haulage system. San Manuel's efficiency figures indicate that approximately 1700 man shifts are involved in preparing a block 150 x 150 feet for caving; approximately 3 such blocks would cover the Old Reliable ore zone.

Assuming labor costs at $20 per man shift, 5100 man shifts would total $102,000. Double this for supply costs, giving a development cost of $204,000 for the 3 blocks, plus $100,000 for the haulage tunnel, or 27¢ per ton for development.

San Manuel under-cut crews average 114.46 sq. ft. per man-shift in the procedure of starting the cave; 520 man shifts would start the Old Reliable cave. Thus, including powder, the actual breaking costs should be about 5¢ per ton.

If $1.00 per ton is added for loading, tramming, and mine general expense, the approximate mining cost should then be about $1.32 per ton. Admittedly, the figures are "horsebacked", and will require much closer investigation if the mine is of interest. They are offered here to determine whether there is a possibility fo profitable operation.

Overhead and indirect expenses are estimated at 20% of direct mining and milling costs, or $0.94 per ton. Estimated costs are summarized below:

	Per Ton	Per lb. Cu
Direct mining cost	$1.32	$0.055
Direct milling	3.38	0.155
Overhead and Indirect	0.94	0.039
	$5.64	$0.249

Smelting

Assuming the grade is 1.5%, 80% recovery and 30:1 concentration ratio yields a concentrate of 36% Cu. Inspiration's Open Schedule indicates that this grade of concentrate would yield a payment of $189.00 per ton, less treatment charges of $21.45 and freight costs estimated at $7.00, or a net pay of $160.55 per ton. At 30:1 CR, the crude ore would have a value of $5.35 per ton, or 22.3¢ per pound of recoverable copper.

Conclusions

The Old Reliable offering is somewhat peculiar in that the property obviously contains quite a large number of pounds of copper in a deposit which is structurally adaptable to low-cost mining methods. Various analyses and profit estimates have been made, using varying grades and costs, with some suggesting potentially high profits, and I felt the property deserved a careful analysis.

In block-caving, or in any of the low-cost volume tonnage mining methods, the ore cannot be selectively mined for separated higher grades. I think 1.5% Cu is a fair average grade for the body, and it is obviously uneconomic. Further, even if a 2.4% grade was possible, an 80% recovery and the necessary amortization costs would eliminate the possibility of profit.

For these reasons, I conclude that the developed ore on the Old Reliable is not of interest to Hecla. As for the potential disseminated ore in the ridge area to the northwest, it is an unknown. The mode of ore occurrence within the district, concentrated within localized breccia zones surrounded by blocky to massive, weakly mineralized rock, does not suggest the presence of large disseminated bodies. The quartz-sericite type of alteration, however, is often associated with major mineralization. Outcrops on the ridge suggest the former presence of some copper along fractures, but not a strong mineralization.

The southwesterly portion of the ridge area has been tested by Bear Creek DDH No. 3. The northwesterly part was apparently tested by the Swope hole to an unknown depth. No mineralization is reported in Bear Creek holes 3 or 10, and no activity ever resulted from the Swope drilling, indicating negative results.

The mineralization in Bear Creek DDH No. 2, on the American Eagle claim, is apparently the downward extension of that developed to the 300 Level in the upper workings. Here, ore was confined to a fracture zone, said to be 50 feet wide on the 300 Level, trending N 60 E and dipping 70 N. The ore in the drill hole is of relatively limited extent, 180' of 1.13% Cu and 0.178% Mo, at a depth of about 1300 feet, and with a value of about $9.30 per ton. It seems of unlikely interest.

Bear Creek, in its earlier exploration of the district, apparently had not acquired rights in the Childs-Aldwinkle ground. They are apparently now going to concentrate exploration in that property.

Pennebaker has expressed interest in seeing the district, and we may again examine the outcrops NW of the Old Reliable, but for the present, I do not feel that the Siskon offering is of interest.

Respectfully submitted,

J Douglas Bell
Geologist, Exploration

JDB:jan

TO: Mr. H. E. Harper

FROM: J Douglas Bell

SUBJECT: Enclosure, Siskon Copper Creek Report

DATE: 25 January 1964

Enclosed, Herb, is my analysis and report on Siskon's offering of its Copper Creek properties.

The Kuhn bulletin on the pipe deposits should be returned to Pennebaker after you've had a look at it. The two Siskon files should be returned to Mr. Chessher after separating correspondence directed to me.

Will you inform Mr. Chessher of your opinion concerning our interest in the property, perhaps with some reservation dependent on a later look by Pennebaker?

Best regards,

J Douglas Bell
Geologist, Exploration

JDB:jan

Enclosure: Siskon Copper Creek Report

Hotel Florence
Florence, Arizona
June 1, 1949

Mr. E.N. Pennebaker
Box 2996
Globe, Arizona

Dear Mr. Pennebaker:

The areas listed below have either not been looked at at all or should be examined before leaving this area, I believe.

The old Troy Mine This may be located on the Ray quadrangle. To get to Troy now you have to go to Winkelman and drive over the Winkelman-Globe highway until you get to Dripping Springs Wash. You then drive up this wash on the old Globe-Kelvin road.

According to one of the old timers one of the tunnels there assayed .75% Cu for about 500 ft. The air is bad in this tunnel though so caution will have to be used in entering it.

On the way to the Troy Mine you will pass by the Nora Belle claims which I described in my report on the various properties that I have examined.

Knudle Mt. Area This area lies between Cochran and the Silver Bell Mine. Both of these points can be located on the Florence quadrangle. The contact between the Pinal schist and pre-Cambrian granite should be checked in this area also.

Winkelman Coal fields Area Mr. Jimmy Owens, Box 1431, Miami, Arizona has an area that he wants us to look at which is near the coal fields and about 25 miles E of Wilkelman. It is someplace near the Saunders Ranch at the head of Hawk Canyon.

Crozier Peak Area Crozier Peak can be located on the Winkelman quadrangle. It is about 5 miles SW of Winkelman. Mr. Bittick of Winkelman has some claims there and would like for us to look at them. The nearest that we have been to this area is the Florence road to Dudleyville and Hackberry Wash.

Consolidated Gold and Copper Co. To get to this property you take the Florence-Ray road and turn left eleven miles from Florence on the Whitlow Ranch road. There is quite a large area of fair looking capping here and I think the area should be mapped.

Sincerely yours,

M. R. Arrowsmith

M.R. Arrowsmith

Copy/J. Hope Jr.

REPORT ON PINAL COUNTY PROPERTIES
As Examined
By
M.R. Arrowsmith

Ripsey Mine Described in Tortilla Mt. report.

Kelvin-Sultana Described in Tortilla Mt. Report.

Bob Edward's Property Located in the Owl Heads Mining District about 26 miles south of Florence just west of the Florence-Tucson highway. See report by John Hope, Jr..

Jimmy Owens Property Located in the Owl Heads Mining District about a mile south of the Edwards Property. A N-S vein runs through the mill here and some ore has been taken out. The ore is a copper silicate and the vein averages about 2 feet in thickness.

Mrs. Ferguson Property This property is located across the highway to the east from the Edwards and Owens properties. This property is on the desert and very few outcrops are present to look at.

Most of the rocks exposed are copper stained. This property was drilled by A.S.& R. sometine in the early 1900's.

Kullmann-McCool Mine This property is in Sec. 27, 28, Range 15 E, Township 4 S. It is between the "79" Mine Property and the Chilleta Property, which was recently drilled by Kennecott.

The deposit is a replacement deposit in the Martin limestone.

Sulphides and carbonates of lead and copper were seen in the various shafts and tunnels. Some wulfenite was also present.

This property comprises part of the old London-Arizona Mine which is described by Ransome in the Ray Folio.

Victor Lamb Property This is a lead property and is located in the Mineral Mountain area north of Florence. There are a lot of lead prospects in this area but all of them appear to be pockety.

This property was examined by Eagle-Picher and turned down as being too small.

Of all of the properties that I looked at in the Mineral Mt. region this one looked the most promising.

The Silver Queen claims which comprise the property are cut by about 40 feet of calcite which runs roughly E-W and contains pockets of galena throughout it.

Magma Junction Property This property is west of Magma Junction and was formerly owned by the Magma Copper Company.

This property has been drilled by Magma, is in pre-Cambrian granite, and has some relief limonite after chalcocite in the granite.

To more fully understand the value of this property, I think that it whould be mapped or several self-potential lines run across it.

Neither of the holes were drilled over the good looking capping.

Guild Property This property is near the Owl Heads, south of Florence. To get to the area, you drive on the Florence-Tucson highway until you come to the Palo Verde Ranch road then you take it to the Owl Heads.

Part of this property is similar to the Edward's property. The copper stains here are found in pre-Cambrian granite and in Pinal schist. Some of the volcanics carry peculiar green stains too but these may not be caused from copper.

XXXXXXXXXXXXX

P. O. Box 2996
Globe, Arizona

September 6, 1948

Mr. John A. Richards
Mammoth - St. Anthony, Limited
Tiger, Arizona

Dear Jack:

In reply to my query, Eldred Wilson of the Arizona Bureau of Mines forwarded me copies of two articles dealing with the Copper Creek area in the Galiuro Mountains. The mine we looked at is named the "Old Reliable".

The articles are:

(1) U. S. Bureau of Mines Report of Investigations No. 4006, entitled "Old Reliable Copper Mine, Pinal County, Arizona" by Thomas C. Denton, February, 1947. This contains the results of Kumke's sampling.

(2) An article in Economic Geology for August, 1941, entitled, "Pipe Deposits of the Copper Creek Area, Arizona," by Truman H. Kuhn.

The Bureau of Mines report is easily obtainable.

With kindest regards,

Yours sincerely,

cc: John Hope, Jr.

University of Arizona
TUCSON

COLLEGE OF MINES
ARIZONA BUREAU OF MINES

September 3, 1948

Mr. E. N. Pennebaker
P.O.Box 2996
Globe, Arizona

Dear Mr. Pennebaker:

In reply to your letter of August 31, the Copper State Company worked the Old Reliable mine, in the Copper Creek district. It is one which Kumke examined, and it has been described by the U. S. Bureau of Mines in their R.I. 4006. Mr. Hedges kindly dug up a spare copy of this for you. We are sending it under separate cover together with a reprint of Kuhn's article.

We have in our office a copy of Kuhn's thesis, in case you want to see it when you are down this way.

With kindest regards,

Yours sincerely,

Eldred D. Wilson

Eldred D. Wilson
Geologist

T. 8 S. R 18 E.

BUNKER HILL MINING DISTRICT

COPPER CREEK, PINAL COUNTY
ARIZONA
-1957-

SCALE: 1" = 600'
MAG. DECL. 14°

RED SISKON
DASHED RED - LEASED BY SISKON
HACHURED RED - OFFERED TO BEAR CK
YELLOW PHELPS DODGE

BLUE CHILDS ALDWINKLE
REPORTEDLY LEASED BY BEAR CK, 1969

GREEN BEAR CREEK

Geology: From KUHN, MARCH, 1940.
Note: DDH 1 thru 12 were drilled by Bear Creek in 1960-61.

Note: Kuhn, 1940, maps 120-125 breccia pipes in district. All not shown.
grd - granodiorite
Ks - Cretaceous sediments
Kt - Andesite tuff

MAIN FRACTURE TREND IN SECTIONS 9, 10, and 11 is E-W.

MAIN FRACTURE TREND IS E-W

MAIN FRACTURE TREND N60E IN THIS SECTION

KENNECOTT - BEAR CREEK

Copper Creek P.O.

CC NO. 11

CC NO. 9

NAVAJO NO. 1

N.5 W 840' from drill-hole to Globe Shaft.
At Globe Mine, 3 small pipes.
Shaft Pipe
150 L. El. 4046 36,000 T. 3.15% Cu (Appears larger on assay map - apx 65,000 T. - JDB)
250 L. El. 3946 50,000 T. 1.44%
Southeast Pipe
250 L. El. 3946 128,000 T 1.67% (Appears much smaller - apx 29,000 T. - JDB)
South Pipe
250 L. El. 3946 22,000 T. 1.98%

COPPER PRINCE Shaft Ore Body
1st L. El. 3950 180,000 T. 2.64%
2nd L. El. 3850 92,000 T. 2.64%
3rd L. El. 3750 11,000 T. 2.15%
Jeralemon estimate 1909 ?, less 50,000 T. ? mined 1937.

EAST ORE BODY
2nd L. 39,000 T. 2.57%
3rd L. No estimate.

PHELPS DODGE
SISKON CORP.

CC NO. 12

Holes apparently drilled to test a NNE'ly alignment of breccia pipes leading toward Globe pipe to NNE.
Vertical holes, no collars, no information

NAVAJO NO. 3

DARK CANYON

FORTUNA - 4059

MODERATE SLOPES

GOOD LUCK - 4059

andesite tuff
granodiorite

DH
SWOPE STAKED 6-18-50

Siliceous & sericitic andesite tuff

NAVAJO NO. 5

VERY STEEP DOWN

bx

70-90

Resistant ribs of silicified and sericitized andesite tuff, well bleached. Occas. red limonite on fractures.

CC-1 △ BEAR CK TRIANG.

Ridge top is broad and flat, good drilling surface.

4250'

gd

Apparently a small plug of granodiorite intruding the andesite tuff

WEDGE 4059

Outside DDH No. 1

WATER TANK

4200
4150
4100
4050
4000
3950
3900
3850
3800
3750

In place leach experimental area

Outside DDH No. 2

Silicified & sericitized andesite tuff

bleached, sericitic, siliceous tuff

BC DDH 10
0°-60° 1363.5'

? Breccia Limit on Surface

? Breccia Limit on 100 Level ?

? Breccia Limit on 200 Level ?

EL. 3750'

EL. 3649'

MILL

granodiorite
andesite tuff

NAVAJO NO. 4

STEEP SLOPES

OLD RELIABLE - 4059

BC DDH 30
Vert. 1855.5'

200 LEVEL OLD RELIABLE

EL. 3580.9'

NAVAJO NO. 8

COPPER CREEK

CAMP

TO MAMMOTH

CAMINO

GULCH - 4059

SISKON CORP.
CHILDS - ALDWINKLE

N

OLD RELIABLE AREA
BUNKER HILL MINING DISTRICT
PINAL COUNTY, ARIZONA
SCALE: 1" = 100'

JDB

1-24-1964