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Arizona Geological Survey
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Tucson, Arizona 85701
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inquiries@azgs.az.gov

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REPORT ON THE

YELLOW JACKET MINE PROPERTY

Wikieup, Mohave County, Arizona, U.S.A.

FOR: Canamex Industries Ltd.

December 7, 1982

REPORT ON THE

YELLOW JACKET MINE PROPERTY

WIKIEUP, MOHAVE COUNTY
ARIZONA, U.S.A.

FOR

CANAMEX INDUSTRIES LTD.
24th Floor
1066 West Hastings Street
P.O. Box 12534
Vancouver, B.C. V6E 3X1

BY

M. H. Sanguinetti, P.Eng.

CORDILLERAN ENGINEERING
1418-355 Burrard Street
Vancouver, B.C. V6C 2G8

Vancouver, B.C., Canada

December 7, 1982

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S U M M A R Y & C O N C L U S I O N S

The Yellow Jacket Mine property consists of 18 contiguous mining claims in the Cedar (Aubry) Mining District, Arizona. The property is in good standing, the 1982 assessment work having been filed. Road access is from Wikieup, 6 miles to the northeast. The terrain is foothills to low mountains, moderately rugged with about 400 feet of relief. Vegetation is sparse.

The claims lie in an area of Precambrian granite and schist intruded by early Tertiary dykes and sills. Mineralization at the Yellow Jacket consists of granite and porphyry breccias cemented in part by sulphides carrying values in gold, silver, zinc, copper, lead and cadmium. These breccias occur along northwest trending shears or fracture zones which dip steeply to the southwest. The width of the breccia zones varies but was noted to pinch and swell both along strike and down dip. The main breccia vein (Vein No.2) is reported to exceed 16 feet in width at a depth of 150 feet, but was observed to increase from 2 inches to about 10 feet over a down-dip distance of approximately 75 feet. Strike length of the breccia veins exceeds 600 feet; parallel limonite stained shears have been observed along a strike length of more than 1000 feet.

Grab and chip samples were collected from surface, from underground and from old dump material. A composite suite of high grade samples

SUMMARY AND CONCLUSIONS

from the decline dump assayed: gold 1.355 oz/t; silver 21.85 oz/t and zinc 29.30%. Higher grade samples have been reported. The averages of one shipment of 69 tons made in 1975 are: gold 0.435 oz/t; silver 15.73 oz/t; zinc 53.05%; copper 2.19%; lead 2.75% and cadmium 0.25%.

The property has been developed by two adits, several small pits, a shaft (400 feet+) now caved and partially reopened as a decline. A mill operated on the property, probably around World War I, but no records of production have been located. Approximately 700 tons of high grade material was mined from the decline during the period 1972 to 1975.

Potential exists for the location of several swells or pods of mineralized breccia along the shear zones. A strike length of 1000 feet is indicated, three breccia-veins have been observed, and a down-dip length of more than 150 feet has been shown to exist. A small tonnage, high-grade operation is envisaged with possibly 10,000 tons in each mineable pod. The grade of this material could be expected to be less than that shipped in the past, possibly averaging 0.3 oz/t gold, 10 oz/t silver, 10% zinc and 2% copper. Exploration directed to the location of four or five pods of such material is recommended. Another possible source of revenue is the pyritized granite, a sample of which assayed 0.008 oz/t gold and 1.03 oz/t silver. Investigation of this material should be a high priority. Providing that a suitable option or working agreement can be worked out with the vendors, acquisition of this property is warranted.

A two-phase success contingent program is recommended. The first phase would consist of grid preparation, mapping, geochemistry, sampling, ground geophysics and diamond drilling (1000 feet, BQWL) at an estimated cost of $100,000 (Cdn.). The second phase would consist of 5000 feet of BQWL diamond drilling at an estimated cost of $200,000 (Cdn.).

INTRODUCTION

The Yellow Jacket Mine property of 18 contiguous mineral claims is situated in the Hualpai Mountains, 6 miles southwest of the town of Wikieup and 56 miles by road southeast of Kingman, Arizona. The property was examined on November 3, 1982 in the company of Mr. Wirt Cunningham. Access was by pickup truck from Kingman. Mr. Cunningham, a contractor who had previously mined on the property when under lease, owns nine claims through the Arizona Mining Company and controls a further nine claims under lease from Gold Silver Resources, Inc.

The terrain is moderately rugged with about 400 feet of relief. Vegetation is sparse. Sufficient water for exploration or small scale mining is available from a well on the property; electrical power is available from Wikieup.

Mineralized breccia veins occur in a sheared or faulted Precambrian granite which has been intruded by younger dykes. The breccia fragments have been cemented by sulphides carrying values in gold, silver, zinc, copper, lead and cadmium.

Development consists of two adits, several small pits, bulldozer trenching, an open decline and a 400 foot (+) shaft (now backfilled). While no records are available for earlier work around World War I, a mill site and waste dump indicate the previous existence of a small tonnage highgrade operation. Recent development (1975) has included shipment of 700 tons of highgrade material. A shipment of 69 tons to Asarco's Amarillo smelter averaged gold 0.435 oz/t; silver 15.73 oz/t; zinc 53.05%; copper 2.19%, lead 2.75% and cadmium 0.25%.

INTRODUCTION

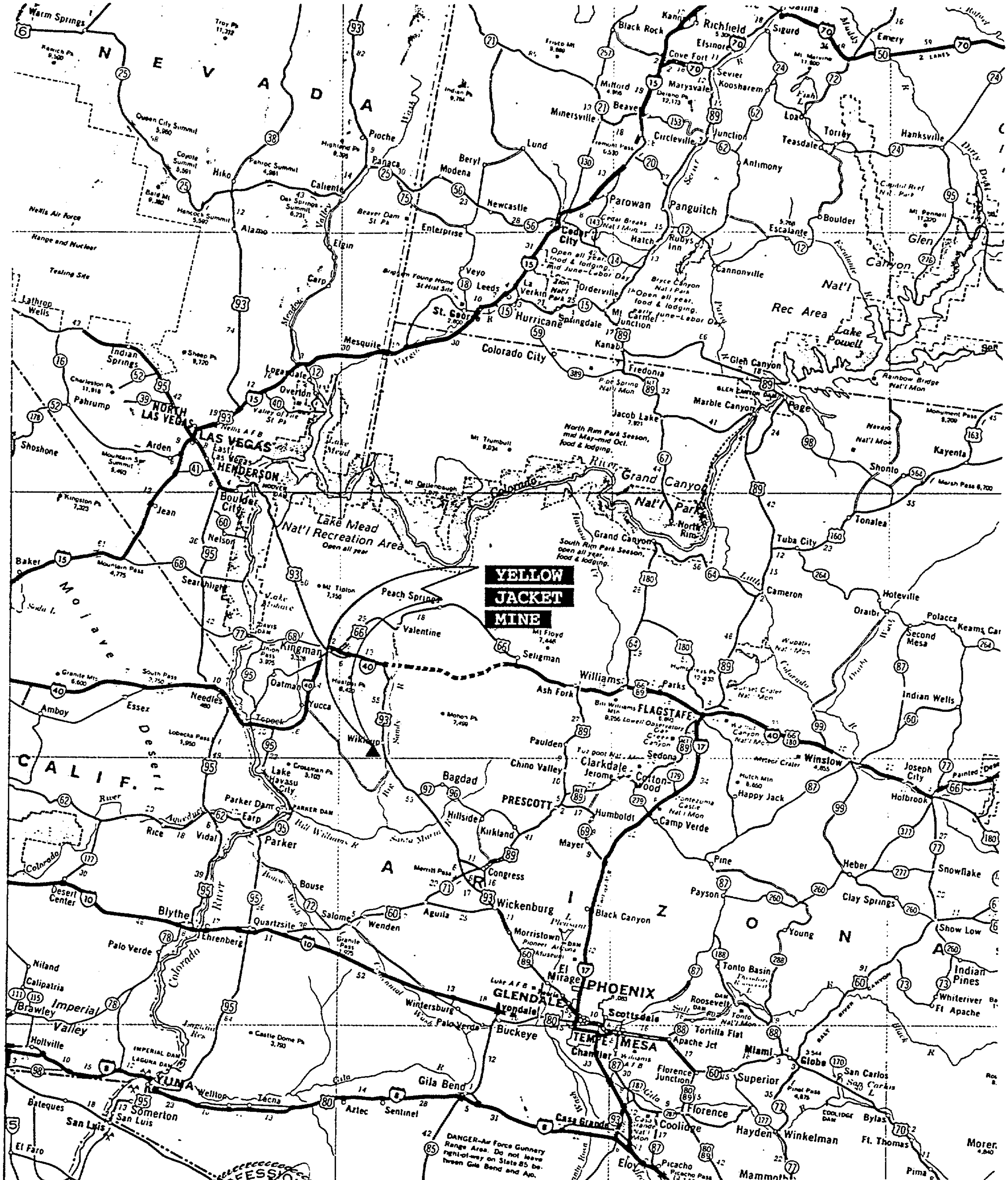
Mineralization has been observed in narrow shears and breccia zones along a strike length of more than 600 feet. A possible strike length exceeding 1000 feet was observed in narrow limonite fractures and shears. While surface widths are very narrow, a considerable increase with depth has been demonstrated. The main breccia "vein" is 2 inches wide on surface and is reported to exceed 16 feet in width at a down-dip distance of 150 feet. Three mineralized breccia veins were observed with a good potential for locating other parallel shears. Potential also exists for the location of small economic pods of mineralized breccia material both down dip and along strike on these shear zones.

LOCATION & ACCESS

(Figure 1)

The claims are located in the Hualpai Mountains, Mohave County, Arizona in Sections 2 and 11, Township 15N, Range 14W, Gila-Salt River Base Line and Meridian.

Road access was by light truck from Kingman, Arizona. From the adit area a 2 mile dirt road joins the Chicken Springs gravel road about 6 miles southwest of Wikieup. Wikieup is on Arizona State Highway No.93, approximately 56 miles southeast of Kingman.



PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. H. SANGUINETTI

LOCATION MAP

YELLOW JACKET MINE PROPERTY

MOHAVE COUNTY, ARIZONA

0 25 50 75 mi.

December, 1982

FIGURE 1

PROPERTY

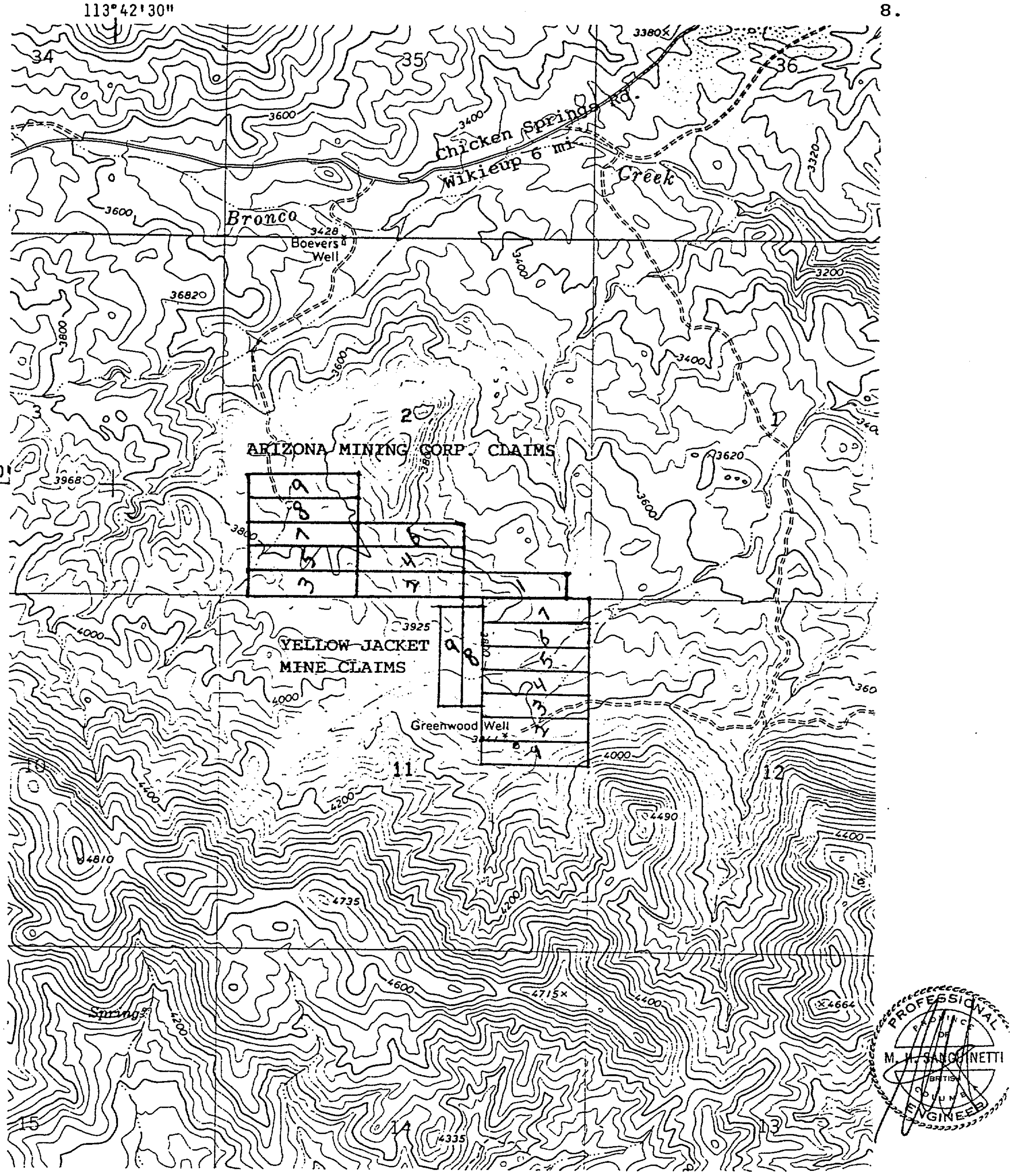
(Figure 2)

The Yellow Jacket property consists of 18 Arizona mining claims in the Cedar (Aubrey) District registered in the name of Gold Silver Resources, Inc. (Hoffman et al) and Arizona Mining Company (W.& J.Cunningham). Claim records were checked at the County Court House in Kingman, Arizona.

Arizona Mining Company (Cunningham) claims	(37465-37473)	recorded in Book 257, pages 68 to 76
Yellow Jacket Mines (Hoffman) claims	(37474-37482)	recorded in Book 6V, pages 324 to 332.

Affidavits for assessment work for 1981 and 1982 on all claims were inspected. They are in Book 867, pages 629 and 630. Two monuments (claim posts) were noted in the field.

The nine Yellow Jacket Mine claims, owned by Gold Silver Resources, Inc., are under lease to W. & J. Cunningham.



NB: SKETCH PROVIDED
BY W.Cunningham

R 14W

0 1000 2000 3000 ft.
1:24,000

C L A I M M A P

YELLOW JACKET MINE PROPERTY
Mohave County, Arizona

December, 1982

FIGURE 2

PHYSIOGRAPHY, VEGETATION, CLIMATE

The terrain is situated in foothills to low mountain country and is moderately rugged. Mean elevation is around 3900 feet above sea level, relief is about 400 feet.

Vegetation is sparse, consisting of grasses, mesquite bushes, stunted juniper and cypress and a variety of cacti.

The climate is semi-arid, mild in winter and warm with cool nights in the summer. The rainy season occurs during July and August. Sufficient water for mining purposes is available from a well on the property.

HISTORY

The Yellow Jacket property has undergone intermittent exploration since World War I. No records are available for production prior to 1972 but it is known that concentrates were shipped. The upper oxidized mineralization was explored by shafts and trenches. One shaft was sunk to over 400 feet and possibly to 600 feet on the main breccia-gouge contact zone. Ore from this shaft was supplied to a mill located on the property. This shaft was filled in and later reopened as the existing open cut decline. The older workings, in addition to the shafts, included 195 feet of adit cross-cut.

Two small adits totalling 303 feet, as well as more than 500 feet of long hole drilling, were completed by Gold-Silver Resources after 1972. These workings are presently inaccessible.

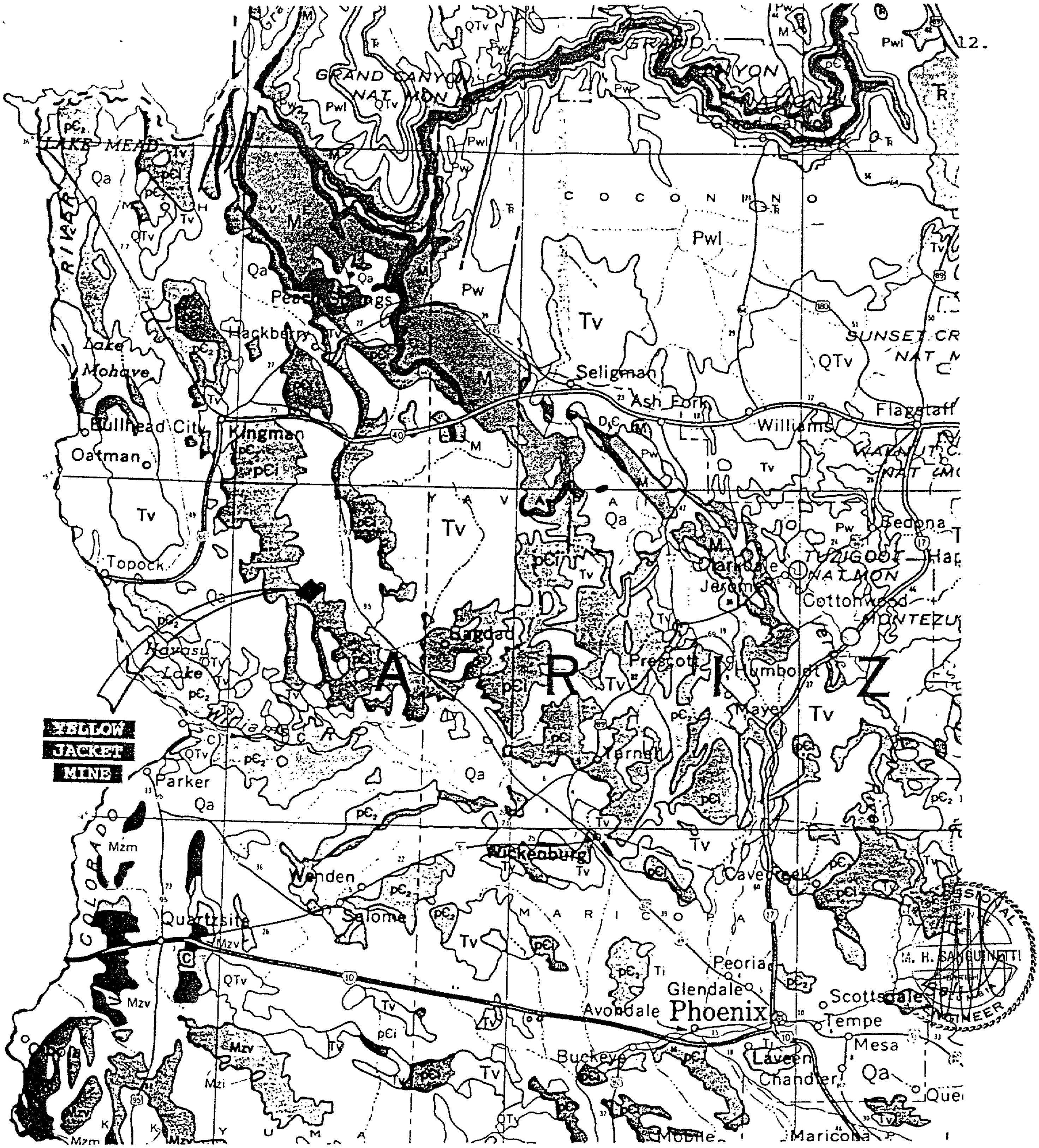
Between 1972 and 1975 an open cut decline was driven to exploit mineralization in the old shaft. During 1974-75 ore from this decline totalling 700 tons (averaging 0.435 oz/t gold, 15.73 oz/t silver, 53.05% zinc, 2.19% copper, 2.75% lead and 0.25% cadmium) was shipped to the Asarco smelter at Amarillo, Texas. This operation was reportedly stopped by the state mining inspector in 1975.

In addition, geophysics in the form of induced polarization, resistivity, self potential and magnetic surveys were completed in 1971 and 1972.

REGIONAL GEOLOGY

(Figure 3)

The Yellow Jacket property is situated in the Hualpai Mountain Range between Kingman and Wickenburg, Arizona. This range is primarily Precambrian granites and local Precambrian metasediments (schists). Some porphyritic granite has been reported. Tertiary (Eocene) volcanics and granite occur both within and overlying the Precambrian units.



EXPLANATION	
Qa	Quaternary alluvium
Tv	Tertiary volcanics
PЄ₂	Precambrian metamorphic rocks
pЄi	Precambrian granite

After: Geological Highway Map of the Southern Rocky Mountain Region.. A.A.P.G. 1967.

REGIONAL GEOLOGY

YELLOW JACKET MINE AREA

MOHAVE COUNTY, ARIZONA

0 10 20 30 40 50 mi.

December,1982

FIGURE 3

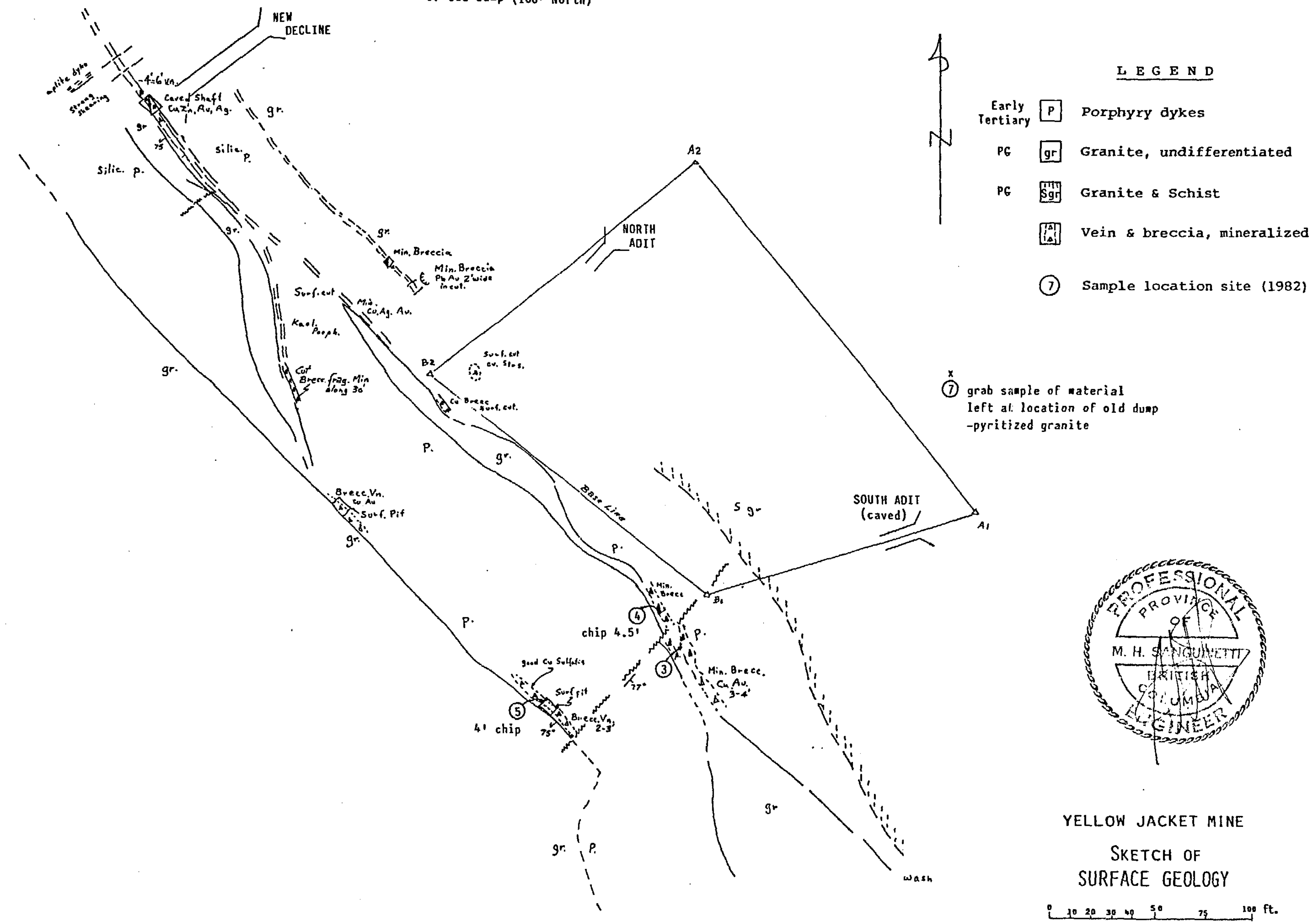
E C O N O M I C   G E O L O G Y

(Figures 4, 5)

On the Yellow Jacket Mine property, three mineralized brecciated shear zones or veins are exposed on surface, in underground workings, in the shaft/decline area and in pits. Breccia zones have developed along shears at the contact of younger intrusions with Precambrian granites. These intrusions consist of numerous dykes composed of andesite, rhyolite, pegmatite and aplite which may be related to different stages of fracturing or faulting.

The principal shear zones and mineralized breccias have a northwesterly trend with a steep southwesterly dip. Interpretation of a 1971 McPhar geophysical survey (IP and resistivity) shows this southwest dip and a rake to the southeast. A surface strike length exceeding 600 feet has been observed while the down dip exposure, in the vertical shaft (decline) area is reported to be over 400 feet and possibly to as much as 600 feet (Anderson, 1975). The width of mineralized breccia widens from a few inches on surface to sixteen feet at a depth of 150 feet in the decline. The shape of the individual breccia bodies can be expected to pinch and swell both along strike and down dip.

The breccia fragments are cemented by a mixture of quartz, carbonate, pyrite, sphalerite, chalcopyrite and galena and contain values in gold, silver, zinc, copper, lead and cadmium. Sulphides occur within the breccias as part of the matrix, in tight shear zones and in fractures. Intense



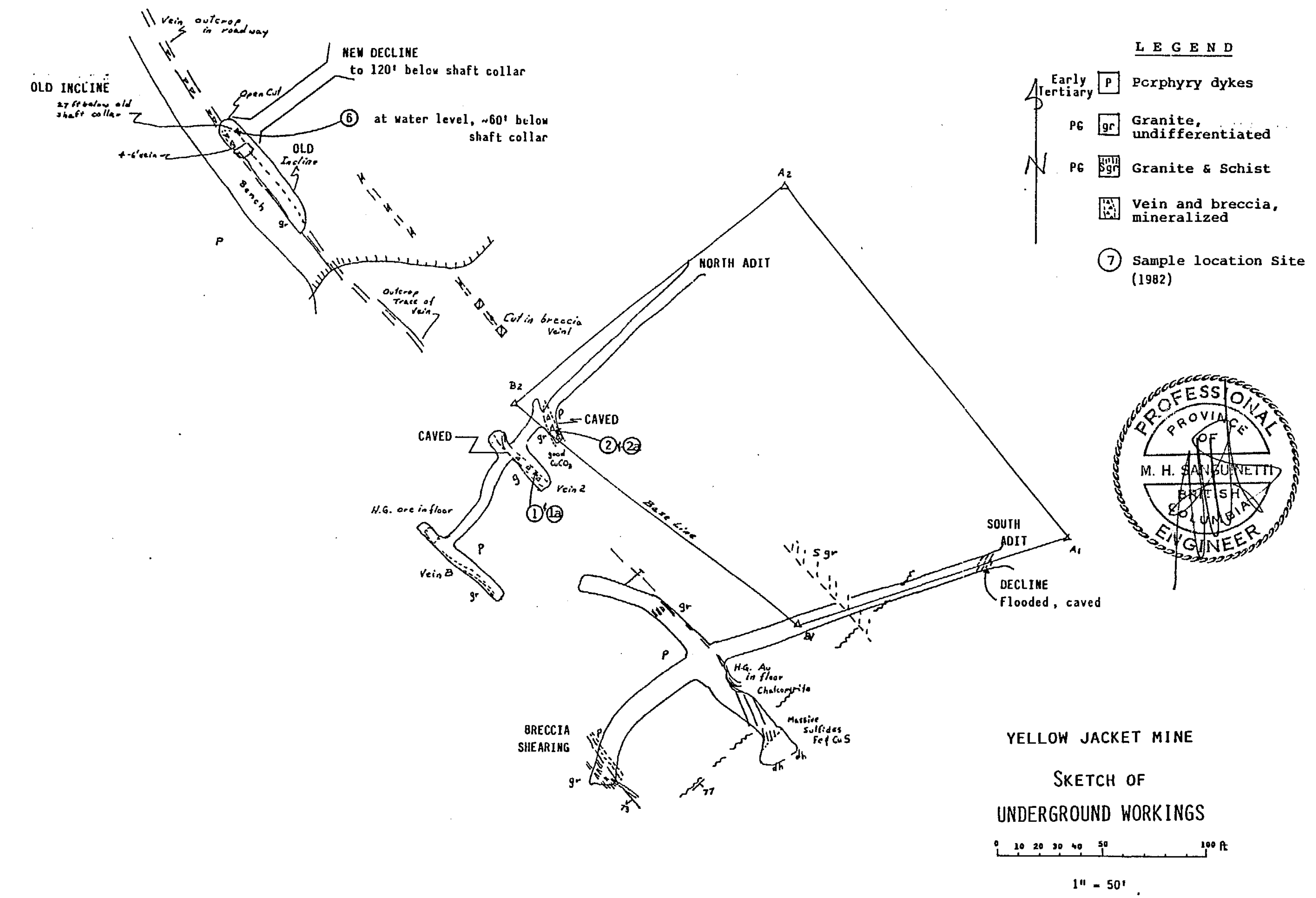
YELLOW JACKET MINE

SKETCH OF SURFACE GEOLOGY

December, 1982

FIGURE 4

Note: Traced from Map No.2, by C.R.Ranney, May,1974.



Note: Traced from Map No.3, by C.R.Ranney, May,1974.

December, 1982

FIGURE 5

E C O N O M I C   G E O L O G Y

(Figures 4, 5)

On the Yellow Jacket Mine property, three mineralized brecciated shear zones or veins are exposed on surface, in underground workings, in the shaft/decline area and in pits. Breccia zones have developed along shears at the contact of younger intrusions with Precambrian granites. These intrusions consist of numerous dykes composed of andesite, rhyolite, pegmatite and aplite which may be related to different stages of fracturing or faulting.

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The breccia fragments are cemented by a mixture of quartz, carbonate, pyrite, sphalerite, chalcopyrite and galena and contain values in gold, silver, zinc, copper, lead and cadmium. Sulphides occur within the breccias as part of the matrix, in tight shear zones and in fractures. Intense

CONOMIC GEOLOGY

ocal pinching and swelling was noted on both breccia veins in the north adit.

Minor amounts of gold, silver, zinc and copper were noted at all ites where the breccia material or fracturing was sampled. Of significant nterest is a grab sample of pyritized granite (R 2085 - No.7) collected from waste dump area outside the south adit. It contained approximately 5% pyrite nd no other sulphides but returned 0.008 oz/t gold and 1.03 oz/t silver. This ample may represent a Tertiary granite porphyry dyke since it has been observed hat Tertiary granites in this area are often pyrite bearing (Hauck and Bell, 971).

R E C O M M E N D A T I O N S

The following success-contingent exploration program is recommended on the Yellow Jacket claim group at estimated costs of $100,000 (Cdn.) for Phase I and $200,000 (Cdn.) for Phase II.

PHASE I

- Establish control grid
- Geological mapping
- Geochemical soil survey
- Clean out and drain, map and sample all underground workings, pits and open cuts
- Conduct VLF electromagnetic survey across mineralized structure
- Diamond drilling (BQWL): allow 1000 feet in 4 holes to test the mineralized structure at depth.

PHASE II

Contingent upon the success of Phase I a program of diamond drilling to test the mineralized structures at depth and along strike is recommended

- Allow 5000 feet.

Respectfully submitted

CORDILLERAN ENGINEERING

M. H. Sanguinetti, P.Eng.

December 7, 1982
Vancouver, B.C., Canada

APPENDIX "A"

WRITER'S CERTIFICATE

CORDILLERAN ENGINEERING

1418 MARINE BUILDING, 355 BURRARD STREET, VANCOUVER, BRITISH COLUMBIA V6C 2G8 TEL: (604) 681-8381

WRITER'S CERTIFICATE

I, Michael H. Sanguinetti of Vancouver, British Columbia hereby certify that:

1. I am a geologist residing at 2208 West 35th Avenue, and employed by Cordilleran Engineering of 1418-355 Burrard Street, Vancouver, British Columbia.

2. I am a graduate of the University of British Columbia, B.Sc., in 1965, and have practiced by profession since that time.

3. I am a member of the Association of Professional Engineers of the Province of British Columbia.

4. I am the author of this report which is based on a study of private and published reports and on an examination of the Yellow Jacket Mine property near Wikieup, Arizona in the company of Mr. Wirt Cunningham on November 3, 1982.

5. I own no direct or indirect beneficial interest in the above property nor in the shares or securities of Canamex Industries Ltd., nor do I expect to receive any such interest.

6. I hereby consent to the publication of this report in a prospectus or a statement of material facts.

PROFESSIONAL
PROVINCE OF
M. H. SANGUINETTI
BRITISH COLUMBIA
ENGINEER

CORDILLERAN ENGINEERING

Michael H. Sanguinetti, B.Sc., P.Eng.,
Geologist

MHS/z
December 7, 1982
Vancouver, B.C., Canada

APPENDIX "B"

ESTIMATED COST OF RECOMMENDED PROGRAM

APPENDIX "B"

ESTIMATED COST OF RECOMMENDED PROGRAM

PHASE I

PROGRAM:

Grid preparation
Geological mapping
Geochemistry
Clean out, mapping, sampling of old workings
Geophysical test
Diamond drilling (1000 feet BQWL)

ESTIMATED FIELD DURATION: 2 months

ESTIMATED COST:

Salaries			
Geologist	3 mos x $2500/mo	$ 7,500	
Assistant	2 mos x $2000/mo	4,000	
	Overtime	2,500	
	Benefits	1,500	$ 15,500
Fees:			
Management		10,000	
Professional	20 days x $350/day	7,000	17,000
Diamond drilling (BQWL)			
Mobilization/demobilization		1,000	
1000 feet x $18.00/ft		18,000	
Consumables		5,000	
Board, lodging		1,000	25,000
General Expenses:			
Travel		3,000	
Vehicle rental (4 wd: 2 mo x $1000/mo)		2,000	
Fuel		1,000	
Food, lodging		2,500	
Assays (50 x $45: Au,Ag,Zn,Cu,Pb,Cd)		2,250	
Analyses (500 soil samples x $13: Au,As,Zn,Cu)		6,500	
Insurance		250	
Freight, express, customs brokerage		1,000	
Equipment, supplies		1,000	
Currency exchange ($50,000 @ 1.235)		12,000	
Miscellaneous, petrography, photography		2,250	
Report preparation, drafting		1,250	35,000
	Sub total		92,500
	Contingency....		7,500
	TOTAL PHASE I		**$100,000 (Cdn.)**

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. H. SANGUINETTI

ESTIMATED COST OF RECOMMENDED PROGRAM

PHASE II

Contingent upon the results of Phase I, a program of 5,000 feet of BQWL diamond drilling may be warranted. This program would entail 2 months field time at an estimated cost of .... $200,000 (Cdn.)

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M. H. SANGUINETTI

APPENDIX "C"

ASSAY AND ANALYSIS CERTIFICATES

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
Canada V7P 2R5
Phone: (604) 985-0681
Telex: 04-352667

BONDAR-CLEGG

Geochemical Lab Report

REPORT: 122-4014

FROM: CORDILLERAN ENGINEERING LTD.   SUBMITTED BY: N-SANGUINETTI
DATE: 19-NOV-82   PROJECT: WIKIEUP

ELEMENT	LOWER DETECTION LIMIT	EXTRACTION	METHOD	SIZE FRACTION	SAMPLE TYPE	SAMPLE PREPARATIONS
Cu	1 PPM	HNO3-HCL HOT EXTR	Atomic Absorption	-100	OTHER	CRUSH,PULVERIZE -100
Pb	2 PPM	HNO3-HCL HOT EXTR	Atomic Absorption	-100		RETENTION OF REJECTS
~~Zn~~	~~1 PPM~~	~~HNO3-HCL HOT EXTR~~	~~Atomic Absorption~~	~~-100~~		~~AS RECEIVED, NO SP~~
As	.1 PPM	HNO3-HCL HOT EXTR	Atomic Absorption	-100		
Cd	.2 PPM	HNO3-HCL HOT EXTR	Atomic Absorption	-100		
Bi	1 PPM	HNO3	Atomic Absorption	-100		
Au	5 PPB	AQUA REGIA	Fire Assay AA	-100		
Sn	5 PPM		X-RAY Fluorescence	-100		

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REMARKS: SAMPLE SHIPMENT # 802
ASSAY OF HIGH Pb TO FOLLOW ON 622-4014
3. Sn - INTERFERENCE NOTED DUE TO Zn

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Telex: 04-352667

BONDAR-CLEGG

Geochemical Lab Report

REPORT: 122-4014 PROJECT: WIKIEUP

SAMPLE NUMBER	ELEMENT UNITS	Cu PPM	Pb PPM	Zn PPM	As PPM	Cd PPM	Bi PPM	Au PPB	Sn PPM	NOTES
R 2087		18		54	0.2			25		
R 2088		13	14	45	0.2			<5		
P 2077			1830			32.0				
P 2079			2600			420.0				
P 2081		3400	220	1600		11.0				
P 2082		1800	700	1600		13.0				
P 2083			2000			1.3				
P 2084			> 10000			370.0				
P 2085		660	430	3200		18.0				
P 2086							30		20	3*

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North Vancouver, B.C.
Canada V7P 2R5
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Telex: 04-352667

BONDAR-CLEGG

Certificate of Analysis

REPORT: 422-4014

FROM: CORDILLERAN ENGINEERING LTD.
DATE: 18-NOV-82 PROJECT: WIKIEUP

SUBMITTED BY: M.SANGUINETTI

ELEMENT	LOWER DETECTION LIMIT	EXTRACTION	METHOD	SIZE FRACTION	SAMPLE TYPE	SAMPLE PREPARATIONS
Au	.002 OPT			-100	ROCKS	CRUSH,PULVERIZE -100
As	.02 OPT			-100		
Cu	.01 PCT			-100		
Pb	.01 PCT			-100		
Zn	.01 PCT			-100		
Cd	.01 PCT			-100		

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Registered Assayer, Province of British Columb

Bondar-Clegg & Company Ltd.
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North Vancouver, B.C.
Canada V7P 2R5
Phone: (604) 985-0681
Telex: 04-352667

BONDAR-CLEGG

Certificate of Analysis

REPORT: 422-4014 PROJECT: WIKIEUP

SAMPLE NUMBER	ELEMENT UNITS	Au OPT	As OPT	Cu PCT	Pb PCT	Zn PCT	Cd PCT	NOTES
R 2076		0.077	9.10	3.55		0.54		
R 2077		0.039	3.20	3.46		0.62		
R 2078		0.030	1.26	0.13		6.35		
R 2079		0.095	3.32	0.32		8.40		
R 2080		0.035	4.95	0.68		0.24		
R 2081		0.005	0.75					
R 2082		0.060	1.41					
R 2083		0.055	6.70	0.10		0.04		
R 2084		0.016	1.35	0.11		6.50		
R 2085		0.008	1.03					
R 2086		1.355	21.85	1.82	0.55	29.30	0.18	

Registered Assayer, Province of British Columbi

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
Canada V7P 2R5
Phone: (604) 985-0681
Telex: 04-352667

BONDAR-CLEGG

Certificate of Analysis

REPORT: 622-4014

FROM: CORDILLERAN ENGINEERING LTD.
DATE: 23-NOV-82 PROJECT: WIKIEUP

SUBMITTED BY: M-SANGUINETTI

ELEMENT	LOWER DETECTION LIMIT	EXTRACTION	METHOD	SIZE FRACTION	SAMPLE TYPE	SAMPLE PREPARATIONS
Pb	.01 PCT			-100	PREPARED PULP	AS RECEIVED, NO SP

REPORT COPIES TO: CORDILLERAN ENGINEERING

INVOICE TO: CORDILLERAN ENGINEERING

REMARKS: SAMPLE SHIPMENT # 802

Registered Assayer, Province of British Columbia

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
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Canada V7P 2R5
Phone: (604) 985-0681
Telex: 04-352667

BONDAR-CLEGG

Certificate of Analysis

REPORT: 622-4014 PROJECT: WIKIEUP

SAMPLE NUMBER	ELEMENT UNITS	Pb PCT	NOTES
P 2084		1.53	

Registered Assayer, Province of British Columbi

APPENDIX "D"

REFERENCES

REFERENCES

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS:

Geological Highway Map of the Southern Rocky Mountain Region, Map No.2, 1967.

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Preliminary Report, Yellow Jacket Mine, for Wirt Cunningham, May,1974.

U.S.G.S.:

Wikieup N.W. Quadrangle, Mohave County, Arizona, Topog. Map.

TAB

Yellow Jacket

PHONE 625-3688
BOX 99, SANTO TOMAS RTE
SAHUARITA, ARIZONA

PHONE 793
AVE JUAREZ 23[illegible]
CANANEA, SONORA, ME[illegible]

YELLOW JACKET MINE, WIKIEUP, ARIZONA

INDEX

MAP INDEX

PHONE 625-3688
BOX 99, SANTO TOMAS RTE
SAHUARITA, ARIZONA

PHONE 793
AVE JUAREZ 2
CANANEA, SONORA,

PRELIMINARY REPORT

YELLOW JACKET MINE

Wikieup, Arizona

by

Charles R. Ranney

CONCLUSIONS:

1. The Yellow Jacket Mine is an unusual prospect with excellent values shown both on the surface and underground.

2. Good ore grade mineralization in copper, silver, zinc, and gold is exposed on the surface for over 600 feet.

3. Underground development by means of adit incline, drifts, shaft, and long hole drilling have corroborated the surface showings.

4. A two-phase development project is recommended:

   (1) An adequate drilling program below the high grade showings in the main shaft.

   (2) Subsequent development by an adit incline and trackless mining, guided by the results of the drilling program.

INTRODUCTION

The Yellow Jacket Mine is situated in the Hualapai Range, in the Aubrey Mining District, 8-1/2 miles by good gravel road from the town of Wikieup, Arizona. Wikieup is 55 miles south of Kingman, Arizona on U.S. Highway 93, approximately 47 miles northwest of Bagdad Copper Mines. It is 75 miles south of the Ithaca Peak copper operation of Pennzoil-Duval Corporation. (See Map No. 1)

This preliminary report was prepared for Mr. Hy Hoffman, Managing Director of Gold Silver Resources Inc., a Nevada Corporation, owners of the property.

My first visit to the property was made on March 22, 1972 in the company of Mr. Francis J. Denten, mining contractor. Five additional days were spent on the property in April 1972 as exploration and preliminary development work proceeded. I particularly wish to thank Mr. F. J. Denten and Mr. Denys Poyner for their assistance and the many courtesies extended to me during my examination.

SUMMARY

1. The Yellow Jacket property comprises 18 claims located in Sections 11 and 2, Twn 15 N, Salt River Base line, R 14 W Gila and Salt River Meridian.

2. The original workings, in addition to the main shaft and subdrifts now backfilled, included 195 feet of adit x-cut in which three veins were exposed. This x-cut was reopened and cleaned out by Mr. Denys Poyner.

3. Surface showings were stripped and exposed by bulldozer in August 1971.

4. Since February 5, 1972, new underground workings comprise 303 feet of adit incline and drifting, and over 500 feet of long holing above the bottom workings. In addition, a 10 x 12 foot shaft, back-filled for many years, was partially cleaned out by clamshell and sampled to a depth of 54 feet. All work was accomplished under the direct supervision of Francis J. Denten, a mining contractor of forty years experience in hard rock mining. See Map No. 4

SUMMARY (continued)

5. Good ore grade mineralization is exposed on the surface in cuts, pits and stripping for over 600 feet, with principal values in copper, silver, zinc and gold.

6. In preliminary observations, it was noted that ore occurs associated with breccia structures, both as a cementing material, and in fractures and shearing along the edges of the porphyry intrusives, particularly where they contact the Precambrian granites. (See Map No. 3)

7. Some secondary copper oxide and sulfate were also noted in surface exposures. Massive primary sulfides, including chalcopyrite, are found in new workings 100 feet below the outcrops. Bulk sampling, to date, has indicated approximately a 3 to 1 ratio of silver to copper in the massive sulfides.

8. Two independent geophysical surveys have been made over the Yellow Jacket claims as an adjunct to the preliminary exploration work by Mr. Hy Hoffman, Managing Director of Gold Silver Resources, Inc.

The first survey was conducted by McPHAR GEOPHYSICS. It was entitled "Report on the Induced Polarization and Resistivity Reconnaissance and Test Survey at the Yellow Jacket Mine, Mohave County, Arizona."

The second survey was conducted by SAMPSON G. SARGIS, Consulting Geophysicist, formerly with U.S. Steel. This report is entitled "Self Potential and Magnetic Profile, Yellow Jacket Mine, Mohave County, Arizona."

Both reports indicate a rake of sulfide mineralization to the southeast. Two rather prominent anomalies were shown beyond the southeastern limits of the recent underground development workings. See Map No. 4.

9. The Yellow Jacket mining property is an excellent prospect and warrants further exploration and development.

RECOMMENDATIONS

A phased project to be undertaken in two stages is recommended as follows:

1. An adequate diamond drilling program to test below the high grade showings in the main shaft. This program should include at least 1500 feet of drilling at an estimated cost of fifteen dollars per foot.

Estimated cost	$ 22,500
Test drilling massive sulfide zones beyond the southeast end of workings	6,000
Bulk sampling, assaying and testing	2,500
Total Phase 1	$ 31,000

2. Phase 2 is dependent upon the results of phase 1: Subsequent development by an adit incline and trackless mining guided by the results of the drilling programs.

Estimated costs 800 feet @ $70.00/foot	$ 56,000
3. Contingencies 20%	17,400
Total Estimated Costs	$104,400

GENERAL DESCRIPTION

LOCATION

The Yellow Jacket Mine comprises 18 claims as shown on the Wikieup N.W. Quadrangle, Mohave County, Arizona. U.S. Geological Survey Topog. Map.

The claims, as shown on map, are located in Sections 2 and 11, Twn 15 N, R 14 W Gila Salt River Base Line and Meridian.

GENERAL DESCRIPTION (continued)

CLIMATE

The climate is semi-arid, mild in winter, warm with cool nights in the summer. The rainy season usually occurs during July and August. The average elevation is around 3900 feet.

WATER

Ample water for mining purposes has been developed in the mine 120 feet below the outcrop.

POWER

R.E.A. power is available in Wikieup.

GENERAL GEOLOGY

The Yellow Jacket claims lie in an area of Precambrian granitics which have been intruded by porphyritic and granitoid intrusives, probably of Middle Cetaceous age; they occur as dikes and tongues in the immediate area of the mine.

It was particularly noted in preliminary observations that the ore is associated with brecciated structures, both as a cementing material, and in fractures and shearing along the edges of the porphyry intrusives, particularly where they contact the Precambrian granite. The principal shearing and ore occurrences have a northwesterly trend. The ore itself, as shown both in surface and underground exposures, dips steeply to the southwest and rakes to the southeast. This trend and rake was corroborated by longhole drilling from underground and by the apparent anomalies shown in the geophysical surveys.

(See map underground workings and appended Geophysics Reports).

The two principal northwest shearings appear to merge in the area of the main shaft where the best ore grades and greatest thicknesses were encountered.

GENERAL GEOLOGY (continued)

Massive sulfide mineralization was noted where the principal northwest shears were intersected by complimentary shearing. (See maps showing new workings).

ORE RESERVES

There has been no attempt made to date to define and block-out measured ore reserves in the preliminary exploration work.

However, excellent ore occurrences have been noted for 1000 feet on the surface, and in both the old and new underground workings. (See map showing preliminary samplings).

Charles R. Ranney
Mining Engineer

BOX 34, SANTO TOMAS PTE
SAHUARITA, ARIZONA

AVE JUAREZ
CANANEA, SONORA,

May 11, 1972

Mr. Hy Hoffman
Managing Director
Gold Silver Resources
14333 Addison Street
Sherman Oaks, California

Re: Report Yellow Jacket Mine

Dear Mr. Hoffman:

Please find enclosed my report to you on your Yellow Jacket Mine, Mohave County, Arizona. I am sending under separate cover the maps covering your preliminary exploration project.

The map file also contains a map of underground workings showing check samples and assay copies.

Please note that I have included a budget for bulk sampling and further test diamond drilling in my recommendations for a two-phase program.

Assays taken from the lower section of the old shaft, recently cleared out by clamshell, are exceptionally encouraging.

Respectfully submitted,

Charles R. Ramey
Mining Engineer

CRR:lm

Enclosure

THE EISENHAUER LABORATORIES
316-322 South San Pedro Street
Los Angeles, California 90013

ED. EISENHAUER JR.
C. EISENHAUER RAYMOND
LAWRENCE EARL RAYMOND
All members of American Institute of Mining, Metallurgical, and Petroleum Engineers

PHONE 622-0528

ASSAY CERTIFICATE

Los Angeles, Calif. April 28/72 19

I hereby Certify that the samples described below, received from

Gold-Silver Resources assay as follows:

Owner's Mark and Sample	Gold		Silver		Total Value Per Ton	Percentage of		
	Ozs. Per Ton	Value Per Ton	Ozs. Per Ton	Value Per Ton		Copper	Lead	Zinc
1483-MC	.24	$ 9.12	9.06	$ 14.49	$ 145.51	11.50		

GOLD @ $ 38 / 1.60 PER OZ.

[signature]

THE EISENHAUER LABORATORIES
316-322 South San Pedro Street
Los Angeles, California 90013

ED. EISENHAUER JR.
C. EISENHAUER RAYMOND
LAWRENCE EARL RAYMOND
} All members of American Institute of Mining, Metallurgical, and Petroleum Engineers

ASSAY CERTIFICATE

PHONE 622-0620

Los Angeles, Calif. April 28/72 19

I hereby Certify that the samples described below, received from

Gold-Silver Resources assay as follows:

Owner's Mark and Sample	GOLD		SILVER		TOTAL VALUE PER TON	PERCENTAGE OF		
	OZS. PER TON	VALUE PER TON	OZS. PER TON	VALUE PER TON		COPPER	LEAD	ZINC
RDRB-1303-MC	.28	$ 10.64	4.16	$ 6.65	$ 81.42	6.10		

GOLD @ $ 38 PER OZ.
SILVER @ $ 1.60 PER OZ.
LEAD @ ____ C.
COPPER @ ____ 52

CHARGES ____

[signature] ASSAYER

THE EISENHAUER LABORATORIES
316-322 South San Pedro Street
Los Angeles, California 90013

ED. EISENHAUER JR. / G. EISENHAUER RAYMOND / LAWRENCE EARL RAYMOND — All members of American Institute of Mining, Metallurgical, and Petroleum Engineers

ASSAY CERTIFICATE

PHONE 622-9820

Los Angeles, Calif. April 28/72 19

I hereby Certify that the samples described below, received from

Gold-Silver Resources assay as follows:

Owner's Mark and Sample	GOLD		SILVER		TOTAL VALUE PER TON	PERCENTAGE OF		
	OZS. PER TON	VALUE PER TON	OZS. PER TON	VALUE PER TON		COPPER	LEAD	ZINC
O.T.R.V.-back 1469 MC	.56	$ 21.28	13.62	$ 21.79	$ 144.83	9.60		

GOLD @ $ 38 PER OZ.
SILVER @ $ 1.60 PER OZ.
LEAD @ ____ C.

CHARGES

ASSAYER

THE EISENHAUER LABORATORIES
316-322 South San Pedro Street
Los Angeles, California 90013

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PHONE 622.9020

ASSAY CERTIFICATE

Los Angeles, Calif. April 28/72 19

I hereby Certify that the samples described below, received from

Gold-Silver Resources assay as follows:

Owner's Mark and Sample	GOLD		SILVER		TOTAL VALUE PER TON	PERCENTAGE OF		
	OZS. PER TON	VALUE PER TON	OZS. PER TON	VALUE PER TON		COPPER	LEAD	ZINC
L.D. floor-S.I.-1408 MC	.03	$ 1.14	11.38	$ 18.21	$ 69.17	4.70		

GOLD @ $38 PER OZ.
SILVER @ $ 1.60 PER OZ.
LEAD @ ......C...

ASSAYER

THE EISENHAUER LABORATORIES
316-322 South San Pedro Street
Los Angeles, California 90013

ED. EISENHAUER JR. } All members of American Institute
C. EISENHAUER RAYMOND } of Mining, Metallurgical,
LAWRENCE EARL RAYMOND } and Petroleum Engineers

ASSAY CERTIFICATE

PHONE 622-0828

Los Angeles, Calif. April 28/72 19

I hereby Certify that the samples described below, received from
Gold-Silver Resources
assay as follows:

Owner's Mark and Sample	GOLD		SILVER		TOTAL VALUE PER TON	PERCENTAGE OF		
	OZS. PER TON	VALUE PER TON	OZS. PER TON	VALUE PER TON		COPPER	LEAD	ZINC
C.V.L.T.-1470-MC	1.06	$ 40.28	9.70	$ 15.52	$ 92.90	3.50		

GOLD @ $38 PER OZ.
SILVER @ $1.60 PER OZ.
LEAD @ ___ C.
53

CHARGES ________

[signature]
ASSAYER

ASSAY CERTIFICATE

316-322 South San Pedro Street
Los Angeles, California 90013

ED. EISENHAUER JR.
C. EISENHAUER RAYMOND
LAWRENCE CARL RAYMOND
All members of American Institute of Mining, Metallurgical, and Petroleum Engineers

Los Angeles, Calif. May 9/72 19

I hereby Certify that the samples described below, received from

Gold-Silver Resources assay as follows:

Owner's Mark and Sample	Gold		Silver		Total Value Per Ton	Percentage of		
	Ozs. per Ton	Value per Ton	Ozs. per Ton	Value per Ton		Copper	Lead	Zinc
S-40	.44	$ 22.00	10.60	$ 16.96	$ 149.70	6.44		11.[illegible]

GOLD @ $ 50 PER OZ.
SILVER @ $ 1.60 PER OZ.
LEAD @ 5
COPPER @ 53 C. Zinc @ 18¢

CHARGES ____________

[signature] ASSAYER

Established 1916

CHARLES R. RANNEY
MINING ENGINEER

PHONE 625-3688
BOX 99, SANTO TOMAS RTE
SAHUARITA, ARIZONA

PHONE 793
AVE JUAREZ 231
CANANEA, SONORA, MEX

Mr. Wirt Cunningham
Holiday Inn
Kingman, Arizona

May 4, 1974

Re: Report, Yellow Jacket Mine

Dear Mr. Cunningham,

Please find enclosed my report on the Yellow Jacket Mine, Wikieup, Arizona, completed at your request.

I have included a claim map on U.S.G.S. Topog., Wikiup N.W. Quad., a surface geology map of the mineralized area, and a map showing present underground workings. Please note that the former main shaft is completely back filled which you are now in the process of evacuating.

Respectfully submitted,

Charles R. Ranney
Mining Engineer

Professional Engineer,
State of Washington
No. 3213, Jan. 1, 1948

CHARLES R. RANNEY
MINING ENGINEER

PHONE 625-3608
BOX 59, SANTO TOMAS RTE
SAHUARITA, ARIZONA

PHONE 793
AVE JUAREZ 231
CANANEA, SONORA, MEXICO

PRELIMINARY REPORT

YELLOW JACKET MINE

Wikieup, Arizona

by

Charles R. Ranney

CONCLUSIONS

1. The Yellow Jacket Mine is an unusual prospect with excellent values shown both on the surface and underground.

2. Good ore grade mineralization in copper, silver, zinc, and gold and silver is exposed on the surface for over 400 feet.

3. Underground development by means of incline, drifts, shaft, and stripping have corroborated the surface showings.

4. A two-phase development program is recommended:

   (1) Mining of the ore shoot exposed by surface stripping in the area of the old shaft.

   (2) Dependent upon results of phase 1., subsequent development by an adit incline and trackless mining.

RECOMMENDATIONS

A phased project to be undertaken in two stages is recommended as follows:

1. Mining of the ore shoot exposed by the surface stripping in the area of the main shaft. This area is where the best ore grades and greatest thicknesses have been exposed; a sample from a depth of 54 feet below this shaft collar assayed over 10% zinc, 5% copper, and one half ounce in gold over a width of four feet. It can best be developed by excavating a trench below the fifty foot level to provide access, about thirty feet below the present incline; and drifting both northwest and southeast on the vein. From 500 to 1000 tons of good grade ore can reasonably be expected. The ore mined will provide an excellent bulk sample of the grade and character of ore to be anticipated with further development.

Estimated cost	$ 22,500
Bulk sampling, assaying, testing	2,500
Total Phase 1.	$ 25,000

2. Dependent upon results of phase 1., subsequent development by an adit incline and trackless mining can be undertaken.

YELLOW JACKET MINE, WIKIEUP, ARIZONA

INTRODUCTION

The Yellow Jacket Mine is situated in the Haulapai Range, in the Aubrey Mining District, 8½ miles by good gravel road from the town of Wikieup, Arizona. Wikieup is 55 miles south of Kingman, Arizona on U.S. Highway 93, approximately 47 miles northwest of Bagdad Copper Mines. It is 75 miles south of the Ithaca Peak Copper Operation of Pennzoil-Duval Corporation. (See Map No. 1)

SUMMARY

1. The Yellow Jacket property comprises 18 claims located in Sections 11 and 2, Twn 14 N, Salt River Base line, R 16 W Gila and Salt River Meridian.

2. The original workings, in addition to the main shaft and subdrifts now backfilled, included 195 feet of adit x-cut in which three veins were exposed.

3. Surface showings were stripped and exposed by bulldozer in August 1971.

4. Since February 5, 1972, new underground workings comprise 303 feet of adit incline and drifting. In addition, a 10 by 12 foot shaft, back-filled for many years, was partially cleaned out by clamshell and sampled to a depth of 54 feet. All work was accomplished under the direct supervision of Francis J. Denten, a mining contractor of forty years experience in hard rock mining. (See Map No. 2)

5. Good ore grade mineralization is exposed on the surface in cuts, pits and stripping for over 400 feet, with principal values in copper, silver, zinc and gold.

6. In preliminary observations, it was noted that ore occurs associated with breccia structures, both as a cementing material, and in fractures and shearing along the edges of the porphyry intrusives, particularly where they contact the Precambrian granites. (See Map No. 3)

7. Some secondary copper oxide and sulfate were also noted in surface exposures. Massive primary sulfides, including chalcopyrite, are fould in new workings 100 feet below the outcrops. Bulk Sampling, to date, has indicated approximately a 3 to 1 ratio of of silver to copper in the massive sulfides.

SUMMARY (continued)

8. Two independent geophysical surveys have been made over the Yellow Jacket claims as an adjunct to the preliminary exploration work.

The first survey was conducted by McPHAR GEOPHYSICS. It was entitled "Report on the Induced Polarization and Resistivity reconnaissance and Test Survey at the Yellow Jacket Mine, Mohave County, Arizona."

The second survey was conducted by SAMPSON G. SARGIS, Consulting Geophysicist, formerly with U.S. Steel. This report is entitled "Self Potential and Magnetic Profile, Yellow Jacket Mine, Mohave County, Arizona."

Both reports indicate a rake of sulfide mineralization to the southeast. Two rather prominent anomalies were shown beyond the southeastern limits of the recent underground development workings. (See Map No. 4)

9. The Yellow Jacket mining property is an excellent prospect and warrants further exploration and development.

GENERAL DESCRIPTION

LOCATION

The Yellow Jacket Mine comprises 18 claims as shown on the Wikieup N.W. Quadrangle, Mohave County, Arizona, U.S. Geological Survey Topog. Map.

The claims, as shown on map, are located in Sections 2 and 11, Twn 15 N, R 14 W Gila Salt River Base Line and Meridian.

CLIMATE

The climate is semi-arid, mild in winter, warm with cool nights in the summer. The rainy season usually occurs during July and August. The average elevation is around 3900 feet.

WATER

Ample water for mining purposes has been developed in the mine 120 feet below the outcrop.

POWER

R.E.A. power is available in Wikieup.

GENERAL GEOLOGY

The Yellow Jacket claims lie in an area of Precambrian granitics which have been intruded by porphyritic and granitoid intrusives, probably of Middle Cretaceous age; they occur as dikes and tongues in the immediate area of the mine.

It was particularly noted in preliminary observations that the ore is associated with brecciated structures, both as a cementing material, and in fractures and shearing along the edges of the porphyry intrusives, particularly where they contact the Precambrian granite. The principal shearing and ore occurrences have a northwesterly trend. The ore itself, as shown both in surface and underground exposures, dips steeply to the southwest and rakes to the southeast. This trend and rake was corroborated by longhole drilling from underground and by the apparent anomalies shown in the geophysical surveys.
(See map underground workings and appended Geophysics Reports).

The two principal northwest shearings appear to merge in the area of the main shaft where the best ore grades and greatest thicknesses were encountered.

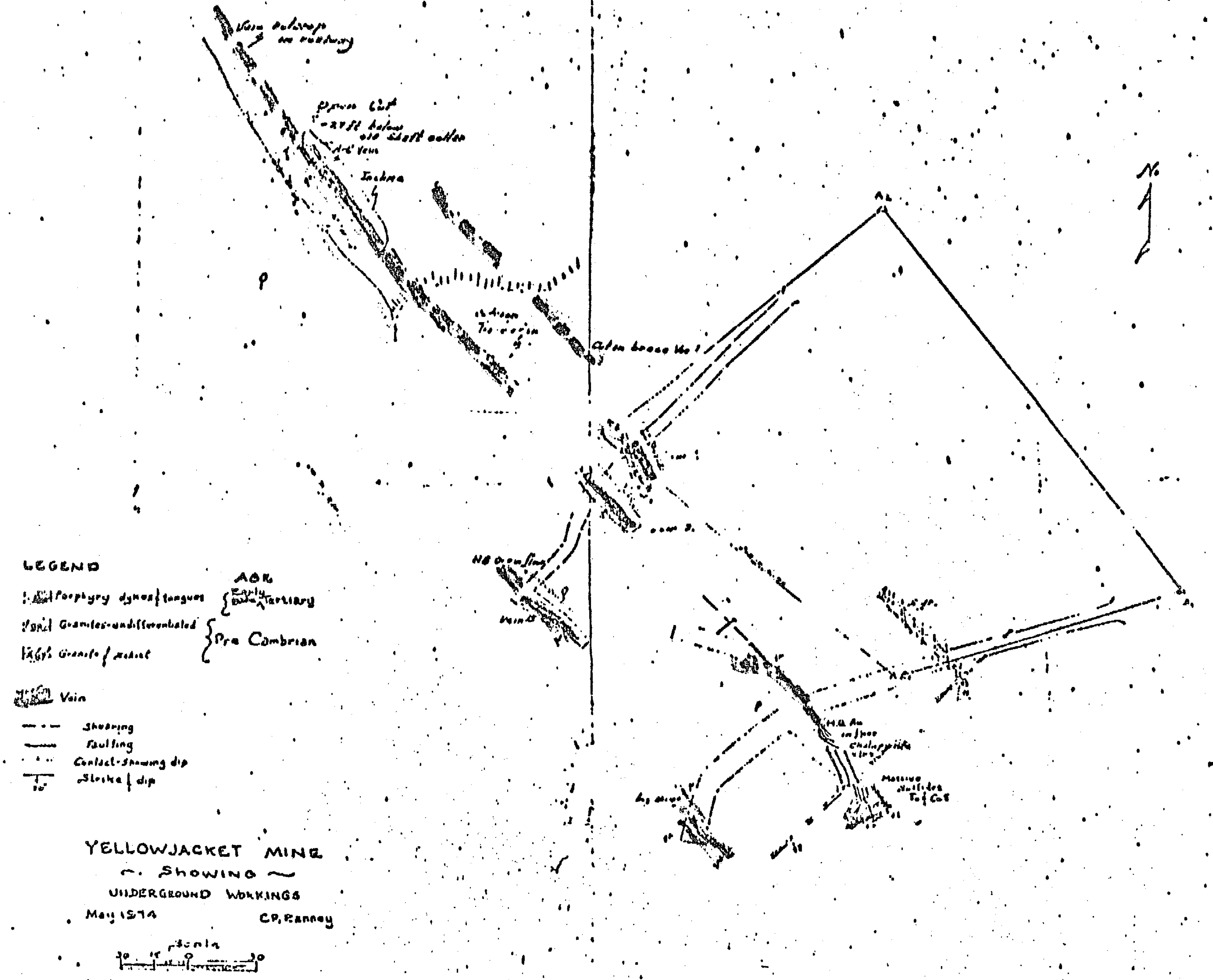
Massive sulfide mineralization was noted where the principal northwest shears were intersected by complimentary shearing.
(See maps showing new workings).

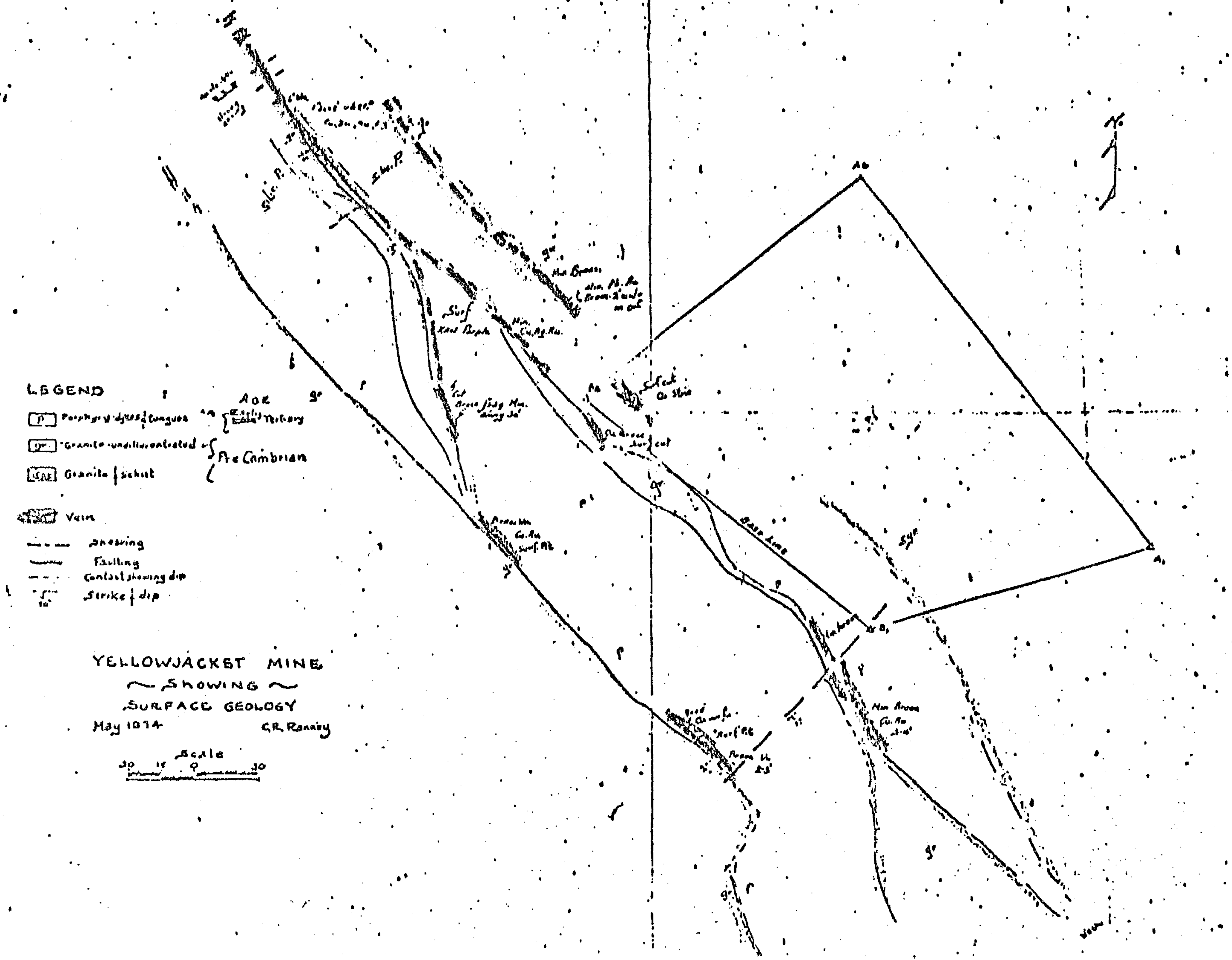
ORE RESERVES

There has been no attempt made to date to define and blockout measured ore reserves in the preliminary exploration work.

However, excellent ore occurrences have been noted for 400 feet on the surface, and in both the old and new underground workings.
(See map showing preliminary samplings).

Charles R. Ranney
Mining Engineer


LEGEND
Porphyry dykes & tongues
AGE
Early Tertiary
Granites-undifferentiated
Granite & schist
Pre Cambrian
Vein
Shearing
Faulting
Contact-showing dip
Strike & dip
YELLOWJACKET MINE
~ SHOWING ~
UNDERGROUND WORKINGS
May 1974
C.P. Ranney
Scale
Vein outcrop on roadway
Inclines
No


LEGEND
Age
Pre Cambrian
Granite & schist
Vein
Shearing
Faulting
Contact showing dip
Strike & dip
YELLOWJACKET MINE
~ Showing ~
SURFACE GEOLOGY
Scale
Base Line

YELLOW JACKET MINE

The Yellow Jacket property comprises 18 claims, located in Sections 11 and 2, T. 15 N., R. 14 ¼., Gila and Salt River Base Line and Meridian.

The property is controlled by Gold Silver Exploration under lease and option to purchase. It is currently being developed under sublease by Wirt Cunningham of Los Angeles, California and Wikieup, Arizona.

Good ore grade mineralization has been exposed on the surface in cuts, pits, and stripping for over 600 feet with the principal values in copper, zinc, silver, and gold. Three different veins have been exposed, varying in width from 2 to 10 feet. The veins are roughly parallel and are associated with a porphyry tongue from 30 to 70 feet in width. The ore is found in brecciated structures, both as a cementing material, and in fractures and shearing along the edges of the porphyry intrusives, particularly where they contact the PreCambrian granitics as previously noted.

In 1972, Gold Silver Exploration accomplished over 300 feet of new development 110 feet below the surface on the south east end of the ore exposed on the surface, in addition to two geophysics surveys by McPhar Geophysics and Sampson G. Sargis. The original workings during the First World's War included a 10 x 12 shaft. This shaft was partially cleaned out by clam shell and sampled at a depth of 54 feet, where excellent values in Copper, Zinc, Gold and Silver were encountered. Mr. Cunningham is presently engaged in stripping and sampling this area. He is reported to be planning an underground develpment program.

With proper development, the Yellow Jacket property has an excellent chance of exposing substantial quantities of good grade copper zinc ores carrying appreciable gold and silver values.

CONCLUSIONS

1. The southern end of the Hualapai Range, west of Wikieup, Arizona, is an area which has largely been overlooked since the early 1900s when many small high grade gold and silver operations were producing. The fine free gold found in the oxidized zones was locked in the sulfides at relatively shallow depths, the area was remote, and the metallurgy of the time did not permit economic recovery.

2. A considerable quantity of zinc and copper was produced from this area during the first World War. It is significant that the base metal deposits contain appreciable precious metal values at depth.

Charles R. Ranney
Mining Engineer

DALE ANERSON, GEOLOGIST
REPORT: MARCH 17, 1975

YELLOW JACKET CLAIMS

Location:

The Yellow Jacket Claims and mine are approximately six (6) miles southwest of Wickieup, Arizona and Federal Highway #93. The group consists of nine (9) contiguous claims, all claims being in section 11, T 15 N, R 14 W, Mohave County, Arizona. Surface elevation of the mine and claims is approximately 4000' above sea level and are in the Hualapai Mountains.

Accessibility:

Chicken Springs Road, a good, gravelled county road, passes within two (2) miles of the property to the north and in an east-west direction. A bulldozed road leads to the mine property approximately two (2) miles to the south from its intersection with Chicken Springs Road. Travel by any type of vehicle is unrestricted from Wickieup, and the mill site, to the mine.

Previous Exploration or Development:

The Yellow Jacket claims were explored and developed for the production of gold, silver, copper, lead and zinc ores in the past. No records are available or could any reference be found in literature to this mine but it is known that concentrates were shipped from the workings. The upper oxidized dike contacts were explored by shallow shafting, these shafts being present to this time. One shaft was sunk to over 400' and possibly to 600' on the breccia-gouge contact zone and this shaft supplied ore to a mill located on the property. This shaft has now become the site for an open cut decline to the breccia ore body.

Two small drifts by Gold-Silver, as shown on the accompanying map, were driven in order to evaluate the properties. Extensive mineralization was found by these workings.

Present State:

At this time the Yellow Jacket Claims and mine area has been leased to another operator for development and production of the complex ore present on the property. Extensive excavation work has been and is being done at this time by the operator in an attempt to open pit mine the ore body. 700 tons of ore have been mined and shipped by this method and another 600 to 800 tons of good ore is now exposed and will be removed in the near future. The open pit, or cut, has become impractical to work due to the steep rock faces and the possibility of large rock falls or slabbing into the pit of these faces. The operator is now planning to build a portal using structural steel and rock bolts to anchor the steel into the face in order to start an underground operation at the site. The operator is also exploring the adjacent areas for a continuation of the breccia-gouge zone under the surrounding talus and alluvium covered areas. The operator also plans to drift into the face at depth to ascertain if a shear or fracture system is present and mineralized. Several mineral bearing dikes are present in the granites of the mine area and at least one dike has been noted to be crosscutting other dikes so this exploration could well lead to the development of other bodies of ore. *

The lease at present in effect on this property calls for a 7½% royalty on smelter run ore to Gold-Silver Exploration from the lessee. In June of 1975 this return to Gold-Silver will rise to 10%. At the end of 4 years a payment of $200,000.00 will be made to Gold-Silver, less any amount previously paid, and at that time the royalty will be lowered to 5% of smelter returns for the life of the mine. The property will be returned to Gold-Silver on default of contract or non-performance of other clauses.

Although this property is being developed at this time, further exploratory work and detail mapping of all claims should be carried out. The extensive breccia-gouge zone, large fractures or shears, intruding dikes both mineralized and barren and the structure of the area necessitates a better understanding of all features in order to carry out the exploration and development required for this property.

Geology:

~~All areas examined during the course of the study were found to be of Pre-Cambrian Age.~~ In some localized areas the granites tended to become porphorytic. An extensive dike pattern is present with four (4) different types noted; pegmatite, aplite, porphory and andesite, probably relating to three (3) different times or ages of fracture and faulting activity. Mineralization was noted to be present in the porphory and andesite dikes. All areas examined were in locales of heavy shear zones, with crushed zones being present in areas of extreme shearing. Many of the dikes were noted to be fractured, offset and intruded by dikes of a different age and material.

The only extensive breccia zone located in the immediate vicinity to date is found on the Yellow Jacket Claims and this breccia was replaced in part and cemented with and by the solutions carrying the sulphide ores of silver, lead, zinc, copper and free gold. The breccia is located at the contact of a large fracture or fault with both lateral and vertical movement and is given a Tertiary age. A hard granite, cut by porphory dikes, forms the hanging wall while a very extensive kaolin gouge zone in contact with a rotten granite forms the foot wall. The vertical shaft sunk on the breccia vein was collared on a thin vein exposure and reportedly was sunk to over 400' and possibly to as much 600' in this ore bearing breccia. The present pit is approximately 150' below the former collar of the shaft and timbers from the shaft are present in the floor of the pit. The vein can be seen in the wall of the pit and at the present depth the breccia contact zone of mineralization has widened to sixteen (16') feet in width. The length of this contact zone has not been determined but over forty (40) feet has now been exposed to view. A six (6') foot high bench of ore is ready for removal at this time. Assay 101 was cut across the top of this bench. Assay 102 was cut down the face of the bench in country rock in order to determine possible dissemination of minerals into country rock. Appearances indicate to the author that only the top of the fracture-shear system and subsequent mineralization have been exposed by erosion. This is also indicated by the radical widening of the breccia zone from the previous exposure to that found at approximately 150 feet of depth; a few inches to sixteen feet in width.

Three maps dated 1972 and 1974 are included with this report. Mr. C. R. Raney, mining engineer, drew the maps. The deep cut now present was excavated after these surface and sub-surface maps were completed.

The two drifts to the east of the mine face are shown on two of the maps. Good ore of gold, silver and copper was found in these drifts and a massive sulphide zone of pyrites was found in the most easterly workings. The heavy shearing and fracturing of the rocks is indicated and this shearing with the intrusion of prophory dikes and mineralization of fracture veins and breccias can be inferred from this map work. Three shears with mineralization are found in the western drift. Dikes intruded into the granite along fracture and/or shear zones intruded by porphory dikes can be located surficially above the mine and are also visible in the rock face as now exposed. The surface dike contacts have been explored in at least two places by shafts sunk on the granite-porphory contact. The minerals have been oxidized and leached but the brilliant green of copper oxide is still present and the gold content will still be present in these upper, exposed and near surface contact zones. At one point a dike cuts through another dike and at this intersection the oxides of copper are found to be present in good quantity, grading into sulphide ore at a shallow depth.

An extensive shear pattern is suspected to be present in the immediate area of the present mine face. The fault-fracture-shear system at the mine face is striking N 37° W and near vertical dip. A number of mineralized shears in the underground workings are found to be paralelling this strike.

The present operator is exploring just west of the present face in order to determine if additional fractures are mineralized. One dozer cut shows the top of shear fractures in rotten granite. Assay Yellow Jacket 103 was taken from this incipient vein system and does show some mineralization. With some depth this fracture vein could well be commercial. The Yellow Jacket 104 assay was a grab sample of an oxide zone above and to the east of the mine face and on an upper bench. This sample represents a leached area in contact with a porphory dike.

Evaluation of Present Mine:

A true evaluation of the Yellow Jacket Mine and claimed area cannot be made at this time. A total of 700 tons of ore has been shipped to a mill for concentration and then to a smelter for sale. A further 600-800 tons of the same type of ore is in sight at this writing. A vertical shaft at and near the point of removal of all of the ore penetrated the ore body for another 250 feet and possibly for another 450 feet. A mill was present on site and the ore from this shaft supplied the mill so an inference can be made that the ore body will continue to the depth of the shaft. Assuming the block to be only 16 feet by 40 feet by 250 feet then a total of 25,000 tons of ore would be in this inferred block. All present information indicates that at least this much ore will be shipped but a guess would be that this figure is highly conservative.

An I P was run over this mine area by the owners, Gold-Silver, and this survey instrument indicated extensive metallic mineralization to be present over a wide area. Verification of one area was made by bull dozer cuts and excavation. The area is the one now being mined.

Mill Shipments:

Approximately 700 tons of mill run ore has been shipped to a mill for concentration. 96.97 tons of concentrates were then shipped to smelter for sale. A concentration ratio of 7.2:1 has therefore been established on the ore shipped to date. After all deductions of smelter charges and various deductions included in the smelter charges an average of $44.15 per ton of concentrate was returned to the mill facility for further deduction of their charges. I have no figures or statements of these charges to examine and can not give a figure per ton realized by the mine operator.

An average figure of $141.03 per ton of concentrates was deducted for smelter charges. Another $16.78 per ton was deducted for freight charges from mill to smelter. Another $10.00 per ton was deducted as freight charges from mill to railhead. As previously noted no mill costs for concentrating the ore are at my disposal. Recovery rates are quoted as being, mine run to concentrate:

Gold	81.58%
Silver	82.08%
Copper	82.52%
Lead	66.76%
Zinc	91.93%

For this reason assay reports are included but not discussed with this report. All assay reports do indicate more contained metal in samples than that recovered. A heavy dilution of the ore at the mine face could account for the low dollar figures given above. A total of $30,906.42 was paid to the mill before their deductions and the balance paid to the mine operator.

Recommendations:

1. A detailed mapping program utilizing all existing surface and sub-surface knowledge be instituted at an early date to adequately evaluate this property.

2. This mapping work should indicate other favorable areas for mineral exploration on the claims.

3. Should the claims and mine be forfeited or returned to the owners, at that time an underground mining program should be carried out by the owners.

4. A contract to mill the produced ore should be obtained from the present operator for all ore to be beneficiated at the Wickieup facility.

Respctfully submitted,

Dale Y. Anderson
Geologist
March 17, 1975

CHARLES O. PARKER & CO.

Bill Bealer, Owner

CHEMISTS • ASSAYERS • ENGINEERS

DENVER, COLORADO 80205

Folio 584

Date March 10, 197

Gold Silver Explorations
14333 Addison
Sherman Oaks, Calif. 91423

We hereby Certify, that the samples assayed for you gave the following r

DESCRIPTION	GOLD OUNCES PER TON	SILVER OUNCES PER TON	COPPER PER CENT (WET)	LEAD PER CENT (WET)	ZINC PER CENT	IRON PER CENT	INSOLUBLE PER CENT	VAL PER T
Yellow Jacket, 101	0.10	4.18	0.95	0.12	20.63			
Yellow Jacket, 102	0.06	0.90	0.20	0.12	5.25			
Yellow Jacket, 103	0.02	0.10	0.06	0.10	0.22			
Yellow Jacket, 104	0.03	4.80	0.10	23.20	0.12			

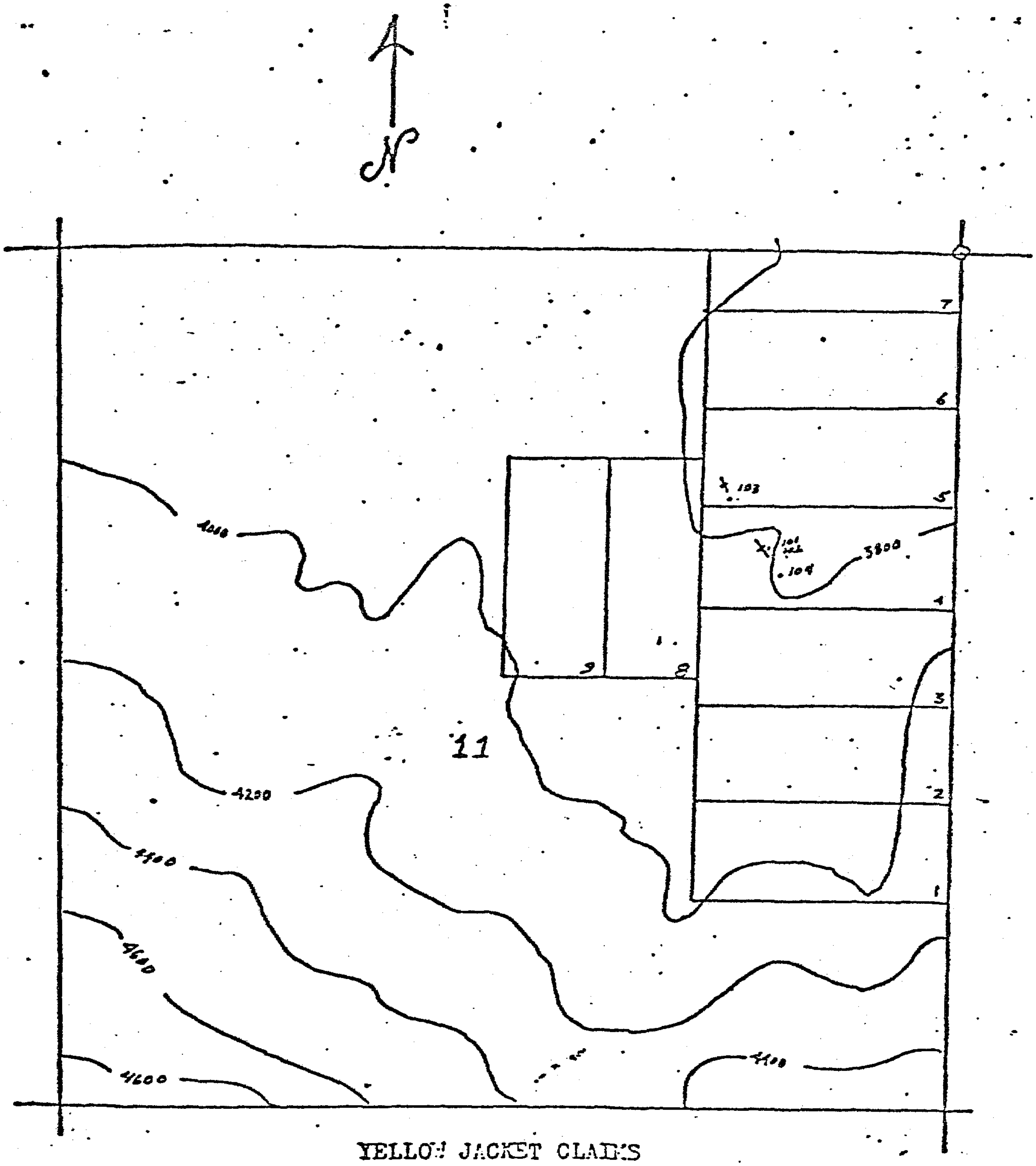
old at ________ per ounce   Copper at ________ per unit

lver at ________ per ounce   Zinc at ________ per unit   Charge $ 56.00

ad at ________ per unit

CHARLES O. PARKER & C

CHEMISTS, ASSAYERS and ENGIN



YELLOW JACKET CLAIMS
Refer to mine map for development work

Section 11, T 15 N, R 14 W
Mohave County, Arizona

Scale: 1:12,000
Contours: 200'
Dip and strike of located veins
Sample point
Shaft

G. H. STOFFERS
MINE SUPT.
BRUCE MINE, BAGDAD ARIZONA

Introduction:

The Yellow Jacket Mine is situated in the Haulapai Range, in the Aubrey Mining district, 8½ miles from the town of Wilieup, Arizona.

The writer has based his opinions on one field trip to the mine site plus the reports, both written and verbal of several associates in the mining industry. The writer has 27 years experience in the field of mining and 18 years in supervision and management.

Objective:

To explore, develop and mine the ore exposed by surface cuts and tunnels to a vertical depth of 140 feet below the incline adit.

Summary of report and conclusions:

The generally accepted first step on most mining properties are to core drill the best targets for a down dip extension of the ore, However, the nature of the Yellow Jacket ore body appears to be in the form of pockets and chimneys, whcih require closer spacing of the drill holes, therefore a greater cost.

On completion of a drill program, the cost of development is still necessary, however, the cost savings in a drill program is the elimination of needless development.

To reach a balance between exploration, development and mining of the Yellow Jacket ore body, I recommended the trackless mining method for the following reasons:

1. Development and evaluation of the down dip extensions of the ore exposures between the incline adit and the known ore on the north ore shoot are possible, while at the same time a mining depth of 60 feet can be obtained on the morth ore shoot.

2. Mining of the north ore shoot can be carried on while the incline continues down dip to the south to explore the parallel vein, and to obtain a mining depth of 140 feet on the ore reported in the incline adit and exposed in the upper tunnel.

3. By raising a shaft to the surface and installing a hoist for material removal, the ramping system can continue down indefinately.

Recommendations:

1. Recondition and enlarge the incline adit to accommodate an 2 yard load-haul-dump unit for trackless mining.

2. Drive an incline following the vein to the north @-20% to the end of the vein. (Approx. 350 to 400 feet).

3. Drive a raise from a point near the end of the incline to the surface (in the most promising showing of ore)

4. Evaluate your position as per grade and tons of ore.

A. Positive Position

Start mining north ore shoot while simultaneously driving the incline to the south on the parallel vein at 20 % (a distance of

350 to 400 feet should expose the ore down dip from the incline adit). Drive a raise to the surface. *

B. Negative Position

Mine the ore that is profitable and get out. * A raise is necessary to comply with the mining laws for a second way out; ~~thought should be given to the possibility of widening said raise out~~; thought should be given to the possibility of widening said raise out to shaft size, should ramping down continue.

Cost of recommended mining steps:

1. Recondition and enlarge the incline adit to accommodate a 2 yard-haul-dump unit for trackless mining.

Cost: excavation of 300 feet of 6' x 7' to a 8' x 8' size @ \$ 1.00 ft ^{3} = \$ 6,600.00

timbering caved area 3,400.00 (wild guess)
10,000.00 TOTAL

2. Drive a 8' x 8' incline following the vein to the north @-- 20 % to the end of the vein 350' to 400'.

Cost: 375 ft. @ \$ 75.00 per foot = \$ 28,125.00.

3. Drive a 4' x 5' raise from end of inlcine to the surface (in the most promising showing of ore).

Cost: 60 ft. @ \$ 50.00 per foot = \$ 3,000.00

4. Drive a 8' x 8' incline back to the south 350" to 400'.

Cost: 375 ft @ \$ 80.00 per foot = \$ 30,000.00

5. Drive a 4' x 6' timbered raise to the surface.

Cost: 140 ft @ \$ 70.00 per foot= 9,800.00

\$ 80,925.00
15 % contingencies....... 12,000.00

Total 92,925.00

Gff

The above costs include all disposables i.e. powder, fuse, pipe, vent tube, power line, timber, wedges. pipe fittings, drill oil, drill, steel, bit and etc.

The cost of mining the ore is impossible to calculate as it depe on the type of mining selected, which in turn, is some what determine by the competence of the ore and surrounding walls. However, the recommended equiptment list is adequate to service one stope in addit to the incline and raise, so I have estimated your front money needs as follows:

200 tons per week $ 20.00 per ton x a six week waiting period + $ 24,000.00 front money needed.

G H Stoffers
Mine Supt
Bruce Mine, Bagdad, az

Recommended Equiptment :

1	50 to 60 KVA generator		
1	900 CFM Compressor		
1	2 yard LHD unit		$ 40,000.00
1	Long tim jumbo with 2 machines		12,000.00
1	2 stage blower 20 HP		1,400.00
1	single stage blower 10 HP		
2	sludge pumps		1,500.00
2	stoppers in JR 38 class		3,800.00
1	bit or steel sharpener		
1	dry room for 10 employees with showers		
12	cap lamps and chargers		900.00
12	self rescue units		480.00
100	feet 1¼" air hose		
200	feet ½" water hose		
100	feet 1" air hose		
10	PC drill steel-- 2 ft.	Carbide inserts intraset	240.00
10	PC drill steel--4 ft.	" " "	260.00
20	PC drill steel--6 ft.	" " "	560.00
20	PC drill steel-- 8 ft.	" " "	600.00
1	Air tugger single drum 5 HP		

GHf

AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK, N.Y. 10005

MONTH January 19 75 | VOUCHER No. 1-308

AMARILLO, TEXAS, February 4 19 75

PAY 18066 58 | No. 547

TO THE ORDER OF

$18,066.58

TONTO MINING & MILLING COMPANY
TONTO BASIN, ARIZONA

AMERICAN SMELTING AND REFINING COMPANY
AMARILLO PLANT

Collectible Through
CHASE MANHATTAN BANK
1 CHASE MANHATTAN PLAZA
NEW YORK, N.Y. 10015

⑆0210⑈0002⑆ 910⑈3⑈001336⑈

DETACH BEFORE DEPOSITING

The endorsement by the Payee of the detached check constitutes a receipt in full for the items listed hereon. Draft No. 5477

First liquidation Tonto Mining ...
Lot 2----------
Cadmium--------- 58.51
$18,066.58

COPY CHECK
FROM AM. SMELTING
AND REFINING FEB. 4 75
FOR CONC'S FROM
YELLOW JACKET

ADDRESS Box 275 Tonto Basin, Arizona 85553 — January, 19

Zinc Concentrates MINE LOT — MINE — SHIPPED FROM Santa Cruz, Arizona

	Au	Ag	Pb	Cu	Zn	Fe	Mn	Cd	Cl		
	.355	15.30	2.70	1.82	53.10	5.3		.25			
	.410	15.50	2.80	2.19	53.05	—		—			
S & W	.510	15.73		2.56	54.00						
[illegible]	.435	15.73	2.75	2.19	53.05	5.3		.25			

	DATE REC'D	DUMP NO.	CAR INITIAL	CAR NUMBER	WET WEIGHT	H2O %	DRY WEIGHT	FREIGHT CHARGES
2	12-18	563	SP	334056	133,400	9.30	120,994	931.16
				TOTAL	133,400	12,406	120,994	931.16

PAYMENTS:

176.268	61.47
4.1375	43.76
.20000	—
.55903	8.65
.37669	339.40

DEDUCTIONS

[illegible]	—
[illegible]	100.00
[illegible]	20.73
[illegible]JUSTMENT	6.71
[illegible]	7.32
[illegible]	.57
[illegible]	31[illegible].25

QUOTATIONS DATE January, 1975

GOLD 176.268 SILVER 4.1925 LEAD .21500

COPPER .68103 ZINC .39153

POWER 14.45

LABOR RATE $ 6.237 FUEL RATE $ .507 M BTU

VALUE ONE F.O.B. Amarillo, Texas

60.4970 TONS @ 314.45	19,023.28
FREIGHT VALUATION ____ RATE ____	931.16
UMPIRE Au, Ag,	20.00
Air Pollution Surcharge	
936 Pounds Copper @ .015	14.04
PROVISIONAL PAYMENT	
ROYALTY % TO	
TOTAL [illegible]	1[illegible] 0[illegible] 0[illegible]

COPIES TO: (6)

CHECK PAYABLE TO:

Tonto Mining & Milling Company
c/o Jack Hamilton
P. O. Box 275
Tonto Basin, Arizona 85553 (2 w/check & Umpire)

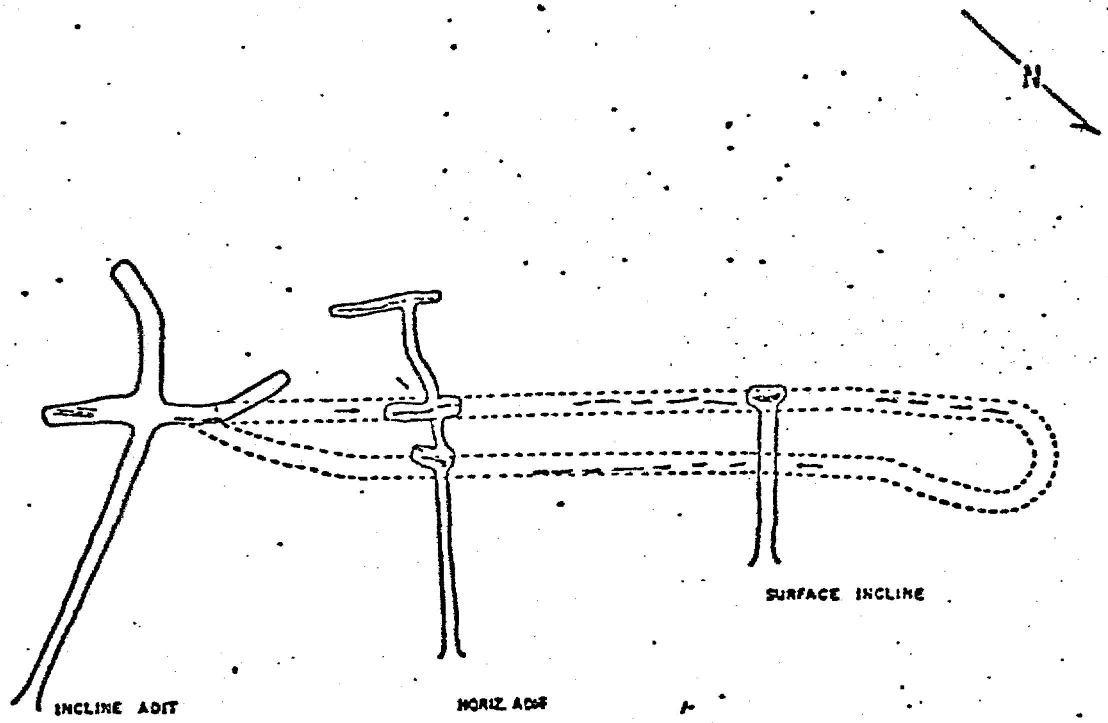
Mr. A. J. Kroha (1)

Mr. A. L. Doteman (1)

Voucher (1)

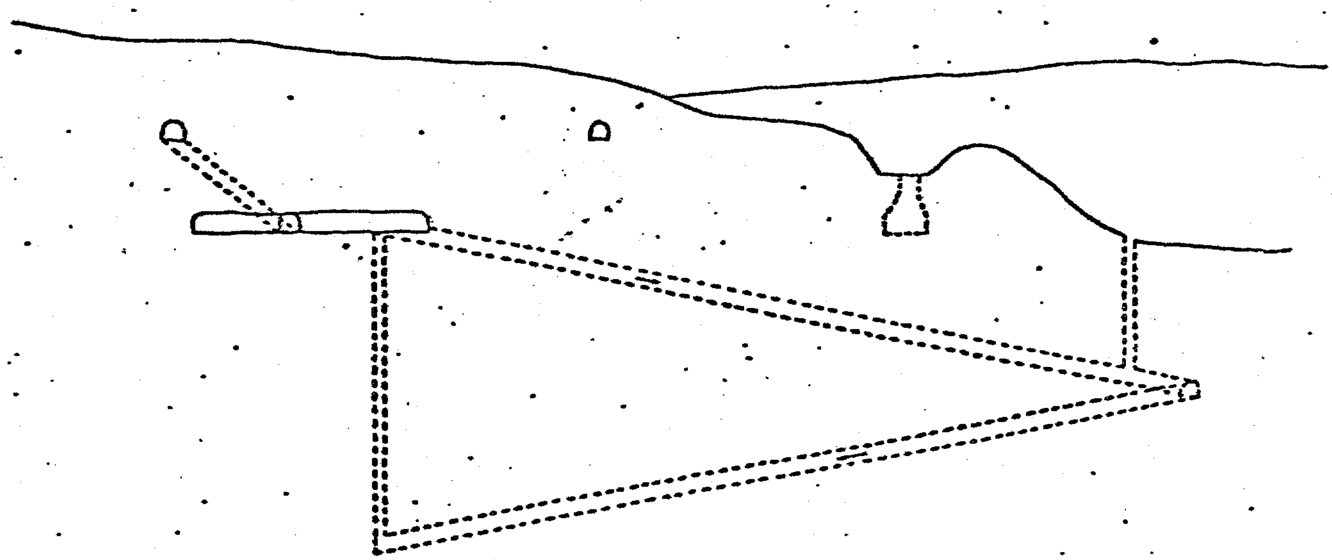
File (1)

CORRECT: [illegible] CORRECT: [illegible]



PLAN VIEW

SECTION



YELLOWJACKET M	
AUGREY MINING DIST	
PROPOSED DEVELOPM	
DATE: 4-26-75	DRAWING N
DRAWN BY: R TJ	REF: M-3

COPPERHEAD, INC.
P.O. BOX 931
WIKIEUP, ARIZONA 85360
(602) 765-2269

Arizona Mining Co.
15840 Ventura Blvd.
Encino, California

Gentlemen:

The following is our proposal for driving decline drift and mining ore at Yellow Jacket:

We propose to drive an incline drift from the S.E. inclines cross cut to the N.W. on a 20% decline past the open cut and then return to that ore body which will put us at the 200' level (see drawing). The block of ore now measures 50' x 9', and weighs 9 cu. ft. per ton and will give us 100' of overhead ore.

Cost of driving decline 385 @ $70 per ft.	$ 26,950
Cost of mining ore @ $6.50 per ton x 5000 tons	32,500
Timbering for aeras needed	10,000
Total cost for driving, mining & timbering	$ 69,450

The ore in this block has increased in value with depth. The relative samples assayed at the 100' level assay #101, March 10, 1975 by Charles O. Parker & Co. taken by Mr. Dale Anderson, an independent Geologist showed a value of $195 per ton in place.

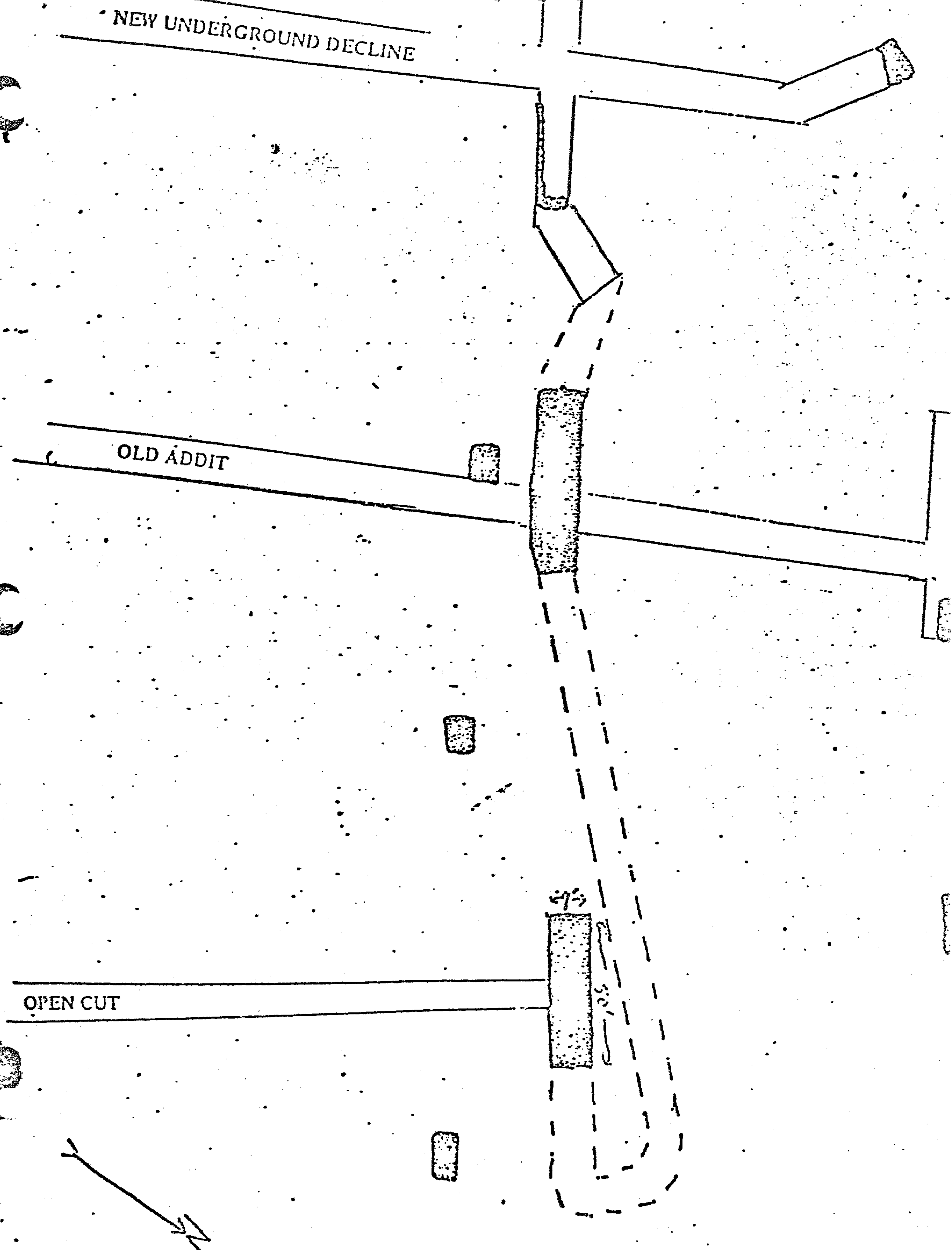
50' long x 9' wide x 100' deep = 5000 tons in the initial block x $195 per ton Value of mined ore stock piled at mine	$975,000

This proposal is for the initial mining of 5000 tons of ore to a stock pile at mine site. Further evaluation of ways to mine remaining ore should be made at that time. The possibility of sinking a shaft from this point should be given primary consideration.

Yours very truly,

F. J. Denten

F. J. Denten


NEW UNDERGROUND DECLINE
OLD ADDIT
OPEN CUT

ARIZONA MINING CO. OF CALIFORNIA
8500 LOUISE AVENUE
NORTHRIDGE, CALIFORNIA 91436
349-5917

COST OF MINING OPERATION

The following costs were taken from our actual trucking, milling, and smelting charges on ore shipped todate. The ore values are from assays taken by Dale Anderson, an independent geologist, and assayed by Charles O. Parker & Company, Denver, Colorado, copies of which are in this report dated 3/10/75, Yellow Jacket, assay #101.

Mining Cost . . . . incl. overhead and supervision	$ 22.00 Per Ton
Trucking ore to Mill	12.00 Per Ton
Milling Cost	25.00 Per Ton
Trucking concentrate from mill to rail head @ 3 to 1 ratio . .	3.33 Per Ton
Shipping from railhead to smelter @ 3 to 1 ratio	5.00 Per Ton
Smelting cost 143.83 Per concentrated ton @ 3 to 1 ratio . . .	47.94 Per Ton
10% royalty of net smelter returns	13.87 Per Ton
Contingency	5.00 Per Ton
Total Cost of mining, Milling, smelting and shipping	$134.14 Per Ton

Assayed value of ore	$195.00 Per Ton
Less mining + processing cost . .	134.14 Per Ton
Net profit	$ 61.86 Per Ton

Production of 1560 tons per mo. x 61.58 = $96,501.60 profit per month.

CAPITAL REQUIRED

Capital required	$400,000.00

COST OF MILL ON SITE

Projected cost to purchase and install a 150/200 ton per day Flotation Mill	200,000.00
Repayment of loans and accounts payable	90,000.00

WORKING CAPITAL

Cost of operating mill, $13.50 per ton x 1 mo. tonnage of 1,560 tons	21,060.00
Cost of driving decline of 385' @ 70.00 per ft.	26,950.00
Mining cost of $22.00 per ton x monthly production (1,560 Tons)	34,320.00
Total	$372,330.00

PROJECTED COST OF OPERATING MILL ON SITE

a. Cost of operation	$	11.00 per ton
b. Trucking ore from mine to mill on site		1.50 per ton
c. Contingency		1.00 per ton
Total cost to operate mill	$	13.50 per ton

PRESENT COST

a. Custom Mill Charges	$	25.00 Per Ton
b. Trucking from Mine to Mill		12.00 Per Ton
Present Cost	$	37.00 Per Ton
Cost of Milling and Trucking on Site		13.50 Per Ton
Net Savings Per Ton	$	23.50
1,560 Tons per month Production Savings @ $23.50 per ton =		36,660.00 Per Mo.
Annual Savings		$439,920.00

With the installation of a 150/200 ton per day mill at the site, it is possible to double mining and milling capacity, which will result in doubling our profits.

LINCOLN MACHINERY

12920 E. IMPERIAL HWY. - SANTA FE SPRINGS, CALIFORNIA 90670
868-6796 582-5491

August 14, 1975

Mr. David Zipp
17600 Gledhill Street
Northridge, California 91324

Dear Sir:

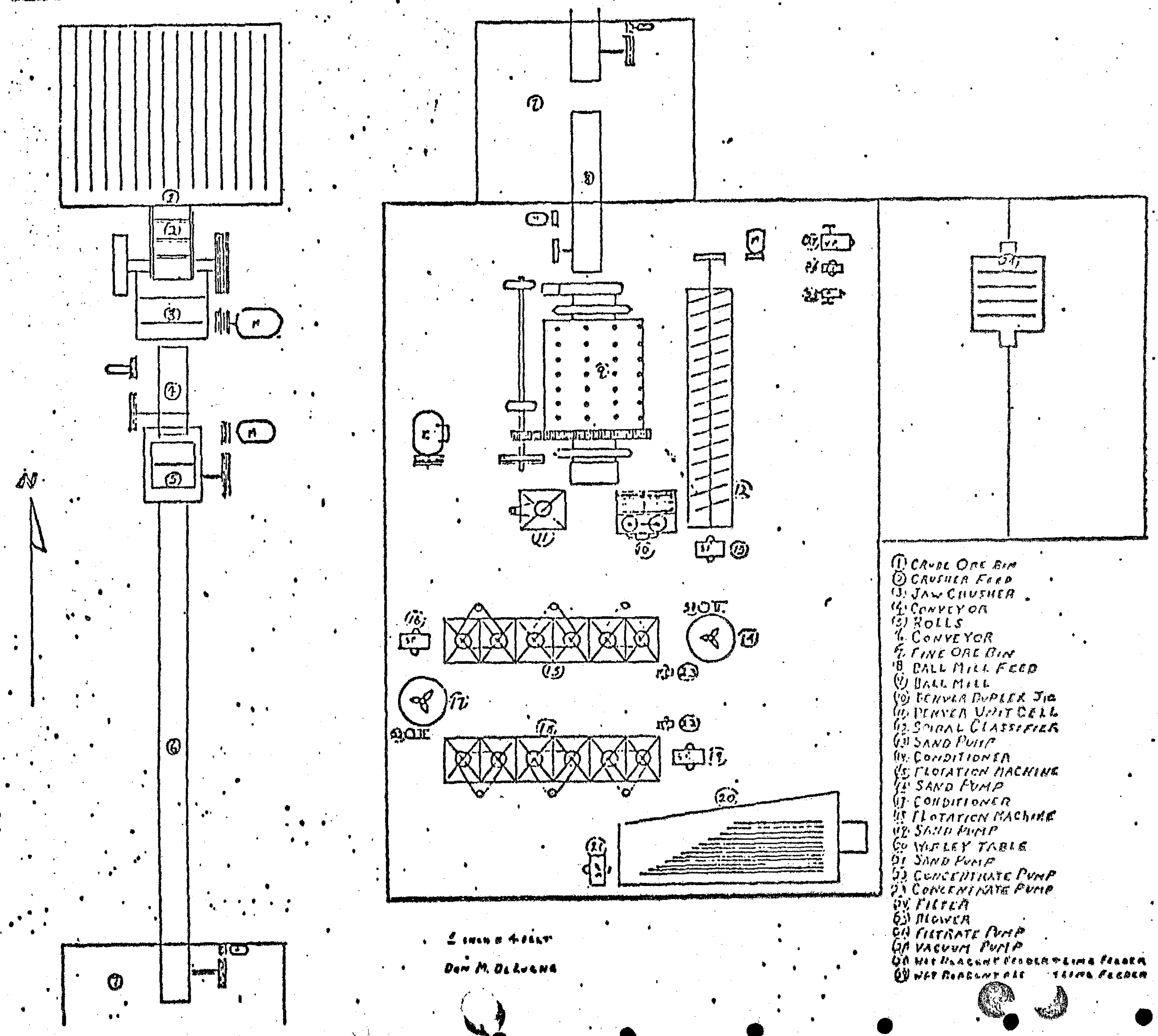
Persuant to your instructions, the following items are new and used costs (estimated) of quartz ore processing and precious metal recovery system for processing 150-200 tons of ore per day. These are contemplated for a location with established truck rates. Wikieup, Arizona, is such a location.

Also, adjustment should be made for items contemplated which are not required or for items required which are not included in this estimate; welders, shop tools grinder, drill press, etc., and also for rest room facilities and living accomodations, laboratory or assay facilities, chemicals, etc.

Due to inflation and adjustments and items not herein contemplated, I would suggest a $250,000. budget to provide the flexibility for adjustment of ecological items, replacement of terrain, after mining and landscaping, etc., also processing of used mine water, etc.

These items contemplate a wet processing situation; however, it may be desirable to use a dry system for much of this separation in order to reduce the capitol equipment and also improve ecological conditions.

Total for electrical installation, wire, electrical starters, switch boxes, etc., (material)	$ 7,500.	$ 12,750.
Labor	12,000.	11,000.
Installation of equipment	35,000	27,500.
foundations, etc. labor, concrete, maintenance, shop, etc.	18,000.	28,000.
	171,150.00	282,700.00


N
(1) CRUDE ORE BIN
(2) CRUSHER FEED
(3) JAW CRUSHER
(4) CONVEYOR
(5) ROLLS
(6) CONVEYOR
(7) FINE ORE BIN
(8) BALL MILL FEED
(9) BALL MILL
(10) DENVER DUPLEX JIG
(11) DENVER UNIT CELL
(12) SPIRAL CLASSIFIER
(13) SAND PUMP
(14) CONDITIONER
(15) FLOTATION MACHINE
(16) SAND PUMP
(17) CONDITIONER
(18) FLOTATION MACHINE
(19) SAND PUMP
(20) WILFLEY TABLE
(21) SAND PUMP
(22) CONCENTRATE PUMP
(23) CONCENTRATE PUMP
(24) FILTER
(25) BLOWER
(26) FILTRATE PUMP
(27) VACUUM PUMP

NEW AND USED

		USED	NEW
1.	Crude ore bin	750	2,000
2.	Crusher feeder	1500	3,500
3.	Jaw crusher, 18"x36" primary	4500	11,000
4.	Conveyor to rolls	2750	4,500
5.	Roll crusher 30"x18" or larger	7500	18,000
6.	Conveyor	3250	5,200
7.	Fine ore bin	1250	3,250
8.	Ball mill feeder	1800	3,750
9.	Ball Mill 5'x6'	18,500	50,000
10.	Denver duplex jig	8000	14,000
11.	Denver unit cell	6500	12,750
12.	Spiral classifier	3750	7,500
13.	Sand Pump	3200	5,400
14.	Conditioner	2400	3,800
15.	Flotation cells	3800	6,000
16.	Sand pump	3200	5,400
17.	Conditioner tank	1500	3,200
18.	Flotation cell	2750	5,000
19.	Sand pump	3200	5,400
20.	Table, concentrating	4500	8,000
21.	Sand pump	3200	5,400
22.	Concentrate pump	1700	3,000
23.	Concentrate pump	1700	3,000
24.	Filter	1500	3,200
25.	Blower	750	1,500
26.	Filtrate pump	700	1,200
27.	Vacuum pump	1500	3,500
28.	Wet rea-agent feeder & line feeder	1500	2,500
29.	Wet rea-agent feeder & line feeder	1500	2,500
		$98,650.00	$203,450.00

This estimate contemplates the Wikieup, Arizona area and requires a 90 day construction period which begins upon acceptance and completion of contractural arrangements.

I am available for further discussion of this project, at your convenience.

Respectfully submitted,

John W. Nelson

John W. Nelson

JWN:cs

WILLIAM J. LOGAN
3200 Como Ave. S. E.
Minneapolis, Minnesota 55414
612-331-4980

October 9, 1975

Mr. Wirt Cunningham
8500 Louise Avenue
Northridge, Ca. 91324

Re: Your request for quantity take offs from engineered projection chart of targets A, B, C, & D of Yellow Jacket Mine, Wikieup, Arizona

Dear Mr. Cunningham:

TARGET A – Tonnage to 400 foot level	194,569 Tons	
TARGET B – Tonnage to 400 foot level	157,267 Tons	
TARGET C – Tonnage to 400 foot level	142,551 Tons	
Total of Targets A, B, C	494,387 Tons	
TARGET D – From 400 foot to 600 foot level	558,933 Tons	
Total Tonnage of Targets A, B, C, & D		1,053,320 Tons

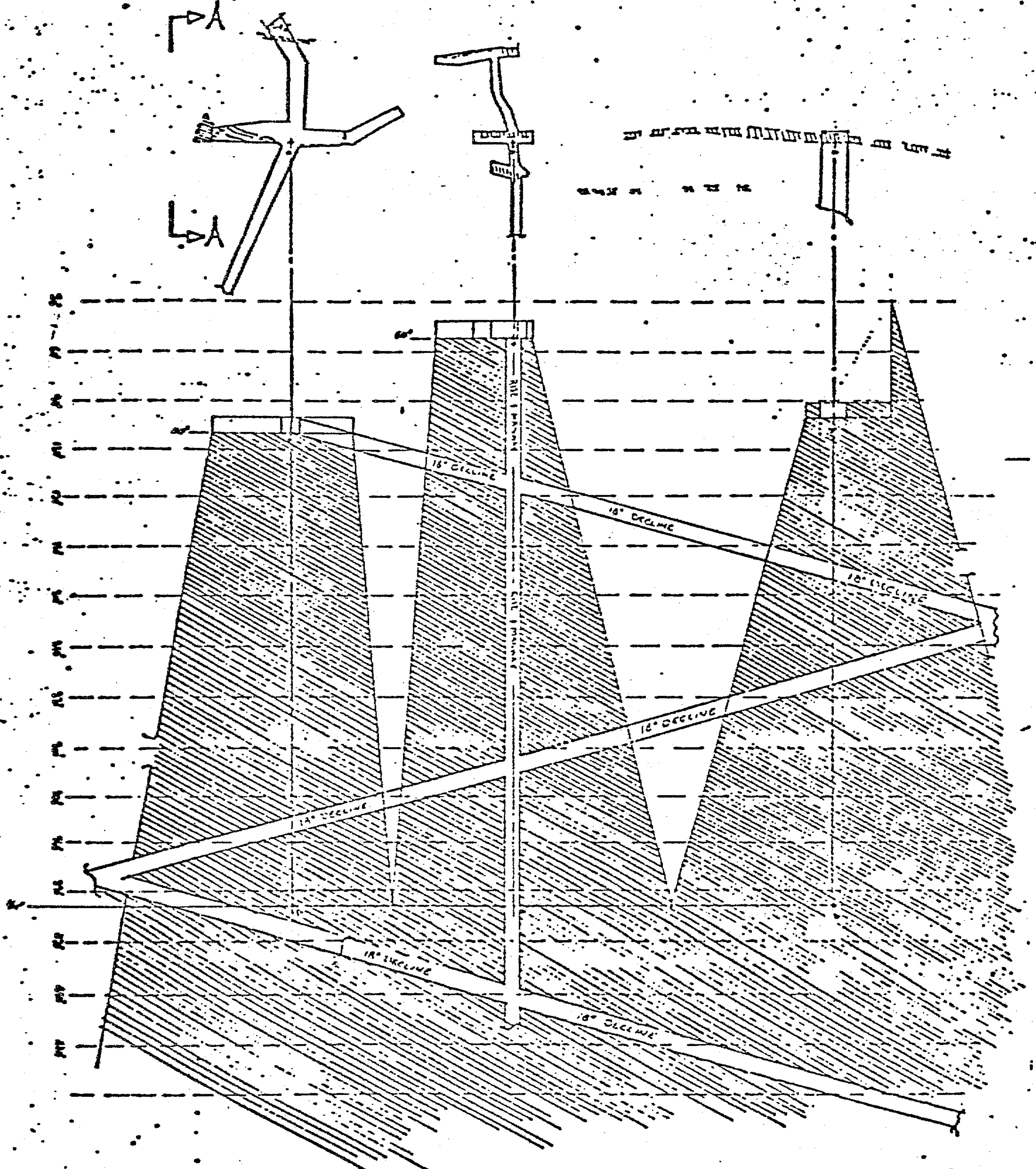
Please find attached work sheets showing derivation of computation.

Respectfully submitted,

W. J. Logan

William J. Logan
Mining Engineer

Professional Engineer
State of Washington
No. 3227, Feb. 1, 1948



SECTION A-A ROTATED 90° CC

ARIZONA MINING CO.
YELLOW JACKET MINE

SCALE: 1" = 50'

[illegible] - Mining Engineer
Prof. Engineer - State of Washington No. [illegible] [illegible]

WILLIAM J. LOGAN
3200 Como Ave. S. E.
Minneapolis, Minnesota 55414
612-331-4980

ENGINEERING CACULATIONS FOR TARGETS A, B, C, & D
FOR YELLOW JACKET MINE, WIKIEUP, ARIZONA

TARGET A

Rectangle	=	16' x 68' x 295'	=	320,960 cu. ft.		
Triangle A	=	(78' x 295')/2	=	11,505 sq. ft. x 16'	=	184,080 cu. ft.
Triangle B	=	(86' x 295')/2	=	12,685 sq. ft. x 16'	=	202,960 cu. ft.
Triangle C	=	(16' x 295')/2	=	2,360 sq. ft. x 221'	=	521,560 cu. ft.
Triangle D	=	(16' x 295')/2	=	2,360 sq. ft. x 221'	=	521,560 cu. ft.

1,751,120 cu. ft./9

194,569 Tons

TARGET B

Rectangle	=	8' x 35' x 350'	=	98,000 cu. ft.		
Triangle A	=	(47' x 350')/2	=	8,225 sq. ft. x 8'	=	65,800 cu. ft.
Triangle B	=	(79' x 350')/2	=	13,825 sq. ft. x 8'	=	110,600 cu. ft.
Triangle C	=	(20' x 350')/2	=	3,500 sq. ft. x 163'	=	570,500 cu. ft.
Triangle D	=	(20' x 350')/2	=	3,500 sq. ft. x 163'	=	570,500 cu. ft.

1,415,400 cu. ft./9

157,267 Tons

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ENGINEERING CACULATIONS FOR TARGETS A, B, C, & D FOR YELLOW JACKET MINE, WIKIEUP, ARIZONA

TARGET C

Rectangle	=	16' x 82' x 290'	=	380,480 cu. ft.		
Triangle A	=	(55' x 290')/2	=	7,975 sq. ft. x 16'	=	127,600 cu. ft.
Triangle B	=	(20' x 290')/2	=	2,900 sq. ft. x 16'	=	46,400 cu. ft.
Triangle C	=	(16' x 290')/2	=	2,320 sq. ft. x 157'	=	364,240 cu. ft.
Triangle D	=	(16' x 290')/2	=	2,320 sq. ft. x 157'	=	364,240 cu. ft.

1,282,960 cu. ft./9

142,551 Tons

TARGET D

FROM 400' TO 600' LEVEL

Rectangle	=	48' x 200' x 410'	=	3,936,000 cu. ft.		
Triangle A	=	(92' x 200')/2	=	9,200 sq. ft. x 48'	=	441,600 cu. ft.
Triangle B	=	(136' x 200')/2	=	13,600 sq. ft. x 48'	=	652,800 cu. ft.

5,030,400 cu. ft./9

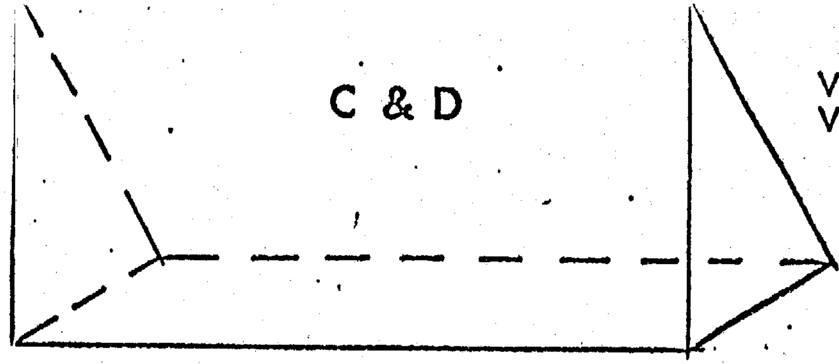
558,933 Tons

TOTAL TONS = 1,053,320

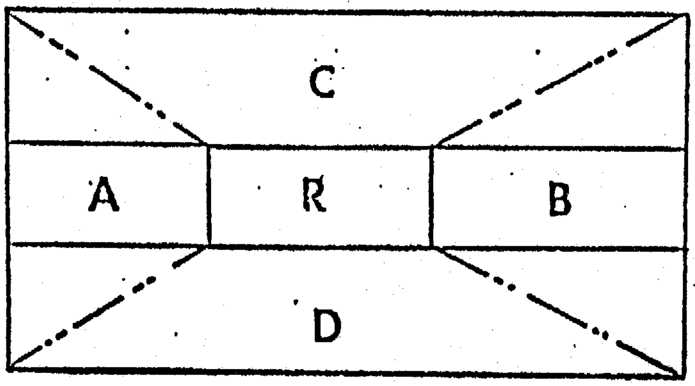
WILLIAM J. LOGAN
3200 Como Ave. S. E.
Minneapolis, Minnesota 55414
612-331-4980.

Volume of Rectangle R = bhw

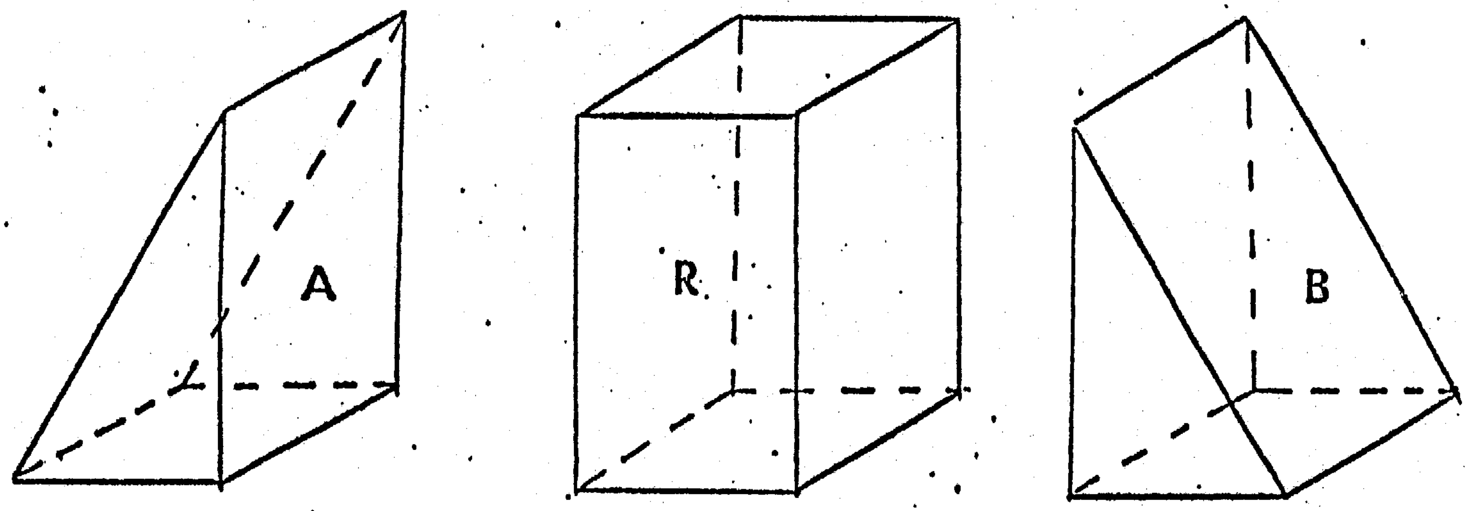
Volume of Triangle A, B, C, D = $\frac{bh\,(w)}{2}$



PROJECTED VIEW ROTATED 180



VIEW LOOKING DOWN AT ORE DEPOSIT



PROJECTED VIEWS

McPHAR REPORT
INDUCED POLARIZATION
AND RESISTIVITY

REPORT ON THE
INDUCED POLARIZATION
AND RESISTIVITY
RECONNAISSANCE AND TEST SURVEY
AT THE
YELLOW JACKET MINE
MOHAVE COUNTY, ARIZONA
FOR
HOFFMAN MINERAL RESOURCES
EXPLORATION COMPANY

McPHAR GEOPHYSICS

NOTES ON THE THEORY, METHOD OF FIELD OPERATION AND PRESENTATION OF DATA FOR THE INDUCED POLARIZATION METHOD

Induced Polarization as a geophysical measurement refers to the blocking action or polarization of metallic or electronic conductors in a medium of ionic solution conduction.

This electro-chemical phenomenon occurs wherever electrical current is passed through an area which contains metallic minerals such as base metal sulphides. Normally, when current is passed through the ground, as in resistivity measurements, all of the conduction takes place through ions present in the water content of the rock, or soil, i.e. by ionic conduction. This is because almost all minerals have a much higher specific resistivity than ground water. The group of minerals commonly described as "metallic", however, have specific resistivities much lower than ground waters. The induced polarization effect takes place at those interfaces where the mode of conduction changes from ionic in the solutions filling the interstices of the rock to electronic in the metallic minerals present in the rock.

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d. c. current is allowed to flow through the rock; i. e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the interfaces, to appreciably reduce the amount of current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

When the d. c. voltage used to create this d. c. current flow is cut off, the Coulomb forces between the charged ions forming the polarization cause them to return to their normal position. This movement of charge creates a small current flow which can be measured on the surface of the ground as a decaying potential difference.

From an alternate viewpoint it can be seen that if the direction of the current through the system is reversed repeatedly before the polarization occurs, the effective resistivity of the system as a whole will change as the frequency of the switching is changed. This is a consequence of the fact that the amount of current flowing through each metallic interface depends upon the length of time that current has been passing through it in one direction.

The values of the per cent frequency effect or F. E. are a measurement of the polarization in the rock mass. However, since the measurement of the degree of polarization is related to the apparent resistivity of the rock mass it is found that the metal factor values or M. F. are the most useful values in determining the amount of polarization present in the rock mass. The MF values are obtained by normalizing the F. E. values for varying resistivities.

The induced polarization measurement is perhaps the most powerful geophysical method for the direct detection of metallic sulphide mineralization, even when this mineralization is of very low concentration. The lower limit of volume per cent sulphide necessary to produce a recognizable IP anomaly will vary with the geometry and geologic environment of the source, and the method of executing the survey. However, sulphide mineralization of less than one per cent by volume has been detected by the IP method under proper geological conditions.

The greatest application of the IP method has been in the search for disseminated metallic sulphides of less than 20% by volume. However, it has also been used successfully in the search for massive sulphides in situations where, due to source geometry, depth of source, or low resistivity of surface layer, the EM method can not be successfully applied. The ability to differentiate ionic conductors, such as water filled shear zones, makes the IP method a useful tool in checking EM anomalies which are suspected of being due to these causes.

In normal field applications the IP method does not differentiate between the economically important metallic minerals such as chalcopyrite, chalcocite, molybdenite, galena, etc., and the other metallic minerals such as pyrite. The induced polarization effect is due to the total of all electronic conducting minerals in the rock mass. Other electronic conducting materials which can produce an IP response are magnetite, pyrolusite, graphite, and some forms of hematite.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of vertical changes in the properties. Current is applied to the ground at two points in distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes is an integer number (n) times the basic distance (X).

The measurements are made along a surveyed line, with a constant distance (nX) between the nearest current and potential electrodes. In most surveys, several traverses are made with various values of (n); i.e. (n) = 1, 2, 3, 4, etc. The kind of survey required (detailed or reconnaissance) decides the number of values of (n) used.

In plotting the results, the values of the apparent resistivity, apparent per cent frequency effect, and the apparent metal factor measured for each set of electrode positions are plotted at the intersection of grid lines, one from the center point of the current electrodes and the other from the center point of the potential electrodes. (See Figure A.) The resistivity values are plotted above the line as a mirror image of the metal factor values below. On a second line, below the metal factor values, are plotted the values of the per cent frequency effect. In some cases the values of per cent frequency effect are plotted as superscripts of the metal factor value. In this second case the frequency effect values are not contoured. The lateral displacement of a given value is determined by the location along the survey line of the center point between the current and potential electrodes. The distance of the value from the line is determined by the distance (nX) between the current and potential electrodes when the measurement was made.

The separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. The plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line. The interpretation of the results from any given survey must be carried out using the combined experience gained from field results, model study results and theoretical investigations. The position of the electrodes when anomalous values are measured is important in the interpretation.

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the electrodes are moved after a series of potential readings has been made. One of the advantages of the induced polarization method is that the same equipment can be used for both detailed and reconnaissance surveys merely by changing the distance (X) over which the electrodes are moved each time. In the past, intervals have been used ranging from 25 feet to 2000 feet for (X). In each case, the decision as to the distance (X) and the values of (n) to be used is largely determined by the expected size of the mineral deposit being sought, the size of the expected anomaly and the speed with which it is desired to progress.

The diagram in Figure A demonstrates the method used in plotting the results. Each value of the apparent resistivity, apparent metal factor, and apparent per cent frequency effect is plotted and identified by the position of the four electrodes when the measurement was made. It can be seen that the values measured for the larger values of (n) are plotted farther from the line indicating that the thickness of the layer of the earth that is being tested is greater than for the smaller values of (n); i.e. the depth of the measurement is increased. When the F.E. values are plotted as superscripts to the MF values the third section of data values is not presented and the F.E. values are not contoured.

The actual data plots included with the report are prepared utilizing an IBM 360/75 Computer and a Calcomp 770/763 Incremental Plotting System. The data values are calculated, plotted, and contoured according to a programme developed by McPhar Geophysics. Certain symbols have been incorporated into the programme to explain various situations in recording the data in the field.

The IP measurement is basically obtained by measuring the difference in potential or voltage (ΔV) obtained at two operating frequencies. The voltage is the product of the current through the ground and the apparent resistivity of the ground. Therefore in field situations where the current is very low due to poor electrode contact, or the apparent resistivity is very low, or a combination of the two effects; the value of (ΔV) the change in potential will be too small to be measurable. The symbol "TL" on the data plots indicates this situation.

In some situations spurious noise, either man made or natural, will render it impossible to obtain a reading. The symbol "N" on the data plots indicates a station at which it is too noisey to record a reading. If a reading can be obtained, but for reasons of noise there is some doubt as to its accuracy, the reading is bracketed in the data plot ( ).

In certain situations negative values of Apparent Frequency Effect are recorded. This may be due to the geologic environment or spurious electrical effects. The actual negative frequency effect value recorded is indicated on the data plot, however the symbol "NEG" is indicated for the corresponding value of Apparent Metal Factor. In contouring negative values the contour lines are indicated to the nearest positive value in the immediate vicinity of the negative value.

The symbol "NR" indicates that for some reason the operator did not attempt to record a reading although normal survey procedures would suggest that one was required. This may be due to inaccessible topography or other similar reasons. Any symbol other than those discussed above is unique to a particular situation and is described within the body of the report.

METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS

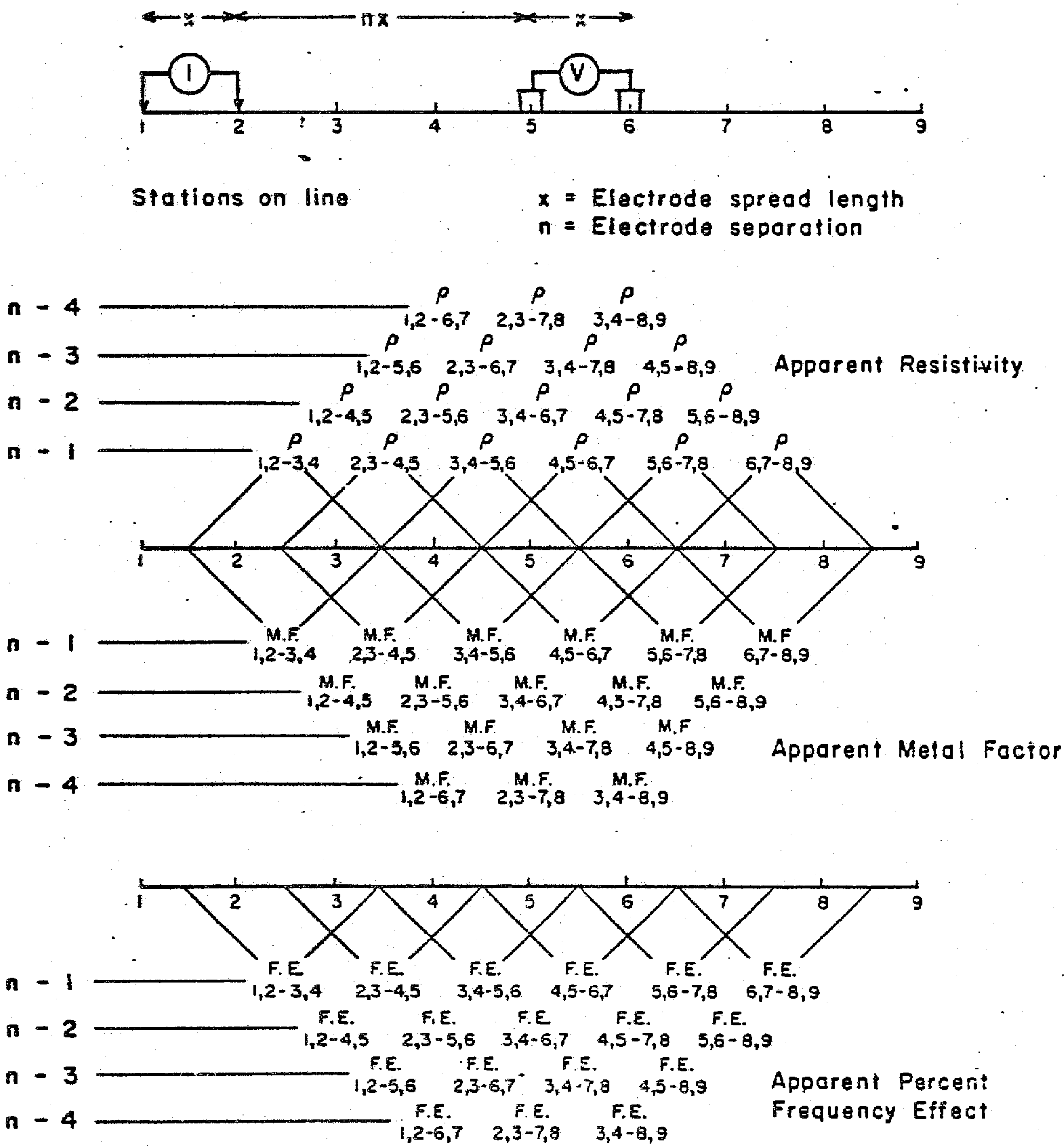


Fig. A

McPHAR GEOPHYSICS

REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY RECONNAISSANCE AND TEST SURVEY AT THE YELLOW JACKET MINE MOHAVE COUNTY, ARIZONA FOR HOFFMAN MINERAL RESOURCES EXPLORATION COMPANY

I. INTRODUCTION

At the request of Mr. Hy Hoffman of Hoffman Mineral Resources Exploration Company, McPhar has completed an Induced Polarization and Resistivity Reconnaissance and Test Survey at the Yellow Jacket Mine, Mohave County, Arizona. The Yellow Jacket Mine is situated in the vicinity of Greenwood Well, within the Hoffman Lode Claims, Section 11, T. 15N., R. 14W., Wikieup NW quadrangle.

Subsequent to the Induced Polarization and Resistivity Survey, the property was examined by Mr. C.P. Keegel of Keegel Engineering Incorporated, engineering consultants to Hoffman Mineral Resources, in order to provide geologic background for the IP interpretation. The geology and mineralization at the Yellow Jacket Mine and Hoffman Lode Claims are described in a Reconnaissance Examination Report dated July 3, 1971, and are summarized below.

The rocks within the claim group are Precambrian metamorphics, later premineral andesite and rhyolite and early Tertiary (?) granites. At the Yellow Jacket Mine an adit with about 200 feet of crosscut and 60 feet of drifts has intersected two northwest-striking fissure veins, 3 to 4 feet wide and 20 to 25 feet apart. A very weakly mineralized slip was intersected approximately 45 feet southwest of the southwesternmost vein. The veins contain kaolinized, granitic breccia fragments which are coated with the oxidation products of chalcopyrite. Ore specimens collected by Mr. Hoffman assay as high as 2.55% copper, 0.43 oz. gold and 19.84 oz. silver, but the exposed mineralization within the veins is erratic and there is no evident zoning. Both fissure veins appear to be the walls of a single late granite dike that intrudes the metamorphics. Local horizontal foliation of the metamorphics caused by east-west vertical faults may have controlled ore deposition. While the zone of oxidation is usually complete, the vertical extent is not great and varies from 50 feet or less at the lower elevations to 150 feet or more near the ridges.

The purpose of the Induced Polarization and Resistivity Survey was to prospect for possible concentrations of sulphide mineralization at depth along the veins. In order to achieve this, measurements were made with 200-foot dipoles along a single northwest-trending reconnaissance line parallel to the veins. Measurements were also made with 50-foot dipoles along a test line normal to the strike and across the exposed mineralization in order to serve as a reference for interpreting the results along subsequent cross lines. This approach has been successful in discovering hidden ore bodies located along vein systems in both the United States and Canada. Mr. C.P. Hensel points out in his report that the early Tertiary granite in often pyrite bearing to some extent and is likely to show anomalies as traversed east to west, particularly in the vicinity of the canyons west of the mine which mark the course of high-angle faults.

The survey was planned and the results reviewed with Mr. Hoffman, who furnished the Keegel Engineering report. The work was performed under the supervision of Mr. Gordon Trefenanko, Crew Chief.

2. PRESENTATION OF RESULTS

The Induced Polarization and Resistivity results are shown on the following data plots in the manner described in the notes preceding this report.

Line	Electrode Intervals	Dwg. No.
Base Line	200 feet	IP 5323-1
2NW	50 feet	IP 5323-2
0	50 feet	IP 5323-3
2SE	50 feet	IP 5323-4

Also enclosed with this report is Dwg. I.P.P. 4837, a plan map of the Yellow Jacket Mine area at a scale of 1" = 100 feet. An enlargement of the mine area at a scale of 1" = 30 feet taken from the Keegel Engineering report is shown as an insert on this drawing. The claim locations shown on Dwg. I.P.P. 4837 have been taken from maps furnished by Mr. Hy Hoffman.

In this report both percent frequency effect (PFE) anomalies and metal factor (MF) anomalies are shown on the plan map. Percent frequency effect is a measure of the intensity of polarization and anomalies are classified as very weak to very strong. The percent frequency effect results indicate polarizable areas without taking into account the resistivity of the areas. Metal factor (MF) is obtained by combining the percent frequency effect and the resistivity. A good conductor (low resistivity) that is strongly polarizable (high percent frequency effect) will give a well-defined or definite metal factor anomaly. Less well-defined metal factor anomalies are designated as probable or possible.

The percent frequency effect and metal factor parameters are complementary. The relative importance of each type of information depends upon the particular geophysical environment and the type of target expected. For example, a mineralized silicified zone will give a strong percent frequency effect anomaly, but may not give a definite metal factor anomaly. Alternatively, an oxidized ore zone may only give a weak percent frequency effect anomaly, but will give a definite metal factor anomaly pattern. Judicious consideration of both the percent frequency effect and the metal factor results permits a comprehensive evaluation of the geophysical environment.

The anomalies as shown on the data plots and plan map represent the surface projection of the polarizable zones. Contacts or faults inferred from the resistivity patterns are also shown. Anomaly boundaries and fault locations should be considered accurate to the electrode interval used.

The anomalies shown on the plan map are designated apparent depths of shallow, moderate, or deep. At larger dipole separations a greater volume of rock is averaged, in lateral extent as well as depth. Thus, the source of a deep-appearing anomaly detected along a single line may be at shallow depth one side of the line. The data plots, therefore, cannot represent true depth.

Depths can be calculated from the apparent resistivity data in the case of ideal horizontal layers, but even this calculation depends on an assumed resistivity contrast between the zone at depth and the overlying rock. Although ambiguous, the simple depth designations are useful for correlating or comparing anomalous zones obtained on adjacent survey lines. Drill hole information from one or more zones frequently permits one to make a fair depth estimate for other zones. The following depth generalizations apply to porphyry copper and contact-replacement bodies:

	Apparent Depth (dipole separations)	Drill Hole Depth (in dipole lengths)
Shallow	1 - 2	$\frac{1}{2}$ - 1
Moderate	2 - 3	1 - 1$\frac{1}{2}$
Deep	3 - 5	1$\frac{1}{2}$ - 2+

Thus, a shallow zone is one detected at a one-to-two dipole separation and should be tested by a drill hole from a half-to-one dipole length deep.

An appendix on the interpretation of Induced Polarization anomalies from small sources is enclosed in this report. It shows the desirability of detailing with shorter spreads when the anomaly is shallow and the source may be narrow.

The Induced Polarization method is a geophysical tool used to determine the electrical properties of the earth. The final evaluation of the Induced Polarization anomalies, e.g., which of the anomalies constitutes the most favourable exploration target, must be based on available geologic evidence and concepts.

5. DISCUSSION OF RESULTS

As shown on the plan map, the 200-foot dipole results along the Base Line indicate a probable metal factor anomaly at shallow to moderate depth 200 feet to 400 feet southeast of the main mine workings. The 50-foot dipole results indicate probable and definite anomalies along Line 2NW and Line 2SW and probable anomalies along Line 0. The associated anomalous PFE responses range from above-background to weak. The Resistivity and Induced Polarization results obtained along each line are discussed in detail below.

Base Line

Low-resistivity zones occur at shallow to moderate depth in the intervals 8SE to 6SE and 4SE to 2SE. The latter zone is associated with a northeast-trending wash which crosses the line between 3SE and 2SE. Resistivity highs are associated with the intervals 6SE to 4SE and 2SE to 0+00. Neither the resistivity highs nor the resistivity lows appear to have been caused by topography. The broad, shallow resistivity lows in the intervals (?) 12SE to 8SE and 2NW to 12NW can be attributed to overlying alluvium and gravels, but there is some indication of a resistivity low at depth in the interval 12NW to 14NW.

The PFE results indicate a very weak anomaly at shallow to moderate depth in the interval 4SE to 1NW. The slightly higher PFE's measured at wider dipole separations in the interval 0+00 to 2NW suggest a possible increase in sulphide mineralization with depth in the vicinity of 0+00. The PFE's in the intervals (?) 2SE to 4SE and 1NW to 12NW (?) are background in magnitude. The probable metal factor anomaly in the interval 4SE to 2SE is due to low resistivities and above-background to very weak PFE's. The anomaly pattern suggests a nearly vertical source. The possible metal factor anomalies in the intervals (?)12SE to 4SE and 4NW to 12NW(?) are mainly due to low resistivities.

Line 2NW

The resistivity results indicate resistivity lows at shallow depth in the interval 3SW to 2+50SW, at shallow to moderate depth in the interval 0+50NE to 1NE and at moderate depth in the interval 2SW to 1+50SW. Tailings in the vicinity of 1NE may have contributed to the resistivity low in the interval 0+50NE to 1NE.

An above-background to very weak PFE anomaly occurs at moderate depth in the interval 0+50NE to 1NE. An above-background PFE zone also occurs at moderate depth in the interval 2SW to 1SW. The definite metal factor anomaly in the interval 0+50NE to 1NE is due to low resistivities and background to very weak PFE's. The anomaly pattern suggests a nearly vertical or slightly northeast-dipping source. The probable metal factor anomaly in the interval (?)3SW to 2+50SW is mainly due to the shallow resistivity low in this interval. The probable metal factor anomaly in the interval 2SW to 1+50SW is due to both low resistivities and above-background PFE's.

Line 0

The resistivity results indicate resistivity lows at shallow to moderate depth in the intervals 0+50SW to 0+00 and 0+50NE to 1NE. The shallow resistivity low in the interval 2+50NE to 3NE may be due to tailings below the main adit.

Slightly above-background to very weak PFE's occur at depth in the vicinity of 1+50SW and 2NE. The probable metal factor anomaly at shallow to moderate depth is the response of the fissure veins. The anomaly is due to low resistivities and slightly above-background to very weak PFE's at depth. The anomaly pattern dips to the northeast, indicating that the source of the anomaly dips to the southwest. The probable anomaly at shallow to moderate depth in the interval 0+50SW to 0+00 is due to low resistivities and above-background to very weak PFE's. The source of this anomaly appears to dip to the northeast and to be deeper than the anomaly in the interval 0+50NE to 1NE.

Line 2SE

A resistivity low occurs at shallow to moderate depth in the interval 0+50NE to 1NE. Partially-delineated resistivity lows appear at shallow to moderate depth in the interval (?) 3+50SW to 3SW and at moderate to deep depth in the interval 1+50NE to 2NE(?).

The PFE's along Line 2SE are higher than those measured along Line 0 and Line 2NW. A very weak to weak PFE anomalous zone occurs in the interval 2+50SW to 1NE. The zone is strongest at moderate depth in the intervals 1SW to 0+50SW and 0+50NE to 1NE. The definite metal factor anomaly in the interval 0+50NE to 1NE is due to low resistivities and very weak to weak PFE's. The anomaly pattern suggests a nearly vertical to slightly northeast-dipping source. The probable metal factor anomaly at shallow to moderate depth in the interval (?) 3+50SW to 3SW is mainly due to low resistivities.

4. CONCLUSIONS AND RECOMMENDATIONS

Based on the response over the exposed mineralization along Line 0, the definite and probable metal factor anomalies detected by the IP survey should all be of exploration interest. The two inclined drill holes proposed by Mr. C.D. Koegel, to be collared underground at approximately 0+00 along Line 0 and inclined 40° and 60° in a N40°E direction, will test the probable metal factor anomaly associated with the exposed mineralization in the interval 0+50NE to 1NE. If the drilling results are encouraging, a drill hole collared at 0+50NE and inclined 45° to the southwest along Line 0 should also be drilled to test the probable metal factor anomaly in the interval 0+50SW to 0+00.

The definite metal factor anomaly in the interval 0+50NE to 1NE along Line 2SE appears to be a particularly fine target that should be tested during the initial test drilling program. The anomaly is due to material that is both conductive and polarizable and the response is greater than that obtained over the exposed mineralization. A drill hole collared at 1+25NE and inclined 40° to 60° to the southwest is recommended. If the drilling results are encouraging, the definite anomaly in the interval 0+50NE to 1NE should be tested in a similar fashion.

The 200-foot dipole results along the Base Line indicate that the area between 4SE and 1NW contains the greatest concentrations of primary sulphides. Consideration should be given to running 50-foot-dipole cross lines at 3SE and 4SE prior to any additional drilling.

The probable metal factor anomalies at shallow depth in the interval

(?) 3SW to 2+50SW along Line 2NW and at shallow to moderate depth in the interval (?) 1+50SW to 3SW along Line 2SE could be associated with pyritic granite, andesite or rhyolite, and should be dozed to permit surface examination, as recommended by Mr. Heegel. If these anomalies prove to be of further interest, both lines should be extended to the southwest. Also, an additional 50-foot-dipole cross line should be run at 3NW along the Base Line to better delineate the probable metal factor anomaly which appears at moderate depth in the interval 2SW to 1+50SW along Line 2NW.

McPHAR GEOPHYSICS INCORPORATED

Anthony M. Hauck III
Geophysicist.

Robert A. Bell,
Geologist.

Dated: August 11, 1971

APPENDIX
THE INTERPRETATION OF INDUCED POLARIZATION ANOMALIES FROM RELATIVELY SMALL SOURCES

The induced polarization method was originally developed to detect disseminated sulphides and has proven to be very successful in the search for "porphyry copper" deposits. In recent years we have found that the IP method can also be very useful in exploring for more concentrated deposits of limited size. This type of source gives sharp IP anomalies that are often difficult to interpret.

The anomalous patterns that develop on the contoured data plots will depend on the size, depth and position of the source and the relative size of the electrode interval. The data plots <u>are not</u> sections showing the electrical parameters of the ground. When the electrode interval (X) is appreciably greater than the width of the source, a large volume of unmineralized rock is averaged into each measurement. This is particularly true for the large values of the electrode separation (n).

The theoretical scale model results shown in Figure 1 and Figure 2 indicate the effect of depth. If the depth to the top of the source is small compared to the electrode interval (i. e. d X) the measurement for n = 1 will be anomalous. In Figure 1 the depth is 0.5 units (X = 1.0 units) and the n = 1 value is definitely anomalous; the pattern on the contoured data plot is typical for a relatively shallow, narrow, near-vertical tabular source. The results in Figure 2 are for the same source with the depth increased to 1.5 units. Here the n = 1 value is not anomalous; the larger values of (n) are anomalous but the magnitudes are much lower than for the source at less depth.

When the electrode interval is greater than the width of the source, it is not possible to determine its width or exact position between the electrodes. The true IP effect within the source is also indeterminate; the anomaly from a very narrow source with a very large true IP effect will be much the same as that from a zone with twice the width and 1/2 the true IP effect. The theoretical scale model data shown in Figure 3 and Figure 4 demonstrate this problem. The depth and position of the source are unchanged but the width and true IP effect are varied. The anomalous patterns and magnitudes are essentially the same, hence the data are insufficient to evaluate the source completely.

The normal practise is to indicate the IP anomalies by solid, broken, or dashed bars, depending upon their degree of distinctiveness. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured. As illustrated in Figure 1, Figure 2, Figure 3 and Figure 4, no anomaly can be located with more accuracy than the spread length. While the centre of the solid bar indicating the anomaly corresponds fairly well with the source, the length of the bar should not be taken to represent the exact edges of the anomalous material.

If the source is shallow, the anomaly can be better evaluated using a shorter electrode interval. When the electrode interval used approaches the width of the source, the apparent effects measured will be nearly equal to the true effects within the source. When there is some depth to the top of the source, it is not possible to use electrode intervals that are much less than the depth to the source. In this situation, one must realize that a definite ambiguity exists regarding the width of the source and the IP effect within the source.

Our experience has confirmed the desirability of doing detail. When a reconnaissance IP survey using a relatively large electrode interval indicates the presence of a narrow, shallow source, detail with shorter electrode intervals is necessary in order to better locate, and evaluate, the source. The data of most usefulness is obtained when the maximum apparent IP effect is measured for n = 2 or n = 3. For instance, an anomaly originally located using X = 300' may be checked with X = 200' and then X = 100'. The data with X = 100' will be quite different from the original reconnaissance results with X = 300'.

The data shown in Figure 5 and Figure 6 are field results from a greenstone area in Quebec. The expected sources were narrow (less than 30' in width) zones of massive, high-grade, zinc-silver ore. An electrode interval of 200' was used for the reconnaissance survey in order to keep the rate of progress at an acceptable level. The anomalies located were low in magnitude.

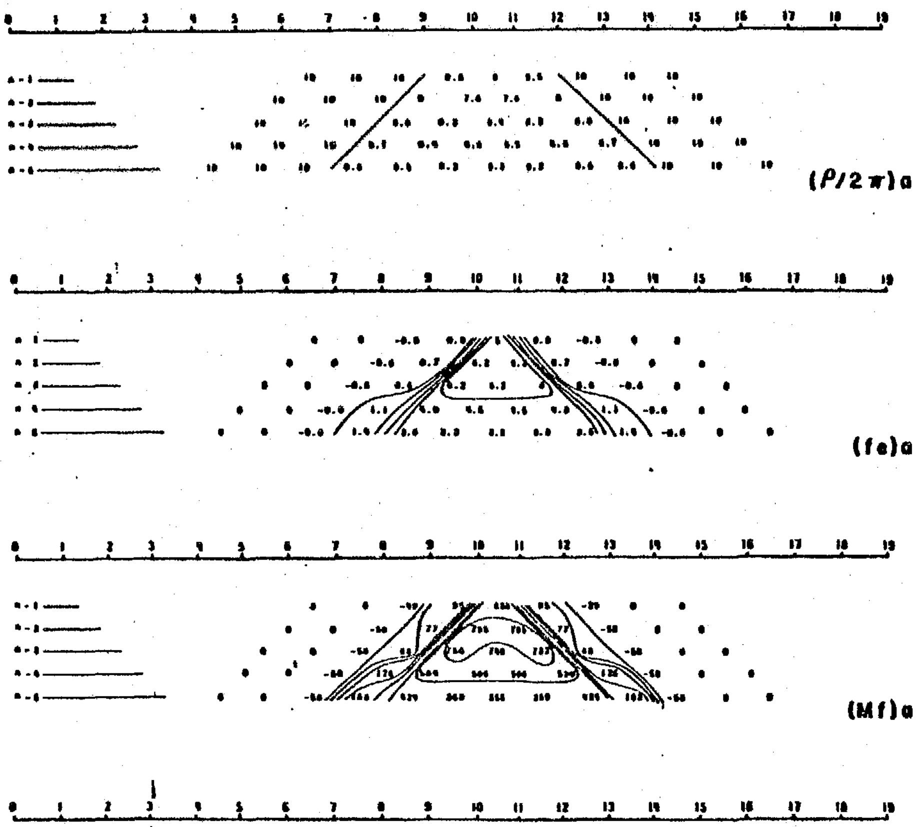
The very weak, shallow anomaly shown in Figure 5 is typical of those located by the X = 200' reconnaissance survey. Several anomalies of this type were detailed using shorter electrode intervals. In most cases the detail measurements suggested broad zones of very weak mineralization. However, in the case of the source at 20N to 22N, the measurements with shorter electrode intervals confirmed the presence of a strong, narrow source. The X = 50' results are shown in Figure 6. Subsequent drilling has shown the source to be 12.5' of massive sulphide mineralization containing significant zinc and silver values.

The change in the anomaly that results when the electrode interval is reduced is not unusual. The X = 50' data more accurately locates the narrow source, and permits the geophysicist to make a better evaluation of its importance. The completion of this type of detail is very important, in order to get the maximum usefulness from a reconnaissance IP survey.

McPHAR GEOPHYSICS LIMITED

Theoretical Induced Polarization and Resistivity Studies

Scale Model Cases



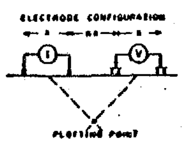
$(\rho/2\pi)_1 = 10$

$(Mf)_1 = 0$

$(\rho/2\pi)_2 = 2{\cdot}51$

$(Mf)_2 = 10000$

$(fe)_2 = 25\%$



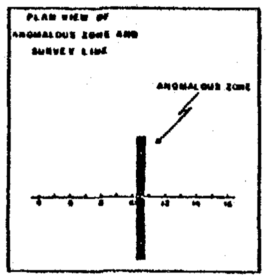


FIG 1

CASE II-0·5-BU-10-a

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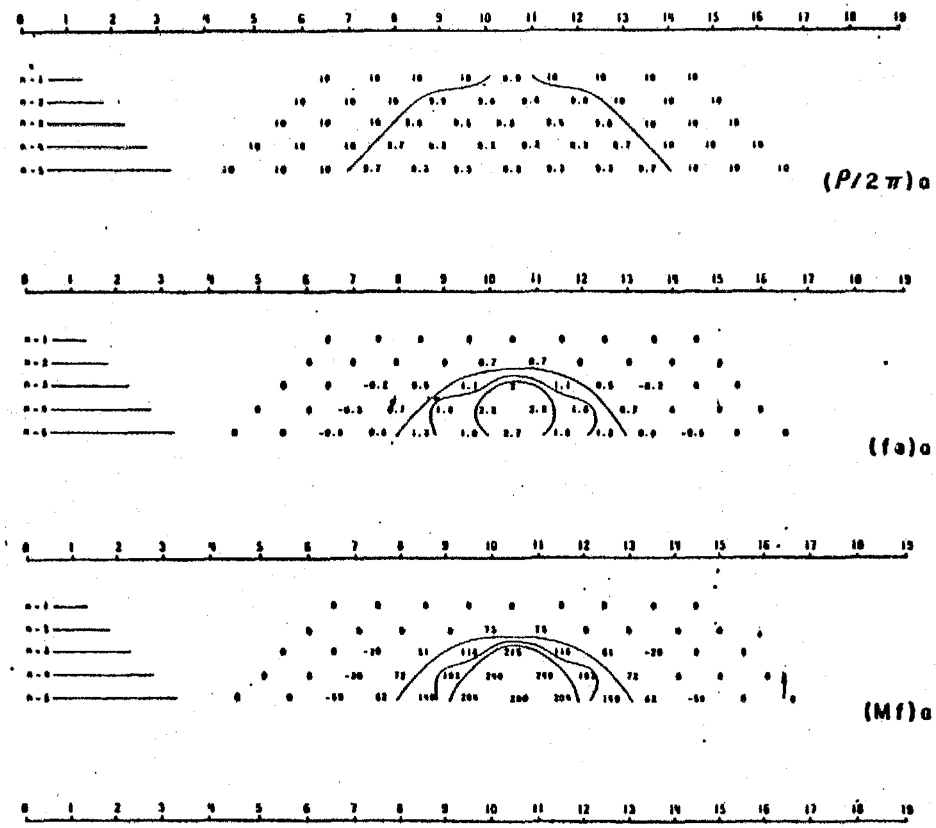
Theoretical Induced Polarization and Resistivity Studies

Scale Model Cases



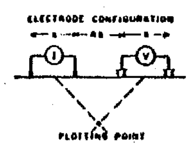
$(\rho/2\pi)_1 = 10$

$(Mf)_1 = 0$

$(\rho/2\pi)_2 = 2{\cdot}6$

$(Mf)_2 = 9250$

$(fe)_2 = 24\%$



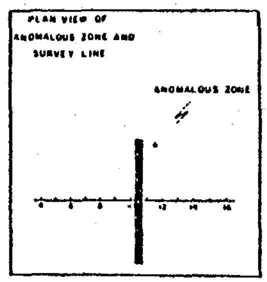
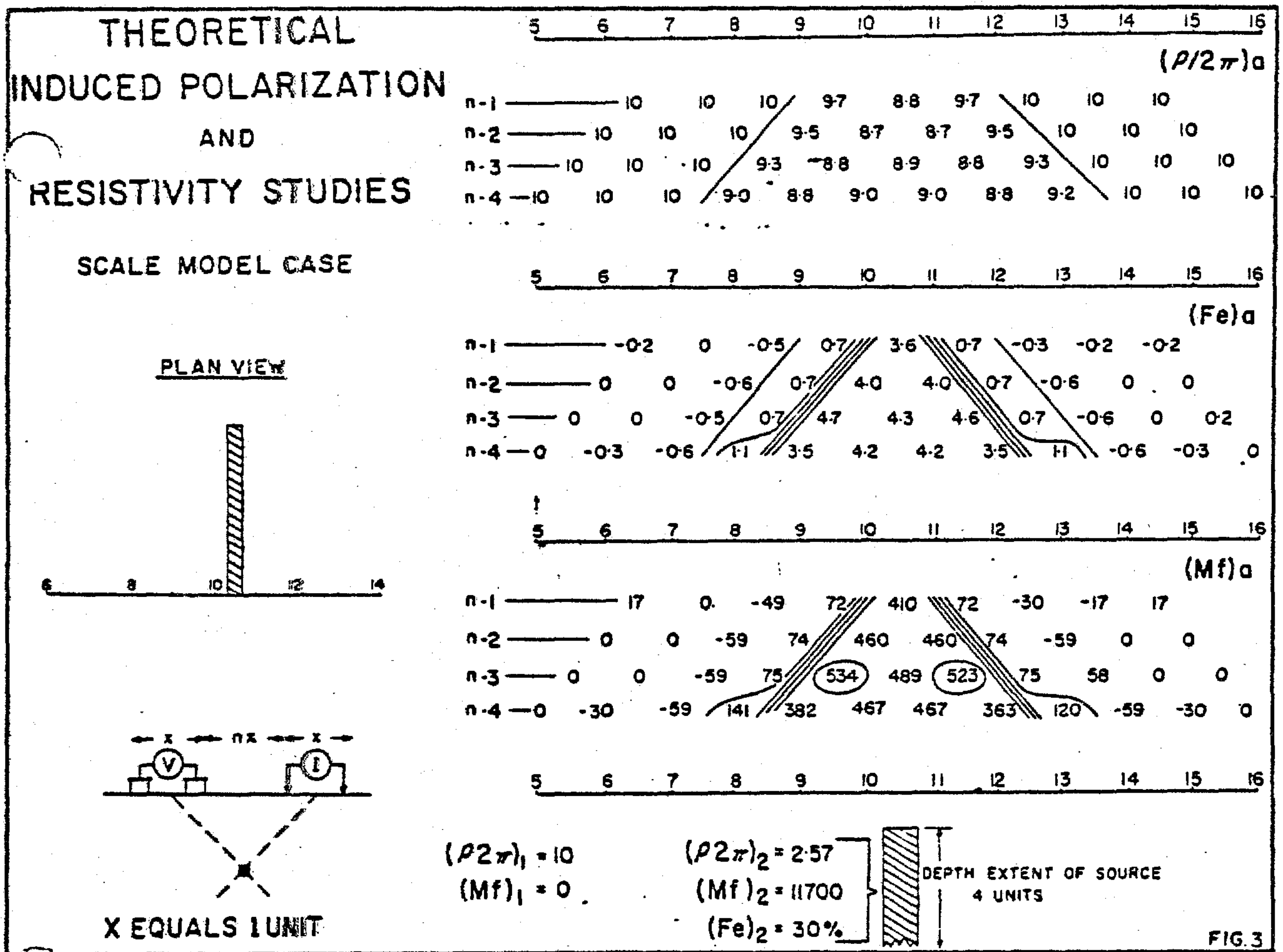
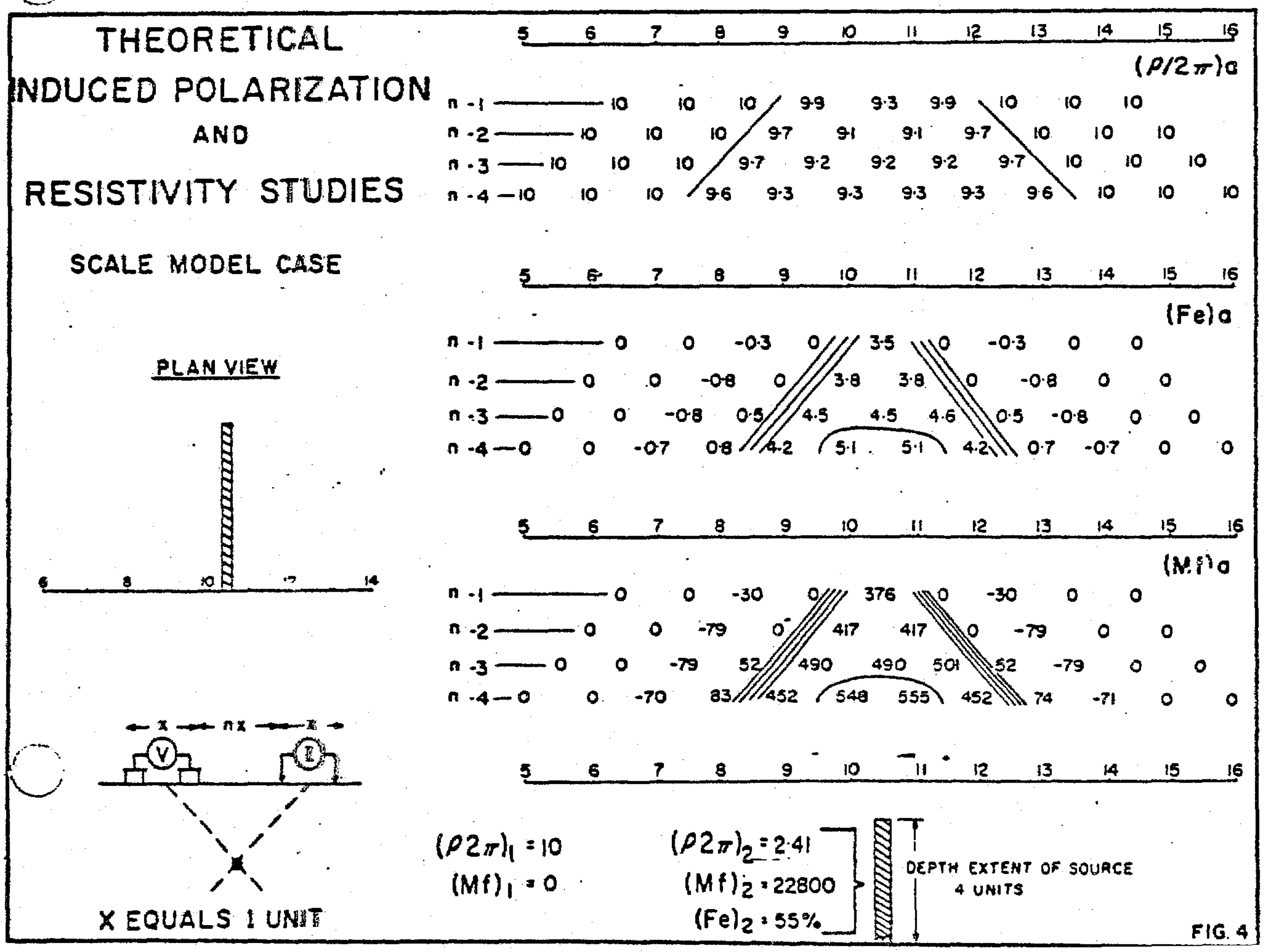


FIG 2

CASE II-1·5-BU-10-a


THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
X nX X
V I
X EQUALS 1 UNIT
5 6 7 8 9 10 11 12 13 14 15 16
(ρ/2π)a
n-1 10 10 10 9.7 8.8 9.7 10 10 10
n-2 10 10 10 9.5 8.7 8.7 9.5 10 10 10
n-3 10 10 10 9.3 8.8 8.9 8.8 9.3 10 10 10
n-4 10 10 10 9.0 8.8 9.0 9.0 8.8 9.2 10 10 10
(Fe)a
n-1 -0.2 0 -0.5 0.7 3.6 0.7 -0.3 -0.2 -0.2
n-2 0 0 -0.6 0.7 4.0 4.0 0.7 -0.6 0 0
n-3 0 0 -0.5 0.7 4.7 4.3 4.6 0.7 -0.6 0 0.2
n-4 0 -0.3 -0.6 1.1 3.5 4.2 4.2 3.5 1.1 -0.6 -0.3 0
(Mf)a
n-1 17 0 -49 72 410 72 -30 -17 17
n-2 0 0 -59 74 460 460 74 -59 0 0
n-3 0 0 -59 75 534 489 523 75 58 0 0
n-4 0 -30 -59 141 382 467 467 363 120 -59 -30 0
(ρ2π)1 = 10
(Mf)1 = 0
(ρ2π)2 = 2.57
(Mf)2 = 11700
(Fe)2 = 30%
DEPTH EXTENT OF SOURCE 4 UNITS
FIG. 3


THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE
PLAN VIEW
6 8 10 12 14
X nX X
V I
X EQUALS 1 UNIT
5 6 7 8 9 10 11 12 13 14 15 16
(ρ/2π)a
n-1 10 10 10 9.9 9.3 9.9 10 10 10
n-2 10 10 10 9.7 9.1 9.1 9.7 10 10 10
n-3 10 10 10 9.7 9.2 9.2 9.2 9.7 10 10 10
n-4 10 10 10 9.6 9.3 9.3 9.3 9.3 9.6 10 10 10
(Fe)a
n-1 0 0 -0.3 0 3.5 0 -0.3 0 0
n-2 0 0 -0.8 0 3.8 3.8 0 -0.8 0 0
n-3 0 0 -0.8 0.5 4.5 4.5 4.6 0.5 -0.8 0 0
n-4 0 0 -0.7 0.8 4.2 5.1 5.1 4.2 0.7 -0.7 0 0
(Mf)a
n-1 0 0 -30 0 376 0 -30 0 0
n-2 0 0 -79 0 417 417 0 -79 0 0
n-3 0 0 -79 52 490 490 501 52 -79 0 0
n-4 0 0 -70 83 452 548 555 452 74 -71 0 0
(ρ2π)1 = 10
(Mf)1 = 0
(ρ2π)2 = 2.41
(Mf)2 = 22800
(Fe)2 = 55%
DEPTH EXTENT OF SOURCE 4 UNITS
FIG. 4

INDUCED POLARIZATION AND RESISTIVITY RESULTS
BATCHELOR LAKE AREA, QUEBEC.

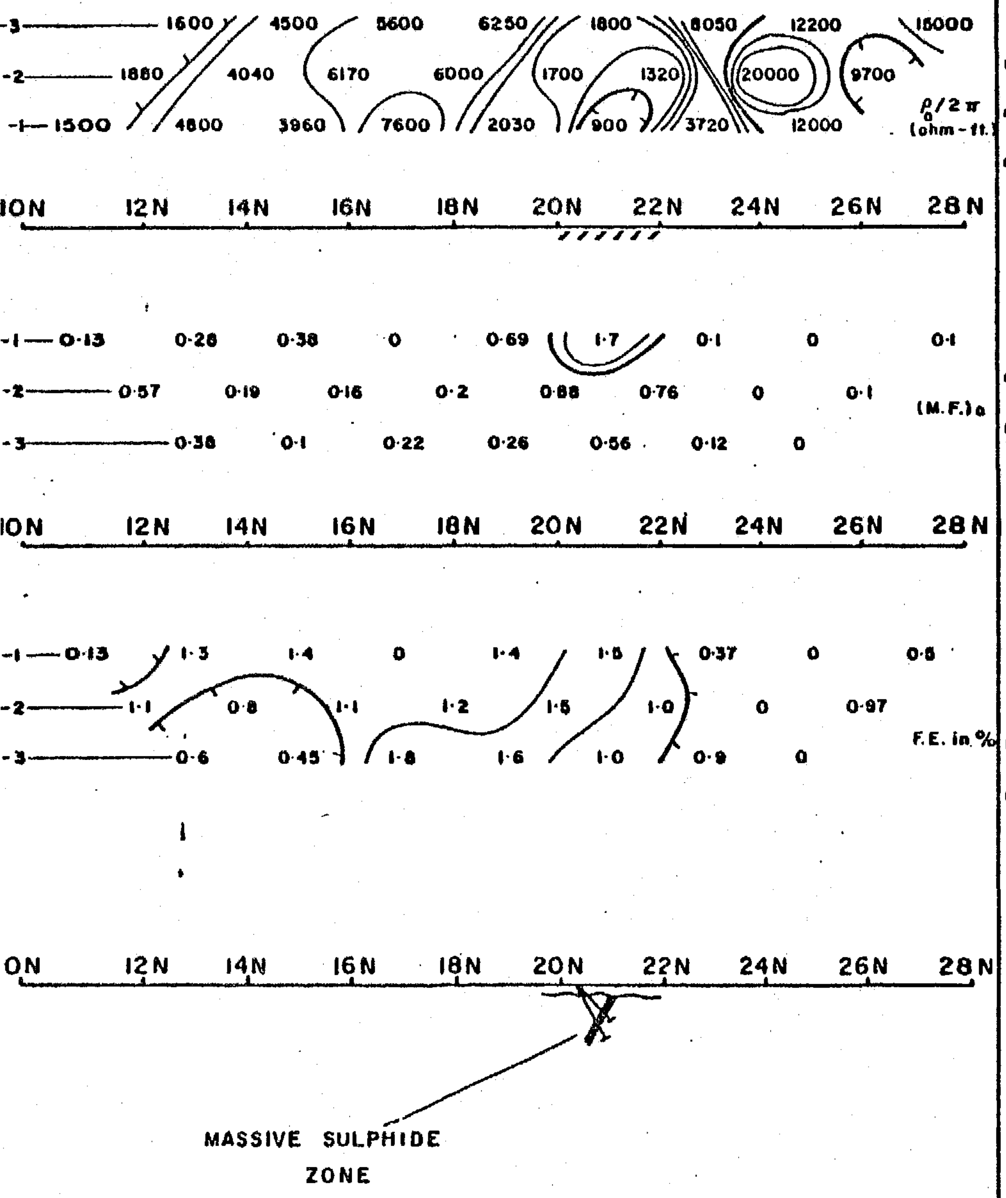


FIG. 5

INDUCED POLARIZATION AND RESISTIVITY RESULTS
BATCHELOR LAKE AREA, QUEBEC.

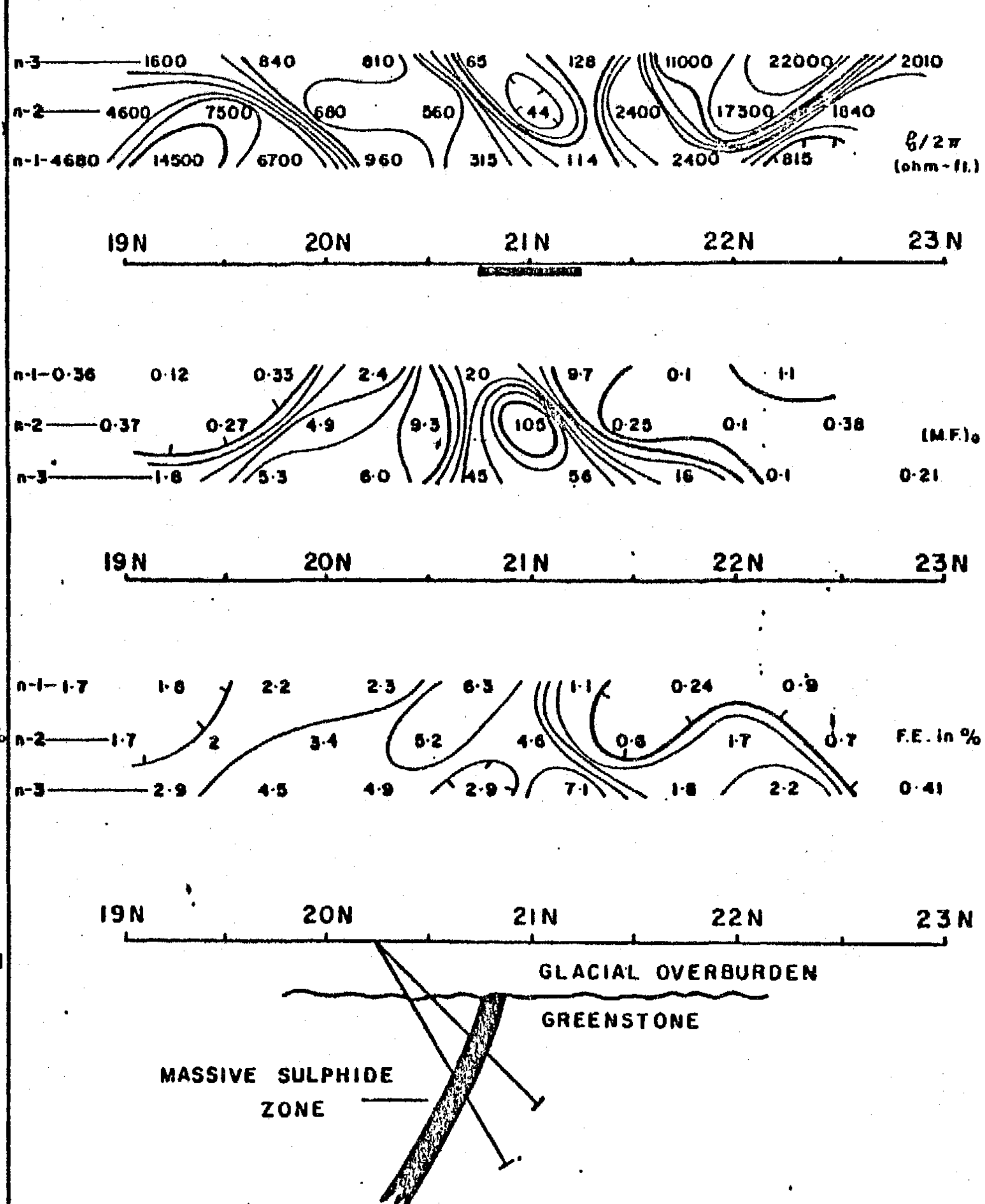


FIG. 6