



CONTACT INFORMATION

Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
<http://www.azgs.az.gov>
inquiries@azgs.az.gov

The following file is part of the

Arizona Department of Mines and Mineral Resources Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

**REPORT
On The
ORE DEPOSITS
MINERAL HILL
YUMA COUNTY, ARIZONA**

Louis W. Cramer

June 1961

CONTENTS

	PAGE
Summary	1
Introduction	3
Property	3
Maps	4
Metallurgy	5
Drilling Program	5
Copper Ore Reserves	7
Production	15
Overburden	16
Iron Ore Reserves	18
Economics	27
Conclusion	27

SUMMARY

COPPER ORE

FLAT COPPER ORE BED

Drilled Out

Tons	364,000
Grade	2.088%
Tons (includes above)	692,000
Grade	1.373%

Geologic Ore, indicated

Tons	212,000
------	---------

Limestone-Tactite Contact Ore

Tons	59,000
Grade	1.31%

NORMA FAULT ORE

Northwest Segment

Tons	138,000
Grade	2.20%
Inferred	138,000

Southeast Segment

Tons	69,000
Grade	2% +

Total tons (all classes)	1,308,000
--------------------------	-----------

IRON ORE (Specularite)

Specularite Point

Tons	361,000
Grade	49.3%

Upper Bed

Tons	839,000
Grade	45.1%

Lower Bed

Tons	2,156,000
Grade	49.3%

Total Tons	3,356,000
------------	-----------

This report and evaluation was made at the request of Mr. Joseph A. Minton of Salt Lake City, Utah. Two other reports have preceded. Report On Mineral Hill Group, Yuma Co., Arizona was presented to Mr. Minton in November 1960. Report On Continental Group and South Part of Mineral Group was presented in April 1961. These discuss the geology and potential of the property.

PROPERTY

The property consists of 15 patented mining claims, 14 located lode mining claims, and 2 placer mining claims:

1	Queen of Copper	Sur. No. 2785
2	Copper King	"
3	Greater Jerome	"
4	Norma	"
5	Mohave Chief	"
6	Apex	"
7	Copper Glance	"
8	Copper Prince	"
9	Greater Bisbee	"
10	Cavern	Sur. No. 2981
11	Continental No. 1	"
12	Continental No. 2	"
13	Continental No. 9	"
14	Continental No. 10	Sur. No. 2981
15	Continental No. 11	"

16	Cobre No. 1	Located Claim
17	Cobre No. 2	"
18	Cobre No. 3	"
19	Cobre No. 4	"
20	Cobre Fraction	"
21	Bobbie	"
22	Annex No. 1	"
23	Annex No. 2	"
24	Annex No. 3	"
25	Bessie Belle	"
26	Extension No. 1	"
27	Extension No. 2	"
28	Extension No. 3	"
29	Extension No. 4	"
30 & 31	Joe No. 1 and No. 2 Placer claims W/2 W/2 Section 2, TION-R 17W.	

MAPS

The following maps are a part of this report and are enclosed in a separate folder:

- 1 200 scale geologic map.
- 1 50 scale ore reserve map.
- 1 100 scale map of iron ore reserves
- 3 Maps of drill hole logs.
- 19 E-W cross-section maps from 4400 N to 5700 N., 100 scale.

LOCATION AND ACCESSIBILITY

The property is located in sections 2, 3, 10 & 11 TION - R 17 W, Gila and Salt River Meridian, Yuma County, Arizona. It is twenty-five miles northeast of Parker, Arizona. The road from Parker to the mine is improved but rough. Traveling time is about one hour.

WATER SUPPLY

Mr. Minton and Associates have acquired the Planet Ranch, located on the Bill Williams River some two miles north of the mine. This insures an adequate water supply for any size operation contemplated.

METALLURGY

The Bureau of Mines has made leaching tests on the Mineral Hill copper ore. A copy of this report is attached.

Tests show that a 95 percent recovery can be made by flood leaching minus 3/8-inch feed with 5 percent sulfuric acid solution for a period of 2.5 days. The acid consumption was nominal and no difficulties were encountered in percolating the leach solutions through the ore bed.

DRILLING PROGRAM

Drilling started on January 27, 1961 and was completed on May 6, 1961. Mr. Duncan Harrison of the Marvel Mining Company or the author was at the drill rig as each hole was drilled and supervised the sampling.

A wagon drill was used, using a Gardner-Denver D 99 air hammer, run by a 600 cu. ft. Gardner-Denver Rotary compressor, powered by a G. M. C. diesel engine. These were mounted on a 6 x 6 truck for mobility

and to carry the drill rods and equipment. In the softer formation on the Norma Fault a rotary head replaced the percussion drill.

Cuttings were carried up the hole by air and saved in a plastic container below the dust catcher. About 25 pounds of cuttings resulted from a drilled interval of 3 feet. These cuttings were put through a sample splitter two or three times depending on the amount and the last split sacked and labeled. One side of the final split was used for assay and the other stored for future reference. Nichols Laboratories, Inc. of Salt Lake City, Utah, did most of the assaying.

The ground over the Flat Copper Ore Bed is highly fractured which caused considerable trouble. However, at most drill sites the copper-bearing bed could be penetrated. Drilling deeper through the iron beds and exploring below the Lower Iron Bed was accomplished in only a few holes.

Attempts were made to explore the Norma Fault Fissure at depth but penetration could not be made below 130 feet.

The holes were logged when drilled or logged when the cuttings from the drilled intervals were classified for assaying. The logs and assay results are reproduced on maps in the separate folder.

A grid pattern could not be drilled because of the rough terrain. Roads were built by blasting and grading by a D-8 Caterpillar Dozer which was on the job throughout the exploration period. However, drilling was accomplished on two levels across the ore zone and is thought to provide adequate information as to the grade and tonnage of the calculated ore re-

serves.

COPPER ORE RESERVES

FLAT COPPER ORE BED

Drill holes and surface samples

Hole No.	Depth Ft.	Thickness Ft.	Grade %
6	8 - 22	14	1.83 ✓
7	10 - 26	16	2.05 ✓
8	12 - 22	10	.97 ✓
9	31 - 42	11	1.66 ✓
10	44 - 48	4	1.07
10A	42 - 54	12	2.24
11	44 - 50	6	.75 ✓
11A	48 - 51	3	.89
12	32 - 50	18	1.00
13	26 - 34	8	3.00
14A	48 - 54	6	.88
16	80 - 86	6	.86
16A	84 - 87	3	1.69
17	87 - 108 ✓	21	3.08
17A	81 - 102	21	1.26
18	68 - 76	12	2.34
	106 - 112		
18A	72 - 96	24	3.93
19	72 - 96	24	3.07

<u>Hole No.</u>	<u>Depth Ft.</u>	<u>Thickness Ft.</u>	<u>Grade %</u>
19A	66 - 90	24	2.03
20	66 - 81	15	1.31
20A	60 - 66	6	.97
20B	51 - 57	6	2.71
22	63 - 69	6	2.00
25	45 - 48	3	1.35
26	42 - 45	3	3.38
27	45 - 48	3	.87
28	27 - 39	12	2.39
28A	24 - 27	3	1.08
29	39 - 45	6	1.95
31	54 - 57	3	1.84
H 2	27 - 39	12	1.68
Sample 4		6	3.98
Sample 5		5	3.06
Sample 6		10	2.55
Sample 7		7	1.94
Sample 11		9	2.76
Sample 12		12	1.73
<u>Weighted Average</u>		10 Ft.	2.088%

The above samples delineate an area of 473,600 square feet.

473,600 x 10 ÷ 13 = 364,000 tons

Copper contained 15,200,640 pounds

Tonnage in thicker section of Flat Ore Bed delineated by drill

holes 6 - 7 - 8 - 9 - 10 - 10A - 17 - 17A - 18 - 18A - 19 - 19A & 20

Weighted Average 16 Ft. 2.254%

Area delineated by above drill holes is 150,125 square feet.

$150,125 \times 16 \div 13$ 185,000 tons

Copper contained 8,339,800 pounds

Copper occurs in the rocks above and below the ore bed in varying amounts. The following tabulation contains an estimate of these tonnages and grades. The break-off value is 0.50 percent.

Hole No.	Depth Ft.	Thickness Ft.	Grade %
6	2 - 22	20	.83
7	2 - 37	35	1.31
8	2 - 36	34	.74
9	24 - 41	17	1.05
10	44 - 56	12	.67
10A	42 - 57	15	1.85
11	1 - 50	49	.71
11A	21 - 54	33	.56
12	1 - 50	49	.74
13	26 - 34	8	3.00
14A	48 - 54	6	.88
16	80 - 93	13	.67
16A	60 - 87	27	.74

<u>Hole No.</u>	<u>Depth Ft.</u>	<u>Thickness Ft.</u>	<u>Grade %</u>
17	81 - 114	33	2.10
17A	72 - 102	30	1.02
18	68 - 102	34	.99
18A	72 - 105	33	3.75
19	69 - 96	27	2.80
19A	63 - 90	27	1.88
20	66 - 72	6	2.35
20A	60 - 66	6	.97
20B	48 - 57	9	1.84
22	60 - 72	12	1.30
25	42 - 50	8	.78
26	42 - 45	3	3.38
27	45 - 48	3	.87
28	27 - 42	15	2.10
28A	24 - 27	3	1.08
29	33 - 45	12	1.13
31	54 - 57	3	1.84
H 2	27 - 39	12	1.68
<u>Weighted Average</u>		19 Ft.	1.373%

473,600 sq. ft. x 19 ft. \div 13 = 692,000 tons

Copper contained 19,002,320 pounds

Thicker Bed Zone

Holes 6 - 7 - 8 - 9 - 10 - 10A - 17 - 17A - 18 - 18A - 19 - 19A &
20.

Weighted Average	25 Ft.	1. 668%
150, 125 sq. ft. x 25 ft. — 13 =		289, 000 tons
Copper contained		9, 641, 040 pounds

The Flat Copper Ore Bed should extend south from the boundary delineated by the drilling, and should extend as far south as the outcrop of the Upper Iron Bed. This area shown on the ore reserve map contains 275, 000 square feet. Assuming an average thickness of 10 feet this block of ground would contain 212, 000 tons of ore.

A northeast-southwest mineral trough makes the Thicker Ore Zone. Hole 45 was drilled in an attempt to extend this trough southwest-erly. Steel was plugged at 140 feet and deeper penetration was made impossible. Values were cut from 135-140. The cross-sections indicate that the hole bottomed about 15 feet above the ore bed.

Limestone-Tactite Contact Ore

Defined by holes H7 and Delta 6, and surface examination along contact.

<u>Hole</u>	<u>Depth Ft.</u>	<u>Thickness Ft.</u>	<u>Grade %</u>
H7	1 - 30	29	1. 73
Delta 6	45 - 63	18	. 63
Average		24	1. 31% ✓

Tonnage

400 ft. long x 80 ft. wide x 24 ft. thick \div 13 = 59,000 tons

Copper contained 1,545,800 pounds

Norma Fault Ore, and ore in argillites on footwall.

Northwest Segment

<u>Hole No.</u>	<u>Depth Ft.</u>	<u>Type</u>	<u>Grade %</u>
5	34 - 102	Argillite	1.19
N1	1 - 9	Vein	2.70
	81 - 129	Argillite	1.20
49	27 - 48	Vein	1.66
49A	69 - 96	Argillite & gouge	4.58
Average Grade			2.20

Tonnage Indicated

Estimated average width

30 ft.

Length

600 ft.

Depth

100 ft.

$30 \times 600 \times 100 \div 13 =$

138,000 tons

A similar tonnage can be inferred between the depths of 100 to 200 feet.

Segment on Norma Fault, Southwest of the Northwest Segment to a point

270 feet southeast of the Norma Shaft.

<u>Hole No.</u>	<u>Depth Ft.</u>	<u>Type</u>	<u>Grade %</u>
N2	48 - 81	Argillite	.64

Hole No.	Depth Ft.	Type	Grade %
47A	6 - 63	Vein	2.24
	63 - 102	Footwall	.69

Tonnage Indicated

Estimated width	6 ft.
Length	1000 ft.
Depth	150 ft.
$6 \times 1000 \times 150 \div 13 =$	69,000 tons

The Norma Fault is a strong fault-fissure which strikes northwest and dips very steeply (85 - 89 degrees) to the northeast. Where exposed in the south part of the Queen of Copper Claim to the gulch in which the Norma Shaft is located, some 1450 feet in length, it carries copper, in places a good grade of ore as encountered in Hole 49A, 69 - 96 feet, 4.58 percent. Unfortunately, this hole could not be drilled deeper.

Holes 47, 47A, 47B, and 48 are located in the gulch at the Norma Shaft, and were drilled in an effort to explore the Norma Fault at considerable depth. Hole 47A, 105 feet, was the deepest penetration. It bottomed in gray and red hematite silica, which carried some values .40 to 1.00 percent. It is believed that this hole from 63 feet to the bottom is in footwall material and that the tenor of the ore in the fault-fissure is represented by the assays above 63 feet. These average 2.35%.

Some 300 feet southeast of the Norma Shaft is the junction of the Continental Fault with the Norma Fault. These anomalies are considered

important in this area and exploration was attempted with Holes 36, 37 and 46. The drill was unable to cut the Norma Fault in Hole 36. Hole 37, 90 feet northeast of the fault, reached a depth of 180 feet. It did not pick up any values. Hole 46, located 40 feet southwest of the Norma Fault drilled schist and argillite to a depth of 90 feet. From 90 feet to 162 feet silica was penetrated and values began at 117 feet to the bottom of the hole at 162 feet. Deeper penetration should be made in this area.

Spread Blow Iron Bed

There is a spread of copper mineralization below the Lower Iron Bed in the Specularite Point area. This mineralization was penetrated in the following holes:

<u>Hole No.</u>	<u>Depth Ft.</u>	<u>Type</u>	<u>Grade %</u>
3	50 - 58	Argillite	.88
33	57 - 66	Argillite	.40
34	27 - 48	Argillite	.61
35	27 - 39	Argillite	.25

The present drilling appears to indicate that this spread of mineralization is sub-marginal commercially, but its potential should not be overlooked.

SUMMARY

Flat Ore Bed	2.088%	364,000 tons
	1.373%	692,000 tons

Inferred (Geologically indicated) 212,000 tons

Tactite Ore

1.31% 59,000 tons

Norma Fault Ore

NW Segment 2.20% + 138,000 tons

Inferred 138,000 tons

SE Segment 69,000 tons

Total 1.4% + 1,308,000 tons

PRODUCTION

Early production from the property is not known, but the workings indicate that it was small.

In 1956 the property was under lease to R. A. Delano & Company. Settlement certificates are available for 24 shipments by this company. This may not represent the total shipped.

There were 1706.19 dry tons in these shipments which contained the following percentages of minerals per ton.

Cu%	SiO ₂ %	Al ₂ O ₃ %	Fe%	CaO%
3.65	51.9	7.9	14.6	1.0

This ore was mined in the area west of Specularite Point. Little or no overburden was removed and no dumps exist to indicate that any sorting was done. Therefore, the above copper value represents the tenor

of the ore bed in this area. Surface sampling indicates a grade of 3.54%.

The copper is in small veinlets in the fractures of the hematite silica ore bed as malachite and chrysocolla. This type ore was observed along the length of the outcrop. This higher grade of ore than that cut in the drill holes suggests that the average grade of the Flat Ore Bed will be higher than the drill hole averages.

OVERBURDEN

The rocks over the Flat Ore Bed are silicified epidote rock, schists, hematite quartzites, and in the southwest part some granite porphyry. As shown on the cross sections the greater part of the overburden is on the south and south-west part of the block.

The overburden is broken down in three parts.

1. West Part
2. Middle Part (area of thicker ore)
3. East Part

West Part	255,000 tons
Middle Part	562,000 tons
East Part	671,000 tons
Total	1,488,000 tons

In the rocks above the .50% cut off, tabulated in the ore reserve estimate, are small copper values. The holes are tabulated below.

Hole No.	Depth Ft.	Thickness Ft.	Grade %
9	0 - 24	24	.35

<u>Hole No.</u>	<u>Depth Ft.</u>	<u>Thickness Ft.</u>	<u>Grade %</u>
10	8 - 44	36	.42
10A	9 - 42	33	.17
11A	15 - 21	6	.21
13	0 - 26	26	.37
14	9 - 48	39	.27
15	17 - 88	71	.16
15A	93 - 99	6	.24
16	56 - 80	24	.23
16A	51 - 60	9	.26
17	27 - 81	54	.22
17A	51 - 72	21	.28
18	1 - 58	57	.11
18A	63 - 72	9	.11
19	27 - 69	42	.30
19A	0 - 33	33	.24
20*	0 - 66		.00
20A*	0 - 60		.00
20B	9 - 48	39	.13
21	66 - 75	9	.21
22	51 - 60	9	.12
23	33 - 45	12	.29
24	0 - 51	51	.15
25	9 - 42	33	.27

<u>Hole No.</u>	<u>Depth Ft.</u>	<u>Thickness Ft.</u>	<u>Grade %</u>
26	0 - 42	42	.28
27	0 - 45	45	.23
28*	0 - 27		.00
28 x 5' from 28	0 - 27	27	.15
28A*	0 - 24		.07
29	0 - 33	33	.13
30	42 - 57	15	.22
31	30 - 54	24	.21
32	0 - 27	27	.16
H2	18 - 27	9	.27
Weighted average		29	0.238%

*holes not included in average.

The estimated quantity that the above holes represent is 700,000 tons, which could be piled separately on an impervious floor and heap-leached. There would be about 4,032,000 pounds of copper in this rock, and if only 50% could be recovered, it would pay for all stripping costs.

The stripping ratio to the .50% cut-off would be 2.15 to 1.

Although the overburden rocks are highly fractured blast hole drilling to depths of 25 feet or so would be no problem. The rock over-breaks with a minimum of explosive, so explosive costs will be very low.

Grade of Iron Ore

Grade

Hole No.	Upper Bed Fe%	Lower Bed Fe%
9	35.8	39.0
10		47.8
10A	45.6	
11A	33.6	33.0
15		41.9
15A	46.3	
16A	44.0	
19	41.6	
19A	40.6	61.8
20	55.7	51.2
20A	52.9	
20B	45.2	
22	50.1	
24	44.8	
25	47.7	
26	42.2	
27	55.3	
28	48.6	48.0
29	49.2	
30	41.5	
31	42.7	
32	46.2	

<u>Hole No.</u>	<u>Upper Bed</u> Fe%	<u>Lower Bed</u> Fe%
33	52.2	55.9
34		63.2
35		48.3
38		51.4
39		55.0
40		51.1
40X		49.3
41		49.8
Average	45.1%	49.3%

In several places the iron carries copper. This is particularly so in regards to the Upper Iron Bed. Analysis of Hole 3 shows only a trace of phosphorous and 2 percent sulphur. It is believed that the specularite does not carry this amount of sulphur generally. Sulphides are practically non-existent on Mineral Hill.

Two samples were run for manganese. Sample 1 was from the iron in Tunnel 18d. It assayed 6.4% manganese. Sample 2 is from cuttings, 33-36 in depth, from hole 41. This assayed 4.6% manganese. This particular type of iron is logged as gray iron and occurs in the drilled area only in holes 35, 38, and 41. Therefore the manganiferous iron appears to occupy a relatively small area.

This grade of ore is slightly below metallurgical grade. Upgrading tests, if conducted, are not known to the writer. However

several drill holes indicate a grade sufficiently high to meet furnace requirements and in mining the copper which generally has the iron ore as a floor, many areas of high-grade iron ore will be exposed.

IRON TONNAGES

Section 4500N - 50' N&S

Upper Bed 420' on section, 10' thick

$$420 \times 100 \times 10 \div 10 = \quad 42,500 \text{ tons}$$

900' on section, 20' thick

$$900 \times 100 \times 20 \div 10 = \quad 180,000 \text{ tons}$$

Section 4600N - 50' N&S

Upper Bed

500' on section, 10' thick

$$500 \times 100 \times 10 \div 10 = \quad 50,000 \text{ tons}$$

Lower or Basal Bed

920' on section, 20' thick

$$920 \times 100 \times 20 \div 10 = \quad 184,000 \text{ tons}$$

Section 4700N - 50' N&S

Upper Bed

600' on section, 10' thick

$$600 \times 100 \times 10 \div 10 = \quad 60,000 \text{ tons}$$

Lower Bed

1200' on section, 20' thick

1200 x 100 x 20 ÷ 10 240,000 tons

Section 4800N - 50' N&S

Upper Bed

800' on section, 15' thick

800 x 100 x 15 ÷ 10 120,000 tons

Lower Bed

1370' on section, 20' thick

1370 x 100 x 20 ÷ 10 274,000 tons

Section 4900N - 50' N&S

Upper Bed

550' on section, 20' thick

550 x 100 x 20 ÷ 10 110,000 tons

Lower Bed

1500' on section, 20' thick

1500 x 100 x 20 ÷ 10 300,000 tons

Section 5000N - 50' S & 25' N

Upper Bed

740' on section, 25' thick

700 x 75 x 25 ÷ 10 121,000 tons

Lower Bed

1350' on section, 20' thick

1350 x 75 x 20 ÷ 10 202,000 tons

Section 5050N - 25' N&S

Upper Bed

750' on section, 15' thick

$750 \times 50 \times 15 \div 10$ 56,000 tons

Lower Bed

1350' on section, 20' thick

$1350 \times 50 \times 20 \div 10$ 135,000 tons

Section 5100N - 25' N&S

Upper Bed

650 ' on section, 15' thick

$650 \times 50 \times 15 \div 10$ 49,000 tons

Lower Bed

1150' on section, 15' thick

$1150 \times 50 \times 15 \div 10$ 86,000 tons

Section 5150N - 25' N&S

Upper Bed

830' on section, 10' thick

$830 \times 50 \times 10 \div 10$ 41,000 tons

Lower Bed

1170' on section, 25' thick

$1170 \times 50 \times 25 \div 10$ 144,000 tons

Section 5200N - 25' N&S

Upper Bed

700' on section, 15' thick

$700 \times 50 \times 15 \div 10$ 52,000 tons

Lower Bed

1110' on section, 20' thick

1110 x 50 x 20 ÷ 10

111,000 tons

Section 5250N - 25' N&S

Upper Bed

800' on section, 15' thick

800 x 50 x 15 ÷ 10

60,000 tons

Lower Bed

1120' on section, 15' thick

1120 x 50 x 15 ÷ 10

84,000 tons

Section 5300N - 25' N&S

Upper Bed

1040' on section, 10' thick

1040 x 50 x 10 ÷ 10

52,000 tons

Lower Bed

1150' on section, 15' thick

1150 x 50 x 15 ÷ 10

86,000 tons

Section 5350N - 25' N&S

Upper Bed

520' on section, west of 5240E, 10' thick

520 x 50 x 10 ÷ 10

26,000 tons

Lower Bed

660' on section, west of 5260E, 15' thick

660 x 50 x 15 ÷ 10

50,000 tons

On this section east of 5260E, the Upper and Lower Iron Beds

merge, indicated by the raise in the Iron Tunnel. Therefore the two beds are treated as one unit in this area designated as Specularite Point.

300' on section, (5280E to 5580E) estimated 40' thick

$300 \times 50 \times 40 \div 10$ 60,000 tons

Section 5400N - 25' S&S

Lower Bed

600' on section, section west of

5170 E, 10' thick

$600 \times 50 \times 10 \div 10$ 30,000 tons

Specularite Point

360' on section, 35' thick

$360 \times 50 \times 35 \div 10$ 63,000 tons

Section 5450N - 25' N&S

Lower Bed

530' on section, west of

5140 E, 10' thick

$530 \times 50 \times 10 \div 10$ 27,000 tons

Specularite Point

330' on section, 35' thick

58,000 tons

Section 5500N 50' N - 25' S

Lower Bed

200' on section, west of

5100 E, 15' thick

$$200 \times 75 \times 15 \div 10 = 22,500 \text{ tons}$$

Specularite Point - 50° N - 25° S

200' on section, 25' thick

$$200 \times 75 \times 25 \div 10 = 105,000 \text{ tons}$$

Section 5600N - 50° S - 25° N

Specularite Point

200' on section, 25' thick

$$200 \times 75 \times 25 = 10 \quad 75,000 \text{ tons}$$

Specularite Point 361,000 tons

5350 N to 5650 N

Upper Bed

4450 N to 5200 N 839, 000 tons

Lower Bed 2,156,000 tons

4450 N to 5525 N

Total 3,356,000

The above tonnages are contained in some 1,250,000 square feet of area. This average thickness between the top of the Upper Iron Bed and the base of the Lower Iron Bed is about 75 feet.

$$1,250,000 \times 75 = 93,750,000 \text{ cu. ft.}$$

Cubic feet in specularite 33,348,000

Siliceous hematite material 60,402,000 cu. ft.

5, 033, 000 tons

ECONOMICS

The costs of plant construction were not investigated. Mining and leaching costs were not estimated, however these costs should be comparative to open pit operations.

1.373% copper ore contains 27.46 pounds of copper per ton. Assuming an average price of copper of \$.25 per pound the gross value of the ore would be \$6.865. At \$.30 copper this mill feed would be \$8.238 per ton.

A 400-500 tons per day operation should return a very satisfactory profit on this grade of ore.

CONCLUSION

The presently developed copper ores on Mineral Hill are adequate to justify a plant of the above capacity.

Considerable additional tonnage should be developed, particularly along the Norma Fault.



Louis W. Cramer

PERCOLATION LEACHING OF OXIDIZED COPPER ORE
FROM MINERAL HILL DEPOSIT, YUMA COUNTY, ARIZ.

by

Philip A. Bloom 1/ and Carl Rampacek 2/

-
- 1/ Executive metallurgist, Tucson Metallurgy Research Laboratory,
Region III, Tucson, Arizona
2/ Research director, Tuscaloosa Metallurgy Research Center, Region
V, Tuscaloosa, Ala.
-
-

C O N T E N T S

	Page
Summary	3
Introduction	3
Description of sample.....	5
Laboratory tests	6
Conclusions	9

T A B L E S

1. Partial chemical analysis of ore	5
2. Screen analyses of leach feeds	6
3. Summarized results of upward flood and downward percolation leaching of Mineral Hill ore	8

SUMMARY

Bench-scale tests were made of a sample of oxidized copper ore containing chrysocolla and malachite from the Mineral Hill group of claims, Yuma County, Ariz., to determine if the material was amenable to percolation leaching with dilute sulfuric acid. The sample was representative of the grade and type of ore being considered for commercial treatment by the process.

Portions of the ore, crushed to pass 3/8, 1 and 2 inches, were treated by upward flooding and downward percolation, using 5-percent sulfuric acid. Upward flood leaching of the minus 3/8-inch feed recovered about 95 percent of the copper during a 2.5-day period, whereas downward percolation leaching of the same size feed gave a copper recovery of 72 percent. Treating coarser feeds for a similar length of time by either method gave substantially lower copper recoveries. Other tests of the ore revealed that a copper extraction of 90 percent could be obtained by percolation leaching the minus 2-inch ore for 14 days.

Because of the hard, consolidated character of the sample, the leach solutions percolated readily through the ore beds indicating that no particular difficulty should be encountered in a larger scale commercial leach operation.

INTRODUCTION

Copper ores containing appreciable chrysocolla or hydrated copper silicates are currently being treated by dilute acid leach methods. The finely ground feeds are leached by agitation or the coarse crushed ore is treated by upward flooding with dilute sulfuric acid 3 4 5 /. The copper is recovered from the leach

liquors by

-
- 3/ Anaconda Copper Mining Company (Editorial Staff), Yorington-Anaconda's Latest Contribution to Copper Metallurgy: Min. World, vol. 16, No. 8, July 1954, pp. 44-69.
 - 4/ Ramsey, R. H., Anaconda's - Nevada Project - A New Approach to Copper Mining: Eng. Min. Jour., vol. 155, No. 8, August 1954, pp. 74-93.
 - 5/ Kettering, C. B., and Power, K. L., The Metallurgical Story of Inspiration: Preprint No. 8817P 10, Paper presented at Annual Meeting of AIME, New York, February 16-20, 1958, 12 pp.
-

electrolysis, precipitation on scrap iron or by precipitation-flotation. Another proposed acid leach method for treating oxidized ores is by downward drainage percolation of the coarse crushed feed in heaps. 6 7 / Although flood leaching is

-
- 6/ Keyes, H. E., Innovations in Copper Leaching Employing Ferric Sulfate-Sulfuric Acid; Bureau of Mines Bull. 321, 1930, 67 pp.
 - 7/ McKinney, W. A., and Rampacek, Carl, Acid Leaching of Oxidized Copper Ores by Downward Percolation: Bureau of Mines Rept. of Investigations 5629, 1960, 16 pp.
-

recognized as being more efficient than downward percolation, the latter method is simpler from the standpoint of equipment requirements, resulting in a lower capital expenditure for plant construction.

During the past several years the Tucson Metallurgy Research Laboratory has tested a number of typical oxidized ores from promising Southwestern deposits using the upward flooding and downward percolation leach procedures. This report presents the results of such bench-scale tests of a sample of oxidized ore

from the Mineral Hill group of claims, Yuma County, Ariz. The sample was received for the specific purpose of ascertaining if acid leaching the ore to recover the copper would be technically feasible on a commercial scale, and if so, what leach method should be employed.

DESCRIPTION OF SAMPLE

The sample received for testing was representative of material taken from seven locations along an outcrop in the Mineral Hill group of claims, N. E. quarter, T-10-N, R-17-W, Yuma County, Ariz. The ore was a dense, reddish-colored vein material composed predominantly of quartz, specularite and hematite, with some chrysocolla, feldspar, clay, calcite and malachite. Most of the copper silicate and carbonate occurred on thin films and veinlets in the fracture planes of the ore; some of the veinlets were as thick as 1/3 inch. Upon crushing the ore to minus 2 inches the material broke along the fracture planes and exposed some of the copper silicate and carbonate veinlets. A partial chemical analysis of the ore is given in table 1.

TABLE 1 - Partial chemical analysis of ore

<u>Constituent</u>	<u>Assay, percent</u>
Cu:	
Total	3.94
H ₂ SC ₄ soluble	3.77
Fe	14.43
SiO ₂	55.6
Al ₂ O ₃	7.1
CaO	0.7
MgO	0.6

LABORATORY TESTS

The leach procedure followed in the tests approximated a commercial operation whereby advancing acid solution would be passed over a number of ore charges undergoing various stages of treatment. The tests were made on portions of the ore crushed to minus 3/8, 1 and 2 inches. Screen analyses of the different leach feeds are given in table 2. The feeds were treated by upward flooding or downward percolation leaching with dilute sulfuric acid solution in standard glass percolation tubes having about 6 kilograms capacity. One series of tests was made in which the ore was treated for a period of 2.5 days and a second series of tests was made using a 16-day leach.

TABLE 2. - Screen analysis of leach feeds

<u>Screen size</u>	<u>Weight, percent</u>		
	<u>2-inch feed</u>	<u>1-inch feed</u>	<u>3/8-inch feed</u>
-2 inch + 1.06 inch	39.1	-	-
-1.06 inch + 0.375 inch	46.6	82.7	-
-0.375 inch + 10 mesh	11.0	14.2	80.5
-10 mesh + 35 mesh	1.8	1.6	12.0
-35 mesh + 65 mesh	0.4	0.3	2.4
-65 mesh + 200 mesh	.7	.6	2.8
-200 mesh	.4	.4	2.3
Composite	100.0	100.0	100.0

In the short leach tests, the ore was treated with 5-percent H_2SO_4 throughout the 2.5-day period. Fresh acid solution was added to the ore at 8-hour intervals to maintain the acid concentration on the charge as near to 5 percent as practicable. When leaching for the extended period of time only enough 5 percent

sulfuric acid was added to the ore at the start of the test to assure a 1-percent concentration of acid in the final leach solution. At the termination of the leaches, the ore charges were washed with water either by flooding or downward percolation. About 24 hours were required for washing. Results of the different tests are summarized in table 3.

No difficulty was encountered in percolating the leach solutions through the ore beds regardless of the feed size treated. Flood leaching proved more rapid and efficient than downward percolation, requiring less time and yielding higher copper extractions. Flood leaching of the minus 3/8-inch ore recovered 94 percent of the copper in 2.5 days as compared to 72-percent copper recovery by downward percolation. However, extending the leach period to 16 days increased the copper recovery by downward percolation to 91 percent.

Leaching for only 2.5 days was inadequate when treating the minus 1- and 2-inch feeds, whereas, acceptable copper recoveries were obtained by extending the leach periods to 16 days. The copper recoveries in the extended flood leaches of the 1- and 2-inch feeds were about 90 and 94 percent, respectively, as compared to 84-percent copper recoveries by downward percolation.

The acid consumed in leaching the ore was nominal, comparing favorably with acid requirements of commercial operations. The leach liquors obtained from treating the ore were relatively free of dissolved impurities. For example, a typical leach solution produced by flood leaching the 3/8-inch feed for 16 days assayed 19.6 grams Cu, 0.5 gram Fe and 8 grams H_2SO_4 per liter. Silica and alumina analyses of the solutions were less than 0.5 gram per liter.

TABLE 3. - Summarized results of upward flood and downward percolation leaching of Mineral Hill ore

Feed size	Leach Method	Length of leach, days	Leach solution strength, percent H_2SO_4	H_2SO_4 consumed, lb. per ton Feed	H_2O for washing, tons per ton Feed	Leach residue assay, percent total Cu	Copper recovery percent	H_2SO_4 consumed, per lb. Cu recovered, lb.
Minus 2 inch	U. F.	2.5	2 /	195	0.5	1.11	74.0	2.48
	U. F.	16	3 /	206	.5	.43	89.9	2.90
	D. P.	2.5	2 /	202	.4	1.93	54.9	2.56
	D. P.	16	4 /	197	.5	.66	84.4	2.82
Minus 1 inch	U. F.	2.5	2 /	191	.5	.81	82.6	2.42
	U. F.	16	3 /	205	.5	.28	93.5	2.89
	D. P.	2.5	2 /	206	.4	1.44	59.4	2.62
	D. P.	16	4 /	206	.5	.68	84.2	2.82
Minus 3/8 inch	U. F.	2.5	2 /	182	.5	.29	94.7	2.31
	U. F.	16	5 /	204	.5	.34	92.1	2.81
	D. P.	2.5	2 /	215	.4	1.34	72.4	2.73
	D. P.	16	6 /	207	.5	.41	90.6	2.91

U. F. Upward flood leach

3 / H_2SO_4 concentration dropped to 2 percent after 16 days

D. P. Downward percolation leach

4 / H_2SO_4 concentration dropped to 1 percent after 16 days

1 / One additional day required for washing

5 / H_2SO_4 concentration dropped to 1 percent after 3 days

2 / Maintained at 5 percent H_2SO_4

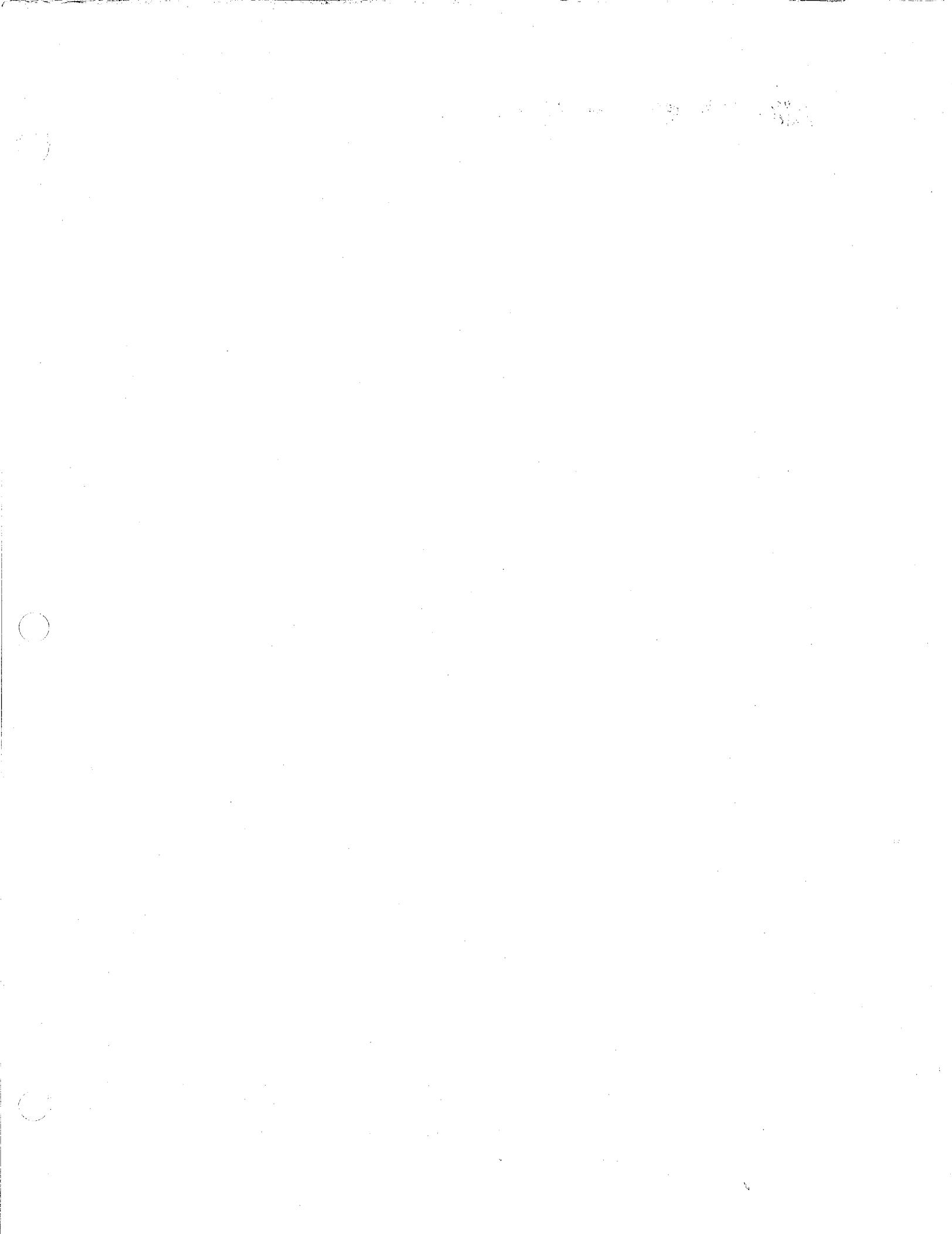
6 / H_2SO_4 concentration dropped to 1 percent after 9 days

CONCLUSIONS

The bench-scale leach tests of the Mineral Hill ore demonstrated that a recovery of about 95 percent of the copper could be obtained by flood leaching minus 3/8-inch feed with 5-percent sulfuric acid for a period of 2.5 days.

Treatment of 1-inch and 2-inch feeds by flooding procedure gave lower recoveries in the short leach periods but the recoveries were improved by extending the treatment time to 16 days. Downward percolation leaching of the different size feeds was inferior to the upward flood procedure.

No difficulty was encountered in percolating the leach solutions through the ore beds regardless of the feed size treated. The acid consumed in leaching the ore was nominal, comparing favorably with acid requirements in commercial operations.



No. 1

EI. 942

N. 5698

E. 5305

Depth

1-70 gray quartzitic argillite; some streaks of gneiss.

Assay Data

Composite of hole

Assayed .05% Cu

No. 1-A

EL. 950

N. 5684

E. 5279

Depth

1- 3	gray argillite siliceous - Fe
3- 6	Green siliceous argillite, consid quartz.
6- 9	gray siliceous argillite, consid quartz.
9-18	gray green siliceous argillite, qtz *.
18-24	gray argillite qtz.
24-33	gray green siliceous schist, some qtz.
33-51	gray siliceous argillite, consid quartz.

Assay Data

<u>Description</u>	<u>Copper %</u>
1- 9	None
9-15	None
15-21	None
21-27	None
27-33	None
33-39	None
39-45	None
45-51	None

No. 2

EI. 935

N. 5714

E. 5412

Depth

1-20 dark gray quartzitic argillite

No. 2-A

3' E. of No. 2

Depth

1-15 dark gray quartzitic argillite

No. 2-B

5' E. of 2-A

Depth

1-15 dark gray quartzitic argillite

23 gray schist?

Analytical Data

No. 2

Depth

Cu%

0- 5 .40

5-11 .40

11-17 .40

(Assay Data Continued)

No. 2-A

<u>Depth</u>	<u>Cu%</u>
2- 8	1.00
3-14	.65

No. 2-B

<u>Depth</u>	<u>Cu%</u>
2- 7	2.18
7-11	1.09
11-17	.93

No. 3

EL. 1009

N. 5580

E. 5359

Depth

0- 8	Hematite and some specularite.
-10	As above with silica streak.
-20	Red oxide.
-26	black specularite.
-28	Red oxide, some specularite.
-32	Red oxide and black specularite.
-40	Black specularite.
-46	Red oxide.
-48	Orange red oxide (silica?).
-50	as above, trace copper on cone plate
57.5	Gray and brown siliceous schist or argillite.

Assay Data

<u>Description</u>	<u>%Silica</u>	<u>%P₂O₅</u>	<u>%Sulphur</u>
Composite 0-20	68.72	trace	3.80
Composite 20-40	52.60	trace	0.86
Composite 40-60	46.98	trace	0.33

Hole #3

	<u>% Copper</u>	<u>% Iron</u>
1'-4'	0.25	18.10
4 - 6	0.35	19.30
6 - 8	0.50	18.10

Assay Data Continued

<u>Hole No. 3</u>	<u>Copper %</u>	<u>% Iron</u>
8 -10	0.15	18.35
10-12	0.20	17.70
12-14	0.51	16.65
14-16	0.22	16.33
16-18	0.19	18.65
18-20	0.32	20.98
20-22	0.25	32.73
22-24	0.25	43.10
24-26	0.35	32.70
26-28	0.55	21.42
28-30	0.33	29.50
30-32	0.32	26.20
32-34	0.28	29.35
34-36	0.27	33.45
36-38	0.19	26.65
38-40	0.28	30.50
40-42	0.36	24.75
42-44	0.32	19.80
44-46	0.32	21.10
46-48	0.42	15.50
48-50	0.46	12.45
50-52	0.62	12.85

Assay Data Continued

<u>Hole No.</u>	<u>Copper %</u>	<u>% Iron</u>
54-56	1.00	13.60
56-58	0.85	12.30

Average .41% Copper

Average 22% Iron

No. 4

E.I. 935

N. 5711

E. 5397

Depth

1- 8	block quartzitic argillite
- 9	oxide copper streak
-19	Black quartzitic argillite; some copper
-21	hard gneiss
-23	dark quartzitic argillite and white quartz; trace pyrite?
-27	as above
28.5	dark quartzitic argillite.
-29	brown quartz sand
-31	gray-green schist
-35	schist as above; some argillite as above; considerable gray and white quartz.
-39	dark quartzitic argillite; considerable quartz.
-43	gneiss
-49	dark quartzitic argillite; much quartz
49-51	gneiss
-55	block quartzitic argillite; white quartz
-63	as above with some quartz
-70	as above, with considerable quartz

Assay Data

<u>Depth</u>	<u>%Cu</u>	<u>Depth</u>	<u>%Cu</u>
3-7	.45	11-15	.33
7-11	.62	15-19	.40

No. 5

E.I. 935

N. 5707

E. 5446

Depth

2-6	red clay, trace copper at 4-6
-21	brown clay
-25	gray clay, trace copper
-34	gray clay, some quartz at 34
-38	dark gray quartzitic argillite and quartz
-40	as above, some copper
-48	as above, no copper noted
-50	gray schistly argillite; some quartz
-60	as above, with copper
-64	as above,
-66	as above, less cu
-69	as above, more cu
-71	brown sand, some copper
-72	Gray quartzitic argillite, considerable copper
-74	brown and gray quartzite, less copper
74-76	Brown quartzite, some copper
-77	as above, with some gray schist
-82	gray schist, with some copper
-88	red oxide and gray schist, some copper
-102	gray schist

No. 5 Continued

Assay Data

Composite	2-34	1.27
	34-38	1.00
	38-42	1.38
	42-46	1.17
	46-50	1.75
	50-54	2.60
	54-58	2.05
	58-62	1.30
	62-66	1.42
	66-70	1.41
	70-74	1.22
	74-78	.85
	78-82	.32
	82-90	.38
	90-102	.13

No. 6

EI. 1067

N. 5440

E. 5029

Depth

2-4.5	red oxide
-8	specularite
-12	specularite, with copper
-21	brown hematitic silica with copper
-39	red oxide, some copper
-42	specularite, some copper
-44	specularite and brown silica

Assay Data

<u>Depth</u>	<u>% Cu</u>
2-8	.50
8-12	3.70
12-18	1.40
18-22	.82
22-26	.58
26-32	.40
32-36	.30
36-42	.55

No. 7

El. 1076

N. 5415

E. 4992

Depth

2-10	gray quartzitic tactite.
-14	gray as above, and red hematite, quartzite, some copper.
-18	red oxide with some specularite, some copper
-26	Red hematite quartzite some copper
-30	Green siliceous tactite or schist some copper
-34	as above, copper?
-38	green, as above; red hematite quartzite
-40	red oxide

Assay Data

<u>Depth</u>	<u>%Cu</u>
2- 6	.38
6-10	.65
14-18	.82
22-26	2.20
18-22	1.68
26-30	.70
30-36	.58
36-40	tr

No. 8

EI. 1087

N. 5384

E. 4951

Depth

2- 4	Gray tactite; red hematite quartzite (silica) some specularite; trace copper.
- 6	Specularite and hematite silica, some copper
- 8	Gray siliceous tactite; hematite silica
-10	Gray as above
-12	Gray as above; red hematite silica; some black specularite.
-14	As above, considerable copper.
-28	Red hematite silica, some copper.
-37	Gray, siliceous, tactite or schist
-39	Gray quartzite
-44	Red hematite silica.

Assay Data

<u>Depth</u>	<u>% Cu</u>
2-10	.64
10-14	1.32
14-18	.57
18-22	1.03
22-28	.37
28-36	.53
36-44	.40

El. 1098

N. 5364

E. 4898

Depth

2- 4	dark quartzite; some specularite
- 6	brown quartzite; some gray, green schist or tactite (epidote)
- 8	gray-green schist
-12	gray quartzite, considerable quartz and hematite
-14	quartzite as above; siliceous hematite
16	siliceous hematite; some quartzite, dark.
-22	gr green schist, or tactite
-24	dark gray quartzite with considerable specularite
-28	as above with some hematite
-30	gray-green schist and specularite
-36	gray-green siliceous schist; some dark quartzite; some specularite
36-37	as above; with some copper
-40	red siliceous hematite, some copper
-41	brown silica
-42	as 37-40
-50	specularite and hematite
-60	siliceous hematite
-70	as above, considerable silica
-76	specularite

No. 9 continued

<u>Depth</u>	<u>% Cu</u>	<u>Assay Data</u>	
			<u>Fe %</u>
2- 8	.27		
8-12	.38		
12-16	.40		
24-28	.60		
28-30	.50		
30-36	.27		
36-40	2.50		
40-42	2.30		
42-46	.92		
46-50	.15		35.8
50-54	.15		
54-58	.27		
58-62	.00		
62-66	.05		
66-70	.05		
70-76	.05		39.1

No. 10

EI. 1109

N. 5343

E. 4865

Depth

2- 6	gray and gray-green schist some dark quartzite
-8	black quartzite
-12	gray tactite or schist
-14	brown quartzite; considerable hematite
25.5	gray-green schist
-32	red hematite quartzite
-36	brown, gray quartzite
-38	as above, with considerable specularite
-41	as above, with considerable quartz
-44	gr-green siliceous tactite
46.5	gr quartzite, trace copper
-51	hematite quartzite some copper
-56	orange and red hematite silica
-58	specularite

Assay Data

<u>Depth</u>	<u>%Cu</u>	<u>Fe %</u>
2- 8	.05	
8-14	.33	
14-20	.54	
20-26	.33	

No. 10 Continued

Assay Data

<u>Depth</u>	<u>%Cu</u>	<u>Fe%</u>
26-32	.76	
32-38	.27	
38-44	.27	
44-48	1.07	
48-52	.53	
52-56	.65	
56-58	Tr	47.8

Ck Assay

44-46	.81
46-50	1.12
50-52	.60
52-56	.30

No. 10A

E.L. 1116

N. 5278

E. 4828

Depth

1- 6	red hematite silica
-15	brown silica
-18	red hematite silica
-24	brown silica
-27	gray-green epidote rock
-42	gray siliceous epidote rock
-51	black specularite
-60	red hematite
-66	red hematite and red specularite
-75	orange red silica

Assay Data

<u>Sample No.</u>	<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1	1- 9	0.05	
2	9-18	0.12	
3	18-27	0.17	
4	27-36	0.22	
5	36-42	0.18	
6	42-45	3.46	
7	45-48	0.38	

No. 10-A Continued

<u>Assay Data</u>			
<u>Sample No.</u>	<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
8	48-51	1.45	
9	51-54	3.67	
10	54-57	0.29	
11	57-66	0.05	
12	66-75	0.07	
	Comp 42-51		45.6
	" " " 51-66		26.4

No. 11

El. 1114

N. 5282

E. 4763

Depth

1-6	red hematite quartzite
-10	as above, w/consid. qtz.
-12	gray brown qtzite
-24	gray siliceous epidote rock.
-26	black quartzite.
-28	as above, consid quartz
-32	siliceous specularite
-40	dark gray quartzite
-44	red hematite quartzite
-46	red-brown quartzite
-50	gray siliceous epidote rock
-58	red hematite quartzite
-68	red hematite, siliceous
-74	siliceous epidote rock with hematite
-80	black specularite
-86	quartzite and specularite.

Assay Data

<u>Depth</u>	<u>%Cu</u>
1- 6	1.05
6-10	.35
10-14	.80

No. 11 Continued

Assay Data

<u>Depth</u>	<u>%Cu</u>
14-18	1.05
18-20	.70
20-22	.60
26-30	.44
30-34	1.00
34-40	.80
40-44	.40
44-50	.75
50-54	.32
54-58	.50
58-62	.33

No. 11-A

EI. 1125

N. 5288

E. 4702

Depth

15-18	brn quartzite
-27	gray-green epidote rock
-30	brown siliceous epidote rock
-45	gray silica with specularite
-48	gray-brown silica
-60	red hematite silica
-69	gray silica
-72	brown silica
-78	orange-red silica
-93	dark red siliceous specularite

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>Fe%</u>
15-18	0.13	
18-21	0.29	
21-24	0.48	
24-27	0.68	
27-30	0.88	
30-33	0.29	

No. 11-A Continued

<u>Description</u>	<u>%Cu</u>	<u>Fe%</u>
33-39	0.48	34.7
39-45	0.38	
	0.56	32.5
45-48	0.51	
48-51	0.89	
51-54	0.48	
54-60	0.33	
60-69	0.27	
69-72	0.24	
72-75	0.05	
75-58	0.05	
78-87	0.07	33.0
87-93	tr	14.9

No. 12

EI. 1123

N. 5239

E. 4638

Depth

- 4	gray siliceous epidote rock
-8	gray green epidote rock
-10	brown quartzite
-18	as above and gray epidote rock
-24	hematite quartzite
-30	gray quartzite
-34	gray quartzite w/some hematite
-42	black siliceous specularite
-50	red hematite and silica
56-62	gray green epidote rock.
-66	red hematite silica and gr epidote rock
-72	red hematite silica, touched black specularite

Assay Data

<u>Depth</u>	<u>%Cu</u>
1- 8	.57
8-14	.75
14-20	.35
20-26	.60
26-32	.65
32-38	1.15
38-44	.92
44-50	.93

No. 13

E.L. 1119

N. 5289

E. 4587

Depth

- 1- 6 green siliceous epidote bed; sm cu, some specularite
- 8 gray green epidote bed
-10 as above; sm brn quartzite
12 green as above; tr cu
14 green as above; some hematite; some cu
16 green as above; and red hematite, sm cu
18 gray quartzite; sm hematite
20 gray quartzite and hematite; sm cu
22 dark gray quartzite
24 as above, some hematite consid cu
26 gray quartzite; sm cu
28 gray quartzite (silica?); red hematite quartzite; cu *
32 red hematite quartzite; cu **
34 red hematite quartzite; black specularite; sm cu
34-36 black specularite sm red as above; sm cu
38 gray quartzite; specularite; red hematite; cu
40 red and black specularite; cu
44 as above, no cu seen

No. 13 Continued

Assay Data

<u>Depth</u>	<u>%Cu</u>	<u>%Fe</u>
1- 6	.43	
6-10	.27	
10-14	.55	
14-18	.33	
18-22	.27	
22-24	.31	
24-26	.46	
26-28	.88	
28-30	3.28	
30-32	2.76	
32-34	2.96	
34-36	.26	
36-38	.31	
38-44	.05	24.0

Ck Assay

26-30	2.40
30-34	2.45
34-40	.52

No. 14

EI. 1139

N. 5115

E. 4535

Depth

- 1-6 Gray green epidote rock; sm hematite at 4'; tr cu
10 gray - green as above andred hematite quartzite
14 gray quartzite
16 as above; sm hematite at 15'; some quartz
18 gray-green epidote rock
20 as above, w/sm hematite
28 gray green epidote rock
31 brown quartzite
38 gray green epidote rock.
42 red hematite quartzite
44 gray quartzite, some specularite
50 red hematite quartzite (silica)
58 grey silica with some specularite

Assay Data

<u>Depth</u>	<u>%Cu</u>
1-6	.00
6-20	.00
20-38	.31
38-44	.62
44-50	.31
50-58	.26

No. 14-A

El. 1130

N. 5152

E. 4573

Depth

- 1-3 gray green quartzitic epidote rock.
6 brown quartzite
9 red hematite quartzite
12 grey quartzite
18 brown hematite quartzite
21 gray green quartzite epidote rock.
24 brown quartzite
27 red hematite quartzite
30 brown quartzite
43 gray green quartzite epidote rock.
54 red-brown hematite quartzite.
60 black specularite
66 red hematite
75 bright red hematite
78 dark red hematite

Assay Data

<u>Description</u>	<u>% Cu</u>	<u>%Fe</u>
1-9	0.05	
9-18	0.12	
18-24	0.05	

Assay Data Continued

No. 14 - A

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>SiO₂</u>
24-27	0.28		
27-33	0.26		
33-39	0.42		
39-45	0.42		
45-48	0.37		
48-51	1.08		
51-54	0.68		
54-57	0.28	Comp. 54-60	31.1
60-63	0.05	" 60-69	26.0
63-66	0.05		
66-69	0.05	" 69-78	28.5
69-78	0.12		

No. 15

El. 1169

N. 4985

E. 4557

Depth

- 1-12 Pink granite porphyry
- 14 as above, w/sm epidote rock and hematite
- 17 Pink porphyry
- 33 gray green siliceous epidote rock
- 35 red hematite quartzite
- 40 gray-green epidote rock, sm quartz at 40
- 50 gray green epidote rock
- 57 as above, w/sm hematite
- 64 red hematite quartzite
- 70 as above w/sm brown silica
- 77 gray siliceous
- 79 gray green epidote rock, considerable specularite
- 80 red hematite quartzite
- 86 as above and gray silica
- 100 red siliceous hematite
- 100-108 black specularite
- 116 red hematite
- 124 black specularite
- 126 brown silica and black specularite

No. 15 continued

<u>Assay Data</u>			
<u>Depth</u>	<u>% Cu</u>	<u>Fe%</u>	<u>SiO₂%</u>
1-17	.00		
17-32	.31		
32-36	.21		
36-50	.21		
50-56	.10		
56-62	.10		
62-68	.10		
100-108	.10	37.4	35.8
108-116	.10	26.0	55.2
116-124	.10	46.5	

No. 15-A

EI. 1170

N. 5036

E. 4612

Depth

0-51	samples not collected
51-54	brown schist or epidote rock
57	gray green epidote rock
60	brown epidote rock or schist
66	gray epidote rock or schist
69	gray green epidote rock.
72	brown schist
81	gray green epidote rock or schist
87	gray epidote rock or schist
93	red brown hematite quartzite
102	red hematite quartzite
105	red hematite and spec.
111	spec.
114	spec and hematite
120	spec.

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>%SiO₂</u>
51-57	Tr		
57-63	Tr		
63-69	Tr		

No. 15-A continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>%SiO₂</u>
69-75	Tr		
75-81	Tr		
81-87	Tr		
87-93	Tr		
93-96	0.12		
96-99	0.36		
99-102	0.05		
102-108	Tr	48.2	19.4
108-114	Tr	47.2	20.5
114-120	Tr	43.5	32.8

No. 16

EI. 1162

N. 5027

E. 4676

Depth

- 1-7 gray epidote rock, sm hematite at 4
- 13 gray and yellow clay (schist)
- 15 gray quartzite
- 17 red hematite quartzite
- 20 gray quartzite
- 24 gray quartzite, sm hematite
- 25 gray quartzite
- 32 gray schist
- 36 as above with sm hematite
- 42 gray green epidote rock.
- 44 red hematite quartzite
- 50 gray green epidote rock.
- 54 as above & red hematite quartzite
- 56 gray green epidote rock; sm red hematite
- 60 red and brown hematite quartzite
- 66 red hematite quartzite

No. 16 continued

Depth

- | | |
|-------|----------------------------|
| 66-72 | gray silica |
| 82 | red hematite siliceous |
| 84 | as above, some specularite |
| 87 | red hematite quartzite |
| 91 | gray silica |
| 100 | red siliceous hematite |
| 102 | as above and specularite |

No. 16-A

El. 1161

N. 5110

E. 4673

Depth

- 51-54 gray green siliceous epidote rock
57 gray quartzitic epidote rock
60 gray green siliceous epidote rock
63 red hematite quartzite
66 brown hematite quartzite
69 red hematite silica (quartzite?)
75 gray quartzite epidote rock
78 gray-brown quartzite
81 brown quartzite
84 gray green siliceous epidote rock
87 red-brown hematite quartzite (silica)
93 red, siliceous hematite
96 red hematite & brown specularite
102 brown specularite
117 red siliceous hematite

Assay Data

<u>Description</u>	<u>%Cu</u>
51-60	0.26
60-66	0.57
66-72	0.74

No. 16-A continued

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>%SiO₂</u>
72-75	0.21		
75-78	0.84		
78-81	0.57		
81-84	0.57		
84-87	1.69		
87-90	0.21		
90-93	Tr		
93-102	0.15	44.0	29.6
102-111	Tr		
111-117	Tr		

No. 17

El. 1164

N. 5172

E. 4686

Depth

- 1- 6 red-brown hematite quartzite
- 9 red hematite
- 12 gray quartzitic epidote rock
- 15 lt brn. siliceous schist
- 21 red-brown hematite quartzite
- 27 brown quartzite
- 63 gray green quartzitic epidote rock
- 72 gray epidote rock or siliceous schist
- 84 gray green epidote rock
- 87 blk specularite
- 90 blk silica
- 93 blk silica, with specularite
- 96 dk brown specularite
- 99 red brown hematite quartzite
- 102 red siliceous hematite
- 105 red-brown hematite quartzite cu *
- 114 red hematite lost circulation

No. 17 continued

<u>Assay Data</u>	
Description	%Cu
1-15	Tr
15-27	Tr
27-39	0.15
39-51	0.15
51-63	0.15
63-72	0.22
72-81	0.36
81-84	0.74
84-87	0.63
87-90	2.19
90-93	0.97
93-96	2.90
96-99	2.19
99-102	5.10
102-105	5.89
105-108	2.35
108-111	0.67
111-114	0.49

No. 17-X

El. 1164

Depth

- 1-8 Gray green epidote rock
- 11 gray quartzite
- 12 red hematite
- 22 gray-green epidote rock
- 24 gray quartzite
- 28 gray green epidote rock
- 32 dark gray quartzite
- 35 light gray schist
- 37 red hematite quartzite
- 42 dark gray quartzite
- 44 gray epidote rock

No. 17-A

El. 1162

N. 5177

E. 4738

: Depth

- 1-12 red hematite quartzite
- 24 gray quartzitic epidote rock and gr quartzite
- 31 gray green epidote rock.
- 42 red hematite quartzite (silica)
- 51 brown hematite quartzite
- 54 red hematite
- 57 brown silica
- 63 gray-green siliceous epidote rock
- 67 red-brown hematite quartzite
- 78 gray green epidote rock
- 81 brown hematite, consid specularite
- 87 black specularite
- 90 brown siliceous hematite
- 93 dk brn as above
- 96 red hematite
- 99 brn hematite silica
- 114 red hematite

No. 17 - A continued

Assay Data

<u>Description</u>	<u>%Cu</u>
1-12	Tr
12-24	Tr
24-33	Tr
33-42	Tr
42-51	0.10
51-57	0.10
57-60	0.42
60-63	0.26
63-66	0.16
66-59	0.37
69-72	0.37
72-75	0.56
75-78	0.76
78-81	0.76
81-84	1.88
84-87	1.88
87-96	0.56
96-99	1.58
99-102	1.12
102-105	0.15
105-111	0.10
111-114	0.15

No. 18

EI. 1160

N. 5159

E. 4805

Depth

- 1-4 gray quartzite
10 as above
12 as above, with red hematite
16 gray quartzitic epidote rock
20 red hematite quartzite
26 brown quartzite
34 red hematite quartzite
36 as above, with considerable specularite
38 silica with specularite
42 red hematite and silica
46 gray quartzite or silica, with considerable specularite
52 red hematite and silica
56 gray and gray-green-quartzitic epidote rock
58 red hematite quartzite
58-66 green-siliceous schist
68 gray silica with specularite
70 specularite
76 gray silica, with considerable specularite
78 red hematite and as above
102 red hematite with silica

No. 18 continued

Depth

106 gray silica, with some hematite

116 red hematite with silica

118 as above, more silica

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>Description</u>	<u>%Cu</u>
1-10	0.26	94-102	0.42
10-12	0.21	102-106	0.52
12-16	0.05	106-112	2.57
16-20	0.16	112-118	0.47
26-30	0.05		
30-34	0.05		
34-38	0.21		
38-42	0.05		
42-46	0.051		
46-52	0.16		
52-56	0.05		
56-58	0.10		
58-62	0.56		
62-68	0.26		
68-70	2.05		
70-76	2.17		
76-82	0.26		
82-88	0.16		
88-94	0.16		

No. 18-A

EI. 1154

N. 5092

E. 4833

Depth

- 2-15 red hematite
- 21 gr brn quartzite
- 24 brown quartzite
- 30 red hematite
- 33 brn silica
- 42 gray green siliceous epidote rock
- 45 brown quartzite
- 48 gray quartzite
- 51 gray epidote rock or schist
- 60 gr grn epidote rock
- 63 specularite
- 69 red hematite silica
- 72 gray quartzite
- 78 brown hematite quartzite
- 81 red hematite; considerable specularite
- 87 red hematite silica
- 105 red hematite - slightly orange color
- 117 brown hematite considerable specularite

No. 18-A continued

Assay Data

<u>Description</u>	<u>%Cu</u>
2-15	Tr
15-24	None
24-30	None
30-39	Tr
39-48	0.10
48-57	0.21
57-63	Tr
63-66	0.10
66-69	0.15
69-72	0.36
72-75	1.17
75-78	5.15
78-81	5.46
81-84	3.77
84-87	4.84
87-90	7.27
90-96	1.90
96-105	0.42
105-111	0.15
111-117	0.26

No. 19

Elt. 1151

N. 5066

E. 4891

Depth

- 1- 3 Red hematite quartzite
6 gray quartzite with hematite as above
9 gray-green siliceous epidote rock
15 gray quartzite with hematite
21 gray quartzite
27 gray-green epidote rock
30 red hematite quartzite
36 gray quartzite
42 light gray quartzite
45 red hematite quartzite
51 gray green epidote rock
54 gray quartzite with considerable specularite
63 gray quartzite with some hematite
63-66 gray green siliceous epidote rock
69 brown hematite quartzite or silica
72 gray - green quartzitic epidote rock
78 gray specularite
81 brown as above
84 red-brown hematite

No. 19 continued

Depth

87 red hematite
90 red brown hematite
93 red hematite
96 red brown hematite
99 red hematite, with considerable specularite
102 brown specularite
114 black specularite some brown
117 brown specularite
123 red hematite
126 brown
129 red hematite

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	0.05	
9-21	0.05	
21-27	0.05	
27-36	0.26	
36-42	0.26	
42-45	0.31	
45-51	0.36	
51-57	0.31	
57-66	0.36	

No. 19 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
66-69	0.26	
69-72	0.57	
72-78	2.67	43.90
78-81	3.72	36.90
81-84	2.56	35.80
84-87	4.95	23.30
87-90	5.75	19.90
90-93	0.25	13.10
93-96	1.94	17.60
96-99	0.35	51.60
99-105	0.15	51.60
105-111	Tr	44.60
111-117	Tr	61.20
117-123	0.005	30.30
123-129	0.13	

No. 19-A

E.L. 1147

N. 5119

E. 4935

Depth

- 1-12 red hematite silica
- 15 gr-brn quartzite
- 24 red hematite quartzite
- 27 black specularite quartzite
- 39 gray quartzite
- 45 gray-brn quartzite
- 48 red hematite quartzite
- 51 gray quartzitic epidote
- 54 gray-green epidote rock
- 57 red hematite silica
- 60 brn quartzite
- 63 brown hematite quartzite (silico)
- 66 red hematite quartzite
- 78 specularite
- 93 red hematite
- 96 red specularite
- 108 black specularite,
lost circulation,

No. 19-A continued

I-12		<u>Assay Data</u>	
<u>Description</u>		<u>%Cu</u>	<u>%Fe</u>
1-12	Tr		
12-24		0.15	
24-33	Tr		
33-45		0.15	
45-54		0.15	
54-60		0.31	
60-63		0.26	
63-66		0.67	
66-69		1.02	42.6
69-72		4.10	40.1
72-75		2.40	39.6
75-78		2.17	
78-81		1.53	40.2
81-84		0.45	
84-87		3.26	
87-90		1.34	
90-96		0.26	
96-102		0.15	62.5
102-108		0.15	60.0

No. 20

EI. 1146

N. 5152

E. 4993

Depth

- 1-6 red hematite quartzite
- 9 brown quartzite
- 21 gray siliceous epidote rock
- 33 gray-green siliceous epidote rock
- 36 red siliceous hematite
- 42 brown siliceous - epidote rock
- 45 red siliceous hematite
- 48 gray brown siliceous epidote rock
- 54 red siliceous hematite
- 57 brown siliceous epidote rock
- 69 gray epidote rock
- 72 red hematite
- 81 brown specularite
- 90 red hematite
- 90-96 brown specularite
- 108 black specularite
- 117 brown specularite siliceous
- 129 black specularite
- 135 brown specularite

No. 20 continued

Depth

138 red hematite

141 brown silica and hematite

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	None	
9-18	Tr	
18-27	Tr	
27-33	Tr	
33-36	Tr	
36-42	Tr	
42-45	0.005	
45-48	0.15	
48-54	0.15	
54-57	Tr	
57-66	Tr	
66-69	3.16	
69-72	1.53	
72-75	0.20	58.5
75-78	0.005	52.9
78-81	1.17	26.6
81-84	0.005	31.8
84-90	0.005	22.0
90-96	0.15	27.3

No. 20 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
96-102	Tr	58.8
102-108	None	47.7
108-117	None	46.6
117-123	None	54.1
123-129	None	48.7
129-135	None	37.2
135-141	Tr	21.6

No. 20-A

Elt. 1147

N. 5100

E. 5014

Depth

- 2-15 red hematite quartzite
27 gray-green siliceous epidote rock
30 red hematite quartzite
39 gray green siliceous epidote rock
42 gray schist
54 red hematite quartzite
66 black specularite
72 brown specularite
80 red hematite & specularite

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>%SiO₂</u>
2- 9	None		
9-18	None		
18-27	None		
27-30	None		
30-42	None		
42-48	None		
48-54	None		
54-60	None	52.0	17.6

No. 20-A continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>%SiO₂</u>
60-66	0.97	58.2	10.4
66-72	0.42	54.4	13.6
72-80	0.37	34.8	36.4

No. 20-B

El. 1147

N. 5045

E. 5079

Depth

- 9-21 gr green siliceous epidote rock
33 gray quartzite
42 gray green siliceous epidote rock
51 red hematite quartzite (cu)
57 bright red hematite quartzite
60 red hematite & specularite
78 black specularite
81 brown specularite

No. 20 B-B

El 1147

N. 5035

E. 5068

Depth

- 36-42 red hematite quartzite

Assay Data
No. 20 B

<u>Description</u>	<u>%Cu</u>
9-18	0.18
18-27	0.12
27-36	0.11

No. 20-B continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>%SiO₂</u>
36-42	0.11		
42-45	0.12		
45-48	0.12		
48-51	0.73		
51-54	3.32		
55-57	1.48		
57-60	0.32		
60-66	0.11	47.1	30.8
66-72	0.27	39.8	41.8
72-76	0.11	49.2	29.1
76-81	0.11	23.9	64.0

Assay Data
Hole No. 20 B-B

<u>Description</u>	<u>%Cu</u>
36-39	0.66
39-42	0.53

No. 21

EI. 1147

N. 5059

E. 5179

Depth

- 1- 3 Red hematite quartzite
- 9 gray quartzite and gray-green epidote rock
- 12 brown quartzite
- 15 gray green siliceous epidote rock
- 18 gray quartzite
- 24 as above; siliceous epidote rock
- 27 red siliceous hematite
- 30 gray siliceous epidote rock
- 33 red siliceous hematite
- 45 brown quartzite
- 54 gray quartzitic epidote rock
- 63 brown silica
- 75 red hematite quartzite
- 81 red hematite
- 84 gray silica
- 93 red hematite
- 95 brown specularite and hematite
- 102 red hematite

No. 21 continued

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	None
18-24	Tr
24-27	None
27-36	None
36-45	Tr
45-54	None
54-60	Tr
60-63	None
63-66	None
66-69	0.21
69-72	0.31
72-75	0.10
75-81	0.005
81-87	0.36
87-93	0.005
93-102	Tr

No. 22

EI. 1144

N. 5004

E. 5200

Depth

- 1- 3 gray quartzite
9 red hematite quartzite
12 red brown hematite quartzite
15 brown quartzite
18 light gray schist
36 red hematite quartzite
39 red-brown hematite quartzite
48 gray quartzite epidote rock, considerable quartz
60 gray-green quartzite epidote rock
66 red brown hematite quartzite
90 black specularite
99 red oxide

Assay Data

Description

%Cu

Tr

3-12

Tr

12-15

Tr

15-24

Tr

24-27

Tr

27-30

Tr

30-36

Tr

No. 22 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
36-42	Tr	
42-45	Tr	
45-51	Tr	
51-57	0.16	
57-60	0.08	
60-63	0.62	
63-66	1.57	
Comp 66-72		45.5
69-72	0.58	
72-75	0.16	
75-78	Tr	
Comp 72-78		50.8
78-84	Tr	52.1
84-90	0.08	52.1
90-99	Tr	31.9
Cut Samples		
Dump at 47'	0.22	
Across 5' of Bed	0.92	
in shaft 140' SW of 47G		

No. 23

E.I. 1138

N. 4977

E. 5264

Depth

- 1- 6 brown quartzite
12 red hematite quartzite
15 yellow schist
21 gray green epidote rock
27 red brown hematite quartzite
30 gray quartzite
39 gray green quartzitic epidote rock
45 red hematite siliceous

Assay Data

<u>Description</u>	<u>%Cu</u>
	<u>Tr</u>
6-12	Tr
12-21	Tr
21-27	Tr
27-33	Tr
33-36	0.58
36-39	0.27
39-42	0.16
42-45	0.16

No. 24

El. 1137

N. 5015

E. 5306

Depth

- 1- 3 red hematite quartzite
- 9 gray-green epidote rock
- 12 red hematite quartzite
- 27 gray green schist or epidote rock
- 51 red oxide
- 57 red & brown specularite
- 72 black specularite
- 75 red specularite
- 78 as above and red oxide
- 90 red oxide

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	0.08	
9-12	0.16	
12-18	0.16	
18-27	0.32	
27-30	0.32	
30-36	0.08	
36-42	Tr	

No. 24 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
42-51	0.08	
51-60	0.08	47.0
60-63	None	45.4
63-72	Tr	44.6
72-75	Tr	42.2
75-81	Tr	
81-90	None	

No. 25

El. 1136

N. 5067

E. 5331

Depth

- 1- 6 brown quartzite epidote rock
12 red hematite quartzite
15 gray green schist or epidote rock
33 red hematite quartzite
39 brown quartzite
48 brown hematite quartzite
54 red hematite & red specularite
60 black specularite

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	0.05	
9-15	0.05	
15-24	0.17	
24-33	0.22	
33-39	0.43	
39-42	0.43	
42-45	0.49	
45-48	1.35	
48-51	0.49	
51-54	Tr	
54-60	Tr	47.70
Comp 48-54		34.60

No. 26

E.I. 1132

N. 5112

E. 5357

Depth

- 1- 3 red hematite quartzite
6 brown quartzite
9 gray green quartzite epidote rock
24 red hematite quartzite
27 gray green quartzite epidote rock
39 brown quartzite
42 gray green quartzite epidote rock
45 dark red hematite some red specularite
51 dark red specularite
60 black specularite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 3	0.32
3- 9	0.05
9-12	0.81
12-15	0.75
15-18	0.27
18-21	0.05
21-24	0.27
24-30	0.27

No. 26 continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
30-36	0.22	
36-39	0.32	
39-42	0.32	
42-45	3.38	
45-48	0.32	
48-51	0.16	
51-54	0.32	
54-57	0.05	
57-60	0.16	
Comp 45-51		43.00
Comp 51-60		41.50

No. 27

EI. 1127

N. 5160

E. 5377

Depth

- 1- 6 red hematite quartzite
9 gray epidote or schist
24 brown quartzite
27 gray quartzite
33 brown quartzite
36 red hematite quartzite
39 brown quartzite
45 red brown quartzite
48 gray green quartzite epidote rock
51 red hematite, some specularite
57 black specularite
60 black siliceous specularite
69 red hematite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 6	0.27
6-15	0.16
15-24	0.10
33-39	0.43
24-33	0.22
39-45	0.22

No. 27 Continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
45-48	0.87	
48-51	0.16	
51-54	0.27	
54-57	0.22	
Comp 51-57		55.30
57-63	0.10	
63-69	0.22	
Comp 60-69		27.70

No. 28

E.L. 1121

N. 5188

E. 5417

Depth

- 1-27 red hematite quartzite
33 brown quartzite
54 black specularite
57 red specularite
60 red siliceous hematite
63 red hematite
72 red-brown specularite
73-1/2 black specularite

No. 28-X

Depth

- 1-12 red hematite quartzite
15 brown quartzite
18 red hematite quartzite
27 brown quartzite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 6	Tr
6-12	Tr
12-15	Tr

No. 28 Continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
15-18	Tr	
18-24	Tr	
24-27	Tr	
27-30	1.30	
30-33	1.68	
33-36	1.68	
36-39	4.88	
39-42	0.54	
42-48	0.27	
48-54	0.10	
54-57	0.10	
57-60	0.19	
60-63	0.22	
63-66	Tr	
66-72	Tr	
72-73-1/2	Tr	48.00
Comp 33-42		44.80
42-54		52.60
60-63		27.20

No. 28-X continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>Assay Data</u>
1- 3	0.10		
3- 6	0.16		
6-12	Tr		
12-18	0.22		
18-21	0.12		
21-24	0.16		
24-27	0.27		

No. 28-A

El. 1102

N. 5273

E. 5432

Depth

- 1- 3 brown quartzite
12 gray quartzite epidote rock
18 gr-grn schist
24 gray quartzite epidote rock
27 brown hematite quartzite
30 red hematite
33 red hematite and red specularite
45 black specularite siliceous

<u>Description</u>	<u>%Cu</u>	<u>Assay Data</u>	
		<u>%Fe</u>	
1- 9	0.05		
9-18	0.05		
18-24	0.12		
24-27	1.08		
27-30	0.21	34.20	
30-36			
36-45	0.10	45.00	

No. 29

EI. 1119

N. 5167

E. 5468

Depth

1- 3	gray quartzite
6	red hematite quartzite
9	brown siliceous epidote rock
18	red hematite quartzite
21	brown quartzite
24	gray quartzite
27	brown siliceous epidote rock
30	red hematite quartzite
36	brown quartzite
42	gray silica, considerable black specularite
48	red hematite
81	black specularite
84	red specularite
84	red hematite and red specularite
88	red specularite cu

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	0.16
9-12	0.08
12-15	0.08

No. 29 Continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
15-18	0.05	
18-21	0.21	
21-24	0.16	
24-27	0.08	
27-30	0.05	
30-33	0.27	
33-36	0.48	
36-39	0.16	
39-42	1.08	
42-45	2.81	
45-48	0.22	
48-54	0.27	32.00
54-60	0.05	45.00
60-66	Tr	46.10
66-72	Tr	49.90
72-78	Tr	56.10
78-84	Tr	34.90
84-88	Tr	26.40

No. 30

EI. 1121

N. 5115

E. 5497

Depth

- 1- 6 gray-green siliceous epidote rock
12 brown siliceous schist or epidote rock
15 red hematite quartzite
21 gray-brown quartzite
24 gray-green siliceous epidote rock
30 red hematite quartzite some specularite
33 black siliceous specularite
39 gray green quartzite epidote rock
42 gray green epidote rock
45 red hematite quartzite
51 gray quartzite
54 red hematite quartzite
63 red hematite
72 black specularite siliceous
48 red hematite some red specularite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	0.16
9 -12	0.05

No. 30 Continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
12-15	Tr	
15-21	0.05	
21-27	0.12	
27-33	Tr	
33-42	0.05	
42-45	0.32	
45-48	0.12	
48-51	0.17	
51-54	0.27	
54-57	0.21	
57-60	0.05	
60-63	Tr	
63-72	Tr	41.50
72-78	Tr	

No. 31

EI. 1120

N. 5078

E. 5492

Depth

- 1- 3 red hematite quartzite
6 gray green epidote rock
9 gray epidote rock
15 light brown quartzite or silica
21 gray green siliceous epidote rock
24 gray silica
27 gray-brown silica with some specularite
39 gray silica
42 brown silica
45 gray siliceous epidote rock
57 black specularite
60 red brown hematite silica
69 orange-red silica
73 red hematite, some specularite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 6	Tr
6 - 9	Tr
9 -12	Tr
12-21	Tr

No. 31 Continued

Assay Data Continued

<u>Description</u>	<u>% Cu</u>	<u>%Fe</u>
21-30	Tr	
30-33	0.22	
33-42	0.27	
42-45	Tr	
45-48	0.17	
48-54	0.38	
54-57	1.84	36.7
57-60	0.17	
60-63	0.10	
63-73	Tr	
Comp 45-54		42.7

No. 32

E.I. 1112

N. 5007

E. 5499

Depth

- 1-12 grey green siliceous epidote rock
15 red hematite silica
18 brown siliceous epidote rock
24 red hematite silica
27 red brown hematite silica
30 black specularite
33 brown specularite
54 black specularite
57 red hematite silica
60 orange red silica
78 red hematite with some specularite

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	0.08	
9-18	0.17	
18-21	0.10	
21-24	0.05	
24-27	0.38	
27-30	0.22	54.3
30-36	0.17	42.8

No. 32 Continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
36-45	0.27	46.5
45-54	0.32	41.0
54-60	Tr	
60-69	None	
69-78	None	

No. 33

EI. 1032

N. 5457

E. 5312

Depth

- 0-15 black specularite
18 brn silica
21 red brn silica
24 orange-red silica
27 dark brn silica
30 red hematite
33 red hematite and red specularite
48 blk specularite
51 gray silica
57 red silica
66 gray argillite some cu
96 gray siliceous argillite

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	None	55.60
9-15	None	48.70
15-21	None	20.60
21-27	None	29.60
27-33	None	30.70
33-39	None	61.50

No. 33 continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
39-48	None	50.30
48-57	Tr	
57-60	0.40	
60-63	0.50	
63-66	0.30	
66-69	None	
69-78	None	
78-87	None	
87-96	None	

No. 34

EI. 986

N. 5602

E. 5472

Depth

- 1- 3 blk specularite
9 blk specularite some brown silica
15 black specularite
21 black specularite and red brn silica
24 red hematite, some red specularite some red silica
27 red silica
30 yellow silica
33 drk siliceous argillite, cu
36 gray-green siliceous schist or arg. tr cu
39 as above, some gray arg. tr cu, hit crack
42 as above
48 gray argillite tr cu

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	None	66.20
9-15	None	60.20
15-21	None	41.80
21-27	Tr	23.30
27-30	0.50	
30-33	0.80	

No. 34 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>
33-36	0.70
36-39	0.60
39-42	0.60
42-45	0.60
45-48	0.50

No. 35

EI. 979

N. 5262

E. 5705

Depth

- 3-12 black specularite
15 blk specularite, sm brown silica
18 brn-red silica some spec
24 red brn silica
27 yellow silica
30 yellow silica and gray argillite some cu
39 gray siliceous argillite cu?

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
3-12	None	48.30
12-18	None	30.80
24-27	None	15.40
27-30	0.40	
30-33	0.20	
33-39	0.20	

No. 36

EI. 942

N. 4450

E. 6481

Depth

- 1- 3 brown schist
6 brown schist, some specularite
45 brown schist, with streaks siliceous argillite
54 brown silica or schist
69 brown schist, considerable gray argillite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	None
27-36	None
36-45	None
45-54	None
54-63	None
63-69	None

No. 37

EI. 927

N. 4489

E. 6545

Depth

- 1- 3 dark silica with some hematite
6 as above with some gouge material
12 brown-red fault material with some dark silica
18 as above, with some gray gouge rock
21 red-brn silica some dark silica, some specularite
24 red-brn silica some specularite
27 red brn silica
36 as above
45 brown schist
54 brown schist and gray gouge some dark silica
57 brown schist some dark silica
63 brown and gray schist
63-66 gray silica or schist, some brn
69 brown schist
72 brn and gray schist
87 red clay or gouge, some gray
90 as above with considerable quartz
93 as above some specularite
99 red-brown clay
102 as above, some gray gouge

No. 37 continued

Depth- continued

- 108 red clay
111 red clay some gray gouge
114 gray schist or gouge - red clay
117 red clay some gray
120 red clay
123 red and gray clay
129 red and gray clay
132 red clay and pink por? considerable quartz
132 -141 pink porphyry considerable quartz
144 pink porphyry and dark silica ?
150 dark brown siliceous
153 gray siliceous
179 as above

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	None
18-27	None
27-36	None
36-45	None
45-54	None

No. 37 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>
54-63	None
63-72	None
72-81	None
81-90	None
90-99	None
108-117	None
117-126	None
126-135	None
135-144	None
144-153	None
153-162	None
162-171	None
171-179	None

No. 38

EI. 967

N. 4695

E. 6091

Depth

- 1- 6 red oxide siliceous
27 black specularite
30 red hematite sil, some specularite
33 red hematite silica
36 red brown silica
51 gray argillite no cu seen

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 6	None	10.00
6-15	None	47.00
15-21	None	52.20
21-27	None	57.60
27-36	None	27.40
36-42	0.02	
42-51	None	

No. 39

EI. 974

N. 4761

E. 6052

Depth

collared on hematite ore bed

1- 6 red hematite quartzite ore bed

9 red siliceous hematite

12 as above with some specularite

29 black specularite

unable to go deeper

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1 - 6	None	12.70
6-12	None	27.50
12-21	None	56.60
21-29	None	53.40

No. 40

EI. 1022

N. 5122

E. 5634

Depth

- 1-12 red hematite silica
- 15 red hematite and black silica with specularite
- 18 black silica with specularite
- 21 black specularite
- 27 black specularite

No. 40 X

EI. 1022

N. 5119

E. 5636

Depth

- 1-14 orange red silica
- 29 black specularite

Assay Data
No. 40

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 6	None	
6-12	None	
12-18	None	30.80
18-27	None	51.10

No. 40 X continued

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	None	
9-15	None	
15-21	None	48.80
21-29	None	49.80

No. 41

EI. 1042

N. 4998

E. 5618

Depth

- 1-23 red schist gray silica
27 gray silica
33 black specularite siliceous
36 grey specularite tr brn silica
39 gray specularite, considerable brn silica
42 as above
48 specularite and silica black
51 red silica, some specularite
59 red silica
69 gray argillite or schist

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 6	None	
6-12	0.20	
12-18	None	9.40
18-24	None	15.40
24-30	None	50.80
30-36	None	53.40
36-42	None	45.20

No. 41 continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
42-48	None	32.30
48-57	None	
57-63	None	
63-69	0.30	

No. 42

EI. 1029

N. 5053

E. 5670

Depth

- 1-18 red hematite silica
24 orange-red silica
27 red hematite silica
33 brown silica with specularite

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 6	None	
6-12	None	
12-18	None	
18-24	None	
24-30	None	23.80
30-33	None	18.20

No. 43

E.L. 1228

N. 4821

E. 4583

Depth

- 1-14 red hematite silica
15 gray silica
18 brown hematite silica and gray silica
30 gray-green epidote rock
36 gray schist

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	None
18-27	None
27-36	None

No. 44

EI. 1212

N. 4868

E. 4647

Depth

- 1- 6 gray siliceous quartzite or silica
- 9 gray - grn epidote rock
- 18 as above with gray silica
- 21 gray green epidote rock
- 26 gray epidote rock
- 27 porphyry
- 39 porphyry

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	None
18-27	None
27-33	None
33-39	None

No. 45

El. 1212

N. 4901

E. 4659

Depth

1- 9 porphyry pink
15 as above, some dark silica
44 porphyry pink
60 gray epidote rock
72 gray schist siliceous some brown quartzite or silica
89 gray siliceous schist
90 red hematite silica
101 gray sil schist
103 red hematite silica
114 gray sil schist
114-117 gray schist hit fissure
120 brown silica
129 gray silica
140 gray brown silica

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	None
18-27	None

No. 45 continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>
27-36	None
36-45	None
45-54	None
54-63	None
63-72	None
72-81	None
81-90	None
90-99	None
99-108	None
108-117	None
117-126	None
126-135	None
135-140	0.30

No. 46

EI. 942

N. 4353

E. 6485

Depth

- 1-48 gray schist some siliceous streaks
80 gray siliceous argillite some brown silica
85 brown silica and gray argillite
93 gray argillite and red-brown hematite silica
98 red brown silica
108 red hematite silica with some specularite and gray silica
116 red hematite silica may be porphyry
135 gray argillite or schist
153 brown silica, may be schist
159 red-brown hematite silica
162 brown silica

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	None
18-27	None
27-36	None
36-45	None
45-54	None

No. 46 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>
63-72	None
72-81	None
81-90	None
90-99	None
99-108	None
108-117	None
117-126	0.20
126-135	0.20
135-144	0.20
144-153	0.20
153-162	0.20

No. 47

EI. 875

N. 4649

E. 6293

Depth

- 0- 3 gray argillite
- 6 red gouge
- 11 orange red silica
- 21 gray soft argillite
- 39 hard dark gray, argillite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 3	4.00
3- 6	0.80
6- 9	0.20
9-12	0.40
12-18	0.20
18-21	0.20
21-30	0.20
30-39	0.20

No. 47-A

EI. 875

N. 4553

E. 6295

Depth

- 1- 3 light gray schist, some gray silica
- 9 gray and brown schist
- 12 gray silica
- 15 dark gray silica
- 18 as above, with some red hematite silica
- 21 red-brown silica
- 27 gray silica
- 36 red clay gouge
- 39 orange-red silica
- 72 red gouge clay
- 81 as above and gray silica
- 87 red hematite silica and gray silica
- 105 gray silica and red hematite silica

No. 47-A continued

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 6	0.20
6- 9	1.80
9-12	2.00
12-15	2.00
15-18	2.00
18-21	2.20
21-24	3.60
24-27	3.80
27-30	1.00
30-36	0.60
36-42	0.20
42-48	1.60
48-51	3.40
51-54	3.80
54-57	4.40
57-63	1.20
63-69	0.40
69-75	0.60
75-81	1.00
81-87	0.80
87-93	0.60
93-99	0.60
99-102	0.80

No. 47-B

Elt. 875

N. 4659

E. 6295

Depth

- 1-46 brown and gray schist
- 57 gray silica
- 60 gray silica some red hematite silica
- 69 red hematite silica
- 87 red hematite silica and gray silica

No. 48

EI. 877

N. 4664

E. 6304

Depth

- 1-14 brown schist
18 gray and brown schist
36 brown schist some gray silica
47 gray siliceous schist
51 gray and brown siliceous schist
69 brown schist
75 brown schist some gray schist
81 brown and gray schist
87 gray schist, some gray silica

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	None
18-27	None
27-36	None

No. 48 continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>
36-45	None
45-54	None
54-63	0.20
63-72	0.20
72-81	0.20
81-87	0.20

No. 49

EI. 956

N. 5452

E. 5641

Depth

1-12 gray argillite or schist

36 dark gray as above

48 gray argillite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	0.20
9-18	0.20
18-27	0.60
27-30	1.40
30-33	2.10
33-36	1.90
36-39	1.00
39-42	2.30
42-45	1.60
45-48	1.30

No. 49-A

EI. 956

N. 5450

E. 4641

Depth

1- 6 yellow clay gouge

15 red clay gouge

30 orange-red gouge

drilled 30-69 without catching samples, red gouge

69-81 gray argillite

87 gray argillite, considerable red gouge

93 gray argillite and red gouge

96 red gouge

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 6	0.40
6-12	0.20
12-21	0.20
21-30	0.30
69-72	3.20
72-75	4.90
75-78	4.50

No. 49-A continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>
78-81	5.70
81-84	5.30
87-90	5.20
84-87	4.60
90-93	5.30
93-96	2.50

Hole X

El. 1171

N. 4867

E. 4557

Depth

- 1- 6 gray quartzitic epidote rock
- 12 brown schist
- 17 red hematite schist
- 24 gray-green schist or epidote rock
- 30 gray siliceous epidote rock
- 33 brown quartzite, considerable quartz
- 36 brown quartzite
- 42 gray green schist
- 45 red hematite quartzite
- 60 gray schist
- 63 brown quartzite schist
- 75 gray schist
- 78 brown schist
- 81 dark red hematite
- 84 red hematite
- 96 orange red hematite
- 117 red hematite
- 126 dark red hematite some specularite

Hole X continued

Assay Data Continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
108-114	Tr	
114-120	Tr	
120-126	Tr	
126-132	Tr	29.50

Hole X continued

Depth - continued

132 dark red specularite siliceous.

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 6	Tr	
6-12	Tr	
12-15	Tr	
15-21	Tr	
21-27	Tr	
27-36	Tr	
36-42	Tr	
42-45	0.05	
45-51	0.05	
51-60	0.05	
60-63	0.05	
63-72	0.05	
72-75	0.21	
75-78	0.16	
78-81	0.37	
81-84	0.16	
84-90	0.05	
90-96	0.16	
96-102	0.05	
102-108	0.16	

Hole V 6

Elt. 1212

N. 5216

E. 4208

Depth

- 1-15 red hematite quartzite
24 brown quartzite or silica
27 black specularite
45 black silica with specularite
51 gr-grn epidote rock
54 dark gray silica
66 gray-green siliceous schist
69 gray schist
84 gray green schist

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 9	None	
9-18	Tr	
18-27	0.05	30.0
24-27		52.4
27-33	0.16	35.8
33-39	0.16	
39-42	0.43	
42-45	0.82	
45-48	0.49	

Hole V - 6 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
48-51	0.38	
51-54	0.98	
54-57	0.63	
57-63	0.49	
63-69	0.33	
69-75	0.22	
75-84	0.29	

Hole 7G

El. 1183

N. 4837

E. 4344

Depth

- 1- 3 very dark red hematite quartzite
12 brown quartzite schist
18 yellow gray siliceous schist
27 gray & brown schist
36 gray-green schist or epidote rock
48 gray schist
66 brown siliceous schist or
72 orange-red silica
78 brown silica
87 yellow silica

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>	<u>%SiO₂</u>
1- 9	Tr		
9-18	Tr		
18-27	Tr		
27-36	Tr		
36-45	None		
45-54	Tr		
54-63	0.16		
63-72	None		
72-78	None		
78-87	None	4.2	77.2
			86.4

Hole H-1

El. 1219

N. 5226

E. 3981

Depth

- 1- 9 light brown siliceous quartzite
- 21 brown hematite quartzite
- 30 red hematite
- 39 dark red hematite
- 51 brn hematite quartzite
- 60 dark silica with specularite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	0.16
9-18	Tr
18-27	0.05
27-36	Tr
36-45	Tr
45-51	0.33
51-54	0.27
54-57	0.38
57-60	0.59

Hole H-X

El. 1219

N. 5125

E. 3980

Depth

51-56 dk brown siliceous quartzite

60 gray quartzite

63 brown quartzite

72 yellow siliceous schist

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>Gold oz.</u>	<u>Silver oz.</u>
48-54	0.27		
54-57	1.52	0.003	Tr
57-60	2.06	0.003	Tr
60-63	0.05	0.005	Tr
63-72	0.05		

Hole H-2

El. 1125

N. 5077

E. 4443

Depth

- 1- 6 dark brown quartzite
9 yellow green schist
21 brown quartzite
27 green siliceous epidote rock
36 gray siliceous epidote rock
39 red hematite quartzite
51 red hematite
54 orange red hematite siliceous
57 brown siliceous hematite
63 red hematite siliceous
lost circulation

Assay Data

<u>Description</u>	<u>%Cu</u>
1-9	Tr
9-18	0.05
18-27	0.27
27-36	1.35
36-39	2.01
39-45	0.16
45-51	0.05

Hole H-2 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>
51-54	0.05
54-57	0.16
57-63	0.16

Hole 3H

El. 1153

N. 5070

E. 4371

Depth

- 1- 6 red hematite quartzite
- 12 brown siliceous schist
- 15 red schist
- 21 red-brown schist
- 30 brown schist
- 33 yellow green schist
- 36 brown schist
- 39 gray schist
- 42 brown schist
- 51 gray schist
- 57 gray-green schist
- 60 black silica with specularite
- 63 gray silica
- 66 brown silica
- 69 orange red silica
- .72 dark red hematite silica
- 75 black specularite
- 84 red hematite silica
- 87 pink granite porphyry?
- 90 orange red silica
- 99 gray schist

Hole 3-II continued

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	Tr
9 -18	Tr
18-21	0.10
21-30	Tr
30-39	Tr
39-48	0.10
48-57	0.22
57-60	0.10
60-66	0.32
66-75	Tr
75-84	Tr
84-90	Tr
90-99	0.10

Hole 4-H

EI. 1138

N. 5139

E. 4409

Depth

- 1-15 brown silica or quartzite
18 yellow-green schist
21 gray siliceous schist
24 gray-green epidote rock
30 brown siliceous schist
39 gray-green siliceous schist
48 brown siliceous schist
51 red brown silica

Assay Data

<u>Description</u>	<u>%Cu</u>
1-9	0.17
9-15	0.10
15-24	0.10
24-33	0.32
33-42	0.38
42-45	0.27
45-48	0.38
48-51	0.54

Hole 4-H-X

E.L. 1138

N. 5143

E. 4410

Depth

45-48 gray silica
51 red-brown silica
54 red hematite silica
63 orange red silica
81 red hematite silica

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
45-51	0.32	
51-54	0.10	
54-57	Tr	
57-60	Tr	
60-63	Tr	
63-66	Tr	
66-69	Tr	
72-75	Tr	
75-78	Tr	
78-81	Tr	
Comp 63-72		21.6
69-72	Tr	

Hole N-1

E.I. 941

N. 5620

E. 5525

Depth

1- 3	hematite silica
-6	gray silica
-9	yellow gouge
-12	red-yellow gouge
12-24	orange red gouge
24-30	brown gouge, some silica
42-45	red brown gouge
45-51	yellow gouge
51-57	orange gouge
57-66	red gouge
66-81	brown gouge
81-84	yellow gouge
84-90	brown silica?
90-105	gray siliceous argillite
105-108	brown silica
108-129	gray siliceous argillite
30-42	brown gouge, some silica

Hole N-1 continued

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 3	2.60
3- 6	3.80
6- 9	1.70
12-15	0.60
9-12	0.60
15-18	0.40
18-21	0.40
21-24	0.20
24-27	0.40
27-33	0.40
33-36	0.30
36-39	1.00
39-42	0.20
42-51	0.20
51-60	0.30
60-69	0.30
69-72	0.50
72-75	0.40
75-78	0.70
78-81	0.60
81-84	1.30

Hole N-1 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>
84-87	1.30
87-90	1.30
90-93	1.70
93-96	1.30
96-99	0.80
99-102	0.90
102-105	1.10
105-108	1.20
108-111	1.10
111-114	1.10
117-120	0.80
114-117	1.30
120-123	0.80
123-129	0.30

Check Assay

<u>Description</u>	<u>%Cu</u>
1- 3	2.20
3- 6	3.20
6- 9	1.40
9-18	0.40
18-27	0.30

Hole N-1 continued

Check Assay - continued

<u>Description</u>	<u>%Cu</u>
27-36	0.60
36-39	0.70
39-48	0.20
48-57	0.20
57-66	0.20
66-75	0.30
75-81	0.70
81-84	1.20
84-87	1.30
87-90	1.10
90-93	1.50
93-96	1.10
96-99	0.70
99-102	0.80
102-105	1.10
105-108	0.90
108-111	1.10
111-114	0.90
114-117	0.90
117-123	0.70
123-129	0.40

Hole N-2

El. 946

N. 5048

E. 5946

Depth

1-15	red gouge
15-24	brown gouge some silica
24-30	orange red silica or gouge
30-48	light brown gouge
48-57	gray siliceous argillite
57-60	brown silica or siliceous argillite
60-81	gray siliceous argillite

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 9	None
9-18	0.20
18-27	0.20
27-36	None
36-48	0.20
48-51	0.60
51-54	1.20
54-57	0.60
57-60	0.80

Hole N-2 continued

Assay Data continued

<u>Description</u>	<u>%Cu</u>
60-63	0.60
63-66	0.20
66-69	0.20
69-72	0.80
72-75	0.60
75-78	0.80
78-81	0.60

Check Assay

<u>Description</u>	<u>%Cu</u>
1-12	0.10
12-24	0.20
24-36	0.10
36-48	0.20
48-51	0.50
51-54	1.00
54-57	0.50
57-60	0.60
60-66	0.30
66-72	0.40
72-81	0.50

Hole 5-H

El. 1111

N. 5241

E. 4425

Depth

- 1- 3 gray brown quartzite
- 6 brown schistly quartzite
- 9 yellow brown siliceous schist
- 12 brown siliceous schist
- 21 red brown silica
- 36 orange red silica
- 42 red hematite silica

Assay Data

<u>Description</u>	<u>%Cu</u>
1-6	0.22
6-12	0.27
12-15	0.38
15-18	None
18-21	0.10
21-24	0.10
24-30	Tr
30-36	None
36-42	Tr

Hole 6-H

El. 1123

N. 5268

E. 4408

Depth

- 1- 3 yellow brown quartzite
- 9 red hematite quartzite
- 15 brown quartzite
- 24 red hematite silica
- 33 brown silica
- 36 red hematite silica
- 39 orange red silica

Assay Data

<u>Description</u>	<u>%Cu</u>
1- 6	None
6-12	0.22
12-21	0.08
21-24	0.22
24-30	0.32
30-39	0.10

Hole H-7

Elt. 1109

N. 5347

E. 4398

Depth

- 1- 3 red brown silica
9 gray silica, with considerable specularite
15 red hematite silica
21 gray silica and schist
30 red hematite some silica
33 red hematite silica
38 orange red silica

Assay Data

<u>Description</u>	<u>%Cu</u>	<u>%Fe</u>
1- 3	0.75	
3- 6	1.24	
6- 9	2.62	
9-12	2.16	
12-15	3.24	
15-18	1.31	
18-21	1.51	
21-24	0.92	
24-27	2.70	
27-30	0.86	
30-33	0.32	
33-38	0.17	
Comp 24-30		32.5

Hole H-8

El. 1153

N. 4753

E. 4934

Depth

- 1-21 granite porphyry pink
24 gray siliceous epidote rock
30 brown siliceous epidote rock
36 red hematite silica
57 orange red silica
87 red hematite silica
108 orange red silica

Assay Data

<u>Description</u>	<u>%Cu</u>
1-12	Tr
12-21	None
21-24	0.22
24-33	0.08
33-42	0.08
42-51	0.22
51-60	Tr
60-69	None
69-78	None
78-87	Tr
87-96	0.05
96-108	None