DMA 393
4815

Bureau of Mines
Report of Investigations 4689

INVESTIGATION OF THE SUNRISE COPPER-GOLD MINE, GRANITE COUNTY, MONT.

BY JOHN W. COLE

FROM
MIKE MANSFIELD
MEMBER OF CONGRESS
1ST DISTRICT MONTANA

11202

United States Department of the Interior — May 1950

INVESTIGATION OF THE SUNRISE COPPER-GOLD MINE, GRANITE COUNTY, MONT.

BY JOHN W. COLE

* * * * * * * * * **Report of Investigations 4689**

UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary
BUREAU OF MINES
James Boyd, Director

Work on manuscript completed June 1949. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 4689."

May 1950

INVESTIGATION OF THE SUNRISE COPPER-GOLD MINE GRANITE COUNTY, MONT.

by

John W. Cole[1]

CONTENTS

	Page
Introduction and summary	2
Acknowledgments	3
Location and accessibility	3
History and production	3
Physical features and climate	4
Labor supply and living conditions	5
Water supply and power	5
Property and ownership	5
Mine workings	5
Description of the deposits	6
General geology	6
Ore deposits	6
Queen vein	6
Maud "S" vein	6
Henderson Gulch tungsten-bearing granodiorite	7
Golden Eagle group	7
The ore	7
Queen vein	7
Maud "S" vein	7
Golden Eagle veins	7
Work by the Bureau of Mines	7

ILLUSTRATIONS

Fig.		Follows page
1.	Index and geology map	2
2.	Topography, geology, property, and drill holes, Sunrise mine	4
3.	Underground workings, Sunrise mine, holes 2, 4, 5, and 7	4
4.	Plan of holes 1 and 3, Maud "S" claim	6
5.	Plan of hole 8, Golden Eagle claim	6

1/ Mining engineer, Bureau of Mines, Albany Branch, Albany, Oreg.

Report of Investigations 4689

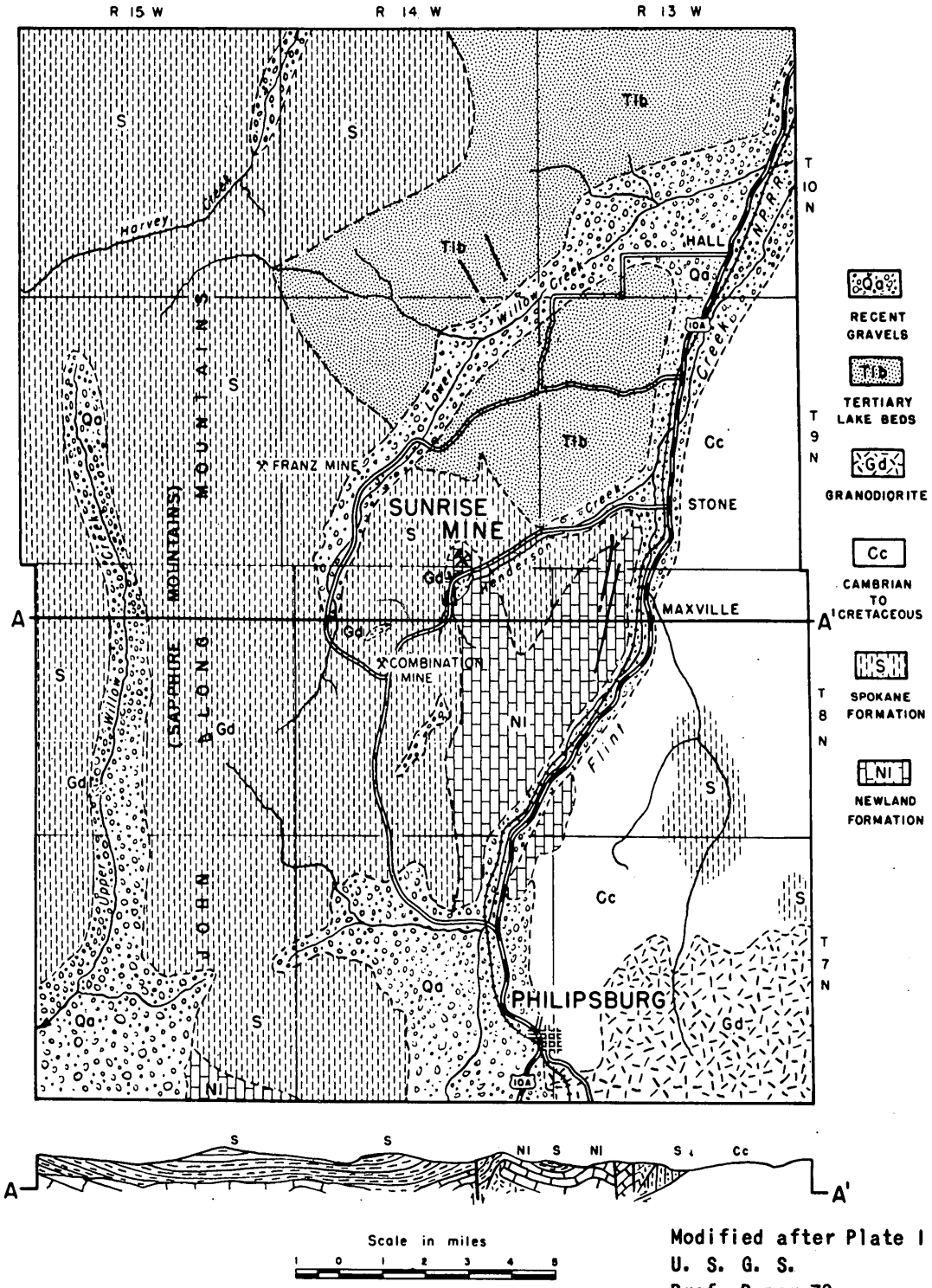
INTRODUCTION AND SUMMARY

The Bureau of Mines conducted a trenching and sampling project during 1947 on the tungsten-rich granodiorite that outcrops in Henderson Gulch, Montana. During the course of this investigation, interest was attracted to the Sunrise copper-gold mine in metamorphosed limestone in the north slope of the gulch. The mine was examined by S. H. Lorain, Chief, Mining Division, Albany Branch, in May 1948. A trenching and drilling program was recommended to develop a parallel vein indicated by outcrops to lie below the principal productive Queen vein. In the meantime, the Queen Mining Syndicate initiated a trenching program that exposed high-grade lead-copper-silver-gold ore in a nearly vertical vein that strikes N. 60° E. to east. A core-drilling program to develop this vein was initiated in September 1948. This report presents the factual data obtained from the trenching and drilling operations.

The Sunrise mine was discovered about 1890. Production has been estimated to be $120,000 in gold from 40,000 tons of ore mined during the period 1892-1903. The tailing from this operation was treated by cyanidation in 1912, with a reported recovery of $3.50 to $4.00 a ton from 15,000 tons of material. Subsequent production of sulfide ore was 7,396 tons treated by smelting, with recovery of 1,569.42 ounces of gold, 10,003 ounces of silver, 352,899 pounds of copper, and 354 pounds of lead.

The mine is situated in Henderson Gulch, 16 miles by road southwest of Drummond, Mont. The altitude at the mine is 6,000 feet. The climate is typical of western Montana. Water is available from Henderson Creek. A transmission line supplied by Montana Power Co. ends within 1 mile of the mine. Underground workings consist of more than 7,000 feet of drifts and raises driven on the vein. The vein has been developed and partly mined throughout 800 feet along the strike and 1,500 feet down the dip. The ore occurs in a gently dipping tabular vein enclosed in metamorphosed limestone of the Newlands formation. The Newlands formation is below the Spokane formation that comprises the youngest rocks in the Belt series of pre-Cambrian sediments. The unoxidized ore is composed of quartz and pyrite with chalcopyrite, bornite, and minor amounts of galena. The oxidized ore contains quartz, limonite, and traces of oxidized copper minerals.

The objective of the Bureau of Mines program was to develop veins other than the Queen vein, because ore in the Queen vein is reasonably assured. Six holes were drilled from surface stations and two from the main adit in the Queen vein. Holes ranged from 100 to 307 feet in depth. Total drilled was 1,727.2 feet.



Modified after Plate I
U. S. G. S.
Prof. Paper 78

Adapted from Geologic Map of Montana and Plate I
Professional Paper 78, U. S. Geological Survey

Figure 1. - Index and geologic map, Black Pint district, Granite County, Mont.

ACKNOWLEDGMENTS

The field work was supervised by S. H. Lorain, Chief, Mining Division, Albany Branch. Analyses were performed at Albany, Oreg., under the general supervision of Stephen M. Shelton, Chief, Metallurgical Division, Albany Branch.

Officials of the Queen Syndicate kindly permitted the Bureau of Mines to use company assay data and engineering reports in their possession. Prosecution of the work also was facilitated by free use of trenching and mining equipment made available by the mine owners. W. A. Noon, Manager, H & H Mining Co., deserves special thanks for his assistance in completing the project work.

LOCATION AND ACCESSIBILITY

The Sunrise mine is 20 miles by road southwest of Drummond, Mont. (fig. 1), the nearest station on the main lines of the Northern Pacific and Chicago, Milwaukee, & St. Paul Railroads and 16 miles by road northwest of Philipsburg, the county seat of Granite County. The Philipsburg Branch of the Northern Pacific Railroad, 26 miles long, and U. S. Highway 10S connect Philipsburg and Drummond. The railroad and highway approach within 5 miles of the mine at Stone Station, a country siding 15 miles south of Drummond. The mine is reached from Stone Station by 5 miles of county and Forest Service road through Henderson Gulch.

HISTORY AND PRODUCTION

The Sunrise mine was discovered about 1890. According to local reports, it was operated intermittently from 1892 to 1903. During this period, gold ore was mined from the residually enriched oxidized part of the vein. The gold was saved by gravity concentration and amalgamation in a 20-stamp mill on Henderson Creek. Production is reported unofficially to have been $120,000 in gold from 40,000 tons of ore treated.

A cyanide mill to treat the tailing was erected in 1912. According to reports, 15,000 tons of tailing were treated; $3.50 to $4.00 a ton in gold was recovered.

From 1913 to the present the mine was operated intermittently by lessees and by the present owners. Production during this period is tabulated as follows:

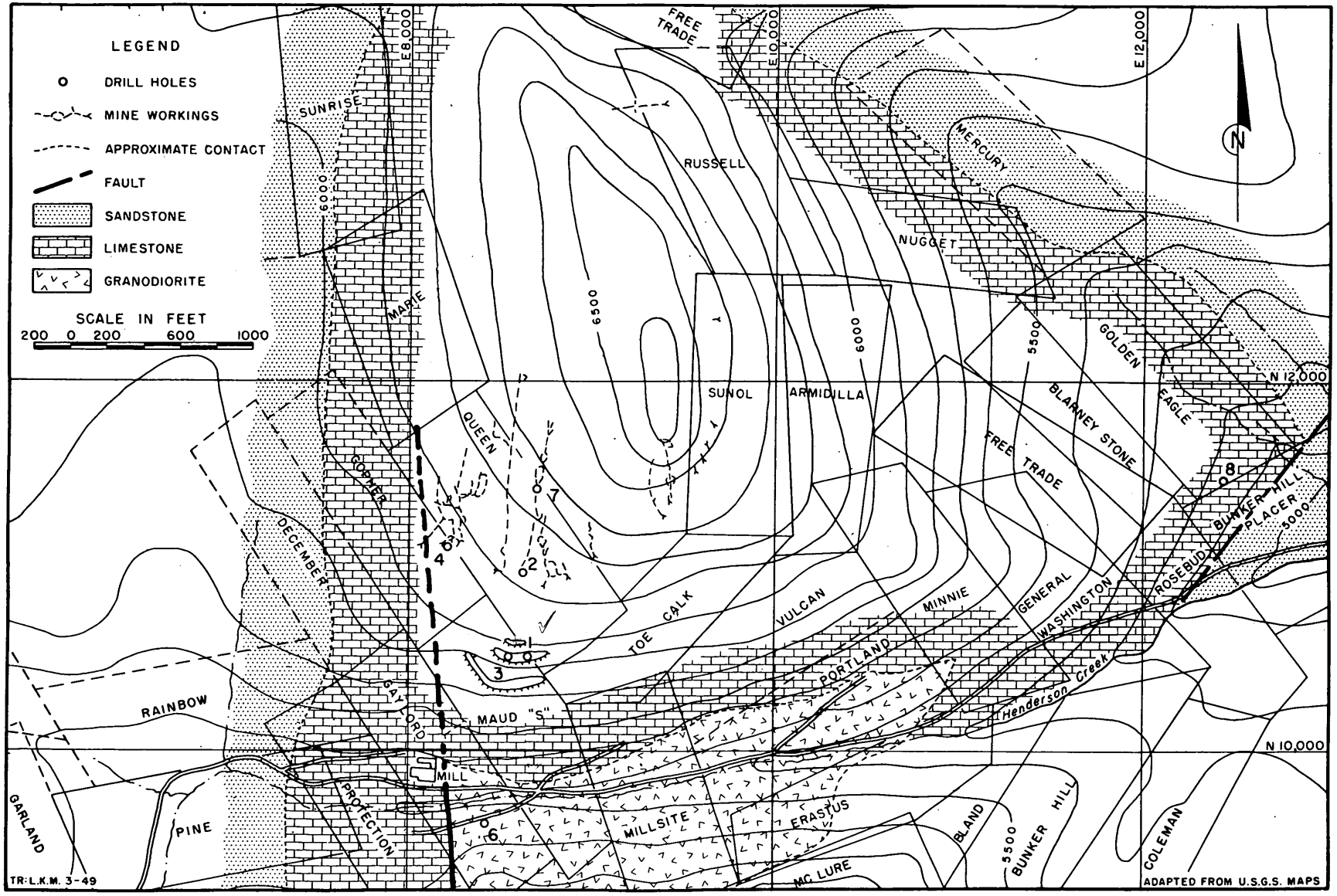


Figure 2. - Topography, geology, property, and drill holes, Sunrise mine, Granite County, Mont.

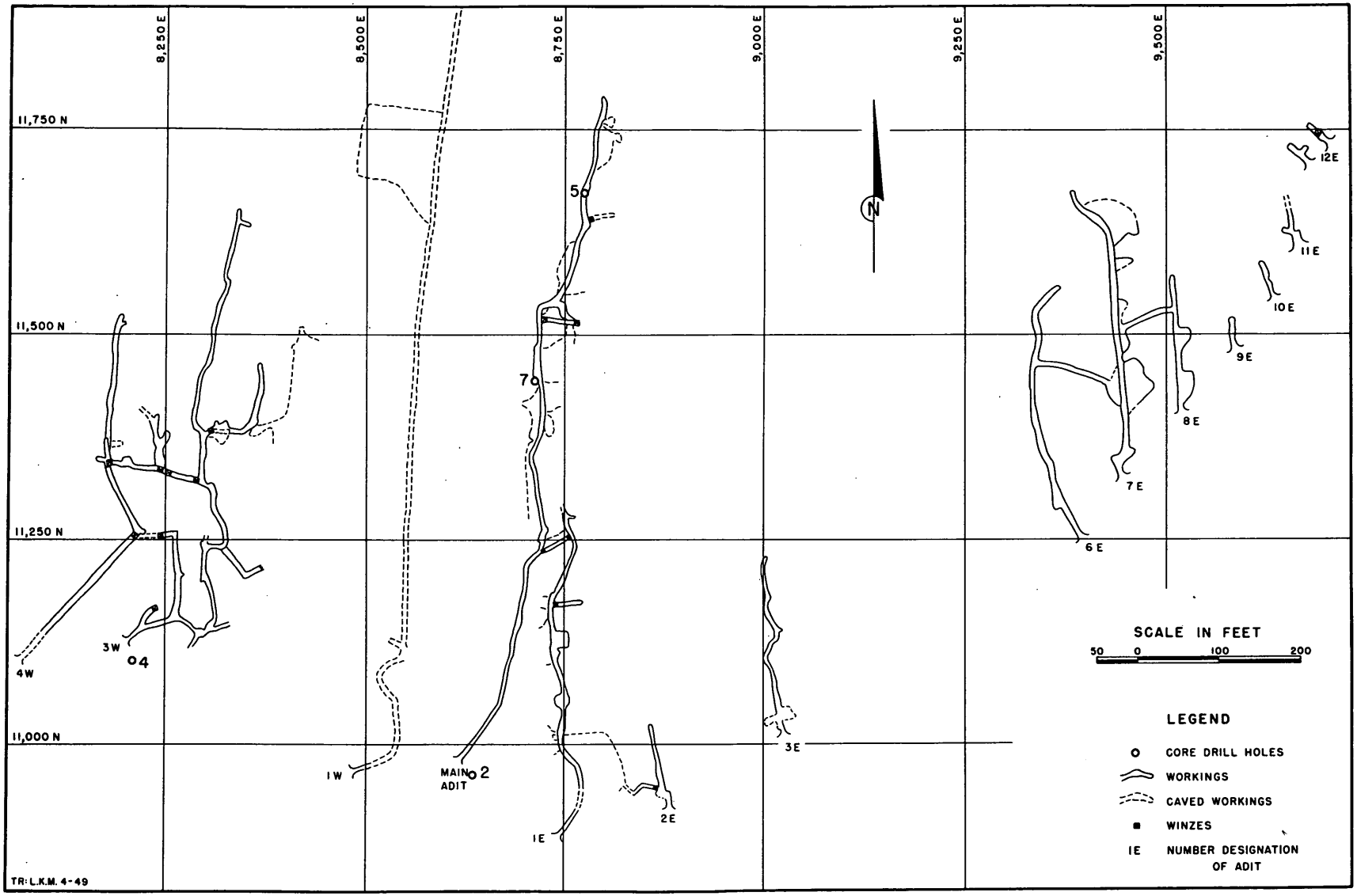


Figure 3. - Underground workings, holes 2, 4, 5, and 7. Sunrise mine, Granite County, Mont.

LABOR SUPPLY AND LIVING CONDITIONS

A few skilled miners are available in Philipsburg. Labor for more than a small development operation, however, probably would have to be imported or trained locally. The present wage scale in mines at Philipsburg is about $11.00 for an 8-hour day for miners; common labor receives about $1.00 less per day.

There are no living accomodations at the mine. The H & H Mining Co., which operates a placer dredge in Henderson Gulch, prefers to furnish transportation for workers from Drummond rather than build living quarters at the mine.

WATER SUPPLY AND POWER

The flow of water in Henderson Creek is sufficient for small mining operations. Excellent reservoir sites, however, exist in the basin above Henderson Gulch if water storage should prove to be desirable. Water for domestic purposes is available from perennial springs nearby.

Power is supplied to the H & H Mining Co. by the Montana Power Co. The end of the transmission line is within 1 mile of the Sunrise mine.

PROPERTY AND OWNERSHIP

The core drilling accomplished was done on two groups of mining claims.

One group, comprising the Gaylord, Maud "S", Queen, Toe Calk, and Sunol, patented claims, and the Gopher, unpatented, is owned by Lowndes Maury, Butte, Mont., and leased to the Princeton Mining Co., L. L. McLean, secretary, Room 8, Duncan Block, Missoula, Mont.

The other group includes the Golden Eagle and Blarney Stone, patented claims, owned jointly by Lowndes Maury and Charles A. Murray, Butte, Mont. These two claims are under lease to W. A. Noon, Drummond, Mont.

MINE WORKINGS

The underground workings on the Queen vein consist of more than 7,000 feet of drifts, raises, and winzes driven on the vein through more than 14 adit portals (fig. 3). The altitude of the workings ranges from 5,900 feet to 6,400 feet. The over-all lateral dimensions of the part of the vein that was developed and partly mined from these workings are 1,500 by 800 feet. The main adit and No. 3 west adit are accessible. The workings shown in figure 3 are not complete; much of the stoped area has not been surveyed.

The Russell workings consist of a crosscut and winze on the Queen vein or a vein that is similar to the Queen in attitude and mineralization. These workings are situated approximately 1,000 feet north of the Queen workings (fig. 2). The length of crosscut and winze is about 170 feet.

Numerous other prospect drifts and winzes on the property are caved and inaccessible.

DESCRIPTION OF THE DEPOSITS

General Geology

The following description of the regional geology is abstracted from the work and Emmons and Calkins.[2]

Flint Creek valley is the surface expression of the Philipsburg overthrust fault, which is thought to be the southward extension of the Lewis overthrust, which outcrops near Glacier Park. As a result of this movement, Algonkian sedimentary rocks have come to rest on Cretaceous sedimentary rocks. The rocks that crop out west of Flint Creek valley in general are Algonkian; the ages of the rocks east of the valley range from Algonkian to Cretaceous. The Henderson and Sunrise Mountains are underlain by a granitic intrusive that has metamorphosed the impure limestones and calcareous shales of the Newlands formation to form erosion-resistant hornfels. The ore deposits in the Sunrise mine are enclosed entirely by the Newlands formation. The overlying Spokane formation surrounds Sunrise Mountain completely except where bordered by Henderson Gulch (fig. 2).

Ore Deposits

Queen Vein

All production has come from the Queen vein. It is a tabular deposit that strikes N. 10° E. and dips 15° to 37° NW. The strike and dip of the vein are nearly the same as the strike and dip of the Newland formation. The thickness of the vein ranges from 1 to 10 feet; it averages about 3-1/2 feet. The vein has been developed by drifts for 800 feet along the strike and 1,500 feet down the dip. Undeveloped outcrops indicate that the total strike length of the vein may be as long as 2,400 feet. The vein, as exposed in the main adit, is oxidized for 600 feet from the portal; the next 100 feet contains partly oxidized sulfide minerals; the remaining 300 feet is sulfide ore. Apparently the vein minerals replace a bed in the Newlands limestone. Normal faults offset the vein frequently. The principal systems of faulting strike north to N. 10° E. and N. 60° E. The faults dip steeply in each direction. Gouge is developed in places on the hanging wall of the vein.

Maud "S" Vein

A wide iron- and manganese-stained shear zone that enclosed a lens of high-grade copper-lead-gold-silver ore is exposed by trenches and a 50-foot drift (fig. 4). As exposed in the drift, this shear zone strikes N. 60° E. and dips 75° SE. The strike is parallel to one of the main systems of faulting exposed in the workings on the Queen vein. The high-grade lens exposed in trench 1 (fig. 4) strikes east-west across the strike of the shear zone. This lens appears to terminate at the west end against the footwall of the shear zone.

2/ Emmons, W. H., and Calkins, F. E., Geology and Ore Deposits of the Philipsburg Quadrangle, Mont.: U. S. Geol. Survey Prof. Paper 78, 1913, 271 pp.

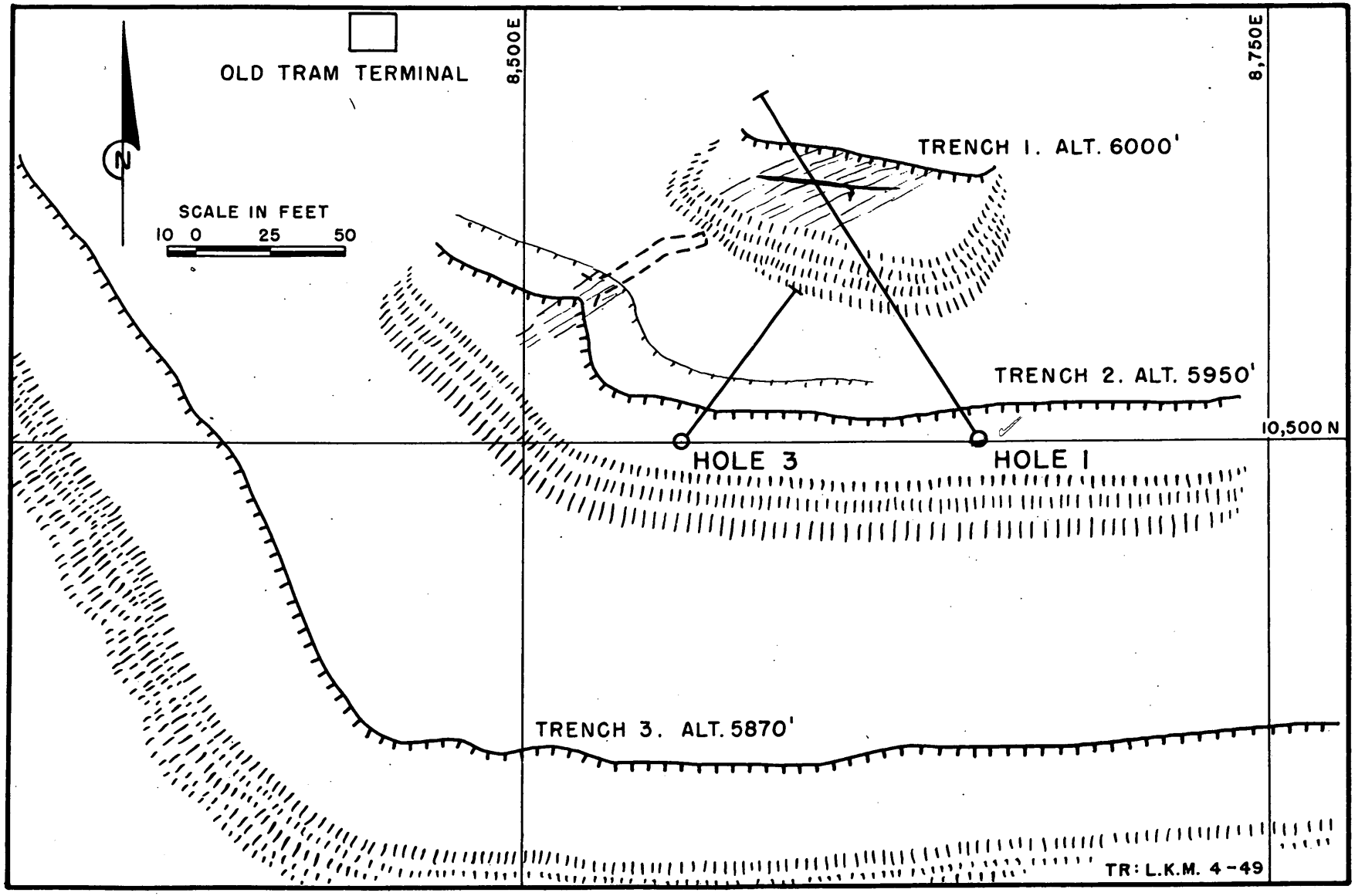


Figure 4. - Plan of holes 1 and 3, Maud "S" claim, Sunrise mine, Granite County, Mont.

Henderson Gulch Tungsten-bearing Granodiorite

This triangular mass is 1,000 feet long and 600 feet across the base at the west end (fig. 2). It is a rather soft and easily decomposed rock, sparsely impregnated with scheelite. Hole 6 was drilled to determine the tungsten content of the granodiorite below surface samples taken by the Bureau of Mines in 1947.

Golden Eagle Group

On the east slope of Sunrise Mountain, calcareous shales near the top of the Newlands formation strike north-south and dip 45° to 50° E. At least three strong bedding plane veins are indicated by outcrops in this area (fig. 5). The outcrops are highly oxidized. They contain minor quantities of copper, lead, gold, and silver in addition to quartz and iron. Hole 8 was drilled to intersect three of these veins below the zone of oxidation.

The Ore

Queen Vein

Dominant minerals in the ore are quartz and pyrite. Copper occurs in chalcopyrite and bornite. The oxidized ore near the outcrop is composed chiefly of quartz and limonite, which contains some copper oxide and carbonate.

Maud "S" Vein

The outcrop of the lens of ore exposed in this vein is composed of quartz stained with salts of iron, manganese, and copper associated with some lead carbonate pseudomorphic after galena.

Golden Eagle Veins

The Golden Eagle veins consist of quartz containing fine-grained iron pyrite. Breccia fragments of limestone and shale are enclosed in parts of the veins.

WORK BY THE BUREAU OF MINES

Prospecting and development work by past operators have proved that the Queen vein is persistent and consistent in mineralization. It may be inferred, at least, to be continuous between exposures in the main adit and the Russell workings. Efforts therefore were directed toward development of ore in deposits other than the Queen vein.

Six core drill holes were drilled from the surface, and two core drill holes were drilled from the main adit on the Queen vein. The holes ranged from 100 to 307 feet in depth. Total drilled was 1,723.2 feet. Of this, 53.5 feet was drilled by the Queen Syndicate in hole 8.

The drill hole locations are shown on figures 2, 3, 4, and 5. Logs of the drill holes are tabulated in table 2, following:

TABLE 2. - Logs of drill holes

Hole 1

Coordinates: N. 10,503 E. 8,654
Depth: 245.9 feet
Bearing: N. 32° W.

Inclination: -56°
Altitude of collar: 5,940 feet

Interval, feet	Length, feet	Core recovery percent	Formation		Analyses				
					Percent			Oz./ton	
					Cu	Pb	WO_3	Au	Ag
0- 9.0	9.0	-	Overburden						
9.0- 49.6	40.6	49	Hornfels						
49.6- 50.7	1.1	100	Quartz vein	c	*0.05	*0.05		0.01	1.43
39.0- 48.3	9.3	42	Hornfels	s	.06	* .05		tr.	tr.
48.3- 58.0	9.7	63	do.	s	.06	* .05		.01	tr.
58.0- 63.0	5.0	32	do.						
63.0- 64.4	1.4	0	Fault gouge						
64.4-160.1	95.7	79	Hornfels						
160.1-165.5	5.4	63	do.	s	* .05	* .05		tr.	.24
165.5-168.1	2.6	85	Hornfels and quartz	s	* .05	* .05		tr.	.36
168.1-204.3	36.2	91	Hornfels						
204.3-209.3	5.0	100	do.	s	* .05	* .05		tr.	.16
209.3-216.6	7.3	98	do.	s	* .05	* .05	*0.01	tr.	.10
216.6-245.9	29.3	92	do.						

Hole 2

Coordinates: N. 10,960 E. 8,630
Depth: 200 feet
Bearing: -

Inclination: Vertical
Altitude of collar: 6,115 feet

0- 6.0	6.0	-	Overburden						
6.0- 10.8	4.8	42	Hornfels	s	0.3	*0.05		0.01	tr.
10.8- 16.0	5.2	56	do.						
16.0- 19.6	3.6	42	do.	s	.07	* .05		tr.	tr.
19.6-128.7	109.1	94	do.						
128.7-136.9	8.2	46	Hornfels, oxidized vein 129.0-132.5 did not core	c	* .05	* .05		tr.	tr.
128.7-136.9	8.2	46		s	.06	* .05	*0.01	.01	0.15
136.9-139.0	2.1		Hornfels	c	* .05	* .05		.01	tr.
139.0-139.5	.5		Oxidized vein	c	* .05	* .05		.02	tr.
139.5-143.0	3.5	98	Hornfels		* .05	* .05		tr.	tr.
136.9-143.0	6.1	98		s	* .05	* .05		.01	tr.
143.0-200.0	57.0	92	do.						

TABLE 2. - Logs of drill holes (Cont'd.)

Hole 3

Coordinates: N. 10,503 E. 8,554
Depth: 100 feet
Bearing: N. 30° E.

Inclination: -50°
Altitude of collar: 5,954 feet

Interval, feet	Length, feet	Core recovery percent	Formation		Analyses				
					Percent			Oz./ton	
					Cu	Pb	WO_3	Au	Ag
0- 6.0	6.0	0	Overburden						
6.0- 38.5	32.5	51	Hornfels						
38.5- 44.5	6.0	33	do.	s	*0.05	*0.05		tr.	0.14
44.5- 48.5	4.0	0	Oxidized vein	s	* .05	* .05		tr.	tr.
48.5- 49.5	1.0	100	Quartz vein	c	* .05	* .05		tr.	.88
49.5- 54.5	5.0	38	do.	c	* .05	* .05		0.01	tr.
54.5- 64.5	10.1	21	Hornfels	c	* .05	* .05		tr.	tr.
				s	* .05	* .05		.01	.27
64.5- 74.2	9.7	27	do.	s	* .05	* .05		tr.	.30
74.2- 84.2	10.0	8	do.	s	* .05	* .05		tr.	.32
84.2- 88.7	4.5	51	do.	s	* .05	* .05		tr.	.58
88.7- 94.0	5.3	20	do.	s	* .05	* .05		.01	1.21
94.0-100.0	6.0	18	do.	s	* .05	* .05		.01	.55

Hole 4

Coordinates: 11,100 E. 8,210
Depth: 240 feet
Bearing: -

Inclination: Vertical
Altitude of collar: 5,980 feet

.0- 4.0	4.0	0	Overburden						
4.0- 15.5	11.5		Hornfels						
15.5- 25.5	10.0	0	Oxidized vein	s	0.1	*0.05	nil	0.05	0.11
25.5- 32.0	6.5		Hornfels						
32.0- 38.2	6.2		do.	s	.07	* .05	0.02	tr.	.10
38.2- 81.5	43.3		do.						
81.5- 90.7	9.2		do.	s	* .05	* .05	.01	tr.	tr.
90.7-183.6	92.9		do.						
183.6-193.3	9.7		do.	s	* .05	* .05	nil	tr.	.12
193.3-225.3	32.0		do.						
225.3-228.6	3.3		do.	s	* .05	* .05	.01	tr.	.26
228.6-232.3	3.6		do.						
232.2-240.0	7.8		do.	s	* .05	* .05	.01	tr.	.24

TABLE 2. - Logs of drill holes (Cont'd.)

Hole 5
(Drilled underground from Main Queen Adit)

Coordinates: N. 116,670 E. 8,753
Depth: 170 feet
Bearing: -

Inclination: Vertical
Altitude of collar: 6,130 feet

Interval, feet	Length, feet	Core recovery percent	Formation		Analyses: Percent Cu	Pb	WO_3	Oz./ton Au	Ag
.0-123.0	123.0	99	Hornfels						
123.0-130.0	7.0	100	do.	s	*0.05		0.01	0.01	0.10
130.0-137.0	7.0	100	do.						
137.0-138.2	1.2	100	do.	c	.1		.01	tr.	tr.
138.2-140.6	2.4	67	do.	c	.25		* .01	tr.	.10
				s	.09		* .01	tr.	.26
140.6-145.0	4.4	59	do.	c	.06		* .01	tr.	.10
145.0-146.6	1.6	59	do.	c	.05		* .01	tr.	.10
140.6-146.6	6.0	59	do.	s	.06		* .01	.01	.20
146.6-148.6	2.0	80	do.	c	* .05		* .01	tr.	.14
148.6-170.0	21.4	99	do.						

Hole 6

Coordinates: N. 9.600 E. 8,430
Depth: 300.3 feet
Bearing: S. 81° W.

Inclination: -43°
Altitude of collar: 5,550 feet

Interval, feet	Length, feet	Core recovery, percent	Formation		Analyses: Percent WO_3	Mo	Oz./ton Au	Ag
.0- 18.0	18.0		Overburden					
10.0- 15.0	5.0	30		c	0.01	*0.05	tr.	tr.
15.0- 18.0	3.0	100		c	* .01	* .05	tr.	tr.
18.0- 31.0	13.0	18	Granite	c	* .01	* .05	tr.	tr.
31.0- 36.0	5.0	80	do.	c	* .01	* .05	tr.	tr.
36.0- 41.0	5.0	90	do.	c	* .01	* .05	tr.	tr.
41.0- 45.1	4.1	100	do.	c	* .01	* .05	tr.	tr.
45.1- 49.0	3.9	54	do.	c	* .01	* .05	tr.	tr.
49.0- 54.9	5.9	75	do.	c	* .01	* .05	tr.	tr.
54.9- 56.0	1.1	100	do.	c	* .01	* .05	tr.	tr.
56.0- 61.0	5.0	100	do.	c	.02	* .05	0.01	tr.
61.0- 66.0	5.0	100	do.	c	.03	* .05	tr.	tr.
66.0- 67.8	1.8	100	do.	c	.02	* .05	tr.	tr.
67.8- 71.8	4.0	100	do.	c	.01	* .05	.01	tr.
71.8- 75.5	3.7	100	do.	c	.02	* .05	.01	tr.
75.5- 80.5	5.0	100	do.	c	.02	* .05	.01	tr.
80.5- 85.5	5.0	80	do.	c	.02	* .05	.01	tr.
85.5- 90.5	5.0	100	do.	c	.01	* .05	tr.	tr.
90.5- 95.5	5.0	100	do.	c	.02	* .05	tr.	tr.
90.5-100.5	5.0	100	do.	c	.01	* .05	.01	tr.

TABLE 2. - Logs of drill holes (Cont'd.)

Hole 6 (Cont'd.)

Interval, feet	Length, feet	Core recovery, percent	Formation		Analyses			
					Percent		Oz./ton	
					WO_3	Mo	Au	Ag
100.5-105.5	5.0	100	Granite	c	.03	* .05	.01	tr.
105.5-110.5	5.0	60	do.	c	.03	* .05	.01	tr.
110.5-115.5	5.0	100	do.	c	0.01	0.06	tr.	tr.
115.5-120.5	5.0	100	do.	c	.02	* .05	0.01	tr.
120.5-125.5	5.0	100	do.	c	.02	* .05	tr.	tr.
125.5-130.5	5.0	100	do.	c	.01	* .05	tr.	tr.
130.5-135.5	5.0	90	do.	c	.01	* .05	tr.	tr.
135.5-140.5	5.0	100	do.	c	.05	* .05	tr.	tr.
140.5-144.9	4.4	85	do.	c	.02	* .05	.01	0.15
144.9-148.8	3.9	26	do.	c	.02	* .05	.02	tr.
148.8-153.8	5.0	100	do.	c	* .01	* .05	.02	tr.
153.8-158.8	5.0	100	do.	c	.02	* .05	tr.	tr.
158.8-163.8	5.0	70	do.	c	.01	* .05	tr.	tr.
163.8-168.8	5.0	100	do.	c	.01	* .05	tr.	tr.
168.8-169.6	.8	100	do.	c	.03	* .05	.01	tr.
169.6-175.5	5.9	71	do.	c	.01	* .05	tr.	tr.
175.5-180.5	5.0	100	do.	c	* .01	* .05	.01	tr.
180.5-185.5	5.0	88	do.	c	.01	* .05	.01	tr.
185.5-186.0	.5	100	do.	c	* .01	* .05	.01	tr.
186.0-190.8	4.8	100	do.	c	* .01	* .05	.01	tr.
190.8-194.0	3.2	100	do.	c	* .01	* .05	tr.	tr.
194.0-199.0	5.0	90	do.	c	.01	* .05	tr.	tr.
199.0-204.0	5.0	30	do.	c	.01	* .05	tr.	tr.
204.0-209.0	5.0	100	do.	c	.02	* .05	.01	tr.
209.0-210.9	1.9	100	do.	c	.01	* .05	.01	tr.
210.9-215.7	4.8	100	do.	c	.02	* .05	tr.	tr.
215.7-220.0	4.3	100	do.	c	.02	* .05	tr.	tr.
220.0-221.5	1.5	70	do.	c	.01	* .05	tr.	tr.
221.5-226.0	4.5	100	do.	c	.02	* .05	.01	tr.
226.0-231.0	5.0	100	do.	c	* .01	* .05	.01	tr.
231.0-235.8	4.8	42	do.	c	.03	* .05	.01	tr.
235.8-239.1	3.3	100	do.	c	.02	* .05	tr.	tr.
239.1-243.7	4.6	100	do.	c	.01	* .05	tr.	tr.
243.7-248.7	5.0	76	do.	c	.02	* .05	tr.	tr.
248.7-253.7	5.0	76	do.	c	.02	* .05	tr.	tr.
253.7-258.7	5.0	42	do.	c	.03	* .05	tr.	tr.
258.7-261.7	3.0	87	do.	c	* .01	* .05	.01	tr.
261.7-266.8	5.1	100	do.	c	.03	* .05	tr.	tr.
266.8-271.5	4.7	100	do.	c	.01	* .05	tr.	tr.
271.5-276.5	5.0	100	do.	c	* .01	* .05	tr.	tr.
276.5-280.8	4.3	56	do.	c	* .01	* .05	tr.	tr.
280.8-286.0	5.2	19	do.	c	.04	* .05	tr.	tr.
286.0-291.0	5.0	92	do.	c	* .01	* .05	tr.	tr.
291.0-295.3	2.3	100	do.	c	.02	* .05	.01	tr.
295.3-300.3	5.0	100	do.	c	.04	* .05	tr.	tr.

TABLE 2. - Logs of drill holes (Cont'd.)

Hole 7
(Drilled underground from Main Queen Adit)

Coordinates: N. 11,400 E. 8,700
Depth: 160 feet
Bearing: -

Inclination: Vertical
Altitude of collar: 6,122 feet

Interval, feet	Length, feet	Core recovery, percent	Formation		Analyses: Percent Cu	Pb	WO_3	Oz./ton Au	Ag
.0- 6.0	6.0	7	Hornfels	s	0.4		0.01	tr.	0.34
6.0- 11.0	5.0	10	do.	c	.9		.01	tr.	.18
				s	.4		.01	0.01	.40
11.0- 12.0	1.0	97	do.	c	.7		* .01	tr.	tr.
11.0- 13.8	2.8	97	do.	s	.6		.13	.01	.63
13.8- 67.0	53.2	91	do.						
67.0- 77.0	10.0	100	do.	s	.5		.01	tr.	.58
77.0-120.7	43.7	100							
120.7-129.2	9.2	100	do.	s	.2		.01	tr.	tr.
129.2-138.3	9.1	100	do.						
138.3-141.3	3.0	80	do.	s	.6		.01	tr.	tr.
141.3-156.0	14.7	100	do.						
156.0-156.8	.8	100	do.	c	1.4		.01	.12	tr.
151.0-160.0	9.0	100	do.	s	* .05		nil	.01	.30

Hole 8

Coordinates: N. 11,470 E. 12,440
Depth: 307 feet
Bearing: W.

Inclination: -34°
Altitude of collar: 5,165 feet

.0- 8.0	8.0		Overburden						
8.0- 99.7	91.7	20	Shale, calcareous						
99.7-103.9	4.2	8	do.	s				0.02	0.14
103.9-109.0	5.1	11	do.	s				tr.	tr.
109.0-114.0	5.0	14	do.	s				.01	.10
114.0-119.0	5.0	8	do.	s				.01	.11
119.0-123.0	5.0	8	do.	s				.01	tr.
123.0-132.5	9.5	20	do.	s				.01	tr.
132.5-139.4	6.9	14	do.	s				.01	.33
139.4-148.6	9.2	3	do.	s				.01	1.20
148.6-158.6	10.0	0	do.	s				.01	.29
158.6-164.0	5.4	23	do.	s			*0.01	.01	tr.
164.0-174.0	10.0	4	do.	s				.01	tr.
174.0-180.2	6.2	13	do.	s				tr.	.10
180.2-186.5	6.3	10	do.	s				.01	tr.
186.5-192.0	5.5	27	do.	s				tr.	.12
192.0-197.9	5.9	10	do.	s				tr.	tr.
197.9-203.0	5.1	18	do.	s				tr.	tr.
203.0-208.5	5.5	30	do.	s				tr.	0.18
208.5-213.5	5.0	6	do.	s				tr.	.10

TABLE 2. - Logs of drill holes (Cont'd.)

Hole 8 (Cont'd.)

Interval, feet	Length, feet	Core recovery, percent	Formation		Analyses				
					Percent			Oz./ton	
					Cu	Pb	WO_3	Au	Ag
213.5-218.5	5.0	6	Shale, calcareous	s				tr.	tr.
218.5-223.5	5.0	7	do.	s				tr.	tr.
223.5-225.5	2.0	0	do.	s				0.01	tr.
225.5-230.5	5.0	7	do.	s				tr.	.16
230.5-235.5	5.0	0	do.	s				tr.	.14
235.5-240.0	4.5	0	do.	s				tr.	tr.
240.0-244.0	4.0	0	do.	s				tr.	tr.
244.0-253.5	9.5	7	do.	s				tr.	tr.
253.5-259.0	5.5	27	do.	s				.01	tr.
259.0-269.0	10.0	26	do.	s				tr.	tr.
269.0-274.5	5.5	20	Quartz vein	c	0.1	*0.05	0.02	.05	.13
				s	* .05	.13	* .01	tr.	tr.
274.5-279.5	5.0	17	Shale, calcareous	s				.01	tr.
279.5-284.5	5.0	17	do.	s				.01	tr.
284.5-289.5	5.0	16	do.	s				.02	tr.
289.5-294.5	5.0	40	do.	s				.02	tr.
294.5-299.5	5.0	16	do.	s				.01	.15
299.5-307.0	7.5	-	do.	s				.01	tr.

* Less than.
tr. Trace.
c Core sample.
s Sludge sample.