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DMEA 2082, Idm-E248
Mt. Wheeler Mines
White Pine County, Nevada

Summary

The Mt. Wheeler mine was explored under a Defense Minerals Exploration Administration contract between January 29, 1952 and December, 1953.

The purpose of the work was to explore a favorable layer of the Wheeler limestone for the eastward extension of tungsten showings at the Pole adit, and to test adjacent areas within the limestone for inferred ore bodies.

The work was conducted in stages, each stage contingent upon revealing ore in commercial quantities in the preceding stage, and at intervals as the work progressed laterally. The work was accomplished by extending the Pole adit easterly, under and as close to it as practicable to the favorable limestone. At intervals, laterals and raises were driven into the ore bed and flat crosscut-raises driven up dip of the bed to test for parallel ore bodies. Drifts were driven short distances along most of the ore bodies cut, and raises were driven above the two of the drifts to test upper layers of the limestone.

The applicant has applied for $113,000 additional funds to explore the property at two locations:

(1) Extend the Pole adit 1200 feet eastward to the Sheffield fissure to explore the eastward extension of known ore bodies.

(2) Drift on surface tungsten showings in the North zone 500 feet eastward and allow with 200 feet of crosscuts and raises to explore for new ore bodies.

Conclusions and Recommendations

The project was successful in revealing ore bodies of commercial size and grade. Net change in reserves is as follows:

Class	Tons at start of project	- $\%WO_3$	Tons at end of project	- $\%WO_3$	Net change Tons	- Units
Measured	80	1.0	180	0.8	+100	+64
Indicated	175	1.0	5,290	0.8	+5,115	+4,057
Inferred	15,400	1.0	11,300	0.8	-4,100	-6,360
Total	15,655		16,770		+1,115	-2,239

The increase in measured and indicated reserves constitutes a discovery and it is recommended that it be certified as such.

The ore bodies discovered are marginal in grade; although they can be mined at a profit it is unlikely that they will yield sufficient ore to repay the Government's share of the cost of exploration.

Additional ore must be discovered and known ore bodies further developed, if a sustained operation is to result from this project. Although it would appear to be in the national interest to assist the operator in making a profitable operation with the hope that he will continue to operate and ultimately repay the loan, it is not considered to be within the scope of the DMEA to assist in development. The examining engineer and geologist consider the proposed additional work along the Pole adit ore zone to be development work rather than exploration, and recommend, therefore, that additional development as proposed by the operator be done at his own expense.

They consider the work proposed at the North zone to be a separate exploratory program on a separate deposit and recommend that the Government enter into a new contract to do the work proposed by the operator if it is in the national interest to explore for deposits of this size and grade. They also recommend that Government participation be on a unit basis at $40 per foot without extra allowance for equipment.

Geology and Ore Deposits

The ore bodies revealed by the DMEA work are scheelite-bearing quartz veins and nearly horizontal pipe-like replacement bodies in limestone. The veins range from a fraction of an inch to about 6 inches in width and occupy steep east striking fractures. The replacement bodies consist of scheelite-bearing ankerite (?), calcite, siderite, and iron oxide adjacent to the scheelite-bearing quartz veins; they range in width and height from a few inches to about 15 feet within the favorable part of the Wheeler limestone, and they pinch and swell along the strike.

Steep north-striking faults and fractures cut the ore bodies; the east side is commonly downthrown and the throw may be as much as 25 feet. One of the most prominent faults has been named the Sheffield fissure; displacement along it is inferred to be several hundred feet. The age of the north-striking fractures is not known, but most of them are thought to be post-mineral, although a few contain scheelite and are pre-mineral. In some places--especially laterals A and

B--replacement ore bodies appear to be localized at the intersections of these fractures with east-striking quartz stringers; In other places the north-striking fractures appear to have little or no relation to the ore bodies. The ore mineral is principally scheelite which is commonly in coarse crystals in the quartz veins and in the ankerite replacement bodies where it is commonly concentrated in ~~bands~~ layers parallel to the bedding planes.

The best ore occurs in the bottom part of the Wheeler limestone bed from 3' feet to 10' feet above the underlying shale. A second layer of ore near the top of the Wheeler bed--12-18 feet above the underlying shale--is exposed in raises above laterals 3 and 5 (fig. 3). The extent and continuity of this layer is not known but it is reasonable to expect sufficient uniformity in the limestone to] inferred that it will be favorable for ore deposition elsewhere. Lower grade ore occurs between the upper and lower layers.

Parts of the favorable lower layer of limestone ~~is~~ were dissolved by supergene waters and the cavities were filled with mud. These mud-filled cavities occur along the north-striking fractures and extend outward from them as much as 15-20 feet. Presumably the favorable upper layer is also similarly affected but this was not observed. In some localities--notably near lateral No. 4--20 percent of the area of the bed may be replaced with mud. This percentage may decrease eastward where distance to the surface is greater.

The ore bodies occur in an east-striking zone about 100 feet wide extending easterly from the portal of the Pole adit as far as explored--about 800 feet. Within this zone two pipe-like ore bodies

appear to have reasonable continuity; they are roughly parallel but may join or cross in places, or there may be three parallel ore bodies in other places (fig. 2, laterals 1 and 5).

The average grade of all rock mined from the Pole adit ore zone is about 0.5 percent WO_3 as shown by the production figures.

Production	Tons	% WO_3	Units WO_3
Milled			
Sorted ore	65	1.88	122
Mine run	361	0.78	282
Stockpiled - est.	800[1/]	0.32	256
	1226	.54	660

1/ U. S. Bureau of Mines samples and estimated tonnage.

The ore pinches and swells along the strike; most of the scheelite is contained in about two-thirds of the rock so that the average grade of the ore bodies is about 0.8 percent WO_3. This grade applies to material which contained some proportion of waste, because parts of the drifts were driven on or near the shale contact (e.g. lateral No. 5-fig. 3) and included some of the bottom 3 feet of the Wheeler limestone. By selective mining a grade of 1.0 percent WO_3 probably can be maintained.

About 900 feet north of the Pole adit the North zone (fig. 4) is explored by a short adit which reveals a quartz vein 3 feet wide. Other parallel quartz stringers occur over a width of 60 feet. Samples taken here by the Bureau of Mines average 0.88 percent WO_3 across 1.5 feet.

SAMPLING

As most of the ore in the ore bodies explored is removed by the exploratory work, and relatively little is left on the walls, channel sampling is difficult and individual samples are not reliable. This difficulty has been partly overcome by taking a large number of samples. The arithmetic average of 58 samples taken in all drifts is 1.1 percent WO_3; the weighted average is 0.80 percent WO_3; average length is 3.7 feet.

Car samples from all material mined are reported by the operator to average 0.5 percent WO_3. He has increased this figure to 0.88 percent WO_3 by multiplying 0.5 by 7/4, the ratio of total tons to ore tons mined. Although some increase is justifiable, this ratio is too high as all drifts are not on the shale contact.

ORE RESERVES

The ore reserves are summarized as follows:

Class	Tons	Percent WO_3	Units
Pole adit ore zone			
Measured	180	0.8	144
Indicated	5,290	0.8	4,232
Inferred	4,900	0.8	3,920
	10,370	0.8	8,296
North ore zone			
Measured - a few tons			
Indicated - a few tons			
Inferred	6,400	0.8	5,120
Grand Total	16,770	0.8	13,416

The measured ore reserves were calculated as follows: The total strike length of ore bodies mined during the exploratory work is 223 feet in six locations. Measured ore extends along the strike eastward and westward from each location a distance equal to 10 percent of the strike-length exposed, or a total of 45 feet. The measured reserve block is 7 feet high, 7 feet wide and 45 feet long, and contains 180 tons. A factor of 12 cubic feet per ton was used.

Indicated ore extends 1000 feet along two quartz stringers in the ore zone between the laterals and also as far east as lateral No. 6. The two stringers have a combined length of 2000 feet; ore bodies 7 feet high and 7 feet wide may occupy about two-thirds of this length.

Indicated reserves in this block are 5,470 tons less 180 tons measured ore, or 5,290 tons containing about 0.8 percent WO_3. No reserve tonnage figure is estimated for the upper ore layer, but a few tons averaging 1.0 percent WO_3 or more (samples 1035, 1036, 1042) is indicated.

Ore is inferred to extend eastward from lateral No. 6 along at least two quartz stringers in the ore zone 1200 feet long as far east as the Sheffield fissure. The two stringers have a total length of 2400 feet, one half of which may be in ore 7 feet high and 7 feet wide. Inferred reserves in this block are 4,900 tons which may average 0.8 percent WO_3. No tonnage figure is estimated for the upper ore layer, but it is reasonable to infer that some ore will be found.

In addition, ore is inferred along two quartz stringers in the North ore zone (fig. 5). The two stringers have a total length of 4400 feet, one half of which may contain ore bodies averaging 5 feet high and 7 feet wide, totaling 6,400 tons averaging 0.8 percent WO_3.

PROPOSED EXPLORATIONS

The operator has proposed to further explore the property at two locations at a total cost of $113,014.00:

(1) Pole adit

Extend the Pole adit 1200 feet eastward to cut the Sheffield fissure, drive six laterals northward at intervals of approximately 200 feet within the strongest north-trending shear zones, and drive raises where necessary to enter the ore zone.

Pole adit	1200 feet
Laterals and raises	600 feet
	1800

4. The work proposed by the operator specifies 600 feet for laterals which does not provide enough footage for more than two laterals to reach the zone of inferred ore as each lateral would have to be at least 250 feet long.

The geologic conditions existing in the explored part of the Pole adit zone are inferred to extend eastward as far as the Sheffield fissure.

not As the Sheffield fissure is one of the north-striking fractures, its effect on tungsten deposition cannot be predicted. On the surface small lead-zinc showings have been explored along the Sheffield fissure, and the St. Lawrence fissure, also one of this set, has yielded a few hundred tons of high-grade lead-silver ore. (See DMEA 89, application approved.) Near the Sheffield fissure it is expected that the Wheeler bed will be highly brecciated, but it cannot be predicted that the bed will be mineralized with tungsten. It may be mineralized with lead-zinc ore, but no reserves can be inferred.

The inferred ore reserve in the block to be explored will be 4900 tons containing 3920 units of WO_3. Gross value of the ore at $61 per unit would be $239,120--the exploration cost estimated by the operator is $85,014.00, or $21.69 per unit.

(2) North zone

Drift easterly 500 feet in the Wheeler limestone, drive three laterals north and south to crosscut the ore zone, and drive three raises to determine the vertical thickness of the ore.

Drift east	500 feet
Laterals and raises	200 feet
	700

The inferred reserves in the block to be explored are 1450 tons estimated to contain 1160 units of WO_3. Gross value of the ore at $61 per unit is $70,760--the exploration cost at $40 per foot is $28,000 or $24.14 per unit.

Inferred reserves in the entire North zone are 6400 tons of 1.0 percent WO_3 distributed along a strike length of 2200 feet, but as the proposed exploration will extend only 500 feet along the strike only a part of the reserve block will be explored.

If no further exploration or development were done at the Mt. Wheeler mine and the indicated ore were mined and milled, the operation would show an estimated net loss of $140,000, whereas if the Pole adit ore zone were developed all the way to the Sheffield fissure and the inferred reserves were developed, mined, and milled the operation would show an estimated net loss of only $106,000. From the operator's viewpoint, additional development and exploration are an economic necessity as illustrated in the following table:

Block	Existing	Existing and North zone	Existing and Pole adit	Existing and Pole adit and North zone
Ore Reserve tons	5,470	6,920	10,370	11,820
Ore Reserve Units at 0.8% WO_3	4,376	5,536	8,296	9,456
Gross return at 85% recovery $61 per unit	$ 226,895	287,042	430,148	490,294
Mining, milling and marketing at $17.50 per ton	$ 95,725	121,100	181,475	206,850
Exploration Cost to date	$ 271,685	271,685	271,685	271,685
Exploration Cost proposed	--	$ 28,000	85,014	113,014
Net loss	$140,515	133,743	108,026	101,255
Loss to Govt.	$ 95,237	113,868	150,990	169,621
Govt. cost/unit	$ 21.76	20.57	18.20	17.94