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MT BISCHOFF MINE
ORE RESERVES
at 11/1944
by C.L. Knight

Mt. Bischoff Mine Ore Reserves, Nov 1944
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12/12/44.

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COMMONWEALTH OF AUSTRALIA

- DEPARTMENT OF SUPPLY AND SHIPPING -

543002

MINERAL RESOURCES SURVEY

- MOUNT BISCHOFF MINE ORE RESERVES AT NOVEMBER, 1944 -

(Report No. 1944/47, Plan Nos. 1161, 1162). NO PLANS RECEIVED WITH THIS REPORT.

I. INTRODUCTION

A geological survey of the Mount Bischoff Mine area was commenced in January, 1944, with the objects of delimiting the known ore shoots, determining the field relationships of these and so arriving at an understanding of ore occurrence which could be applied to the locating of possible new shoots.

By April the open cut area had been surveyed accurately and in detail, a general geological reconnaissance made and detailed geological mapping carried out of half of the open cut and a considerable part of the area outside the open cut.

This work established several important facts -

(a) There are two main types of ore occurrence (i) replacement of pre-existing rock and (ii) filling of fault fissures. The former had been by far the most productive and any chance of locating large tonnages of new ore lay in this type of occurrence.

(b) In the worked out areas the ore was shown to be the result of replacement of a bed overlying shales and folded with the latter.

(c) The Greisen orebody and Pig Flat orebody were the continuation of this mineralised bed to the south.

By the time this stage of the survey was reached it was evident that mining of the then low-grade Pig Flat body was unprofitable, due in large measure to the very low mill recovery of concentrates. Attention was therefore directed by the Management to prospecting portion of the so-called Greisen orebody. The initial prospecting drive gave encouraging results and Mr. G. Lindsay Clark asked for an assessment of the possibilities of the orebody. Detailed mapping of the orebody on the surface and in mine openings was carried out, and the conclusion reached that 28,000 tons of ore were considered to be reasonably assured. A report with plans and sections was prepared (Report No. 1944/27, Plans Nos. 1085-1090, Jun 1944) which included a scheme for testing the section of the orebody west of the Main Tunnel by diamond drilling.

Diamond drilling on this scheme was initiated about August 15th and completed on November 2nd.

An estimate of reserves as indicated by the results of drilling up to October 4th was prepared and submitted to Mr. Clark. Drilling since that date has improved the position somewhat and a revised estimate is given herein.

The survey of the whole of the mineralised area has not yet been completed, but sufficient work has been done to show that the field has not been adequately tested, and to indicate areas in which extensions of ore may occur.

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Two plates are attached: Plate 1 - Assay plan of No. 1 Drive from Main Tunnel; Plate 2 - Assay sections showing all available information on grade of ore, and assumed limits of shoots.

II. RESERVES OF GREISEN OREBODY BETWEEN MAIN TUNNEL AND WEST FAULT.

(a) General: On Line B (see Plates 1 and 2) at the western end driving, rising, crosscutting and diamond drilling have proved the grade and determined the cross-sectional area of the ore. Also driving from the Main Tunnel to the Western Fault proved a 25 foot band of ore (named herein No. 1 Drive Band) for 260 feet at Tunnel Level and proved the average grade to be 0.83 per cent tin (the weighted average wet assay, obtained by automatic mill sampling, of 3,533 tons of ore taken from the drive.)

Apart from the above, on all other section lines but B information on grade and tonnage is much less exact, and as a result the estimates given below cannot be taken as proved, but it is considered that they will be realised in mining.

One most important factor which will affect the economics of mining is the distribution of the shoots of tin ore within the larger pyrrhotite mineralisation. The No. 1 Drive from Main Tunnel proved a shoot 25 feet wide and 260 feet long which, for at least 200 feet of its length, conformed closely to the sedimentary structure of the host rock. In the tributary stope at the western end the same coincidence of attitude of ore shoot and sedimentary structure has been established. Bedding control of ore shoots has been assumed therefore to be an important one, although not the only one operative. The limited amount of drilling done suggests also a control by folding, but indications are too vague to be of much assistance in delimiting shoots.

The boundaries of ore shoots shown on Plate 2, are based on the results of diamond drilling and sampling, combined with a knowledge of the bedding of the host rock.

The known ore occurrences are apparently referable to three stratigraphic horizons called herein (i) hangingwall band (ii) No. 1 Drive band and (iii) footwall band.

(b) Tonnage. The estimates below represent the amount of ore considered probable, without regard to the problem of whether this ore is economically available or not.

The estimates for ore above No. 1 Drive are calculated from the areas of ore shown on the section lines on Plate 2. The section lines are 50 feet apart.

The estimate below Main Tunnel Level is based on the area of ore proved in the No. 1 Drive (see Plate 1). A drillhole at the west end between Lines A and B proved the continuity of this ore to 25 feet below the drive. On Line F a drillhole proved the extension of mineralisation to 50 feet below the drive level, but intersected only low-grade ore. The length of shoot has been reduced from 260 feet at No. 1 Drive level to 150 feet at 50 feet lower, and tonnage worked out on this assumption.

A conversion factor of 11 cubic feet to 1 ton has been assumed. A factor for dry ore determined by measuring and weighing 340 feet of dried core was 11.5.

Above No. 1 Drive

	<u>Hangingwall Band</u>	<u>No. 1 Drive Band</u>	<u>Footwall Band</u>
West Fault to Line A	3,600 tons	3,300 tons	-
Line A to Line B	8,700 "	5,900 "	-
Line B to Line C	7,600 "	6,600 "	-
Line C to Line D	2,900 "	7,000 "	2,800 tons
Line D to Line E	-	7,100 "	5,100 "
Line E to Line F	-	5,800 "	3,500 "
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	22,800 tons	35,700 tons	11,400 tons

Below No. 1 Drive

West Fault to Line F	-	26,000 tons	-
	<u>Total</u>	95,900 tons	
	Less ore mined	<u>4,200 "</u>	
		<u>91,700 tons</u>	

(c) Grade.

(i) Hangingwall Band. Grade determined from four diamond drillholes, surface sampling across three sections, and adit crosscut - 0.91 per cent Sn.

(ii) No. 1 Drive Band above Main Tunnel Level: Mill Head Value of 3,533 tons taken from No. 1 Drive - 0.83 per cent. Sn; otherwise sampled by two drillholes - (0.65 per cent. and 0.90 per cent) and surface sampling. Ore removed by tributaries is assumed on convincing evidence to assay higher than 1 per cent. On Lines D and E there appears to be a blank portion in this band between the ore in the No. 1 Drive and the ore at a higher level. This has not been included as ore. On Line C the band has narrowed above the Drive.

(Notes: 0.83 for 3,533 tons is a later figure than that supplied to Mr. Burns - i.e. 0.92 for 2,409 tons)

(iii) Footwall Band: Sampled by drillholes on D and E lines, surface sampling east of F line, and surface sampling above the two drillholes. The two drillholes pierced rich values and the surface sampling east of F Line averaged 1 per cent. The grade over limits shown on Plate 2 is probably 0.9 per cent to 1.1 per cent.

(iv) No. 1 Drive Band Below Tunnel Level: Grade of ore proved in No. 1 Drive is assumed, viz. 0.83 per cent Sn.

(v) From the foregoing, probable average grade of the 91,700 tons is 0.85 - 0.90 per cent. Sn.

(vi) Overall Grade: If a method of mining is adopted which does not lend itself to rejection of low-grade material, the grade of ore sent to the mill will drop considerably and at the same time the tonnage transported to the mill will increase: e.g. at the western end, between the West Fault and Line C, a low-grade band between the Hangingwall Band and No. 1 Drive Band, if mined with the ore, would increase the tonnage from 37,000 to 51,000 but reduce the grade from 0.85 - 90 per cent to 0.65 - 0.70 per cent. At the eastern end there is insufficient data on which to base an overall grade.

The distribution of tin within the ore shoots is known to be patchy while some ore of payable grade is known to occur in the otherwise low-grade material. As cost of transport from Mine to Mill is high and as Mill capacity will probably be the bottleneck, it is desirable to reject as much low-grade material as possible at the mine. In view of the general patchiness of the ore this calls for a mining method which will permit sampling of firings and rejection of unprofitable material.

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III. MINERALISED ZONE ABOVE PROVED ORE, WESTERN END.

The Mine Manager and Messrs. Burns and Kirby of Rosebery agree that, before the major part of the 37,000 tons of ore between West Fault and Line C can be mined approximately 32,000 tons of mineralised material and 16,000 tons of shale over the back of the tributers stope must be removed in addition to low-grade material on the hangingwall side. The quantity of ore payable grade within this 32,000 tons block of mineralised overburden will have a considerable effect on the economics of mining. This fact has been realised from the beginning and attempts have been made to sample it. Two drillholes plus sampling in the end and back of the stope taken out by the tributers beneath the block revealed on the whole very low values. Recent sampling of pillars in the stope indicate the presence of 2 per cent. ore just below the block, an, presumably going up into the block for some distance at least in one place. It seems probable to me that 25 per cent. of the 32,000 tons would be ore of grade, say 0.8 per cent. Sn. However, the grade of the block can be settled by the erection of staging inside the stope to allow boring of testholes into the back of the stope.

IV. OTHER POSSIBILITIES OF ORE IN GREISEN OREBODY.

(a) Between the West Fault and Line C and behind the tributers stope, there is a block of some 60,000 tons of mineralised zone not yet tested in any way. In addition there are other blocks within the limits so far considered which have not been tested e. g. on lines E and F, (see Plate 2)

(b) The portion of the Greisen orebody so far prospected and considered in detail above, lies west of the Main Tunnel. The main pyrrhotite mineralisation, which constitutes the Greisen orebody, continues eastwards at the surface for 350 feet. Of this 350 feet, the first 80 feet have been tested by two drillholes which did not find ore. This leaves a 270 feet length of virtually untested orebody, comprising some 500,000 tons. Tributers at the eastern end mined an appreciable tonnage of grade estimated to exceed 1 per cent. Sn. from the footwall section. Systematic prospecting by diamond drilling may well discover shoots of tin ore comparable with those at the western end.

V. POSSIBLE ORE IN OTHER SECTORS.

The Pig Flat Orebody occupies the same stratigraphic position relative to the footwall shales as the Greisen Orebody and is the eastern continuation of this mineralisation, its position to the south of the latter being due to folding of the beds.

From the beginning of production from Pig Flat by the Commonwealth in September 1943 to April 1944, 24,962 tons were mined with average assay 0.28 per cent. Sn. (chemical assay) The open cut was directed at right angles to the strike of the orebody and in April 1944 a stratigraphically lower zone, made up of gossan and siliceous ore, was encountered. The open cut is still being developed at right angles to the orebody on a face sixty feet long. From April to October, 12,758 tons taken out assayed 0.84 per cent. Sn. (wet assay) most of which could not be recovered in the mill due to the fineness in grainsize of the cassiterite. Data are not available for an estimation of reserves of this higher grade ore, but the quantity would be at least 15,000 tons.

The percussion drill and auger boring campaign of 1943 proved 50,000 tons of low-grade ore of grade 0.18 per cent. Sn (by vanning assay) immediately west of the Pig Flat cut, and a further 25,000 north of the Pig Flat face of the same grade. From the

White Face area, which is a continuation of Pig Flat eastwards, a further 50,000 tons of ore of low but unknown grade can be anticipated above the Main Line Level, in this sector however, there would be shale overburden to remove. Other areas, in particular along the West Fault, would probably yield considerable tonnages of similar grade.

VI. OTHER POSSIBILITIES

Apart from these more or less accessible possibilities there are possibilities indicated by the geological set-up. The geological survey has not been completed but conclusions arrived at to date are as follows -

(a) The open cut workings are continuous over an area 2,000 feet north-south by 1,400 feet east-west. The deepest part of the open cut is 180 feet (Brown Face). The large areal extent compared with shallow vertical extent is due to the fact that the tin ore-bodies are the result of replacement of a favourable bed roughly 100 feet thick resting conformably on shale, the whole being folded in a complex manner before replacement by mineralising solutions took place. The ground surface over the northern half of the cut roughly paralleled the base of the orebody and exposed easily won ore over an area of 1,000 feet by 1,000 feet.

(b) Over this northern 1,000 feet the mineralised bed has been almost completely stripped to the underlying shales, yielding about half of the tin produced at Mount Bischoff.

(c) Immediately south of this stripped area the mineralised favourable bed plunges underfoot. The Greisen, Pig Flat and White Face orebodies form the upturned edge of this bed which is continuous across the cut for 1,400 feet. The underlying footwall shales are not exposed anywhere in the southern 1,000 feet of open cut.

(d) The mineralisation which constitutes the Greisen orebody has been proved to continue below the Main Tunnel level near No. 1 drive although with reduced thickness. This is the lowest and most southerly point at which it has been prospected.

In the Pig Flat Cut ore dips below the floor of the cut. It has not been prospected farther south.

(e) i.e. There is a large area - 1,000 feet by 1,000 feet - in the southern part of the cut virtually untested under which the favourable bed is considered to occur at moderate depths below the surface dolomite. Mineralisation of the bed in this area and the occurrence of bodies or shoots of tin ore similar in grade to Greisen orebody are envisaged as definite possibilities.

(f) Probable reserves in North Valley Reef are 14,000 tons of grade 0.9 per cent. Sn.

The Queen and West Bischoff reefs have not yet been investigated, and nothing can be said at present of the possibilities of finding ore outside the present cut limits except in the known veins.

VII. SUMMARY

1. Probable reserves in western half of Greisen Orebody equal 91,700 tons, of grade 0.85 - 0.90 per cent. Sn.

2. Eastern half of Greisen Orebody has not yet been tested and may yield similar tonnages.

3. In the Pig Flat area there is 15,000 tons of grade 0.84 per cent. Sn. (wet assay) and 75,000 tons of grade 0.18 (vanning assay). In the White Face area 50,000 tons of low-grade ore can be anticipated, and other portions of the open cut will probably yield considerable tonnages of similar grade.

4. Apart from this partly tested ore, mineralisation and the occurrence of shoots of tin ore at moderate depth under dolomite cover over an area of 1,000 feet by 1,000 feet in the south of the open cut are envisaged as definite possibilities.

5. The various fissure reefs have not been examined, except the North Valley Reef which has probable ore reserves of 14,000 tons of grade 0.9 per cent. Sn.

CANBERRA, A.C.T.
12th Dec., '44.

(C.L. Knight)
GEOLOGIST