

666A-TRANS

REPORT ON  
THE KING ISLAND SCHEELITE DEPOSITS  
& BORING CAMPAIGN TO TEST SAME

The scheelite deposits at Grassy, King Island, were discovered by Mr. T. Farrell, a few years before 1916. The deposits were prospected and developed by the King Island P.A. until 1916 and the King Island Scheelite Company N.L. was formed on the 13th February, 1917, to work them. The company carried out active mining and treatment operations from the middle of 1917 until 28th July, 1920, with the following results:-

Year	Tons of ore Treated	Tons of Con-centrates Produced	Approximate Value of Con-centrates	Percentage Yield of Concentrates	Divi-dends.
1917	4937	69	£12,130	1.4	5000
1918	21088	216	39,352	1.02	10000
1919	27832	199	43,181	0.71	5000
1920	13853	105	17,903	0.76	5000
		589	£112,566		25000

The decrease in the percentage yield of scheelite concentrates was brought about largely by:

- (1) Difficulty of keeping the ore free from overburden and country in the open cuts during larger scale operations.
- (2) Mining of the ore in the North Open Cut which was reported to be of lower grade than that in the Western open cut.

Operations ceased in 1920 owing to the fall which occurred in the price of tungsten ores after the war period. Ore was still showing in the open cuts, while westerly extensions of the ore had been proved in trial shafts.

On the 30th September, 1919, the mine manager reported ore reserves of 69,200 tons with an average value of 0.85% W.O.3, and allowing for later extraction at least 50,000 tons can be considered to remain, with of course larger quantities that have not yet been proved.

In view of the recent increases in the price of tungsten ore which now approaches those of the war period, consideration is being given to the possibility of working the deposits again.

It was desired to test the extensions of the ore bodies,

especially to shallow depths, by diamond drilling and the examination upon which this report is based, was made with the object of assisting in the preparation of a scheme for a drilling campaign.

Many factors such as location, access etc. are described in L.L. Waterhouse's report (Mineral Resources No.1, part III, 1916) and will not be dealt with in this report.

#### GEOLOGY

The country rocks adjacent to the mine consist of quartzites and slates. The quartzites occur to the north and north-east while the slates occur with the ore bodies and to the south thereof.

An aplite dyke and numerous small veins exist in the open cut and are intrusive into the slates etc. Aplite also occurs some 20 chains to the west, while loose pieces at the surface indicate other veins and dykes. It is reported that granite occurs to the south and the aplite is without doubt connected with the granitic intrusions.

The surface is largely covered by sand and is otherwise well soiled. Exposures are therefore few and most information as to rocks is obtainable from the mine workings, Gravels etc. are found at heights of 120 feet to 150 feet above sea level and represent either valley fillings or an old shore line.

The slates etc. have a general E-W strike with a dip to the south, but the strikes and dips have a considerable range.

#### ECONOMIC GEOLOGY

It is difficult to detect scheelite in the ore by eye, although coarse patches can at times be seen in narrow quartz veins and it is visible occasionally in the garnet rock. The scheelite is readily proved by assay and this method and, of course, the mining proved that it occurs mainly in the garnet rocks.

The garnet rock is for the most part coarse-grained, the crystals being up to  $\frac{1}{2}$ " diam. and apparently free from gangue. In some of the finer-grained types, quartz is present between the garnet crystals. The ore in the treatment contained 66% of garnet, so that other gangue minerals (probably including some country rock) are present to the extent of at least 33% (allowing 1% scheelite.)

Associated with the garnet rock, there are bands of fine-grained garnetiferous rocks some of which were found by L.L. Waterhouse to be proxene-garnet rocks.

The aplite is also reported to contain scheelite, but this was not investigated.

Waterhouse reported the presence of quartz, epidote, calcite, pyroxene and actinolite in the ore and quartz, albite, sericite, chlorite, biotite and magnetite in the country rocks.

The garnet ore-bodies are associated with, and occur as, bands in a series of slaty and shaley rocks. They appear to be conformable in strike and dip with these rocks and therefore apparently represent replacements of

certain beds. The mine reports refer to limestone in some of the underground workings and it is possible that ~~the~~ ores are replacements of limestone beds although no limestone beds were observed during the recent examination. However, garnet bodies can be formed by alteration of shale as well as of limestone, and so the ore bodies may have been formed by alteration of such rocks. Further, it is certain that the iron content of the garnets was introduced by the mineralising solutions and so also may have been the calcium content, so that a local source of calcium is not necessary for the formation of the garnet (andradite).

The ore-bodies occur in a mineralised zone about 400 feet wide. The zone is bounded on the north by quartzites, the boundary corresponding generally with the northern edge of the Northern open cut. The actual junction is probably a faulted one and it appears to have a strike of 315 degrees. It was probably cut in the old Nos. 1, 2 and 3 adits and had a similar strike but the dip ranged from vertical to 60 degrees to the south-west.

The zone has a general E-W strike in agreement with the slates etc. existing in it. The southern boundary is not so well-defined, but dark quartzites and slates occur to the south of the most southern ore-body. There is no evidence of any fault at this boundary, but the rocks appear to conformably overlies the mineralised zone. The extension of the ore-bodies at depth should be found beneath those slates and quartzites.

The principal extension will be found to the west of the open-cuts in the region partly tested by the prospecting shafts.

The mineralizing solutions responsible for the formation of the ore-bodies undoubtedly represent the final differentiates from the granite magma. The aplite dykes and veins were also derived from the granite but at a slightly earlier stage. It is probable that the presence of aplite dykes and veins will serve as a general indication for places (outside the open-cuts) favourable for prospecting for scheelite.

#### THE ORE - BODIES.

The problem of determining the position, strike and dip of the ore bodies is not easy as only the opencuts are available for examination. Moreover, the ore is a 1% scheelite ore and the scheelite is only visible at a few places, and it has to be assumed that the garnet and the pyroxene-garnet rocks represent the ore-bodies.

#### Information obtained from reports, plans etc.

The early prospecting work consisted of a number of adits, but these have been almost entirely removed by the working of the open-cuts. At the time of L.L. Waterhouse's visit at the end of 1915, five adits had been driven and one shaft sunk. Of the adits, two had already collapsed, but Waterhouse described the rocks and the ore-body exposed in Nos. 3 adit (afterwards No. 1 level), No. 2 adit (afterwards No. 2 level) and No. 1 adit (about level of later No. 3 level). The orebody exposed was the most northern one on the property and afterwards became known as the Northern ore-body.

Further prospecting by adits etc. was carried out during 1916 and consisted chiefly of the extension of No.2 adit and the adit and shaft on the west shaft formation. Little information is available about these workings except such as is marked on old plans. The West shaft workings (entirely removed by later open-cuts) proved the existence of the ore-body which became known as the Western ore-body.

When the King Island Scheelite Co. started operations in 1917, adits were driven at a lower level than the prospecting ones in order to mine the ore by Glory Hole methods. These were called No. 3 level and that under the Northern ore-body was termed the North (or No.1 adit) and that under the Western the West (or No.2 adit). The North adit intersected the Northern ore body and also revealed the Middle ore-body (already partly proved by the old No.2 adit drive to Vaudeau's shaft). The West adit intersected a smaller ore-body before reaching the West ore-body. Fairly complete records of the rocks and ore-bodies passed through in these adits are available as are also partly completed plans. While these are extremely helpful, a complete set of records (weekly progress reports, half-yearly reports etc.) and a complete plans would have been of greater assistance. The chief difficulty caused by the incompleteness is that of identifying the various rises, winzes, crosscuts, and drives with those unlabelled ones shown on the plans.

During the end of 1917, or beginning of 1918, the No.1 Prospecting shaft proved the existence of an ore-body between the Northern and Western workings. In correspondence in 1918, it is stated that the ore in this shaft and also in No.5 rise off West adit, proved that the Western ore body is continuing in the direction of the Northern workings on a north-eastern course.

In 1919, the Chairman's speech referred to the Northern Middle and Western ore-bodies. During this year, a number of prospecting shafts were sunk in order to test the western extension of the ore-bodies. The available records of these shafts are not complete but ore was cut in a number of them including Nos. 2, 4 and 6.

As a result of the above work, the mine manager shows on the available plans, five parallel ore-bodies at the level of No. 3 level numbered from south to north, and with a strike of 280 degrees. Their form on the plan, however, suggests that the representation has been arrived at by joining ore intersected at several points into a number of perfectly straight lodes.

#### Information obtained by observation.

Observations on the southern face of the Western opencut show that there are possibly two ore-bodies which occur as somewhat irregular lodes agreeing more or less in strike and dip with the enclosing country rocks, the strike being approximately 260 degrees and the dip to the south at 20 degrees to 30 degrees. The northern face of the same cut does not lend itself so readily to observation but there appears to be two more or less definite ore bodies with similar strikes and a flat dip to the south, corresponding probably to the two on the southern face.

The ridge between the two open cuts has a more or less continuous band of slates and quartzites along its central part with a general E-W strike but a higher dip to the south, which, however, is local and may be due to a flexure in the strata or faulting. An ore-body (probably the Middle) occurs north of and below this band of slate etc. It can be traced along the southern face of the Northern opencut (northern face of the ridge between the open cuts) and then rises (up the dip) along the western face of the cut, with about 10 feet of slates and quartzites capping it. This ore-body may be a wide one but it is possible that there are bands of country rock within it. The position on the northern face is not clear and it is difficult to say anything about the most northern ore-body

#### Information obtained by constructing Geological Cross-Sections.

The two geological sections attached to this report have been prepared from available plans and the ore placed on them from the Company's reports, from observation, etc. No attempt has been made to join up the various patches of ore, but the patches certainly suggest that the ore-bodies consist of a number (probably five) with low dips to the south.

#### Number

The Company's reports referred to three ore-bodies being worked, and the plans showed five ore-bodies, including one not worked. From observations in the cuts and deductions from reports, it would appear that there are five ore-bodies so far proved.

#### Dip.

The geological observations and the cross-sections strongly suggest a low dip to the south. In the West opencut the dip is probably between 20 degrees and 30 degrees, but in the North opencut, the dip is probably steeper and between 30 degrees and 50 degrees.

#### Strike.

The Company's plans show the five lodes as being absolutely straight and parallel with a strike of 280 degrees.

The exposures in the West opencut suggest a strike of 260 degrees and the positions in which the ore is shown in the West adit (No. 3 level) appear to confirm this.

In the North opencut the strike is not so definitely ascertainable but is in a general E-W direction. The No. 2 adit seems to indicate on the plans an E-W strike of the footwall of what is probably the "Middle" ore-body while the West shaft formation (Western ore-body) is indicated with a similar strike.

#### DRILLING SCHEME

The above descriptions suggest that an east-west mineralized zone about 400 feet wide exists in the vicinity of the King Island scheelite mine. The zone contains probably five ore-bodies with general east-west strikes and dips of 20 degrees to 50 degrees to the south.

While a certain amount of developed ore remains in

the mine and ore can be seen in the open cuts, it is desired to test the extensions in order that the re-opening of the mine can be considered. The strike and dip of the ore-bodies are such that drill-holes to test them should be directed in a general northerly direction and have a depression of 45 degrees to 60 degrees from the horizontal.

As the crosscut from Vaudeau's shaft will probably be re-opened and will yield valuable information as to the ore-bodies cut therein, and is slightly west of the Northern opencut in which direction working will proceed, it is suggested that a line of bore-holes be put down along the extension of the line of the crosscut, to intersect the orebodies at depth.

No. 1 hole is sited in the Western opencut and will intersect the three northern ore-bodies. It will have a depression of 45 degrees, and a length of 164 feet will test the country to sea-level.

No. 2 hole is sited in the same opencut with a depression of 60 degrees. A length of 138 feet would test the country to sea-level, but it might have to be drilled somewhat deeper to ensure that it will intersect the three ore-bodies cut in No. 1 hole.

No. 3 hole is sited near an old tramway with a depression of 45 degrees. A length of 200 feet would test the country to sea-level. This hole should intersect the two southern ore-bodies and might cut the next one to the north. Deeper drilling would, of course, cut all of them.

No. 4 hole is sited near the entrance to the West opencut with a depression angle of 45 degrees. A length of 150 feet should test the country to sea-level and should test the three northern ore-bodies.

In order to test the western extensions, lines of holes could be drilled in general northerly directions and with depressions of 45 degrees and 60 degrees. The first line of 3 or 4 holes would be conveniently sited along the line of prospecting shafts, Nos. 11, 4, 9, and 5. Similar lines could be selected still further west.

Only the first four holes have been marked out on the ground and they may provide sufficient information to enable those interested to decide the question of re-opening the mine. The other sites could be readily sited later if required.

It must be pointed out that the drill holes would be most useful in determining the positions, widths and extensions of the ore-bodies. They will give some idea of the grade of the ore but unless the scheelite values are uniformly distributed throughout the ore, the drill samples will not be representative of the ore in general.

P.B. Nye.

GOVERNMENT GEOLOGIST.

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