

REPORT ON THE COPPER-NICKEL DEPOSITS OF THE
FIVE MILE DISTRICT, ZEEHAN.

Location and Access.

The copper-nickel field is situated in the Five-Mile district, 5 miles to the north-east of Zeehan.

Access is gained by the road and Emu Bay railway from Zeehan. From the Nickel Junction a branch tramway (2 foot gauge) traversed the field and short branches from it served the individual mines.

Leases.

The land is held under mining lease by several individuals. F. Kershaw holds lease No. 10935/M of 157 acres while applications have been made for 40 acres to the south (10923/M) and 40 acres to the north (10921/M) of this lease.

J.S. Munro holds the following leases; 10272/M (10 acres) 10854/M (10 acres), 10853/M (34 acres), while an application (10926/M) for 10 acres has been made.

S. Nixon has an application (11078/M) for 20 acres.

It has been stated that the interested parties have or had, an agreement between them as regards amalgamation so that all the leases could be obtained and the field worked as a whole under one control.

Geology.

The copper-nickel field embraces a low-lying swamp region now mainly covered by low scrub. Outcrops are few, but the prospecting and mining operations have made available sufficient sections to enable the geological structure to be determined.

The Dundas group of slates and breccias of Cambrian age occupy the greater part of the field. The slates are most common and the typical purple, grey and green types are present. These rocks are intruded by at least two dykes of basic to ultrabasic types. These dykes have a general width of 50 feet and are about 5 chains apart. Their strike is 353° and the dips appear to be easterly.

In the swampy places, the peat, soil etc. covers and obscures the bedrock.

Economic Geology

The copper-nickel deposits are associated with the eastern dyke. The lodes are either in or at the western or footwall of the dyke. They conform to the dyke in strike and in dip except in so far as they might pass from the centre to the footwall of the dyke.

The eastern dyke is at least $1\frac{1}{2}$ miles in length, and the copper-nickel deposits occur along a length of $1\frac{3}{4}$ miles. The deposits are not continuous but occur as a number of separate ore-bodies along the above length.

The ore is a massive sulphide one consisting of pyrrhotite, pyrite, chalcopyrite, pentlandite, and marcasite. The chalcopyrite is the mineral which contributes the copper content to the ore. The pentlandite (sulphide of iron and nickel) supplies the nickel content, but is not readily distinguishable by eye owing to its similarity to the pyrrhotite. The pyrrhotite, pyrite and marcasite contain no valuable metallic contents, although the first named may contain small amounts of nickel and copper due probably to inclusions of pentlandite and chalcopyrite.

The ore has been oxidised at the surface to limonite with secondary copper and nickel minerals. At a depth of 100 feet in one working it is stated that the ore has been replaced by cellular quartz. The average metal content appears to be copper 5% - 6% and nickel 9% - 12%.

The Ore-Bodies

The various ore-bodies will be briefly described starting from the south end and describing them in order.

Deveraux Ore-Body. (Abandoned Section 8851/M, 10ac.)

This ore-body represents a parallel line to the remainder which will be described below. Shallow shafts have exposed copper nickel ore and a recently excavated trench is stated to have exposed ore at the approach and at the shaft with which it connects. To the north of the shaft the ore body does not appear in the usual position on the west side of the ultrabasic dyke. In this ore body the composition of the ore differs from the others in that the copper content (13 to 18 per cent) exceeds the nickel content (5 to 9 per cent).

The width at surface is stated to be 12 to 18 inches, but the length has not been determined. The ore is reported to contain 1.1 to 1.4 ozs. silver, 0.02 to 0.04 ozs. gold, and 0.10 to 0.16 ozs. platinum per ton.

Nickel Reward Ore-Body. (Lease 4M/46, 20 ac., Montana Silver Lead N.L.)

Copper-nickel ore was mined at this locality during or prior to 1894. It is reported that the ore-body was 30 feet long and 2 to 8 feet wide. Two bore-holes were put down in 1914 but did not intersect any ore. Recently in sinking a new shaft, ore was discovered on one side of it.

From the surface, it is difficult to determine the position and strike of the ore-body.

The ore sold is reported to have contained 8 to 12% nickel, 3 to 5% copper.

Melbourne Copper-Nickel South or Vaudeau Ore-Body.

(Application 2M/51, 34 ac. R.E. Clark)

This ore-body was worked in Vandeau or south shaft of the Melbourne Copper-Nickel Co. during 1913 and 1914. A shaft was sunk to 127 feet and levels opened out at 70

and 122 feet. The 70 foot level was driven 27 feet north and 52 feet south. At the 122 foot level, the cross-cut and north drive did not cut ore, but a lode of vughy quartz. In the south drive ore was cut at 11 feet and was followed for 30 feet being 3 feet wide.

It has been estimated that 1500 tons of ore exist above the 122 foot level, and apparently the ore-body extends below the south drive. The Melbourne Copper-Nickel Co. in 15 months produced 2776 tons of ore and in addition to refunding the capital expenditure provided £9,600 in dividends. Prior to the company's operations 73 tons were mined from near the surface.

Five bore holes were put down in 1914. No. 1 cut the ore body at 50 feet and proved 10 feet of ore, No. 2 cut it at 100 feet and proved 1 foot of ore while No. 3 did not reveal any ore at 200 feet in depth. It is stated that Nos. 4 and 5 bores were put down north and south of No. 1 and variously stated that they did and did not reveal any ore. Where ore was proved by these bores it has been worked out. As the ore-body apparently pitches south, No. 3 hole might have missed the ore owing to not being suitably sited.

Blowfly or Melbourne Copper-Nickel North ore-body.

(Application 2M/51, 34 ac. R.E. Clark)

This was worked from the Blowfly & Mosquito shafts. Two bore-holes (1914) were put down to cut two shoots of ore shown at the surface, at a depth of 50 feet, but failed to prove ore. Later 52 tons was mined from Mosquito shaft and 250 tons from Blowfly shaft. The shoots were apparently short and lenticular.

Dundas Cuni South Ore-bodies.

(Application 11M/52, 30 ac. Montana Silver Lead, N.L.)

(1) Eastern ore-body. This ore-body was worked in the Dundas Cuni South shaft. A level was opened at 75 feet, and the ore-body proved to be 90 feet long and to have a southerly pitch. Some 1189 tons were mined, the shipments assaying 5 to 5.5% copper and 10.3 to 11.57% nickel. Work stopped owing to the absence of markets following the outbreak of war in 1914.

In 1930, the Mines Department put down three boreholes to test the extension of this ore-body. No. 1 was 100 feet south of the shaft, No. 7 was 100 feet south of No. 1 and No. 8 was 100 feet north of the shaft. None of the bore-holes intersected ore, proving that the ore-body cannot be much longer than the 90 feet proved in the workings. The extension in depth was not tested.

Geophysical survey in 1928 proved a minor conductive zone 150 feet in length, coincident with the above ore-body.

(2) Western ore-body. The Geophysical survey obtained a minor conductive zone about 100 feet west of the Eastern ore-body.

Two trenches were sunk to expose this ore-body. The trench proved a two-foot formation containing 1" pyrite while that at Beacon No. 2 proved a four-foot formation of oxidised material with a good footwall dipping east.

Dundas Cuni North Ore-body (ore Copper Nickel South Ore-body)
(Lease 2M/46 157 ac. Montana Silver Lead N.L.)

This ore-body occurs in the workings from the old Dundas Cuni North shaft, afterwards (1928) re-opened by the Copper Nickel Mng. Co.

The geophysical survey suggests that this has a possible maximum length of 300 feet, with a greater concentration over 200 feet. The outcrops and exposures in trenches suggest a length at the surface of 130 feet, mainly to the south of the shaft. Gossanous material occurs at intervals along a length of 150 feet to the north of the shaft, while boulders of sulphide in clay occur a further 100 feet to the north.

In the shaft workings the lode was 2 feet wide, being vertical near the surface and dipping east at 40° at a depth of 40 feet. It was driven on at the 70 feet level and stoped out for 30 feet above the level over a length of 80 feet. The general strike is north and south. In 1929, this company extracted 842 tons which contained 85.44 tons of nickel and 46 tons of copper. In 1930 the ore mined contained 117.6 tons of nickel. The workings were carried out from the old shaft.

Copper Nickel North Ore-body.(Lease 2M/46, 157ac.
Montana Silver Lead, N.L.)

This ore-body was originally cut in a trench, where it was stated to be small and of low grade.

The Geophysical Survey obtained indications by several methods. Three trenches dug proved the presence of gossan and sulphide ore.

The ore-body has a general strike of 40° to 50° . At the south-western end, lode capping outcrops and has been exposed over a length of 100 feet. To the north-west gossanous capping and some sulphide ore were exposed in trenches at Beacons 4 and 5. At the surface therefore the lode has a possible length of 350 feet.

In order to test the lodes at depth, three diamond drill holes were put down in 1930. No.3 hole No.1 (Iges) was designed to cut the lode below No.5 beacon. It was started at a point 75 feet south-east of the outcrop and put down in a north-easterly direction at an inclination of 45° . Though drilled to a depth of 110 feet, no ore was intersected. No.2 hole was sited similarly with regard to No.4 beacon. At 72 feet a lode 3 feet wide was intersected and consisted of soft sulphide ore which yielded little core. The available core assayed 6.01% nickel and 2.6% copper. A third hole (No.4) was put down between No.1 and 2, but further away so to cut the lode at a vertical depth of 100 feet. At $140\frac{1}{2}$ feet, 3 feet of solid sulphide ore was intersected, which on assay (average of three samples) gave a result of 10% nickel and 5.5% copper.

Summary of Information on Ore-bodies.

	Length Feet	Width Feet	Depth feet	
Deveraux		1-1.5		
Nickel Reward	30	2 - 8		
Vandeau	79' at 70' level 30' at 122'	0 - 10 3' at 122' level	122	Worked down to 122' level with 1500 tons left above this level
Mosquito Blowfly	47' 60'	? ?	Small Small	Worked down to 10' " " " 14'
Dundas Cuni South (Eastern)	90'	?	75	Worked down to 75' level.
Dundas Cuni South (Western)	Possible maximum 150'	2 - 4	Not Known	Indicated by Geophysical Survey Outcrop proved by two trenches. Nickel & copper contents not known.
Dundas Cuni North or Copper- Nickel South	80 at 70' level Possible maximum 200-300'	2	70	Zone 300' long indicated by Geophysical survey with concentration over 200'. Partly worked out above 70'.
Copper-Nickel North	Possible maximum 350	3	110	Indicated by Geophysical survey. Several trenches and 2 bore-holes have proved ore- body. Worked down to 10ft. over length of 70' in Genats Winze.

Reserves.

It will be realised from the above that though there are eight ore-bodies along a length of $1\frac{3}{4}$ miles, each ore-body is comparatively short and narrow and has only been proved to shallow depths.

The Dundas Cuni North and the Copper-Nickel North ore-bodies appear to represent the longest and any mining should be started on these bodies. It is possible that a maximum of 15,000 tons of ore could be considered to exist in the field made up chiefly from the above two ore-bodies. Small reserves would exist below the bottom levels in the Vandeau and Dundas Cuni South ore-bodies, and also from the Deveraux and Nickel Reward ore-bodies.

It is possible that other ore bodies exist along the length of the dyke. However, prospecting is difficult and the Geophysical Survey did not reveal any other indications as far south as the Vandeau ore-body.

Prospecting and Development and Mining.

The copper-nickel lodes occur in a flat region, the greater part of which is swampy, while the whole is covered with scrub. Prospecting by trenches is difficult in the swampy places on account of the depth of soil etc. and the large amount of water, but in the dry places, trenching can be carried out to a certain extent. Shallow shafts involve pumping and render prospecting difficult in this respect also.

As the lodes are of dense sulphides and occur under known geological condition, viz. in a narrow basic dyke intruding slates etc. boring is the best means of proving them.

When working shafts are sunk, large quantities of water are met with and require comparatively large pumping plants.

As the ore-bodies are generally widely separated, a number of mine openings would be required.

Treatment and Marketing.

In the past, the ore was mined, bagged and sold overseas, prices from £3 to £5 per ton being obtained.

Though this may have been profitable, it would be desirable from several viewpoints to treat the ore up to a certain stage in Tasmania. Two suggestions have been made.

- (1) Smelting the ore to give a copper-nickel matte. As a general rule, I believe that the first matte in such smelting does not contain a much higher content of copper and nickel than the ore. Further treatment such as converting might therefore be necessary to further increase the metallic contents. This would involve considerable plant, unless existing plants would undertake the treatment. Further no information is available as to whether such a product could be marketed.
- (2) Concentrating the ore by flotation and preparing a copper-rich and a nickel-rich concentrate. The former could possibly be purchased and treated by the Mt. Lyell M. and R. Company. The nickel concentrate could be shipped, or possibly treated by the Mt. Lyell or the Electrolytic Zinc Company for the production of electrolytic nickel. However, little is known of the market overseas for nickel concentrates, or the possibility of marketing metallic nickel in Australia. The latter would be largely a matter of the price at which the nickel could be sold.

Signed P.B. Nye
GOVERNMENT GEOLOGIST.

Mines Department,
Hobart.
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