

REPORT ON THE RED HILL COPPER DEPOSITSIntroduction:

In view of the fact that extremely low grade copper ores are being successfully treated in Tasmania at the present, it was considered advisable to review the position with reference to other deposits of a similar nature not being exploited. The Red Hill district was accordingly selected as one which had shown promise in the past, but which had been abandoned thirty years before as of little commercial importance under then existing economic conditions.

Surveys were, therefore, undertaken between 29th April and 4th May, 1938.

Owing to heavy snow falls which curtailed the examination, it was only possible to map a small section covering Red Hill.

A detailed contour map outlining an area of approximately 110 acres has been prepared to accompany this report.

Location and Access:

The Red Hill is situated  $5\frac{1}{2}$  miles to the south-east of Rosebery, a township on Emu Bay Railway Line, 68 miles from the port of Burnie.

Access is gained from the township by way of Dunkley's timber tram and pack-track - a distance of eight miles. A foot track, having a more direct route and following the electric power line, connecting Rosebery with Queens-town, is also available. The power-line passes to the west of Red Hill within half a mile.

History:

Mineral leases covering the area were first issued in 1891 to several individuals, and early in 1897 the Red Hills Mining Company was formed to test the deposits.

Other areas to the north and south were acquired by North Red Hills Mining Company, Red Hills Proprietary, and South Red Hills Company respectively, but little prospecting was carried out in these directions.

Intermittent prospecting and testing were undertaken by the Red Hills Company during the next three years and six adits were driven, as well as several open cuts, trenches and benches. Work was then suspended and the leases became forfeited.

In 1907 mineral rights were acquired in the interests of the Mount Lyell Mining and Railway Company, who lengthened two of the existing adits, drove crosscuts from a winze, and cut several trenches. A precise sampling campaign throughout the openings was then instituted but no further work was attempted.

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Dormant conditions have prevailed during the past thirty years, and although a Special Prospecting Licence of 1000 acres covering the area was recently issued in the name of J.M. Platt, no further prospecting has been undertaken.

#### Topography:

The Red Hill is represented by a ridge trending south-south-easterly for over half a mile from the southern base of Mount Murchison (3765 feet) to which it is connected by a low saddle and above which the hill rises sharply for 600 feet to the highest point (2600 feet above sea level) - a distance of under 30 chains.

From the ridge the slopes fall in a like manner to the east, west and south.

Drainage is effected by way of Red Hill Creek flowing to Anthony Creek on east side of ridge, in the south-west by tributaries of Julia Creek running to Henty River, and on the north-west slopes by affluents of Stitt River which eventually joins Pieman River.

From a mining aspect the topographical features may be regarded as decidedly favourable for mining both by means of adits and open cuts.

#### Geology:

(a) Silurian: Interbedded quartzites and siliceous conglomerates of the West Coast Range series occur one quarter of a mile to the north of Red Hills on Mount Murchison, immediately to the east of the ridge on the fall to Anthony Creek, on the south eastern part of the Red Hill Ridge, half a mile to the south in Julia Creek watershed, and on the Gooseneck, three quarters of a mile to the south west.

These rocks are similar to those which have been described in detail in previous reports dealing with the West Coast Range and need no further explanation here.

They are intruded by a suite of porphyries which in the vicinity of Red Hill have been altered to chloritic schists.

This series of rocks is now generally recognised as representing the basal beds of the Silurian system. In other districts it conformably underlies the fossiliferous Queen River Slates and Sandstone series of undoubted Silurian age.

(b) Devonian: The rocks of Red Hill area consist generally of chloritic schists which were originally porphyries but have since been altered by dynamic metamorphism and mineralising solutions to their present form. They are analogous to the chloritic schists of Mt. Lyell, Read-Rosebery and Lake Dora. The schists occupy a south-east trending embayment in contact with, and almost surrounded by, West Coast Range conglomerates. They connect in a north-westerly direction with a much larger and varied belt of porphyries and schists extending north and south along the West Coast Range.

West of Red Hill, quartz sericite schists occur and these grade insensibly into massive quartz felspar porphyries at a distance of one mile.

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In general the chlorite schists are harder and more massive than the quartz sericite schists and in places contain small areas of sheared porphyries, in which partly altered and silicified feldspars are visible to the eye.

The schist planes strike in a regular manner, being almost invariably between  $150^{\circ}$  and  $160^{\circ}$ . The dip is generally to the south-west at angles between  $60^{\circ}$  and  $80^{\circ}$ , but the planes are vertical in some localities.

In addition to the planes of schistosity joint planes are prominent which in many instances consist of two planes at right angles, one of which is almost horizontal.

In the vicinity of Red Hills the irregular junction of the schists with Silurian conglomerates suggests an intrusive contact.

The intrusive nature of the porphyries and schists (altered porphyries) into Silurian rocks has been conclusively proved in Mount Lyell district, thereby dating the rocks as post-Silurian.

On the south-eastern slopes of Mount Sedgwick level bedded Permo-Carboniferous conglomerates and mudstones rest unconformably on a quartz feldspar porphyry offshoot of the main porphyry belt. The porphyries are, therefore, pre-Permo-Carboniferous.

It now seems possible to place the porphyries and their schistose derivatives in the Devonian period in conformity with Tasmanian granite batholiths.

#### Economic Geology:

Introduction - The Red Hill Copper deposits are confined to the chloritic schists which represent altered porphyries. As the latter appear to intrude Silurian sedimentary rocks they are considered to be of Devonian age, and it is probable that the mineralisation was contemporaneous with, or followed closely, the alteration of the porphyries into schists.

The mineralisation of the schists was brought about by the action of mineralising solutions principally comprising silica, iron, sulphur and copper. The solutions invaded the schists and precipitated quartz, pyrite, chalcopyrite, magnetite and hematite.

#### Mineralogy:

Quartz veins occur irregularly in the schists and in the conglomerates adjacent to the contact with the schists. Quartz is also present in the chloritic schists and quartz sericite schists as small bunches and nodules, and as small blebs in the latter.

Pyrite is abundantly dispersed through the chloritic schists. It occurs chiefly as small crystals through the rock but is present in places as narrow erratic veins between the planes of schistosity.

Chalcopyrite is the principal copper mineral of the locality. It occurs as small aggregates and bunches in association with pyrite in chloritic schists and occasionally as short veins in the schist. It is also present as patches and lumps in quartz veins. Malachite occurs in small amounts

Mineralogy -

Magnetite is a common element of the mineralised schists in the form of fine disseminated crystals. It also occurs in massive form in association with pyrite and chalcopyrite.

It is mineralised to a certain extent... but from similar veins... are indicated in which the rocks appear to be... greater extent than elsewhere.

There are insignificant openings... some to be wholly defined and only in the... Red Hill has mining been concentrated enough to... mineralised some of appreciable extent.

(1) MINING

The northern mine, which appears to be the most important, is situated at the lower northern end of the ridge... at about 1000 feet elevation No. 1007-N at 40 degrees in width.

It is exposed by... over a length of 1/2 chain in a north westerly direction... and for eight (8) chains in width, and may be considered to represent one or more potential ore-bodies.

As appears by the workings the mineralisation consists of pyrite and chalcopyrite in... In addition... veins occur in... of the zone.

The mine has been developed to some extent by adits, open cuts, and trenches. No. 1 North Adit is located on west side of hill at a height of 2131 feet above sea level and extends for 157 feet on a bearing of 80°. It... from face of an open cut, 13 feet high, in which pyrite and chalcopyrite are freely distributed. At 35 feet from surface a quartz vein carrying malachite, with the... along a bearing of 150° is... was intersected at 75 feet from entrance and followed on west side along a bearing of 150° for 52 feet. The... and was mineralised.

Although the greater portion of the rock in this... soil carries some... occur in the first 70 feet only. One... in the open cut... (Report on the Mineral District of... 1907) reported that "the first class ore comprises a heap of about 40 tons, and the second class about 200 tons. The published... first-class... per cent, and second-class 2 per cent... The average of the ore body at entrance to... No. 1 North cut from... per cent to 3.1 per cent copper."

A... of... and... the... for... in the face of... to... per cent copper.

There are... at... and... chains... positively... The first and... of these... and... veins of pyrite.

as secondary alterations of chalcopyrite.

Hemimorphite is present both in massive and earthy forms as impregnations of chloritic schists.

The Mineralised Zones -

The Red Hill belt of chloritic schists appears to be mineralised to a certain extent almost throughout, but from mining works undertaken in the past certain zones are indicated in which the rocks appear to be pyritised to a greater extent than elsewhere.

There are insufficient openings to enable the zones to be wholly defined and only in the northern part of Red Hill has mining been concentrated enough to indicate a mineralised zone of appreciable extent.

(1) Northern Zone -

The northern zone, which appears to be the most important, is situated at the lower northern end of the ridge on abandoned mineral section No. 1707/M of 40 acres in extent.

It is exposed by prospecting works at intervals over a length of 14 chains in a north easterly direction and for eight (8) chains in width, and may be considered to represent one or more potential ore-bodies.

As exposed by the workings the mineralisation consists of pyrite and chalcopyrite in chloritic schists. In addition quartz-chalcopyrite veins occur in western part of the zone.

The zone has been developed to some extent by adits, open cuts, and trenches. No.1 North Adit is located on west side of hill at a height of 2131 feet above sea level and extends for 187 feet on a bearing of 80°. It commences from face of an open cut, 33 feet high, in which pyrite and chalcopyrite are freely distributed. At 35 feet from portal a quartz vein carrying chalcopyrite was driven on for 22 feet, along a bearing of 160° in pyritised schist. A similar vein was intersected at 75 feet from entrance and followed on west side along a bearing of 150° for 50 feet. The schist in the end was unmineralised.

Although the greater portion of the rock in this adit carries some copper, enrichments occur in the first 70 feet only. Ore obtained from the latter embody two stacks in the open cut outside adit entrance. W.H. Twelvetrees (Report on the Mineral Districts of Zeehan and Neighbourhood, 1907) reported that "the first class ore comprises a heap of about 40 tons, and the second class about 200 tons. The published bulk assays of these heaps are:- first-class 4.9 per cent, and second-class 2 per cent copper. The average of the ore body at entrance to tunnel No.1 North was from 4.15 per cent to 5.1 per cent copper."

A winze was sunk outside adit door to a depth of 38 feet and a cross-cut from the bottom driven 42 feet easterly below the adit. From the cross-cut a drive went south-easterly for 17 feet. The material in the face is said to assay 2 to 3 per cent copper.

Three open cuts occur at 1½, 3 and 5 chains respectively south-east of No.1 North Adit. The first and third of these expose dissemination and small veins of pyrite,

together with a little chalcopyrite. In the second cut a small quartz vein, trending south-easterly carries appreciable bunches of pyrites. Fine pyrite disseminations are also present in the adjoining schists.

No. 3 East Adit was commenced, in a cliff face from north-east end of Hill, at a height of 96 feet above, and 750 feet distant from No. 1 North Adit. It was driven 69 feet on a bearing of  $200^{\circ}$ , when the direction was altered to almost west towards No. 1 North Adit, for a distance of 101 feet. The rock is disseminated with pyrite and small amounts of chalcopyrite. Twelvetreese states that the first 57 feet of this adit was sampled in 10 feet sections and that assays of under one per cent were obtained throughout. At one chain and a half north-easterly from No. 1 North Adit a trench with a break of  $\frac{3}{4}$  of a chain between two portions, extends north-easterly over a distance of  $7\frac{1}{2}$  chains. Pyrite is present as veins and disseminations together with minor quantities of chalcopyrite. At eastern end magnetite occurs in close association with pyrite in the schist planes.

About  $1\frac{1}{2}$  chains south-east from eastern end of this trench, near top of cliff and 55 feet above No. 3 East Adit, small masses of magnetite occur at surface as apparent impregnations of the schists. A shallow pit on the magnetite outcrop discloses disseminated pyrite less than one foot below surface.

A short trench  $4\frac{1}{2}$  chains south of No. 3 East Adit is overgrown and waterlogged and no mineralisation is visible in schists on the spoil dump. At  $4\frac{1}{2}$  chains further to the south-east another short trench exposed pyrite plentifully distributed as bunches and veins in the schist planes and accompanied by finely crystalline magnetite.

No. 2 North adit is located in a low cliff on north-west end of main portion of ridge, at a point 8 chains south-south-east of No. 1 North Adit and 114 feet higher in elevation. It is 24 feet in length along a bearing of  $152^{\circ}$ . At 8 feet from portal a drive, bearing  $205^{\circ}$ , extends 19 feet. Erratic pyrite veins and disseminations occur about the entrance and along drive.

## (2) Southern Zone -

This is situated on Section 1705/M - 75 acres in south-west part of the area.

The zone has so far been proved over a small area only, along a length of 3 chains in a north-easterly direction and a maximum of one chain in width.

It is developed by means of an adit and several benches distributed along the bed of a small south-west flowing stream, falling sharply down a steep ravine.

No. 2 West Adit is the lowest working and occurs at a height of 2,996 feet above sea level. It commences from an open cut 20 feet in height, and is directed on a bearing of  $66^{\circ}$  for a distance of 157 feet. Erratic distributions of pyrite and chalcopyrite in chloritic schists are visible in the face of open cut at adit entrance.

No. 2 Bench, 125 feet distant north-easterly and 70 feet above adit, exhibits large patches and veinlets of pyrite and chalcopyrite. A cliff face on north west of creek

shows some disseminated pyrite.

No.1 Bench is 85 feet north-east of No.2 Bench and 54 feet higher. Pyrite and chalcopyrite are present in much the same manner as in the latter but to a less degree.

Twelvetreets records that "Bulk assays have been made from the south benches and No.2 west tunnel, showing considerable variations. Thus the assay of the first 12 feet across No.2 bench was 1.7 per cent copper, and of the second 12 feet 2.1 per cent, while the average of the country all through these benches was only 0.48 per cent, and the average of the tunnel 0.252 per cent."

A possible northerly extension of the Southern Zone is indicated at No.1 West Adit, situated 18 chains north of No.2 West Adit, on western fall of the ridge, in Section 1711/M. This adit extends  $75^{\circ}$  for a length of 101 feet and exposes slight pyritic disseminations about the entrance. In the open cut, 120 feet to the east and 40 feet higher up the hill, pyrite is similarly distributed.

### (3) Eastern Zone:

On eastern side of ridge a minor zone is suggested by mineralisation in two short adit levels. The most northerly of these, No.2 East, is located 22 chains east-north-east of, and 100 feet lower than, No.1 West Adit on opposite side of ridge. It extends on a bearing of  $255^{\circ}$  for a distance of 78 feet. Minor amounts of pyrite and chalcopyrite occur along the adit approach.

No.1 East Adit is situated about 13 chains to the south-east of No.2 East Adit and has been driven 28 feet on a bearing of  $260^{\circ}$ . Disseminated pyrites is plentiful in association with a little hematite along the schist planes.

No prospecting has been undertaken between these two adits but there appears to be a possibility of a mineralised zone in the intervening country.

### Elements Controlling the Position of the Mineralised Zones:

The chief element in the mineralisation is the chloritic schists or altered porphyries which the solutions invaded. The latter probably played a large part in the formation of the schistosity and chloritisation of the original constituting the porphyries.

Another element appears to be the contiguity of the zones to the schist conglomerates contact. The belt of chloritic schists occupies a bay in the conglomerates and is partly enclosed by them. The zones have not yet been determined as extending to the contact, but in most cases the nearest known mineralisation is only 8 to 12 chains distant.

A factor which may have had some influence in determining the location of the zones is the possible existence of a fault indicated by a line of cliffs along the eastern slopes of Red Hill. This extends from eastern contact of the conglomerate mass situated at south-east end of the ridge, and trends in a general north-westerly line through the schist belt. The greater part of the mineralisation is distributed on the western side of this supposed line of faulting.

Relation of Outcrop to Ore:

Owing to the youthful topography of the area oxidation and leaching of the mineralised belt has not proceeded to any appreciable depth below surface. This is owing to the fact that the weathering agents have been able to keep pace with erosion.

Where the chloritic schists are exposed at surface, about the upper parts of Red Hill, the rocks are stained brown, by oxides in the form of limonite. The latter is not only derived by oxidation of sulphides but to a certain extent by alteration of small quantities of magnetite and hematite which impregante the schist.

In the prospecting works complete oxidation is seen to operate to approximately one foot below surface only, so that the zone of oxidation and leaching is very thin and secondary enrichments are almost entirely absent.

Conclusions and Recommendations:

So far no large tonnages of copper ore have been proved to exist at Red Hill.

Low grade deposits in the form of erratic disseminations of pyrite and chalcopyrite in chloritic schists have been developed at irregular intervals by short adits, open cuts and trenches. Some enrichments occur but these appear to be small and sporadic.

Records of a limited amount of sampling prior to 1900 are quoted. Although the openings were systematically sampled in 1907 after the last work was completed, the assay results are not now available.

Three mineralised zones have been indicated in which possibilities of the occurrence of low grade ore bodies are assumed.

Apart from the area surveyed continuations of the mineralised belt may be looked for :-

- (1) To the north of Red Hill, along south western foothills of Mt. Murchison, in the schists near the contact with conglomerates.
- (2) Along the easterly, southerly and westerly extensions of the contact bordering the Red Hill chloritic schist embayment.

Much more exploratory work must be attempted before the economic potentialities of the district can be reviewed. To this end it is recommended that a geophysical survey of the area be instituted and that the indicated zones be the first objectives in the following order:-

- (1) Northern Zone
- (2) Southern Zone
- (3) Eastern Zone

Any intense anomalies indicated by the geophysical surveys should then be thoroughly tested by drill holes to ascertain the quantity and average quality of any ore-bodies revealed.

Mines Department, HOBART. F. BLAKE ACTING GOVERNMENT GEOLOGIST