

PRELIMINARY REPORT

on

THE RAZORBACK TIN MINEINTRODUCTION -

On the 26th day of April 1909 a Reward Claim of 10 acres was granted to P.P. Quinn for the discovery of tin ore at Dundas. The honour attached to the discovery is shared by Peter Hodge, his partner, who assisted also in the preliminary operations of development. This property had been held under lease for lead and silver and iron oxide by many parties during the past thirty years, and even since it has been known that tin only of the commercially important metals is found there, the ownership has changed several times. A lease of the property was ultimately obtained by O.C. Kingsley, who, with his partner E. Woodward, subsequently recovered several tons of tin ore in sluicing the detritus of the ore-body.

In 1918, A.M.T. Page and C. Wood, securing an option of purchase, formed a small company known as "The Peace Tin Mining Syndicate" for the purpose of erecting the necessary machinery and developing the mine. Before these works were fully accomplished, funds became exhausted and operations were suspended. Last year a controlling interest in the mine and plant was purchased by J.L. Frisoni, who, under agreement with F. Johnson and party, has since been successfully operating the mine on the share system.

AREA, SITUATION, &c. -

The property comprises Mineral Lease 7771/M of 80 acres, Machinery lease 8243/M of 5 acres, and Water Right Lease 2036/W of 20 sluice-heads.

The southern boundary of the mineral lease is only 8 chains from the Dundas Railway, and not more than half-a-mile from the township. Zeehan, the chief mining centre of the western district, is 6 miles distant by rail and is connected with the ports of Strahan and Burnie and with the chief industrial centres of Tasmania.

The industrial activities of Dundas in the past depended upon the production of iron and manganese oxide fluxing material and silver-lead and zinc ores. Since the closing of the works of the Tasmanian Smelting Company at Zeehan, the township has been abandoned by all but a few of the residents and many houses are now vacant. The population of Dundas is now only 25 and there is housing accommodation for one hundred. A train runs from Zeehan one day (Friday) a week.

PHYSIOGRAPHY -

Dundas at an elevation of 700 feet lies in a depression at the base of Mount Dundas, which rises to an altitude of 4000 feet. The high range extends unbroken from the south-east to the north and north-west; south-west and west low hills afford very little protection from the severe storms which come from that quarter. The rainfall is fairly general throughout the year, the annual precipitation being from 90 to 110 inches. In summer and autumn dry periods of a fortnight's duration are not uncommon.

Parts of the area are exceedingly rugged although the lower hills are characterised by gentle slopes and smooth outlines. Many sharply incised steep valleys indent the highlands but a few of them closely approach the centre of the range. In few of these valleys do streams persist throughout the summer although the main stream (Dundas Rivulet) affords sufficient water for general mining requirements, but not for the generation of power. The hilly nature of the country enables mining in the early years of production to be performed through adit openings, and open-cutting of the ore-bodies is possible in some parts.

The sedimentary rocks exposed in the district include Pre-Cambrian quartz and argillite schists and Cambro-Ordovician rocks of the Dundas series. The Pre-Cambrian occur outside the area under review and therefore will not be dealt with. Sediments belonging to the Dundas slate group are quartzites, sandstones, grits, conglomerates of two distinct beds, breccias and tuffs. An attempt has already been made to distinguish the green, purple and reddish slates, tuffs and conglomerates from the other group which consists of sandstones, grits, quartz conglomerates and grey and black slates; but the evidence in hand is not conclusive and the question of relative age will be left in abeyance for the present.

The Dundas slate series has been intruded by an olivine-rich basic rock now completely serpentinised. This serpentine dyke is over half a mile thick at Dundas and is well exposed throughout the area, but southward the covering of sedimentary rocks has not been completely removed. It is part of a great intrusive extending north and south many miles. This beautiful sea-green rock is the most striking geological feature of the district, not only because of its physical attractiveness but because the most important pre-bodies are closely associated with it.

The close genetic relation that exists between this rock and its acidic component, the granites and granite porphyries has been remarked so often that the phenomenon will not be dwelt upon in this account. Suffice it to state that the appearance of one may be taken as an indication of the near presence of the other. Now, in this district there is no record of an outcrop of granite or porphyry, yet are found minerals of many kinds - tin ore among them - which could be derived only from solutions emanating from a granite magma. With the exception of osmiridium, nickel ores, and chromite, which accompanied the basic intrusive, the ores of all other metals of commercial importance originated from the acidic portion of the magma. From the foregoing it follows that the granite batholith lies at no great depth below the surface in the Dundas district. In fact the carbonic acid emanations from the underlying granite are responsible for the conversion of the peridotite and dunite rocks of the basic intrusive into serpentine, and the separation of the clay, ironstone, and quartz which accompany it. Much of the ironstone covering of the serpentine was formed in this way from the iron constituent of the original basic rock and does not form the capping of lodes. In some cases it is difficult for the uninitiated to distinguish between the ironstone so produced and that occurring in lodes. The last differentiate of the granite magma, the "acid extract" contains the mineralising solutions and the agents that completed the process of metamorphism.

The last stage is illustrated by the deposition of metallic minerals and the further transformation of the basic rock (serpentine) into dolomite, talc, chrysotile, quartz, magnesite, manganosiderite, rhodochrosite, etc. Such alterations are most prominent along the lines of contact between serpentine and slate and where the lode fissures traverse serpentine. The greatest effect also is noticeable where high temperature minerals, such as cassiterite (tin ore) pyrrhotite and arsenopyrite are highly developed. The most striking change in the vicinity of the tin ore lodes is the complete transformation of serpentine into cellular quartz in one part and dense cherty quartz in another. This secondary quartz occurring along the line of contact through the Razorback property is referred to locally as "porphyry." Another extraordinary development is that of talc which is commonly associated with the tin ore, either massive and compact or soft and unctuous. Dolomite is not only a companion of tin ore, but, in other parts of the district, forms generally the matrix of the lead and zinc ores.

THE TIN ORE-BODIES -

Tin oxide ore (cassiterite) is at present the only product of the Razorback Mine. It occurs at or near the contact of slate and serpentine, and, in the unoxidised portion of the lode, always associated in intimate relationship with arsenopyrite, pyrrhotite and quartz. The first change noticeable in the sulphidic ore is that of pyrrhotite to marcasite (here termed pyrites), followed by the separation of the arsenic as oxide, the rapid conversion of iron sulphide to sulphate and ultimately into limonite or goosan. The oxidation of the sulphides and the dissolution of the sulphates by percolating waters bring about the release of the cassiterite and the binding of cellular quartz which appear as gritty friable material resembling ashes. Where the "ashes" appear in the oxidised portion of the ore-body the tin content is invariably high. Incipient oxidation of the ore out of contact with air results in the transformation of pyrrhotite into marcasite and part of the arsenopyrite into orpiment. When these secondary minerals are brought into contact with the air oxidation is intensified and the material rapidly disintegrating, releases the contained tin ore. Cellular ferro-manganese oxide generally represents the oxidation product of the manganosiderite and is usually devoid of tin.

In addition to the common accessory minerals, the ore contains crystalline chromite, a foreign mineral derived from the serpentine gangue. It is not easily perceptible in unwashed material but it shows up prominently on the concentrating tables.

The ore here found occurs in a lode at or near the line of contact between slate and serpentine. The lode material consists dominantly of a ferro-manganese oxides and quartz and is essentially of the replacement-fissure type. It is of great extent and width, passing in a north-north-west direction through this and the adjoining property. Ore occurs in the lode in shoots erratic in size and distribution and likewise in value. The shoots dip north-easterly at a fairly high angle and pitch northward at an angle of much lower degree.

There location appears to be governed by the occurrence of cross-fractures which form an angle of 45 degrees with the strike of the lode and dip of which gives pitch to the shoots. It seems reasonable to assume that at such junctions the greatest deposition took place.

DEVELOPMENT -

Exploratory works consist of a large number of deep trenches cut at regular intervals across the outcrop of the lode over a distance of 2000 feet, and two shallow shafts. Developments of a more permanent character consist of seven adit-crosscuts with occasional short laterals driven on the course of the lode. These are all indicated on the accompanying plan. In addition to these works, the main ore-shoot has been well exposed in two open-cuts, one of considerable dimensions, from which supplies are now being drawn for treatment in the milling and concentrating plants.

No. 1 adit driven on a north-westerly course penetrated the ore-body at 130 ft and passed through it at 140 feet from the entrance. The ore-body consists of ferro-manganese oxide and interlacing quartz and is contained in massive crystalline talc. Where intersected, the ore contains very little tin. At 169 feet the dark grey slate wall-rock is entered and the adit penetrates it a distance of 29 feet.

No. 1 Open Cut - This is the most important work yet performed on the property. The opening is 80 feet long and 50 feet wide at the top converging to 25 feet at a depth of 30 feet from the original surface. With the exception of a few wonderfully rich boulders of sulphidic material, the ore here is completely oxidised and very soft. The width varies from 6 to 12 feet and is becoming narrower in the northern end of the cut. It is not expected that this shoot will continue much further northward at that level as it pitches sharply in that direction. Below the floor of the open-cut two shallow winzes have been sunk on very rich sulphidic ore, but very little has been removed. One of these winzes is accessible for inspection.

Forty feet below this open-cut, No. 2 adit passes through the southern end but does not reach the ore-body. At the time of the examination this adit was not accessible. According to report the end is in very hard dolomite which effectively arrested progress and caused the operators to attack the ore at another point. As the ore-shoot pitches northward, this adit if continued on its present course would not intersect rich ore.

No. 3 Adit is 136 feet long and bears a little south of west. It passes through a body of massive talc and dolomite before reaching the lode which here contains pyrrhotite and pyrite. The value of the ore here is not known.

No. 4 Adit was driven directly underneath a body of rich ore exposed in a trench at the summit of the ridge.

It is parallel to No. 3 and reaches the slate footwall at 193 feet. At 140 feet a rise was cut to the surface. Rich ore occurs in the rise from the outcrop to 20 feet where it passes on its northerly pitch. Analyses in the table indicate the value of the material between the rise and the slate wall-rock. An inch band of grey selvage on the slate wall is rich in tin ore - this was not sampled. (It is worthy of note that the wall of contact between the serpentine and slate is nearly upright wherever it has been exposed for examination.). The ore here is completely oxidised and consists largely of ferro-manganese oxides.

No. 5 adit has not exposed any payable ore. At 56 feet massive serpentine gives place to decomposed lode material which continues to the end at 115 feet.

No. 6 adit was driven 121 feet on a bearing of 278 degrees. At 24 feet hard dark green serpentine gives place to soft impure talc, and at 70 feet a four-foot band of gossanous lode material is entered. This abuts hard cherty quartz, evidently a complete silification of serpentine, which continues to 121 feet. No. 7 adit was driven many years ago by prospectors for silver-lead ore. It is situated on the other side of the ridge. From the main crosscut, bearing 75 degrees, a drive leads on a course of 20 degrees on a band of friable quartz. The slate wall is left a few feet from the entrance, and is succeeded by talcose material to 70 feet where a ten-foot band of friable quartz breaks the continuity of the decomposed serpentine. Farther ahead the adit is not accessible.

These constitute all the works of any importance. As crosscuts they have a prospective value, but they have been cut without regard to geological conditions. The situation of these works clearly shows that the operators considered that the rich ore at the outcrop would continue directly below, whereas the short shoots of ore have a northerly pitch, and the adits therefore pass below them. It is a striking fact that not one drift has been cut on the lode from any adit crosscut. Insofar as the investigation has been carried there appears to be no reason why other shoots comparable in richness with that exposed in No. 1 open-cut should not be found. Such shoots are indicated along the outcrop at several points and should be explored immediately on the line of pitch.

The following analyses are representative of samples taken at the mine, not for the purpose of ascertaining the value of the mine as a whole but to determine the grade of material at the two points of operation. A systematic sampling could not be undertaken in the time available. Calculations based on these analyses cannot be made because development has not been carried far enough to estimate the quantity of ore at the points mentioned.

TABLE OF ANALYSES

No. of Samples	Description of Material	Place at which samples were taken	Width of ore sampled	Tin Content %
173	Ferro-manganese Oxides	At Rise, No.4 adit	Feet 4	0.20
174	Ferro-manganese Oxides	West of Rise, No.4	" 15	0.18

TABLE OF ANALYSES (ctd)

No. of Sample	Description of Material	Place at which samples were taken	Width of ore sampled	Tin Content %
175	Quartz and ferro manganese	West of No. 174	5 feet	0.08
176	Decomposed serpentine	At end of No. 4 adit.	3	0.10
177	Gossan	South end of No. 2 open cut	4	2.15
181	Decomposed serpentine and marcasite	End of small prospect drive below No. 2 open-cut	3	0.18
182	Gossan & quartz	East of No. 181	3	0.89
183	Ditto	East of No. 182	5	1.07
184	Decomposed serpentine	South of No. 183	6	0.05
185	Ditto	South of No. 184	6	0.05
186	Gossanous serpentine	South of No. 185	6	0.66
187	Marcasite	North of No. 186, end of winze	3	0.84
188	Gossan	North end of No. 2 open-cut	4	0.51
189	Gossan	East of No. 188 in open-cut	4	3.51
190	Gossan	East of No. 189 in open-cut	4	0.79

Samples 173 to 176 were taken from the ore-body and wallrock exposed in No. 4 adit. This adit was driven directly underneath a rich body of ore exposed in a trench on the summit of the ridge. The small proportion of tin in the lode material at adit level indicates that, in accordance with other occurrences here, the ore shoot pitches in a northerly direction at a high angle.

Samples 177 to 190 indicate the tin content of the ore shoot exposed in the open cuts and workings a few feet below.

MILLING AND CONCENTRATING PLANT -

The milling section of the plant consists of a battery of ten stampers, each weighing 800 pounds, and a Forward-Down grinding pan. The stamp battery is of the old screw-head type, but is fairly efficient and capable of much useful work. The grinding pan is of late design and is in good order.

The crushed ore is concentrated on two Card, one Wilfley, and one Curvilinear table, and the slimed material is further treated on a canvas strake. Accessories to the plant consist of hydraulic classifiers and a sand pump.

189

The plant is driven by means of a low pressure turbine operating under a head of 40 feet. Water is obtained from Dundas Rivulet over a mile upstream and conveyed to the plant in a well-constructed ditch and flume at the rate of 200 cubic feet per minute. This supply is insufficient for the purpose, as the battery and grinding pan cannot be operated together, but at the intake of the water-race a dam of large capacity could be constructed thereby providing an ample storage during the periods of low rainfall.

The milling and concentrating plant is incomplete and not well designed, but the machinery will serve as a nucleus for the modern plant which it is proposed to erect shortly. Owing in the first place to the clay nature of the matrix and to the fine grain of the ore, and also to the inefficiency of the plant, the loss in treatment is heavy and is estimated at not less than 40 per cent. These losses could be greatly reduced by the addition of more slime-saving appliances and large settling vats, and by the provision of another power unit to operate the concentrating section independently and thus ensure smooth running conditions. The containing rock, consisting largely of soft talcose material, passes through the battery very quickly being easily reduced to slime, thereby causing overloading of the tables. This difficulty is aggravated by the lack of settling tanks which should be used to remove a large portion of the waste material held in suspension by the water. Despite the heavy loss, no serious attempt has been made to arrest the tailing sands in boxes or in dams for further treatment.

Only five heads of stamps were employed by the tributors and the battery was in operation for 80 days only last year. The average crushing capacity of the mill is eleven tons per day of eight hours.

#### TRANSPORT AND WATER SUPPLY -

Ore is transported from Main Open-out to the treatment works in a truck of  $1\frac{1}{2}$  ton capacity running on a wooden-rail 2 foot gauge tramway. The grade of this tramway, which is 28 chains long, is so steep that the brakes have to be applied to the trucks all the way. A horse draws the truck on the return journey to the mine. A stout horse is employed for this work and the strongest animal requires two stoppages for rest on each journey. By this means as many as 25 truck loads have been conveyed in 8 hours. A lower level steel rail tramway on a gentle grade would make light work for the horse, double the capacity, reduce the cost by half, and enable the operators to erect storage bins at the mine. Part of the formation of a low-level tramway has already been completed.

Reference has already been made to the water-supply, and there is little further to add. During all seasons of the year the supply for the milling and concentrating plants is ample, but not for power purposes. The suggestion is offered that the concentrating machinery be run by water power and that a Diesel oil-engine be employed to drive the crushing and grinding machinery. This would obviate the necessity for dam construction and allow the present mill site to be retained. The adoption of this plan would provide facilities for continuous operation and perfect control.

770

PRODUCTION -

No details are available concerning the production of tin ore from this mine during the early period of its development, but it is reported that in sluicing the detrital material P.P. Quinn and Peter Hodge saved 5 tons of concentrated ore. The records during the Kingsley regime are incomplete, details concerning the operations of the Peace Syndicate, however, are available and are given herein. Since its acquisition by J.L. Frizoni and party, it has been worked with advantage to all concerned on the leasing system. The lease applies to oxidised materials only and is tenable for two years, of which one year has already expired. Under the agreement the lessees receive wages at the rate of 14/- per diem and after deducting the total amount, the remaining portion of the revenue is equally divided between the lessee and the lessor. Renewals of plant are paid out of general revenue, but all other expenses are met by the lessee. Under this arrangement a profit of 16 per cent. on working costs has been made. Since April of last year the work of 4 men has produced ore to the value of £1020. Actually production commenced at the end of June as a large amount of preliminary work had to be performed before the ore could be attacked. The tin content of the crude ore mined and milled is shown in the table given hereunder. In this table no account is given of the ore won in sluicing the detrital material.

(For table see next page).

ORE RESERVE -

On the basis that a body of ore is required to be open on three sides to estimate the quantity in sight the ore reserve is very small. Under the present system the lessee cannot be expected to keep development well ahead of mining - to look a month ahead is sufficient for his purpose. The lessor likewise cannot undertake the necessary work of development and intends to seek outside assistance. A very considerable outlay is necessary in order to ascertain the true value of the property and to provide additions to the plant. At present on the rigid basis mentioned, the reserve is not more than 200 to 300 tons, but the probable reserve, of course, is very considerable.

The value of the crude ore cannot be estimated because of the rapid variations from point to point. In an ore-body of this kind value based on production is the only sound guide. From the table it will be seen that the proportion of tin (Metallic) in the crude ore varies from 0.51 to 1.34 per cent.

In the sulphidic ore exposed for examination, the proportion of tin is much higher, some of it being of extraordinary richness; but the extent of this grade of ore is not known. In the early stages the tributors rejected everything save the richest boulders of sulphide ore.

2.  
1914

TABLE SHOWING QUANTITY AND VALUE OF TIN ORE PRODUCED

DATE	NAME OF PRODUCER	CONDITION OF ORE	QUANTITY OF CRUDE ORE MILLED. TONS	TIN CONTENT OF CRUDE ORE PER CENT.	NUMBER OF BAGS	WEIGHT OF PARCEL				TIN CONTENT OF CONCENTRATE PER CENT	VALUE AT MINE		
						Tons	Cwt.	Qrs.	Lbs		£	s	d
	Kingsley & Pty.	Lump	--	30 to 60	--	4	2	0	0	30 to 60	360	-	-
1920	Peace Tin Synd.	Concentrate	--	--	--		3	2	1	70.0	28	17	2
1920	Peace Tin Synd.	"	--	--	--		10	2	23	67.0	84	1	1
1923	Peace Tin Synd.	"	--	--	--		8	3	11	60.0	53	8	5
9 June	Johnson & Pty.	"	--	--	9		9	1	15	67.1	50	1	1
24 Aug.	Johnson & Pty.	"	265	0.51	27	1	7	0	6	65.8	149	9	4
14 Sep.	Johnson & Pty.	"	51	1.17	12		12	0	18	70.0	68	12	5
28 Sept.	Johnson & Pty.	"	125	0.6	15		15	0	13	71.3	92	13	7
12 Oct	Johnson & Pty.	"	80	0.9375	15		15	0	17	71.8	93	3	11
3 Nov	Johnson & Pty.	"	93	1.34	25	1	5	2	0	71.6	166	19	10
7 Dec.	Johnson & Pty.	"	136	0.88	24	1	4	3	6	70.9	176	7	4
21 Dec.	Johnson & Pty.	"	124	0.766	19		19	3	21	69.1	148	2	3
1924	Johnson & Pty.	"	--	--	8		8	1	9	69.4	71	17	2
						13	2	2	0		546	13	7

X. Estimated value

Although the lode continues unbroken over 2000 feet in length and is from 5 to 30 feet in width, pay ore occurs only in short shoots separated by lode materials almost barren of tin.

BY-PRODUCTS

Some of the sulphidic ore contains a large proportion of arsenic, the saving of which in future operations on a more extensive scale may be worthy of consideration.

This depends, in the first place, on the quantity available, and also on the ultimate necessity for a calcining plant when the oxidised ore shall have been removed and the sulphidic zone shall have been entered.

The oxidation of arsenopyrite if associated with marcasite under natural conditions is very rapid and is sufficient to set free the contained tin ore; but it must be kept in mind that the zone of primary sulphides, where pyrrhotite takes the place of marcasite, lies at no great depth below the surface. If developments warrant it provision should be made for the treatment of an ore consisting largely of pyrrhotite. Assuming that a calcining furnace becomes a necessary adjunct to the existing plant, long flues should be attached to collect the arsenious oxide that volatilises in the process of roasting.

The roasted ore after having been reground and treated on concentrating tables for the tin ore it contains becomes of value as a paint material. The complete oxidation of pyrrhotite and arsenopyrite, whether under natural conditions or by the direct application of heat, produces a red pigment of considerable value. If this residual material is dumped and exposed to the atmosphere for a few months the colour deepens in tone and the value is enhanced accordingly.

The arsenious oxide and the iron oxide pigment may prove valuable by-products in the process of tin-ore concentration - that depends upon the quantity and quality.

A selected specimen of tin ore with arsenic was composed of:-

Silica	...	...	...	8.90	per cent
Ferric oxide	...	...	...	22.06	" "
Alumina	...	...	...	1.94	" "
Lime	/..	...	...	nil	" "
Magnesia	..	...	...	2.89	" "
Arsenic	...	...	...	20.93	" "
Antimony	...	...	...	0.43	" "
Tin	...	...	...	11.33	" "
Sulphur	...	...	...	0.13	" "
Loss on ignition	..	...	...	21.80	" "

The analysis is interesting in showing the comparative proportion of the various constituents.

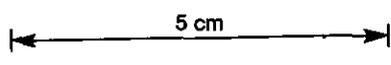
SECTION 3756/M - LESSEE, PETER HODGE -

This is a 20 acre block lying north and adjoining the Razorback property and on the same line of lode. It occupies the northern extension of Lewis Hill, a low ridge flanking Razorback Mountain.

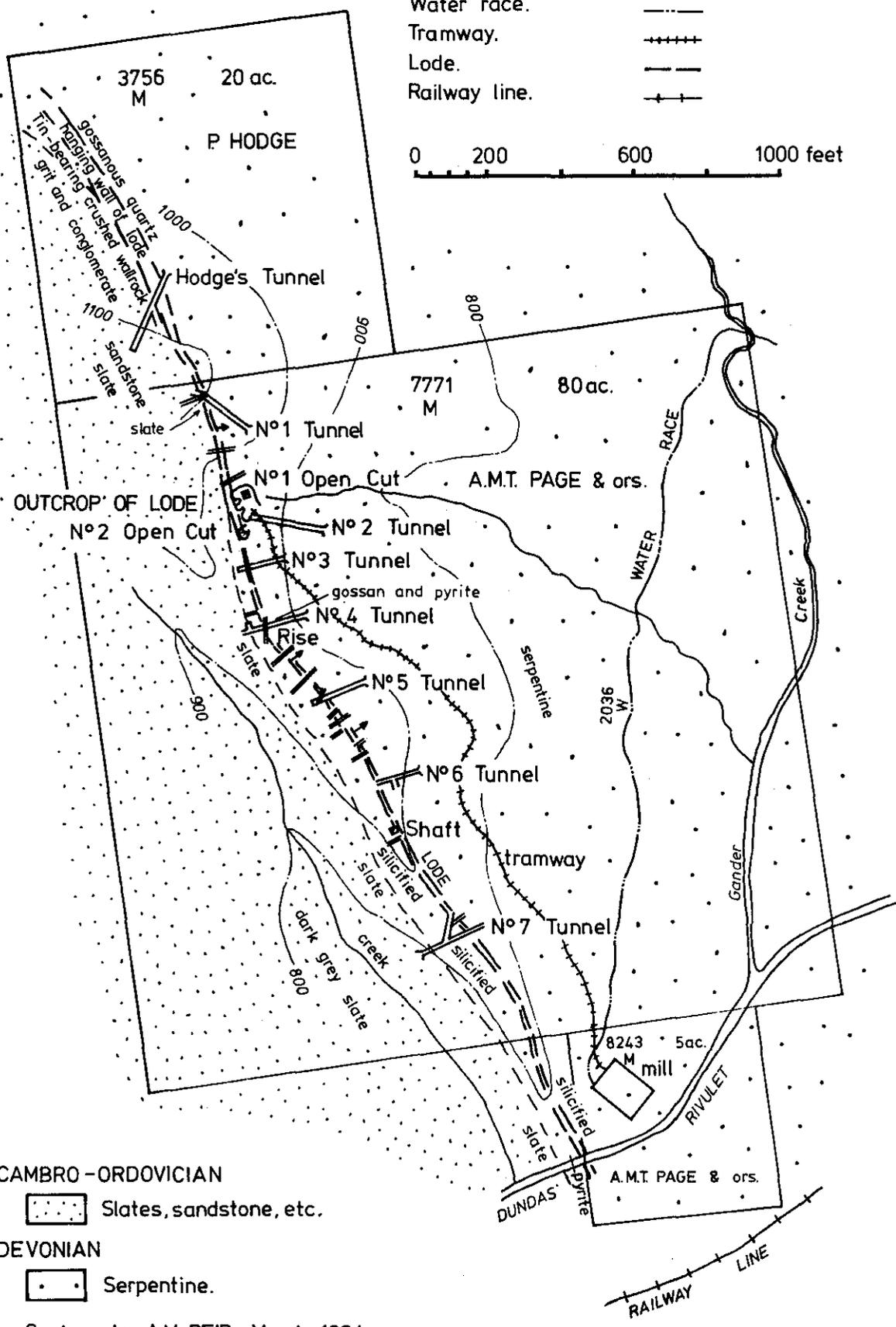
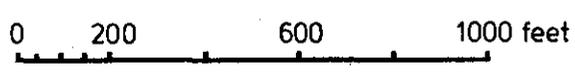
Like the occurrence just described the lode here is

173a

# GEOLOGICAL SKETCH MAP RAZORBACK MINE AREA



- Geological boundary. ---
- Contours. - - - - -
- Water race. — · — · — ·
- Tramway. + + + + +
- Lode. — — — — —
- Railway line. — + — + — +



- CAMBRO-ORDOVICIAN
  - Slates, sandstone, etc.
- DEVONIAN
  - Serpentine.

Geology by A.M. REID, March 1924

als

of the replacement-fissure type and occurs close to the line of contact between serpentine and brecciated slate and conglomerate, which also is impregnated with tin ore. The main ore-body is 20 to 30 feet wide and consists dominantly of limonite and interstitial quartz with a little cassiterite. Manganese oxide is not at all prominent in any part of the ore-body. (The presence of much ferro-manganese oxide is often indicative of a mangano-siderite origin in which tin ore is not found in profitable proportion). The limonite suggests a derivation from pyrrhotite, a common companion of tin ore.

The intrusion of the serpentine is probably responsible for the brecciated condition of the wall-rock. Into this crushed material tin-bearing solutions found easy access depositing their burden in the interstices between the detached particles. Thus were formed the blebs and veinlets of clean ore exposed in sluicing the detritus of the brecciated rock. In these deposits, pyrite takes the place of pyrrhotite as the associated mineral. This formation has provided the bulk of the ore won on the section.

The principal development is an adit crosscut which passes obliquely through the main lode near the entrance and continues 150 feet further into the brecciated wall rock. A drift leads from the adit-crosscut along the footwall, of the lode, but has not revealed ore of commercial importance. It is stated that fair prospects were obtained at many points in the crosscut but this was not verified. The other development works consist of a small open-cut and one or two trenches.

Sufficient work has not been performed to test the value of the deposits. Prospecting along the course of the lode by adit is recommended as the cheapest and most expeditious way of obtaining the desired information.

CONCLUDING REMARKS -

The foregoing account should convey an idea of the origin and nature of the ore and the commercial possibilities of the deposits. Unfortunately the works thus far performed have not, in some cases, been productive of good results, but this is largely due to faulty location. Haphazard crosscutting is unsatisfactory; drifting along the course of the lode and occasionally crosscutting to the walls is the only safe method of exploration. No drifts have thus far been cut.

This lode a mile further northward has shed a very considerable amount of ore, a portion of which has been recovered in sluicing. The occurrence there suggests the probability of other shoots on the intervening line of lode. So far no serious attempt has been made to prospect the contact country north of Hodge's where conditions are equally favourable for ore deposits.

All things considered the prospects appear decidedly encouraging, but a cautious policy is desirable and care should be exercised in the design of future operations.

(sd) A. McINTOSH REID  
GOVERNMENT GEOLOGIST

7th March 1924.