

REPORT  
on

Mineral Leases Nos. 79P/M, 80P/M, 82P/M, 83P/M, 78P/M,  
71P/M, 64P/M, 65P/M, 66P/M and 107P/M.

KING ISLAND

Charted in the name of

THE SEA ELEPHANT PROSPECTING ASSCN.Geographical Position

King Island is situated at the Western entrance of Bass Strait midway between Tasmania and Victoria. The island is 40 x 16 miles, the longer axis lying due north and south.

Situation and Access

The leases are situated about 5 miles west of Sea Elephant Bay on the east coast. From Currie, the principal settlement on the West Coast, the distance by road is 16 miles. The road for the greater portion of the distance is practically level and in good condition. Some stretches of it after branching off the main road are not formed, and being through level country, pools of water accumulate on it in the wet season. With a little attention to drainage and forming, it could be rendered fit for light traffic at any season of the year. In its present condition, the journey from Currie to a point within a short distance of the leases can be negotiated by motor car without difficulty in a little over an hour's run. The last mile section of the road is merely an unformed cart track.

Topography

The area embraced in the leases as well as the surrounding country has no outstanding topographical feature, being of low relief with a gentle and even slope southerly towards the valley of the Sea Elephant R., the nearest point to which is about one mile from its central portion. The Sea Elephant R., a small low lying stream, takes a north-easterly course past the leases to a point within three-quarters of a mile of the sea shore, thence to the south-east emptying into the sea a little to the north of Sea Elephant Bay. The general level of the area has an altitude of 80 feet above the sea, (aneroid reading) at the nearest point on the Sea Elephant from it the altitude of the latter is 24 feet above sea level. The whole area and the surrounding country viewed from the most elevated point on the leases is one of an unbroken plain extending in all directions. To the east two small hills closely situated rising to a height of a few hundred feet above the general level can be seen adjacent to the sea coast.

The area is sparsely covered with light stunted scrub. A belt of timber lies about a mile to the north-east; this consists of young gum trees 6" to 8" in diameter and represents a younger growth, the older forests having been subjected to a succession of bush fires which destroyed most of the older timber. Two small creeks flow through the area and junction on section 64/P taking a south-east course to the Sea Elephant R. The creek is small and shallow and in the summer months would carry very little water. There are very fair facilities for water storage by dams at various places along the course of the stream. At the camp site on the western portion of section 64P/M the altitude above sea level (by aneroid) is 80 feet, at a short distance to the north-east on the opposite side of the creek the ground rises

sharply to a maximum of 166 feet and continues at that altitude going north-easterly. From north-west to south-east there is a gradual fall towards the Sea Elephant R. in the form of a wide flat valley.

### History

The discovery of tin in commercial quantities dates back to some six years ago when N. White prospecting in the small creek which flows through the area obtained small quantities of tin oxide from the rubble by dish washing.

Shortly afterwards a company called the Currie Tin Mining Co. was formed on the Island and equipped the property with a plant consisting of 60 B.H.P. portable steam engine, an eight inch gravel pump, sluice boxes etc. Following about six months productive work operations were suspended, the quantity of tin recovered, and the relatively small body of drift available being apparently unpayable. At a later date Mr. P. Hawkes took over the working of the mine and carried on active operations for a considerable period when work was finally abandoned by him. The actual production of tin is not known. Altogether an area of about half an acre of ground has been sluiced. Subsequently a Mainland syndicate called the Sea Elephant Prospecting Association acquired the leases and commenced a systematic examination of the area by sinking shafts and boring, which work is at present in progress.

### Geology

From a geological aspect the whole area comprised in the leases as well as the surrounding country for miles in extent, the impression is gained that the land surface during the ice age has been subjected to severe erosion. This belief is strengthened when a study of the drift underlying the surface soil is made.

The latter consists of sand and boulder clay; in places sand alone covers the drift, in others, clay. In parts of the area the deposit of covering sand is iron-stained and cemented. The recent alluvium covering the drift varies from a very thin layer to a depth of 20 feet. The drift referred to is made up of more or less angular fragments varying in size from a foot in diameter to sand, of white opaque quartz, micaceous schist and micaceous slate associated with clay, also tin oxide and black spinel in granular form; and small quantities of zircon sand. In the southern portion of the area tested, considerable quantities of iron pyrites are distributed through the drift. The pyrites occur in grains of an average size of about 1/16 of an inch. It is found that the pyrites is not associated with the tin to any extent to speak of. In areas where the best prospect of tin occur there is an absence of pyrites.

The drift may be described as a glacio-fluvatile deposit carried to its present position by an ice flow travelling from a north-westerly direction to the south-east down the general depression in the plain extending towards the valley of the Sea Elephant R. This morainic debris is composed chiefly of opaque white, to dark coloured quartz fragments of an average size of 2" to 3" in diameter, also angular to subangular pieces of micaceous schist and micaceous slate; the latter often showing black tourmaline on the cleavage faces.

The schist and slate are much softened through age and weathering agencies. The slate where exposed in a face in the old workings shows a most irregular arrangement of

of the component fragments of rock, there being a complete absence of evidence that the deposit has been subjected to the action of flowing water.

In portions of the drift well formed prisms of the mineral staurolite (silicate of iron and aluminium) are plentiful.

(This mineral crystallises in the orthorhombic system and a number of perfect specimens in cruciform shape have been found. The prisms vary in size from  $\frac{1}{4}$ " to 1" across by an inch to  $1\frac{1}{2}$ " or more in length. Staurolite is usually found as embedded crystals in mica-schist.)

The black spinel (oxide of magnesia and aluminium) referred to is fairly plentiful and occurs in a form of more or less rounded grains of about  $\frac{1}{2}$ " in diameter. This mineral in appearance resembles black tin oxide: it is slightly harder than the latter from which it can be readily distinguished by its relatively inferior weight. The specific gravity is 3.7 while that of tin oxide is 6.86.8 to 7.

The tin oxide occurring in the drift is in the form of abgular particles of an average grain size of about  $\frac{1}{32}$ ". In some parts it is much coarser, samples of the concentrate showing a grain size of  $\frac{1}{4}$ " or more in diameter. In colour it varies from dark to very light brown. It is not found here in crystal outline. The particles represent the waste material from tin ore lodes such as those occurring in the reef sections to the north-west.

In the area tested the underlying rock consists of mica-schist of pre-Cambrian age. This rock as a rule is weathered to a clay for depths varying to a foot or more from the surface. In the old workings an exposure of the schist in the solid form can be seen; here the bedding planes have a general trend of N48°W dipping at an angle of 20° south-west. The surface of the schist on which the drift is lying judging from the information obtained by boring is fairly even.

What appears to be the undoubted source of the tin bearing drift is a lode or series of lode formations located on sections Nos. 79P/M, 80P/M, 82P/M, and 83P/M situated some three miles north-west of the area above described.

Several shallow shafts have been sunk at various points on lode outcrops on these sections. The lode material consists of quartz similar to that of the drift. Samples of the quartz contain tin oxide in the form of veins and irregular patches through the stone. The tin oxide in the lode is in every respect similar in character to that contained in the drift. An examination of the workings was not possible owing to the shafts being full of water. The material excavated there from is identical with that composing the drift. Midway between these points some prospecting by trenching and a shallow shaft has been carried out on a lode formation several feet in width consisting of dark coloured vitreous quartz showing small quantities of black tourmaline. This formation is similar to that referred to further north but is not so rich in tin.

All rocks in the area examined are of sedimentary origin, no trace or evidence of the presence of igneous rocks having been observed. Granite country is said to occur about

1½ miles to the east of the point where the lode formations have been located in the shafts referred to.

### Former Workings

Following the discovery of tin in the drift an effort as stated was made to work the property. Operations were commenced near the eastern boundary of section 64P/M on what appears to be the north-eastern extremity of the tin-bearing ground. Here a small paddock was worked on a shallow run of drift in a narrow depression skirting along the base of the rising ground to the eastern side of the creek. There is no lateral extent of the tin bearing drift here, consequently the work was carried out under great disadvantages and it is not surprising that operations were financially unsuccessful and the work abandoned. At that time the ground had not been thoroughly prospected, and the operators did not have the information concerning its value and extent that is now available.

The present lessees have systematically proved by boring and sinking prospecting shafts an area of approximately 320 acres in extent. Altogether over 600 bores have been put down and over 100 prospecting shafts have been sunk on the area. The bores have been lined in rows parallel to the boundary lines of the sections varying from two to four chains apart and spaced in the rows two chains apart.

The full limits of the tin bearing ground have not yet been determined and further boring is in progress. The ground to the west of section 71P/M also warrants prospecting by boring.

The data obtained from the bores clearly indicates that the run of tin bearing ground takes a course from the north-west to the south-east through the sections and that the values decrease sharply towards the eastern portions of sections 65P and 66P, also that the area bored which covers that on which the prospecting shafts have been sunk shows an irregular distribution of tin in the drift. In some portions the drift has very little superficial covering, in others it attains a depth of 20 feet. The average depth of the overburden on the area of 50 acres referred to below is 2.7 feet; the average depth bored to reach bed rock in the same area is 6.18 feet. The actual thickness of the tin bearing drift is therefore 3.48 feet.

In places the overburden consists of sand sometimes in a more or less cemented form, in others it is a clay or a mixture of both. Being of recent origin derived from alluvium washed down by rain water and small streams from slightly elevated areas in the vicinity, it is not tin bearing and can therefore be removed and disposed of without the necessity of passing it through the sluice boxes with tin bearing drift.

The latter carries more or less calvee material but on the whole judging from that thrown out of the prospecting shafts it is a class of drift not difficult to work.

The average size of the stones would not exceed 2" diameter. The relative size of the individual pieces range from sand to a foot in diameter but comparatively few of the latter size are to be seen.

### Boring Values

The area as stated has been extensively bored, the results showing a considerable variation in the tin ore content of the drift ranging from a trace to 14lbs. to the cubic yard.

A large part of the ground bored contains tin ore in such low proportion as not to allow of profitable operation.

On the north-west portion of section 64P and the south-west part of 71P is an area of tin - bearing ground approximately 50 acres, which from the results indicates an average of 1.13 lbs of tin per cubic yard. The average depth of the bores is 6.18 feet which on calculation should carry 5.03 tons of tin ore per acre or 251.5 tons on the 50 acres.

Extending south-east from this is an area of 21 acres with an average depth of ground as proved by boring of 10.98 feet carrying 0.9 lbs per cubic yard which is equivalent to 7.1 tons of tin per acre or a total of 149.1 tons.

Combining the two areas the average depth of ground is 7.6 feet containing 870.522 cubic yards of an average value of 1.03 lbs. per cubic yard. Total tin content 400.4 tons.

The tin oxide is of the highest grade quality. There are no heavy minerals associated with it in the drift to prevent a clean product being obtained.

#### Method of Working

The ground being low-lying with very little fall it will be necessary to elevate the material to be worked on order to dispose of the tailings. The drift is suitable for treatment by the established method of hydraulic sluicing and elevation by gravel pump. Power will be required for both nozzle and gravel pumps there being no natural headpressure available from the water supply. The limited quantity of water available will render it essential to make provision for use of "return" water

#### Water

The only supply available in the vicinity of the leases is from the small creek which flows through the property. In the wet season the quantity running in the creek should be sufficient for all purposes but in order to ensure a continuity of operations it will be necessary to make provision for storage by constructing a series of dams along the course of the creek. The facilities for carrying out this work are favourable at a reasonable cost.

The Sea Elephant R. which is situated about a mile south-west of the central portion of the leases carries a fair volume of water which could be utilised if that of the creek should prove to be inadequate. To make use of the water from the river would necessitate provision for considerable addition to the amount of power needed, as a pumping station would be required to raise the water to the requisite height for use in the face. The difference in altitude between the general level of the ground in the vicinity of the camp and the Sea Elephant R. is approximately 66 feet. The rainfall recorded at Currie on the west coast of the Island taken over a period of ten years is 33 inches; inland it is stated to be at least six inches higher. The official records show a fairly general distribution of the rainfall throughout the year.

#### Lode Workings

Those known as the "Reef Workings" are on leases Nos. 80P/M, 82P/M, 83P/M and 79P/M, aggregating 280 acres. The sections lie about three miles north-west of the other leases held by the Syndicate. The area is flat and practically

treeless. Some three years ago a considerable amount of work was carried out by sinking an a tin lode formation at various points extending northerly through the leases. There are no rock exposures or lode outcrops above the surface of the ground, the prospecting shafts were full of water preventing an examination of the workings below the surface. What are known as "A" workings are on the south part of section 82P where several small prospecting shafts have been sunk to a depth of 20 feet. The country rock is a pre-Cambrian mica-schist, much softened near the surface through weathering. The lode which consists of dark vitreous quartz is said to be 14 feet wide. Some specimens of the lode material on the tip head contain tin ore in large proportion. The softening of the schist due to weathering has made the ground rather difficult to support some of the shafts having caved in near the surface.

"C" workings are on the south-western part of section 80/P. Several small prospecting shafts have been sunk on the lode, the deepest about 20 feet, two others 15 to 16 feet deep. The surface of the ground is very flat and for a depth of 3 to 4 feet consists of yellow clay. The deepest shaft was put down on a formation of hard dark coloured vitreous quartz in which occur seams and irregular bunches of dark brown tin oxide in crystalline form. The shaft being full of water prevented an examination of the lode below the surface. At the time prospecting work was in progress the water proved too heavy for windlass and bucket methods to continue further. The excavated country rock from the shafts consists of schist and black slate both being micaceous. The relative position of these rocks will respect to the lode could not be ascertained.

"D" workings. These are on the same line of lode as the former and consist of two shafts put down on the northern part of section 83P. The easterly one was sunk to a depth of 53 feet on the lode which here is similar in character to where explored further south. At a depth of 20 feet from the surface owing to the underlay the lode passes out to the west of the shaft. The other shaft was sunk at a distance of about a chain to the west presumably with the object of intersecting the lode at a deeper level but this was not accomplished probably owing to the influx of water. At a depth of 20 feet from the surface it is stated that a X cut was put out easterly to cut the lode, but was not continued far enough for that purpose.

The lode material on the tip head of the deeper shaft shows very rich specimens of tin oxide, also small quantities of iron pyrites. The country rocks here are similar to these at the shaft workings further south consisting of mica-schist and slate.

### Scheelite

In some of the samples of lode material taken from the shafts it was noticed that the mineral scheelite was associated with the tin oxide. (Scheelite-tungstate of Lime  $\text{CaWO}_4$ , is a heavy light grey coloured mineral, streak white, hardness 5, specific gravity, 5.91. It occurs in well developed crystals usually double tetragonal pyramids, but often occurs in massive form.)

(The specific gravity of tin oxide is 7, it would therefore not be practicable to separate scheelite from it by other than chemical methods. The association of tin stone and scheelite is not common. A separation of the concentrates of the mineral can be effected by fusion with sodium carbonate and lixiviation, the tin oxide remaining insoluble.)

Until more work is carried out on the lode it is not possible to make any definite statement regarding the relative

quantity of scheelite to tin stone present in the ore.

On the south-eastern portion of the Island an extensive deposit of scheelite was profitably worked during the war period.

Owing to the fall in the price of tungstic acid at that time from 55/- per unit to about 15/- per unit following the termination of the war, operations were suspended and the plant removed.

The small amount of work carried on this line of lode at the various points located and the inaccessibility of the workings through being flooded with water, no definite data concerning the structure and average value of the lode could be obtained. Judging from the quantity of material lying on the various tip heads the lode is of fairly large dimensions. It strikes nearly north and south and the dip is steeply inclined to the west. It is of promising character and has been proved by the shaft workings to persist for over a mile in length. The shaft workings are situated many chains apart on the line of lode and it remains to be determined whether the lode continues in an unbroken line between the points at which it has been located.

The most inexpensive and expeditious method of carrying out further prospecting work would be by diamond drilling. The wet nature of the country would necessitate the installation of a pumping plant if further prospecting by shaft work was undertaken. The comparatively level state of the area with no bush land makes it ideal for drilling by diamond drill. The transport of the drilling plant from point to point along the line of lode would offer no difficulty. Belts of timber for firewood are within fairly easy distance for cartage by dray or other vehicle.

#### Summary and Conclusions

From the foregoing observations it will be seen that the deposit of tin bearing drift is one of unusual occurrence. In many respects it is quite unlike an ordinary deposit which has been subject to the action of moving water in its deposition. In the latter type of deposit the drift is usually continuous along a more or less definite course such as would occur along the bank and bed of a river or stream. A deposit of morainic debris would not have the same characteristics particularly in its longitudinal extension where it would most probably rest abruptly with the melting of the ice. In other respects it is similar to an alluvial deposit of water worn material being deposited in a horizontal sheet of drift, the method of working for the recovery of its valuable mineral contents would be the same.

The quality of the tin ore concentrate washed from the borings and the material thrown from the shafts is of high grade. The division between the superficial covering of drift is very even and sharply defined which will be an advantage in working.

The Writer is indebted to Mr. D. McNab, consulting engineer to the Sea Elephant Prospecting Association, also to the foreman, Mr. C. Scott, both of whom spared no effort in supplying information and giving assistance in connection with the preparation of this report.

HOBART.  
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