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REPORT ON THE QUEEN OF THE EARTH GOLD MINE AND NEIGHBOURHOOD.

Government Geologist's Office,
Launceston, 15th February, 1900.

SIR,

I HAVE the honour to report that, in pursuance of your instructions, I visited and examined the Queen of the Earth Gold Mine, near Hogan's Track, on the 6th and 7th inst.

The mine is usually approached from Mathinna eastwards, *via* Hogan's Track, 16 miles. Opposite the turn-off to the New Carthage Mine, a footpath turns down to the Queen of the Earth, half a mile to the south. I visited it by traversing the country from the Scamander Bridge, on the coast, by a route estimated at 16 miles, but the charted distance east and west, as the crow flies, is not more than 9 miles. At the mouth of the Scamander River, where a tourists' and anglers' hotel has been started by Mr. J. G. Walker, the strata are the slates and sandstones of the Lower Silurian. On the road south of the bridge the dark sandstones weather light grey, and are of a metamorphic nature, converted into quartzite. Accompanying these are softer, unaltered sandstones. These are surmounted by recent marine wash and pebble-beds, 20 or 30 feet above present tide-mark, and form the hill spur on the south side of the river. The strike of the beds is N. 5° to 10° W., and their dip S.E. On the north side of the river, close to the bridge, is bedded yellow sandstone, with the same strike and dip. These are underlaid conformably by soft clay-slates, alternating with sandstone beds, often seamed with small veins of quartz. The road W. along the south bank of the Scamander exhibits alternations of similar slates and sandstones, sometimes distinctly schistose, and overlaid by a pebble wash, which marks the former bed of the river, when it flowed at a higher level than at present. There are signs of anticlinal flexures in the strata, for the dip at one place is reversed, and the beds are inclined to the N.W. The road passes through the farms of settlers for about 6 miles, when Mr. J. Ryan's farm, the last on the line, is reached, and thence the track leads to Robinson and Delaney's camp on the Scamander, 2 miles further N.W. Here, these plucky prospectors are working alluvial tin ground of a somewhat peculiar character. It is a wash containing pebbles of sandstone associated with a little quartz, and carrying handsome ruby and black tin ore and several good-sized nuggets of that metal. I could not see any granite detritus in the alluvial, but pieces of granite can be picked up in the river-bed near by, and the granite bed-rock itself is exposed about a mile further west. There are only two ways of accounting for this deposit, which occupies a kind of recess or former embayment of the river, *viz.*, either it has been derived from stanniferous veins in the sandstones, which is an idea supported by the almost exclusive sandstone character of the wash, or the tin ore has been washed out of the granite. I think the latter will be found to be the correct explanation. Proceeding westwards for a mile, over the usual

succession of sandstones, often schistose and much oxidised, granite country is reached, which continues, off and on, for three miles. The Scamander is often crossed running in this rock, but shortly before reaching the foot of Gentle Annie, on the Hogan's Track, hard, brown sandstone reappears, and, alternating with quartzite, continues all the way up the four-mile rise on the Ridge Hill. The Queen of the Earth Mine is situated in the same great series of strata, in which beds of hard quartzite take a rather prominent part. The rocks at this mine are somewhat harder and more schistose than those which prevail on the Golden Ridge and Brilliant sections, but I believe that their geological age is the same. Chronologically, they may occupy a lower position in the series. The creek below the mine flows over dense, bedded quartzite, and is between 700 and 800 feet above sea-level, and the same vertical distance below the Brilliant. I consider it rather probable that the granite exposed on the northern flank of the Ridge Hill underlies the Queen of the Earth sections at no very great depth below creek level. The creek, which flows eastwards through the 5-acre section, has carved its valley in such a way that the whole 25 acres belonging to this mine form a basin, surrounded by lofty timbered hills, with steep declivities; and when one stands in the creek bottom, and gazes at the encircling girdle of mountains, one wonders how ingress and egress are attained. I was assured, however, that transport of stone to Mathinna could be effected at 35s. per ton. This would have to be packed for 2 miles, and then transferred to drays on leaving the stony ground of the Ridge Hill, which runs E. and W. to the north of these sections. This part of the Ridge Hill is about half way between Mathinna and George's Bay.

The mine comprises works on an auriferous quartz reef on the 10-acre section, bearing N. 35° E., and dipping from 45° to 60° S.E. The country strata, laminated and bedded sandstones, and semi-slates, strike N.E., and are inclined at high angles to the N.W. The reef, consequently, is transgressive, and forms a true fissure-lode, carrying grey, dense, and honeycombed quartz, from 1 foot to 4 feet or 5 feet wide, as far as exposed, but the full width of actual stone is not yet known. The gold is sometimes visible, and sometimes free gold is obtained by crushing, though perhaps most of it is associated with the pyrites. The quartz is often heavily charged with arsenical pyrite, accompanied by a little iron pyrite, galena, and zinc blende, all of which minerals are characteristically associated with gold in the quartz veins of this field. Some bulk trials were made a few years ago of the stone from this mine, namely, 5 tons crushed at Rowley's mill, at Salisbury's foundry, Launceston, returning 25 dwts. gold per ton, and 49 tons crushed at Mathinna battery, yielding 21 dwts. 15 grs. per ton.

The following are the results of treatment of blanket-sand and assay of tailings from these parcels:—

RESULTS obtained at the Clyde Smelting and Chlorination Works, near Granville, N.S.W.,
December, 1895, from blanket sand from 49 tons of stone crushed at Mathinna battery, which yielded 53 ozs. free gold:—

Lot No	No. of bags	Gross weight.	Tare.	% Moisture.	Mois- ture.	Net weight of ore.		Assay value per ton gold.	Gross gold contents.	Allowance 10%.	Net gold contents.	
						cwts. qrs.	grs.				ozs. dwts.	grs.
1325	Tailings.	15 2	2	5	3	14 1	3 1	2 3 11	4 11	1 19		
1325	Pyrites.	0 2	—	2½	—	0 2	20 0	0 10 0	1 0	0 9	2	8

Mr. W. F. Ward's (Government Analyst) assay of tailings, 23rd February, 1893, taken during crushing of 5 tons at Salisbury's Foundry:—

No. 1.

Gold at the rate of	ozs.	dwts.	grs.	
Silver "	267	15	16	per ton.
	61	19	16	"

No. 2.

Gold at the rate of	ozs.	dwts.	grs.	
Silver "	20	8	8	per ton.
	7	20	10	"

No. 1 weight of sample = 313 grains.
No. 2 " = 1230 "

No. 1 sample was taken after passing over the tables, being caught in a prospecting dish.

No. 2 sample was taken from the tables.

The amount of free gold shown by these crushings is satisfactory, but a good deal, taking the mine through, will, I think, be found to exist in the pyrites, and like all the gold I have seen in this field, alloyed with silver to an appreciable extent. This admixture reduces the value of the gold, which, I am informed, realises £3 17s. per ounce. In the erection of reduction works the best advice

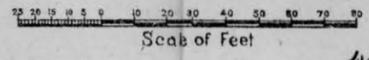
obtainable had better be sought, as it is well known that if an ore contain much silver there is a tendency for the gold to acquire a coating of chloride of silver in the chlorination process, which protects it from the action of the chlorine. In this mine the quartz, on the whole, is of a kindly appearance, though there is a milk-white variety with no pyrites, less promising in aspect. There is also another variety of stone, about which I feel uncertain, namely, the quartzose rock within the reef legs. This is not pure quartz, but rather indurated and silicified country-rock, converted into what, strictly speaking, is a quartzite. This rock, or its selvages and bands in it, are often mineralised, and possibly the pyritic mineral may prove payable.

About 100 feet above the creek level a tunnel has been driven S. 18° E. into the hill, intersecting the reef at 90 feet in, 44 feet vertical from surface. A selvage of clay and quartz marks the foot-wall of the reef, inside of which is a "formation" of quartz and quartzite, with country 12 feet wide. The tunnel has been driven through this and through country rock beyond, until, at about 160 feet from entrance, it struck a wall which has been assumed to be the hanging wall of the formation. I take it to be the wall of the other leg of the reef. The tunnel was then turned south, and the wall or band of quartzite followed south about 40 feet.

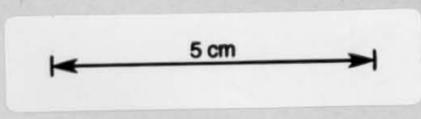
An inclined elbow shaft from surface comes down into the bunch of stone intersected by the tunnel inside the footwall. This is No. 2 shaft. The stone has been stoped from surface all down the shaft. Drives have been extended on this N. and S. In the N. drive—or more strictly N.E.—the quartz first lies on the footwall, but soon passes over to the other side, and keeps to the hanging wall. The drive has been continued 70 feet, and the present end is between reef walls 5 feet apart, with a filling of quartzose matter, not pure reef quartz, striped with thin veins of arsenical pyrites. About 10 feet behind the end is a prospecting winze, which goes down vertically for 27 feet, and then 23 feet deeper on the underlay. The undoubted quartz seems to have been exchanged for the inclined direction. Lower down I did not see any pure quartz, and in the bottom the reef channel is filled with 2 feet of quartzose matter between walls. At bottom of winze a drive has been extended E. 18 feet, only intersecting a small quartzose leader, and the end is in country rock, a light grey laminated sandstone or arenaceous slate. The bottom of this winze is the deepest part of the workings, and I was told that no gold had been got out in sinking. The outlook here, just at present, is not promising, and the only encouragement derivable is that the reef walls continue in depth. Some uncertainty exists as to the relation of this winze to the ore-body. It is neither on the footwall of the formation, nor is the bottom drive far enough east for the hanging wall. The reef above is irregular in dip, as shown by the elbow in No. 2 shaft, and has split into two legs, enclosing a horse of mineralised country. Of the two legs, the footwall one seems to be the main one, and while the drive E. at bottom of winze has been unsuccessful, it is just possible that a break through the apparent W. wall of the inclined winze might disclose quartz in that direction.

The drive from tunnel S. or S.W. is the best in the mine. Just at its entrance is a shallow winze, sunk 9 or 10 feet below the sole. It was filled with water, and I was told that it had yielded no stone, but just beyond it 6-inch stone was lying on the footwall, expanding afterwards to a body of white quartz the full width of the

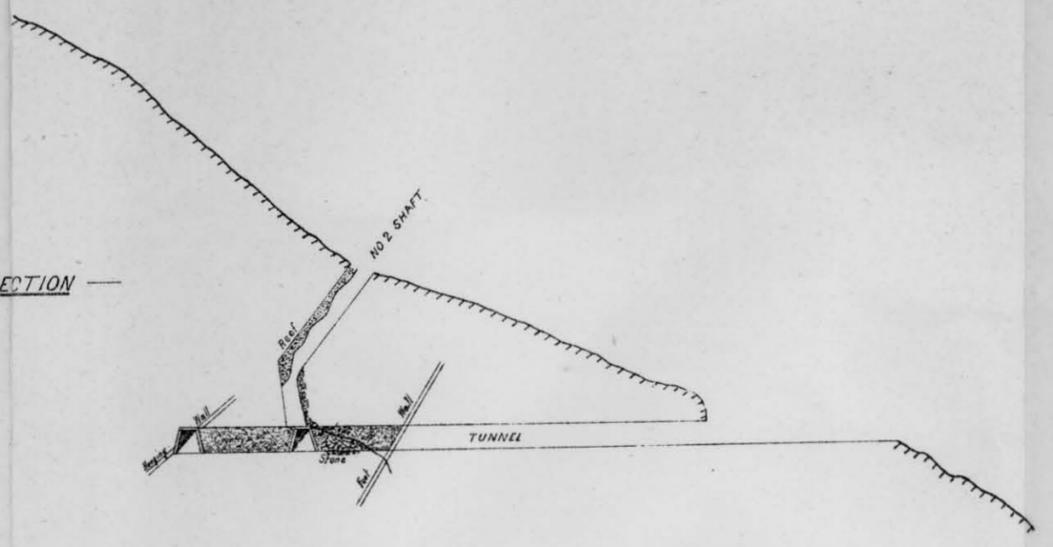
PLAN AND SECTION OF QUEEN OF THE EARTH GOLD MINE



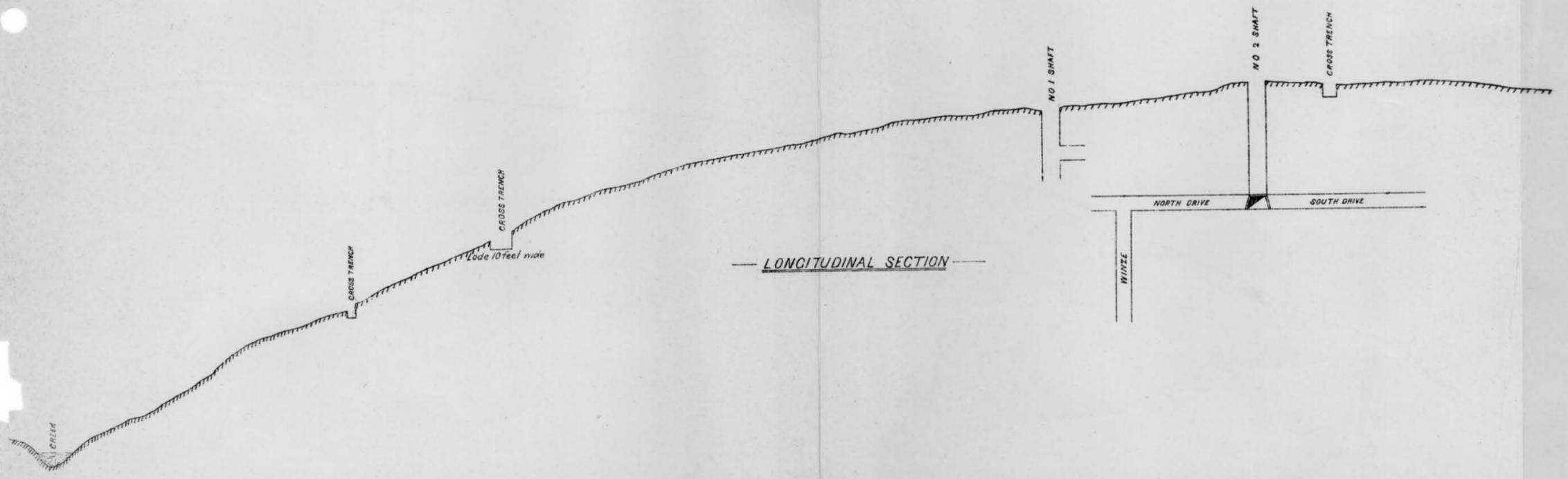
*W. H. Twelvetrees,
Government Geologist
15th Feb. 1900*



CROSS SECTION



LONGITUDINAL SECTION



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— PLAN —



10 ac. Sec 7

5 ac. Sec 7

CREEK

NO. 1 SHAFT

WHALE

Hang'g Wall

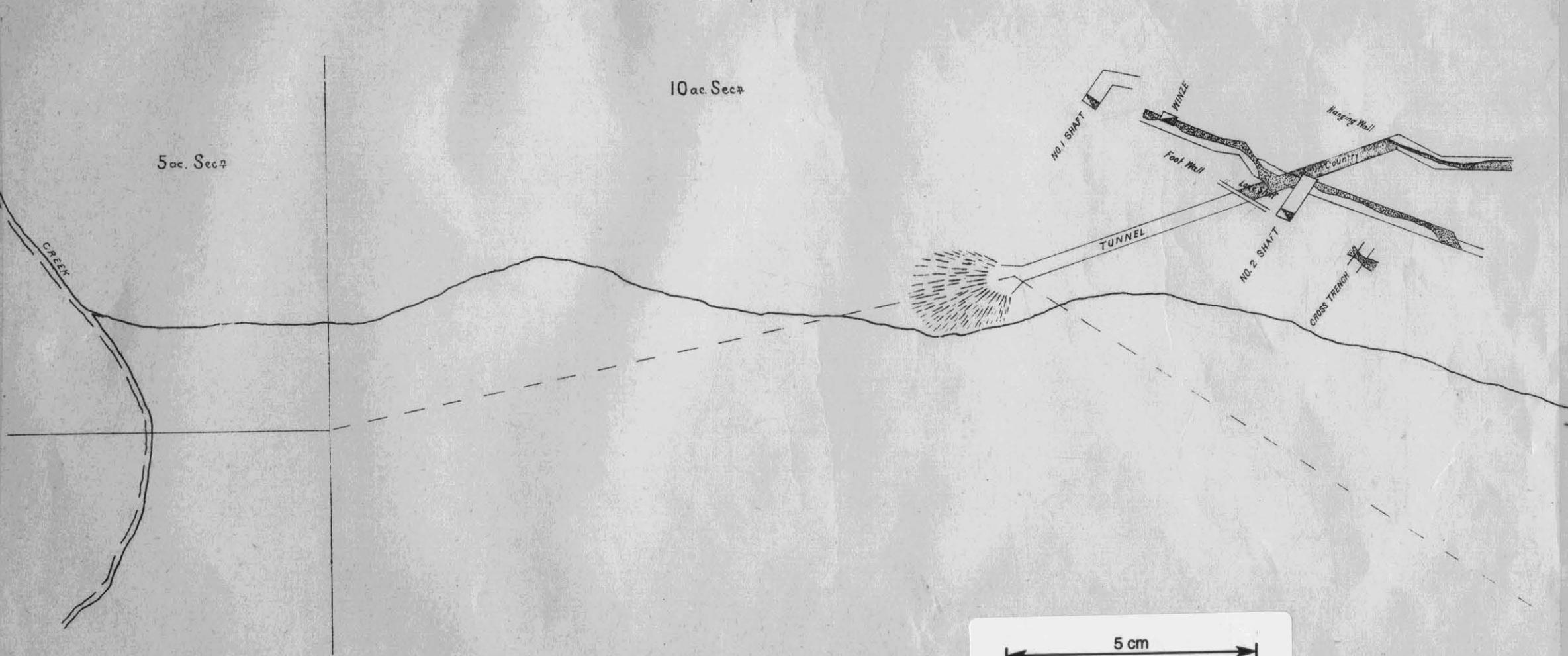
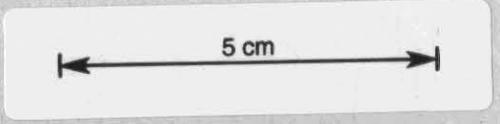
Fool Wall

Country

TUNNEL

NO. 2 SHAFT

CROSS TRENCH



level. The reef in this level seems to have changed its dip and turned over to the W. The best gold in the mine is said to have come from this drive, but there has been no stoping. The level has been driven 70 feet, carrying stone varying from 6 inches to 5 feet, sometimes well mineralised, but on the whole sparsely so. Behind the end the stone has gone out of the level to the W., and the end is in hard quartzose matter, with no walls. The backs here are only 40 or 50 feet, but further south these would increase by several hundred feet. I cannot understand why a cross-cut has not been put in behind the end. A cross-cut west is urgently required to discover where the stone has gone to, and where the stone fills the level its full width should be ascertained by cross-cutting.

At surface further N. an underlay shaft has been sunk a little way on the reef, showing a foot of stone at top, widening to 2 feet at bottom. The reef has been surface-trenched at a few points along a line of 400 feet. Eighty feet N. from No. 2 shaft is No. 1 shaft, now under water, said to have been carried down on the underlay 30 feet on 6" to 10" stone, with some stoping.

Sufficient work has not yet been done to establish the value and assure the future of this mine. The early work was abandoned just when its continuance was most imperative. Enough, however, can be seen of the reef to produce a conviction that in any other part of the Colony the mine would receive ready attention. All the other old claims in the neighbourhood are also abandoned, and the District consequently does not bear a good name, but the success of one mine would doubtless result in the resuscitation of some of the others. I have seen the others, and I consider the Queen of the Earth the most promising mine of the group. All the mines of this group have the drawback of being in a remote, not easily accessible region, but this disadvantage need not be looked upon as a permanent one.

To develop this mine in a systematic and satisfactory way the underlay shafts and winzes must be discontinued. Such shafts are only preferable when the reef underlies very flat, and has a regular uniform dip, or at least a dip admitting of easy curves in the shaft. These conditions do not obtain here. A main vertical shaft must be sunk, and the best place would probably be to the E. of the tunnel intersection. It could be carried down 150 feet from surface before opening out, and, continued down, opening out at every hundred feet, and driving on the reef north and south. A deep adit further north would enable the reef to be worked lower down. This would connect with the upper workings, and drain that part of the mine. The present south drive must be boldly continued into the hill. A crushing and concentrating plant would eventually be necessary. A small chlorination plant would be part of the programme. The creek, when I saw it, was very low, in fact nothing but a succession of pools, but there seems to be an underground flow, and a good site for a conserving dam higher up the stream. I ought to say that my visit was at the driest time of the year. For work on this scale, a capital of £10,000 to £15,000 would be required, and, as returns would not come in for some time, a calling power of a few thousands more would be advisable.

This plan would decisively prove the mine and exploit the reef. Seeing, however, the small amount of work done to date, it is questionable whether a continuation of tentative work is not the better plan. In this case I should recommend the extension of both main drives, crosscutting

from winze and south drive, and sinking in sole of level near or at the point where the present shallow winze is sunk, with any other exploratory work which may suggest itself to the manager in charge. After this the owners would be in a position to judge whether prospects warranted a main shaft and complete reducing plant. A small capital of between £2000 and £3000, if spent on underground work, would suffice for this. The only thing which may be urged against this is that, after all is done, failure of the prospecting work would not justify the utter condemnation of the mine, which may be a satisfactory property at deeper levels. On the other hand, I cannot say that the mine is sufficiently developed as yet to warrant a heavy outlay, and certainly, if the development proceeds in anything like an encouraging way, there ought to be no difficulty in forming a company for work on a larger scale.

My examination of the whole traverse of country from the mouth of the Scamander to Mathinna leads me to anticipate that several reefs in this belt will be worked when the country becomes better opened up. Occurrences of gold-bearing quartz veins seem more frequent in the neighbourhood of the granite contacts than far away from the granite. The farther away they are from granite the more unimportant they are, but this generalisation perhaps needs verifying by a more complete inspection of the country. The whole field has had only a cursory examination, and I have no doubt will repay further and closer inspection.

One or two items of interest may be commended to the geological student. First, these reefs have a family likeness, in that their gold is always largely alloyed with silver, and they may be suspected to belong, within comparatively narrow chronological limits, to one geological age. But what is their relation to the reefs of Mathinna and Mangana? And what connection have they with the argentiferous lodes of the northern and eastern parts of the Scamander field? We seem to be here in a silver country, and a little out of the line of the great auriferous slate-belt of the Colony, though in strata of the same geological system. As these reefs have not been worked yet to any great depth, their behaviour at deep levels is at present a matter of conjecture, but the fissure lodes will doubtless extend down into the subjacent granite.

Another question is whether these granites differ in age from the coarse porphyritic granite of the Derby field. They differ in being harder, finer-grained, and carrying less white mica, but I do not see that much stress can be laid on these differences, for the differences among the more northern granites are equally great. If we place the granite of the New Carthage Mine on the Scamander side by side with that of Mussel Roe, South Mt. Cameron, we shall see that they are almost identical; both are characterised by an abundance of black mica, and are practically indistinguishable from each other. Yet porphyritic granite is abundant at Mt. Cameron. The point to verify is whether transitions can be found. These physical differences need not involve difference in age, as it is well known that different parts of a single granite *massif* generally vary a good deal both in texture and composition. My present view is that the general mass of the north and east coast granite, apart from elvans and other dykes, is of one and the same age, probably Devonian; but all facts bearing on the point I have now mentioned should be carefully noted.

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Another question is the age of the quartzose grits, sandstones, and conglomerates, which lie in horizontal beds on the highly-inclined Silurian sandstones on Hogan's Track and Mt. Victoria. These occupy a position between the Silurian and the marine strata of the Permo-Carboniferous Systems, but it is not yet settled whether they are Devonian or basal members of the Permo-Carboniferous. Fossil evidence is wanted, besides which it is desirable to know whether they have anywhere been penetrated by granite or quartz reefs, as this would have a bearing on the age of our granites. Fossils, apparently spirifers, have been reported from the grits or beds associated with them, but the precise beds were not shown to me.

The country between the coast and the foot of Gentle Annie is a succession of timbered hills rising higher to the west, but no great elevation is reached before arriving in the neighbourhood of Hogan's Track. My aneroid readings (in fine weather) on this traverse were as follow:—

	Above Sea-level (Feet.)
Robinson and Delaney's Camp on Scamander, 8 miles from coast.....	150
River at foot of Gentle Annie on Hogan's Track.....	300
Queen of the Earth Mine, in creek.....	750
Brilliant Mine.....	1500
Ridge Hill Track above the Brilliant.....	1700
Mathinna Township.....	900
Ridge between Mathinna and New Golden Gate.....	1000

The annexed plan and sections of the Queen of the Earth Mine will show the workings to date.

I have the honour to be,

Sir,

Your obedient Servant,

W. H. TWELVETREES,

Government Geologist.

W. H. WALLACE, *Esq.*,

Secretary for Mines, Hobart.