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REPORT
ON
THE FEDERATION TIN MINE, HEEMSKIRK

1. PREVIOUS EXAMINATIONS & REPORTS

During the last 20 years there have been four official examinations of the area which now constitutes the Federation Tin Mine. The present report brings the total up to five.

In the year 1900, the late W.H. Twelvetrees made an examination.

G.A. Waller, then Assistant Government Geologist, made a thorough examination of the Heemskirk Field in 1902, and his report deals in detail with the Federation Mine, as well as the neighbouring properties.

In the summer of 1913-14, L.L. Waterhouse, B.E., then Assistant Government Geologist, made a complete geological survey of the Heemskirk Field, and his report, dated 15th October, 1915, contains a meticulous description of the Federation Mine.

Mr. A.S. Morton of Zeehan was employed under the direction of the State Mining Engineer in 1914, to carry out a thorough and systematic sampling of the tin deposits of the Heemskirk Field. This work occupied most of the summer of 1914-15. The results of this sampling are in the possession of the Mines Department. The Federation Mine was included in this sampling and the whole of the workings accessible at that time were systematically sampled. The results of this sampling have been largely made use of in the present examination and in the compilation of this report

II. OBJECT OF THE PRESENT EXAMINATION -

The present examination was undertaken for the purpose of determining the value and permanency of the lodes on this mining property in the light of recent developmental work carried out thereon. Particularly was it desired to ascertain whether the "Black Face lode" persists in depth. In addition, it was desired to know whether the other lodes on which work has been done are sufficiently large and possess sufficient tin contents to warrant the expectation that they will constitute a source of payable tin ore in appreciable quantities.

III. SCOPE OF THE EXAMINATION -

The meticulous description of the geology of the area presented by L.L. Waterhouse in Geological Survey Bulletin No. 21, obviated the necessity of repeating such work.

Accordingly the information contained in that Bulletin was made use of in this examination, which was confined to the immediate proximity of the lodes themselves. The structure of the lodes and of the granite in their vicinity was closely studied to enable conclusions to be drawn in regard to the probable persistence of the lodes in depth and the distribution of the tin contents.

In connection with the determination of the actual tin

content of the lodes, the existence of the results of the systematic sampling by Mr. A.S.Morton and the numerous samples taken by previous investigators, made it unnecessary to resample the old workings. However, measures were taken to ascertain the thoroughness of Mr. Morton's sampling, and the conclusion was arrived at, after an examination of the sampling channels made by him, that the work of sampling had been conscientiously carried out. To bring this information up to date, the recently exposed faces were sampled and the assays made in the Geological Survey Laboratory, Launceston.

IV THE MORE IMPORTANT TIN-BEARING LODES

There exist a very large number of lodes on the leases held by the Federation Company. A great number of these, however, have had little or no work done on them, and consequently their influence on the value of the Federation property can only be stated in terms of general possibilities.

In arriving at conclusions, therefore, in regard to the permanency and value of the mine attention should be confined to those lodes which have had sufficient work done on them to disclose a definite body of ore. The more important of such lodes are enumerated below:

(a) Black Face Lode
(b) Whip Shaft Lode
(c) Cumberland Lode
(d) Air Shaft Lode
(e) The Pipe
(f) Big Trench Lode
(g) Hadley's lode
(h) Fowler & Dunn's Lodes
(i) Grey's Lode
(j) Montagu Lodes
(k) Wakefield Lode
(l) Eastern Lode

V. THE PROVED DIMENSIONS AND VALUE OF THE LODES

(a) Black Face Lode-

The total proved length of this lode is 500 feet. The average width over which payable tin values have been demonstrated to occur is 28 feet. The vertical dimensions have been shown to be at least 60 feet. The lode has not yet been penetrated at a lower level than this, but has undiminished values at a depth of 60 feet. The average of all samples taken of this lode is 1 per cent. metallic tin.

(b) Whip Shaft Lode -

The length of this lode at the top of the Whip Shaft is 60 feet; at the 500 ft. tunnel (80 feet below collar of shaft), the length is 180 feet; at the 570 ft. tunnel (150 feet below collar of shaft), the lode is 350 feet in length. The vertical range thus proved by the Whip Shaft is 150 feet.

The average width is 5 feet. The average content of metallic tin is .75 per cent.

(c) Cumberland Lode -

The length of lode exposed in the Long Tunnel workings is 200 feet. The average width is 5.6 feet. The average tin content is .61 percent. This latter figure has been obtained by sampling the exposed back of the drive along the lode, but the average is probably higher than this, as rich patches occur in the lode. The acceptance of .61 per cent. as the average tin content is therefore on the conservative side.

The vertical dimension from the surface to the bottom of the 80 ft. winze sunk from the Long Tunnel level is 400 feet

(d) Air Shaft Lode -

The average width of this lode at the surface is 24 feet, and where cut by the Long Tunnel it is 20 feet in width. The length has not been definitely disclosed, but appears to be about 300 or 400 feet; the proved length, however, cannot be taken as more than 50 feet. The proved vertical range is 270 feet. Bulk samples at the surface show an average content of .4 per cent. tin, but the value at the Long Tunnel level is not available as the old stopes have been filled.

(e) The Pipe -

This ore-body is of a totally different type from that of the usual quartz-tourmaline lodes of the district, being richer in tin content but less regular in structure. The greater part of the richer portion of this pipe has been worked out down to the Tributer's Tunnel level, but there is a definite portion of it on which a winze has been sunk which has dimensions of:-

Length, 30 feet; width, 8 feet; depth, 30 feet.

The average value of this block is 3 per cent. metallic tin. An adit is being driven to cut the downward continuation of this pipe at a depth of 60 feet, but is at present 180 feet from this objective.

(f) Big Trench Lode -

This lode has only recently been developed and has a somewhat similar mineralogical composition to the Pipe. It has been proved on the surface over a total length of 100 feet, with an average width of 10 feet. It has been driven on for 40 feet and proved to a maximum of 30 feet below the surface. At this level the average width so far proved is 4 feet, with an average tin content of 3 per cent. metallic tin. Work is proceeding on this lode.

(g) Hadley's Lode -

This lode has not had much work done on it, but outcrops at the surface over a length of at least 700 feet. The width averages about 5 feet. Assays of from .5 to .75 per cent metallic tin have been obtained from bulk samples.

(h) Fowler & Dunn's Lodes -

A very rich ore-body was worked by Messrs. Fowler and Dunn, from which they took 1000 tons of 6 per cent. ore by open-cut workings. No work has since been carried out at this point and no defined ore-body of similar character is now visible. There are, however, a number of intersecting veins which carry from .2 to .32 per cent. tin. There is certainly a locus of strong tin deposition here and further work will doubtless result in disclosing other rich concentrations similar to that already excavated.

(i) Grey's Lode -

Several trenches have been cut on this lode, the width of which is about 25 feet. Bulk samples in these trenches assay .5 per cent. metallic tin. Although the lode is visible on the surface for a considerable length, the trenches are limited to a length of about 50 feet.

This is a very promising lode on which very little work has been done.

(j) Montague Lodes -

These lodes were worked by the old Montague Company, but the lease has recently been acquired by the Federation Co. They have been proved to outcrop on a length of about 250 feet, and the width varies from 1 foot to 15 feet. At the point of intersection of these two lodes, the tin values have been proved to persist to a depth of at least 100 feet. Some high grade tin ore was obtained, but the workings are not accessible for sampling. The old reports, however, state that both lodes carry tin values and they are very promising formations.

(k) Wakefield Lode -

The lease on which this lode occurs has recently been acquired by the Federation Company. The lode is well defined and of the quartz-tourmaline type. The old workings are inaccessible for sampling. Good tin values can be seen at the surface above the old adit. The width here is 15 feet.

VI ORE RESERVES -

In relation to the number of lodes definitely known to carry tin values, the amount of ore which can be indicated as ore-reserves in terms of tonnage, is small. This is due to the fact that the work so far accomplished has been distributed over such a large number of lodes. In the past no systematic scheme of development work has been carried out, and much of the work has been confined to the extraction of certain rich shoots of ore. The figures presented below, therefore, must serve as an indicator to the general potentialities of the property, and should serve as a nucleus around which future development work will accumulate a tonnage of ore more nearly commensurate with the general possibilities indicated by the geological features of the lodes already known.

1. Proved ore -

Certain portions of the ore-bodies exposed in the workings in the following lodes may be regarded as "proved ore":-

Black Face — Cumberland
Whip Shaft — Big Trench
The Pipe

Including 2000 tons of ore assaying 1.2 per cent. tin, already mined and stacked, this "proved ore" constitutes a reserve of approximately 60,000 tons, the assay of which is 1.0 per cent metallic tin.

2. Probable ore -

In addition to the portion of the above-mentioned ore-bodies which is exposed on three or four sides and which constitutes "proved ore", there exist blocks of ore which are definable as "probable ore".

The total tonnage of this probable ore may be put down in round figures as 400,000 tons, the assay value of which, judging from the sampling of the exposed faces, should approximate that of the "proved ore".

3. Prospective ore -

This property possesses potentialities in addition to those indicated above in the form of tonnage figures which are only possible of indication in a general way. In

addition to those portions of the Black Face, Whip Shaft, Cumberland, and Big Trench Lodes, and the Pipe, taken into consideration in arriving at the above, estimate of "proved and probable ore" there are the following which indicate general possibilities or "prospective ore", which are quite justifiable on the geological evidence:-

(1) The Whip Shaft Lode below the 570 ft. level,

(2) The downward continuation of the Black Face Lode below the 85 ft. level,

(3) The downward continuation of the Cumberland lode below the Long Tunnel level,

(4) The downward continuation of the Big Trench Lode below the present tunnel,

(5) The continuation of the Pipe below the bottom of the winze at the Tributer's Tunnel.

In addition there exist the undoubted possibilities of developing considerable ore-reserves in the following lodes, which, as indicated earlier in this report, are tin-bearing and of considerable dimensions, but which have not been taken into consideration in estimating "proved and probable ore":-

Air Shaft	Hadley's
Fowler's & Dunn's	Montague
Grey's	Wakefield
Eastern	

In addition to those tin-bearing lodes, there are the bismuth lodes disclosed in the workings near Fowler and Dunn's lodes, which have very promising features.

VII. THE PERSISTENCE OF THE LODES IN DEPTH -

In considering the question of the influence of depth on the size and value of the tin lodes, cognizance must be taken of the proved vertical range of the lodes and the structural features disclosed by geological examination.

The geological survey made by L.L. Waterhouse has shown that the tin has been deposited in the Heemskirk field over a vertical range of at least 1500 feet. On the Federation Mine the greatest proved vertical extent of any one lode is 400 feet but the actual vertical extent is clearly greater than this as the lode is continuing strongly underfoot.

An important, although not vital, consideration in regard to the future prospects of the mine is the downward continuation of the Black Face lode. The recent examination of the structural features of this lode has revealed the fact that it is located at the locus of convergence of two series of parallel fractures in the granite which have been simultaneously developed. One series of parallel fractures has a strike of 14 degrees and consists of a large number of closely spaced fractures having a slight inclination towards the east. The other set has a strike of 70 degrees, and the fractures are not so closely spaced and are more nearly vertical. The line of intersection of these two series strikes 40 degrees, which is the strike of the Black Face Lode.

The seams in the ore-body which have a strike of 14 degrees are due to the solutions, which rose through the 70 degree fractures, having spread along the 14 degree fractures and replaced the granite outwards from these. The ore-body is thus an irregular width along a main axis striking 40

degrees, the band being parallel to the 14 degree fractures, but the walls of the ore-body having no exact relationship. to either set of fractures, the limit of the ore being regulated by the distance the ore-bearing solutions travelled from the 70-degree fractures along the 14-degree fractures.

Any conclusion as to the dip of the ore-body as a whole must, therefore, be drawn from a consideration of the angle of dip of the plane of intersection of the two series, of fractures, and from neither the apparent dip of the walls of the ore-body observable at the surface, nor from the dip of the bands within the ore-body. This plane of intersection will not depart more than a few degrees from the vertical and therefore the orebody may be expected to be practically vertical. It is significant in this connection that all of the quartz-tourmaline tin-bearing lodes on this property, which have been exploited to any depth, have been found to be approximately vertical.

The Long Tunnel is being driven to intersect the Black Face lode at a depth of 320 feet below the highest point of the out-crop. It is at the present time 50 feet from a point vertically below the nearest portion of the outcrop on the hill. The fact that this tunnel has not yet cut the lode cannot be taken as evidence that the lode does not persist to this level.

The whole of the geological evidence and the work already carried out on the lodes of the property, justify the conclusion that both the lodes and their tin content will continue to considerable depths.

VIII CONCLUSION -

The Black Face lode is the largest ore-body on the Federation property. Development work up to date has not proceeded far enough to definitely establish its existence 320 feet below the surface, but there is every reason to anticipate on the geological evidence that the lode will be encountered at the Long Tunnel Level.

Besides this ore-body there exist four lodes on which sufficient work has been done to allow of the calculation of approximate ore-reserves. The amount of ore available in these and the Black Face lode may be stated as:-

Proved ore - 60,000 tons assaying 1 per cent. tin
Probable ore -400,000 tons probably of similar grade.

This estimate does not exhaust the possibilities of these five ore-bodies, and the additional prospective ore contained therein must be added to that in seven other lodes, which have been proved to contain payable tin values and to be of appreciable dimensions, as indicated in this report.

With such a large number of tin-bearing lodes available for operating upon, the Federation Mine should, with efficient management, become a stable producer of tin.

signed LOFTUS HILLS, M.B.E., M.Sc.

GOVERNMENT GEOLOGIST

Gormanston,
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