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MOUNT ZEEHAN SILVER-LEAD LODES AND  
OTHER DEPOSITS :

REPORT BY G. THUREAU, F.G.S., GOVERNMENT MINING  
GEOLOGIST.

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Presented to both Houses of Parliament by His Excellency's Command.



## REPORT ON THE MOUNT ZEEHAN SILVER-LEAD LODES AND OTHER DEPOSITS.

*Government Mining Geologist's Office,  
Launceston, March, 1888.*

IN March, 1885, the above ore deposits were examined as occurring in the County of Montagu, West Coast of Tasmania, situate within a few miles north-east of Mount Zeehan, and at that time but two proprietaries\* were in possession of sections exhibiting these argentiferous lead ores. That report was published in April, 1885, so that nearly three years have elapsed since that inspection. Since then this promising silver-lead field has been considerably extended, and the area containing similar ore deposits is being added to gradually.

The country now known to contain silver-lead deposits extends from north to south about 6 to 7 miles, and from east to west from 2 to 3 miles. The locality consists of low swampy ground, drained by sluggish creeks, which eventually fall into the Henty (N.) and Badger Rivers; here and there a series of low hills, not above 400 feet in height, serve to divide the country by means of belts of timber.

The nearest shipping port is at Trial Harbour (Reminé) about 12 miles west of the silver-lead field, of which distance rather more than half has been made passable for cartage, and one mile seventy chains for packing, leaving only about 5 miles of a track to be constructed for through traffic.

*Geological Features.*—The country rocks in which these silver-lead ores are found belong to the Silurian series, represented by dark blue slates and grey sandstones, both of which exhibit fossiliferous beds of very great interest to the palæontologist, as clearly establishing the existence of this class of sedimentary rocks, and of that age. The fossils I found in greater abundance were—Trilobites, Polyzoa, Corallites, Crinoids, and Brachipoda, &c. All these rocks in the vicinity of the ore lodes appear as very contorted, especially in the north, and not so much south of the manganese outcrop, and in this manner both lodes and country rocks form syn- and anticlinal sections, as depicted on the Geological Sketch Plan. In a similar manner, but altogether independent of the adjacent country rocks, do the principal silver-lead ores occur, which latter are generally enclosed between two good and well-defined walls, so that, in a manner of speaking, a lode may appear, at or near the surface, to assume quite a number of varying bearings, thus indicating junctions or intersections at various points; but to judge from the character of the ores laid bare in prospecting and their surroundings, it becomes quite clear to the careful observer that all these irregularities in strike and underlay represent really but one or two main lodes, which, at greater depth and in more settled country, will doubtless assume that regularity and greater value upon which so much of the future success of the whole district depends. There is no doubt whatever that, so far as my examination has gone, that these are “true fissure lodes,” and therefore their permanency to great depths is well assured. In this connection it appears, as a matter for regret, that I could not examine a main lode in the deepest shaft sunk in the district (56 feet) through the water standing therein, and the baling of which shaft, I was informed, would not have taken a very great deal of time to accomplish, because such an examination would have enabled me to speak authoritatively as to the behaviour and general character of the whole of these valuable deposits at increased depths; and, besides, it would have likewise afforded me a rare opportunity for classifying the various silver-lead ores, and thus comparatively establish the commercial value of the whole region.

\* The Arthur and Long Plains Prospecting Association and the Dispatch Prospecting Association.

Before proceeding any further with a more detailed description of the several lodes or lode-formations, the following list of ores and minerals discovered is, at this stage, furnished to facilitate future reference, viz. :—

- (a.) *Galenite* occurs as forming the principal portion of the Mount Zeehan silver-lead lodes. It is coarsely crystalline, with a cubical fracture, and contains the greater percentage of lead.
- (b.) Antimonial silver-lead ore occurs generally in bands at or near the walls of lodes. It is characterised by its metallic, streaky appearance, and its considerable percentage of silver.
- (c.) *Tetrahedrite* (*Germ.* "Fahl Ore.")—This I observed for the first time in the ores raised by the so far apart located Silver Queen and Silver King Companies, where it occurs in strong veins. It presents a peculiar appearance, being of a dullish, whitish-grey colour, and sometimes a yellow-greenish tint prevails, owing to the admixture of copper pyrites. It is mostly very dense, presenting sometimes a semi-conchoidal fracture, and I have no doubt, from my experience in the old country, that it, and the associated steel-grey and finely granular galenite, have furnished the much greater percentage of silver obtained from various assays.\*
- Limonites*.—These occur frequently throughout the district, where they are known as *gossans*, but as they form in this swampy country the ferruginous "caps" of underlying lodes, and as they assimilate more closely to "bog iron" ores, their frequent occurrence is of considerable interest to the prospector, especially where they exhibit traces of galena or other silver.
- (d.) *Carbonate of Iron*.—"Siderite."—This ore forms a very frequent constituent in all these lodes and lode formations, and it has, in some instances, been mistaken for carbonate of lead (*Cerussite*), but, so far, the latter, and much more valuable mineral, was not found in the district.
- (e.) *Iron Pyrites*.—These occur as an admixture of the silver-lead ores, and in a compact form, in two lodes in the south-western portions of the Arthur and Long Plains P.A., No. 560M lease, where they form regular lode from one foot to fifteen inches in thickness.
- (f.) *Zinc Blende*.—"Sphalerite" is well distributed throughout the whole silver-lead lodes, but it appears as more prominent in the last-mentioned pyrites lodes, in which it forms a kind of transition or transmutation from the pyrites to the sphalerite, and ultimately into rich silver-lead ores with increased depths.
- (g.) *Manganites*.—These form the last of the list of metalliferous minerals observed, and they deserve attention from the fact of their forming a massive outcrop some 8 to 12 feet in width, and standing in places from 8 to 15 feet high, and for over a mile in length; in places also forming huge boulders. It is not, however, this great accumulation of a peculiar class of ore having but little commercial value that deserves attention, were it not the fact that manganese ores, though more decomposed or earthy, also form a similarly serrated outcrop at the Proprietary Silver Mines, Broken Hills, N.S.W. There, it was firstly ascertained, that these manganites carried a small percentage of silver, which increased, it is now well known, so much as to displace the first mentioned ores altogether, their places being taken up by cerussites (carbonates of lead), chlorides of silver, and ferro-manganese with some kaolin and silica. This extraordinary rich ore measures at their 216 feet level 104 feet from wall to wall, and is traceable with frequent rich ore shoots for over fifteen miles in length. After this digression, it may be observed that careful examinations of the Mount Zeehan manganites—so beautifully radiate-crystalline—proved the occurrence of iron pyrites and a white mineral resembling kaolin, so that it is quite possible that this immense "cap" may, at greater depths, be transmuted into a much more valuable metalliferous deposit. As already stated, these manganites are on the whole of a more dense and crystalline character than those of Broken Hills, with the exception of the extreme northern peak, where it is more decomposed and forms stalactitic cavities. The hill, Section 1209, on which it is located, is from 350 to 450 feet high, and from its isolated position offers splendid opportunities for driving deep adits. Looking at the geological plan, it will be noticed that north of this manganese deposit the S.L. lodes are much more irregular, as well as the country, than south of the same, where it is apparent that likewise a greater width obtains for these valuable lodes and formations.

In passing, it may be observed here that at Broken Hills, though occurring in gneissous rocks, and within dykes of garnet-rock and orthoclase quartz porphyry, very similar ores were observed by myself as the Mount Zeehan galenites; but their much higher percentage of silver was entirely due, in my opinion, to the occurrence of chlorides of silver above the water level.

The mode of occurrence of these Mount Zeehan silver-lead ores may be described as forming three principal groups with their ramifications, to which the manganese may be added; bearing in mind that fresh discoveries are now being made, and that consequently this rich mineral district is still expanding.

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\* An assay of this ore, selected in consequence of my expressed opinion, gave 216 ounces of silver per ton.

The No. 1 group comprises the Silver Queen Sections, also Sections 243-87; likewise Sections 201-87, 199-87, 197-87, and 198-87, and some Sections, not yet shown on the Plan, west of 201-87, 199-87, and 198-87.

The first-named Association (prospecting) exhibit principally on Sections 1636M and 1637M quite a number of lodes and veins, forming quite a network of the same; thus representing, so far as prospected, a mining property of very considerable value.

I may, at this stage, state that, so far I am aware of, but one Government analysis or assay having been reported to me in 1885 by the late Secretary for Mines, which gave metallic lead 43 per cent., silver 37ozs. 4dwts. 19 grs., gold 2dwts. 15grs. per ton of ore, as taken from undressed ore and from Section 909M.

The main lode, Section 1636M, has been sunk upon, I was informed, to a depth of 56 feet from the surface; it underlies to the east and though very attenuate at and near the surface, it now measures, at that depth, 3 feet 6 inches in width; another lode was intersected in a western crosscut underlying also east but at such an angle as to form a junction in the bottom of the shaft; this last-named lode was 22 inches in width, or for the total width of both lodes, it was stated that over two-thirds were fit for smelting purposes. It is not my intention to question these statements, as the piles of ores heaped up at the surface near the shaft (main) were sufficient to prove that a strong body of very rich ore had been met with. The ores had that peculiar laminated structure usually met with in lodes of a permanent character, the ores being likewise represented by all those varieties mentioned above, though carbonate of lead was not present. The occurrence of tetrahedrite (Germ. "Fahl ore") may be regarded as a good indication of rich shoots of ore in such lodes, and which could not be proved in a small shaft sunk vertically. As it appears unnecessary to describe all the other various lodes, because of their greater or lesser similarity and value of the ores contained, I will now proceed to state the width of the eight lodes and formations wherever prospected, and if these are compared with the plan it should become apparent that these mines in their embryo state of development deserve the notice of investors, and the employment of a large amount of working capital for the purpose of opening and developing these ore deposits first, and, when the probable quantity of available ore has been ascertained, to consider the question of disposing of the crude ores to smelting companies elsewhere, and afterwards to erect furnaces or smelters at the most convenient part where lime, iron (manganese), and charcoal can be obtained for the purpose.

The east lode formation is 6 feet thick, and it is traversed by a central solid vein of "metal,"\* enclosed by carbonates of iron; the north by south lode, also east of main shaft, shows fourteen inches of metal, and it has been traced for about eighty yards; the new lode, which apparently traverses the old Dispatch Company's ground, Section 243-87M, in its north north-western corner, has been proved 18 inches in width, and is composed of gossan (?), pyrolusite, and galenites; up the creek the main lode again exhibits good ores in a formation two feet in width at a distance of about eighty yards from the present main shaft; a new lode, 45 feet west of the "main," is two feet in width, charged occasionally with rich ores; forty or fifty yards further up the same creek a very massive and rich lode forms a junction with the last-mentioned in a formation 6 feet in width. Besides these various deposits of rich ore, indications were met with of others not yet proved within the boundaries of this holding. It should also not be omitted to be mentioned that this, so to speak, "cluster" of lodes as opened at the surface by numerous trenches and small shafts sunk within a very limited area, can, by judiciously selecting a site for a main engine shaft, be wrought in the course of time with expedition and economy from such a central shaft.

Further north north-west a prospecting association, whose sections have not yet been surveyed and placed on the plan, have succeeded in tracing another branch of the lodes referred to ramifying throughout the country, in a creek having a northern fall from the dividing range, over which the Old or Carlisle's Track passes. This formation bears N. 34° west, underlying slightly to the west. The country rock, a blackish blue slate of great hardness, crosses the lode at nearly right angles, or, if anything, a little southerly, and a cross vein of ore occurs north-west of the creek, and the ores of both exhibit mineral of great purity and richness.† As this metalliferous formation traverses the eastern flanks of a prominent hill, which is quite an exception in this flat, low-lying, and swampy region, further favourable developments may be expected, whilst at the same time very considerable quantities of ore can be won above the water-level or some 140 feet vertical or more. At first these veins of ore were but a couple of inches wide at or near the surface, but at about 6 feet deep they have increased to 8 or 10 inches, with every appearance of a further increase; this appears to be mostly the case at Mount Zeehan. A prospecting association holding sections 199-87, 201-87, 197-87, 198-87, has not yet opened a strong ferruginous and somewhat galeniferous deposit which has been found on the surface.

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\* The term "metal" is used for galenites or silver-lead ores.

† Private assays gave over 80 ozs. of silver and about 70 per cent. of lead per ton.

The second group comprises the Arthur and Long Plains sections, with their important lode extensions, and of a lode discovered upon section 368-87m in a formation or "gangue" 6 feet wide. The former proprietary is one of the original discoverers, as made in 1884-85; and owing to the difficulties connected with the then great expense of raising and packing the ore over an almost impracticable track (half a ton cost £12) to Trial Harbour, and other drawbacks, not much work has been done in the way of extending prospecting and mining operations. Other new discoveries have, however, since been made, and these have considerably added to the value of these various surface outcrops; and the evidence I have been able to collect, and from my geological survey, indicates that ore deposits of much greater value will eventually be met with if systematic mining operations were in future more vigorously prosecuted, and carried to a considerably greater depth than has been the case at present.

Inclusive of the two pyrites lodes, silver-lead ores have been discovered in eight or more distinct lodes or formations, the bearings of each being at variance with any other of this system of ore deposits. Inasmuch, however, these bearings would bring about junctions in most cases not far from where the lodes, &c. have been uncovered in or in close vicinity to the creek, it is in my opinion more than probable that eventually all these irregularities will disappear at a depth and in more settled country, but one, or, more probably, two main lodes will be found.

The main lode marked 1 on the plan, section 559m, exhibits a formation of 14 feet width, with three or four veins of galenites running through, the "gangue" being chiefly composed of hard and decomposed carbonate of iron and grey slate.

No. 2 is not so well defined, and presents the usual characteristics of these lodes. No. 3, Section 909, is one foot wide. It has been traced for 5 chains in its strike, and is composed of good solid "metal."

No. 4 is 2 feet 6 inches wide, and it contains a moderate amount of "metal."

No. 5 is a very rich lode one foot wide, and is slightly mixed with zinc blende.

No. 6 is almost pure carbonate of iron, but in the Silver-Lead Creek it shows thin streaks of very rich ore.

These are the more prominent silver-lead deposits, but there are others of considerable promise, which, however, were not sufficiently opened for examination.

The two pyrites lodes of this company are, so to speak, in a transition state, and therefore require no particular mention, though the incoming vein matter at the depth they have been opened to affords every indication that rich galenites will eventually take the place of both zinc-blende and of iron pyrites, which latter I believe contain a little gold also.

These two lodes are from 12 to 16 inches in width, and as they underlie in an easterly direction they must eventually form junctions with the silver-lead lodes at greater depths, because the latter dip in a westerly direction.

A prospecting association's discovery is situated on Section 368-87 in E creek. It is a strong formation, about 6 feet wide, and it partakes of the usual character of such like (lode) formations,—viz., a much greater prevalence of carbonates of iron and some thin veins of silver-lead ore. In most of these cases not enough work has been done to enable one to pronounce favourably or otherwise of what these mineral veins may lead to at a greater depth.

The third and last group includes those that are occurring on Sections 223-87, 221-87, 222-87 (Silver King), and under the name of Silver Bell on a section of 80 acres not yet surveyed, and south of Section 222-87, acquired by a Victorian syndicate.

The first-named proprietary possesses a very large piece of ground, over 400 acres, I believe, sufficient, in fact, to give ample scope and employment to three or four companies in order to fully develop their metalliferous deposits, and it is to be hoped that as soon as a "through traffic" can be initiated, the clauses relating to labour covenants of lessees may be strictly enforced, and which rule also applies to all the other mining proprietaries at Mt. Zeehan. So far there have been two discoveries made on the first-named sections,—viz., one, a very strong lode of very rich silver-lead ore, and one of those ordinary ferruginous formations.

The former has been opened by means of surface cuttings, and thence by an underlay shaft to a depth of about 15 feet. This ore crops out boldly at the surface, and is of a strongly permanent character. The solid ore (metal) measures over two feet thick, and at that depth a large increase was perceptible, nearly five feet, all of which presents ore of a clean character, of which about half is more than ordinarily rich in silver, as it carries branches and strong veins or "tetrahedrite" which I have not seen outside the home silver-lead mines. This lode has been traced by surface trenches, &c. over  $2\frac{1}{2}$  chains in length, as shown in the plan, and in its course to the south it can be traced right down to block or Section 222-87m, where about 30 feet from the southern boundary of the said section it again crops out with about the same strength and of a

very good description. On a moderate calculation, this lode traverses for about 30 chains this Company's holdings, and, so far as seen, nothing stands in the way of at once shipping quantities of good and profitable ore, except about seven miles of a pack track to be yet constructed.

The next block of 80 acres, south of Section 222-87M, formed at the time of my examinations the extreme southern outcrops of silver-lead ores that had hitherto been found. There were a few more outlying discoveries\* upon sections further south, but, as I was not offered the usual facilities, with a special guide for instance, and as I understood the water had not been taken out of the workings, I felt it would be but a loss of time to wait for an opportunity for doing so this time, and especially as it was almost continually raining all the time. About half a chain south of Section 222-87M, or the northern boundary of a block of 80 acres, two remarkably strong lodes have been opened for examination; of these, the eastern measured 2 ft. 2 in. in width, and the western lode is 2 ft. 4 in. wide. Two feet of greyish slate separate these two lodes from each other, but after a very careful examination I have come to the conclusion that this is only a temporary obstruction, and that this "horse" of slate will disappear with greater depth, and thus a solid lode of over four feet will be found. The ore is remarkably pure, and very rich where the tetrahedrite occurs, which latter ore is quite new to me in Australasia, not having met with it either here or in California and Nevada, U.S.A. A private assay of this ore, which I stated, when at Mt. Zeehan, would turn out very rich, gave 216 ozs. of silver per ton, irrespective of the high percentage of lead. This lode, or lodes, are certainly one of, if not the richest and most promising in this mining district.

In closing this Report, I hope I have been able to demonstrate that a most valuable and promising development has taken place at or near Mount Zeehan; and as the discoveries are very rich, and already cover a considerable area of ground, it is hoped that late experience in placing mining concerns upon the market will lead to a more legitimate course of *practically working* than has been done near by in the same district.† Silver-lead mining is a very different thing from either gold or tin mining, because before any mine can obtain any value in this swampy and wet ground, deep shafts and levels, equipped by powerful steam machinery, are the desiderata, and, then, the treatment either on the dressing floors or in the smelting furnaces requires a great deal more skill than what our mine managers have been accustomed to, or in all probability possess. It is therefore most requisite that a *large amount of available working capital* should be provided by the shareholders, because otherwise it is almost certain to end in a failure all round. Then, again, the means of communication with the nearest shipping port, where the furnaces can be supplied with the best ingredients for fluxes, viz., iron (manganese), lime, and hard charcoal. So far as I have been able to ascertain, everything points to Strahan, Macquarie Harbour, as the site for the smelters, because lime could be obtained from the cliffs at the River Gordon, and iron (manganese) from Mount Zeehan, and about charcoal there would not be much difficulty I apprehend. The connection between these rich mines and Strahan should be provided for by means of a tramway, which would cost about £1000 per mile without rolling-stock. Meanwhile the pack-track to Trial Harbour should be completed so as not to check, but rather promote, the shipment of crude silver-lead ores to the smelting works in other colonies.

G. THUREAU, F.G.S., *Government Mining Geologist.*

\* These were mentioned to me as "Bell's big iron blow," said to be 60 feet in width, and Adams's, i.e. Sunrise, lode, in the bed of the North Henty River.


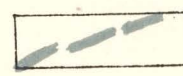


† Mount Heemskirk.



GEOLOGICAL  
SKETCH PLAN  
OF  
THE MOUNT ZEEHAN  
SILVER LEAD LODES

Scale 10 Chains to One Inch

REFERENCE *see G. Murray F.G.S.  
Government Mining Geologist  
Launceston 1888.  
(Tasmania)*

-  Silurian
-  Silver Lead Lodes and continuations
-  Ironores (Limonites) i.e. Indications for Calcareous deposits
-  Pyrites veins with Zinc blende and Silver Lead Ores

