

SCAMANDER COPPER FIELDIntroduction.-

War requirements, with their consequent necessity of obtaining greater supplies of copper, again justify a comprehensive investigation of the copper resources of the State, with the object of determining whether the output could be increased. Accordingly, the writer was instructed to undertake a re-interpretation of the geology of the Scamander copper deposits.

The principal object of the present examination has been to acquire all possible information bearing upon the genesis of the lodes, their structural features, the distribution of the metallic contents, the probable extensions and any evidence pertinent to the question of ore deposition, as these geological factors have a vital bearing on the supplies of ore and methods of prospecting and sound information relating to them must be of the greatest value.

The increased price of copper is high enough to warrant attention being paid to deposits previously unprofitable and has stimulated activity in this area.

Location and Access.-

The copper deposits are located about two miles north north east of the Upper Scamander bridge and occupy an area, roughly rectangular in shape, of approximately two square miles, the long axis of the rectangle having a north westerly trend.

A road has been constructed from the Upper Scamander bridge to the Orieco Mine, a distance of approximately two and three quarter miles. It is in fairly good order, but requires some attention on a short stretch across the valley of a small creek, an affluent of Eastern Creek. This road connects with the old cart road from the eastern mine to the landing on the North Arm, where in the early days the ore, carted from the mine was transhipped in small boats to Scamander.

Physiography.-

The area under investigation is situated on the south eastern slopes of the Scamander Tier, a parallel range about one mile west of the coastal range. It consists essentially of two physiographic units, one the dissected plain 100 to 200 feet above sea level composed of wide open valleys, and the other the prominent mass of the Tier, here deeply bisected by Eastern Creek. The ravines and valleys are steep sided, v-shaped and for the most part, dry accumulations of wash indicate torrential rains and rapid drainage.

These ridges stand high relief because the neighbouring valleys with which they are in contrast have been carved by erosion below a surface, once broadly coincident with the present ridge crests, that rise nearly 900 feet above the valley of Eastern Creek.

Practically, the whole of the drainage of the area is effected by the Eastern Creek and its tributaries; while Eastern Creek is the only permanent stream although reduced to a small flow owing to the extremely dry conditions.

Geology.-

The geological sequence is not complicated, consisting as it does wholly of slates and sandstones of the Mathinna Series; there is no direct evidence for the assignment of this age to these rocks but in view of their contiguity with the Mathinna area and the lithological similarity of the types no other correlation is possible.

The rocks range from soft drab greenish grey, purple and dark slates through argillaceous and indurated sandstones to white quartzites. Although the slates are a soft formation in comparison with the sandstones and quartzites and weather into smooth slopes, it is nevertheless well indurated, firm and in places not a very fissile rock. The sandstones and quartzites, when massive are short jointed and give rise to accumulations of angular debris.

The strata have been folded regionally but where folding was on a small scale and acute, rupturing has occurred.

In the minutely faulted rocks of this series no complete section could be found and it was impossible to obtain a clear structural picture even by inference from the fragmentary data from the different fault blocks.

These rocks, so far as is known, are not fossiliferous and present no characteristics that mark them indubitably as marine or fluviatile in origin.

No igneous rocks occur within the area examined but are well developed in the immediate vicinity.

Structural Features.-

As might be expected in rocks so distorted by the intrusions of batholithic granitic masses, they show extreme variations in strike and dip and locally the planes are intensely crumpled into sharp isoclinal folds. Although the stratified rocks have been elaborately faulted, the fault pattern is on an extraordinary minute scale, apart from the several major faults.

In a final analysis, deformation of rocks under stress takes place by flow or fracture or by some combination of the two processes. In a broader structural sense and without consideration of that kind of flowage, which is associated with the development of schistosity or general recrystallization, rocks may be deformed by folding and faulting. In most regions both of these kinds of major deformations are exemplified and the character of the resultant structure depends upon the relative share of each. Although folding in this area is intense, faults on the other hand are extraordinarily numerous and the characteristic structural unit is the tilted fault rock.

A general and significant grouping of the faults on the basis of common trend is possible. The dominant group is the north 45° west line, which includes the ore-channels of the Ringarooma P.A., Orieco and Dunn's prospects; this is followed by the north south group represented by the gossanous occurrences on and to the north

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west of section 8291/93M. The other group, developed to a much lesser degree is the north 80° west line, which is indicated by the occurrence of gossanous material south west of Gramps Workings and near the north-eastern corner of 5239/M.

Of the many faults that have been mapped, comparatively few are so exposed as to permit a measurement of the dip of the fault fissure; but in Orieco workings all are high angle faults, probably averaging 80° and dip south west.

There is no evidence available that the faults are of distinctly different ages and discrimination must be based on other criteria than that of differences in strike.

The lack of rock outcrops has somewhat lessened the effectiveness of the survey, in that infinitely more detailed mapping is required to reveal the intricate structure. However, an endeavour was made to use topographic criteria as an aid in the interpretation of the structure, the writer being fully cognizant of the temptation to use them as a basis for detailed work, where outcrops are few and correlation difficult or impossible.

The hills are all of the narrow straight ridge type, which are profoundly steeper on the south western side, with a gentler slope on the north eastern flank; as characteristically developed in sharply folded areas.

The main streams follow, generally, the strike of the beds, while the lesser ones are at right angles to it, giving rise to typical block drainage.

But there are so many limiting features that great care must be exercised in giving the topographic evidence its proper place in structural mapping.

Ore Occurrences.-

The ore occurrences consist of groups of parallel arsenopyritic, quartz-chalcopyritic, veins with occasional developments of zones of mineralised material on each side of the primary fissures. The veins are formed in distinct fissures of great length and although the differential movement, apparently, is not great, the actual amount of the displacement could not be determined, owing to lithological similarity of the members of this series and the complete absence of distinctive marker beds.

The line of gossanous outcrops indicating the course of the Orieco lode can be traced, in a north westerly direction from the western bank of the North Arm of the Scamander River, a distance of at least two miles. The outcrops have rather a barren appearance and consist essentially of limonitic, cherty matter accompanied by chloritised slate with occasionally veins of quartz.

It was possible, only at the Orieco mine, to study the conditions governing the relationship of gossan outcrop to ore shoots. Here the adit has been driven in the lower part of the zone of weathering, commencing at a point approximately 16 feet above ground water level and passing through it somewhere about 600 feet from the portal.

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This study shewed that although the outcrops are roughly lenticular and although in some cases ore existed in depth which had no clearly seen equivalents at the surface, nevertheless the areas of good outcrops have good ore beneath. Insufficient evidence is available to arrive at any conclusion regarding the grade of the underlying sulphide as compared with the surface shewing.

The shoots of ore in the Orieco mine pitch from 80° - 83° in a southerly direction.

In view of the underdeveloped condition of the ore occurrences, in this field, it has been deemed advisable for descriptive purposes to refer to the individual occurrences as prospects; their location is indicated on the accompanying plan, while detailed sections of each occurrence, also, are given.

Only one mining tenement is held in this area, at the present time, that being a ten acre section 15M/41, charted in the name of I.A. Berwick, which embraces part of the Orieco workings. The remainder of the area having been reserved to the Crown by withdrawing it from the provisions of the Mining Act.

The Orieco Prospect.-

This prospect is the only one which offers any facilities for examining the ore occurrences, near the lower limits of the zone of weathering.

The workings consist of an adit, driven in a general north westerly direction for nearly 900 feet on the main ore-channel and two relatively deep shafts have been sunk on the main fissure, about 35' south east of the adit portal and the other approximately two chains south of the main shaft; these shafts appear to be located on a prominent cross fault which strikes north 10° east and dips east at 70° , and it is very problematical whether the main Orieco ore-channel persists in that direction without serious dislocation.

It is unfortunate that the results of the deep workings are not available for study, as the nature of the lode, at least 100 feet below adit level is of the utmost importance in determining the future prospects of the ore occurrences and every endeavour should be made to determine the nature of the ore shoots at that depth.

As is common in copper veins, the workings of the Orieco mine reveal that very complete leaching of the copper minerals has occurred to a depth of over 200 feet. The oxidised ores consist of cuprite, chalcantite, azurite and malachite with the chief concentrations occurring as a selvage on a wide formation of much kaolinised slaty lode material.

Several ore-shoots were intersected in driving the adit but only two were productive of ore of a sufficiently high grade to warrant mining under the market conditions prevailing at that time. The last 500 feet of driving failed to locate any further payable ore-shoots in the northern extension of the ore-channel.

The first lens of ore was intersected at 130 feet from the portal and extended approximately 60 feet. A winze was put down 16 feet and drives opened out for a distance of 32 feet; the ore has been stoped to adit level, over a distance of 25 feet. The stope is partly filled with mullock, so that no attempt could be made to determine the grade of ore under foot by sampling.

Sampling, by means of channel samples cut over the back of the adit every ten feet, was undertaken to determine the grade and width of the shoot, at adit level. No sample was cut above the winze area, owing to the height of the back. The section sampled was 60 feet in length and indicated an average copper content of 1.82 per cent, for an average width of 4.42 feet; a sample taken in the south end of the stope, nine feet below adit level, shewed a copper content of 5.91 per cent, over a three foot section.

The main ore shoot is only partly accessible owing to the collapsed condition of the workings in the vicinity of the main winze and rise; but four samples taken over a length of 150 feet indicate a minimum average width of 7.38 feet with an average copper content of 5.39 per cent, while in the south east drive from the 20 foot winze, two samples indicate an average grade of 7.51 per cent copper, with an average width of 3.25 feet.

The ore shoots appear to be confined to crush zones developed particularly in the thinly bedded slates and the mineralization has followed the many component fractures of the zone. As the structure of the western fault block consists essentially of an overturned, south pitching fold, the truncated crest of which is composed of dense, blocky sandstones and quartzites, with occasional intercalations of the thinly bedded slates, few crush zones are developed, while on the eastern side of the main ore-channel, where the thinly bedded slates are more apparent, many crush zones occur. Due regard to the strike of these zones has not been given in directing prospecting operations and there appear to be several areas which warrant further attention to determine their extent and value.

Beyond the No. 4 cross-cut, the rock type is predominantly dense, blocky sandstones and quartzites.

South Orieco Prospect.-

The southern extension of the Orieco ore channel has had little or no prospecting, apart from the driving of a short adit and the sinking of a shallow shaft, from creek level, some 24 chains south east of the main adit. The lode formations as exposed in the creek is nine feet wide and consists essentially of a dense chloritised rock with arsenopyrite, sphalerite and chalcopyrite. A shaft was sunk on the southern side of the creek, but is now filled with hillside scree and creek wash and could not be examined. The adit was driven south 55° east for forty-three feet on a level of fifteen feet above the creek bed and was well in the zone of weathering; beyond proving the persistence of the ore channel, it served no useful purpose in testing the occurrence.

On the northern slopes of the ridge, between these workings and Eastern Creek, a prominent gossanous outcrop marks the line of the ore channel; a few shallow surface cuts have been made to determine the extent of the gossan in place. This indication is very promising and merits further prospecting below the zone of weathering.

Paul Beahr's Prospect.-

This is the only other prospect on the southern extension of the Orieco line and it is situated on the western bank of the North Arm of the Scamander River. An adit has been driven to intersect the lode but as the adit has been inaccessible for many years, little information regarding the prospect can be obtained. Apparently a fairly strong channel has been intersected for in spite of the exceptionally dry period prevailing, there is flowing from the adit, a good stream of water, heavily charged with yellow iron oxide. The copper content of the water, however, is very low.

An outcrop is visible on the hillside, which rises very steeply from adit level and the evidence suggests that the lode warrants prospecting to determine its mineral content and limits.

Ringarooma Bay. P.A. Prospect.-

Two prospects occur on 5239/M, and parallel to the Orieco line and the other approaching the east-west type. Two shallow cuts at the foot of the hill constitute the only prospecting attempted.

The gossanous outcrop is well developed and can be traced to top of the hill over 500 feet above sea level. Where exposed in the trench, it shows at least six feet of siliceous gossanous material.

The same conditions of oxidation most probably exist here as at the Orieco so that a zone of weathering up to 200 feet must be anticipated and any shallow surface work cannot provide a true indication of the prospects of this ore occurrence.

No prospecting whatever has been undertaken on the east-west occurrence.

Dunn's Prospect.-

This represents a parallel vein some 25 chains north east of the Orieco ore-channel.

Prospecting operations consist of an adit driven 100 feet in a north easterly direction on an ore-channel represented by a foot of gossanous material containing some arsenopyrite and a little copper. A shaft was sunk 25 feet at the entrance of the adit but could not be examined owing to water.

The southern and northern extensions of this line are represented by strong gossanous outcrops upon which little work has been done; the northern outcrop is associated with a considerable amount of dense milky-white quartz.

An assay of a five foot channel sample across the face of Dunn's adit indicate a copper content of 0.15 per cent.

Cramp's Prospect.-

A shaft was sunk 100 feet to test this prospect, but it is reported that no driving on the lode was possible owing to an influx of water and bad air conditions; the dump shows ore consisting essentially of iron pyrites and a little chalcopyrite with blue and green copper stains. There is nothing to indicate the size of the vein. A fairly strong gossanous outcrop occurs about 10 chains north north east of the shaft but no prospecting has been undertaken.

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The remaining prospects indicated on the plan are wholly untested and as they appear strong enough to indicate veins of fair dimensions, there is ample justification to warrant prospecting below water level.

Conclusions and Recommendations.-

The re-examination of the Scamander area has proved that apart from the mining operations of the Orieco mine, no real attempt has been made to test the various prospects in this zone of mineralization beyond two short adits high in the zone of weathering, and several shallow surface cuts. In view of the depth of the zone of weathering here, the prospects cannot be regarded as having been prospected with any degree of completeness and testing by means of the diamond drill offers the most effective method of achieving rapid results. A comprehensive drilling campaign, therefore, has been outlined.

In view of the number of unknown factors in relation to the vein systems, apart from the Orieco group, the drilling campaign must be regarded as tentative only and may be subjected to extreme modification if the test holes indicate conditions varying from those appertaining at the Orieco.

It is fully realised that the premises, upon which these assumptions are based are somewhat slender, but in view of the encouraging nature of the prospects, there is no argument against the possibility of locating copper bearing shoots at ground water level and the risk can only be regarded as legitimate.

It is estimated that 3,000 feet of drilling will be required to complete preliminary testing of the prospects located within the Scamander area.

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