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# ST. PAUL TIN FIELD



## INTRODUCTION

This field, with that of Story Creek, belongs geologically to the Avoca District and it is a part of that physiographic province, yet for purpose of description it is convenient to accept the natural division presented by St. Paul Dome and the conterminous range of mountains. That barrier separates the St. Paul and South Esk River systems to the line of their convergence at Benham Plain; and Mineralogically also that range forms a distinct break, for the tin granites there pass underneath the post-mineral rock formations of which the upper part of the mountain is composed.

The acceptance of such division, arbitrary though it be, is asked in order that a separate report and one in more detail may be presented of this area.

## AREA

St. Paul tin mining field may be placed within the confines of St. Paul River Valley for all the mines lie on one side or other of that channel. The potential tin-bearing part of the area is not large, being 7½ miles long from east to west and 5 miles wide from north to south, or 37½ square miles in extent.

## PHYSIOGRAPHY

St. Paul River flows along a wide 'U' shaped valley flanked on the north by Mt. St. Peter, St. Paul Dome and Mt. Foster, and the south by Snow Mountain Range. The shape of the valley suggests a glacial agency in its sculpture, and to that allusion is added belief by further evidences in tributary valleys. On the north side of the road bridge over St. Paul River a granite spur, projecting above the general level, shows enormous flat surfaces of granite planed in the forms of roches moutonnes. Again, in the upper sections of the Main valley and in many of the tributary valleys, are deposits of boulder clay composed almost wholly of diabase derived from the higher mountain ranges to the south and north. Such deposits could not have been formed by means of any other agent.

On the south side of the river bridge vesicular basalt overlies compacted sands of Tertiary age. These sands in the upper reaches rest upon river gravels composed almost wholly of diabase and the waste of the Permo-Carboniferous formation. There, however, the Tertiary sands are covered with dark grey sandy clay the deposition of which probably was due to the obstruction of the river by basaltic lava. The clays are overlain with 10 to 30 feet of granitic tin-bearing sands of Recent age.

In connection with the development of the present topography it is interesting to note that the Permo-Carboniferous strata were laid down on a very uneven floor of Cambro-Ordovician sandstones, tuffs, quartzites, and slates, and of Devonian granites. In the lower parts the basal member is a conglomerate (in many instances tin ore bearing) of well-rounded and assorted quartz and quartzite stones overlain with hard quartz grit or arkose; in the upper parts fossiliferous mudstone or a fossiliferous limestone may be seen resting directly upon Cambro-Ordovician sediments or Devonian granite. The original Devonian topography therefore probably exerted a modifying influence on the sculpture of the land since early Tertiary time.

The valley of St. Paul River then has been scooped out of all pre-Tertiary formations, such as Mesozoic diabase, Trias-Jura coal measure sandstones and Permo-Carboniferous strata, and the bedrocks have not only been denuded of the deep covering of those rocks but have suffered corrosion themselves. It appears that the original river course followed the lines of a plane of Mesozoic faulting. The valley thus started became more generally moulded by glaciers in Pleistocene time, and they, in turn, gave place to the present system of rivers which are now entrenched in their old beds.

St. Paul Dome (3,368 feet above sea-level) capped with erosion-resisting diabase, stands out prominently from the less eminent peaks projecting from the northern mountain range. In somewhat like manner the diabase bluffs of Snow Mountain and Mt. Lewis appear the most striking features of the southern range. In contra-distinction, the broad valley floors of St. Paul River and its numerous tributaries lying between these sharply inclined ranges present an opposite aspect, but one not the less striking.

## GEOLOGICAL RELATIONS.

The oldest rocks (Cambro-Ordovician sediments and tuffs) in the district are well exposed on both sides of the valley and rise to an altitude of 1800 feet above sea-level on the north side. The sediments consist largely of quartzites; but sandstones and phyllites are not unimportant members of the formation, and interbedded tuffs are prominent. Where this formation is tin-bearing it is generally found that the tuff member has suffered more than the others from the effects of mineralising solutions and tin ore replacements of that rock are therefore not uncommon marks.

In Devonian time a rising granitic magma, charged with mineralisers, invaded the Cambro-Ordovician, effecting a complete metamorphosis of those rocks in direct contact with a partial change of those nearby. Physical effects of the intrusion on the sedimentary rocks may be cited as fissuring and faulting. The granitic magma differentiating in place separated into a number of modifications and thus are found represented here the rock varieties given in the order of their formation:-

1. A porphyritic granite consisting of quartz, felspars, and biotite with large directionally arranged phenocrysts of oligoclase,

2. Coarse graphic granite with nests and veins of pegmatite.

3. Quartz porphyry,

4. Pegmatite of orthoclase felspar, tourmaline, and quartz.

5. Alaskite.

The cooling and contraction of the granitic mass led to the opening of fissures in the intruded Cambro-Ordovician sediments and in the granitic body, and in adjusting itself to the solid condition fault fissures were developed in the rock. Faulting of the granitic body took place along north-east lines which are marked by hard bluish quartz-tourmaline veins almost barren of tin ore. The reopening of these veins, however, led to the deposition of tin ore and quartz on the hanging walls. The examination shows that the important greisen veins, -- coursing north-west and dipping south-west, are contained in graphic granite and quartz porphyry bodies which course about 280° and dip south. It will therefore, be noted that the tin-bearing bodies cross obliquely the containing rocks and with them come to an end at the lines of faulting. The particular points of interest are:-

1. Greisen veins in the quartz porphyry are siliceous and contain a fairly high proportion of pyrite and chalcopyrite, and that they are narrower but closely spaced,

2. Greisen veins in graphic granite are wider, more micaceous, and further apart than those in the quartz porphyry,

3. The quartz porphyry greisen veins course on a slightly different bearing and coalesce with those of the graphic granite.

After a period of erosion, during which the intrusive granite was denuded of its cover of Cambro-Ordovician sediments, the basal member of the Permo-Carboniferous (lower coal measures) formation was laid down horizontally upon the granite and quartzites. This consists of a conglomerate of well-worn quartz and quartzite stones with granite waste firmly cemented together and in places containing a fairly high proportion of tin ore. The next stratum in horizontal succession is a coarse grit or arkose made up almost wholly of the waste of granite rocks and this contains tin ore also in certain places. As remarked in another part of this report the basal conglomerate is found only at the lowest elevations of the older rocks and in some places arkose and its successors sandstone, mudstone, and limestone rest directly on the bedrock at the higher elevations). Deposition of Permo-Carboniferous -- sediments containued upon a gradually subsiding floor and without serious interruption, the Trias-Jura coal measure series were laid down in successive beds upon them. That long-continued sedimentation came to an end with the intrusion of diabase, which in the forms of dykes, sills and transgressive masses, completely disrupted both systems. At that time the Cambro-Ordovician sediments and Devonian granites had become deeply covered with Permo-Carboniferous and Trias-Jura strata and the ore-bodies well-protected from agents of erosion. The intrusion of the diabase and the accompanying uplift of the land brought into being the next cycle of erosion, which excepting occasional interruptions of short duration, continued through the Cretaceous Period. In this process the bedrocks containing the ore-bodies were again exposed to view in the valley of St. Paul River.

In early Tertiary time sedimentation on the floor of Mt. Paul valley began with the deposition of materials from the disintegration of Mesozoic diabase and the coal measure strata. These beds are 50 to 100 feet thick, but are almost barren of tin ore. That period of sedimentation ended with the eruption of basalt in the mid-Tertiary and the concomitant land uplift. Vesicular basalt land now covers Tertiary - sediments in St. Paul valley and on Benham Plain. Since that time Quaternary to Recent deposits of alluvium have been and are being laid down on top of the Tertiary muds and gravels lying on the bedrock of the valley floor. These latest deposits are tin-bearing in places but are only 5 to 30 feet deep. In the valleys of tributary streams are tin-bearing deposits of Recent age.