03-251

REPORT ON THE LODDON & JANE RIVERS

251 1/12

REPORT BY MR. L. K. WARD, ASSISTANT GOVERNMENT GEOLOGIST.

Geological Survey Office,
Launceston, 19th June, 1909.

SIR,

I HAVE the honour to present the following report upon that portion of the work of western exploration which was entrusted to me during the past summer.

I.—INTRODUCTION.

Personnel of the Party.—In the work of exploration I was accompanied by Mr. L. P. Seal, of Hobart, who generously volunteered his services, and Messrs. M. Donoghue and J. T. Riley, two able prospectors and experienced bushmen. I desire to record my appreciation of their loyal assistance and unabating energy throughout the expedition.

Period Occupied by the Examination.—I left Launceston on 15th February, and proceeded eastwards from Gormanston on 18th February. The party reached Gormanston on the return journey on 15th April, and I arrived in Launceston on the 17th of that month.

The Area which was Examined.—Acting under your instructions, the party moved southwards towards the Gordon River, along the track cut by Mr. J. L. Moore from the Franklin River near the foot of Mt. Arrowsmith.

We therefore followed the Linda track eastwards from Gormanston to a point near the confluence of the Surprise and Franklin Rivers, and there crossed the latter river.

During the previous summer I made a geological examination of the country along the route of the proposed Great Western Railway, and my operations were carried out from the Linda track over the country between Gormanston and the Iron Store at the foot of Mt. King William I. The recent exploration work is thus an extension of that carried out last year.

From the Franklin River we made our way along the valley of the South Loddon River to its source in Calder's

Pass, prospecting the country as we went. At Calder's Pass we found that the track diverged, one branch turning eastwards along the pass, and the other rising abruptly towards the west.

We followed the easterly track in the hope that we could penetrate the country at the northern extremity of the Prince of Wales Range, and prospect it. Moreover, it seemed advisable to move southwards, if possible, without having to cross the Jane River, so that we should not be cut off by floods in the river.

However, the eastern deviation of the track was found to terminate at a distance of less than 3 miles from the turn-off. We proceeded to the Jane River, and cut a track along the eastern bank for some miles. Thus we reached the foot of the mountain which I have called Algonkian Mountain, and the base of the northern extremity of the Prince of Wales Range.

Finding that our progress was too slow along the eastern bank of the Jane River, and that it was impossible to move southwards without much preliminary track-cutting, I decided to take the western track, carried southwards from Calder's Pass. We therefore cut a rough track along the Jane River, and effected a junction with Mr. J. L. Moore's main track at a point about 13¼ miles distant from the Franklin River.

Moving southwards along this track we crossed the Upper Jane River, after some delay caused by floods, but were unable to cross the lower portion of the same river for some days on account of the heavy floods. Finally, a crossing was effected and I reached the confluence of the Acheron and Jane Rivers, but was unable, under the circumstances, to penetrate any further towards the south.

The country in the neighbourhood of the routes mentioned has been geologically examined in such detail as was permitted by the time at my disposal, and the results of this examination are recorded on the geological map which is attached to this report.

General Results of the Expedition.—The general results of the expedition are confirmatory of last year's work, and the account of last year's exploration should be read in connection with this report. The conclusions arrived at with regard to the possibilities of the district as a source of mineral wealth are precisely those which were stated with regard to the more northerly strip of country examined during the summer of 1908.

This is a matter which follows as a logical consequence when the similarity between the geological features of the two areas is borne in mind; and the conclusions thus theoretically deduced have received empirical confirmation from the actual results of our prospecting operations.

Although the recent brief examination has not given encouraging results, when the direct economic possibilities of this particular area are considered apart, yet it is contended that the expedition has not been altogether unfruitful, for definite knowledge of a portion of the State hitherto more or less completely unknown has been acquired, and additional information has been gathered concerning the character and sequence of some of the older sedimentary rocks. This information has already proved of material value in the correlation of the strata encountered, and in the fuller interpretation of the geological history of those parts of Tasmania where these strata recur. Indirectly, therefore, the western exploration of 1909 has afforded results which have a real bearing upon many economic problems.

Inasmuch as the exploration work of 1909 constitutes an extension of the similar work of the previous year, it will be proper to give a succinct account of the geology of the area from which my party proceeded southwards. Embodied in this brief statement are the results of the recent work of the geological survey.

II.—Geology.

(*a*) *Summary of Observations of* 1908.

The area lying to the northward of that which was recently examined is not characterised by a great variety of rock-types, nor are many geological systems represented over the greater part of this area.

The topography of this portion of Tasmania is notably rugged, having been developed by the corrosive and erosive action of the Franklin River system upon a region which has long been elevated high above sea-level. Since the elevation of central Tasmania at the close of the Mesozoic era, this cycle of denudation has been in progress. Minor oscillations may have occurred, but in the central portion of the island at least there has not been any serious interruption in the work of degradation.

So long a period of continuous denudation has resulted in the removal of a very large portion of the geological formations once represented in the district, and laid bare a broad expanse of the quartzitic and micaceous schists which are the oldest rocks known in Tasmania.

Remnants of certain of the Palæozoic formations have survived in some portions of the area, and partly indicate the former extent of the sedimentary basins of which they once formed a part. The intrusions of diabase, which contribute largely to the bulk of the King William and Loddon Ranges and Mt. Gell, have also been dissected by this river system.

The geological systems known to occur in this region are these:

(*a*) *Pre-Cambrian.*—The great complex series of quartzites, quartzite schists, quartz-mica schists, micaceous and argillaceous schists, cover the greater part of the area. They constitute the Raglan and Collingwood Ranges, together with Mts. Hardy and Arrowsmith, and the less prominent hills on the northern bank of the Collingwood River. These rocks are greatly contorted, and present no structional features which are constant throughout the region.

(*b*) *Cambrian.*—A small hill formed of reddish quartzite lies to the east of Mt. Arrowsmith, and its constituent strata rest unconformably upon the eastern borders of the Pre-Cambrian schists. This is the only outcrop of the Cambrian strata in this particular spot. However, much larger masses were observed to the southward by Mr. Twelvetrees. And it appears to be now certain that the horizon represented by these outcrops is that of the West Coast Range conglomerate. If the formation has been once continuous across the space intervening between the West Coast Range and the Denison Range, the effects of crustal movements and subsequent denudation have been such that all the central portion of the formation has been removed. However, it is not known that a single continuous series stretched without interruption across this area.

The slates of the King River Valley probably belong also to this period.

(*c*) *Silurian.*—There is an extensive deposit of fossiliferous Silurian sandstone lying to the northward of the Nelson River. A small fragment of a sedimentary basin of this age occupies a part of the summit of Mt. Arrowsmith.

(*d*) *Permo-Carboniferous.*—A considerable thickness of sandstone of this age was found to occupy part of the flanks of Mt. King William I., but no traces were found in the country lying to the westward of the King William Range.

Yet this formation and the subsequent sediments of Mesozoic age, which are not now visible anywhere in the region, have presumably extended for some distance to the westward of Mt. Gell and the Loddon and King William Ranges. The reason for this supposition is mainly that the diabase which caps the mountains referred to is a rock which must have consolidated at some depth below the surface. Hence, though it is now devoid of covering on the mountain ridges, there must have been sedimentary rocks above the diabase at the time of its consolidation.

(*e*) *Mesozoic (Cretaceous).*—The Mesozoic sediments are now entirely removed by denudation. The diabase invasion is thought to have taken place at the close of the Mesozoic era. This igneous rock has, in all probability, solidified in the form of great sills or laccolites of the "cedar-tree" variety beneath a cover of Permo-Carboniferous and Mesozoic sediments.

(*f*) *Recent.*—The unconsolidated river gravels which are found on the banks of the present-day rivers or forming terraces on the fringes of the valley-floors are of recent date. They are not of importance as regards bulk.

The igneous rocks, other than the diabase which has been mentioned, are noticeably absent from the greater part of the region. In the valley of the Collingwood River and between the points where the Cardigan and Balaclava Rivers unite with the Collingwood River some dykes of garnetiferous zoisite amphibolite were found.

Also, near the junction of the Cardigan and Collingwood Rivers, some few lenticular veins of pegmatite were seen in the mica-schist. These latter intrusions probably have some genetic relationship with a few veins of tourmaline-bearing quartz which were found in the vicinity.

The prospecting of this district gave only negative results.

Quartz-veins were observed widely distributed throughout the schists of Pre-Cambrian age, and in some places irregularly-shaped impregnations of the schists with pyrites, arsenical pyrites, and haematite were found.

No constant direction of fracturing could be determined in any part of the region, nor could the few outcrops of mineralised rock be traced for more than a few feet.

The main belt of mineralisation of the West Coast lies to the westward of the region examined, and no parallel metalliferous zone has yet been located to the eastward of the conglomerate of the West Coast Range.

(*b*) *The Loddon River Valley.*

The Loddon River is separated from the Franklin River by a high ridge, which extends for some miles in an east and west direction. The main mass of this ridge is known as Mt. Mullens, and extends to the westward as far as the confluence of the two rivers named. From it two spurs run northwards, and of these the more westerly is known as Junction Peak, being situated at the junction of the Collingwood and Franklin Rivers.

After leaving the deposit of river alluvial on the banks of the Franklin River, almost the whole of the country intervening between that river and the Loddon River is constituted of the Pre-Cambrian schists. There are all varieties represented—quartzitic, micaceous, and argillaceous. And, at one point beside the track and 3 miles distant from the Franklin River the schist is graphitic, and some pyrites is present in the rock.

In the bed of the small creek which flows into the Franklin River from the south-east, not far below the Surprise River, there is a certain amount of carbonate of lime intimately intermingled with silica. The origin of this calcite cannot be definitely settled. It is a difficult question, and is bound up with that of the origin of the limestones found in the Jane River, mention of which is made below.

On the northern slope of Mt. Mullens, at a considerable elevation above the level of the Franklin River, there is a small deposit of alluvial material resting upon the schist. This constitutes part of an old river terrace, but the course of the stream, in the bed of which it was formed has since been diverted by the readjustment of the divides. The principal constituent boulders of the elevated terrace are of diabase and different varieties of the quartz-mica schists. Hence, we may infer that they were brought to this place by a stream which has had its source in the diabase-covered country to the eastward.

On the top of Mt. Mullens there is a small development of sandstone, which appears to be a portion of the formation more extensively developed in the region to the southward. This is, however, a local development only, for the western portion of the ridge is wholly constituted of the quartzitic schist.

The southern slopes of the ridge are steep, and not heavily timbered, and the quartzose schist outcrops here and there along the whole length of the mountain.

The upper portion of the valley of the Loddon River is fairly well graded, and has been filled with alluvial material. The ridge between the two easterly branches of the river consists of sandstone, and carries imperfectly preserved fossil imprints of the same character as those found in Calder's Pass, and mentioned below. The dip of the sandstone is westward, and the angle of inclination is small.

The eastern branches of the Loddon River join at the end of this tongue of sandstone, and the main southern branch of the river unites with the easterly portion a little further down-stream. As the river approaches the Franklin River Valley the alluvial deposit on its banks disappears, and it flows for the last portion of its course through an exceedingly narrow gorge.

The South Loddon River, too, is fringed by a deposit of recent alluvial material brought down by the river. In one place, due east of the top of Mt. Brown, a quantity of secondary pyrites was seen in this alluvial, but no valuable mineral was found with it. Organic matter is abundant in the river wash at this spot, and has doubtless effected a precipitation of the pyrites from iron sulphate carried down in solution by the river.

The flatness of the grade of the river valley in this district makes the prospecting of the stream beds difficult without the expenditure of some considerable amount of time and labour. The prospecting effected during this expedition did not meet with any encouraging results at all

The South Loddon River traverses the belt of sandstone which has been referred to above, and which extends to the westward as far as the foot of Brown Mount and the lower slopes of the Frenchman's Cap.

At its western border the nature of the sandstone becomes apparent, since it carries a number of tubular casts which are circular or oval in section. Entirely similar sandstone carrying similar casts has been recognised at a number of different places in the West Coast region. The rock is commonly referred to as the "tubicolar," or "pipe-stem," sandstone. The tubular casts are thought to be most probably casts of the burrows made by tubicolar annelids. No equally satisfactory explanation of these casts can yet be offered. They are uniformly devoid of any traces of organic structure. The sandstone is usually white, and to some degree indurated by an infiltration of silica.

The lowest visible members of the series in this locality are pebbly conglomerate beds, conformable with the tubicolar sandstone. These beds outcrop along the western border of the valley of the South Loddon River in a number of places. The strike at one point, where the stratification is very clearly visible, is N. 5° E., and the dip is towards the east at 40°. Variations occur, however, within short distances.

There appear to be several horizons of the tubicolar sandstone, and between them bands of quartzite, breccia, or conglomerate. The stratigraphical relationship of the visible outcrops is difficult to determine, since the greater part of the valley floor has been levelled off by the action of denudation, and only isolated outcrops of the denser varieties stand out above the vegetable cover. The occurrence of the breccia proves especially perplexing in this respect, when the outcrops in the lower part of the valley are considered. From the observations made in Calder's Pass it appears to be at the bottom of the series.

In a few places on the slopes of the small hills in this valley there is an iron-stained argillaceous sediment associated with the sandstone.

The several members of this sedimentary series rest directly upon the quartz-mica schists in every case which was observed, and there is a marked unconformity at the junction with the foliated rocks.

The schists represented to the westward of these unfoliated sediments are variable in aspect. The lower slopes of the high country are commonly composed of the more micaceous varieties, and the higher slopes, together with the ridges and peaks of the more quartzose types. There are no well-marked divisional lines between the several varieties in the great majority of cases; and the quartzitic schists are in some places to be seen so surrounded by the micaceous schists that the two types must be regarded as one complex whole.

The micaceous varieties of the schist series carry numerous veinlets and lenticles of white quartz, which cut across the foliation planes or conform with them. On the weathering of the schist the quartz from these veinlets is set free, and the broken fragments remain covering the surface of the ground, while the material of finer grain is carried away by the streams. The quantity of small fragments of white vein-quartz lying on the floor of the valley of the South Loddon River is remarkable. The quartz is quite free from visible inclusions of metallic minerals.

To the east of the South Loddon River the sandstone formation was found to continue as far as our examination extended. The outcrops are very few in this portion of the area mapped, and the vegetation is exceptionally dense.

No alteration was found in the country to the southward until Calder's Pass was reached. The eastern wall of the pass is a very steep hill of white sandstone. The lower layers of this sandstone carry a very large number of the tubular casts which have been referred to above. The tubes are in some cases 2 feet in length, and are usually oval in section. They are continuous across the bedding planes, to which they are roughly perpendicular. The majority of the tubes are not quite straight, but they have never been seen to follow a direction which is very tortuous. These characteristics are not at variance with the view expressed above with regard to their origin.

This sandstone gives place, at the top of the wall of the pass, to another sandstone, which is lithologically similar to and conformable with the tubicolar variety, but which differs from it in the matter of the fossil contents. The tubular casts are entirely replaced by vast numbers of hollow moulds, which have been impressed upon the sandstone by some organic body having the shape of a disc with a central hole. The disc or ring has, in radial section, the form of a doubly-convex lens, the major axis of which lies in the plane of the disc. The outside diameter of these discs is usually about $\frac{3}{4}$ of an inch, and the central hole is about $\frac{1}{10}$ of an inch in diameter.

No trace of organic structure remains, and from the form of the moulds alone no guess can be hazarded with regard to the nature of the organism which has given rise to the impressions. The discs most commonly conform to the bedding planes, but in some cases are inclined thereto. The strike of the discoidal sandstone is N. 20° W., and the dip is towards the east at an angle of 32°.

The only other markings, similar to those described, which have been recognised in Tasmania are some which occur in the Upper Cambrian beds of Caroline Creek. But in this latter place the outside diameter of the discs is usually less than $\frac{1}{10}$ of an inch.

In the light of this occurrence between Dulverton and Latrobe, it is necessary to enquire into the possible age of the sandstone.

Should the discoidal imprints prove to be of stratigraphical value, the age of the underlying tubicolar sandstone and the discoidal sandstone itself must be Cambrian. This is, however, a matter which requires further investigation at the several places where these rocks have been observed. Hitherto it has been customary to regard the tubicolar rock as Silurian, on the evidence obtained from the Zeehan and Bell Mount districts. There the tubicolar sandstone is overlaid by sandstone which bears a strong lithological likeness to it and carries Silurian fossils. But there may be some break in the succession which has hitherto passed unnoticed.

At Zeehan the tubicolar sandstone lies immediately above the West Coast Range conglomerate, which, as stated above, is thought to be of Cambrian age.

(c) *Calder's Pass.*

The narrow defile between the hills, which is called Calder's Pass, is the source of the South Loddon River. The walls of the pass are steep, and the low-level passage between them is shaped like the letter L, with the two arms opening towards the north and east. The northern branch of the pass follows the line of junction between the

tubicolar sandstone and the mica schist which constitutes the eastern foothills of the Frenchman's Cap.

At the base of the sandstone series there is a coarse breccia composed of subangular blocks of quartzite. These fragments of quartzite carry a number of small pits which, from their cubical form, are to be ascribed to a former filling with pyrites. The pyrites is now wholly removed, and doubtless the limonitic cement of the breccia derives its iron content from the oxidation of the pyrites.

The pass turns abruptly to the eastward at a point 10 miles distant from the Franklin River, and at this place the sandstone terminates. No trace of the sandstone could be found to the southward, and on the northern wall also of the eastern branch of the pass it is replaced by members of the schist series.

Most commonly the schist is greenish and micaceous, but quartzose varieties also occur. The veins of quartz are very common, and some fragments of white vein-quartz carrying needles of tourmaline were found at this place. The fragments could not be traced back to their parent vein. Doubtless the occurrence is similar to that observed during last year's expedition in the valley of the Collingwood River. No metallic mineral was found in association with these vein fragments. The pass, at its eastern extremity, deploys into a button-grass plain, traversed by one of the branches of the Jane River, which takes its rise in the pass itself.

Towards the eastern end of the pass the micaceous schist gives way to a highly schistose conglomerate, which clearly belongs to the same formation, but differs from the usual rock-type, in that there are present pebbles of jasper and quartz which have been flattened, drawn out, or sheared by the stresses which have produced the metamorphism of the rocks. This crushed conglomerate is prominent on the southern spur, which runs down to the low country from the eastern extremity of the southern wall of the pass. It also outcrops in a few places on the low country which lies between the pass and the Jane River.

So few exposures are available for examination that it is impossible to make any statements about the structural relationship between the schistose conglomerate and the mica schists. The latter certainly appear to belong to a higher horizon, and the junction between the two appears to dip to the westward at a low angle. However, this matter requires further investigation before it can be regarded as settled.

Here, too, only negative results were obtained from our prospecting operations.

In the bed of a creek which rises among the hills to the westward of the bend in the pass some angular fragments of vein matter, composed of a coarse pegmatitic intergrowth of quartz and felspar, were found. The angular character of these fragments points to a local derivation of this vein matter, but the exact source was not located. The vein material is closely allied in composition and in origin to the pegmatite dykes which are most frequently observed in association with exposures of granite. When this occurrence is reviewed in conjunction with that of the quartz-tourmaline veinstuff mentioned above, a strong presumption arises in favour of the existence of a granitic mass in depth below the schists which appear at the surface.

The granitic magma has no representative consolidation product visible at the surface at this place; yet its presence in depth may be deduced from the occurrence of veins consisting of such mineral aggregates as are usually the associates of granite.

Moreover, during the exploratory work of last year pegamtite and quartz-tourmaline veins were found in the valley of the Collingwood River. These occurrences at Calder's Pass appear to offer strong confirmatory evidence in support of the view expressed last year—that there is connection between the granite outcrops at Cox's Bight and at Granite Tor. The question of the extension of this granite beneath the surface is one of great economic importance, since it is held that the greater part of the ore deposits of Western Tasmania have a definite genetic relationship with the magma from which the granite has consolidated.

No metallic minerals having been observed in connection with these veins, no indication can be given as to their possible association with any deposits of the ores of valuable metals. On the one hand tin ore, and on the other cupriferous gold ore might be found in association with tourmaline, but no higns of the presence of either vein-type were detected.

(d) The Head of the Jane River.

The Jane River takes its rise in the mountain called the Frenchman's Cap, and the main stream flows southwards as if it would pass between the Surveyor's Range and Deception Range. But it turns abruptly at the southern end of Lightning Plain, and flows eastwards, cutting off the Surveyor's Range from the foothills of the Frenchman's Cap.

The head waters are augmented by small contributing streams flowing in from both the northern and southern sides of the main stream.

Almost the whole of the basin drained by the upper portion of this river is occupied by the normal micaceous and argillaceous schists. Some of the latter are very dark in colour, and possess a slaty cleavage rather than the typical foliation of a schist, and in a few places graphite is visible. In this part of the district some of the siliceous veins in the schist carry haematite, and in a few cases cubical cavities from which pyrites has been removed were detected in the quartz.

In the immediate vicinity of the spot where J. L. Moore's track crosses the upper portion of the main stream there is a considerable development of limonite, the origin of which is not apparent. There is a strong outcrop on both banks of the river, and a bar of limonite is visible in the river bed when the water is low. In prospecting at this spot traces of gold were found in the shallow alluvial deposit at the water's edge. It is impossible to say whether this gold was derived from a distant source, or whether both the gold and limonite have a local origin.

Along the course of the Jane River at a number of spots there are to be seen outcrops of limestone which are restricted in a remarkable way to the bed of the river only. This limestone does not appear on the river banks beyond the water's edge.

The observed outcrop which is furthest up the stream is almost due south of the turning point of Moore's track in Calder's Pass. Despite the horseshoe curve followed by the river, between this point and the southern end of the Surveyor's Range, the limestone was seen from point to point along the whole of this course, and always in the river bed.

Thus it does not seem possible that the river should be following the line of outcrop of a narrow bed tilted up till it stands on edge. In other words, it does not appear to be possible that the limestone could be a calcareous zone in the Pre-Cambrian schists.

Neither does it seem probable that the limestone is a Tertiary or Recent deposit of fresh-water origin laid down in the river beds. For, though no actual fossils were obtained from the limestone, the general appearance which it presents is that of one of the Palæozoic limestones which have partially recrystallised. If we are correct in assigning these outcrops to one geological horizon, and if this horizon is the same as that represented, not many miles distant, in the beds of the Franklin and Gordon Rivers, the age of the limestone is Ordovician. Provisionally, in my opinion, it should be so regarded, but it must be borne in mind that the classification does not rest upon a sound basis.

If then these limestone outcrops in the river bed are of Ordovician age, we are still confronted with the extraordinary facts observed with regard to its distribution, and these facts appear to me to be explicable in one way only.

It appears that the Ordovician limestone accumulated upon a land surface which was deeply eroded at the close of the Cambrian period. The sedimentary deposits following after those of Ordovician time buried the latter beneath a load which was ever increasing until the middle of the Mesozoic era. Since that time there has been continuous denudation in progress over the greater part of the western portion of the island.

The cycle of erosion has now reached such a stage that almost every trace of the Palæozoic sediments has been removed, and the physiographical outlines presented by the country are apparently almost exactly those which obtained at the close of the Cambrian period. The early Palæozoic topography has exercised a strong control over that of to-day, and denudation has progressed until all but the lowest layers of the Ordovician deposits have been removed.

An earlier stage in this cycle of erosion is exhibited by the area lying to the northward of the Raglan Range, where the Nelson River is steadily working northwards and carrying off the Silurian sediments which rest against the Pre-Cambrian of the Raglan Range.

Throughout the district at the head of the Jane River all but the very base of the Ordovician seems to have disappeared, and the phenomena are not restricted to the valley of the Jane River only. For entirely similar features are shown by the Denison River, which lies to the east of the Prince of Wales Range. Again, a small bed of limestone was found during the expedition of last year in the bottom of the gorge of the Surprise River, between Mt. King William I. and the Loddon Range.

All these occurrences must be taken into account at the same time. If the correct explanation of them has been given, it is none the less remarkable that the drainage systems of to-day should have almost reached the level of the base of the Ordovician in so many places, while corrosion is still the prominent phase of denudation.

The restriction of the present rivers to the early Palæozoic valleys seems to be largely due to the superior hardness and consequent powers of resistance possessed by the more quartzose portions of the Pre-Cambrian schists which formed the ridges of the Pre-Ordovician topography. These ridges still remain prominent among the land forms of to-day; although it is, of course, evident that they have been modified during the present cycle of erosion.

After flowing for some miles towards the northern end of the Prince of Wales Range, the Jane River bends southwards, and then returns towards the southern end of the Surveyor's Range. The river first turns abruptly to the southward at the base of a great rounded mountain, which I have named Algonkian Mountain, since it is largely composed of Upper Pre-Cambrian (or Algonkian) sediments. In the time at my disposal I was unable to ascend this mountain, and regret that such a visit was impossible, for at a distance the summit appeared to be partly occupied by diabase. If this does prove to be the case, it seems probable that the diabase is a western outlier of the masses which can be seen to the north and east, capping the Loddon and King William Ranges.

(e) The Surveyor's Range.

The main stream of the Jane River system divides the Surveyor's Range from the Frenchman's Cap, having corroded a deep gorge between the two.

The Surveyors' Range has an approximately meridional trend, and is deeply dissected, so that the ridge is crowned with a succession of eminences separated by deep gaps.

The highest point of the range is on the largest of these eminences, which has a rounded top and steeply-graded sides. (1)

The greater part of the range is constituted of foliated which rests a quartzite schist almost entirely free from micaceous or argillaceous schists and quartz schist, upon foliation. The latter rock-type forms the substance of the higher peaks only. From a short distance the schistose character is not visible, and the rock appears to be a bedded sandstone, lying unconformably upon the foliated schists. The original bedding planes of the rock have been accentuated by weathering, but the rock is in texture a dense quartzite which possesses a slight schistosity.

The presence of this horizon of practically unfoliated quartzite above the contorted quartz-mica schists appears to me to mark a distinct unconformity; and the evidence at this place should be examined in conjunction with that offered by other places in this district.

Looking northwards towards the eastern end of the Frenchman's Cap from the top of the Surveyors' Range it it at once seen that the summit of this portion of the mountain consists of a horizon of massive quartzite. The latter is bent into gentle anticlines and synclines, and also fractured, but does not exhibit the crumpling and contortion of the schists found on the foothills of the same mountain. The southern end of the Raglan Range also presents a similar appearance when viewed from the top of Brown Mount.

Again, the north-western and western faces of Algonkian Mountain show an excellent exposure of a thick bed of quartzite quite free from deformation and exhibiting a bold white bluff devoid of vegetation encircling the mountain. The dip of the horizon is clearly at a low angle towards the south-west.

In the face of these several occurrences I am of the opinion that there are probably two distinct periods of sedimentation represented throughout this region. The more contorted schists seem to be sediments which belong to the older period, and have apparently been subjected to powerful stresses, and thereafter reduced to a base level by erosion before the deposition of the upper siliceous sediments. These latter acquired a slight schistosity at a still later period.

It is necessary that these observations should be checked by detailed examination at all the points which have been mentioned before the opinions here expressed can be regarded as established.

Here and there on the Surveyors' Range small patches (each consisting of a few square inches only) of the foliated quartz schist were found to be stained brown by the presence of limonite. On closer examination the stained areas were found to contain a number of cubical cavities which seem to be the result of the removal of crystals of pyrites. It is possible that a small amount of gold may have been associated with the pyritic impregnations, and that the alluvial gold which is reported to have been obtained from this area has been shed from some such small patches of mineralised rock. Yet it seems improbable that many of these pyritic impregnations have contained any appreciable amount of gold, for none was seen *in situ*, and the only alluvial gold found during prospecting was that discovered in the Jane River and mentioned above.

The Pre-Cambrian schists extend for some distance to the westward. They form the substance of Deception Range, which is separated from the Surveyors' Range by the valley of the Acheron River and a southern branch of the head of the Jane River. The divide between the watersheds of the Acheron and Jane Rivers is a very low ridge, and the valley of the former appears to run back to the foothills of the Frenchman's Cap until a close examination is made.

At the south end of the Surveyors' Range the Jane River occupies a very deep and narrow gorge, and the rock exposed is still the micaceous schist. The bare peaks visible to the southward present the appearance of quartz schist from a distance, but I was unable to visit and examine them during this expedition.

(1) The name "Mt. Elliott" has been applied to this rounded peak, but the name should be abandoned forthwith; for, on account of the neighbourhood of the Elliott Range, it is apt to to confusion.

III.—Tracks in the District Examined.

It has been indicated that the district can best be approached by way of the Linda track, which is the main overland track between the West Coast and eastern Tasmania. This track is in a very bad condition at a number of points between Gormanston and the foot of Mt. Arrowsmith. The smaller bridges and culverts are all in need of repairs at the present time, having been seriously impaired by the continually recurring floods. Horses cannot now be taken along this track without considerable risk.

From the Franklin River all packing must be done without the help of horses, for the track leading southwards is narrow and full of obstacles. It was cut in 1900 by Mr. J. L. Moore, and since that time has fallen into disrepair. Trees have fallen across it in the wooded country, and the stakes erected across the areas covered by button-grass have, for the most part, rotted and fallen. Should any discovery be made in the future which might necessitate the frequent use of this track, it will require to be entirely reopened and restaked.

The grade is steep on both sides of Mt. Mullens, but between the Loddon River and Calder's Pass there is only one small hill to cross. Moore's track from the pass is rough, and for the most part steep, until the top of the Surveyors' Range is reached. The descent in either direction from this range is exceedingly steep. The Jane River is crossed twice by this track, and must always prove a serious obstacle, since it rises very rapidly and floods are of frequent occurrence.

The eastern branch track which was recently marked out for a short distance towards the Prince of Wales Range would, if completed, make it possible to travel southwards for some distance when the Jane River is too high to cross. In its present condition the track is useless. The eastern bank of the Jane River in the neighbourhood of Algonkian Mountain cannot be followed without the preliminary expenditure of much labour in track-cutting. In a few places the piners have marked out a rough track for a few yards between clumps of timber, but no continuous track exists.

To reach Moore's track from the eastward, at any point in its course, would prove a tedious and difficult matter, since the whole country is very heavily timbered. The Franklin River forms a serious obstacle on the westward.

From the Gordon River on the south some track-cutting has been done in a northerly direction, but no junction with Moore's track has yet been effected.

IV.—Conclusion.

From the foregoing account of the observations made during this expedition, it will be apparent that, when considered as a possible source of mineral wealth, the district does not offer great promise. Brief as the recent examination has been, it has served to prove a general absence of valuable minerals. More detailed prospecting than was possible during the exploratory traverse of this country may result in further discoveries being made; but, in my opinion, any such future discoveries will not be of any great extent. It does not therefore seem reasonable to suppose that the district will in this respect ever prove such that improvements in the means of communication will be justified. There are, however, other possible economic considerations to be taken into account.

The chief asset of this district, and that which appears most likely to be turned to material account, is the belt of Huon-pine which follows the course of the Jane River. This is neither a wide nor a continuous belt, but the pine timber follows the main stream for many miles. Some of this pine has been cut, but not removed from that portion of the river which is nearest to Algonkian Mountain. The banks of the Jane River are rather low in places, and this fact must undoubtedly cause losses when the logs are being sent down in flood time. There does not appear to be any likelihood of the utilisation of any portion of this district for purposes of agriculture. While the scenery to be viewed from the high country will compare very favourably with that to be seen in other portions of Tasmania, the difficulties of access will prevent tourists from reaching the necessary points of vantage. There is but little game in the district, and certainly not enough to attract sportsmen.

With this report I beg to forward two sketch-maps, one to illustrate the topography, the other to show the geology of the area examined.

I have the honour to be,
Sir,
Your obedient Servant,

L. KEITH WARD, B.A., B.E.,
Assistant Government Geologist

E. A. Counsel, Esq., Surveyor-General and
Secretary for Lands.

Appendix C.

REPORT BY CHIEF FOREST OFFICER.

Department of Lands and Surveys,
Hobart, 1st July, 1909.

Sir,

I have the honour to submit the following report on the Forest Branch of this Department for the year ending 30th June, 1909.

Revenue from Timber.—The revenue received by the Department for the year 1908-9 under the heads rent of timber leases, royalty on timber cut on sawmilling, logging, and firewood leases, licence fees to obtain timber of all descriptions from Crown land, and timber inspection fees, show a small increase in the aggregate on the collections for the preceding 12 months of £28 6s. 9d. There is a decrease in the items rents and licences, and an increase in the items royalty and inspection fees. The items are as follows:—

	Rent.			Royalty.			Licences.			Inspection Fees.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1907–8	929	10	0	860	5	3	1621	10	0	431	5	6	3842	16	9
1908–9	913	2	6	1042	6	8	1279	8	10	636	5	6	3871	3	6

The revenue in the form of licences for the right to strip wattle bark on Crown land for the year 1908-9 was £72. This is a little in excess of that received for the preceding year.

The royalty payable on beech or myrtle timber cut upon sawmilling, logging, or splitting leases which has hitherto come under the category of "other ornamental timbers," at the rate of 7s. 6d. per 1000 superficial feet, has been reduced to 2s. 6d. per 1000 feet, by regulation by the Governor in Council of 5th March, 1909.

Sawmilling and Timber Industry.—The past 12 months has been a busy one for the timber industry, as is shown by the exports for the year. The value of the timber exported exceeds that of the preceding year by over £40,000, and has not been equalled for over half a century; while the records show that the figures in respect of quantity have not been reached in the history of the State.

The total area of timber-bearing land held from the Crown is 96,547 acres, which consisted of 128 leases, held by 72 separate individuals or companies. Thirty-one new leases were issued during the year, comprising 19,276 acres.

The Tasmanian Hardwood Corporation had the misfortune to have its extensive sawmilling plant, situated at Hopetoun, Dover, destroyed by fire in November last. The reconstruction of it has been undertaken, and it is anticipated that these works will be again in full operation in the course of two or three months.

A new company, the Hobart Timber Company, Limited, has recently been formed, and has taken over the sawmilling businesses of Messrs. Gray Brothers, Adventure Bay, and that of Messrs. Facy and Fisher, of Strathblane, Port Esperance.

Export Timber Trade.—The quantity and value of timber exported from the State for the 12 months ending 31st December, 1908, was as follows:—

Foreign Exports.

Destination.	Quantity in super. feet.	Value
		£
New Zealand	4,224,516	18,747
United Kingdom	5,062,053	25,418
India	2,444,294	10,147
Belgium...	397,343	2302
Germany	670,856	2008
Other British Ports ...	1,482,007	6281
Other Foreign Ports ...	2,487,426	8279
	*16,768,540	£73,182

Transfers, Interstate.

New South Wales	1,962,132	16,341
Victoria	5,803,236	40,529
South Australia	5,999,400	32,187
Western Australia	†4204	654
Queensland	85,708	639
	‡13,854,680	£90,350

* 816,280 palings, and 8000 laths not included in super. feet.

† 641,147 palings, 266,276 staves, 1000 laths, and 36,701 pickets not included in super. feet.

‡ Door stocks not included in super. feet.

The total quantity of timber exported from Tasmania, including transfers to other States, for the year 1908 was therefore 30,623,220 super. feet, of the value of £163,532. For the year 1907 the foreign exports amounted to 12,664,393 super. feet, valued at £53,794, and the interstate transfers were 12,114,947 super. feet, valued at £43,046. There has therefore been an increase in the total quantity of timber exported of over 5½ million feet, of the value of £40,344.

Sawmill Areas.—Prior to the year 1904 the area of Crown land that any one person was entitled to hold for sawmilling purposes was 5000 acres. In that year it was reduced to 1000 acres, and subsequently in 1906 the area that could be held for carrying on such a business was increased to 1500 acres, at which it still stands under the existing regulations. It is a matter of common complaint of persons contemplating entering into a sawmilling venture that the area in question is totally inadequate to justify the expense attending the outlay necessary to provide the expensive machinery, buildings, cattle, &c., and to construct a tramway at a cost probably of about £200 per mile.

It should be borne in mind that it is almost impossible to select an area for a sawmilling lease which will contain timber-bearing land without having some barren patches upon it, thus for all practicable purposes very considerably limiting the quantity of land to be operated upon by the lessee, who is not therefore assured of a continuity of timber supply for a number of years, even to repay him for his outlay, much less to derive any profit from the risky enterprise in which he has invested his capital. I respectfully recommend to your favourable consideration the necessity of increasing the area of land that may be held under lease for sawmilling purposes, which, I am of opinion, should be at least 2500 acres.

Inspection of Timber for Export.—The very close resemblance in the appearance of the woods of our several forms of eucalypts when converted into timber has always been a source of some difficulty to the officers whose duty it is to inspect timber for export on behalf of the Government. This has led to the necessity for a very precise and stringent examination of all timber that has been passed by them, and as a consequence large quantities of a doubtful nature have from time to time been rejected. Although in the great majority of orders that have been executed the conditions of purchase have not required that the timber should be seasoned (which would necessitate a second inspection after the lapse of a stipulated period), yet a second inspection has almost invariably been made, in order that every possible precaution might be taken to secure the supply of the timber ordered in the very best quality. These inspections have been carried out by officers appointed by the Government, and a charge of one penny halfpenny per 100 feet super. for sleepers, and a penny per 100 feet super. for other timber, has been exacted to recoup the Government for providing the necessary inspecting staff. The amount of inspection fees thus collected proved to be insufficient to meet the costs of the present methods of inspection. The fees for inspection of sawn timber were therefore increased to two-pence per 100 feet super., and for piles to threepence per 100 feet super. The exporters feeling somewhat harassed by the severity of the inspections, and being of opinion that the inspection fees charged were excessive, were requested to meet the Hon. the Premier and the Hon. the Minister for Lands to discuss the subject with them, as well as other matters appertaining to the export of timber, the Secretary for Lands and myself being also present. It was the unanimous opinion of the gentlemen present that the Government should merely issue a certificate that the timber was Tasmanian hardwood, and not specify the species of eucalyptus from which the wood was obtained. Messrs. A. E. Risby, H. G. Gray, and A. H. Ashboult were appointed to confer with the Secretary for Lands in drawing up an altered specification for the adoption of persons placing orders for Tasmanian timber, but as yet no action has been taken in the matter. Being aware of the difficulties with which those who are producing timber for export are beset, I can fully appreciate their desire for an alteration in the conditions under which the granting of a Government inspection and certificate should be undertaken, but do not favour the granting of a certificate to include eucalypti of all kinds. With the knowledge that we possess of our timbers it would be indiscreet to jeopardise their good name by allowing any of them to be exported under Government surveillance for purposes for which some of them may be known to be unsuitable. As a solution to the difficulty a certificate might be given for Tasmanian hardwood timber, a designation that might be allowed to embrace blue-gum, stringy-bark, peppermint, ironbark, and the so-called gum-topped stringy-

bark, but swamp-gum should be excluded or be included only for certain purposes for which it is known to be adaptable.

For the year ending 30th June, 1909, the quantity of timber exported from the State that received Government inspection, and for which certificates were issued, was 319,315 pieces, containing 10,730,701 superficial feet, shipped in 30 vessels, for which 39 certificates were issued. There were two shipments more than in the preceding year, and an increase in the number of pieces shipped of 18,182, containing 439,406 superficial feet of timber.

Timber Reserves.—The constant drain upon the State forest resources to supply the annual output of timber must naturally cause a gradual lessening of the areas from which such supplies are derived, and it has been recognised for some years past that all available timber-bearing land must be withheld from selection by intending selectors for agricultural and pastoral purposes until the timber has first been removed from the land. There are at the present time 35 proclaimed timber reserves, containing approximately 283,954 acres, of which about 117,000 acres have been reserved for the preservation and growth of the young race of trees that are already in various stages advancing towards maturity. The majority of these reserves are in the settled districts, and are generally in the vicinity of lands that are now being operated upon for the production of marketable timber, and the trees on them for the most part consist of the varieties of eucalypts that form the staple export timbers of the State. It is in the settled districts that it is more necessary to use every available method for the protection of the timber-bearing lands. In the outlying and inaccessible places at present shut off from all communication there is very little cause for apprehending any danger to the forests by the advancement of settlement for many years to come.

There are several localities in fairly favourable situations where there are both mature and young trees that it is very desirable to save the future supplies of hardwood. I propose, as opportunity offers, visiting Lady Bay, Parish of Garrett, Buckland, and Triabunna, Parish of Hodgson, and Mount Arthur, Parish of Patersonia, where I am aware there is Crown land on which good timber is said to exist, and on ascertaining the nature of it, the extent of the areas, and the boundaries of them, I will recommend that such of them as are found to be suitable shall be added to the timber reserves that have already been proclaimed.

Timber Samples.—The number of applications that have been received for samples of Tasmanian timbers has been very considerable, and these have in all cases been supplied. They have all been provided by the Railway Department, at cost price, and have been turned out by the railway workshops in a most satisfactory manner. The majority of the applications have been from timber merchants, railway companies, and contractors, and the distribution of them has been to all parts of the world.

Timber Pamphlet.—The pamphlet "Tasmanian Forestry, Timber Products, and Sawmilling Industry," of which a large number were printed by the Department a few years ago, has been much sought after and greatly appreciated. It has proved a most excellent advertisement. The stock has now run out, there being no copies left on hand. I am awaiting approval for the printing of a second edition, when the compilation of it will be undertaken without delay, in order to meet the constant demands that are being made from all quarters for copies of this very useful publication.

I have the honour to be,
Sir,
Your obedient Servant,

J. COMPTON PENNY,
Chief Forest Officer.

The Secretary for Lands, Hobart.

APPENDIX D.

No. 1.

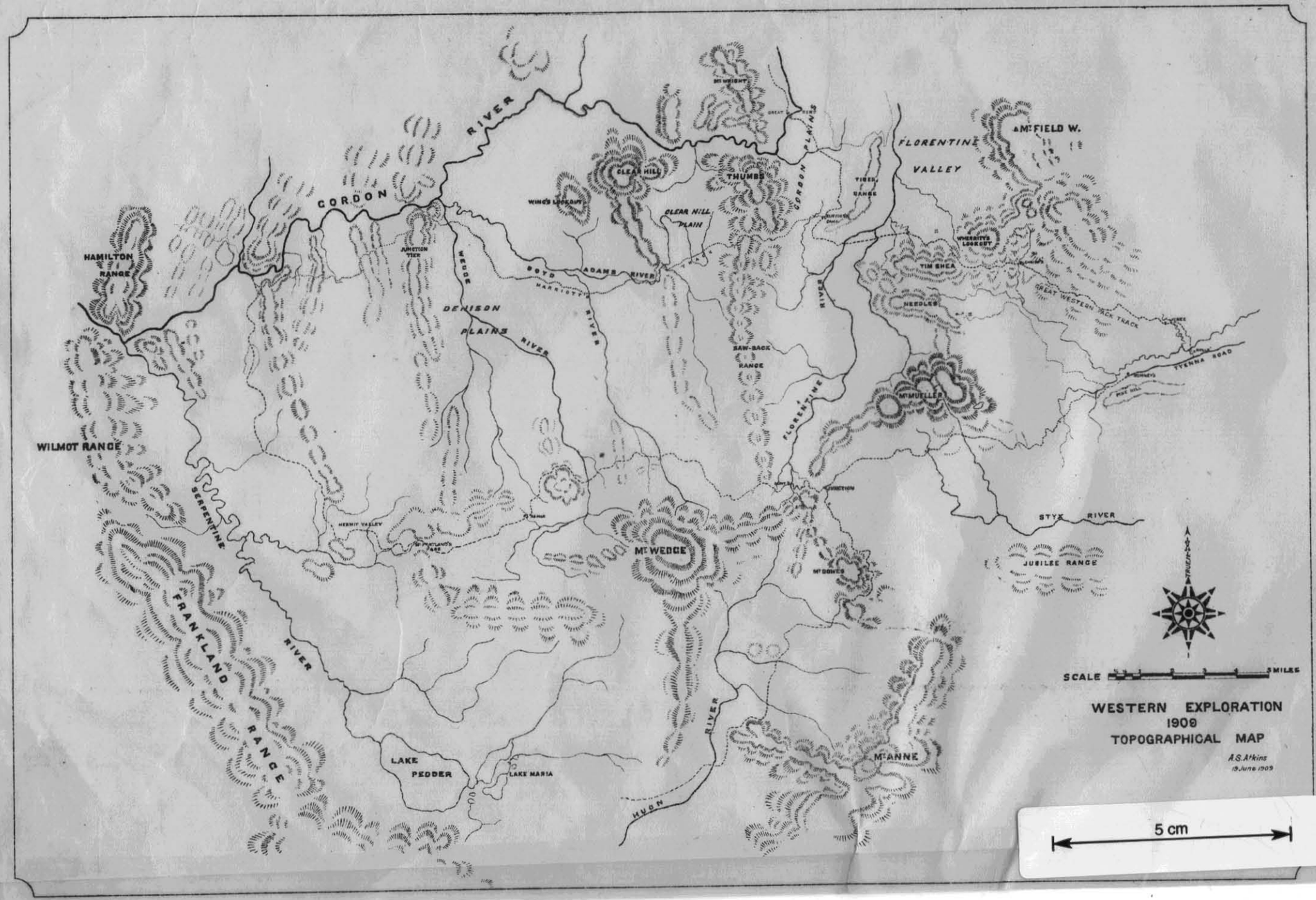
GENERAL RETURN, Crown Lands Branch.

	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
Receipts from all sources £	55,860	55,804	57,303	66,140	73,086	57,407	61,248	70,585	78,314	83,151
Receipts from Deposits and Instalments (Selection £	20,086	18,115	21,111	25,273	26,537	28,775	27,559	31,118	36,885	46,773
Receipts from other Sales of Crown Lands ..... £	15,597	17,530	14,762	16,094	15,078	11,784	14,838	13,800	16,110	11,366
Rent of Crown Land for Pastoral purposes..... £	5725	7326	7041	8328	8325	7514	6861	6118	6964	6820
Rent of Government property ..... £	...	...	...	...	1170	1028	1100	1019	1232	1908
Fees for Licences, Grant Deeds, &c ..... £	2089	2746	4156	4882	4664	4674	4568	5607	5257	6092
Surveys Fees..... £	12,363	10,087	10,233	11,563	17,312	3632	6322	12,923	11,866	10,192
Area of Country Lands sold..... acres	32,050	39,435	62,073	64,474	87,073	132,629	168,749	142,732	124,905	125,197
Area of Town and Suburban Lots sold ... acres	840	928	636	663	1577	1225	1384	1853	2093	1632
Area of Land leased for Pastoral purposes acres	216,634	428,969	285,160	182,339	177,347	124,020	135,791	197,686	112,723	112,100
Area of Land leased under "The Closer Settlement Act"	...	...	...	...	...	...	...	...	10,365	18,756
Number of Applications for Selection and Purchase	1663	1784	1959	2579	2973	3981	3129	2670	2833	3225
Number of Grant Deeds issued	635	748	680	783	627	541	459	575	686	767

No. 2.

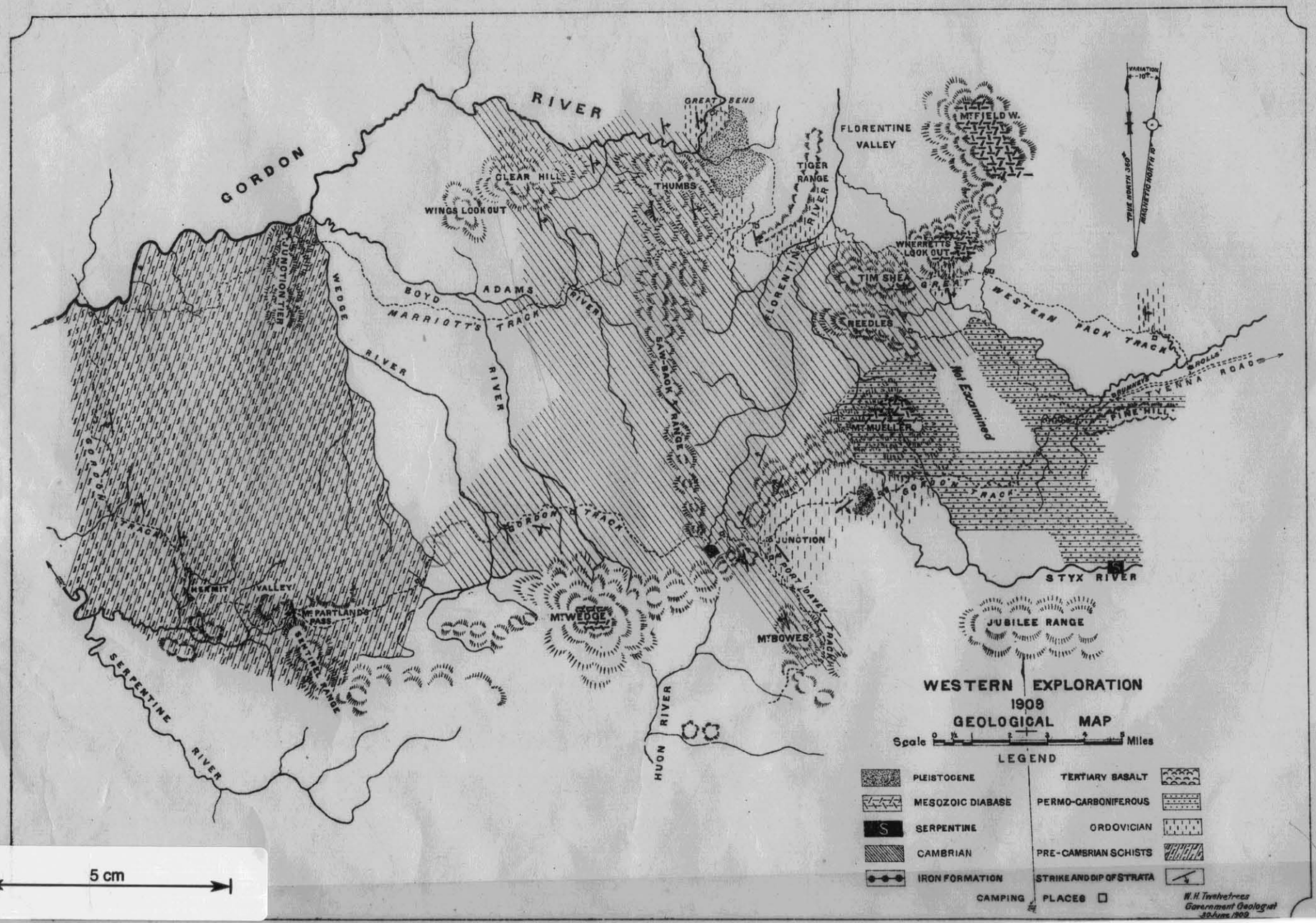
RETURN showing the Number of Lots and Area of Land purchased under "The Crown Lands Acts, 1903, 1905, and 1907," during the Twelve Months ending 30th June, 1908, and 30th June, 1909, respectively.

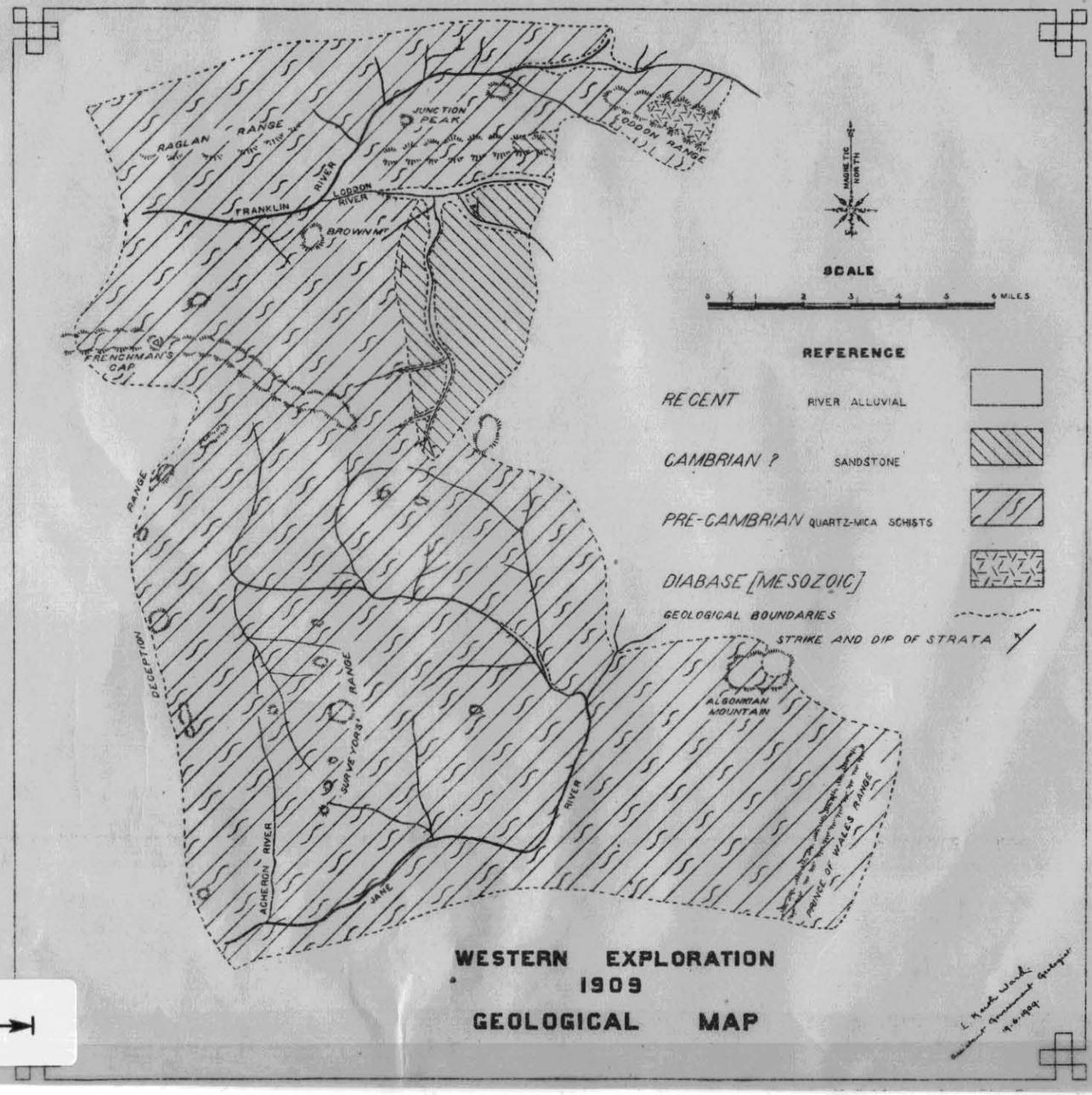
	Twelve Months ending 30th June, 1908.		Twelve Months ending 30th June, 1909.	
	No. of Lots.	Area.	No. of Lots.	Area.
		ACRES.		ACRES.
Crown Lands Acts, 1903, 1905, and 1907, (Selection) first-class land	394	25,933	518	35,153
Homestead Areas	38	1345	47	1695
Second-class	259	25,876	285	35,309
Third-class	236	57,437	327	89,359
TOTALS	927	90,591	1177	161,516


GORDON RIVER
CLEAR HILL
THUMBS
GORDON PLAINS
FLORENTINE VALLEY
Mt FIELD W.
WING'S LOOKOUT
CLEAR HILL PLAIN
TIGER RANGE
WHERRITY'S LOOKOUT
HAMILTON RANGE
JUNCTION TREK
WEDGE
BOYD
ADAMS RIVER
TIM SHEA
NEEDLES
GREAT WESTERN TIER TRACK
DENISON PLAINS
RIVER
SAW-BACK RANGE
FLORENTINE
TYENNA ROAD
Mt MUELLER
WILMOT RANGE
SERPENTINE
HERMIT VALLEY
STYX RIVER
Mt WEDGE
Mt DOWES
JUBILEE RANGE
FRANKLAND RANGE
LAKE PEDDER
LAKE MARIA
HUON
Mt ANNE
SCALE
MILES
WESTERN EXPLORATION
1909
TOPOGRAPHICAL MAP
A.S. Atkins
19 June 1909
5 cm

(9)

A12


GORDON RIVER
GREAT BEND
MT FIELD W.
FLORENTINE VALLEY
TIGER RANGE
CLEAR HILL
THUMBS
WINGS LOOK OUT
WHERRETTS LOOK OUT
TIM SHEA
GREAT WESTERN TIER
WESTERN TIER TRACK
REEDLES
FLORENTINE R.
ADAMS RIVER
BOYD
MARRIOTT'S TRACK
WEDGE RIVER
SAW-BACK RANGE
Not Examined
MT MUELLER
PINE HILL
GORDON TRACK
JUNCTION
FORT DAVEY TRACK
STYX RIVER
JUBILEE RANGE
MT WEDGE
MT BOWES
HERRIT VALLEY
MT PARTLANDS PASS
CENTRAL RANGE
SERPENTINE RIVER
HUON RIVER
VARIATION -10°
THE NORTH 360°
MAGNETIC NORTH 10°
WESTERN EXPLORATION
1908
GEOLOGICAL MAP
Scale 0 ½ 1 2 3 4 5 Miles
LEGEND
PLEISTOCENE
MESOZOIC DIABASE
SERPENTINE
CAMBRIAN
IRON FORMATION
TERTIARY BASALT
PERMO-CARBONIFEROUS
ORDOVICIAN
PRE-CAMBRIAN SCHISTS
STRIKE AND DIP OF STRATA
CAMPING PLACES
W. H. Twelvetrees
Government Geologist
30 June 1909
5 cm


RAGLAN RANGE
JUNCTION PEAK
LODDON RANGE
MAGNETIC NORTH
FRANKLIN
LODDON RIVER
BROWN Mt.
SCALE
0 1 2 3 4 5 6 MILES
FRENCHMAN'S CAP
REFERENCE
RECENT RIVER ALLUVIAL
CAMBRIAN ? SANDSTONE
PRE-CAMBRIAN QUARTZ-MICA SCHISTS
DIABASE [MESOZOIC]
GEOLOGICAL BOUNDARIES
STRIKE AND DIP OF STRATA
DECEPTION RANGE
SURVEYORS RANGE
ALGONKIAN MOUNTAIN
ACHERON RIVER
JANE RIVER
PRINCE OF WALES RANGE
WESTERN EXPLORATION
1909
GEOLOGICAL MAP

5 cm

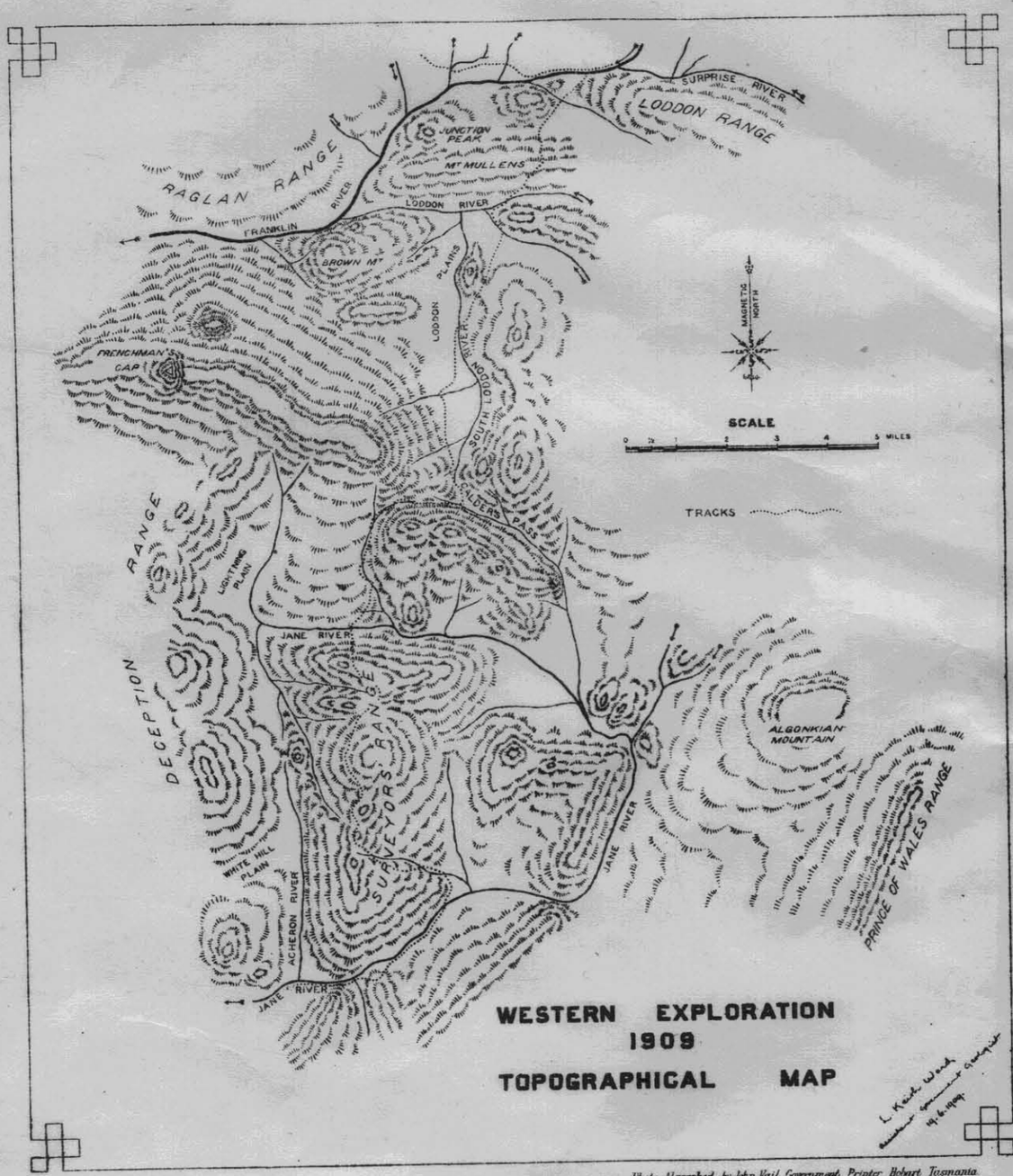


Photo Algraphed by John Vail Government Printer Hobart Tasmania

5 cm