

Appendix 1.

ANNUAL REPORT FOR 1894.

BY THE GOVERNMENT GEOLOGIST.

In January, 1894, I returned to Perth from the Dundas goldfields, where I had been acting as Warden for the preceding four months.

The first work which engaged my attention upon my return was the preparation of a report upon the field and the country passed over on my journey there. This report was published in the *ad interim* Report of the Department of Mines for the half-year ending 30th June, 1894.

Accumulated correspondence, notices of the Colony for the various Year Books, our own "Year Book," and my first edition of "The Miners' Handbook," occupied my time until April, when I started for the Collie coalfield, the boundaries of which I mapped in reporting upon the whole area. This Report also was published in the *ad interim* Report.

Later on I prepared another special report and map of the Collie coalfield area, with a tabulated diagram of the sections obtained in the bore-holes, for the information of Parliament.

The next piece of work undertaken was the Greenbushes tinfield, which I mapped and reported upon, this also being published in the *ad interim* Report.

Shortly after the completion of this piece of work I was instructed to sign, on behalf of the Government, a contract with Mr. Atkinson for diamond drill boring upon the Collie coalfield. This contract was to bore 1,800ft. at such sites as I should select. The fixing of these sites and superintending this work occupied a great deal of time, and was so much a tie that towards the end of the year I appointed a supervisor to be always on the spot to take charge of all cores, measure casing, and measure up and give certificates for all work done.

Until this appointment was made I had made short trips about the country between the Bunbury and Albany Roads, and upon one occasion managed to get as far South as the Margaret River, upon the Augusta Road. However, upon being relieved, I started for the South Coast, which I examined from Lake Muir to Deep River Inlet, and Westward to Point D'Entrecasteaux, returning up the Warren, the Tone, and across to the Balgarrup River.

Since a report upon most of my last year's work has already been published, it only remains for me to give a short description of the country in the South-West portion of the Colony that I had time to partially examine. This work, I may mention here, was undertaken with the idea of determining whether other patches of coal-bearing country existed, and this, unfortunately, has proved not to be the case to the Southward; our only hope, therefore, lies in the belt of country on the Eastern slope of the Darling Ranges, Northwards of the Collie, and between it and the Murray River. It is true, of course, that we have deposits of more recent coals upon the South Coast, and that a large coastal plain, beneath which there may be true coal measures, extends some distance South of the Vasse River, but as there are no surface indications no opinion can be given upon this subject, which can only be set at rest by deep boring.

The full report upon the Collie coalfield must be held over until the completion of the contract.*

HARRY P. WOODWARD.

9-2-95.

[ENCLOSURE TO APPENDIX I.]

THE SOUTH-WESTERN PORTION OF THE COLONY.

Between Capes Naturaliste and Leeuwin, running in a north and south direction, is a low ridge of granite, capped in many places by recent deposits of limestone, which the subterranean water has riddled with caverns, many of which are very extensive, and magnificently decorated with stalactites and moss-like encrustations of carbonate of lime.

Along this line of coast the granite outcrops upon the beach, and it is due to the protecting influence exercised by it that this small promontory exists.

Copper is reported to have been found upon the beach a little south of Cape Naturaliste, but it is probably a mistake, as the rocks are not of a promising appearance, and no signs of mineral veins are to be met with.

Directly to the eastward of this range of hills the country is low for a distance of about 25 miles, the plain being generally covered with sand, except where the Blackwood River has cut its way across it, exposing the underlying crystalline rocks in its bed. This tract of low, sandy country extends northward, following the coast lying between it and the bold Darling Ranges. In this northern portion these flats are often intersected by large marshes or inlets, into which the rivers discharge themselves, whilst along the sea shore high sand dunes are generally met with, the only other formation exposed being the basalt dyke which outcrops and forms the small point at the mouth of the Leschenault Inlet, upon which Bunbury stands.

Beneath this flat, both in the Preston Valley, near Bunbury, also near the Vasse, some deposits of fossil wood were discovered, which encouraged the residents of the former to sink some trial holes, and those of the latter to get

* This is now attached. See Appendix 2.

the Government to test it for them with a drill, the idea, of course, being that there were indications of coal, which, however, is not the case yet; at the same time it is impossible for anyone to say that true coal measures do not exist beneath these recent surface beds, and this matter can only be set at rest by sinking bore holes until older rocks than the carboniferous are met with.

A mesozoic coal deposit was discovered some years ago upon the Fly Brook, a branch of the Donnelly River, on the South Coast, and it was tested by several bore holes, from which, however, the coal did not prove to be of a good enough quality to pay working expenses. [For fuller particulars upon Fly Brook coalfield see Mining Handbook.] Coal and kerosene shale are reported to have been discovered on the western side of this plain, near the Chapman River, a tributary of the Blackwood River, whilst a great quantity of bitumen is washed up all along the south coast, particularly on the sandy bay-like portion between Cape Leeuwin and Point D'Entrecasteaux.

On the eastern side of this belt of low-lying country is a steep escarpment, formed by the outcrop of the crystalline rocks called the Darling Range, along whose base quartz reefs outcrop, which generally contain large quantities of pyrites, and are sometimes auriferous. In comparatively modern times this range presented a bold cliff-like face to the sea, which at that period washed its base; but since the elevation of the land, this precipitous face has, in a great measure, been weathered away or covered by the accumulating "talus." This range may be said to extend for a distance of about 160 miles in a northerly direction from the Blackwood River, where it really terminates, although the same line is continued by more or less low broken ridges south to the Warren River. The termination of this range is due to the change in strike of the rocks from north and south to east and west, to which is also due the change of the direction of the coast line.

In these ranges, for the most part the soil is very good on the small alluvial flats, also in some places on the hill sides; but unfortunately it is, as a rule, limited in extent and heavily timbered, whilst the steep rough hills, covered with conglomerate, render carting very expensive. In this line of country, near Bridgetown, the Greenbushes tinfield is situated (for full report see *ad interim* report of Department of Mines, June, 1894), not very far from which some very fair samples of mica were found, whilst a few miles south, at the head of the Donnelly River, where the formation makes its turn to the eastward, some very large beds of a poor graphite have been tested.

Some years ago a deposit of graphite (plumbago) was discovered near the head of the Donnelly River, about 10 miles east of Dicksons' on the Lower Blackwood Road, and between eight and ten miles south of Nelson Grange, the property of Mr. Allnutt, a few miles from Bridgetown.

About six years ago a syndicate was formed at the Vasse, which took up and prospected several blocks, but the price of graphite at the time was so low that the work was abandoned before much had been done.

Early in the year 1894 Mr. A. Knox Brown reported that he had discovered apparently payable plumbago on a protection area which he had taken up near the older find. This latest discovery is situated between two creeks which flow in deep valleys, from one of which a drive to the north has been put into the side of the ridge at right angles to the outcrop of the deposit, with the result that three beds were passed through. The first of these, which outcrops near the mouth of the drive, is 28ft. in thickness, being followed by 13ft. of schistose rock, containing a small bed 1ft. 6in. in thickness, whilst the third bed is 8ft. in thickness.

Several other shafts have been sunk, and open cuttings made to test the run of these beds. From one of the former, about four chains to the westward of the drive, which appears to be upon the large bed, a sample, weighing 25cwt., was sent to England in order to ascertain its commercial value. In another shaft, about 15 chains further up the spur to the westward, at an elevation of about 100ft. above the mouth of the drive, the deposit was again struck at a few feet from the surface.

These beds should, correctly speaking, be called plumbaginous schists, since the percentage of graphite contained is so small, the main portion of the deposit consisting of a magnesia silicate. The formation consists principally of micaceous and talcose schists, which here strike east and west, dipping at a high angle to the northwards; whilst following along to the southward, close to the outcrop of the graphite beds, is a large dyke of intrusive granite.

A little to the eastward of the drive, at the junction of the two creeks, the outcrop of this deposit is lost, but beds of steatites are met with along this line as far as Wilgarup; therefore the graphite seams will also probably be found to extend in this direction, the local break in the continuity of the rocks being due in all probability to a fault. To the westward the graphite can be traced for several miles, but the beds seem to split up and become smaller upon the claims that were first prospected.

This deposit of earthy graphite is due to the alteration of poor shaley coal seams, because the formation does not consist of veins, but true beds, the metamorphosis being in all probability due to the indurated granite to the southward, which changed the coal seams into graphite, and the shales into schists. It offers exceptional facilities for cheap working, since the spur upon which it is situated rises so rapidly that a drive following the strike from the outcrop in the creek would have 100ft. of backs in a distance of about 20 chains; whilst, if crosscuts were driven about five chains from the valley which runs parallel to the strike, the seam would be obtained.

The firm of crucible makers to whom the sample was sent reported it to be of no commercial value, but since graphite is put to a multitude of uses at the present day, in most of which forms it is largely adulterated with earthy matter, and so long as our deposit does not contain any deleterious substance, it should certainly be of some value.

When we consider the large size of the deposit, the cheapness with which it could be worked, its short distance from good roads, the enormous quantity of karri timber on the spot of almost any length, and the perpetual supply of running water, it should certainly, if not at present, prove in the near future to be of great value.

Along the bold, rough south coast between Albany and Point D'Entrecasteaux, without shelter or harbours for even small vessels, stretches a narrow strip of calcareous country covered with abundance of herbage. This coast consists of bold headlands of granite or high cliffs of sandstone, which latter, when they form capes, are always protected to a certain extent from the action of the sea by reefs or islands of rock.

There are numerous inlets along this coast, but these are useless as harbours, as they are either too shallow or have their mouths barred, whilst the running streams which discharge themselves into them are gradually filling them up with mud. These inlets were at no very remote period permanently connected with the sea by wide and deep channels, but as the coast rose the sand dunes which now form the cliffs were blown up, fringing the coast between the inlets and the sea, often completely blocking up their entrances.

The only good harbour upon this coast is at Albany, where the natural features have protected its entrance from being closed up by sand. It is, however, being rapidly filled in at the head of Princess Royal Harbour by a sand drift, which is gradually creeping over the coastal hills. When this line of hills was first formed they were more continuous than they are now, but, at the same time, they were lower, whilst behind them was a low, swampy flat or lagoon, into which the streams from the north discharged themselves. In this lagoon accumulated large quantities of vegetable matter, which gradually formed a peaty substance of the brown coal class. This coal is found to be of better quality in the middle of these basins, whilst towards the edges it consists almost entirely of sand; it is also overlaid by black sand, which contains a very large quantity of vegetable matter.

Whilst the coast was still rising, these lagoons were gradually raised to some height above the sea level, until the impounded waters behind the sand hills acquired sufficient force to burst a passage through them, forming openings, which are, in all probability, in many instances the present mouths. Drift sand has been, and is, continually blowing inland, filling up valleys and burying these swampy deposits, thus the original long lagoon has been divided up into the present inlets, which either owe their existence to the fact that they were deeper, or were more sheltered

from the sand drifts. Most of these inlets are very shallow, it being possible for a man to walk quite across Broke Inlet, where it is several miles in width. The reason these inlets are silting up so rapidly is that upon this coast the rise and fall of the tide is too slight to cause a scour.

In patches along this coast limestones of a more or less sandy nature occur, being due to deposits of shelly matter, which were thrown up at the same period as the sand hills.

From time to time great excitement is caused by the supposed discovery of coal, but it invariably turns out to be nothing but the brown boggy lake formation mentioned above. This brown coal occurs in seams often of considerable size, with underlying shale beds, which contain roots and pieces of wood, with pyrites, which latter is often found to have decomposed, forming red ironstone nodules and alum, this latter being met with as efflorescences on the cliff faces. Above these coal beds are sandstones, often containing large quantities of carbonaceous matter, whilst the coal itself varies very greatly in quality, often consisting largely of sand. There are no indications of true coal upon this coast, in fact the granite basins seem to be filled entirely with these recent lacustrine and estuarine deposits, for, wherever rock crops out, these formations are found mostly to rest directly upon it, and when they do not they are only separated by accumulations of clayey matter resulting from the decomposition of the granites, similar to the deposits met with around Albany, even high up the hills.

Most of these ancient basins are small, but even where large ones occur, as to the northward of Albany, there are no indications which would lead one to hold out the least hope that true coal will ever be found here, as brown coal, associated with sandstone shales and iron pyrites, are no indication that the carboniferous formation exists, as these same rocks occur in many different modern formations.

Behind these coastal plains and sand hills the country gradually rises, being heavily timbered in belts with karri forests and thickets of dense scrub, interspersed with which are open sandy plains and swamps, with here and there outcrops of granite.

This belt of country, which is from 20 to 30 miles in width, extends from Mt. Barker, near Albany, to the Donnelly River, and forms, like the Darling Range, the edge of the inland plain, but, unlike it, rises gradually from the coast. In this, the best watered portion of the colony, the land is extremely good in patches, but little has yet been done to utilise it, owing, as a rule, to its inaccessibility and the tremendous expense that would have to be incurred in clearing the land of timber, which is extremely thick and large.

The remaining section of this portion of the colony to be described is that situated between the Darling Range on the west and the Great Southern Railway on the east, or, roughly, the country which is drained by the Upper Blackwood River with its tributaries, and the small sandy basin of the Collie River, in which the coalfield of that name is situated (for full report see *ad interim* report of Department of Mines, June, 1894).

This tract, as a whole, is fairly level, lightly timbered, and possessing larger tracts of good land free from rock outcrops than any of the agricultural portions of the Colony, added to which it has a good average rainfall, its only drawback being the poison plant, which grows thickly upon it.

HARRY P. WOODWARD,
Government Geologist.

Appendix 2.

To the Honourable the Minister for Mines.

SIR,

16th August, 1895.

I have the honour to hand you with this my final report upon the boring at the Collie Coalfield.

The boring contract is now completed, but as all communication is interrupted by the flooded state of the river, the section of the last 150ft. bored at No. 4 has not yet arrived, and I cannot say when it will, so I have made up my report without it, since it really is of no value for my purpose, which was to prove the area of workable coal seams.

I have, etc.,

HARRY P. WOODWARD,
Government Geologist.

THE COLLIE COALFIELD.

Since publishing my report, a year ago, considerable development has taken place at the mine itself, from which a thousand tons of coal has been raised, and the seam followed down upon the underlay for a distance of 300 or 400 feet, the general dip of which is about one in seven.

An air shaft has also been sunk from the surface vertically to a point about 150ft. from the mouth of the drive, in which the following section is exposed:—

	ft.	in.
Gravel	3	0
Ironstone	5	0
Clay and sandstone	7	0
Yellow sandstone	6	0
Dark Bind	2	6
Coal	0	2
Rock Bind	0	9
Coal	2	10
Dark Bind	1	3
Coal	12	6
Shale	0	3
Total depth	41	3

} 20ft.

Dip—1 in 6·90, or rather more than 1 in 7.