

2.—On the country between the Ashburton and Minilya Rivers with a view to determining the northwards extension of the Gascoyne Artesian area.

(With a Map.)

In the immediate vicinity of Onslow, the country is of an estuarine character, consisting of salt marshes and mangrove swamps with blown sand ridges containing large quantities of oyster and other recent shells.

For its water supply the town is dependent upon a number of shallow wells sunk in the sand, the water in which varies very considerably in quality, whilst the supply is limited, being entirely dependent upon the local rainfall.

Beneath the sand hills and swamps a heavy blue clay is met with, in the upper portion of which, if water is struck, it is of an extremely bad quality, whilst all attempts to obtain a supply by sinking through it have so far failed. Some years ago a bore was put down by the Government to a depth of 1,729ft., in which the first supply of water was struck at 1,015ft., which trickled over the surface at the rate of 20 to 30 gallons per diem. At a depth of 1,717ft. a further supply was cut which yielded 120 gallons per diem, the hydrostatic pressure being 10.82lbs. per square inch, and hydrostatic head 25ft. above the surface, the water being salt. The bore passed through shale for the greatest proportion of the depth and was discontinued in black shale, locally known as "black Jack."

Following up the Ashburton River in a southerly direction, large alluvial plains stretch east and west as far as the eye can reach, water being either obtained from the pools in the river bed or from wells sunk in the various groups of blown sand hills which here and there break the monotony of the flats.

This class of country extends for a distance of about 50 miles, where it is suddenly terminated by an outcrop of crystalline rocks, which from this point southward present a fairly bold escarpment to the westward.

Between the Ashburton and Yannarie River are large plains of a more or less flooded character, and it is on to these that the last-mentioned river discharges its waters, at a point upon the telegraph line about 65 miles from Onslow, whilst the plains in flood time drain into the salt flats and marshes lying upon the eastern side of Exmouth Gulf.

This plain country extends up the Yannarie as far as Jane Well (C. 29), from which point the country rises rapidly, the

surface being covered by a red sand, with occasional outcrops of limestone.

At Nganyou Pool (C. 26) the crystalline rocks with quartz reefs make their appearance, overlaid by limestone conglomerate, the junction of the two formations following a line slightly to the east of north.

From Wogoola Station (Cameron and Clark's), upon the Yannarie at its junction with Emu Creek, a road runs south-westward to the Winning Telegraph Station, along which the crystalline rocks outcrop for about six miles to be suddenly replaced by shales. At a point seven miles to the westward of the station a well has been sunk in them to a depth of 80 feet, at which depth a good water supply was struck. These shales are highly altered (locally called kaolin); this change from the normal dark blue is in all probability due to the leaching subsequent to the oxidation of the pyrites, which often occurs associated with them in considerable quantities. At a point 10 miles west of the station another well has been sunk in the shales to a depth of 162 feet, but so far no supply of water has been struck. In this well some green fossiliferous shales were passed through, but these have now all weathered away and only portions of a cast of an ammonite were obtained from Mr. Cameron.

For the next 10 miles a series of clay pans and sandy flats are crossed, after which low shale hills strewn in patches with much quartz and ironstone rubble are passed over, until the telegraph line is reached.

To the northward of the Telegraph Station at Winning and to the westward of the line are a series of altered shale hills, which present a cliff-like face to the eastward, the beds of which have a distinct, although slight dip to the north-eastward.

Between Winning and Towera Station on the Yannarie (Mr. Twitehin's), travelling due east, are a series of low shale hills, of which Mt. Forrest is the highest, then sandy flats are crossed to within a distance of 10 miles of the river, where a shaft has been sunk by the Minilya Roads Board to a depth of 62 feet, in dark shale, without striking water, whilst immediately to the eastward of this point the crystalline series again appear and continue for the remainder of the distance to the station.

From the dry well just mentioned the boundary of the granitic rocks can be traced in a south-easterly direction, sweeping past the Round Hill (which is sandstone) upon the eastern side; thence on south of A. 43 Cairn, crossing the Lyndon River just below marked tree A. 31; from there striking back to the north-east of Sugar Loaf Hill, crossing the flooded flats of the river, which it follows close upon the eastern side to A. 36, where it again crosses, following the White Quartz Hill upon the western side, from which

point it strikes south-easterly on to the Minilya to a little east of Williambury Station, up to which point it has been mapped in by Mr. A. Gibb Maitland, the Government Geologist.

Traversing the river westward from A. 31, limestone conglomerates are seen resting directly upon the crystalline series in the bed of the river, to be overlaid lower down by shales. Between Windalia Pool, A. 29, and Chugareyardoo, A. 49, which is upon a branch creek to the southward, there is an outcrop of heavy schistose boulders associated with crystalline limestone; these may probably indicate shallow ground, since lines of these boulders with parallel lines of foliation are often seen outcropping, whereas if they had been a portion of the glacial series described by the Government Geologist they would have been more disturbed and ice scratched. This is the only locality in the whole area where there appears to be anything like shallow ground within the basin.

About one mile north-east of Cordalia Well, near A. 51, a fossiliferous limestone ridge rises from the plain which strikes in a north-westerly and south-easterly direction, with a well-defined dip to the south-westward. The fossils in these beds are similar to those met with upon the Irwin River, and therefore it may be assumed that these rocks belong to the Lower Carboniferous series.

To the south-westward of this ridge is a well defined range of hills, the basal beds of which are shale, whilst the capping is sandstone or quartzite; these latter beds vary from 20 to 70 feet in thickness.

This range attains its greatest elevation at the south end in Moogooloo Peak, which forms a conspicuous landmark, whilst owing to the vertical cliff-like faces presented by the heavy quartzite capping it is most difficult to climb.

This range appears to be the northern extension of the Kennedy Range, which is also similarly capped.

The beds of this range near A. 51 have a much steeper dip than at any other point noted in the district, therefore, it is either only local, or the dip of this series flattens greatly to the northward, which is quite possible, and would account for the plains without rock outcrops.

Between Cordalia Well and Winning the country is mostly low and rolling, the ranges dying away to the northward of the river, the presence of the various formations being only determined by the nature of the soil.

To the westward of Winning, after the shale hills are crossed, the surface of the country consists of a series of calcareous flat, which give place to low shale hills near the Cordalia Creek.

About ten miles west of that creek, at A. 8, there is a bold limestone range, the rocks of which dip at a low angle to the westward, whilst between it and the coast are a series of flats and sand ridges.

South from Winning along the telegraph line to the Lyndon River the country is undulating, the soil being mostly sandy and calcareous.

The beds of this district fulfil all the conditions necessary to an artesian area, consisting as they do of a series of pervious sandstones and limestones interbedded and overlaid by impervious shales of considerable thickness, the whole having a uniform dip to the westward or towards the coast. At the junction of the artesian series with the granite, the surface elevation varies from 450 to 500 feet above the sea level, the coast being about 75 miles distant; but since about 15 miles of coastal country has practically no elevation, this fall may be condensed into 60 miles, which represents from 7 to 8 feet per mile; therefore as the water level at or near the junction varies from 50 to 100 feet (according to the elevation of the surface), it will follow that a sufficient hydrostatic head cannot be obtained to cause water to rise above the surface until a distance of from 12 to 15 miles west from the outcrop of the crystalline series is reached, although in the intervening distance no doubt sub-artesian water (water rising in bore but not overflowing) will be obtained.

In support of the theory that this is an artesian area, we find in the Lyndon Valley and to the southward the unbroken continuation of the rock series, forming hill ridges, which constitute the proved area of the Gascoyne.

In conclusion, it may be stated that a very fine stretch of pastoral country was passed over, which at the present time is practically valueless, because all attempts to obtain a water supply by the means of shallow wells has so far proved futile.

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