

It is likely, therefore, that if a payable ore-body exists under the battery hill, it will have a strike within these limits, and prospecting cross-cuts or trenches running generally east and west would most probably fail to locate it. The hill is therefore considered worthy of further prospecting, but all future cross-cuts should be driven in a north and south direction in order to cut possible east and west shears.

SCAHILL'S FELSPAR QUARRY, LONDON-DERRY, COOLGARDIE GOLDFIELD.

(F. G. Forman, B.Sc.)

This quarry, which is worked for the production of microcline feldspar, is excavated in an extremely coarse grained pegmatite dyke.

The pegmatite consists of quartz, microcline, a little albite and lepidolite. Quartz and microcline are the chief constituents and occur in large masses so that the mining of almost pure microcline without admixture of quartz is an easy operation.

The excavation, which measures approximately 100 by 50 by 15 feet, is situated in a part of the dyke which consists almost wholly of microcline. The quarry has reached its limit on the western side as surface exposures show the remaining dyke material on this side to consist almost wholly of quartz.

The southern end of the quarry, which is the shallowest, still shows a face of microcline feldspar, but the mineral is badly iron-stained and would have to be extracted as second grade material.

The eastern side of the quarry shows lower grade material than that obtained in the central portion. The microcline on this side is mixed with lepidolite mica and albite feldspar with some quartz, the boundary between the high grade material and the lower grade mixture dipping fairly flatly in a westerly direction. This has apparently been the controlling factor in deciding the depth of the quarry, but judging by the adjacent surface outcrops and from the general nature of the pegmatite dyke, there is good reason to believe that workable microcline could be obtained beneath the present bottom of the quarry; the low grade material forming the present floor being probably in the form of a thin irregular vein in the pegmatite mass. The dyke should be prospected at depth by a shaft sunk in the centre of the quarry floor.

In the northern face, where work is at present concentrated, the masses of quartz and microcline constituting the bulk of the pegmatite are more intimately mixed and of smaller dimensions than in the place originally worked. This has led the proprietor to suppose that the deposit would soon become exhausted in this direction. Inspection of the surface, however, shows that the pegmatite dyke extends some distance further to the north and, while that part of the dyke at present exposed in the north face of the quarry is less coarse grained than where originally opened up, there are at least two large masses of microcline still ahead of the face. These are being prospected by shafts and costeans.

It is suggested that the best method of continuing the quarry is by continued working of the whole of the north face. Greater labour will be required in order to expose the more scattered microcline masses

and to discard the useless quartz. This, however, is unavoidable and much to be preferred to the present method of working, which is to locate a mass of microcline and remove it bodily before looking for the next mass by tunnelling. If the present practice is continued the deposit will become unworkable because of the bulk of useless material left in the quarry and the high cost of extraction of the feldspar by underground methods. Prospecting ahead of the face by shaft sinking and costeaning is at present being done and should be continued.

It is unfortunate that those parts of the quarry which have been worked out have been used as a dumping ground for refuse from the face. There is probably much valuable feldspar below the floor of the quarry, and the refuse will need to be moved before this material can be worked or even thoroughly prospected.

SUB-ARTESIAN WATER POSSIBILITIES ON WINNING STATION, LYNDON RIVER, NORTH-WEST DIVISION.

(F. G. Forman, B.Sc.)

The greater part of Winning Station is underlain by rocks of Cretaceous age; Palaeozoic strata (Permo Carboniferous) outcrop over a relatively small area south of a line joining Windalia Hills and A.50. The distribution of the rocks is shown on the accompanying map of the area.

Wells already drilled on Winning Station, and on adjacent pastoral leases, indicate that the most useful artesian and sub-artesian horizon lies at the base of the Cretaceous Series in a greensand or sand-rock, but this horizon has not by any means been fully exploited.

The highest rocks of the Cretaceous outcropping on Winning Station are limestone and shales containing abundant Inoceramus fragments (Cardabia Series). These are underlain by the Winning Series, the upper part of which consists of light-coloured silt-stones, cherts and light grey shales. The lower part of the Winning Series consists of dark green and greenish grey shales and mudstones with thin bands of greensand. It is the lowest band of greensand at the base of the Winning Series from which useful supplies of stock water are obtained. Thin greensand bands carrying intensely salt water occur about 250 feet above the base of the Series. This fact has discouraged boring in a number of localities, particularly at the eastern portion of the property and in what is known as the "9-Mile Paddock."

The Cardabia Series outcrops only on the extreme western portion of Winning Station, west of the "12-Mile" and "Dud" Bores. In this Series there is a greensand lying immediately above a light coloured Inoceramus shale bed which carries small quantities of water, of a quality suitable for stock. This has been tested by two wells on Marilla Station immediately north of Winning, but the supply in both cases was inadequate. This greensand water could be obtained on Winning Station along the western boundary by boring to shallow depth (probably between 100 and 200 feet), but the supply obtainable is not likely to be great, and possibly insufficient for the purpose of watering stock.

The accompanying cross section from west to east through the deeper bores on Winning Station shows that the Winning Series thins rapidly from west to

east. At the "12-Mile" and "Dud" Bores, the Series is at least 1,045 feet thick, it has decreased in thickness to 800 feet at the "4-Mile" Bore, and in the vicinity of the Querrie Hills and Mt. Forrest it is only from 350 feet to 450 feet as shown by the No. 1 East and No. 2 East Bores in this vicinity. Generally speaking it may be said that, going westward from the vicinity of Querrie Hills, the depth to water increases at the rate of about 30 feet to the mile. Water in the No. 3 Bore should be found at a depth of about 450 feet; at Winning homestead the same water horizon should be met with at a depth of approximately 700 feet.

Mt. Forrest-Querrie Hills Area.—In this area the No. 1 East and No. 2 East Bores both obtained sub-artesian supplies at the base of the Winning Series at depths of 474 feet and 357 feet respectively. Having regard to the arrangement of the bed as shown in the accompanying cross section, water should be obtained at the No. 3 Site at approximately 400 feet. This depth has, however, already been passed, and it appears that some local folding is present causing the water-bearing horizon to be at a greater depth in this locality. I would expect water in No. 3 Bore at any depth below 400 feet, and almost certainly not deeper than 450 feet.

Three shallow unsuccessful bores marked on the plan "A," "B," and "C" have not gone deep enough to cut the water-bearing strata, although Bore "A" has met with salt water belonging to the same horizon as the salt water obtained in Nos. 1 and 3 Bores. Good water should be obtained in Bore "A" at a depth of approximately 350 feet; at Site "B" the water should be obtained between the depths of 475 feet and 525 feet; at Site "C" between 275 feet and 325 feet.

In stating the above probable depths to water a factor of uncertainty of 50 feet has been allowed because of the lack of accurate knowledge of the relative surface elevations of the bore sites. The depths given also assume that the water-bearing bed lies on an evenly sloping plane, and no allowance has been made for changes of dip which probably occur but to determine which, not sufficient data is available. The quoted figures are only approximate, and the failure to obtain water at these depths should not cause discouragement.

Nine-Mile Paddock Area.—In the Querrie Hills, Mt. Forrest Area, a salt water horizon occurs about 250 feet above the good water horizon at the base of the Winning Series. In the 9-Mile Paddock Area three shallow bores have obtained intensely salt water at depths between 100 feet and 150 feet, and a fourth bore obtained salt water at a depth of 32 feet. This salt water horizon is presumably the same as that met with in the Querrie Hills-Mt. Forrest bores, and on this assumption, good water should be obtained in the 9-Mile Paddock at a depth of approximately 400 feet. Some uncertainty, however, exists because comparison of the Winning 4-Mile Bore, Mia Mia No. 3 and Mia Mia No. 6 Bores suggests that the depth to good water in the 9-Mile Paddock is between 800 and 900 feet. As it is almost certain that the salt water horizon met with in the 9-Mile Paddock is the same as that cut in the Querrie Hills-Mt. Forrest Area, I would expect good water to be met with at the shallower depth (400 feet), but in the event of good water not being obtained in the

9-Mile Paddock at a depth of less than 600 feet, it is probable that the good water will not be met with until the greater depth (800 to 900 feet) is obtained.

The first test bore in this area should therefore be planned to go down to 600 feet, with a great probability of obtaining good water between 400 feet and 600 feet. In the event of this failing, it would of course be necessary to obtain a heavier plant than that at present in use, but the possibility of this being necessary is, in my opinion, remote.

Bannawong-Pleiades Area.—The paddocks in this area are underlain by Cretaceous Winning rocks on the eastern side along the Rabbit-Proof Fence, but it is doubtful whether any great thickness exists, and the possibility of obtaining sub-artesian water at the base is not as bright as elsewhere. Several tests within one or two miles of the Rabbit-Proof Fence would, however, be justified as the depth is not likely to be great, and one positive result would lead the way to the development of a number of similar supplies. The western paddocks in this area are underlain by older Palaeozoic rocks, and as a general rule, wells in sandstone areas are the most likely to meet with success. A Road Board well on Kialawibri Creek obtained a small supply of good water in a sandstone bed dipping westward. A station well on the same creek, two miles further north-west, has a very poor supply, which is obtained from a flat fissure in a shale band of the Lyons Glacial Stage of the Permo Carboniferous rocks. The rocks at both well sites dip westwards, but the angle of dip is not clear. It is certain, however, that the sandstone in the Road Board well passes underneath the shales of the Station well. This sandstone could be penetrated at the site of the Station well by boring, the depth necessary being governed by the angle of dip of the sandstone, which, unfortunately, is not known.

A bore at the Station well put down with the object of cutting the sandstone of the Road Board well is well worth while, as at this increased distance from the outcrop, the water supply in the sandstone will be under a greater pressure and therefore likely to give better supply. Further search for water in the older rocks would best be confined to boring in sandstone areas, with the object of obtaining supplies in porous sandstones such as those in the well near Windalia Pool and near Round Hill.

To obtain supplies in the western paddocks of Winning Station it will be necessary to bore to depths of between 800 and 1,100 feet as indicated on the accompanying cross section, the shallower water being obtained nearer the Homestead and the deeper water near the west boundary. There is a possibility, which has already been mentioned, of obtaining small supplies at a depth between 100 and 200 feet along the west boundary of Winning, but the supply is likely to be insufficient.

ARTESIAN AND SUB-ARTESIAN WATER POSSIBILITIES, WOODLEIGH STATION, MURCHISON DISTRICT.

(F. G. Forman, B.Sc.)

Woodleigh Station and the adjoining properties are, except for a narrow coastal strip which is covered by Tertiary and Post Tertiary rocks, entirely covered by rocks of Cretaceous age.