GEOLOGICAL SURVEY

UNDERGROUND WATER SUPPLY
CERES DISTRICT
CAPE PROVINCE

I. J.S.Brookman - Nooitgedacht.

2. L.E. Brockman - Long Acres.

3. A.K. Green - De Erf

A GENERAL GEOLOGICAL FEATURES :

These three adjoining properties are situated in the southern part of the region known as the Cold Bokkeveld and lie more then 3000 ft above sea level on the elevated country north of Ceres, Furthermore, they are situated in the Cape Mesozoic folded belt and just about where the north south foldings of the west become entangled with the east west flexures of the south. To the west occurs the Schurfteberg Range of Table Mountain Sandstone trending north south and dipping rather steeply eastwards, and in which direction it is normally succeeded by the other members of the Cape System viz. the Bokkeveld and Witteberg Series. On Long Acres De Erf the formations change their direction at strike to the east and at the same time they flatten out with a resulting low dip to the north. This structural bend forms high ground from which the upper tributaries of the Kruis River originate, and from here the river flows away in a general NNE direction.

On lower ground in this river valley the basal member of the Karoo System viz. the Dwyka Series, is represented to a certain extent.

As a result of the intense folding, and even faulting, suffered by the rocks, the erinaceous members possess remarkably well developed joint and fracture systems and shear zones.

The Dwyka tillite occurs as a hard blue rock with a rough cleavage causing it to weather into lenticular slabs jutting out of the ground

B HYDROLOGY

For the three properties mentioned, the only formations to consider in this respect are the Witteberg quartzite's with the succeeding Dwyka tillite.

As described already, the quartzite's are fractured and sheared to a high degree, and in this condition constitute a good aquifer, especially when low lying in an extended surface catchments area. The cleaved tillite, under favourable surface conditions, will

also yield underground water above its normal average, but this formation is only scantily occurring in the north and NE portions of the farms as a thin cover over the quartzite's. In the shallow valleys isolated quartzite outcrops appear in the alluvium.

The rainfall of the area concerned is fairly high, that of Ceres nearby exceeding 40 inches per annum.

The quality of the sub surface water is good and typical of the supplies obtained from the sandstones and quartzite's of the TMS and Witteberg Series.

1. NOOIGTDAGHT

The western part of this property is well situated for the development of underground water on an extensive scale. More or less level ground is formed by the eastward dipping Bokkeveld beds, which are succeeded by Witteberg quartzite in a low range of hills. This Series is in turn discordantly succeeded by Dwyka tillite, the contact probably being faulted end thus bringing the boulder beds down against the quartzite's with elimination of the Lower Dwyka Shales from the surface.

This area east of the fault is topographically lower than the western part from where a wide drainage system flows eastward, converges, and taking advantage of structural weaknesses in the low range of Witteberg quartzite's, discharges onto the lower ground east or the fault.

The considerable sub surface flow of water from this higher level to the lower one is facilitated by the much fractured quartzite and especially by some very marked shear zones in the same rock. These shear zones, trending east west across the strike of the quartzite's, can easily be detected and followed on the surface as a result of differential weathering i.e. the intimately jointed rock along the zone of shearing has readily been removed by denudation, thus leaving an elongated trench like structure with vertical walls. The larger of these fractured zones are quite wide up to 20 yards or more, and springs occur in them at the base of the hills where they enter the valley. The discoloration of the rock, particularly close to the joint surfaces, is due to the deposition of ferriferous compounds from circulating water.

By sitting prospective boreholes along the eastern base of the low Witteberg quartzite range as well as in the centres of the sheared tracts, the most favourable conditions for striking strong underground supplies of water are complied with.

The water table is shallow and the yield increases in depth. According to reports a recently sunk borehole on a similar site yielded 10,000 galls, or more per hour at a depth exceeding 300 ft.

A few of these suitable sites were pointed out to the owner for future drilling purposes, and the best one is perhaps just south of the house where the river emerges.

As to the rest of the farm where the nearly horizontal Witteberg Series is mostly covered by thin Dwyka rocks, no suitable sites to drill on for irrigation purposes could

be selected. Because of the surface cover, the structure of the underlying quartzite's is obliterated. The surface drainage is also spread so that no large concentration of underground water can readily be expected. Deep holes attempted in the shallow valleys may, however, yield a few thousand gallons/hour at the most.

2. LONG ACRES

This farm is unfortunately not as favourably situated for underground water development as Nooitgedacht, because it lies against the southern limb of the wide pitching syncline of Witteberg quartzite's. It not only misses the excellent surface catchment areas of Nooitgedecht but also lacks the favourable geological structure for sub surface concentration. Furthermore, it lies generally topographically higher too. In the south the property is underlain by the Witteberg quartzites of the Gydo Mountain, dipping NW-wards at a low angle. This formation is locally slightly folded across the strike. Lower down the valley there is a thin irregular cover of Dwyka tillite.

A site for a borehole his been selected near the house close to the water tank in the little valley. The surface drainage area leading down to this locality from the slopes of the Gydo Mountain, is limited with no permanent stream, and the position is topographically rather high. The drainage down the little valley follows along a shallow pitching syncline, however, and where this secondary fold is intersected by a seemingly transverse strike fault or fracture, a weak spring occurs. The prospective site has been marked approximately in the trend of this fracture, although a sandy soil covers the outcrops.

This site seems to be the best in this area, and the prospects will get poorer by drilling higher up in the valley against the incline. It is understood that the owner urgently needs water in this locality for irrigation purposes, but it must be stressed that it is unlikely that this prospective borehole will yield enough for a direct leading stream from the well, and only a moderate supply of perhaps a couple of thousand galls. / hour can be expected in depth.

Should this hole supply inadequately, another supplementary one can be attempted lower down in the valley and just inside the common boundary between Long Acres end Nooitgedecht, close to the successful borehole on the last mentioned property. A hole on the Long Acres side of the fence, similarly situated with regard to the quartzite ridge, will not be fed directly underground by a shear zone, but nevertheless a fair yield may be anticipated in depth on account of the general jointed nature of the rock. To avoid any possible interference with the subsurface flow when the two supplies are simultaneously drawn to capacity, the respective holes should not be placed less than about 40 yards apart. The position of a prospective well in this area has been indicated to Mr.J S Brockrnan.

On the remainder of the farm no other sites for irrigation drilling purposes could be selected, although drilling low down in the valleys should produce enough water for stock needs.

3. DE ERF

Geological conditions here are more or less similar to those on Long Acres, i.e. Witteberg quertzites partly covered by tillite lower down in the valley. One favourable site at the base of the Gydo Mountain and west of the premises has been marked in a shear zone in the quartzite. The yield should be useful in supplementing the supply for crops.

Another site on the eastern part of the property has been marked on the flank of a shallow valley, where drilling will probably proceed into quartzite, with perhaps a thin covering of Dwyka rocks under the soil mantle. A small supply for stock purposes should be obtained.

Mr Vermaak, the Government driller to the district, was present at the marking of the sites.

OBSERVATIONS ON DRILLING OPERATIONS AND SUGGESTIONS

On the recent visit to the Government drilling plant in the Ceres District it was noticed that the only method employed is that of percussion drilling by jumper, because the machine is not fitted out with core cutting apparatus. This is indeed a very undesirable state of affairs when drilling takes place into the resistant quartzite of either the Witteberg or the Table Mountain Sandstone Series.

A recently drilled borehole on Nooitgedacht was sunk totally into quartzite to a depth of over 300 ft. by percussion method alone, and it took about six months to complete this hole. This means that each day of drilling only penetrated a foot or two deeper, and in the process there was a heavy toll on spare parts, as e.g. about a dozen bits were used up. The boreman, of course, also had a most harassing time. Fortunately this well yielded a large supply in depth, but if it should have turned out a failure under the circumstances of drilling, it would have meant severe financial loss to some party.

In order to facilitate and speed up the drilling, a core cutting outfit is essential because boring on all the abovementioned sites will entail piercing of similar quartzite's.

It is further suggested that as soon as the water table is reached in the holes, the yield should be pump tested at every 25 ft increase in depth so as to keep a check on the supply, and to note the relative increase in yield with deepening.

Maximum depths of about 375 ft. are suggested, but more important is the regular testing of the relative yields at various depths.

4. E.F. BACON – OSSENKLOOF AND ROOIFONTEIN

These applicants intend making use of a private machine for their drilling and do not need any aid in the selection of sites for underground water.

The properties are situated right at the base of the Zwartruggens Range, where a well developed drainage system from the Witteberg Series emerges on to the flats, and the narrow alluviumfilled outlet is charged with underground water of a good quality. Various holes have been very successful. No further geological work was undertaken under the circumstances.

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