SOUTH WEST AFRICA

DEPARTMENT OF MINES

Memoir No. II

THE GEOLOGY
OF THE
WARMBAD DISTRICT
SOUTH WEST AFRICA

An Explanation of Geological Sheets Amib (H-33-F), Umeis (H-34-A) and Nakop (H-34-B)

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Published by authority of His Honour the Administrator

Price 10/6 (including Map)

PRINTED BY JOHN MEINERT LTD., WINDHOEK
1936

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CHAPTER I.

INTRODUCTION AND PHYSIOGRAPHY.

The area described in the following pages is that portion of the Warmbad District of South West Africa bounded on the north by the railway line and stretching southwards to the Orange River. It was geologically surveyed in 1926 and 1927 by the writers who, for guidance and consultation, had the work of Dr. P. Range, "Geologie des deutschen Namalandes", and two papers by Dr. W. Versfeld in the "South African Journal of Science". The western boundary is the lower part of the Great Fish River, and the southern the Orange River; but some stretches along the Orange River were not examined on account of the difficulty of access. Reference is made in these pages to the neighbouring part of Namaqualand surveyed by Dr. A. W. Rogers and to a portion of Gordonia surveyed in 1925 by the senior author.

The main object of the survey was the elucidation of the general geological structure of the area, and time did not permit either of a detailed investigation of the mineral resources of the area (with the exception of the lead-bearing district of Aiais) nor of the detailed mapping of the pre-Nama granites, gneisses, and metamorphosed sediments. Although, as will be seen in the sequel, these pre-Nama rocks display an almost bewildering variety of types they have been mapped as a unit under the heading of "Granites, Gneisses, Schists, and Associated Rocks" except for those sediments which can be definitely correlated with the Stinkfontein and Numees series of Namaqualand.

The greater portion of the area is a plain of erosion sloping southwards to the Orange River. In the east, however, there is a "step" in this plain with a rise of some 600 feet caused by the escarpment capped by the lowest beds of the Nama system; whilst in the west there is a mountainous tract of country which culminates in the points Dreikopf (or Driekop) 3477 feet high and Chamgabmund 3877 feet high. Near the Orange River, where the older gneisses and granites are exposed, the plain is highly dissected and almost unoccupied.

The area is a barren one, with a low rainfall. With the exception of the Orange, which runs mainly in a deep valley between rocky walls, there is no perennial stream. There are but few spruits and many of the boreholes sunk have proved unsuccessful. Much of the little water obtained is salty; and the district is very sparsely inhabited. The centre of the Magistracy is the little village of Warmbad, which is some 30 miles by road

from the railway at Kalkfontein. There is practically no agriculture in the area; the farmers have chiefly confined their attention to both Merino and Afrikander sheep and as a sheep-breeding country it has proved itself.

The Great Fish River is not perennial; but water can be found in it for most of the year. In its lower reaches it runs, like the Orange, in a narrow valley between high rocky walls, with every appearance of being an entrenched meandering stream. The other tributaries of the Orange to the east are of a different nature. They are all autochthonous to the area. In the country covered by the Karroo Beds the valleys are broad, open, and sand-filled; in the older rocks near the Orange the valleys are in the nature of poorts. The Geinab, like the Bak River in Gordonia, has cut a deep gorge down through the Blydeverwacht (Nama) Plateau. No waterfalls occur in the river-courses, so that grading of these stream-beds has progressed further than in the case of the Molopo; but the grade seems to be somewhat higher in the last mile or so before the tributary joins the Orange.

It is possible to divide the area into three parts. Along the Orange River and in the west the older rocks (gneisses, granite, etc.) form highly dissected, hilly tracts diversified by patches of sand. In the north and north-east the flat-lying Nama beds form a plateau which is continued eastwards into Gordonia. This plateau is largely covered by angular blocks and pieces of tough Kuibis quartzite which are of irregular size and shape and lie so close to one another that to travel over the area involves considerable discomfort. The vegetation here is very sparse and consists largely of melkbos (*Euphorbia* sp.). The third division lies roughly between these two in the centre of the district, and carries the most abundant vegetation. It is composed almost entirely of beds belonging to the lower part of the Karroo system with intrusive sheets of dolerite. The latter are in part less easily weathered than the sediments and give rise to isolated hills and ridges standing up from the general plain. The most striking of these are the isolated Eisenberg west of Haib, and the Amibberg north of Viol's Drift.

with the quartz and generally filling the central portion of the fissure.

It varies from a massive type in which hardly any crystal form can be made out to perfectly crystallised cubes and octahedra of a delicate green to deep-purple colour. It is doubtful whether more than a few tons of fluorspar could be obtained and the product would at best be very impure. The occurrence therefore has no economic importance.

Rose Quartz:

Some of the massive pegmatitic quartz blows in the Orange river valley and more especially those in Bak river contain considerable proportions of light pink to deep rose coloured quartz. In the north-western tributaries of Oorlogskloof there occur a few massive bodies of rose quartz with sufficient colour to be used as ornamental semi-precious stone. Unfortunately the quartz is generally badly cracked and the colour is not uniform even in comparatively small blocks. In addition inaccessibility and transport difficulties may prove serious handicaps to exploitation.

CHAPTER IV.

WATER SUPPLIES.

The area is one of very low rainfall and with the exception of the Orange river there are no perennial streams; accordingly the majority of the inhabitants depend entirely on underground water for their needs.

There are very few natural springs and these are separated from one another by great distances. Farms situated in between these springs depend on opening up underground supplies.

Water in sand and alluvium in sand-filled valleys. Subsurface water seems to be flowing in the sand and alluvium in the dry river beds, and has been obtained at Ukamas where several shallow wells sunk in the alluvium near the homestead have large supplies of fairly fresh water. At Kums on the north side of the railway line salt water is issuing from the alluvium.

At Haib wells sunk by the Bondelswarts natives in the alluvium of the Haib river tap supplies of fresh water. At Rosynbos near the Fish river a small quantity of water is obtained in a well sunk in alluvium.

Springs. At the Mission Station on Heiragabis a shallow well sunk in the Nama beds (Schwarzkalk) seems to tap a large supply of water in a limestone layer. This stratum which is only 5—6'

thick apparently acts as a subterranean reservoir for the 200′ or so of shales and quartzites above it. At Jerusalem water comes out of joints in a coarse-grained garnetiferous aplite near its junction with the gneiss.

In the Chamgab river valley several small springs issue in places where dolerite sills cut the shales of the Dwyka series, notably at Gaibes, Donas, Kanibeam and Agareibis. These supplies are highly mineralised, containing a high content of magnesium sulphate and accordingly are not potable. The mineral content is presumably derived from the White Band shales through which the water percolates.

The large dolerite sill which extends from Ourus through Nubuoras to Uhabis causes water to appear at the surface at Urus, Tsawisib, Nubuoras, Oabib and Uhabis.

Hot Springs. At Warmbad large quantities of warm water issue from the gneiss.* Just below the point at which the water appears the surface level of the gneiss drops about 15′ forming a ridge. To the west of the bath house at a distance of 100 yards fine-grained granites have been intruded into the gneiss, both rocks being subsequently invaded by pegmatites.

The temperature of the water when it comes out is about 100° F. and it is highly mineralised, containing sodium chloride, sodium sulphate and calcium sulphate. Large quantities of gas accompany the water and proved on analysis by Versfeld to be mainly nitrogen. The smell seemed to indicate the presence of sulphur dioxide.

In the Fish river, hot springs are situated at Groot and Klein Aiais. The former place was not visited but at the latter the water was found issuing from the gravel and alluvium in the river bed; the rock exposed nearby is a dark argillaceous schist. The water is mineralised to a greater extent than that of the Warmbad spring and the temperature at the spring is 131° F. At Blydeverwacht a spring issues from the sand on the river bank about 20′ above the bed; a reef of amphibolite cutting N—S across the sheared gneisses seems to determine the place of outflow. The water is warm and the quantity is estimated at approximately 40,000 gallons per day.

At Gründorn about 2 miles to the north of Ham River Station a warm spring comes out of a small inlier of gneiss in the Zwartmodder beds. The quantity of water flowing here is small but it is accompanied by an inert gas.

At Dreihuk in the Bondels Reserve large quantities of water issue from gneisses exposed in the river bed. This water is not thermal but is highly mineralised.

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* Versfeld, W. The Geological structure of portions of German South West Africa. S.A. Journ. Sci., 1915, p. 227.

Boreholes.

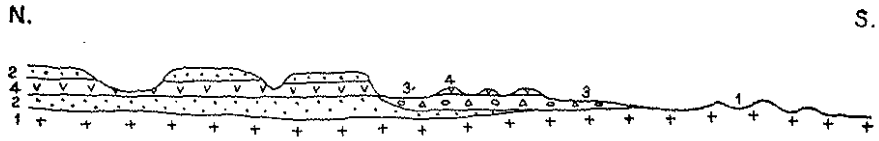
Very little drilling has been done in the rocks of the Dwyka series and large supplies can hardly be expected from this formation as it is so thin.

West of Haib it will probably prove a better water carrier as the number of springs which issue from it seem to show. The water from these springs, however, is in practically every instance brack.

Records of boring in the Nama beds show that fairly good results can be obtained here, especially when the basal beds and the underlying rock are penetrated. These beds lie on an uneven floor of older rocks and have proved themselves to be good water-carriers.

Decomposed areas in the granites and gneisses which are known to hold underground water are difficult to locate and when found they do not seem to be of great extent. In fact in some areas they seem to be absent altogether. The evidence of the large springs issuing from these rocks proves that vast quantities of water must collect and circulate beneath the surface, but the difficulty of locating the subterranean whereabouts of this water from surface indications makes boring for water in these rocks a matter of speculation.

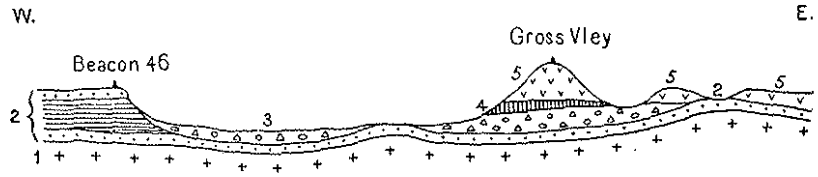
Generalised Section across Nieuwefontein Ost.



1. Granite. 2. Kuibis Beds. 3. Dwyka tillite. 4. Karroo Dolerite.

Fig. 1.

Section across Heirachabis.



1. Granite. 2. Kuibis quarzites and shales. 3. Dwyka shales.
5. Karroo Dolerite.

Fig. 2.