REPORT

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SOIL INFORMATION FOR PROPOSED MINING OPERATION FOR NTSIMBINTLE MINING, NEAR HOTAZEL

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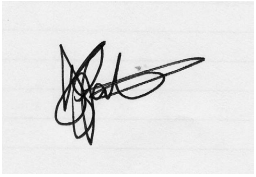
Declaration:

I declare that the authors of this study are qualified, registered natural scientists (soil science), are independent of any of the parties involved and have no other conflicting interests.



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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Metago Environmental Engineers to collect soil information for part of the farms Mamatwan 331 and Moab 700, located approximately 15 km south of Hotazel in the north east of the Northern Cape Province. The purpose of the investigation is to contribute to the environmental impact assessment report for the proposed manganese mining operation for Ntsibintle Mining. The objectives of the study are;

- To classify the soils occurring in the specified area as well as
- To assess the soil potential and soil characteristics in the study area.

2. SITE CHARACTERISTICS

2.1 Location

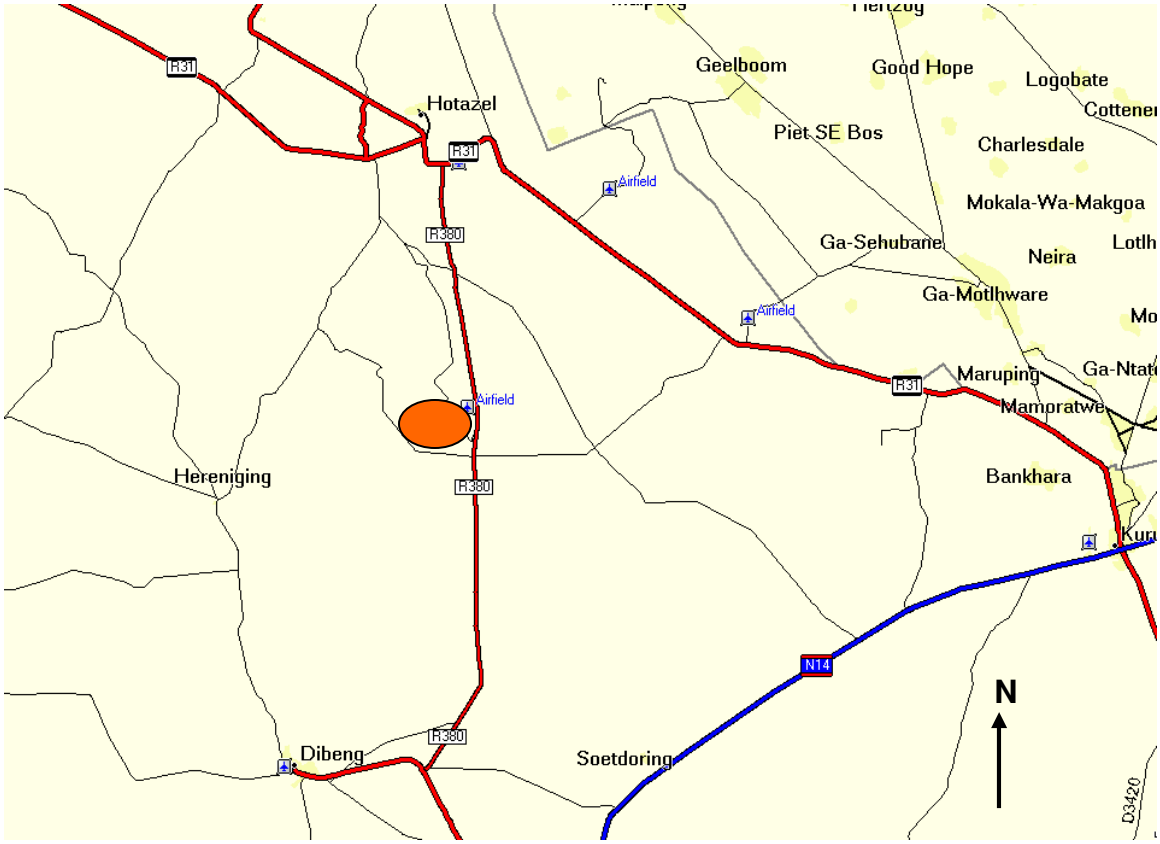

Figure 1: Locality map with the study area in orange.

The area that was investigated covers ± 900 ha on the farms as mentioned above, lying ± 15 km south of Hotazel in the Northern Cape. The area lies to the west of the R300 Kuruman-Hotazel road, and is bounded in the east by the existing Mamatwan manganese mine

2.2 Terrain

The terrain morphological class of the area can described as plains with low relief, lying at an altitude of around 1 080 meters above sea level (Kruger, 1983). The area is flat with no surface drainage in the area. The current agricultural use of the surveyed area is that of grazing for cattle.

2.3 Parent Material

Parent material comprises red to flesh-coloured wind blown sand of Quaternary age and a small piece of surface limestone of Tertiary age in and around the Witleegte stream in the north (Geological Survey, 1979).

2.4 Climate

The climate of the area can be regarded as typical of the northern interior, with cool to cold, dry winters and hot, dry summers (Koch & Kotze, 1986). The main climatic indicators are given in Table 1.

Table 1. Climate Data

Month	Average Rainfall (mm)	Average Min. Temp (ºC)	Average Max. Temp (ºC)	Heat units (hrs > 10°C)
Jan	58.6	17.8	32.0	Summer (Oct-Mar): 2 350 Winter (Apr-Sept): 719
Feb	59.7	17.1	30.8	
Mar	65.7	15.1	28.4	
Apr	34.7	10.9	25.1	
May	15.6	6.4	21.1	
Jun	5.6	2.5	18.2	
Jul	2.9	2.5	18.3	
Aug	5.4	4.6	20.9	
Sep	6.2	8.3	24.5	
Oct	17.1	12.1	27.8	
Nov	26.8	14.9	29.7	
Dec	38.1	16.9	31.6	
Year	**336.4 mm**	**18.3 °C (Average)**		

The long-term average annual rainfall is 336.4 mm, of which 266 mm, or 79%, falls from October to March. Temperatures vary from an average monthly maximum and minimum of 36.7ºC and 11.4ºC for January to 23.2ºC and –2.9°C for July respectively. The extreme high temperature that has been recorded is 41.6°C and the extreme low –7.5ºC.

2.5 Vegetation

According to Low & Rebelo (1996), the dominant vegetation type is that of Kalahari Plains Thorn Bushveld and falls into the Savanna Biome. The Kalahari Plains Thorn Bushveld is characterised by a fairly well-developed tree stratum, the shrub layer is moderately developed and the grass cover depends on the amount of rainfall during the growing season.

3. METHODOLOGY

For a variety of reasons (outlined below), it was decided not to carry out a field survey.

Firstly, the land type survey of the region (Eloff *et al*, 1986) indicated that the study area falls within land type Ah9. The land type inventory for this land type shows that more than 96% of the landscape comprises deep (>1 200 mm), sandy, red and yellow soils of the Hutton and Clovelly forms with a high degree of homogeneity of soil properties.

Secondly, a previous survey (Dreyer & Paterson, 2006) was carried out immediately to the north of the area. That survey involved around 95 auger observations on a 250 x 250 m grid and found that virtually the whole area was covered by deep, sandy Hutton soils. In addition, 16 soil samples were collected and analysed, confirming that the soils are sandy in texture, neutral in pH and have a low CEC value, leading to infertility.

Finally, the low annual rainfall and hot temperatures (Table 1) mean that this area, despite the deep, friable soils, will have a low potential for arable agriculture and that the area is best suited for extensive grazing.

4. AGRICULTURAL POTENTIAL

The entire study area is considered to be of low agricultural potential due to the low clay content of the soils and the low rainfall and is only suited for grazing. According to the criteria by Schoeman (2004), land in the Northern Cape is only considered to be of high potential if it is under permanent irrigation.

5.1 Dryland

The soils of the area are sandy and deep (> 1 500 mm). They will therefore drain rapidly. Due to this tendency, along with the lack of fertility as shown by the low CEC values, they have a low agricultural potential.

Coupled with the hot, dry nature of the climatic regime, it can be seen that this area is not suited to dryland arable agriculture, and most of the farming enterprises in the vicinity are either game farms or cattle ranches. This is the optimum land use option given the environment.

5.2 Irrigation

The soils would have a moderate potential for irrigation, due to the very low clay content. The sandy nature of the soils would necessitate very careful scheduling because of the very low water holding capacity of the soils. The soils would require a substantial and reliable supply of water to ensure optimum soil moisture at all times, even if such a water supply was available..

REFERENCES

Dreyer, J.G. and Paterson, D.G., 2006. Soil Survey for proposed mining operation at Botha 313, Smartt 314 and Rissik 330, Near Hotazel. Report No. GW/A/2006/86, ARC-Institute for Soil, Climate and Water, Pretoria

Eloff, J.F., Idema, S.W.J., Schoeman, J.L., Bruce, R.W. and Bennie, A.T.P., 1986. Field investigation. In: *Land types of the maps SE27/20 Witdraai, 2720 Noenieput, 2722 Kuruman, 2724 Christiana, 2820 Upington and 2822 Postmasburg. Mem. Agric. Nat. Res .S. Afr*. No.3. Department of Agriculture, Pretoria.

Geological Survey, 1979. 1:250 000 scale geological map 2722 Kuruman. Department of Mineral and Energy Affairs, Pretoria.

Koch, F.G.L., 1986. Climate data. In: *Land types of the maps SE27/20 Witdraai, 2720 Noenieput, 2722 Kuruman, 2724 Christiana, 2820 Upington and 2822 Postmasburg. Mem. Agric. Nat. Res .S. Afr*. No.3. Department of Agriculture, Pretoria.

Kruger, G.P. 1983. Terrain Morphological Map of Southern Africa. Department of Agriculture. Pretoria.

Low, A.B. & Rebelo, A.T., 1996. Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs & Tourism, Pretoria.

Schoeman, J.L. 2004. Criteria for high potential agricultural land in South Africa. Institute for Soil, Climate and Water, Pretoria.

Soil Classification Working Group, 1991. Soil classification. A taxonomic system for South Africa. Institute for Soil, Climate and Water, Pretoria.