

REPORT

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SOIL INFORMATION FOR MEDUPI WASTE LANDFILL SITES, MATIMBA POWER STATION, LEPHALALE

By

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Envirolution Consulting (Pty) Ltd to undertake a soil investigation for two alternative sites for a proposed waste landfill site, near Lephalale (Ellisras) in the west of Limpopo Province. The purpose of the investigation is to provide an agricultural potential assessment for the site alternatives. The objectives of the study are;

- To identify the soils and to produce a soil map of the specified area as well as
- The agricultural soil potential and soil characteristics.

2. SITE CHARACTERISTICS

The two sites are located as follows (see Figure 1 below):

Site 1 to 4: on the farm Grootvallei 515LQ

Site 5: near the existing Matimba Power Station on the farm Grootestryd 465LQ.

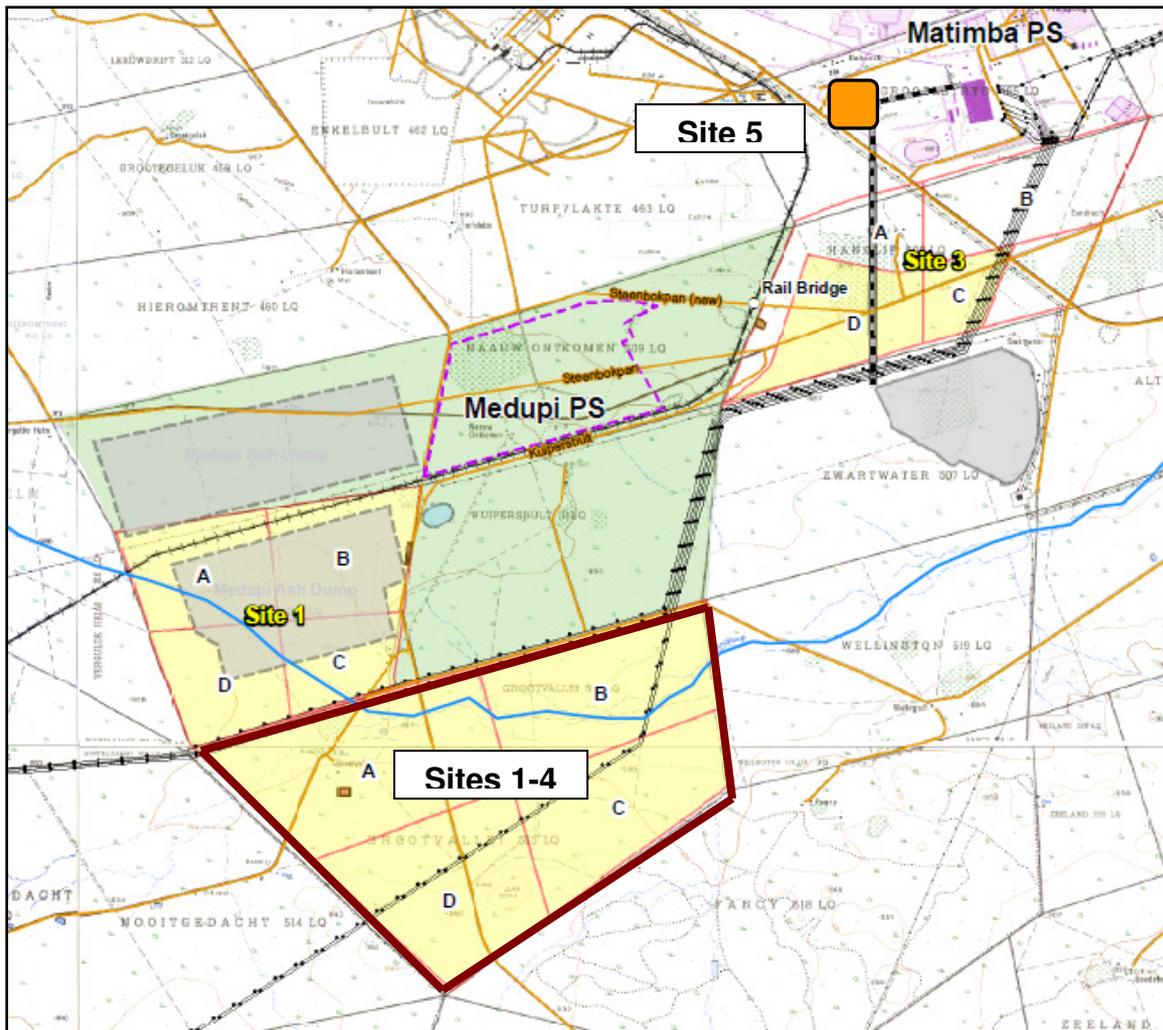


Figure 1. Site alternatives

2.1 Terrain

The terrain morphological class of the area can be described as plains with low relief, lying at an altitude of around 900 meters above sea level (Kruger, 1983). The area is virtually flat, with very gentle slopes (<2%)

2.3 Parent Material

The geology of the area comprises sandstone and mudstone sediments of the Matlabas Subgroup, Waterberg Group, undifferentiated shale, sandstone and coal of the Karoo Sequence and also alluvium (Geological Survey, 1986).

2.4 Climate

The climatic regime of the study area (Koch, 2005) is characterized by hot, moist summers and mild, dry winters. The main climatic indicators are given in Table 1.

Table 1. Climate Data

Month	Average Rainfall (mm)	Average Min. Temp (°C)	Average Max. Temp (°C)	Average frost dates
Jan	95.5	18.2	31.7	Start date: 21/6 End date: 12/7 Days with frost: ± 2 Years with frost: 43%
Feb	81.4	17.9	30.2	
Mar	56.9	17.3	30.2	
Apr	36.3	13.2	26.7	
May	10.3	9.2	25.4	
Jun	5.0	6.0	23.1	
Jul	2.2	6.0	23.2	
				Heat units (hrs > 10°C)
Aug	2.2	8.9	25.9	Summer (Oct-Mar): 2 600
Sep	9.7	12.6	29.0	
Oct	32.5	15.7	30.5	Winter (Apr-Sept): 1 385
Nov	67.0	17.2	31.0	
Dec	86.4	18.3	31.5	
Year	485.4 mm	20.8°C (Average)		

The long-term annual average rainfall is 485.4 mm, of which 420 mm, or 86.5%, falls between October and March. Temperatures vary from an average monthly maximum and minimum of 37.2°C and 13.9°C for January to 27.8°C and 1.5°C for July respectively. The extreme high temperature that has been recorded is 44.5°C and the extreme low -4.3°C. Frost is rare, but occurs occasionally in most years, though not severely.

3. METHODOLOGY

At this stage, it was decided that a field survey was not required. This was for several reasons:

- The national Land Type Survey of the region (Botha, Haarhoff & Paterson, 2005) indicates that the sites occur on the land types **Ae252** (Matimba) and **Bd46** (Grootvallei). Approximately 86% of land type Ae252 comprises deep (>1200

mm), red sandy soils of the Hutton form, while for Bd46, a similar situation exists, except that the soils are generally yellow-brown and around half of them have a subsurface, mottled soft plinthite horizon at 600-1200 mm depth. But in general, the soils are very homogeneous in distribution.

- A previous survey (Dreyer & Paterson, 2006), carried out on the farms Eenzaamheid 987LQ and Naauw Ontkomen 509LQ, lying approximately between Grootvallei and Matimba, showed that the soils are indeed deep and sandy. An auger grid of 200 x 200 m was used to survey approximately 1 200 ha, and samples were collected at ten sites, which confirmed that most of the soils have clay contents of less than 12-15%, the pH values are acidic and the CEC levels are low, indicating reduced fertility.
- As shown in Table 1, the low rainfall and high temperatures indicate a very low potential for arable cultivation.

4. SOILS

The immediate area is very homogeneous in terms of texture, structure and soil depth. Two soil units occur in the vicinity, with the only difference between the two being colour. The larger part of the area consists of deep soils, comprising dark reddish brown, apedal, sandy topsoil on reddish brown to yellowish red, apedal loamy sand subsoil. The soils belong to the Hutton soil form.

The other portion of the area has soils with a dark brown, apedal, sandy topsoil on brown to dark brown, apedal loamy sand subsoil, belonging to the Clovelly form.

5. AGRICULTURAL POTENTIAL

5.1 Dryland

The soils of the area are sandy and generally deep (> 1 200 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 moderate agricultural potential.

However, 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 to high potential for irrigation, due to the lack of any restricting layer, but the sandy nature of the soils would necessitate very careful scheduling. The soils would require a substantial and reliable supply of water to ensure optimum soil moisture at all times.

6. PREFERRED ALTERNATIVE

Purely from the point of view of soils and associated agricultural potential, there is no preferred alternative concerning either Site 5 (Matimba) or Sites1-4 (Grootvallei).

The soils are similar, and the restrictions on dryland cultivation apply equally at both sites.

7. REFERENCES

Botha, M.J., Haarhoff, D. & Paterson, D.G., 2005. Field investigation. In: *Land types of the maps 2326 Ellisras and 2328 Pietersburg. Mem. Agric. nat. Res .S. Afr.* No.19. ARC- Institute for Soil, Climate and Water, Pretoria.

Dreyer, J.G. & Paterson, D.G., 2006. Soil survey for Matimba B power station on the farms Eenzaamheid 987 LQ and Naauw Ontkomen 509 LQ, near Ellisras. Report No. GW/A/2006/11, ARC- Institute for Soil, Climate and Water, Pretoria.

Geological Survey, 1986. 1:250 000 scale geological map 2326 Ellisras. Department of Mineral and Energy Affairs, Pretoria.

Koch, F.G.L. 2005. Climate data. In: *2326 Ellisras and 2328 Pietersburg. Mem. Agric. nat. Res .S. Afr.* No.19. ARC- Institute for Soil, Climate and Water, Pretoria.

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

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

APPENDIX:
LAND TYPE MAP

Medupi Landfill Site: Proposed Alternatives

