REPORT

On contract research for

Bohlweki Environmental

SOIL INFORMATION FOR PUMPED WATER STORAGE SCHEME, STEELPOORT VALLEY

February 2007

By

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Bohlweki Environmental to compile available soil information for areas north of Stoffberg, in Mpumalanga Province. The purpose of the investigation is to contribute to the baseline environmental report for the proposed Steelpoort Pumped water Storage Scheme (Project Lima). The objectives of the study are;

- To classify the soils and to produce a soil map of the specified areas;
- To identify all relevant soil characteristics;
- To assess broad agricultural potential.

2. SITE CHARACTERISTICS

2.1 Location

The area that was investigated occurs on portions of the original farms Keerom 151JS (later within the previous Lebowa homeland) and Luipershoek 149JS, located approximately 30 kms north of Stoffberg on either side of the Steelpoort River (see map in Appendix).

The project comprises an Upper Dam site (on Keerom) and a Lower Dam site (on Luipershoek). The two sites are separated by the *Thaba ya Sekhukhune* (Sekhukhune Mountains), with the Upper Dam site lying on top of the escarpment and the Lower Dam site lying at the foot of the escarpment, close to the Steelpoort River.

2.2 Terrain

The terrain morphological class of the Upper Dam site can described as hills and mountains with moderate and high relief, lying at an altitude of around 1 700 meters above sea level (Kruger, 1983). However, the terrain here is relatively flat, with slopes of less than 5%. The Lower Dam site, closer to the river (around 1 050 metres above sea level), has slopes that vary from around 20% on the higher parts to 5% closer to the river.

There is no surface drainage in the Upper Dam site, while the Lower Dam site is drained by two tributaries of the Steelpoort River.

2.3 Parent Material

The steeper topography of the escarpment is underlain by rhyolite of the Damwal Formation, Transvaal Sequence, while the remainder of the area comprises magnetite gabbro and diorite of the Roossenekal Subsuite of the Bushveld Igneous Complex (Geological Survey, 1984).

2.4 Vegetation

The vegetation of the Upper Dam site comprises grass, with occasional shrubs, including some protea species and ferns. The area has been overgrazed in places, but no erosion was observed.

The Lower Dam site comprises mostly larger trees and shrubs, with some more open areas of grass. The vegetation here is in a much more natural state, with good grass cover.

2.5 Climate

The climate of the area can be regarded as typical of the Highveld, with cool to cold, dry winters and warm, moist summers (Koch, 1987).

The rainfall on top of the escarpment will be higher, around 700 mm, compared to the valley below, where only around 525 may be expected.

Temperatures for the Steelpoort valley vary from an average monthly maximum and minimum of 30.1ºC and 17.6ºC for January to 21.6ºC and 3.8^{o}C for July respectively. The extreme high temperature that has been recorded is 39.7^{o}C and the extreme low –2.3ºC.

No temperature statistics for the Upper Dam site could be obtained (due to a lack of weather stations in the area), but it can be anticipated that, due to the altitude (600 m higher than the river), temperatures will be around 3^{o} cooler at most times of the year, and there will be a definite frost hazard in winter, as well as increased wind speeds, due to the exposed situation.

3. METHODOLOGY

The soil information contained in this report was obtained from two sources, namely the national Land Type Survey (Schoeman et al, 1987), published at 1:250 000 scale, and the irrigation soil survey of the Steelpoort Valley (Paterson et al, 1984), carried out at 1:50 000 scale.

The Land Type Survey is a reconnaissance survey carried out to establish the broad soil patterns occurring in an area, while the irrigation survey was carried out to establish the precise extent of any irrigable soils along the river, using aerial photo mosaics as a base map.

The area covered by the irrigation survey only about half of the Lower Dam site, so a field visit was made on 31st January 2007 to check on the rest of the site and to look at the soils on top of the escarpment.

4. SOILS

The soils that occur can be divided into three broad classes, as shown on the map (Appendix). These are summarized in Table 2 below.

Soil Unit	Depth (mm)	General Characteristics	Agric. Potential
Ms	50-350	Brown to reddish-brown, structureless, sandy loam to sandy clay loam topsoil, often stony, on hard (occasionally weathering) rock. Rock outcrops occur in many parts of the map unit. Mainly soils of the ***Mispah*** (Ms) or Hutton (Hu, shallow phase) form.	Low
Sw	400-1200	Brown to reddish-brown, structureless, sandy clay loam topsoil on brown to reddish-brown, moderately structured, sandy clay loam to clay loam (occasionally calcareous) subsoil on rock. Occasional rock outcrops occur. Mainly soils of the ***Swartland*** (Sw), Valsrivier (Va) or Glenrosa (Gs) form.	Low to moderate
Oa	600-1200+	Brown to reddish-brown, structureless, sandy loam to sandy clay loam topsoil on brown to reddish-brown, structureless to weakly structured, sandy clay loam, occasionally calcareous subsoil. Occurs close to stream channels. Mainly soils of the ***Oakleaf*** (Oa) form.	Moderate

Most of the two areas consist of shallow soils (**Ms** map unit), often rocky, either on the flat terrain on top of the escarpment or on the lower slopes. Close to the streams, a zone of deeper, alluvial soils occurs (**Oa** map unit), but this is usually no more than 100-150 m wide, and often slopes steeply down to the stream in places. In the east of the Lower Dam site, some deeper, but more structured soils occur (**Sw** map unit), with varying depth and rockiness.

Note: while a detailed survey was not carried out for the purposes of this investigation, the previous survey (Paterson et al, 1984) has identified areas in the vicinity where ***high potential soils*** (normally deep, red, structureless soils of the Hutton form) will probably occur. If any of these areas are considered for any type of development, care should be taken. These areas are marked in green on the map in the Appendix.

If such developments are temporary (eg construction camps), it should be possible to return the land to its original condition, but if a more **permanent** impact was considered (eg borrow pits for fill material), it would constitute a serious impact and a loss of high potential agricultural land (especially in view of the adjacent irrigation source that is the Steelpoort River.

5. AGRICULTURAL POTENTIAL

The broad agricultural potential of each of the soil mapping units is given in Table 3 below.

Table 3. Broad agricultural potential

Potential Class	Soil Unit	Soil limitations
Moderate	Oa	Occasional soil depth restriction; however, narrow zone with some steep slopes will restrict arable potential
Low to moderate	Sw	Structured nature of some soils, along with depth variation and occasional stoniness will significantly restrict arable potential.
Low	Ms	Shallow soils, with general occasional rockiness. Unit is suited for grazing at best.

From the map in the Appendix, it can be seen that no areas with high agricultural potential are involved.

6. ENVIRONMENTAL IMPACTS

Two environmental impacts are considered due to dam construction, namely:

1. Loss of soil resource
2. Loss of agricultural potential

The significance of these impacts is summarized in Table 4 below.

Rating for loss of soil resource	
Extent	1
Duration	3
Intensity	1
Probability	4
Total	**9**

This is a **medium** negative impact, and no mitigation measures are possible, since the soils will be covered by the construction of the dams.

Rating for loss of agricultural potential	
Extent	1
Duration	3
Intensity	1
Probability	2
Total	**7**

This is a **low** negative impact, due to the low existing agricultural potential in the area. Mitigation measures are not required.

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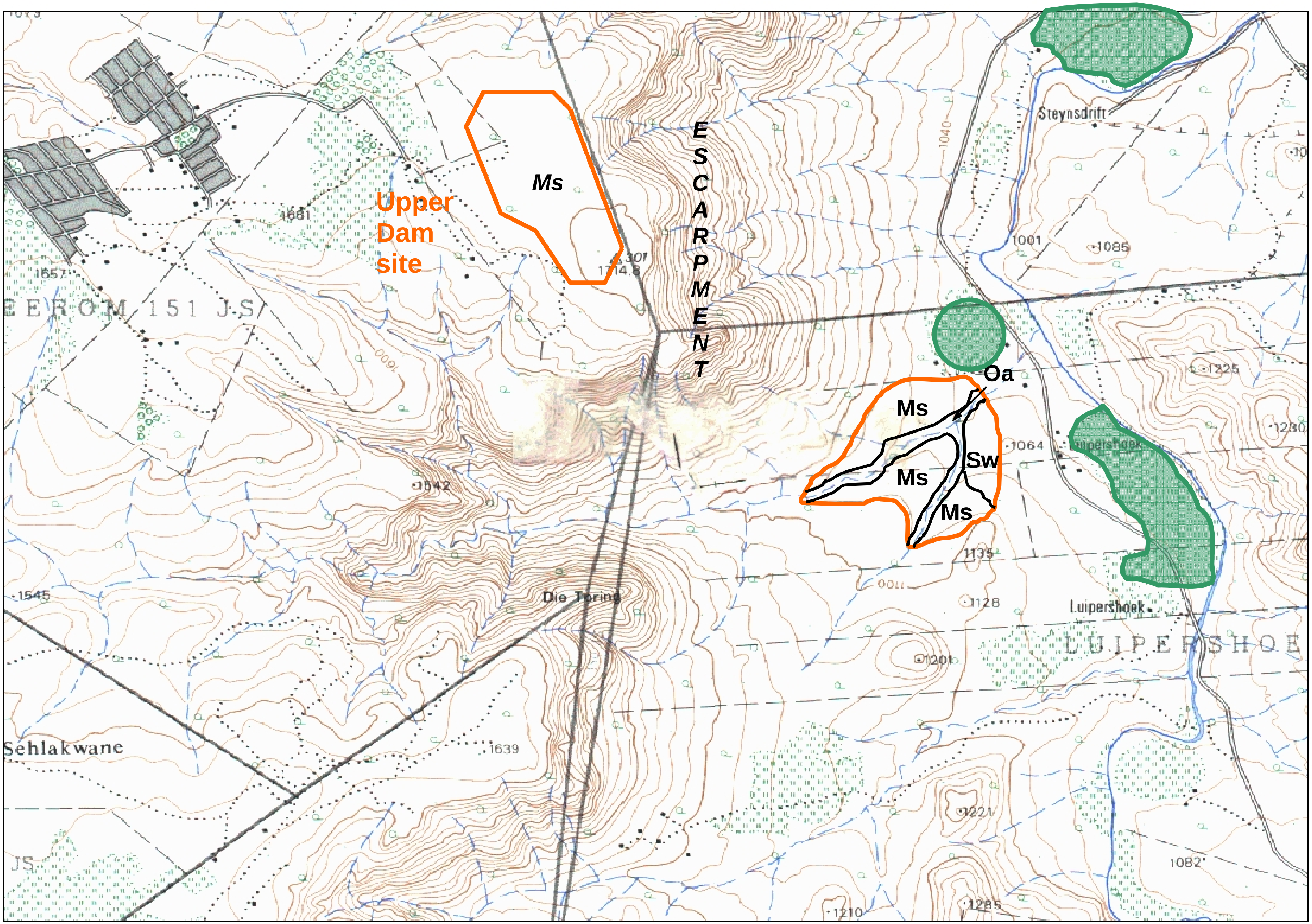
APPENDIX

Soil Map



Upper
Dam
site
Ms
E S C A R P M E N T
Oa
Ms
Sw
Ms
Ms
EEROM 151 JS
Steynsdrift
Luipershoek
Luipershoek
LUIPERSHOE
Die Toring
Sehlakwane
1661
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