On contract research for

ILISO CONSULTING

Proposed Construction of a Photovoltaic Power Plant,
Arnot Power Station,
Mpumalanga Province

Soils and Agricultural Potential

Specialist Study

By

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DECLARATION

I hereby declare that I am qualified to compile this report as a registered Natural Scientist and that I am independent of any of the parties involved and that I have compiled an impartial report, based solely on all the information available.

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January 2015
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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-IS CW) was contracted by ILISO Consulting (Pty) Ltd to undertake a soil investigation near Arnot, in Mpumalanga Province. The purpose of the investigation is to contribute to the Environmental Impact assessment (EIA) process for a proposed Photovoltaic (PV) power generation facility at Eskom’s Arnot Power Station.

The objectives of the study are;

- To obtain all existing soil information and to produce a soil map of the specified area as well as

- To assess broad agricultural potential.
2. SITE CHARACTERISTICS

2.1 Location

The study area which consists of site Alternative 1 and Alternative 3 is located on portions of the farm Rietkuil 491JS, which lies adjacent to the Arnot Power Station. The position of the site is shown by the green areas on the map in Figure 1. The area lies between 25° 56’ and 25° 58’ S and between 29° 46’ and 29° 48’ E.

Figure 1  Locality map

The areas that were identified lie to the south of the Power Station (see map in Appendix A).

2.2 Terrain

The sites have gentle slopes toward the south and south-west, with slopes of less than 5%, and lies at a height of approximately 1 620 to 1 680 metres above sea level. The Rietkuil spruit flows to the south of the two Alternatives, so potentially wet areas may well be present.
2.3 Climate

The climate of the study area (Koch, 1987) can be regarded as warm to mild, with rain in summer and dry winters. The long-term average annual rainfall in this region is 720 mm, of which 610.79 mm, or 85%, falls from November to April. The total annual evaporation is approximately 1 830 mm per year, peaking at approximately 6.4 mm per day in December.

Temperatures vary from an average monthly maximum and minimum of 25.0°C and 12.5°C for January to 16.7°C and 0.2°C for July respectively. The extreme high temperature that has been recorded is 35.6°C and the extreme low –11.1°C. Frost occurs most years on around 25 days on average between mid-May and early September.

2.4 Parent Material

The geology of the area comprises sandstone of the Vryheid Formation, Ecca Group (Geological Survey, 1978).

3. METHODOLOGY

Existing soil information was obtained from the map sheet 2528 Pretoria (Schoeman et al., 1978) from the national Land Type Survey, published at a scale of 1:250 000. A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar et al (1977).

Both Site Alternative 1 and 3 are covered by only one land type, namely:

- **Ba22** (Mainly red, highly weathered, structureless plinthic soils)
It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the land type survey may also occur.

The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground-truthed.

A summary of the dominant soil characteristics of the land type is given in Table 1 below.

The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown in bold type.

4. SOILS

A summary of the dominant soil characteristics is given in Table 1 below.
<table>
<thead>
<tr>
<th>Land Type</th>
<th>Depth (mm)</th>
<th>Dominant soils</th>
<th>Percent of land type</th>
<th>Characteristics</th>
<th>Agric. Potential (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ba22</td>
<td>800-1200</td>
<td>Hutton 16/26/27</td>
<td>32%</td>
<td>Red, structureless, sandy clay loam soils on weathering rock</td>
<td>High: 59.0</td>
</tr>
<tr>
<td></td>
<td>700-1200</td>
<td>Avalon/Glencoe 14/16/24/26</td>
<td>27%</td>
<td>Brown to yellow-brown, structureless, sandy loam to sandy clay loam soils on mottled, soft or hard plinthite</td>
<td>Mod: 8.2</td>
</tr>
<tr>
<td></td>
<td>100-450</td>
<td>Mispah/Glenrosa + rock</td>
<td>22%</td>
<td>Brown to grey-brown (occasionally red), structureless sandy loam to sandy clay loam topsoils on rock or hard plinthite</td>
<td>Low: 32.8</td>
</tr>
</tbody>
</table>
5. AGRICULTURAL POTENTIAL

Both Site Alternatives 1 and 3 are comprised of a mixture of soils, mainly non-structured, with some variable depth (as can be seen from the information contained in Table 1). The high rainfall in the area (Section 2.3) means that rain-fed cultivation can be successfully practiced on suitable soils.

The landscape represented by land type Ba22 is dominated by soils with high agricultural potential, but approximately one-third of the area will have low potential soils, generally due to shallow soil depth and occasional rockiness. For this reason, more detailed survey investigation may be required to delineate the areas of the various soil types.

This would involve carrying out a systematic soil survey of the area or areas selected as viable alternatives, using a hand-held soil auger at a grid of investigation of 150 x 150 m. Samples of topsoil and subsoil from representative soils will be collected and analyzed, so that the soils occurring can be mapped and characterized for the grade of agricultural potential. A detailed soil map and report will be prepared, with all relevant soil-related information.

6. IMPACTS

The major impact on the natural resources of the study area would be the loss of arable land due to the construction of the various types of infrastructure. With the possibility of moderate to high potential agricultural soils in the vicinity, this impact would in all probability have a degree of significance, although local in extent. At the end of the project life, it is anticipated that removal of the structures would enable the land to be returned to more or less a natural state following rehabilitation, with little impact.

The impact can be summarized as follows:

Table 3 Impact significance

<table>
<thead>
<tr>
<th>Nature of impact</th>
<th>Loss of agricultural land</th>
<th>Land that is no longer able to be utilized due to construction of infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of impact</td>
<td>Site only</td>
<td>Confined to areas within the site where infrastructure will be located</td>
</tr>
</tbody>
</table>
7. CONCLUSION

The area investigated is comprised of a variety of soils, but with a significant percentage of shallow soils. The area can be considered as having mainly high potential for agricultural purposes, taking into consideration the annual rainfall. The soil information used in this report is based on a reconnaissance scale survey, revealing only broad soil patterns.

If more detail on the soil patterns is required, then a soil survey (see Section 5) will be necessary to determine the detailed soil patterns that might not be obvious in this report. However, since the property is owned and operated by Eskom, the use of the land for agricultural production would not likely be an option for future development and therefore not accounted for as a loss.
REFERENCES


APPENDIX A

MAP OF LAND TYPES