

REPORT

On contract research for

SAVANNAH ENVIRONMENTAL



SOIL INFORMATION FOR PROPOSED SPITSKOP WIND ENERGY FACILITY NEAR RIEBEEK EAST, EASTERN CAPE

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.

A square box containing a handwritten signature in black ink. The signature is stylized and appears to be 'D G Paterson'.

D G Paterson
February 2011

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISWC) was contracted by Savannah Environmental to undertake a soil investigation near Riebeek East, in the Eastern Cape Province. The purpose of the investigation is to contribute to the Environmental Impact assessment (EIA) process for the proposed Spitskop wind energy facility. 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 area that was investigated lies to the north and West of Riebeek East, with the N10 national road crossing the western portion and the Fish River to the north. The area lies between $33^{\circ} 03'$ and $33^{\circ} 13'$ S and between $25^{\circ} 42'$ and $26^{\circ} 10'$ E and the location is shown in Figure 1.

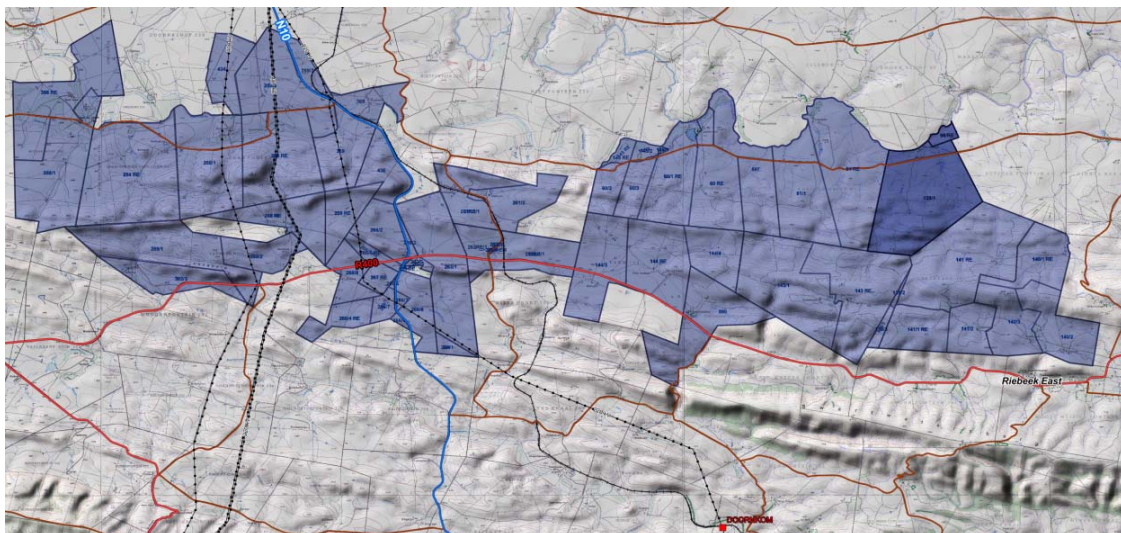


Figure 1 Locality map

2.2 Terrain

The study area consists of a mixture of gently undulating and fairly steeply undulating topography. There are several east-west trending ranges of hilly relief that bisect the area, with slopes of up to 60% in places. The altitude of the area is around 500 m but the higher parts of the area reach 800 to 900 m in places.

2.3 Climate

The climate of the area has an all-year-round rainfall distribution, with an annual **long-term** average of 580 mm (Koch, 2003).

The main climatic indicators are obtained from combining ARC-ISCW weather stations 55/632, 56/065, 75/745 and 77/030, as shown below.

Table 1 Climate Data

Month	Rainfall (mm)	Min. Temp (°C)	Max. Temp (°C)	Average frost dates
Jan	30.7	16.8	30.0	Start date: 21/06 End date: 02/08 Days with frost: 6
Feb	42.9	17.2	30.0	
Mar	42.6	15.9	28.4	
Apr	30.7	13.0	26.4	
May	18.3	9.5	24.3	
Jun	14.6	6.5	20.8	
Jul	14.0	6.0	21.5	
Aug	17.1	7.9	22.3	Heat units (hrs > 10°C) Summer (Oct-Mar): 2093 Winter (Apr-Sept): 1102
Sep	26.4	9.8	24.4	
Oct	39.9	11.7	24.2	
Nov	38.5	13.8	26.5	
Dec	38.3	15.4	28.5	
Year	353.9 mm	18.8°C (Average)		

2.3 Parent Material

The area is underlain mainly shale of the Lake Mentz Formation, with some tillite of the Dwyka Formation, as well as sandstone of the Ecca Group (Geological Survey, 1993).

3. METHODOLOGY

Existing soil information was obtained from the map sheets 3324 Port Elizabeth (Oosthuizen *et al.*, 2003) and 3326 Grahamstown (Oosthuizen *et al.*, 1999) 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).

The areas under investigation are covered by the following 16 land types, as shown on the map in the Appendix, namely:

Ae187, Ae207, Ae208	(red, structureless, highly weathered soils)
Ag29	(red, structureless, highly weathered soils, shallow)
Fb347	(Generally shallow soils with some lime)
Fc176, Fc180, Fc340	
Fc341, Fc342, Fc343	
Fc344, Fc742, Fc743	
Fc744	(Generally shallow soils with abundant lime)
Ia82	(Alluvial soils, usually deep)

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 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.**

While the data contained in the land type survey is of a reconnaissance nature, it can be predicted with reasonable certainty that the degree of dominance of the soils occurring will be reflected on the ground.

4. SOILS

A summary of the dominant soil characteristics of each land type for the study area is given in Table 1 below. Column 6 shows the distribution of ***dryland*** agricultural potential within the land type (see Section 5), with the dominant class shown in **bold**.

Table 1 Land types occurring (with soils in order of dominance) in the Spitskop study area.

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agric. Potential (%)
Ae187	Hutton 30/33/36	100-300	43%	Red, sandy/loamy, structureless soils on rock	High: 3.5 Mod: 17.5 Low: 79.0
	Rock	-	24%	Rock outcrops	
Ae207	Hutton 36/46/47	800-1200	60%	Red, loamy/clayey, structureless soils on rock	High: 76.6 Mod: 3.4 Low: 20.0
	Glenrosa 16/19/26/29	100-250	16%	Grey-brown, loamy/clayey topsoils on weathering rock	
Ae208	Hutton 36/46	600-1200	78%	Red, loamy, structureless soils on rock	High: 50.0 Mod: 45.5 Low: 4.5
	Oakleaf 16/26	600-1200	17%	Red, loamy, structureless soils on rock	
Ag29	Hutton 33/36/46	200-450	55%	Red, sandy/loamy, structureless soils on rock	High: 12.3 Mod: 0.8 Low: 86.9
	Glenrosa 16/17/23/26	50-250	14%	Grey-brown, loamy topsoils on weathering rock	
Fb347	Cartref 12	150-300	27%	Greyish brown, loamy, structureless soils on weathering rock	High: 4.0 Mod: 10.3 Low: 86.2
	Rock	-	23%	-	
Fc176	Hutton 36/46/47	150-300	36%	Red, loamy/clayey, structureless soils on rock	High: 7.8 Mod: 9.8 Low: 82.4
	Mispah 10/20/22/24	50-200	30%	Grey-brown, loamy/clayey calcareous topsoils on rock	
Fc180	Glenrosa 13/16/19/26	50-250	58%	Greyish brown, loamy, structureless soils on weathering rock	High: 4.0 Mod: 11.0 Low: 85.0
	Mispah 10	100-200	17%	Grey-brown, loamy calcareous topsoils on rock	
Fc340	Glenrosa 13/14/16/17	50-250	34%	Greyish brown, loamy, structureless soils on weathering rock	High: 2.8 Mod: 14.8 Low: 82.8
	Mispah 10	50-150	29%	Grey-brown, loamy calcareous topsoils on rock	
Fc341	Glenrosa 16/19/26/29	150-300	61%	Greyish brown, loamy/clayey, structureless soils on weathering rock	High: 7.8 Mod: 26.3 Low: 65.9
	Hutton 36/46	300-1000	24%	Red, loamy, structureless soils on rock	
Fc342	Glenrosa 13/16/19/26	50-250	36%	Greyish brown, loamy, structureless soils on weathering rock	High: 15.3 Mod: 18.6 Low: 66.1
	Oakleaf 16/26/36/46	800-1200	14%	Red, loamy, structureless soils on rock	

Table 1 Land types occurring (with soils in order of dominance) in the Spitskop study area.

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agric. Potential (%)
Fc343	Glenrosa 13/16/19/26	50-250	85%	Greyish brown, loamy, structureless soils on weathering rock	High: 4.0 Mod: 0.5
	Hutton 36/46	150-350	6%	Red, loamy, structureless soils on rock	Low: 95.5
Fc344	Glenrosa 13/16	200-300	31%	Greyish brown, sandy/loamy, structureless soils on weathering rock	High: 28.0 Mod: 11.0
	Oakleaf 16/26/36	600-1200	28%	Red, loamy, structureless soils on rock	Low: 61.0
Fc742	Glenrosa 13/16/23/26	100-250	30%	Greyish brown, loamy, structureless soils on weathering rock	High: 0.0 Mod: 24.3
	Mispah 10/12/20/22	50-200	28%	Grey-brown, loamy calcareous topsoils on rock	Low: 75.7
Fc743	Glenrosa 13/23/26/27	100-250	43%	Greyish brown, loamy, structureless soils on weathering rock	High: 1.0 Mod: 19.6
	Mispah 10	50-150	22%	Grey-brown, loamy calcareous topsoils on rock	Low: 79.4
Fc744	Glenrosa 13/16	100-250	26%	Greyish brown, loamy/clayey, structureless soils on weathering rock	High: 7.8 Mod: 24.9
	Mispah 10	50-300	15%	Grey-brown, loamy calcareous topsoils on rock	Low: 67.3
Ia82	Oakleaf 16/26/36/46	500-1200	70%	Red and brown, loamy, structureless alluvial soils	High: 89.9 Mod: 5.0
	Oakleaf 33/34	>1200	8%	Brown, sandy/loamy, structureless alluvial soils	Low: 5.1

5. AGRICULTURAL POTENTIAL

Much of the study area consists of rock and shallow soils (Glenrosa, Mispah and Cartref) of low potential. The shallower soils are suited for grazing at best. The grazing capacity of the area is moderately low, around 10-14 ha/large stock unit (ARC-ISCW, 2004).

The only two land types where there is a significant proportion of deeper soils, with a consequent high agricultural potential, are **Ia82** (along the rivers in the north) and **Ae207** (in the south).

The long-term annual average rainfall in the area (Section 2.3) means that there is a low potential for arable agriculture unless irrigation is practiced, and this is seen in the few irrigated lands visible along the rivers.

6. IMPACTS

The main impact on the natural resources of the study area would be the loss of potential agricultural land due to the construction of the turbines and associated infrastructure. However, this impact would be of limited significance and the fact that the turbines will be placed far apart would mean that cultivation or other practices, such as grazing or game farming, would still be possible between the structures.

The impact can be summarized as follows:

Table 2 Impact significance

Nature of impact	Loss of agricultural land	Land that is no longer able to be utilized due to construction of infrastructure
Extent of impact	Site only	Confined to areas within the site where turbines (foundations with a diameter up to 5m), substation(s) (up to two sub stations with an area of 60 x 40m each), buildings and access roads etc will be located
Duration of impact	Long-term	Will cease when operation of activity ceases
Probability	Highly probable	

of impact		
Severity of impact	Moderately severe	
Significance of impact	Low	Mainly due to prevailing low soil potential of area, as well as scattered/random nature of infrastructure which would allow for agricultural activities (with the exception of certain types of irrigation) to continue on the land
Mitigation factors	The main mitigation would be to ensure that as much as possible of the planned infrastructure be confined to low potential land, or use is made of existing roads etc. In addition, the infrastructure could be dismantled at a future stage to return the environment to approximately its original state.	

6.1 Recommendations

Due to the occurrence of mainly shallow soils of low agricultural potential, along with steep slopes, throughout much of the area, it is unlikely that a more detailed investigation will be required.

It is recommended that any infrastructure be confined as far as possible to the steeper areas, generally within the various **Fc** land type as shown on the map. Where at all possible, infrastructure should not be placed near any irrigated areas, where high potential soils occur.

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APPENDIX

MAP OF LAND TYPES

Spitskop Wind Energy Facility: Land Types

