REPORT

On contract research for

SAVANNAH ENVIRONMENTAL

ARC • LNR

SOIL INFORMATION FOR WIND ENERGY FACILITY, WESTERN 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.

D G Paterson
July 2007

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Savannah Environmental to undertake a soil investigation north of the Olifants River, on the west coast of the Western Cape Province. The purpose of the investigation is to contribute to the Environmental Impact assessment (EIA) process for a proposed 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

An area was investigated lying to the west of the town of Koekenaap on the farms, Gravewaterkop 158/5 and Portions 617 and 620 of the farm Olifants River Nedersetting. The position of the site is shown in Figure 1.

2.2 Terrain

The site lies on the coastal ridge overlooking the Atlantic Ocean at a height of 60-110 m above sea level and consists of virtually flat to slightly undulating topography, with slopes of less than 4%.

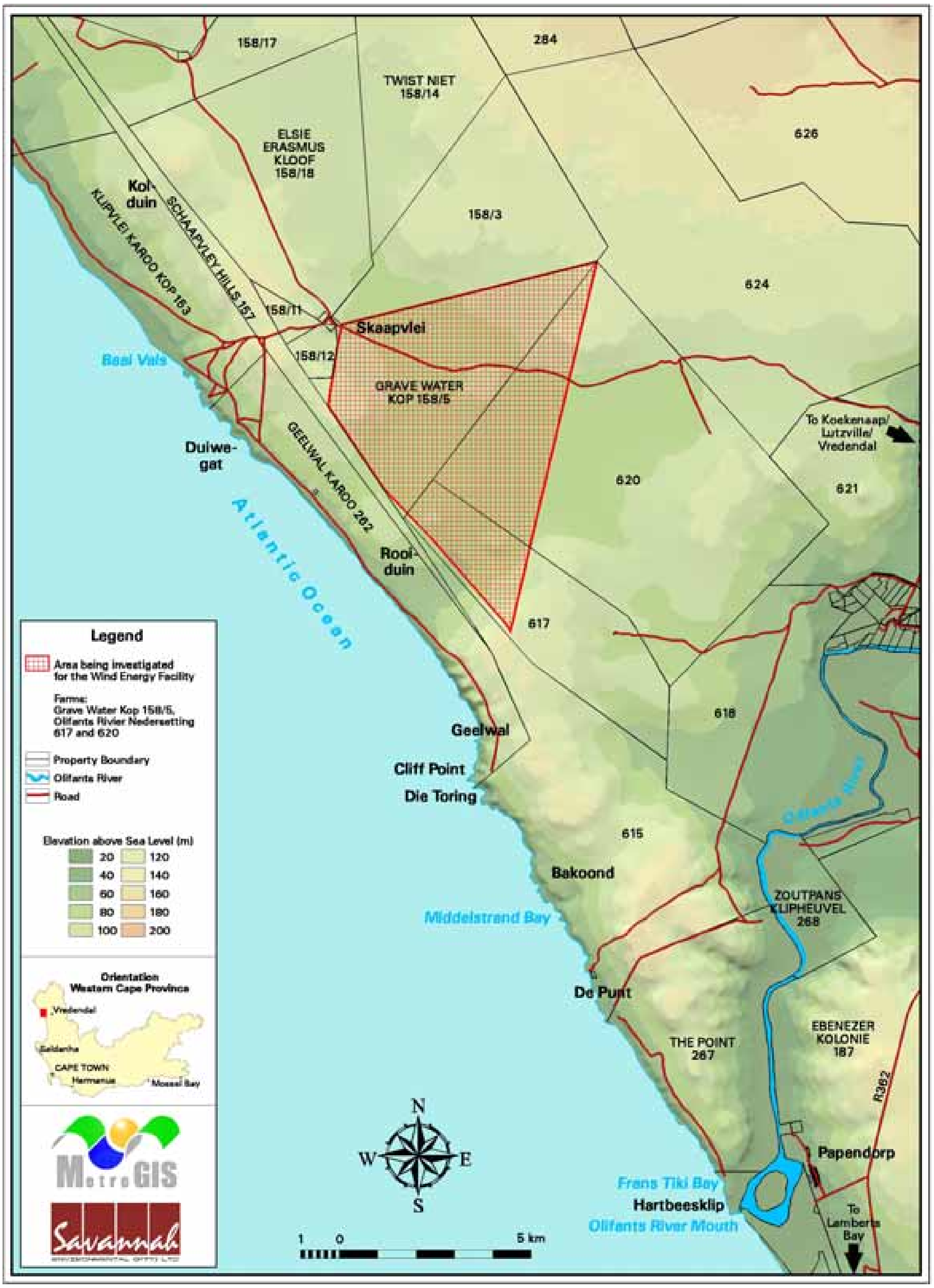

Figure 1. Locality map

2.3 Climate

The climate of the area was derived from the closest station, namely Vredendal, some 20 km inland. The climate can be regarded as typical of the Cape west coast, with an extremely low, all-year round rainfall distribution (with higher rainfall in the winter months), warm to hot summers and cool winters. The main climatic indicators are given in Table 1 below.

Table 1. Climate Data

Month	Rainfall (mm)	Min. Temp (°C)	Max. Temp (°C)
Jan	2.2	14.8	29.8
Feb	3.0	14.9	30.5
Mar	5.9	14.1	29.9
Apr	14.0	12.2	27.6
May	21.2	9.7	24.2
Jun	26.8	8.0	21.5
Jul	22.0	7.0	20.9
Aug	20.0	7.5	21.5
Sep	10.7	8.9	23.5
Oct	9.2	10.7	25.5
Nov	7.0	12.4	27.7
Dec	5.9	14.0	28.8
Year	**147.9 mm**	**18.6°C (Average)**	

The extreme high temperature that has been recorded is 46.0°C (presumably in "berg wind" conditions) and the extreme low –1.0°C.

2.4 Parent Material

The site has aeolian sandy material overlying granite and gneiss of the Namaqualand Metamorphic Complex (Geological Survey, 2001).

3. METHODOLOGY

Existing information was obtained from the map sheet 3118 Calvinia (Potgieter, 1995) from the national Land Type Survey, published at 1:250 000 scale. 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 area under investigation is covered by five land types, as shown by the blue dotted lines on the map in the Appendix, namely:

Ae373 (red, high base status soils, usually deep)
Ae375 (red, high base status soils, usually deep)
Ah44 (deep, sandy, red and yellow soils)
Ca136 (yellow-brown plinthic soils with duplex soils)
Hb108 (deep, grey sands)

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. **Available data was used, and the site was not surveyed during the course of this study.**

4. SOILS

A summary of the dominant soil characteristics is given in **Table 2** below.

Table 2. Land types occurring (with soils in order of dominance)

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics
Ae373	Hutton 31	300-900	54.0%	Red, sandy, structureless soils on rock or calcrete
	Hutton 30/40/41	200-1200	14.9%	Red, sandy, structureless soils on rock or calcrete
	Oakleaf 11/21/10	300-1200	10.4%	Red, sandy, structureless soils on rock or calcrete
Ae375	Hutton 31	600-1200	33.0%	Red, sandy, structureless soils on rock or calcrete
	Hutton 30/40	600-1200	14.5%	Red, sandy, structureless soils on rock or calcrete
	Hutton 31	300-600	11.5%	Red, sandy structureless soils on rock or calcrete
Ah44	Hutton 30/31	300-1200	77.3%	Red, sandy, structureless soils on rock or calcrete
	Clovelly 30/31/40/41	300-1200	10.0%	Yellow-brown, sandy, structureless soils on rock or calcrete
	Dunes	>1200	10.5%	Grey and yellow, sandy, structureless soils
Ca136	Kroonstad 21/22	500-1200	45.0%	Grey, sandy, structureless topsoils on mottled, gleyed clay
	Pinedene 31/32	500-1200	35.0%	Yellow-brown, sandy, structureless soils on grey, mottled soft plinthite
	Avalon 31/ Westleigh 20	500-1200	10.0%	Yellow-brown to grey, sandy, structureless soils on grey, mottled soft plinthite
Hb108	Fernwood 21	1000-1200	62.0%	Grey, sandy, structureless soils
	Clovelly 31	800-12000	15.0%	Yellow-brown, sandy, structureless soils on rock

5. AGRICULTURAL POTENTIAL

As can be seen from the information contained in Table 2, most of the area contains a greater or lesser proportion of deep soils.

However, these deeper soils have a low agricultural potential, due to a combination of:

- excessive drainage due to the sandy texture,
- low fertility associated with the low clay content and
- a susceptibility to wind erosion if exposed, caused by the fine to medium grade of sand. This may be especially prevalent in dune areas.

In addition, the low rainfall in the area (Table 1) means that there is little potential for arable agriculture in the area and that the soils are suited for extensive grazing at best. The grazing capacity of the area is low, around 30 ha/large stock unit (ARC-ISCW, 2004).

There has been some cultivation of wheat in the past, but this has not taken place for at least the last twelve years, mainly due to the unreliable winter rainfall. In addition, the cultivation was done in strips, presumably in an attempt to minimize any effects of wind erosion on the sandy soils. The fact that this cultivation is still visible after twelve years confirms the slow vegetation growth in the area and the associated limitation in agricultural potential.

Conclusion

From the point of view of soils and agricultural potential, there is little scope for arable agriculture or anything other than very extensive grazing.

For this reason, it is not anticipated that a more detailed soil survey to determine agricultural potential will be required for the EIA phase of the project.

6. IMPACTS

The project as envisaged will comprise ±100 turbines, connecting roads, a small substation, connecting powerlines and small office/visitors centre. To minimise impacts on soils, it is recommended that, as far as possible, any access road and power line should follow the existing road from Koekenaap.

The major impact on the natural resources of the study area would be the loss of land with some agricultural potential (or livestock grazing potential) due to the construction of the turbines and associated infrastructure. However, as explained above, this impact would be of limited significance and would be local in extent. The fact that the turbines will be placed relatively far apart would mean that extensive grazing (which is what the area is best suited for in terms of agricultural practices) would still be possible between the structures (although at a reduced scale/intensity).

The impact can be summarised as follows:

Table 3. Impact significance

Nature of impact	Loss of agricultural land	Land that is no longer able to be utilised due to construction of infrastructure
Extent of impact	Site only	Confined to areas within the site where turbines (15x15m) and other infrastructure will be located
Duration of impact	Long-term	Will cease if operation of activity ceases
Probability of impact	Highly probable	
Severity of impact	Moderately severe	
Significance of impact	Low	Mainly due to low potential of area, as well as the scattered nature of the proposed infrastructure
Mitigation	The main mitigation measure would be to ensure that as much as possible of the planned infrastructure be confined to existing roads or areas of existing disturbance. Secondly, the infrastructure could be dismantled at a future stage to return the environment to approximately its original state and current use.	

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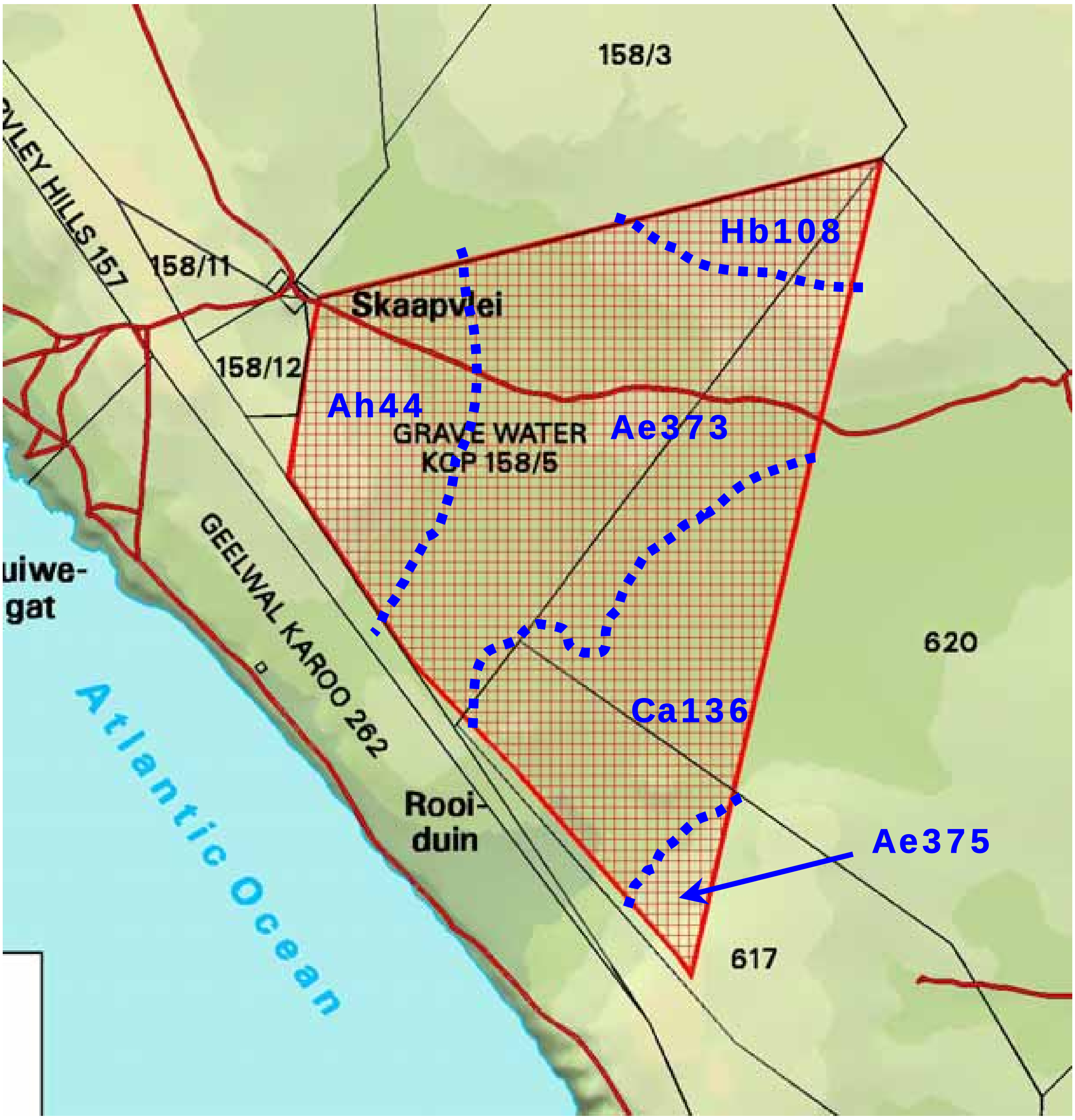
APPENDIX

MAP OF LAND TYPES


158/3
VLEY HILLS 157
158/11
Skaapvlei
158/12
Hb108
Ah44
GRAVE WATER
KOP 158/5
Ae373
uiwe-
gat
GEELWAL KAROO 262
620
Ca136
Atlantic Ocean
Rooi-
duin
Ae375
617