REPORT

On contract research for

ARCUS CONSULTANCY SERVICES SOUTH AFRICA (PTY) LTD

SOIL INFORMATION FOR THE PROPOSED GRID CONNECTION FOR SAN KRAAL SPLIT 1, PHEZUKOMOYA SPLIT 1, HARTEBEESTHOEK WEST AND HARTEBEESTHOEK EAST WIND ENERGY FACILITY, NEAR NOUPOORT, NORTHERN CAPE

By

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Report Number GW/A/2019/09

June 2019

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DECLARATION

I hereby declare that I am qualified to compile this report as a registered Natural Scientist SACNASP Registration No. 400463/04) 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
June 2019

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Arcus Consultancy Services South Africa (Pty) Ltd to undertake a soil investigation near Noupoort, in the Northern Cape Province. The purpose of the investigation is to contribute to the Environmental Impact Assessment (EIA) process for the proposed San Kraal Split 1, Phezukomoya Split 1, Hartebeesthoek West and Hartebeesthoek East Wind Energy Facility (WEF) projects.

Soil investigation was conducted for the original project study areas (namely San Kraal WEF and Phezukomoya WEF), and as part of that function, two reports were submitted for each of the original project study areas. This report deals specifically with the proposed 132 kV transmission line corridor as this area was not previously investigated in the two original reports.

The objectives of the study are;

- To obtain all existing soil information and to produce a soil map of the specified area (area not previously assessed), as well as

- To assess broad agricultural potential.

1.1 Legislative and Policy Framework

In terms of the Subdivision of Agricultural Land Act (Act 70 of 1970), any application for change of land use must be approved by the Minister of Agriculture, while under the Conservation of Agricultural Resources Act (Act 43 of 1983) no degradation of natural land is permitted.

The following section summarises South African Environmental Legislation with regard to soil and agricultural issues:

- The law on ***Conservation of Agricultural Resources*** (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal.

- The ***Bill of Rights*** states that environmental rights exist primarily to ensure good health and well-being, and secondarily to protect the environment through reasonable legislation, ensuring the prevention of the degradation of resources.

- The Environmental right is furthered in the ***National Environmental Management Act*** (No. 107 of 1998), which prescribes three principals, namely the precautionary principle, the "polluter pays" principle and the preventive principle. It is stated in the above-mentioned act that the individual/group responsible for the degradation/pollution of natural resources is required to rehabilitate the polluted source.

- Soils and land capability are protected under the ***National Environmental Management Act*** (Act 107 of 1998), the ***Environmental Conservation Act*** (Act 73 of 1989) and the ***Conservation of Agricultural Resources Act*** (Act 43 of 1983).

- The ***National Veld and Forest Fire Bill*** of 10 July 1998 and the ***Fertiliser, Farm Feeds, Agricultural Remedies and Stock Remedies Act*** (Act 36 of 1947) can also be applicable in some cases.

- The ***National Environmental Management Act*** (Act 107 of 1998) requires that pollution and degradation of the environment be avoided, or, where they cannot be avoided, minimised and remedied.

- The ***Conservation of Agriculture Resources Act*** (Act 43 of 1983) requires the protection of land against soil erosion, and the prevention of waterlogging and salinisation of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.

2. SITE CHARACTERISTICS

2.1 Location

The study area, comprising of a 500 m buffer corridor around the proposed transmission line route, is shown by the black outline in Figure 1 below (with the original WEF study areas shown in blue (left) and pink (right)). The corridor lies to the south of the town of Noupoort on portions of the farms Winterhoek, Koppieskraal, Tweefontein and Hartebeesthoek. The area lies on an undulating plateau landscape between the Renosterberg and Kikvorsberg mountain ranges (see Figure 1). The provincial border between the Eastern Cape and Northern Cape Provinces cuts through the middle of the study area.

The area lies between 31º 15' and 31º 20' S and between 24º 52' and 25º 02' E.

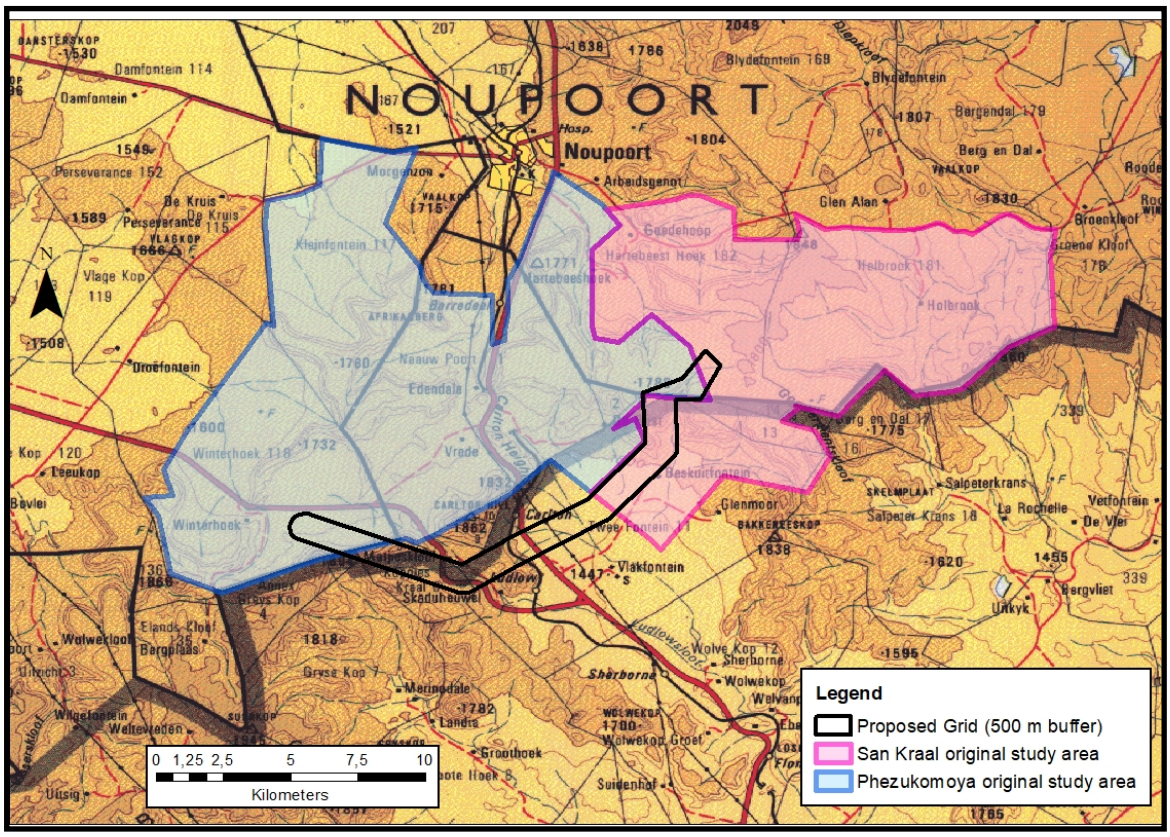

Figure 1 Locality map (with proposed grid corridor in black)

2.2 Terrain

The area consists of slightly undulating to steeply sloping topography, with slopes of less than 10% over much of the western and central parts of the area but becoming as steep as 80-100% on the escarpment zones of the upper mountain slopes. The altitude of the area is between 1 500 and 1 700 metres in most of the area, but the highest parts are close to 1 800 metres. Current land use is dominantly natural vegetation (presumably used for extensive grazing), with a significant proportion of exposed rock.

2.3 Climate

The climate of the area mostly has summer rainfall distribution, but the annual average is low, at around 345 mm per year, although this might be slightly higher in the higher parts of the landscape (Koch, 2012).

Temperatures will be cool to cold in winter, with frequent frost, often heavy, between May and September.

2.4 Parent Material

The area is underlain by mudstone of the Beaufort and Tarkastad Groups, Karoo Sequence, along with small areas of dolerite intrusions (Geological Survey, 1983), as shown in Figure 2.

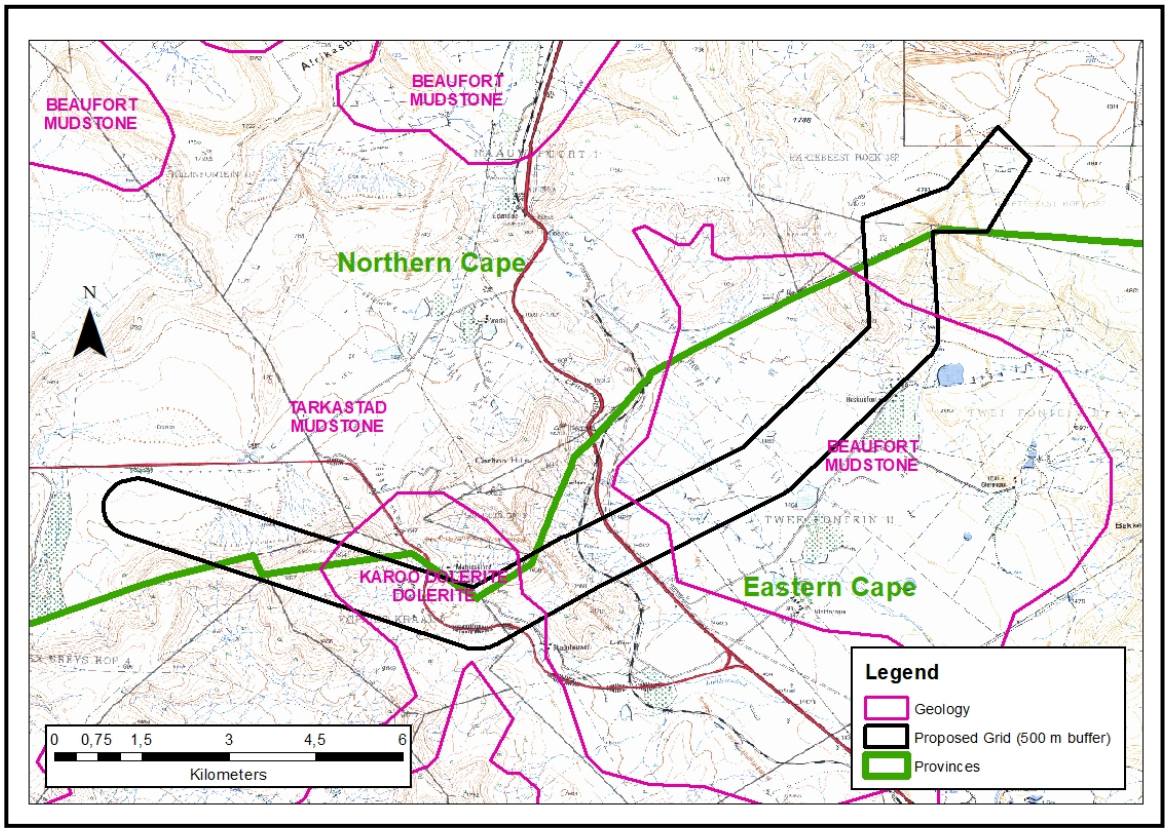

Figure 2 Geological formations, Grid corridor

3. METHODOLOGY

Existing information was obtained from the map sheet 3124 Middelburg (Geers & Eloff, 1992) 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 on the map in the Appendix, namely:

Da77 (Duplex soils*, mostly red)
Fb174, Fb259, Fb373 (Shallow soils, occasionally calcareous)
Ib316 (Shallow soils with much rock)

**Soils with a relatively sandy topsoil horizon abruptly overlying a structured, clayey subsoil horizon*

It should be 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 soil composition of the specific land types has not been ground-truthed. However, this is not seen as a limiting factor for the intent of this study, due to the prevailing shallow soils and steep terrain, which is restricting regarding agricultural activities.

4. SOILS

A summary of the dominant soil characteristics of each land type is given in Table 1 below (the colours correspond to those used in the map in the Appendix).

Column 6 shows the distribution of ***dryland*** agricultural potential within each land type (see Section 5), with the dominant class shown **highlighted in bold**. These figures will always add up to 100% so that the relative proportions of each potential class within every land type can be determined and easily compared with other land types.

Table 1 Land types occurring (with soils in order of dominance)

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agric. Potential (%)
Da77	Swartland 10/11 + Valsrivier 21/41	200-800	30%	Red-brown, sandy topsoils on structured, sandy clay loam to sandy clay subsoils on weathering rock	High: 0.0 Mod: 12.2
	Lithosols + rock	50-150	22%	Grey-brown, sandy/loamy topsoils on hard rock, with rock outcrops	**Low: 87.8**
Fb174	Mispah 10/20	20-100	30%	Grey-brown, sandy/loamy topsoils on hard rock/calcrete	High: 0.0 Mod: 12.3
	Glenrosa 13/16	50-150	23%	Grey-brown, sandy/loamy topsoils on weathering rock	**Low: 87.7**
Fb259	Mispah 10/22	50-150	30%	Grey-brown, sandy/loamy topsoils on hard rock/calcrete	High: 0.0 Mod: 12.0
	Glenrosa 13/16	200-300	20%	Grey-brown, sandy/loamy topsoils on weathering rock	**Low: 88.0**
Fb373	Mispah 10/22	50-150	27%	Grey-brown, sandy/loamy topsoils on hard rock/calcrete	High: 0.0 Mod: 7.1
	Swartland 11/12 + Valsrivier 21/41	200-900	16%	Red-brown, sandy topsoils on structured, sandy clay loam to sandy clay subsoils on weathering rock	**Low: 92.9**
Ib316	Rock	-	62%	Surface rock outcrops	High: 0.0 Mod: 3.4
	Mispah 10	50-100	18%	Grey-brown, sandy/loamy topsoils on hard rock	**Low: 96.6**

5. AGRICULTURAL POTENTIAL

As can be seen from the information contained in Table 1, there are virtually no high potential soils in the study area and very few medium potential soils. Every land type is dominated by either (in the western and central parts) structured, clayey duplex soils (Swartland and Valsrivier forms) or (in the south or north-east) rock and shallow lithosols (Mispah and Glenrosa soil forms), which have low to very low arable potential.

In addition, the low rainfall in the area (Section 2.3) means that there is little potential for rain-fed arable agriculture in the area. Arable production would therefore be very problematic without irrigation. Currently, only a few small cultivated lands can be identified in the area through Google Earth, and these occur alongside the corridor in the east of the area on the farm Beskuitfontein (land type **Da77**).

In general, the soils are suited for extensive grazing at best, and the grazing capacity of the area is relatively low, at around 18-25 ha/large stock unit (ARC-ISCW, 2004).

5.1 Recommendations

The prevailing potential of the soils for rain-fed cultivation throughout most of the area is low to very low. It is thus very unlikely that any further, more detailed investigation will be required.

6. IMPACTS

Impact 1: In most environmental investigations, the major impact on the natural resources of the study area would be the loss of potential agricultural land due to the construction of the transmission towers and any associated infrastructure. However, this impact would be of extremely limited significance and would be local in extent.

Impact 2: In this area, the steep topography in many parts, coupled with the shallow soils, relatively sandy topsoil and dry climate, means that a possible impact would be the increased danger of the erosion of topsoil when vegetation cover is removed. This would be especially relevant for the construction of access roads,

especially since areas of already existing erosion can be identified using Google Earth.

The impacts can be summarised as follows:

Table 1 Impact significance

Impact Phase (Construction and Operation)							
Possible Impact or Risk: **Impact 1. Loss of agricultural land**							
ANTICIPATED SCOPING IMPACTS TO BE SCOPED OUT OR INVESTIGATED FURTHER							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**L**	**L-**	**negative**	**M**	**High**	**High**
With Mitigation	**L**	**L**	**L-**	**neutral**	**M**	**High**	**High**
Can the impact be reversed?	**YES** – very little land will be affected and soil can be replaced						
Will impact cause irreplaceable loss or resources?		**NO** – soil potential in vicinity is low, so no agricultural soils will be affected					
Can impact be avoided, managed or mitigated?	**YES**						
Mitigation measures to reduce residual risk or enhance opportunities: 1) Avoid any areas under cultivation (if any)							
Impact to be addressed / further investigated and assessed in Impact Assessment Phase?	**NO** – considered to be insignificant due to very restricted occurrence of agricultural soils						

Table 2 Impact significance

Impact Phase (Construction and Operation)							
Possible Impact or Risk: **Impact 2. Increased soil erosion hazard**							
ANTICIPATED SCOPING IMPACTS TO BE SCOPED OUT OR INVESTIGATED FURTHER							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	**L**	**M**	**M-**	**negative**	**M**	**High**	**High**
With Mitigation	**L**	**L**	**L-**	**neutral**	**M**	**High**	**High**
Can the impact be reversed?	**YES** – topsoil coverage can be replaced and affected sites re-vegetated and stabilised						
Will impact cause irreplaceable loss or resources?		**NO** – soil potential in the vicinity is low, so no agricultural soils will be affected					
Can impact be avoided, managed or mitigated?	**YES** – soil conservation measures should be implemented						
Mitigation measures to reduce residual risk or enhance opportunities: 1) Minimise vegetation removal to the smallest possible footprint 2) Control possible runoff by using soil conservation and soil retention measures, especially on steep slopes 3) Store any removed topsoil for later use (contains indigenous seeds etc.) and re-vegetate as soon as possible 4) Once specific infrastructure sites are known, site-specific measures can be devised for implementation, and any potentially high-risk sites can be identified.							
Impact to be addressed / further investigated and assessed in Impact Assessment Phase?	**NO**						

1.2 Cumulative Impacts

The likelihood of cumulative impacts is small. Only if other developments (whether wind farms or not) were to occur, using the same access roads and thereby increasing potential soil erosion aspects, would cumulative impacts need to be considered.

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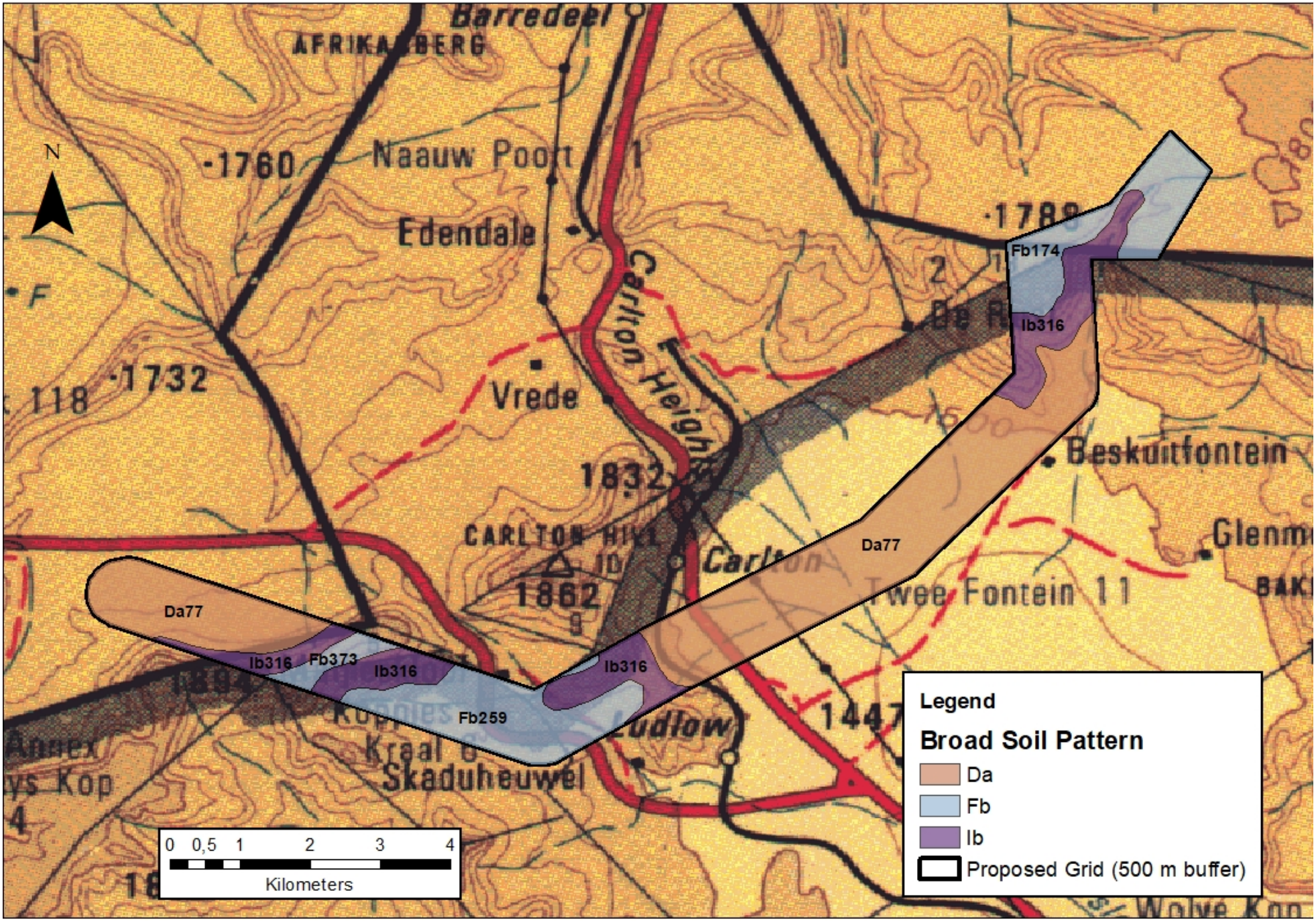
APPENDIX

MAP OF LAND TYPES


Barredeel
AFRIKANERBERG
N
1760
Naauw Poort
Edendale
Carlton Heights
Vrede
1732
118
1832
CARLTON HILL
1862
Carlton
Da77
Fb174
Ib316
Beskuitfontein
Glenmore
Twee Fontein 11
Da77
Ib316
Fb373
Ib316
Ib316
Fb259
Ludlow
1447
Annex
Kop
Kraal
Skaduheuwel
Wolve Kop
0 0,5 1 2 3 4
Kilometers
Legend
Broad Soil Pattern
Da
Fb
Ib
Proposed Grid (500 m buffer)

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ACADEMIC QUALIFICATIONS:

- Matriculated: 1976, Dalziel High School, Motherwell, Scotland
- BSc (Hons) Geography, 1980, University of Strathclyde, Glasgow, Scotland
- MSc (Soil Science) *cum laude*, 1998, University of Pretoria
- PhD (Soil Science), 2014, University of Pretoria

PROFESSIONAL CAREER:

- 1981-1987: Soil Scientist: Soil and Irrigation Research Institute, Pretoria
- 1987-1992: Senior Soil Scientist: Soil and Irrigation Research Institute, Pretoria
- 1992-2017: Senior Soil Scientist: ARC-Soil, Climate & Water, Pretoria
- 2017- : Research Team Manager (Soil Science): ARC-Soil, Climate & Water

FIELDS OF SPECIALITY AND COMPETENCE:

- Soil classification and mapping
- Soil interpretations
- Soil conservation, including biotextiles
- Soil rehabilitation (especially coal mine soils)
- Soil survey project management
- Environmental assessment and land evaluation
- Soil survey and land capability course presentation
- Ground penetrating radar

PUBLICATIONS (see attached list):

- Fifteen refereed articles
- Nine Congress papers/posters
- Two book chapter contributions
- S.A. Soil Classification (1991 and 2018 editions) *(Member of working group)*
- Five 1:250 000 Land Type Maps
- Three Land Type Memoirs
- More than 250 soil survey reports and/or maps

COURSES COMPLETED:

- Course in Project Management (University of Stellenbosch)
- Course in Junior Personnel Management (Dept of Agriculture)
- Course in Handling of Grievances and Complaints (Dept of Agriculture)
- Course in Marketing (ARC-ISCW)
- Course in National Qualifications Framework Assessment, ARC-CO
- Training Course in Ground Penetrating Radar (GSSI, USA)
- Introduction to ArcGIS 8, GIMS, 2004

PROFESSIONAL STATUS:

- Registered Natural Scientist: Soil Science (SA National Council for Natural Scientific Professions) – registration number 400463/04
- Member of South African Soil Classification Working Group, 1990-present
- Convenor of South African Soil Classification Working Group, 2013-2015
- Member of Soil Science Society of South Africa (1982-present)
- President of Soil Science Society of South Africa (2005-2007)
- Member of South African Soil Survey Organisation (2000-present)
- Council Member of South African Soil Survey Organisation (2002-2003)
- Member of International Erosion Control Association
- Scientific Referee, S.A. Journal for Plant and Soil
- External Examiner: University of Pretoria, University of Witwatersrand, University of Venda, University of the Free State

AWARDS:

Best article on Soil Science, South African Journal for Plant and Soil, 2011

MISCELLANEOUS:

- Editor, Soil Science Society newsletter, 1993-present
- Member, Clapham High School (Pretoria) Governing Body, 1998-2002
- Member, Northern Gauteng Football Referee's Association, 2000-2002
- Committee Member, Rosslyn Golf Club (Club Champion 2002 and 2007)

INTERESTS:

Sport, especially golf and soccer; wildlife; reading; music

PUBLICATIONS LIST:

Refereed Articles:

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environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

PROPOSED GRID CONNECTION FOR SAN KRAAL AND PHEZUKOMOYA WIND ENERGY FACILITY, NOUPOORT

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	**Agricultural Research Council-Soil, Climate and Water**			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	**Level 8**	Percentage Procurement recognition	**Unknown**
Specialist name:	**DG Paterson**			
Specialist Qualifications:	**PhD (Soil Science)**			
Professional affiliation/registration:	**SACNASP Registration (Soil Science): 400463/04**			
Physical address:	**600 Belvedere Street, Arcadia, Pretoria 0083**			
Postal address:	**Private Bag X79, Pretoria**			
Postal code:	**0001**	Cell:	**083 556 2458**	
Telephone:	**012 310 2601**	Fax:	**012 323 1157**	
E-mail:	garry@arc.agric.za			

2. DECLARATION BY THE SPECIALIST

I, **DG Paterson**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

ARC-Soil, Climate and Water

Name of Company:

2nd September 2019

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **DG Paterson**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

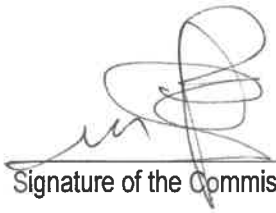
Signature of the Specialist

ARC-Soil, Climate and Water

Name of Company

2nd September 2019

Date



Signature of the Commissioner of Oaths

Date

LANDBOUNAVORSINGSRAAD
INSTITUUT VIR GROND KLIMAAT EN WATER
PRIVAATSAK/PRIVATE BAG X79
2019 -09- 0 3
PRETORIA 0001
INSTITUTE FOR SOIL, CLIMATE AND WATER
AGRICULTURAL RESEARCH COUNCIL

OWEN PULA
Commissioner of Oaths/ Kommissaris van Ede
Ex Officio in terms of Act 16 of 1963
Human Resource Officer
Ex Officio in terme van Wet 16 van 1963
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