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AGRICULTURAL IMPACT ASSESSMENT FOR PAULPUTS WIND ENERGY FACILITY NEAR POFADDER NORTHERN CAPE PROVINCE

EIA REPORT

Report by
Johann Lanz

Prepared for
Arcus Consultancy Services South Africa (Pty) Ltd
Cape Town

10 July 2019

Johann Lanz
Professional profile

Education

• M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - June 1997
• B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
• BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
• Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I am registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science, registration number 400268/12, and am a member of the Soil Science Society of South Africa.

- **Soil Science Consultant** **Self employed** **2002 - present**

  I run a soil science consulting business, servicing clients in both the environmental and agricultural industries. Typical consulting projects involve:

- Soil specialist study inputs to EIA's, SEA's and EMPR's. These have focused on impact assessments and rehabilitation on agricultural land, rehabilitation and re-vegetation of mining and industrially disturbed and contaminated soils, as well as more general aspects of soil resource management. Recent clients include: CSIR; SRK Consulting; Aurecon; Mainstream Renewable Power; SiVEST; Savannah Environmental; Subsolar; Red Cap Investments; MBB Consulting Engineers; Enviroworks; Sharples Environmental Services; Haw & Inglis; BioTherm Energy; Tiptrans.
- Soil resource evaluations and mapping for agricultural land use planning and management. Recent clients include: Cederberg Wines; Unit for Technical Assistance - Western Cape Department of Agriculture; Wedderwill Estate; Goedgedacht Olives; Zewenwacht Wine Estate, Lourensford Fruit Company; Kaarsten Boerdery; Thelema Mountain Vineyards; Rudera Wines; Flagstone Wines; Solms Delta Wines; Dornier Wines.

- **Soil Science Consultant** **Agricultural Consultors International (Tinie du Preez)** **1998 - end 2001**

  Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

- **Contracting Soil Scientist** **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

  Completed a contract to make recommendations on soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

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

Environmental Impact Assessment for the proposed Paulputs Wind Energy Facility and associated infrastructure including grid connection infrastructure near Pofadder, Northern Cape Province

Kindly note the following:

- 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.
- 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.
- A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
- 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.
- 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

SPECIALIST INFORMATION

Specialist Company Name:	Johann Lanz – Soil Scientist			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Johann Lanz			
Specialist Qualifications:	M.Sc. (Environmental Geochemistry)			
Professional affiliation/registration:	Registered Professional Natural Scientist Member of the Soil Science Society of South Africa			
Physical address:	1a Wolfe Street, Wynberg, Cape Town, 7800			
Postal address:	1a Wolfe Street, Wynberg, Cape Town, 7800			
Postal code:	7800	Cell:	082 927 9018	
Telephone:	082 927 9018	Fax:	Who still uses a fax?	
E-mail:	johann@johannlanz.co.za			

DECLARATION BY THE SPECIALIST

I, Johann Lanz, 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
Name of Company:

Date: 2019-07-12

UNDERTAKING UNDER OATH/ AFFIRMATION

I, Johann Lanz, 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

JOHANN LANZ - SOIL SCIENTIST

Name of Company

12/07/2019

Date

Signature of the Commissioner of Oaths

2019-07-12

Date

SUID-AFRIKAANSE POLISIEDIENS
STATION COMMANDER
WYNBERG CP
12 JUL 2019
STATION COMMANDER
WYNBERG CP
SOUTH AFRICAN POLICE SERVICE

Table of Contents

EXECUTIVE SUMMARY

The proposed wind energy facility development will be located on land zoned and used for agriculture (grazing). South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. This assessment has found that the proposed development is on land which is of very low agricultural potential and is unsuitable for cultivation.

The key findings of this study are:

- Soils of the proposed project area are predominantly shallow, sandy to loamy, well drained soils on underlying rock, dorbank or hardpan carbonate. Dominant soil forms are Hutton and Mispah.
- The major limitations to agriculture are the shallow soils and the limited climatic moisture availability.
- As a result of these limitations, the study area is unsuitable for cultivation and agricultural land use is limited to low density grazing.
- The proposed project area is classified with a predominant land capability evaluation value of 4, although it varies from 3 to 7. These are low land capabilities, unsuitable for the production of cultivated crops.
- No parts of the site need to be avoided by the proposed development and no buffers are required.
- The significance of all agricultural impacts is kept low by two important factors. The first is that the actual footprint of disturbance of the wind farm constitutes only a very small proportion of the available grazing land. The second is the fact that the proposed site is on land of very limited agricultural potential that is only viable for grazing.
- Three potential negative impacts of the development on agricultural resources and productivity were identified as:
    - Loss of agricultural land use on the minimal footprint of the development caused by direct occupation by the development infrastructure;
    - Soil degradation due to erosion and topsoil loss from disturbance;
    - Cumulative regional loss of agricultural land use.
- One potential positive impact of the development on agricultural resources and productivity was identified as:
    - Generation of additional land use income from wind farm, which will improve cash flow and financial sustainability of farming enterprises on site.
- Impacts are identical for the different alternative power line routes, and one route is therefore not preferred over another from an agricultural impact point of view. Both alternatives are acceptable.
- All impacts were assessed as having low significance after mitigation.
- Recommended mitigation measures include implementation of an effective system of storm water run-off control; the maintenance of vegetation cover to mitigate erosion; and topsoil stripping and re-spreading to mitigate loss of topsoil.

1 INTRODUCTION

WKN Windcurrent South Africa Pty (Ltd) are proposing the Paulputs Wind Energy Facility and associated infrastructure, including grid connection, approximately 50 km north-east of the town of Pofadder in the Northern Cape Province (see Figure 1). The development is distributed over an area of approximately 11,800 hectares, but will only occupy an actual footprint of less than 5% of this surface area. The proposed wind energy facility will deliver an output of up to 300 MW and will comprise the normal wind farm infrastructure including up to 85 turbines with foundations and crane pads, internal access roads, cabling, an on-site substation and a 132 kV overhead transmission line to the existing Eskom Paulputs Substation.

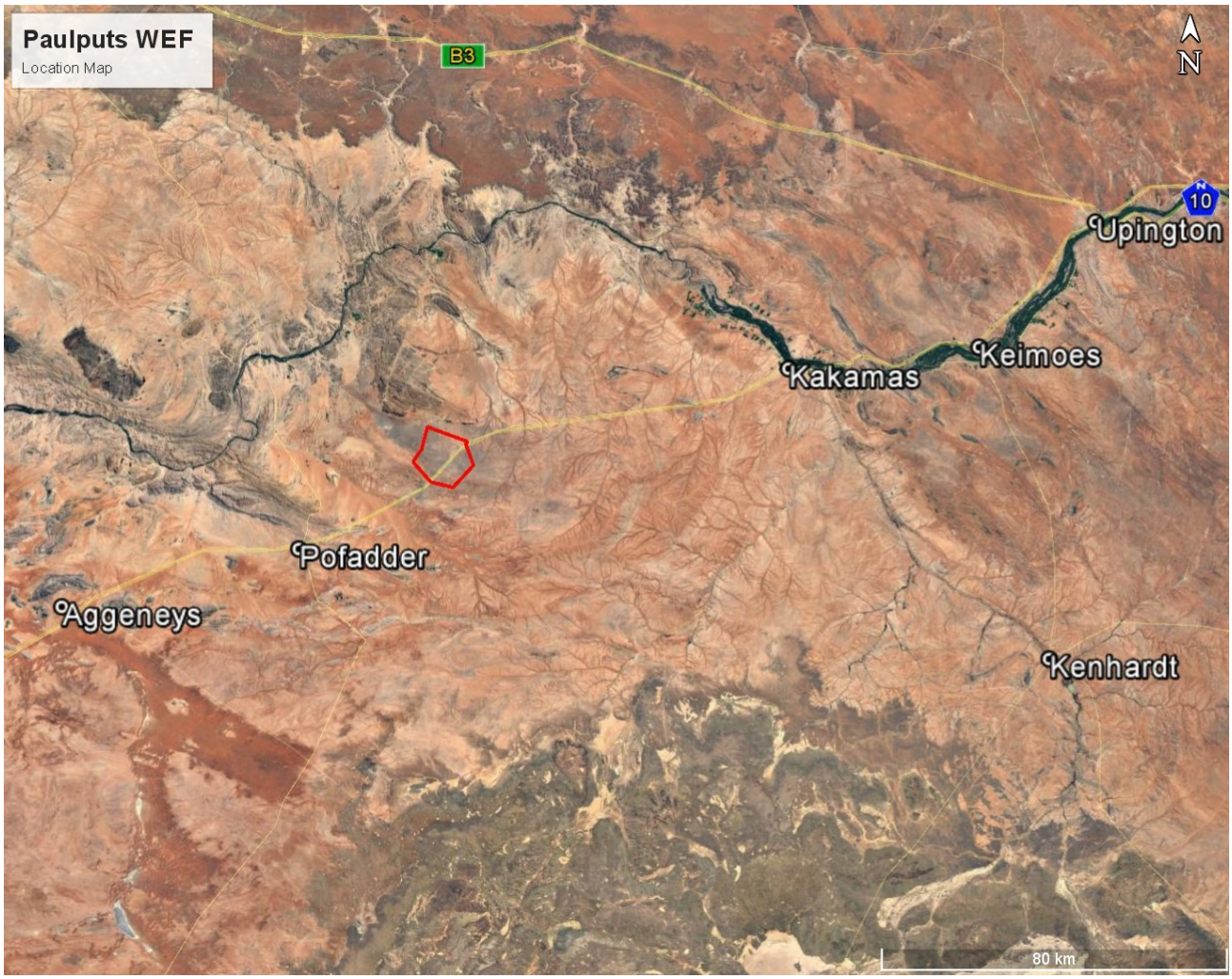

Figure 1. Location map of the Paulputs WEF, north-east of Pofadder.

The objectives of this study are to identify and assess all potential impacts of the proposed development on agricultural resources, including soils, and agricultural production potential, and to provide recommended mitigation measures and rehabilitation guidelines for all identified impacts. Johann Lanz was appointed by Arcus Consultancy Services as an independent specialist to conduct this Agricultural Impact Assessment.

2 TERMS OF REFERENCE

The following terms of reference apply to this study:

The report will fulfil the terms of reference for an agricultural study as set out in the National Department of Agriculture's document, *Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011, with an appropriate level of detail for the agricultural suitability and soil variation on site (less than the standardised level of detail stipulated in the above regulations is justified by the low agricultural potential of the proposed site – see section 3.1). DEA's requirements for an agricultural study are taken directly from this document, but use an older version of the document and not the most recent version, which was updated in 2011.

The report will also fulfil the requirements of Appendix 6 of the 2014 EIA Regulations (as amended). The above requirements may be summarised as:

- Identify and assess all potential impacts (direct, indirect and cumulative) of the proposed development on soils and agricultural potential.
- Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
- Describe the topography of the site.
- Describe climate as it pertains to agricultural potential
- Summarise available water sources for agriculture
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.
- Determine and map, if there is variation, the agricultural potential across the site.
- Determine and map the agricultural sensitivity to development across the site, including any no-go areas.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

Table 1. Compliance with the Appendix 6 of the 2014 EIA Regulations (as Amended)

Requirements of Appendix 6 – GN R326 EIA Regulations 7 April 2017	**Addressed in the Specialist Report**
A specialist report prepared in terms of these Regulations must contain- details of- the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	 Title page Following Title page
a declaration that the specialist is independent in a form as may be specified by the competent authority;	Following CV
an indication of the scope of, and the purpose for which, the report was prepared;	Sections 1 & 2
an indication of the quality and age of base data used for the specialist report;	Section 3.1

a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 5.5, 5.6, 6.2 & 6.4
the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.1
a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 5.8 & Figure 2
an identification of any areas to be avoided, including buffers;	Section 5.8
a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 2
a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4
a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6
any mitigation measures for inclusion in the EMPr;	Section 6
any conditions for inclusion in the environmental authorisation;	Section 7
any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Not applicable
a reasoned opinion- whether the proposed activity, activities or portions thereof should be authorised; regarding the acceptability of the proposed activity or activities and if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	 Section 7 Section 7 Section 6
a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable

3 METHODOLOGY OF STUDY

3.1 Methodology for assessing soils and agricultural potential

The soil investigation applied an appropriate level of detail for the agricultural suitability on site and for the level of impact of the proposed development on agricultural land. A detailed soil survey, as per the requirement in the above DAFF document (see Section 2), is only appropriate for a significant footprint of impact on arable land. However, the area in which the development is proposed is of extremely low land capability and severely limited by climatic moisture availability, so that there is no potentially arable land in the area. In such an environment, even where soils suitable for cultivation may occur, they cannot be cultivated because of the aridity constraints. Conducting a soil assessment at the stipulated level of detail would be very time consuming and add no value to the assessment. A field investigation was not considered necessary. The assessment was based on a desktop analysis of existing soil and agricultural potential data and other data for the site, which is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development.

The following sources of information were used:

- Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries. This data set originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.
- Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the Department of Agriculture, Forestry and Fisheries, Pretoria.
- Rainfall and temperature data was sourced from The World Bank Climate Change Knowledge Portal, dated 2015.
- Grazing capacity data was sourced from Cape Farm Mapper.
- Satellite imagery of the site and surrounds was sourced from Google Earth.

The potential impacts identified in this specialist study were assessed based on the criteria and methodology common to the whole impact assessment. The ratings of impacts were based on the specialist's knowledge and experience of the field conditions of the environment in which the proposed development is located, and of the impact of disturbances on that agricultural environment.

3.2 Methodology for determining impact significance

All potential impacts were assessed in terms of the following criteria:

Criteria	Rank		
	Low	*Medium*	*High*
Intensity	Minor deterioration in land capability. Soil alteration resulting in a low negative impact on one of the other environments (e.g. ecology).	Partial loss of land capability. Soil alteration resulting in a moderate negative impact on one of the other environments (e.g. ecology).	Complete loss of land capability. Soil alteration resulting in a high negative impact on one of the other environments (e.g. ecology).
Extent	Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/national
Duration	Quickly reversible Less than the project life Short-term	Reversible over time Life of the project Medium-term	Permanent Beyond closure Long-term

The consequence of impacts is a function of the intensity, extent and duration. The significance of impacts = probability x consequence

4 CONSTRAINTS AND LIMITATIONS OF STUDY

The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

The study makes the assumption that water for irrigation is not available across the site. This is based on the assumption that a long history of farming experience in an area will result in the exploitation of viable water sources if they exist, and none have been exploited in this area.

There are no other specific assumptions, constraints, uncertainties and gaps in knowledge for this study.

5 BASELINE ASSESSMENT OF THE SOILS AND AGRICULTURAL CAPABILITY

This section is organised in sub headings based on the requirements of an agricultural study as detailed in Section 2 of this report. A satellite image map of the project layout is shown in Figure 2.

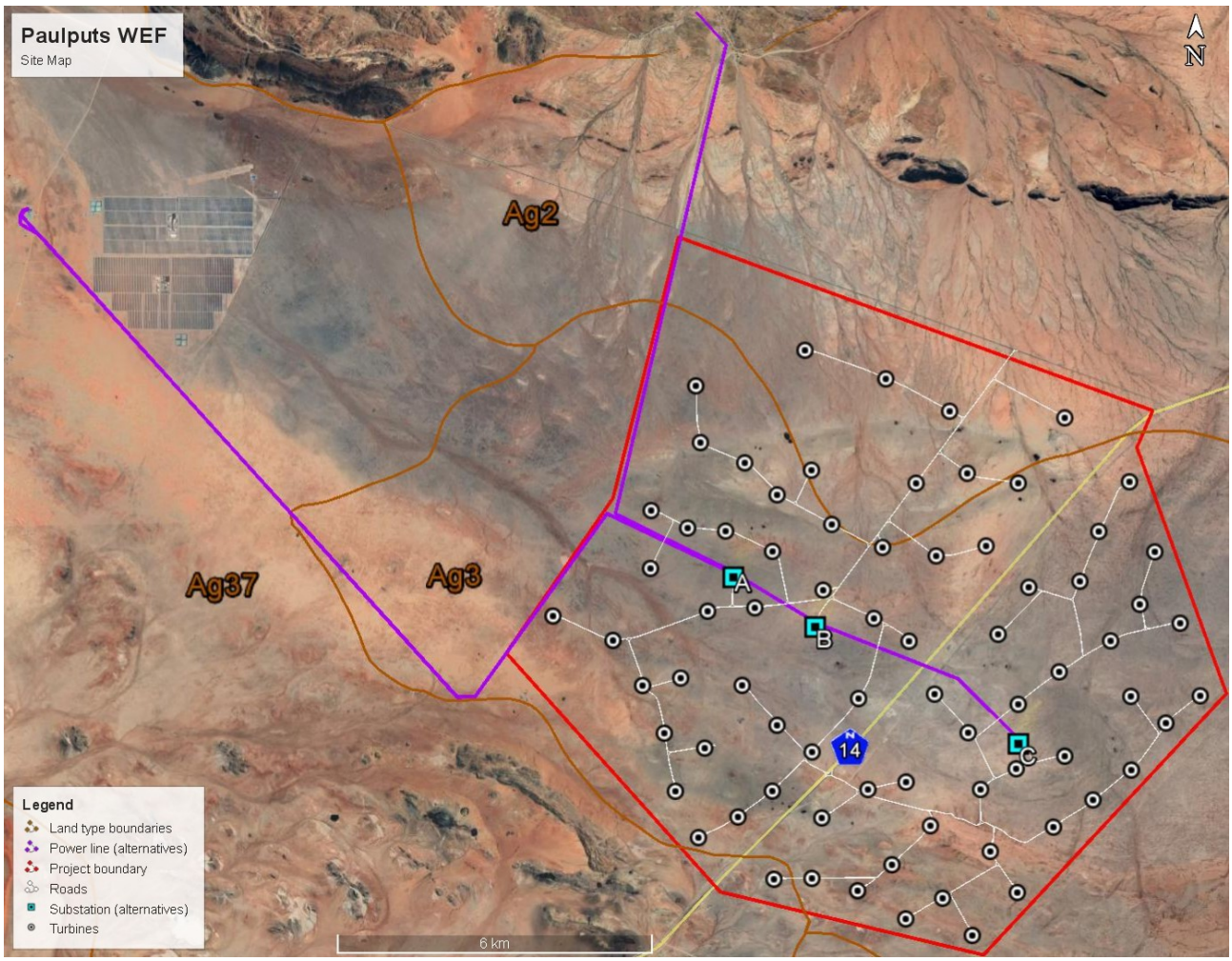

Figure 2. *Satellite image map of the project layout.*

5.1 Climate and water availability

The site has an extremely low average rainfall of 106 mm per annum (The World Bank Climate Change Knowledge Portal, 2015). The average monthly rainfall distribution is shown in Figure 3. The low rainfall is a very significant agricultural constraint that seriously limits the level of agricultural production (including grazing) which is possible. Water availability, even for stock watering purposes, is severely constrained.

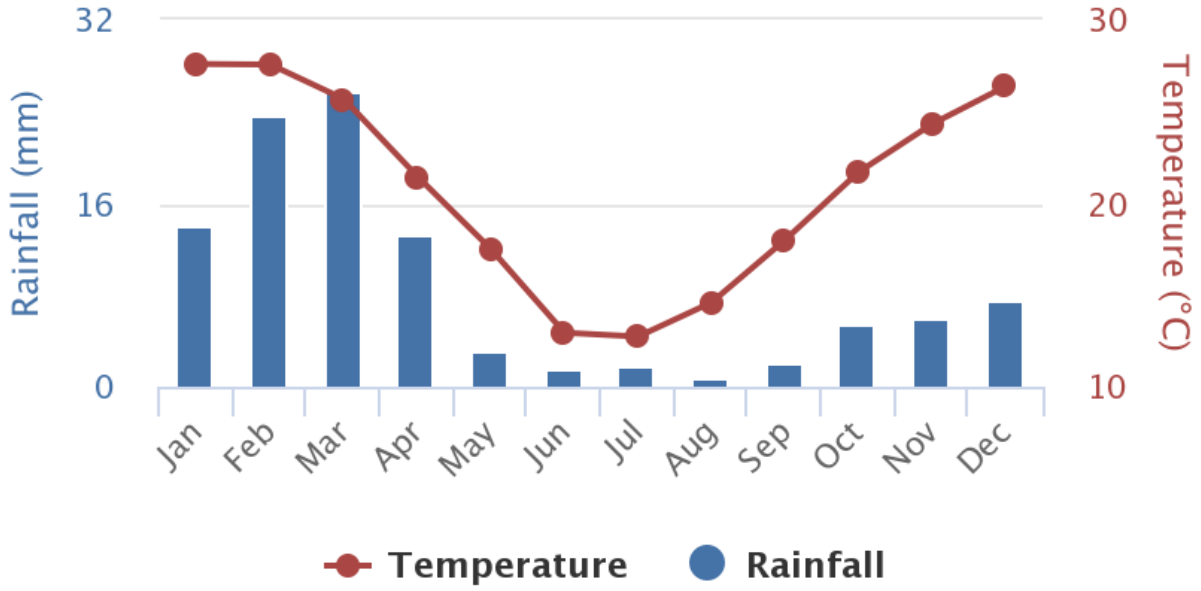

Figure 3. *Average monthly temperature and rainfall for location (-28.92, 19.54) from 1991 – 2015. This location is near the centre of the proposed development.*

5.2 Terrain, topography and drainage

The proposed development is located on a level plain at an altitude of around 800 metres above sea level. The slope across the area is approximately 2%.

There are no perennial drainage courses on the site, only non-perennial ones typical of very arid environments, which would only flow occasionally, after significant rainfall.

The underlying geology is predominantly migmatite, gneiss and granite. Small outcrops of ultrametamorphic rocks occur in places (Namaqualand Metamorphic Complex). Lime nodules and calcrete are abundant and dorbank occurs in places.

5.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The wind farm infrastructure is proposed almost entirely on a single land type, Ag3, although a small part if it extends into a second land type, Ag2, and the grid connection extends into a third, Ag37. Soils of these land types are very similar. They are predominantly shallow, sandy to loamy, well drained soils on underlying rock, dorbank or hard carbonate. Dominant soil forms are Hutton and Mispah. A summary detailing soil data for the land types is provided in Appendix 1.

The environment does not pose a high water erosion risk. Mitigating factors are the low slope, low rainfall, rock outcrops, and high permeability of the sandy soils. Because the soils have a sandy texture, they are however susceptible to wind erosion. Surface disturbance always poses

an erosion risk.

5.4 Agricultural capability

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. In 2017 DAFF released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for production of cultivated crops. Detail of this land capability scale is shown in Table 2.

The proposed development footprint is classified with a predominant land capability evaluation value of 4, although it varies from 3 to 7. Agricultural limitations that result in the low land capability classification of the proposed development location are predominantly due to the extremely limited climatic moisture availability. This renders the site totally unsuitable for any kind of cultivation and limits it to low density grazing only.

The long term grazing capacity of the site is low at 36 hectares per large stock unit

Table 2. Details of the 2017 Land Capability classification for South Africa.

Land capability evaluation value	Description
1	Very Low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	

14	Very High
15	

5.5 Land use and development on and surrounding the site

The area is a sheep farming area. The climate does not support any cultivation and low intensity natural grazing is the only current and viable agricultural activity. The only agricultural infrastructure in the area are wind pumps, stock watering points and fencing surrounding grazing camps. There are no farmsteads (that is a residential and administrative node of buildings and infrastructure from which a farm is managed) within the study area, but there are dwellings.

There are a number of renewable energy developments in close proximity to the site (see section on assessment of cumulative impacts, below).

Access to the developments is directly from the N14 which runs through the site.

5.6 Possible land use options for the site

The extremely low climatic moisture availability means that low density grazing is the only possible agricultural land use for the site.

5.7 Agricultural sensitivity

Agricultural sensitivity is a direct function of the capability of the land for agricultural production. This is because a negative impact on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability. A general assessment of agricultural sensitivity, in terms of loss of agricultural land in South Africa, considers arable land that can support viable production of cultivated crops, to have high sensitivity. This is because there is a scarcity of such land in South Africa, in terms of how much is required for food security. However, there is not a scarcity in the country of land that is only suitable as grazing land and such land is therefore not considered to have high agricultural sensitivity.

Agricultural sensitivity of a particular development is also a function of the severity of the impact which that development poses to agriculture. In the case of wind farms, the impact is low (see impact assessment section). This even further reduces the agricultural sensitivity of the study area for the proposed development.

The entire study area has extremely low agricultural potential and therefore very low agricultural sensitivity to development and consequent loss of agricultural land use. Agricultural potential and conditions are also very uniform across the site, and the choice of placement of facility infrastructure, including access roads and transmission lines therefore has

negligible influence on the significance of agricultural impacts. From an agricultural point of view, no parts of the site need to be avoided by the proposed development and no buffers are required.

6 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or future agricultural production. If there will be no impact on production, then there is no agricultural impact. Impacts that degrade the agricultural resource base pose a threat to production and therefore are within the scope of an agricultural impact assessment. Lifestyle impacts on the resident farming community, for example visual impacts, do not necessarily impact agricultural production and, if they do not, are not relevant to and within the scope of an agricultural impact assessment. Such impacts are better addressed within the impact assessments of other disciplines.

For agricultural impacts, the exact nature of the different infrastructure within the facility has very little bearing on the significance of impacts. What is of most relevance is simply the occupation of the land, and whether it is being occupied by a turbine foundation, a hardstand, a building or a substation makes no difference. What is of most relevance therefore is simply the total footprint of the facility.

The components of the project that can impact on soils, agricultural resources and productivity are:

- Occupation of the land by the total, direct, physical footprint of the proposed project including all roads.
- Construction activities that may disturb the soil profile and vegetation, for example for levelling, excavations, etc.

6.1 Impacts of the wind farm components

The significance of all potential agricultural impacts is kept low by two important factors.

1. The actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the surface area of the affected farms. The wind farm infrastructure will occupy less than 5% of the surface area. According to the typical surface area requirements of wind farms in South Africa, the typical surface area occupation is approximately 2% (DEA, 2015). Therefore, all agricultural impacts, including loss of agricultural land use, erosion and soil degradation will not be widespread and can at worse only affect a very limited proportion of the surface area.

All agricultural activities will be able to continue unaffectedly on all parts of the farms other than the small development footprint for the duration of and after the project.

2. The proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing. Grazing can continue in tandem with the wind farm.

Three potential agricultural impacts have been identified. Two of these are direct, negative impacts and apply to all three phases of the development (construction, operational and decommissioning). The third impact is a positive, indirect impact and only applies to the operational phase. The impacts are assessed in table format below.

Impact Phase: Construction, Operation & Decommissioning							
Potential impact description: Loss of agricultural land use. Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	Low	Low	Medium	Negative	Low	Low	High
With Mitigation	Low	Low	Medium	Negative	Low	Low	High
Can the impact be reversed?			Yes, once the wind farm is decommissioned, the footprint of the infrastructure can again be utilised as grazing land.				
Will impact cause irreplaceable loss of resources?			No, because only a very small amount of grazing land is lost and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			No				
Mitigation measures to reduce residual risk or enhance opportunities: - None							

The intensity is considered low because of the very small amount of land and because of its low agricultural potential only as grazing land. The extent is low because the impact is limited to within the project area and only to parts of it (the direct footprint). The duration is medium because the impact lasts for the life of the project.

Impact Phase: Construction, Operation & Decommissioning
Potential impact description: Soil degradation Soil degradation can result from erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related soil profile disturbance.

Soil degradation will reduce the ability of the soil to support vegetation growth.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	Medium	Low	Medium	Negative	Medium	Medium	High
With Mitigation	Low	Low	Medium	Negative	Low	Low	High
Can the impact be reversed?			Soil degradation can be reversed only to some extent and only with substantial inputs over a significant period of time.				
Will impact cause irreplaceable loss of resources?			No, because only a very small amount of grazing land is lost and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			Yes, see below.				

Mitigation measures to reduce residual risk or enhance opportunities:

- Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.
- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

The intensity is considered medium without mitigation because unchecked erosion would cause a partial loss of land capability. With effective mitigation, degradation can be prevented and the intensity is therefore considered low. The extent is low because the impact is limited to within the project area and only to a small proportion of it. The duration is medium because the impact lasts for the life of the project.

Impact Phase: Operation							
Potential impact description: Generation of additional land use income Income will be generated by the farming enterprises through the lease of the land to the energy facility. This will provide the farming enterprises with increased cash flow and rural livelihood, and thereby improve their financial sustainability.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without	Low	Low	Medium	Positive	High	Medium	High

Mitigation							
With Mitigation	Low	Low	Medium	Positive	High	Medium	High
Can the impact be reversed?			Yes, it is reversed as soon as income generation ceases at the end of the project.				
Will impact cause irreplaceable loss of resources?			Not at all.				
Can impact be avoided, managed or mitigated?			No				

The intensity is considered low because the increased income is only likely to affect a minor improvement to farming on the land. The extent is low because the impact is limited to within the project area. The duration is medium because the impact lasts for the life of the project.

6.2 Cumulative impacts of the wind farm components

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The potential cumulative agricultural impact of importance is a regional loss or degradation of agricultural land. The defining question for assessing the cumulative agricultural impact is this:

> What level of loss of agricultural land use is acceptable in the area, and will the loss associated with the proposed Paulputs Wind Energy Facility, cause that level in the area to be exceeded?

DEA requires compliance with a specified methodology for the assessment of cumulative impacts. This is positive in that it ensures engagement with the important issue of cumulative impacts. However, the required compliance has some limitations and can, in my opinion, result in an over-focus on methodological compliance, while missing the more important task of answering the above defining question more broadly.

The first limitation with DEA's required methodology is that it restricts the cumulative impacts to similar developments, so in this case to renewable energy developments. In order to accurately answer the defining question above, all developments, regardless of their type and similarity, should be taken into account, because all will contribute to exceeding the acceptable

level of change.

The second problem with the requirement, is that it restricts surrounding developments to those within an absolutely defined distance, in this case 35km. Again this does not allow for accurately answering the defining question. To achieve this, the distance used for cumulative impact assessment should be discipline dependent. A different distance is likely to apply for agricultural impact than for economic impact or botanical impact. And a different distance should be used in different environments, for example in high potential agricultural environments versus very low potential agricultural environments.

Given the above, this assessment focuses more on effectively addressing the defining question above than getting distracted by methodological compliance for its own sake. It does this by considering cumulative impacts more broadly. This includes considering a wider area than the 35 km radius, and considering the likelihood of pressure from other types of developments as well.

There are 19 renewable energy applications within 35km of the proposed site (that need to be considered in terms of the DEA requirements). These are listed in Appendix 2.

All of these projects have the same agricultural impacts in a very similar agricultural environment, and therefore the same mitigation measures apply to all.

In quantifying the cumulative impact, the area of land taken out of agricultural grazing as a result of all of the projects above will amount to a total of approximately 3,320 hectares. This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per DEA (2015). The 19 applications listed in Appendix 2 amount to a generation capacity of 1,328 megawatts. As a proportion of the area within a 35km radius (approximately 385,000 ha), this amounts to only 0.86% of the surface area. That is well within an acceptable limit in terms of loss of low potential agricultural land, of which there is no scarcity in the country. This is particularly so when considered within the context of the following two points:

- In order for South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of agricultural land in a region such as the one being assessed, which has no cultivation potential, and low grazing capacity, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country. The limits of acceptable agricultural land loss are therefore far higher in this region than in regions with higher agricultural potential.
- It is also preferable, from an impact point of view as well as from practical considerations, to rather have a concentrated node of renewable energy development within one area, than to spread out the same number of developments over a larger area. Therefore, if the cumulative impact is considered only for the node, it leads to a

false impression of the magnitude of that impact because of the concentrated development within the node, and the absence of development surrounding it. When averaged over a greater area, the magnitude becomes much less.

It should also be noted that there are few land uses, other than renewable energy, that are competing for agricultural land use in this area. The cumulative impact from developments, other than renewable energy, is therefore low.

There is a relatively low risk of significant soil degradation resulting from renewable developments in the vicinity of the study area. This is because erosion risk of the environment is relatively low (see Section 6.3), the kind of activities associated with renewable energy developments, do not pose a high erosion risk, and erosion is fairly easy to manage within such a development. Degradation is therefore not considered a significant cumulative impact.

Due to all of the considerations discussed above, the cumulative impact of loss of agricultural land use is assessed as having low significance. In terms of cumulative impact, therefore, the development can be authorised.

The cumulative impact is assessed in table format below.

Impact Phase: Construction, Operation & Decommissioning							
Potential impact description: Regional loss of agricultural land use. Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	Low	Low	Medium	Negative	Low	Low	High
With Mitigation	Low	Low	Medium	Negative	Low	Low	High
Can the impact be reversed?			Yes, once the wind farm is decommissioned, the footprint of the infrastructure can again be utilised as grazing land.				
Will impact cause irreplaceable loss of resources?			No, because only a very small amount of grazing land is lost and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			No				
Mitigation measures to reduce residual risk or enhance opportunities: - None							

6.3 Impacts of the electrical grid connection components

The assessment of impacts is identical for the two alternatives, as there is nothing materially different that would result in different impacts between either of the two alternatives.

The significance of all potential agricultural impacts is kept low by two important factors.

1. Electricity grid infrastructure has negligible impact on agriculture after construction because all viable agricultural activities in the project area (only grazing) can continue, undisturbed below power lines.
2. The proposed site is on land of very limited agricultural potential that is only viable for low density grazing.

Only one agricultural impact has been identified. It is a direct, negative impact that applies to two of the phases of the development (construction and decommissioning). It is assessed in table format below.

Impact Phase: Construction & Decommissioning							
Potential impact description: Soil degradation Soil degradation can result from erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance and vegetation removal. Loss of topsoil can result from poor topsoil management during construction related soil profile disturbance. Soil degradation will reduce the ability of the soil to support vegetation growth.							
	Intensity	**Extent**	**Duration**	**Status**	**Probability**	**Significance**	**Confidence**
Without Mitigation	Medium	Low	Medium	Negative	Medium	Medium	High
With Mitigation	Low	Low	Medium	Negative	Low	Low	High
Can the impact be reversed?			Soil degradation can be reversed only to some extent and only with substantial inputs over a significant period of time.				
Will impact cause irreplaceable loss of resources?			No, because a very small amount of grazing land is impacted and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			Yes, see below.				
Mitigation measures to reduce residual risk or enhance opportunities: • Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.							

- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

Note: The assessment is identical for each of the two alternatives.

The intensity is considered medium without mitigation because unchecked erosion would cause a partial loss of land capability. With effective mitigation, degradation can be prevented and the intensity is therefore considered low. The extent is low because the impact is limited to within the project area and only to parts of it. The duration is low because the impact will only last for the short term after disturbance.

6.4 Cumulative impacts of the electrical grid connection components

The observations on cumulative impact, presented in Section 6.2, apply for the electrical grid connection components as well. In fact, because of the even lower (negligible) agricultural impacts of power lines compared to wind farms, the agricultural environment can accommodate far more electricity grid infrastructure than currently exists, or is currently proposed, before acceptable levels of change are exceeded. Acceptable levels of change in terms of other types of impact, for example visual impact, would be exceeded long before the levels for agricultural impact became an issue. For the above reasons, the cumulative agricultural impact of the electrical grid connection components can confidently be assessed as negligible and a more formal assessment is irrelevant.

7 CONCLUSIONS

The proposed development is located on land zoned and used for agriculture (grazing). South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of potentially arable land. The assessment has found that the proposed development will only impact agricultural land which is of low agricultural potential and only suitable for grazing.

The significance of all agricultural impacts is low due to two important factors. Firstly, the actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the available grazing land on the effected farm portions (a maximum of approximately 5% of the surface area). All agricultural activities will be able to continue unaffectedly on all parts of the farm other than the small development footprint for the duration of and after the project. Secondly, the proposed site is on land of very limited agricultural potential that is only viable for low density grazing. These two factors also mean that cumulative regional effects as a result of other surrounding developments, also have low significance.

Due to the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised.

There are no conditions resulting from this assessment that need to be included in the Environmental Authorisation.

8 REFERENCES

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Soil Classification Working Group. 1991. Soil classification: a taxonomic system for South Africa. Soil and Irrigation Research Institute, Department of Agricultural Development, Pretoria.

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APPENDIX 1: SOIL DATA

Table A1. Land type soil data for the site. Land types are arranged in the table in descending order in terms of the proportion of the project area that each covers.

Land type	Soil series (forms)	Depth (mm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Ag2	Hutton	100 - 300	4 - 13	6 - 15	so,db,R	30.4
	Mispah	50 - 150	5 - 12		R	18.1
	Glenrosa	100 - 300	3 - 13		so	9.8
	Hutton	100 - 300	10 - 20	15 - 25	so,db,R	9.0
	Hutton	450 > 1200	3 - 13	3 - 15	so,R,db	8.3
	Mispah	50 - 150	5 - 12		db	6.9
	Rock outcrop					6.7
	Hutton	450 > 1200	10 - 20	15 - 25	so,R,db	4.2
	Mispah	50 - 150	5 - 15		ka	3.8
	Pans					2.0
	Oakleaf	450 > 1200	2 - 20	3 - 25	so,R	0.9
Ag3	Mispah	50 - 100	5 - 12		R,ka,db	31.2
	Hutton	100 - 400	6 - 12	6 - 15	R,so,ka,db	23.1
	Hutton	100 - 400	9 - 20	15 - 25	R,ka,so,db	22.8
	Rock outcrop					10.0
	Hutton	450 > 1200	9 - 20	15 - 25	R,ka,so,db	6.0
	Hutton	450 > 1200	6 - 12	6 - 15	R,ka,so,db	5.5
	Oakleaf	450 > 1200	10 - 25	15 - 30	R,ka,so	1.0
	Pans					0.5
Ag37	Hutton	200 - 300	3 - 8	3 - 8	R,ka,db	48.0
	Rock outcrop					20.0
	Dundee	500 - 1000	0 - 6		R,ka	15.0
	Mispah	100 - 200	0 - 6		R	9.0
	Hutton	500 - 1000	0 - 6	0 - 6	ka,ca	8.0

Depth limiting layers: R = hard rock; so = partially weathered bedrock; lo = partially weathered bedrock (softer); ca = soft carbonate; ka = hardpan carbonate; db = dorbank hardpan; hp = cemented hardpan plinthite (laterite); sp = soft plinthic horizon; pr = dense, prismatic clay layer; vp = dense, structured clay layer; vr = dense, red, structured clay layer; gc = dense clay horizon that is frequently saturated; pd = podzol horizon; U = alluvium.

APPENDIX 2: RENEWABLE ENERGY APPLICATIONS WITHIN 35 KM OF PAULPUTS WIND ENERGY FACILITY

DEA Reference	Project	MW
12/12/20/1832	Pofadder Solar Thermal Plant	310
12/12/20/1832/1A	Pofadder Solar Thermal Plant Phase 1	100
12/12/20/1832/2A	100MW parabolic troughs, 200MW Heliostats/Mirrors and 10MW PV near Pofadder	100
12/12/20/1832/3A	Pofadder Solar Thermal Plant Phase 3	10
12/12/20/2098	Konkoonsies & Kleinzwart near Kenhard	20
12/12/20/2098/1	Konkoonsies & Kleinzwart near Kenhard	9.7
12/12/20/2443	Koonkonsies near Poffadder	133
12/12/20/2443/AM1	Koonkonsies near Poffadder	0
12/12/20/2600	Khoi-Sun Solar, Skuitdrift No. 426	75
12/12/20/2601	Farm scuitklip 92	0
12/12/20/2604	Skuitdrif Solar Energy Facility	10
14/12/16/3/3/1/581	Southern Cross Solar Enegry Facility	20
14/12/16/3/3/1/587	Tutwa Solar Enegry Facility	200
12/12/20/2443/AM2	Portion 6 of the Farm Koonkonsies near Poffadder	0
12/12/20/2600/AM1	Khoi-Sun Solar, Skuitdrift No. 426	0
14/12/16/3/3/1/1600	Scuitdrift Photovoltaic Solar Energy Facility on the Farm Skuitdrift 426	10
14/12/16/3/3/2/870	Paulputs CSP facility near Poffadder	200
14/12/16/3/3/1/1600	Scuitdrift Photovoltaic Solar Energy Facility on the Farm Skuitdrift 426	10
	Paulputs PV	300