# APPENDIX F

## Soil, Land Use and Land Capability Assessment

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# AGRICULTURAL AND SOILS IMPACT ASSESSMENT FOR PROPOSED BOKPOORT II PV1 SOLAR POWER FACILITY ON THE FARM BOKPOORT NEAR GROBLERSHOOP NORTHERN CAPE PROVINCE

## EIA PHASE REPORT

**Report by**
**Johann Lanz**

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## Executive Summary

**The proposed development is on land zoned and used for agriculture. 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 site is on land which is unsuitable for cultivation due to both climate and soil limitations.**

**The key findings of this study are:**

- **Soils on the site are shallow to moderately deep, red, sandy soils overlying hard pan carbonate and sometimes rock (Coega and Plooysburg soil forms).**
- **The major limitation to agriculture is the limited climatic moisture availability. The low water holding capacity of the soils is a further limitation.**
- **As a result, the site is unsuitable for cultivation and agricultural land use is limited to grazing.**
- **The land capability is classified as Class 7 - non-arable, low potential grazing land. The site has a grazing capacity of 26-30 hectares per large stock unit.**
- **No agriculturally sensitive areas occur within the proposed site and no part of it is therefore required to be set aside from the development.**
- **The low agricultural potential of the site limits the significance of all on-site agricultural impacts.**
- **Three potential negative impacts of the development on agricultural resources and productivity were identified as:**
    - **Loss of agricultural land use caused by direct occupation of land by the energy facility footprint.**
    - **Loss of topsoil in disturbed areas due to ineffective topsoil management, causing a decline in soil fertility in rehabilitated areas.**
    - **Soil Erosion caused by alteration of the surface characteristics.**
- **All impacts were assessed as having low significance.**
- **Recommended mitigation measures include implementation of an effective system of storm water run-off control to mitigate erosion; and topsoil stripping and re-spreading to mitigate loss of topsoil.**
- **Because of the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which would preclude authorisation of the proposed development.**
- **Despite any cumulative regional impact that may occur, it is preferable, in terms of the national mandate to conserve land for agricultural production, to incur a loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.**
- **Because the site is uniformly low potential, from an agricultural point of view, there is no preferred location or layout within the assessed site.**

- **There are no conditions resulting from this assessment that need to be included in the environmental authorisation.**

## 2 INTRODUCTION

**Development of a 75 MW Photovoltaic energy facility is proposed on the Remaining Extent of the Farm Bokpoort No. 390, approximately 20 kilometres north of the town of Groblershoop (see Figure 1). The developments will consist of various infrastructure including arrays of photovoltaic panels supported by mounting structures, inverter stations, internal access roads, cabling, fencing, on-site substation and connection to the Eskom grid, and buildings. The footprint of the energy facility will utilise up to approximately 400 hectares, of the total farm portion of approximately 8,300 hectares. This report is an assessment of the 400 hectare site.**

**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, monitoring requirements, and rehabilitation guidelines for all identified impacts. Johann Lanz was appointed by Acwa Power as an independent specialist to conduct this Soils and Agricultural Impact Assessment.**

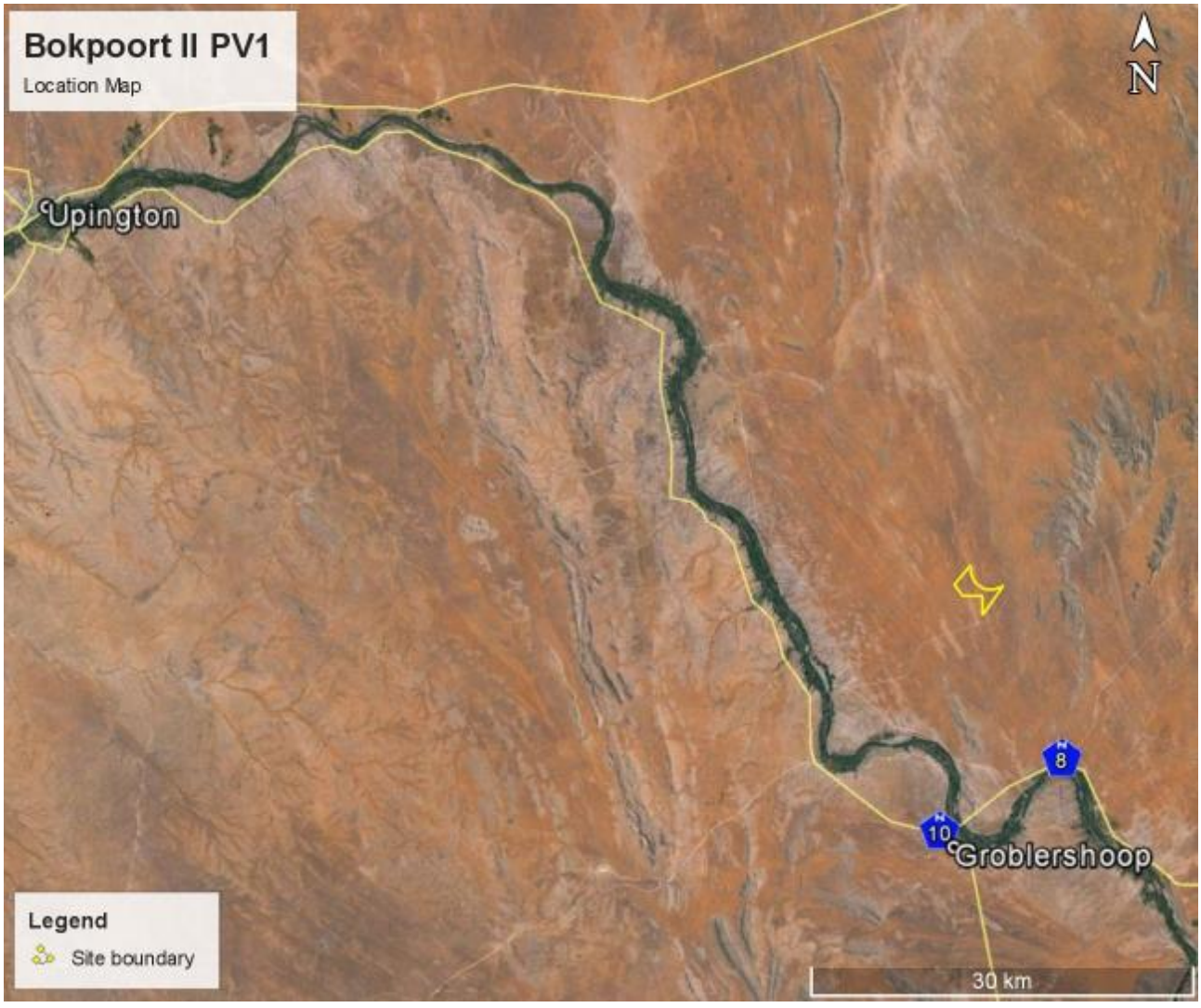


***Figure 1. Location map of the proposed site, north of the town of Groblershoop.***

## 3 TERMS OF REFERENCE

**The terms of reference for the study fulfills the requirements for a soils and agricultural study as described 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. The study applies an appropriate level of detail for the agricultural suitability and soil variation on site, which, because it is justified (see section 3.1), is less than the standardised level of detail stipulated in the above regulations.**

**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 the climate in terms of agricultural suitability.**
- **Summarise available water sources for agriculture.**
- **Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.**
- **Describe the erosion, vegetation and degradation status of the land.**
- **Determine the agricultural potential across the site.**
- **Determine the agricultural sensitivity to development across the site.**
- **Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.**

**The report also fulfils the requirements of Appendix 6 of the 2014 EIA Regulations (See Table 1).**

**Table 1. Compliance with the Appendix 6 of the 2014 EIA Regulations**

| Requirements of Appendix 6 – GN R982 | Addressed in the Specialist Report |
|---|---|
| 1. A specialist report prepared in terms of these Regulations must contain<br>a) details of-<br>i. the specialist who prepared the report; and<br>ii. the expertise of that specialist to compile a specialist report including a curriculum vitae; | <br><br><br><br>Title page<br>Accompanies report |
| b) a declaration that the specialist is independent in a form as may be specified by the competent authority; | Accompanies report |
| c) an indication of the scope of, and the purpose for which, the report was prepared; | Section 1 and 2 |
| d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment; | Section 3.1 |
| e) a description of the methodology adopted in preparing the report or carrying out the specialised process; | Section 3 |
| f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure; | Section 6.8 |
| g) an identification of any areas to be avoided, including buffers; | Section 6.8 |
| h) 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 3 |
| i) a description of any assumptions made and any uncertainties or gaps in knowledge; | Section 4 |
| j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment; | Section 7 |
| k) any mitigation measures for inclusion in the EMPr; | Section 7 |
| l) any conditions for inclusion in the environmental authorisation; | Section 8 |
| m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | Section 7 |
| n) a reasoned opinion-<br>i. as to whether the proposed activity or portions thereof should be authorised; and<br>ii. if the opinion is that the proposed activity 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; | <br><br>Section 8<br><br><br><br>Section 7 |
| o) a description of any consultation process that was undertaken during the course of preparing the specialist report; | Not applicable |
| p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and | Not applicable |
| q) any other information requested by the competent authority. | Not applicable |

# 4 METHODOLOGY OF STUDY

## 4.1 Methodology for assessing soils and agricultural potential

**The assessment was based largely on existing soil and agricultural potential data for the site. The source of this data was the online Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). Satellite imagery of the site available on Google Earth was also used for evaluation.**

**The AGIS data was supplemented by information from previous studies done on the same site.**

**It is my opinion that the level of soil mapping detail in the above Department of Agriculture, Forestry and Fisheries (DAFF) requirements is appropriate for arable land only. It is not appropriate for this site. Detailed soil mapping has little relevance to an assessment of agricultural potential in this environment, where cultivation potential is extremely limited, soil conditions are generally poor and the agricultural limitations are overwhelmingly climatic. 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 required level of detail would be very time consuming and be a waste of that time, as it would add almost no value to the assessment. The land type data is considered more than adequate for a thorough assessment of all agricultural impacts.**

## 4.2 Methodology for assessing impacts and determining impact significance

**In assessing the significance of each impact the following criteria were used:**

| **GEOGRAPHICAL EXTENT** | | |
|---|---|---|
| **This is defined as the area over which the impact will be experienced.** | | |
| **1** | **Site** | **The impact will only affect the site.** |
| **2** | **Local/district** | **Will affect the local area or district.** |
| **3** | **Province/region** | **Will affect the entire province or region.** |
| **4** | **International and National** | **Will affect the entire country.** |
| **PROBABILITY** | | |
| **This describes the chance of occurrence of an impact.** | | |
| **1** | **Unlikely** | **The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).** |
| **2** | **Possible** | **The impact may occur (Between a 25% to 50% chance of occurrence).** |
| **3** | **Probable** | **The impact will likely occur (Between a 50% to 75% chance of occurrence).** |
| **4** | **Definite** | **Impact will certainly occur (Greater than a 75% chance of** |

| | | |
|---|---|---|
| | | **occurrence).** |
| **DURATION** | | |
| **This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.** | | |
| **1** | **Short term** | **The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).** |
| **2** | **Medium term** | **The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).** |
| **3** | **Long term** | **The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).** |
| **4** | **Permanent** | **The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.** |
| **INTENSITY/ MAGNITUDE** | | |
| **Describes the severity of an impact.** | | |
| **1** | **Low** | **Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.** |
| **2** | **Medium** | **Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).** |
| **3** | **High** | **Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.** |
| **4** | **Very high** | **Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.** |

| | | |
|---|---|---|
| **REVERSIBILITY** | | |
| **This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.** | | |
| **1** | **Completely reversible** | **The impact is reversible with implementation of minor mitigation measures.** |
| **2** | **Partly reversible** | **The impact is partly reversible but more intense mitigation measures are required.** |
| **3** | **Barely reversible** | **The impact is unlikely to be reversed even with intense mitigation measures.** |
| **4** | **Irreversible** | **The impact is irreversible and no mitigation measures exist.** |
| **IRREPLACEABLE LOSS OF RESOURCES** | | |
| **This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.** | | |
| **1** | **No loss of resource** | **The impact will not result in the loss of any resources.** |
| **2** | **Marginal loss of resource** | **The impact will result in marginal loss of resources.** |
| **3** | **Significant loss of resources** | **The impact will result in significant loss of resources.** |
| **4** | **Complete loss of resources** | **The impact is result in a complete loss of all resources.** |
| **CUMULATIVE EFFECT** | | |
| **This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.** | | |
| **1** | **Negligible cumulative impact** | **The impact would result in negligible to no cumulative effects.** |
| **2** | **Low cumulative impact** | **The impact would result in insignificant cumulative effects.** |
| **3** | **Medium cumulative impact** | **The impact would result in minor cumulative effects.** |
| **4** | **High cumulative impact** | **The impact would result in significant cumulative effects** |
| **SIGNIFICANCE** | | |
| **Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and** | | |

**therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula:**

**(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.**

**The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.**

| Points | Impact significance rating | Description |
|---|---|---|
| 6 to 28 | Negative low impact | The anticipated impact will have negligible negative effects and will require little to no mitigation. |
| 6 to 28 | Positive low impact | The anticipated impact will have minor positive effects. |
| 29 to 50 | Negative medium impact | The anticipated impact will have moderate negative effects and will require moderate mitigation measures. |
| 29 to 50 | Positive medium impact | The anticipated impact will have moderate positive effects. |
| 51 to 73 | Negative high impact | The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact. |
| 51 to 73 | Positive high impact | The anticipated impact will have significant positive effects. |
| 74 to 96 | Negative very high impact | The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws". |
| 74 to 96 | Positive very high impact | The anticipated impact will have highly significant positive effects. |

## 5 CONSTRAINTS AND LIMITATIONS OF STUDY

**The land type data used for this assessment is considered more than adequate for the purposes of this study (see section 3.1) and is therefore not seen as a limitation. A more detailed soil investigation is not considered likely to have added anything significant to the assessment of agricultural soil suitability for the purposes of determining the impact of the facility on agricultural resources and productivity.**

**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.**

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

# 6 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

**A change of land use (re-zoning) for the development on agricultural land needs to be approved in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA). This is required for long term lease, even if no subdivision is required. Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA). No application is required in terms of CARA. The EIA process covers the required aspects of this. The Department of Agriculture, Forestry and Fisheries reviews and approves applications in terms of these Acts according to their *Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011.**

# 7 DESCRIPTION OF THE SOILS AND AGRICULTURAL CAPABILITY OF THE AFFECTED ENVIRONMENT

## 7.1 Climate and water availability

**Rainfall for the site is given as 265 mm per annum (The World Bank Climate Change Knowledge Portal, undated). The average monthly distribution of rainfall is shown in Figure 2. One of the most important climate parameters for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. Moisture availability is classified into 6 categories across the country (see Table 2). The site falls into the driest of these six categories , which is labelled as a very severe limitation to agriculture.**

**Theoretically there is the possibility of water from the Orange River for the site, but the distance (13km) and the height of the site above the river (over 100 metres) makes irrigation from the river completely non-viable. Water for stock on the site is supplied from wind pumps.**

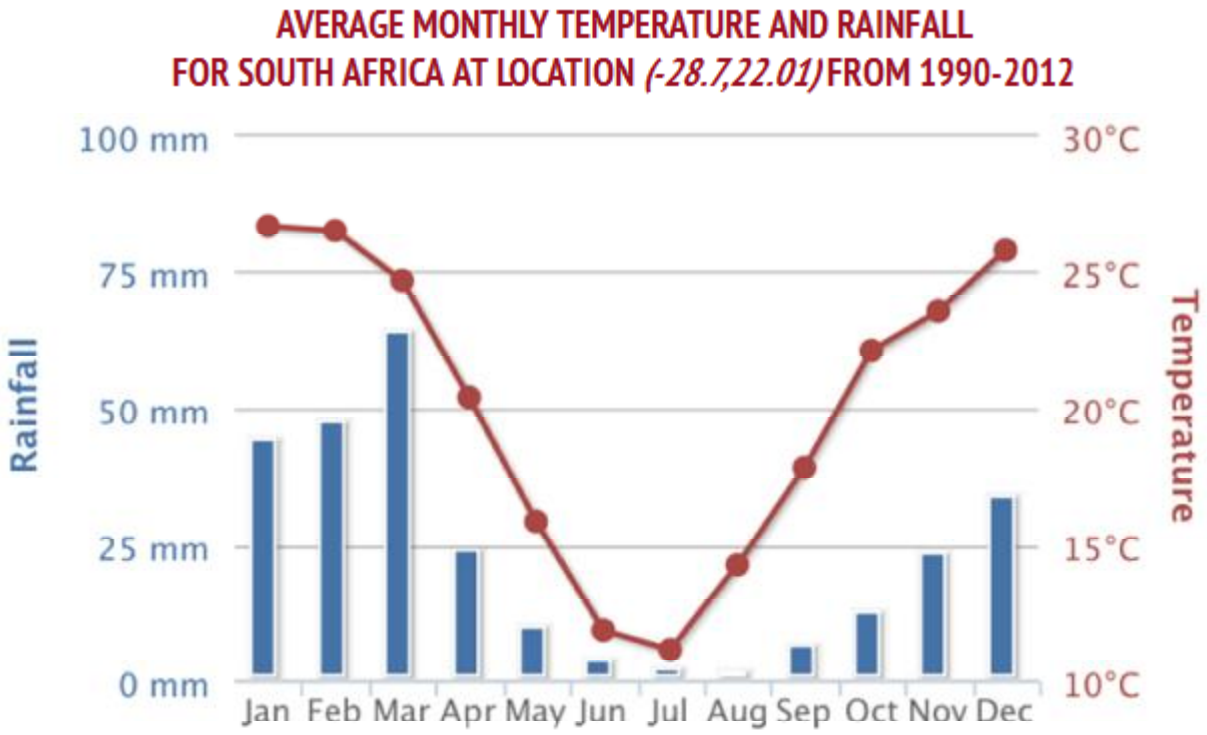


***Figure 2. Average monthly temperature and rainfall for the site (The World Bank Climate Change Knowledge Portal, undated).***

**Table 2. The classification of moisture availability climate classes for summer rainfall areas across South Africa (Agricultural Research Council, Undated)**

| Climate class | Moisture availability (Rainfall/0.25 PET) | Description of agricultural limitation |
|---|---|---|
| C1 | >34 | None to slight |
| C2 | 27-34 | Slight |
| C3 | 19-26 | Moderate |
| C4 | 12-18 | Moderate to severe |
| C5 | 6-12 | Severe |
| C6 | <6 | Very severe |

### 7.2 Terrain, topography and drainage

The proposed development is located on a terrain unit of plains with open low hills or ridges, changing to rolling or irregular plains with low hills or ridges in the extreme north of the site. It is at an altitude of around 1,000 meters. Slope is less than 2% across the site. A satellite image map of the site is shown in Figure 3.

The geology is red to flesh-coloured wind-blown sand and surface limestone of Tertiary to Recent age. Occasional outcrops of quartz- sericite schist and quartzite of the Groblershoop Formation occur.

There are no water courses on or near the site.

### 7.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climate conditions into different land types. There is predominantly one land type across most of the site, namely Ae4. A small part of the site in the extreme north east is on land type Af7. The soils of Ae4 are shallow to moderately deep, red, sandy soils overlying hard pan carbonate and sometimes rock. These soils fall into the Calcic and Lithic soil groups according to the classification of Fey (2010). Land type Af7 comprises deeper red sands and includes dunes. A summary detailing soil data for the land type is provided in Appendix 1, Table A1. Soils are predominantly of the Coega soil form, with lesser coverage of shallow Plooysburg form. It should be noted that the land type classification presented in Table A1 made use of the older South African soil classification system, which did not include the Coega and Plooysburg forms. These forms would have been classified, according to the older system, as Mispah and Hutton respectively.

The soils are classified as having low to moderate susceptibility to water erosion (class 5), and as highly susceptible to wind erosion (Ae4 = class 1b; Af7 = class 1a).

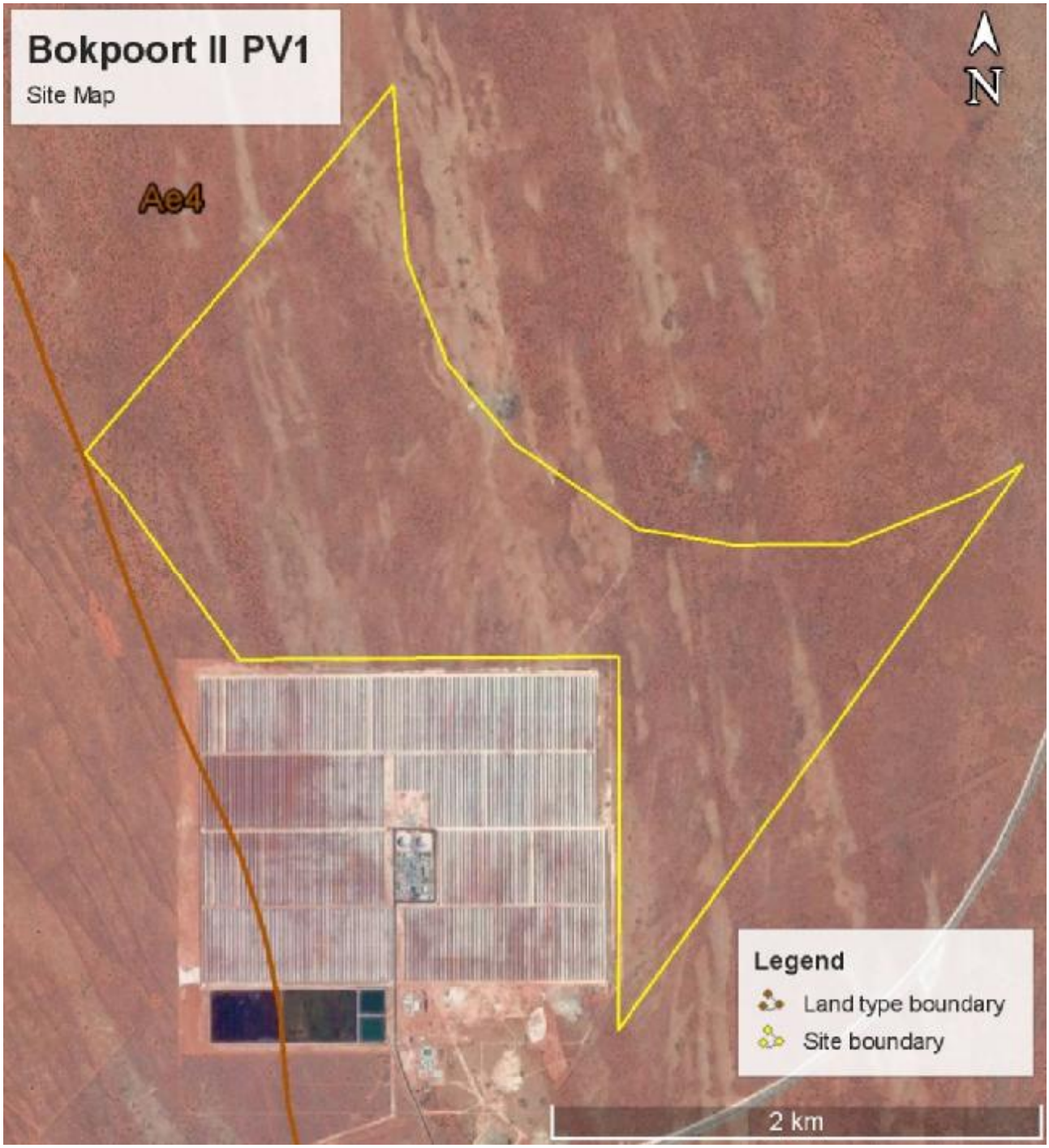


***Figure 3. Satellite image of the proposed site.***

### 7.4 Agricultural capability

**Land capability is the combination of soil suitability and climate factors. The site and surrounds has a land capability classification, on the 8 category scale, of Class 7 – non-arable, low potential grazing land.**

**The limitations to agriculture are predominantly climate related. The moisture availability class**

**6 classification, with high variability of rainfall is a very severe limitation to agriculture, which makes any cultivation without irrigation completely non-viable. The very sandy soils, with very limited water holding capacity are a further limitation. The grazing capacity on AGIS is low, given as 26-30 hectares per large stock unit.**

### 7.5 Land use and development on and surrounding the site

**The site is located within a sheep farming agricultural region and currently used only for grazing. There has never been any cultivation on the site.**

**There are no buildings on the site. The only agricultural infrastructure on the site is fencing into grazing camps, wind pumps and stock watering points. There is an existing solar development on the farm adjacent to the proposed site to its south.**

**Road access to the site is from the existing road access to the adjacent solar development.**

### 7.6 Status of the land

**The biome classification for the site is Kalahari Karroid Shrubland, with a small section of Gordonia Duneveld on land type Af7. The vegetation is grazed and sparse due to low rainfall, but there is no evidence of significant erosion or other land degradation on the site.**

### 7.7 Possible land use options for the site

**Because of predominantly the climate limitations, the site is totally unsuitable for cultivated crops, and viable agricultural land use is limited to grazing only.**

### 7.8 Agricultural sensitivity

**Agricultural conditions and potential are uniform across the site and the choice of placement of infrastructure therefore has no influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the investigated site and no parts of it therefore need to be avoided by the development. There are no required buffers.**

## 8 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

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

- **Occupation of the site by the footprint of the facility**
- **Constructional activities that disturb the soil profile and vegetation, for example for levelling, excavations, etc.**

**The following three potential impacts of the developments on agricultural resources and productivity are identified, and assessed in the table formats below. The assessment includes**

**the impacts of the associated power lines that run beyond the site. These impacts are negligible because the actual footprint of disturbance of the power lines is confined to the pylon bases. All grazing can continue undisturbed below the lines themselves and the footprint of the power line is therefore minuscule in relation to available grazing land.**

**Mitigation and monitoring recommendations are included in the table for each impact.**

### 8.1 Impacts associated with the construction phase

| | | |
|---|---|---|
| ***1. Nature:*** **Loss of agricultural land use**<br>**Caused by: direct occupation of land by total footprint of energy facility infrastructure;**<br>**And having the effect of: taking affected portions of land out of agricultural production.** | | |
| ***Comments:*** **The impact is reversible after the life of the project, with effective topsoiling of the land during rehabilitation, where necessary.** | | |
| | **Without mitigation** | **With mitigation** |
| ***Geographical extent*** | **Low (1) - Site** | **Low (1) - Site** |
| ***Probability*** | **Definite (4)** | **Definite (4)** |
| ***Duration*** | **Long term (3)** | **Long term (3)** |
| ***Intensity / Magnitude*** | **Medium (2)** | **Low (1)** |
| ***Reversibility*** | **Partly reversible (2)** | **Partly reversible (2)** |
| ***Irreplaceable loss of resources?*** | **None (1)** | **None (1)** |
| ***Cumulative effect*** | **Low (2)** | **Negligible (1)** |
| ***Significance*** | **Low (26)** | **Low (12)** |
| ***Status*** | **Negative** | **Negative** |
| ***Mitigation:*** **None possible.** | | |

| | | |
|---|---|---|
| ***2. Nature:*** **Loss of topsoil**<br>**Caused by: poor topsoil management (burial, erosion, etc) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) and during stockpiling**<br>**and having the effect of: loss of soil fertility on disturbed areas after rehabilitation.** | | |
| | **Without mitigation** | **With mitigation** |
| ***Geographical extent*** | **Low (1) - Site** | **Low (1) - Site** |
| ***Probability*** | **Possible (2)** | **Unlikely (1)** |
| ***Duration*** | **Long term (3)** | **Long term (3)** |
| ***Intensity / Magnitude*** | **Medium (2)** | **Medium (2)** |
| ***Reversibility*** | **Partly reversible (2)** | **Partly reversible (2)** |

| | | |
|---|---|---|
| ***Irreplaceable loss of resources?*** | **Marginal (2)** | **Marginal (2)** |
| ***Cumulative effect*** | **Negligible (1)** | **Negligible (1)** |
| ***Significance*** | **Low (22)** | **Low (20)** |
| ***Status*** | **Negative** | **Negative** |

***Mitigation:***

**If an activity will mechanically disturb the soil profile below surface, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation, which may be after construction or only at decommissioning. The depth of topsoil stripping is dependent on the specific field conditions. The maximum depth should be 30cm. If additional unconsolidated material exists below 30cm and needs to be removed for construction purposes, it must be stripped and stockpiled separately from the upper 30cm topsoil. Such material should only be used for fill below a topsoil layer, and not used for spreading on the surface. If there is less than 30cm of unconsolidated soil material above a limiting layer of rock or hardpan, then the entire depth must be stripped and stockpiled as topsoil, even if it contains a high proportion of course fragments.**

**Topsoil should be retained in the area below the panels (or mirrors). It is not desirable to strip and stockpile this topsoil for the whole of the operational phase. It will be much more effective for rehabilitation, to retain the topsoil in place. If levelling requires significant cutting, topsoil should be temporarily stockpiled and then re-spread after cutting, so that there is a covering of topsoil over the entire surface before the panels are mounted. It will be advantageous to have topsoil and vegetation cover below the panels during the operational phase for the following reasons: conservation of topsoil, dust suppression and erosion control.**

**It is only in areas where topsoil cannot be retained on the surface during the operational phase, and where the area will be rehabilitated back to veld after decommissioning, that it should be stripped and stockpiled for the duration of the operational phase for re-spreading during de-commissioning.**

**Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.**

**Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land.**

**During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.**

**If there is compaction, either in re-spread topsoil or in areas where topsoil was retained during the operational phase, it must be loosened through an appropriate plough action.**

**If topsoil has been stockpiled for the duration of the operational phase, re-vegetation is likely to require seeding and / or planting.**

**Erosion must be carefully controlled where necessary on topsoiled areas.**

***Monitoring:***

**Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below.**

**Record the GPS coordinates of each area.**

**Record the date of topsoil stripping.**
**Record the GPS coordinates of where the topsoil is stockpiled.**
**Record the date of cessation of constructional (or operational) activities at the particular site.**
**Photograph the area on cessation of constructional activities.**
**Record date and depth of re-spreading of topsoil.**
**Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.**

***3. Nature:*** **Erosion due to alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, presence of panel surfaces, and the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources.**

***Comments:*** **The water erosion risk is low due to the low slope gradients and low to moderate erodibility of the soils, but wind erosion risk is high.**

| | Without mitigation | With mitigation |
|---|---|---|
| ***Geographical extent*** | **Low (1) - Site** | **Low (1) - Site** |
| ***Probability*** | **Possible (2)** | **Unlikely (1)** |
| ***Duration*** | **Medium term (2)** | **Medium term (2)** |
| ***Intensity / Magnitude*** | **Medium (2)** | **Medium (2)** |
| ***Reversibility*** | **Partly reversible (2)** | **Partly reversible (2)** |
| ***Irreplaceable loss of resources?*** | **Marginal (2)** | **Marginal (2)** |
| ***Cumulative effect*** | **Negligible (1)** | **Negligible (1)** |
| ***Significance*** | **Low (20)** | **Low (18)** |
| ***Status*** | **Negative** | **Negative** |

***Mitigation:*** **Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.**
**Retain as much vegetation cover over as much of the site as possible to protect soil from water and wind erosion.**

***Monitoring:*** **Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site or downstream.**

## 8.2 Impacts associated with the operational phase

***1. Nature:*** **Loss of agricultural land use**

| | | |
|---|---|---|
| **Caused by: direct occupation of land by total footprint of energy facility infrastructure; And having the effect of: taking affected portions of land out of agricultural production.** | | |
| ***Comments:*** **The impact is reversible after the life of the project, with effective topsoiling of the land during rehabilitation, where necessary.** | | |
| | **Without mitigation** | **With mitigation** |
| ***Geographical extent*** | **Low (1) - Site** | **Low (1) - Site** |
| ***Probability*** | **Definite (4)** | **Definite (4)** |
| ***Duration*** | **Long term (3)** | **Long term (3)** |
| ***Intensity / Magnitude*** | **Medium (2)** | **Low (1)** |
| ***Reversibility*** | **Partly reversible (2)** | **Partly reversible (2)** |
| ***Irreplaceable loss of resources?*** | **None (1)** | **None (1)** |
| ***Cumulative effect*** | **Low (2)** | **Negligible (1)** |
| ***Significance*** | **Low (26)** | **Low (12)** |
| ***Status*** | **Negative** | **Negative** |
| ***Mitigation:*** **None possible.** | | |

| | | |
|---|---|---|
| ***2. Nature:*** **Erosion due to alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, presence of panel surfaces, and the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources.** | | |
| ***Comments:*** **The water erosion risk is low due to the low slope gradients and low to moderate erodibility of the soils, but wind erosion risk is high.** | | |
| | **Without mitigation** | **With mitigation** |
| ***Geographical extent*** | **Low (1) - Site** | **Low (1) - Site** |
| ***Probability*** | **Possible (2)** | **Unlikely (1)** |
| ***Duration*** | **Medium term (2)** | **Medium term (2)** |
| ***Intensity / Magnitude*** | **Medium (2)** | **Medium (2)** |
| ***Reversibility*** | **Partly reversible (2)** | **Partly reversible (2)** |
| ***Irreplaceable loss of resources?*** | **Marginal (2)** | **Marginal (2)** |
| ***Cumulative effect*** | **Negligible (1)** | **Negligible (1)** |
| ***Significance*** | **Low (20)** | **Low (18)** |
| ***Status*** | **Negative** | **Negative** |
| ***Mitigation:*** **Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. Any occurrences of erosion must be attended to immediately** | | |

| |
|---|
| **and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.**<br>**Retain as much vegetation cover over as much of the site as possible to protect soil from water and wind erosion.** |
| ***Monitoring:*** **Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site or downstream.** |

### 8.3 Impacts associated with the decommissioning phase

| | | |
|---|---|---|
| ***1. Nature:*** **Loss of agricultural land use**<br>**Caused by: direct occupation of land by total footprint of energy facility infrastructure;**<br>**And having the effect of: taking affected portions of land out of agricultural production.** | | |
| ***Comments:*** **The impact is reversible after the life of the project, with effective topsoiling of the land during rehabilitation, where necessary.** | | |
| | **Without mitigation** | **With mitigation** |
| ***Geographical extent*** | **Low (1) - Site** | **Low (1) - Site** |
| ***Probability*** | **Definite (4)** | **Definite (4)** |
| ***Duration*** | **Long term (3)** | **Long term (3)** |
| ***Intensity / Magnitude*** | **Medium (2)** | **Low (1)** |
| ***Reversibility*** | **Partly reversible (2)** | **Partly reversible (2)** |
| ***Irreplaceable loss of resources?*** | **None (1)** | **None (1)** |
| ***Cumulative effect*** | **Low (2)** | **Negligible (1)** |
| ***Significance*** | **Low (26)** | **Low (12)** |
| ***Status*** | **Negative** | **Negative** |
| ***Mitigation:*** **None possible.** | | |

| | | |
|---|---|---|
| ***2. Nature:*** **Loss of topsoil**<br>**Caused by: poor topsoil management (burial, erosion, etc) during soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) and during stockpiling**<br>**and having the effect of: loss of soil fertility on disturbed areas after rehabilitation.** | | |
| | **Without mitigation** | **With mitigation** |
| ***Geographical extent*** | **Low (1) - Site** | **Low (1) - Site** |
| ***Probability*** | **Possible (2)** | **Unlikely (1)** |
| ***Duration*** | **Long term (3)** | **Long term (3)** |
| ***Intensity / Magnitude*** | **Medium (2)** | **Medium (2)** |

| | | |
|---|---|---|
| ***Reversibility*** | **Partly reversible (2)** | **Partly reversible (2)** |
| ***Irreplaceable loss of resources?*** | **Marginal (2)** | **Marginal (2)** |
| ***Cumulative effect*** | **Negligible (1)** | **Negligible (1)** |
| ***Significance*** | **Low (22)** | **Low (20)** |
| ***Status*** | **Negative** | **Negative** |

***Mitigation:***

**If an activity will mechanically disturb the soil profile below surface, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. The depth of topsoil stripping is dependent on the specific field conditions. The maximum depth should be 30cm. If additional unconsolidated material exists below 30cm and needs to be removed for construction purposes, it must be stripped and stockpiled separately from the upper 30cm topsoil. Such material should only be used for fill below a topsoil layer, and not used for spreading on the surface. If there is less than 30cm of unconsolidated soil material above a limiting layer of rock or hardpan, then the entire depth must be stripped and stockpiled as topsoil, even if it contains a high proportion of course fragments.**

**Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.**

**Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land.**

**During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.**

**If there is compaction, either in re-spread topsoil or in areas where topsoil was retained during the operational phase, it must be loosened through an appropriate plough action.**

**If topsoil has been stockpiled for the duration of the operational phase, re-vegetation is likely to require seeding and / or planting.**

**Erosion must be carefully controlled where necessary on topsoiled areas.**

***Monitoring:***

**Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below.**

**Record the GPS coordinates of each area.**

**Record the date of topsoil stripping.**

**Record the GPS coordinates of where the topsoil is stockpiled.**

**Record the date of cessation of constructional (or operational) activities at the particular site.**

**Photograph the area on cessation of constructional activities.**

**Record date and depth of re-spreading of topsoil.**

**Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.**

***3. Nature:*** **Erosion due to alteration of the land surface run-off characteristics. Alteration of**

| | | |
|---|---|---|
| **run-off characteristics may be caused by land surface disturbance, vegetation removal, presence of panel surfaces, and the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources.** | | |
| ***Comments:*** **The water erosion risk is low due to the low slope gradients and low to moderate erodibility of the soils, but wind erosion risk is high.** | | |
| | **Without mitigation** | **With mitigation** |
| ***Geographical extent*** | **Low (1) - Site** | **Low (1) - Site** |
| ***Probability*** | **Possible (2)** | **Unlikely (1)** |
| ***Duration*** | **Medium term (2)** | **Medium term (2)** |
| ***Intensity / Magnitude*** | **Medium (2)** | **Medium (2)** |
| ***Reversibility*** | **Partly reversible (2)** | **Partly reversible (2)** |
| ***Irreplaceable loss of resources?*** | **Marginal (2)** | **Marginal (2)** |
| ***Cumulative effect*** | **Negligible (1)** | **Negligible (1)** |
| ***Significance*** | **Low (20)** | **Low (18)** |
| ***Status*** | **Negative** | **Negative** |
| ***Mitigation:*** **Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.**<br>**Retain as much vegetation cover over as much of the site as possible to protect soil from water and wind erosion.** | | |
| ***Monitoring:*** **Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site or downstream.** | | |

### 8.4 Cumulative impacts

**There is potential for cumulative impacts to arise as a result of other projects that impact on agricultural land in the area.**

**Although the loss of individual project portions of land has low significance, as discussed above, the cumulative impacts of land loss regionally can become more significant. However, despite this cumulative impact, it is still agriculturally strategic from a national perspective to steer as much of the country's renewable energy development as possible to sites such as this one, with very low agricultural potential. It is preferable to incur a higher cumulative loss in a region with low agricultural potential, than to lose agricultural land with a higher production potential elsewhere in the country.**

**Because of the very low agricultural potential of the site considered in this report, and other sites in the area which are suitable for renewable energy developments, the cumulative impact of the loss of such land to agriculture, while of more significance than the loss of land to a single development, is still of low agricultural significance.**

### 8.5 Comparative assessment of alternatives

**No proposed technology or grid connection alternatives will have any bearing on agricultural impacts. The no-go alternative has zero impact on agriculture, compared to the low, negative impact for the development.**

## 9 CONCLUSION AND RECOMMENDATIONS

**The proposed development is on land zoned and used for agriculture. 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 investigated site is on land which is of low agricultural potential and is not suitable for cultivation.**

**Because of the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which would preclude authorisation of the proposed development. It is preferable to incur a loss of agricultural land on such a site, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.**

**No agriculturally sensitive areas occur within the proposed site and no part of it is therefore required to be set aside from the development.**

**Because the site is uniformly low potential, from an agricultural point of view, there is no preferred location or layout within the assessed site. There are no conditions resulting from this assessment that need to be included in the environmental authorisation.**

## 10 REFERENCES

**Agricultural Research Council. Undated. AGIS Agricultural Geo-Referenced Information System available at http://www.agis.agric.za/.**

**Fey, M. 2010. Soils of South Africa. Cambridge University Press, Cape Town.**

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

**The World Bank Climate Change Knowledge Portal available at**

**http://sdwebx.worldbank.org/climateportal/**

## APPENDIX 1: SOIL DATA

**Table A1. Land type soil data for site.**

| Land type | Land capability class | Soil series (forms) | Depth (cm) | Clay % A horizon | Clay % B horizon | Depth limiting layer | % of land type |
|---|---|---|---|---|---|---|---|
| Ae4 | 7 | Hutton | 45-100 | 3-6 | 6-8 | ka | 42 |
| | | Mispah | 10-25 | 6-10 | | ka | 40 |
| | | Hutton | 20-60 | 3-6 | 6-9 | R, ka | 10 |
| | | Hutton | 60-120 | 2-4 | 3-6 | ka | 5 |
| Af7 | 7 | Hutton | 60->120 | 2-4 | 4-8 | ka | 58 |
| | | Hutton | >120 | 1-2 | 2-4 | | 40 |

**Land capability classes: 7 = non-arable, low potential grazing land.**

**Depth limiting layers: R = hard rock; ka = hardpan carbonate.**

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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**DETAILS OF SPECIALIST AND DECLARATION OF INTEREST**

| | (For official use only) |
|---|---|
| File Reference Number: | **14/12/16/3/3/2/881** |
| NEAS Reference Number: | **DEAT/EIA** |
| Date Received: | |

Application for integrated environmental authorisation and waste management licence in terms of the-
(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and
(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and
Government Notice 921, 2013

**PROJECT TITLE**

**Proposed 75 MW Photovoltaic Development (PV1) on the Remaining Extent of the Farm Bokpoort 390 near Groblershoop in the !Kheis Local Municipalitly, Northern Cape.**

| | | |
|---|---|---|
| Specialist: | **Private Soil Science Consultant** | |
| Contact person: | **Johann Lanz** | |
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| Postal code: | **7612** | Cell: **082 927 9018** |
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| Professional affiliation(s) (if any) | **South African Council for Natural Scientific Professions; Soil Science Society of SA** | |

| | | |
|---|---|---|
| Project Consultant: | **Golder Associated Africa (Pty) Ltd** | |
| Contact person: | **Marie Schlechter** | |
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| Telephone: | **011 254 4800** | Fax: **086 582 1561** |
| E-mail | **mschlechter@golder.co.za** | |

4.2 The specialist appointed in terms of the Regulations

I, **Johann Lanz**, declare that

General declaration:

- 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 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

**Johann Lanz – Soil Scientist (sole proprietor)**

Name of company (if applicable):

**27 April 2016**

Date: