ENVIRONMENTAL IMPACT ASSESSMENT

PROPOSED CONSTRUCTION AND IMPLEMENTATION OF BLOEMSMOND 5 SOLAR DEVELOPMENT, NEAR UPINGTON, NORTHERN CAPE

APPLICANT: Bloemsmond Solar 5 (Pty) Ltd

AGRICULTURAL ASSESSMENT REPORT
JUNE 2019

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1. INTRODUCTION

Bloemsmond Solar 5 (Pty) Ltd is applying for authorisation to construct a 100 Megawatt PV facility, to be known as Bloemsmond 5 on the Farm Bloemsmond 455, portions 5 and 14. The site is situated in the ZF Mgcawu District of the Northern Cape Province, in the Kai Garib local Municipality and ±25 km west of Upington.Total size of the farm is 4829,8239 ha and the development is calculated to cover 320ha.of this area.

Bloemsmond 5 will connect at 132kV to the Upington MTS, via the 132kV Bloemsmond Collector Substation.

The objectives of this study were to consider possible temporary and permanent impacts on agricultural production that may result from the proposed construction and operation of the PV Power Plant.

2. APPROACH AND METHODOLOGY

The approach was to compile a natural resource database for the study area. This would include all necessary information to determine the agricultural potential and risks for farming on this land unit. The proposed development would then be considered in terms of possible impacts it may impose on agricultural production of the unit and on the surrounding area

The resource data was obtained from published data (AGIS) and then compared to a field survey done on 22-24 May 2019

3. ASSUMPTIONS AND UNCERTAINTIES

Regional information was mainly obtained through a desktop study. Climatic conditions, land use, land type and terrain are readily available from literature, GIS information and satellite imagery. This information was verified by the field survey.

The site was visited during the beginning of the winter season, so that information on summer conditions remains the result of the desktop study.

4. DESCRIPTION OF THE PROPOSED PROJECT

The PV energy facility is to consist of solar photovoltaic (PV) technology, fixed-tilt single-axis tracking- or dual-axis tracking-mounting structures, with a net generating capacity of 100 MW. Associated infrastructure will include:

- On-site switching-station / substation; which will connect at 132kV to the Upington MTS, via the 132kV Bloemsmond Collector Substation.
- Auxiliary buildings (gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);
- Inverter-stations, transformers and internal electrical reticulation (underground cabling);
- Access and internal road network;
- Laydown area;

- Rainwater tanks;
- Perimeter fencing; and
- Security infrastructure.

5. THE POTENTIALLY AFFECTED ENVIRONMENT

This section provides a general description of the immediate environment potentially affected by the construction, operation and closure of the proposed PV power plant.

5.1 Locality

The site is located on the Farm Bloemsmond 455 portions 5 and 14, situated in the ZF Mgcawu District of the Northern Cape Province, in the Kai Garib local Municipality. Access to the site is from the N14, approximately 25km south-west of Upington. The study area is 360 ha with the development footprint approximately 265 ha. See Figure 1 and Figure 2.

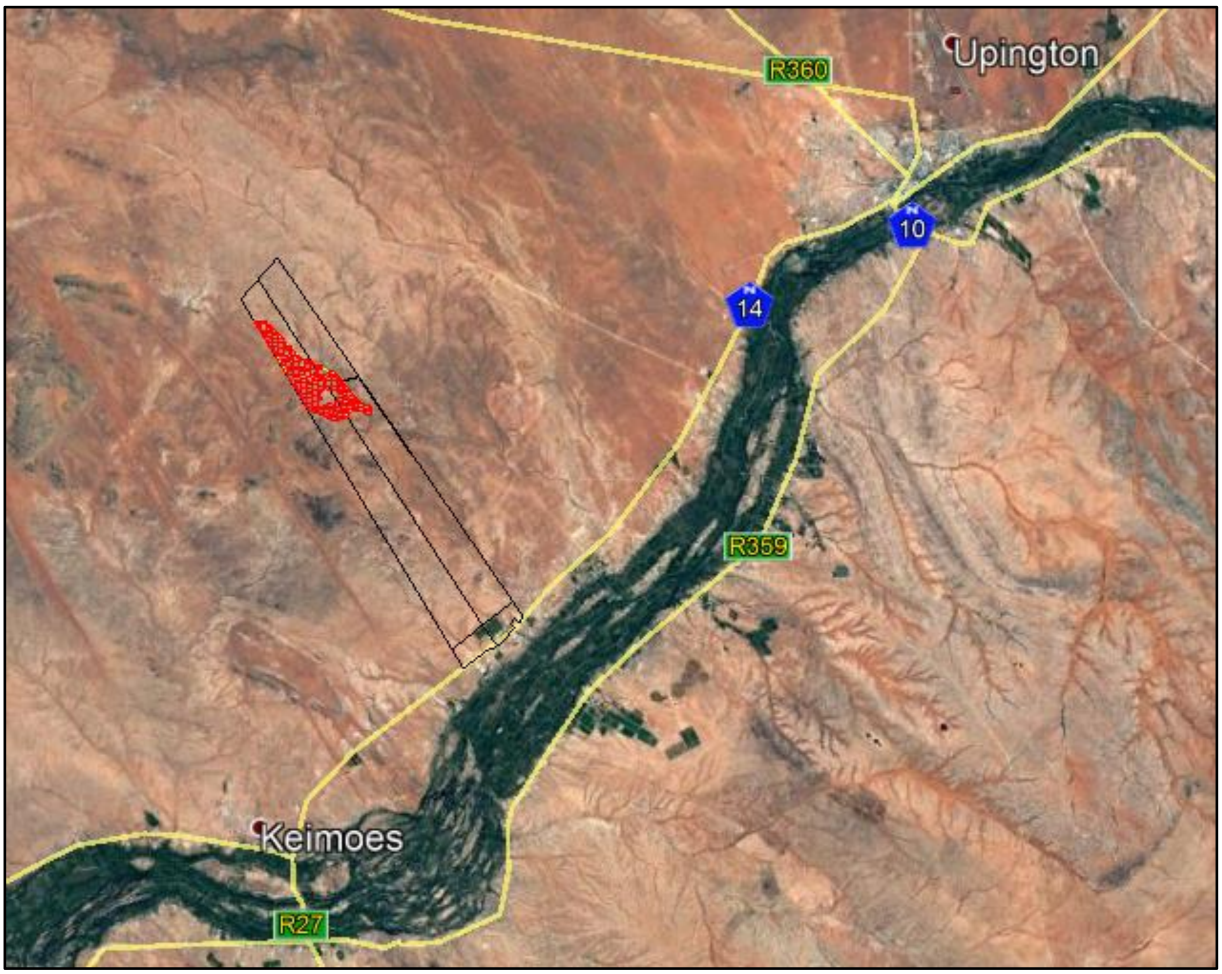
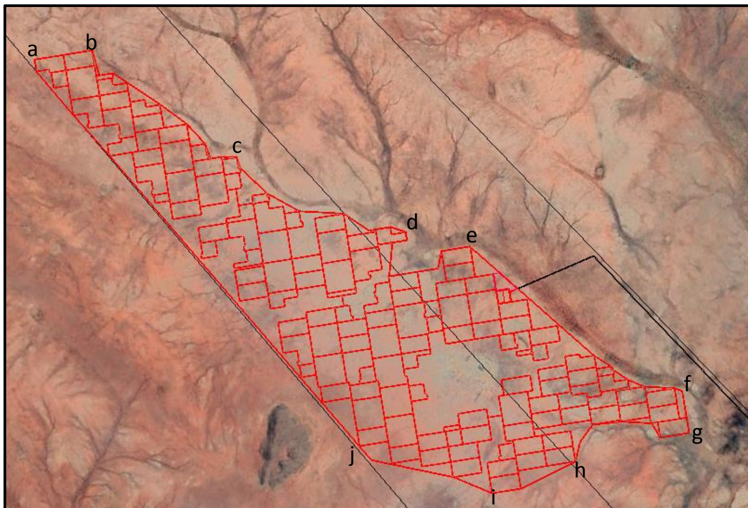


Figure 1: Location of the proposed Bloemsmond 5 PV



Point	Latitude	Longitude
a	28.506472	20.964674
b	28.506273	20.969711
c	28.516496	20.980717
d	28.524135	20.993976
e	28.525681	20.999334
f	28.539081	21.015136
g	28.542255	21.015136
h	28.543128	21.004891
i	28.544404	20.997475
j	28.540537	20.987788

Figure 2: Proposed Layout of Site

With the desktop study using thematic maps with 250 000 scale, the following were noted of the proposed development site.

5.2 Land cover

Characteristic of the environment is the narrow strip known as the Gariep river valley between the physiographic regions Southern Kalahari and Bushmanland – see Figure 3. Intensive cultivation takes place on the alluvial soils in this buffer around the Gariep River. Only extensive livestock farming takes place on the land not in economic reach of the river. Cultivation also is only possible with expensive amelioration of the soils and provision of irrigation.

5.3 Drainage

The site lies in Quaternary catchment D73F of the Gariep River. The effected area is positioned on a lower footslope with level plains as can be seen in Figure 4. The slope gradient is less than 5%. Storm water drains towards two well-defined drainage lines west and east of the site or caught in depressions or small pans.

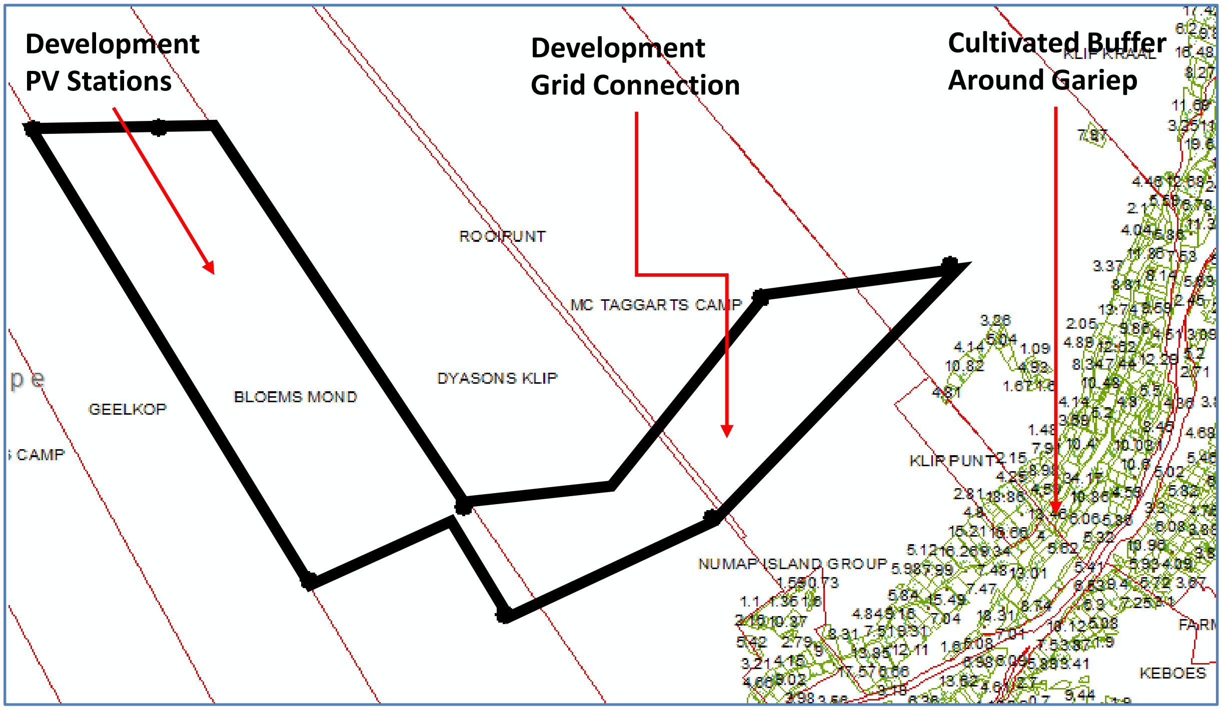


Figure 3: Land cover

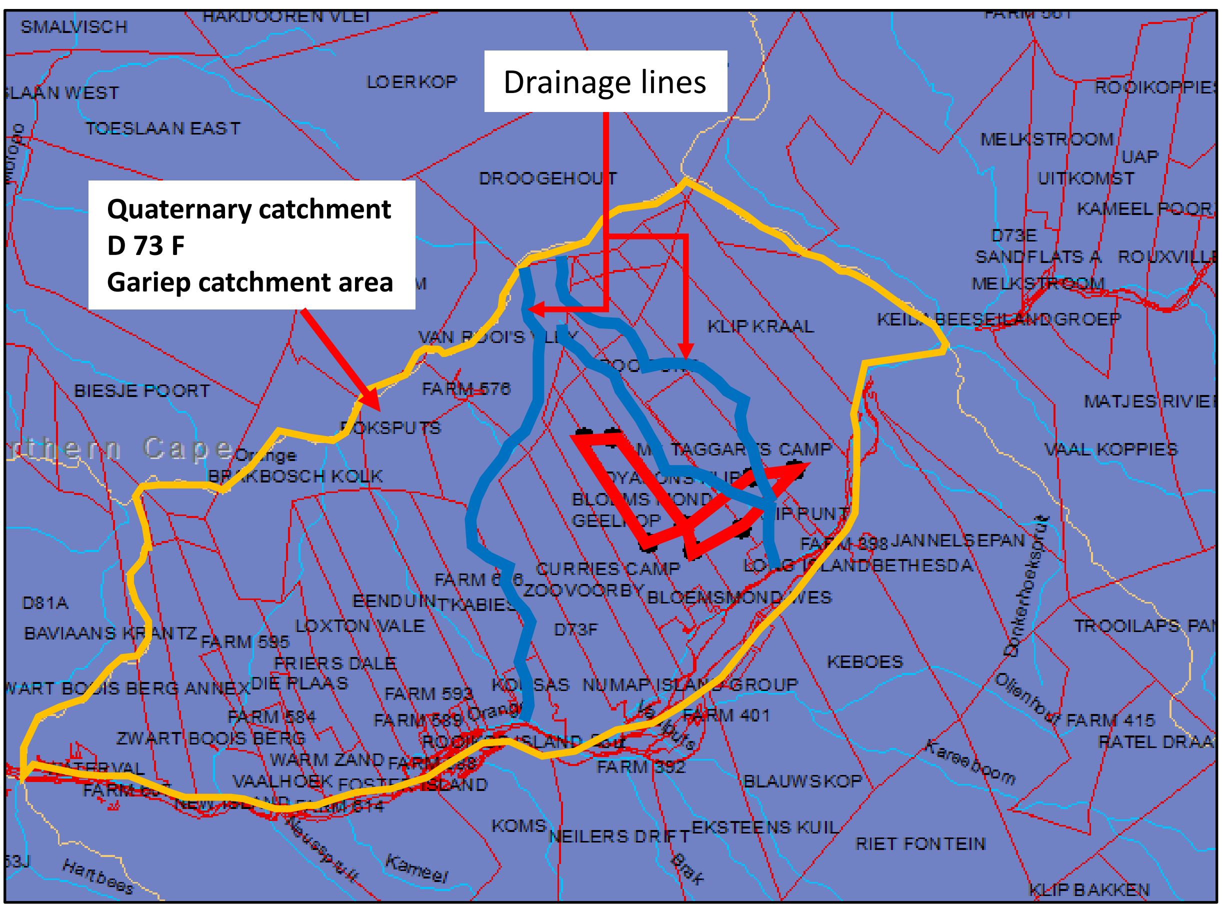


Figure 4: Catchment area

5.3 Vegetation

The site is situated in the Nama Karoo Bushmanland region as indicated in Figure 5. In general, the vegetation is an open shrub land, dominated by small woody shrubs and white Bushman Grass, *Stipagrostis* species. Succulents occur in some areas.

Trees and bigger shrubs are mostly confined to rocky areas, but there are some woody plants on the plains, especially where the soils are shallow, along drainage lines or seasonal watercourses. On the flats, the *Rhigozum* species and *Rhus* species tend to be more common.

The grazing capacity is low at 31 to 35 hectares per large stock unit (LSU). The Normalised Difference Vegetation Index (NDVI) is low.[1]

The area fall in the transition between Kalahari Karroid Shrubland and Bushmanland Arid Grasslands.

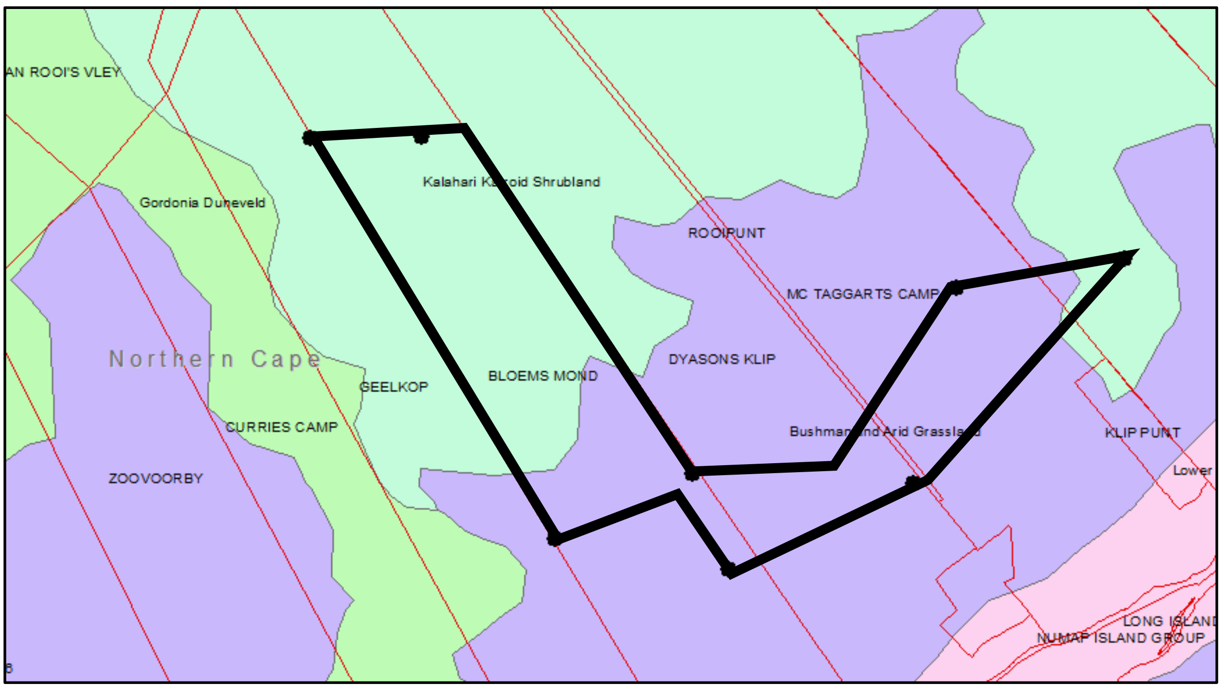


Figure 5: Vegetation map

5.4 Topography

The land surface of South Africa is divided into 22 physiographic regions, according to topography, altitude and surface form. The site lies on the border of The Southern Kalahari and Bushmanland regions, on the Interior Plateau – see Figure 6.

The area consists of level plains with some relief.

[1] *NDVI refers to a mathematical formula applied to satellite imagery to provide information on plant activity or vigour. It is an indicator of active vegetation cover.*

The topography has a slope gradient of less than 5% and a regular shape.

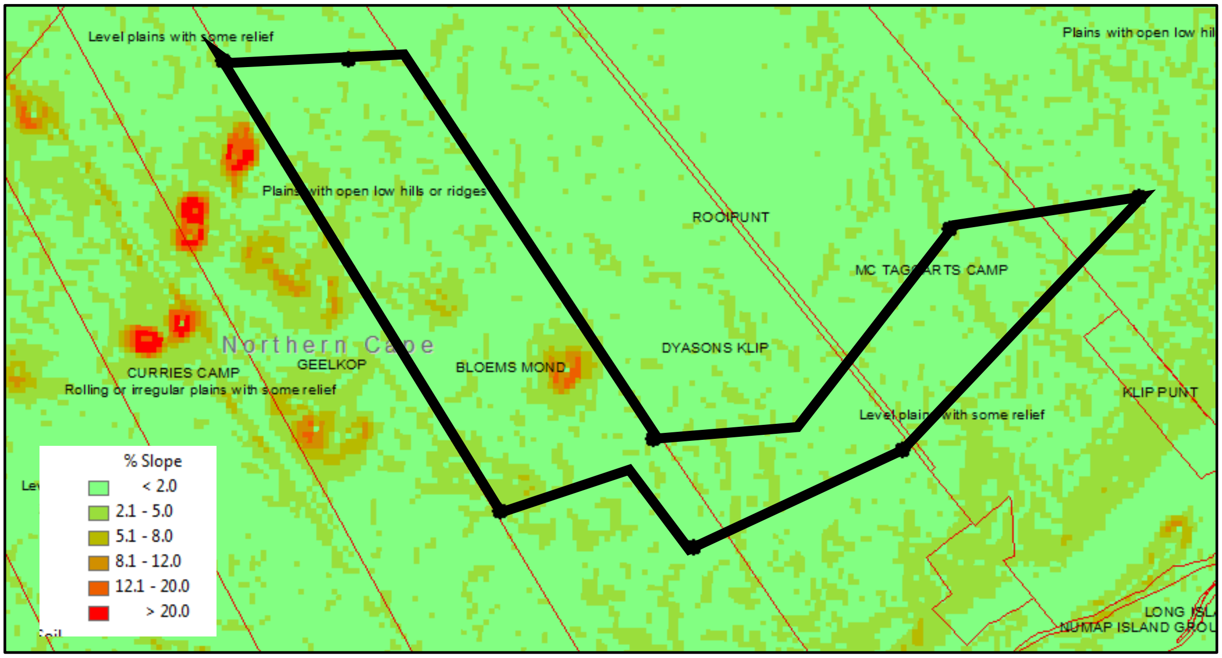


Figure 6: Topographic Map

5.5 Climate

The region is classified as an arid zone with desert climate. Specific parameters are shown in Table 4.

Table 1: Climatic information of the area

Rainfall	
Annual rainfall	0-200mm
Summer rainfall	<62.5mm
Winter rainfall	<62.5mm
Variation in rainfall	40 to 50%
Temperature	
Mean maximum temperature	>35ºC
January Temperature	>27.5ºC
Mean minimum temperature	2-4ºC
July temperature	<7.5ºC
Temperature range	>15ºC
First frost expected	21-31 May
Last frost expected	01-10 September
Hours of sunshine	>80%
Evaporation	>2400mm
Humidity	<30%

5.6 Geology

The area lies in the Kalahari geological group of the Namaqualand metamorphic complex. This is the youngest of the geological groups formed in the past 65 million years.

The lithology (mineralogical composition and texture of rocks) of this area consists of:

Sand

During a very dry period in Southern Africa some 100 000 years ago sand was transported from the Namib dessert by strong and continuous winds and distributed over the Kalahari.

Limestone

Limestone is a sedimentary rock consisting largely of calcium-carbonate, which is usually derived from the shells of minute marine or fresh-water animals. Sand, clay and minerals such as magnesia or iron oxide are also present.

Sedimentary and Volcanic rocks (parent material of soils) found in the area include Migmatite, Schist, Gneiss, Kinzigite and granite.

Soil

Calcic soils are prone to develop under the climatic conditions and geology of the area.

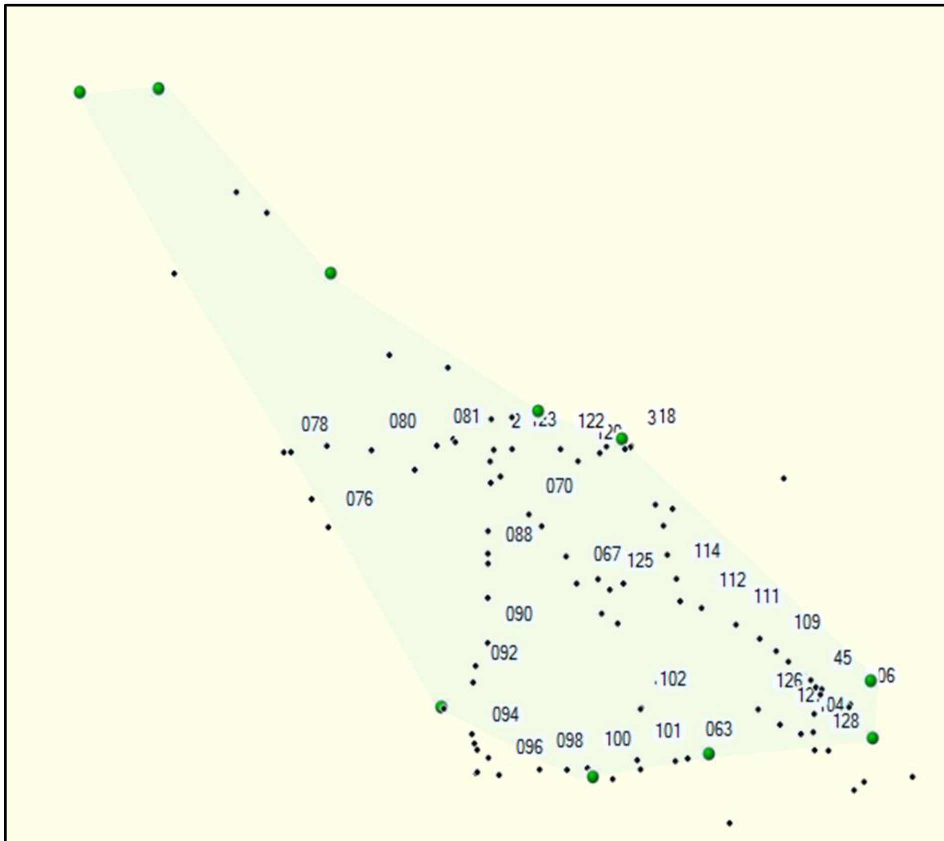
Calcic soils originate in arid climates with the accumulation of secondary lime, forming a distinctive horizon consisting chiefly of calcite. In calcic soils either hardpan carbonate or a soft carbonate horizon or (rarely) gypsic horizon dominates the morphology of the sub-soil.

AGIS indicates the typical profile for soils in this region as follows:

- Soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils;
- Lime generally present in part or most of the landscape;
- Red and yellow well drained sandy soil with high base status;
- Freely drained, structure less soils;
- Favourable physical properties; and
- Soils may have restricted soil depth, excessive drainage, high erodibility and low natural fertility.

On 22-24 May 2019, the site was visited to conduct a field study.

A soil augering survey was carried out, assigning a unique number to each augering point and capturing the physical and morphological information on a coding sheet. The observation points, their coordinates and results are shown in Figure 7.



OBS	LAT	LONG	FORM	FAM	ESD	LTD
63	28.54347	21.00362	Py	1000	70	h
70	28.52995	20.99347	Ms	1000	20	rr
76	28.53066	20.98065	Ms	1000	20	rr
78	28.52651	20.97781	Ms	1000	20	rr
80	28.52639	20.98341	Ms	1000	20	rr
81	28.52614	20.98758	Ms	1000	20	rr
88	28.53267	20.99086	Ms	1000	20	rr
90	28.53707	20.99048	Py	1000	40	h
92	28.53926	20.98991	Ms	1000	20	rr
94	28.54264	20.98999	Ms	1000	20	rr
96	28.54439	20.99156	Ms	1000	20	rr
98	28.54408	20.99415	Ms	1000	20	rr
100	28.54401	20.99722	Ms	1000	20	rr
101	28.54356	21.0004	Ms	1000	20	rr
102	28.54067	21.00068	Py	1000	50	h
104	28.54211	21.01086	Ms	1000	20	rr
106	28.54047	21.01402	Ms	1000	20	rr
110	28.53684	21.00823	Ms	1000	20	rr
111	28.53606	21.00671	Ms	1000	20	rr
112	28.53514	21.00451	Ms	1000	20	rr
114	28.53352	21.0029	Ms	1000	20	rr
118	28.52615	21.00002	Py	1000	70	h
120	28.527	20.99661	Py	1000	40	h
127	28.5418	21.00952	Ms	1000	20	rr

Figure 7: Soil survey

The dominant soil profile is a shallow red sandy top soil, limited by hardpan carbonate and/or rock. See Table 2 and Table 3

Table 2: Dominant Soil Profile

Soil Properties	**A Horizon Topsoil**	**B Horizon Sub-soil**	**C-Horizon Sub-strata**
Texture	Fine sand	0	Rock
Consistency	Loose	Very solid and hard	
Structure	Single grain	Massive	
Colour	Red	Black	
Horizon Depth	200mm	0	
Depth limitation	Rock		
Effective Depth	200mm		
Terrain position	Foot slope		
Geology	Granite		
Slope shape	Undulating		
Slope gradient	2%		
Moisture availability	Low		
Erosion potential	Low		
Soil Form	Mispah		
Soil Family	Myhill		
Veld condition	**Rating**		
Plant cover	Cover is sparse with some bare areas		
Types of grasses most common	Moderate and poor grazing grasses		
Soil surface condition	Moderate levels of topsoil loss		
Bush encroachment level	Medium infestation		
Soil type	Sandy soil		

Table 3: Sub dominant Soil Profile (less than 20% of the area)

Soil Properties	**A Horizon Topsoil**	**B Horizon Sub-soil**	**C-Horizon Sub-strata**
Texture	Very fine sand	Very fine sand	Hardpan Carbonate
Consistency	Loose to very loose	Loose to very loose	
Structure	Single grain	Apedal	
Colour	Red	Red	
Horizon Depth	300mm	500mm	>500mm
Depth limitation	Hardpan Carbonate hard setting		
Effective Depth	500mm		
Terrain position	Foot Slope		
Geology	Granite		
Slope shape	Strait		
Slope gradient	< 5 %		
Moisture availability	Low		

Erosion potential	Low
Soil Form	Plooysburg
Soil Family	Brakkies
Veld condition	**Rating**
Plant cover	Cover is sparse with some bare areas
Types of grasses most common	Moderate and poor grazing grasses
Soil surface condition	Moderate levels of topsoil loss
Bush encroachment level	Medium infestation
Soil type	Sandy soil

In summary, the effective rooting depth and the texture of the soil renders it not suitable for cultivation:

Effective rooting depth

The dominant area surveyed has an effective depth of less than 30cm. The restriction is rock and hard carbonates sub-surface layers. The top surface is also rough with a high level of surface rock. Cultivation is not possible because of these mechanical restrictions.

The root development area is restricted by carbonate hard setting or rock. The stony nature reduces available soil for root development and water retention, and creates a high mechanical risk for agricultural machinery.

Localised observations exceeding 40 cm were found but the area it would represent as a uniform, workable unit, would be less than 9 ha

Texture

The clay content of the top horizon is 6% and the sub-horizon is 6% with medium sand grade. The texture class is sand.

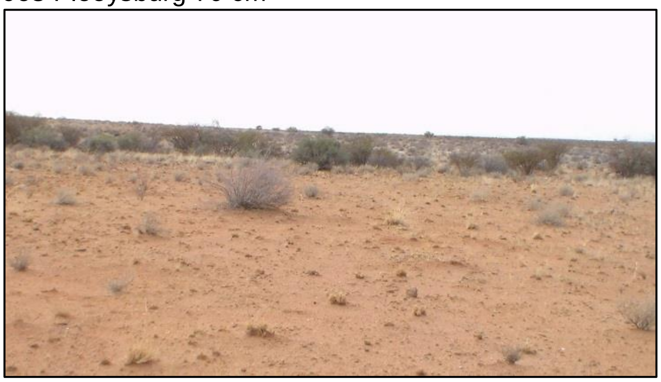
The sand grade of top soil influences the stability and erodibility potential.

A low clay percentage results in low water holding capacity and low nutrient availability, which leads to low soil fertility.

Supporting imagery of the area is shown in Figure 8. Photos were taken at the observation points mentioned in the captions.

063 Plooysburg 70 cm

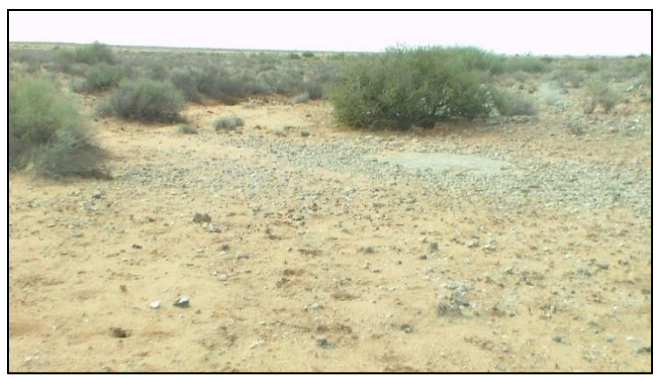
101 Plooysburg 70 cm silt over burden..



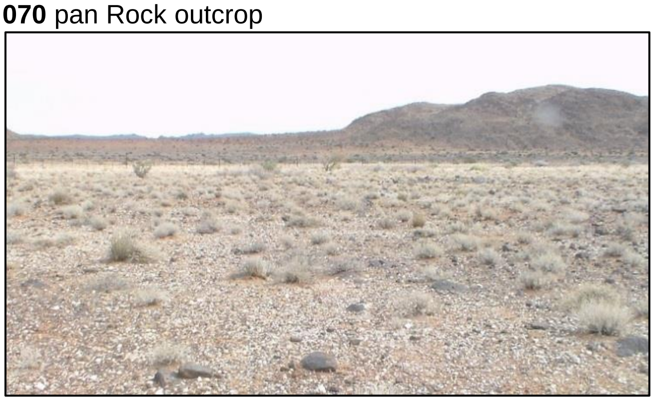
104 Plooysburg 40 cm deep Sparse grazing Large bare areas

88 Hardpan Carbonate surfaces

070 pan Rock outcrop



084 drainage line with Hardpan Carbonate surfaces



096 Stones on shallow soil

110 Abrupt change in vegetation surface carbonate


080 Grazing on 20 cm Mispah


076 Surface carbonate at gate game fence

Figure 8: Imagery of the surveyed area.

6. LAND CAPABILITY FOR AGRICULTURE

Land capability involves considering the risk of land damage from erosion and other causes, the difficulties in cultivation because of physical land characteristics and climatic conditions.

The potential agricultural capability of the site is largely unsuitable for cultivation, based on the natural resources present, including the following limiting factors:

- Low annual rainfall, high evaporation and extreme temperatures restrict dry land cultivation;
- The very shallow soil depth with its limited water holding capacity restricts root development;
- The very fine sand grade of top soil influences the stability and increases erodibility potential; and
- Low clay percentage results in low water holding capacity and low nutrient availability, resulting in low soil fertility.

Erosion Potential

In this arid climate, the erosivity (the potential ability of rain to cause erosion) is low, but the erodability (vulnerability of the soil to erosion) is high due to the low clay percentage and shallow soil depth. Possible erosion caused by water is low, due to the characteristics of the terrain, i.e.:

- Low annual rainfall
- Regular slope of 1.6%
- Length of slope is short
- Small catchment area, because water drain naturally away from the ridge.

The risk of erosion caused by wind is high, due to the low clay percentage of the soil and the fact that the soil is usually dry - therefore prone to blow away. To combat this erosion, vegetation is needed, but the severe climatic conditions prevent possible mechanical conservation measures. However, this erosion risk already exists and the proposed grid connection lines will have a low impact.

The area is adjacent to a dune, which shows the effects of wind erosion (OBS 101).

The land is classified as Capability Class VII, which limits its use largely to pasture, range and woodland. Continuing limitations that cannot be corrected include:

- Severe erosion hazard;
- Stoniness;
- Shallow rooting zone;
- Low water holding capacity; and
- Severe climate.

7. PAST AND CURRENT AGRICULTURAL ACTIVITIES ON SITE AND THE REGION

The site is currently utilised for extensive livestock farming. The livestock comprises of exotic game such as Gemsbok (Oryx gazelle) Springbok with colour variation, Kudu and Boer goat. There is no evidence of past or current cultivation.

There is intensive cultivation of grapes north of the N14, but this would not be economically viable on this site. Reasons are that it is only possible with intensive amelioration of the soil profile and provision of irrigation.

8. STRUCTURES ON SITE

Current structures on site include Game fencing and the remains of a stock watering facility.

9. ASSESSMENT OF ACCESS ROAD AND GRID CONNECTION

9.1 Local Access roads

Access to the site is direct from the N14. Two options are proposed.

Alternative a

Alternative **a** is on the existing alignment used by the owner for access to the property.

Entrance is from the N14, around the vineyard through a gate at OBS 28. The road follows the middle fence (separating portions 5 and 14) up to OBS 31, from where it turns west to OBS 194 and then north to OBS 186.

The dominant soil is a Mispah 1000 with a soil depth of <300 mm. The soil is valued as low potential, due to the low clay content (<10%), loose consistency of top and sub-soil and arid climate.

Plant cover is sparse with large bare areas and poor grasses. Moderate levels of topsoil are lost due to sheet erosion.

Precautionary measures must be taken to mitigate the risk of ground disturbances during construction of the access road. Attention should be given to drainage, water flow and erosion control.

Farming activities are related to cultivation of grapes and farming with livestock (game and goats).

The alignment is such that it will not interfere with vineyard activities. Internal fencing in the grazing area is being demolished to minimise or prevent interruption of livestock management.

Alternative b

Alternative **b** is proposed to run along the eastern border. From the N14, the proposed road will pass along transformed land into extensive grazing camps.

The dominant soil is a Mispah 1000 with a soil depth of <300 mm. The soil is valued as low potential, due to the low clay content (<10%), loose consistency of top and sub-soil and arid climate.

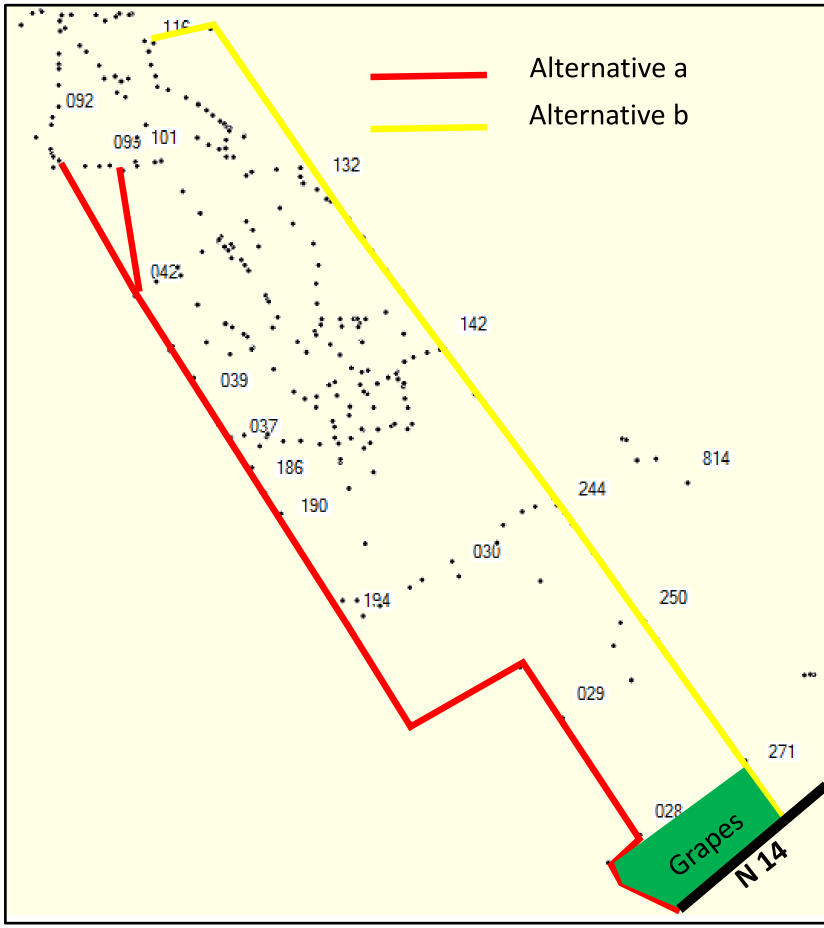
Plant cover is sparse with large bare areas and poor grasses. Some Acacia species exist in this area. Moderate levels of topsoil are lost to sheet erosion.

Precautionary measures must be taken to mitigate the risk of ground disturbances during construction of the access road. Attention should be given to drainage, water flow, erosion, and the existence of *Acacia Eriloba.*

Farming activities relate to farming with livestock (game and goats)

Internal fencing is being demolished to prevent or minimise interruption of livestock farming activities.

The two alternative access roads are shown in Figure 9. Images along the two alternatives (marked with the observation point numbers) are shown in Figure 10.



OBS	LAT	LONG	FORM	FAM	ESD	LTD
28	28.62275	21.0639	Ms	1000	< 35	rr
29	28.60899	21.05365	Ms	1000	< 35	rr
31	28.58014	21.03022	Ms	1000	< 35	rr
37	28.57752	21.01282	Ms	1000	<35	rr
39	28.57211	21.00919	Ms	1000	<35	st
42	28.55936	21.00037	Ms	1000	<35	rr
93	28.54212	20.98983	Ms	1000	<35	st
94	28.54264	20.98999	Ms	1000	<35	st
186	28.58246	21.01619	Py	1000	> 45	h
190	28.58689	21.01921	Ms	1000	< 35	rr
194	28.59803	21.02699	Ms	1000	< 35	rr
116	28.53058	21.00207	Ms	1000	< 35	rr
132	28.54684	2306	Ms	1000	< 35	rr
142	28.56556	210.3893	Ms	1000	< 35	st
145	28.57178	21.04374	Ms	1000	< 35	rr
163	28.57442	21.03489	Py	1000	> 45	h
238	28.57783	21.04842	Ms	1000	< 35	rr
244	28.58486	21.05384	Py	1000	> 45	h
245	28.58619	21.05487	Ms	1000	< 35	rr
246	28.5878	21.0562	Ms	1000	< 35	rr
248	28.59406	21.06098	Ms	1000	< 35	rr
250	28.59769	21.06388	Ms	1000	< 35	rr
252	28.60455	21.06228	Py	1000	> 45	h

Figure 9: Proposed alternative access roads

Alternative a

28 Entrance to site

29 Reservoir and troughs, gate to grazing camps

194 Fence in process of demolition. Shallow soil with surface stones

Alternative b

251 *Acacia erioloba*, degraded grazing

245 Gate, Shallow soil, sparse grazing

163 Deep Plooysburg >70 cm but only local and less than 4 ha

190 Shallow soil, sparse grazing

238

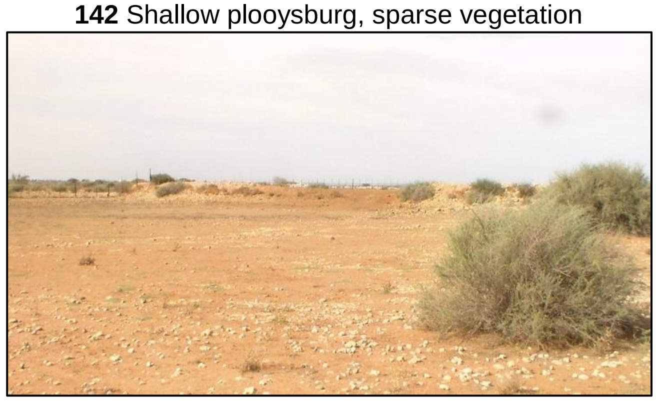
186 Shallow soil, stone surface

145 Shallow soil sparse grazing, surface hard carbonate

037 Shallow stony soil, sparse vegetation

142 Shallow plooysburg, sparse vegetation

042 Shallow soil, hard carbonate surfaces



132 Earth dam, hard carbonate surface

094 Stones, bush, no grass

116 Hard carbonate, change in vegetation

Figure 10: Photos along the access road alternatives

9.2 Grid Connection

The proposed grid connection is with a single circuit 33 kV or 132 kV line from the Bloemsmond 3 substation / switching station to the Bloemsmond Collector Substation on Portion 14 of the Farm Bloemsmond 455.

The alignment will have low interference with agricultural activity as it runs along the boundary fence. With crossing of drainage lines, specific attention to erosion and endangered plant species such as *Acacia Eroiloba* has to be considered.

Two alternatives are suggested.

Alternative a

The alignment follows the approved /constructed Dyasonsklip Substation / switching station on to the Upington MTS.

This alignment will cross the following properties:

- Remainder of Farm Dyasonsklip 454
- Remainder of Farm Rooipunt 617
- Remainder of Farm 638 Tungsten Lodge
- Olyvenhouts Drift Settlement, Agricultural Holding, Holding Number 1080

Soil and vegetation is of very low agricultural value. Predominately the soil is less than 35 cm deep, limited by rock or hard carbonate sub strata with a sandy texture. The plant cover is sparse with large bare areas. Grasses have poor grazing value and medium encroachment of *Rhigozum trichotomum* was noted.

Crossing of riverbeds or drainage lines requires the prevention of erosion and existing *Acacia Erioloba* should be avoided.

Alternative b

This alignment will run southwards along the eastern boundary and then adjacent to the Eskom Aries 400 kV servitude.

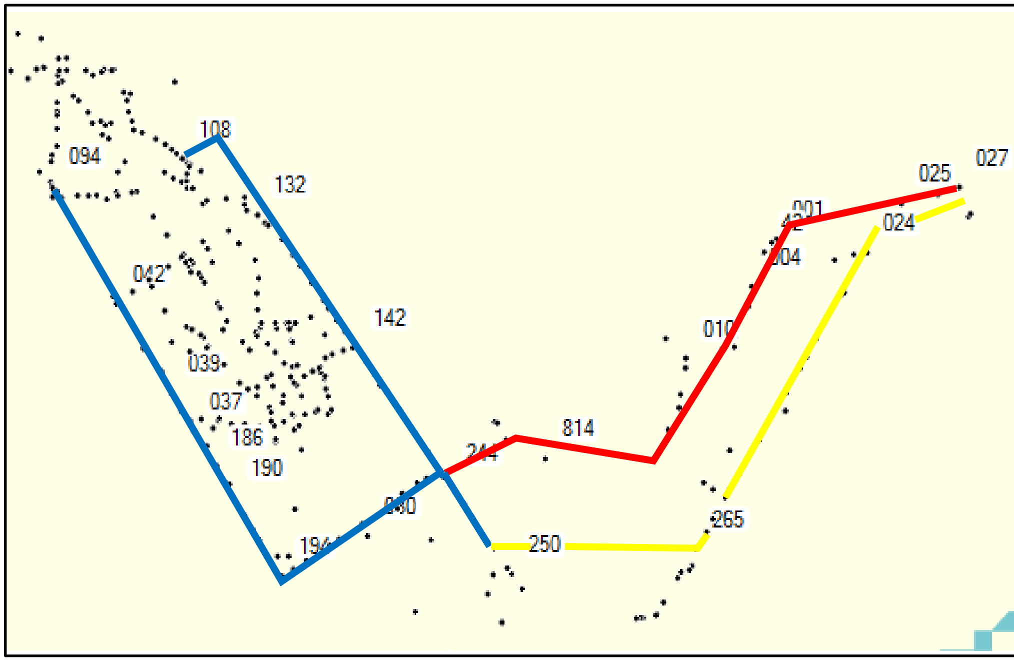
This route will cross the following properties:

- Portion 14 of Farm Bloemsmond 455
- Remainder of Farm Dyasonsklip 454
- Remainder of Farm Rooipunt 617
- Remainder 638 Tungsten Lodge
- Olyvenhouts Drift Settlement Agricultural Holding, Holding Number 1080

As with Alternative a, soil and vegetation is of very low agricultural value. Predominately the soil is less than 35 cm deep, limited by rock or hard carbonate sub strata with a sandy texture. Large areas of surface rocks appear. The plant cover is sparse with large bare areas. Grasses have poor grazing value and medium encroachment of *Rhigozum Trichotomum* were noted

Crossing of riverbeds or drainage lines requires the prevention of erosion and existing *Acacia Erioloba* should be avoided.

Figure 11 shows a map of the proposed alternative alignments and observation points. Photos of the various observation points appear in Figure 12.



OBS	LAT	LONG	FORM	FAM	ESD	LTD
37	28.57752	21.01282	Ms	1000	<35	rr
39	28.57211	21.00918	Ms	1001	<36	rr
42	28.55936	21.00037	Ms	1000	<35	rr
108	28.53882	21.011	Ms	1000	<35	st
186	28.58246	21.01619	Py	1000	> 45	h
190	28.58689	21.01921	Ms	1000	< 35	rr
194	28.59803	21.02699	Ms	1000	< 35	rr
244	28.58486	21.05384	Ms	1000	20	rr
13	28.57413	2109075	Py	1000	40	h
10	28.56711	21.09181	Ms	1000	30	rr
4	28.55692	21.1024	Ms	1000	30	rr
1	28.55022	21.10638	Ms	1000	30	rr
25	28.54523	21.12643	Ms	1000	30	rr
27	28.54286	21.13575	Ms	1000	20	rr
24	28.55218	21.12092	Ms	1000	20	rr
19	28.5685	21.11022	Ms	1000	20	rr
15	28.58366	21.10026	Ms	1000	20	rr
265	28.59408	21.09337	Ms	1000	30	rr
250	28.59769	21.06388	Ms	1000	30	rr

Figure 11: Grid connection alternatives proposed.

Internal connection

094 Stones, bush, no grass

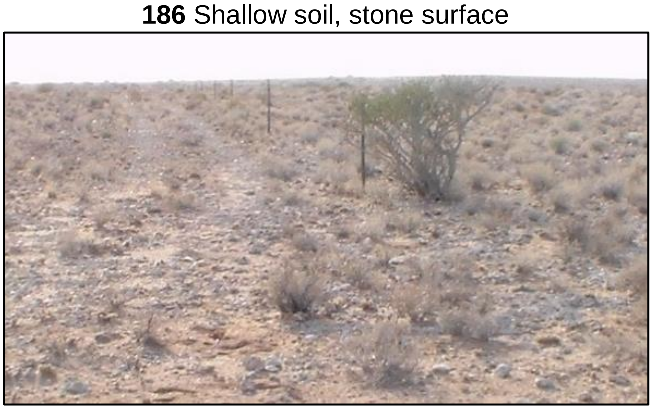
108 Hard carbonate, sparse vegetation

042 Shallow soil, hard carbonate surfaces

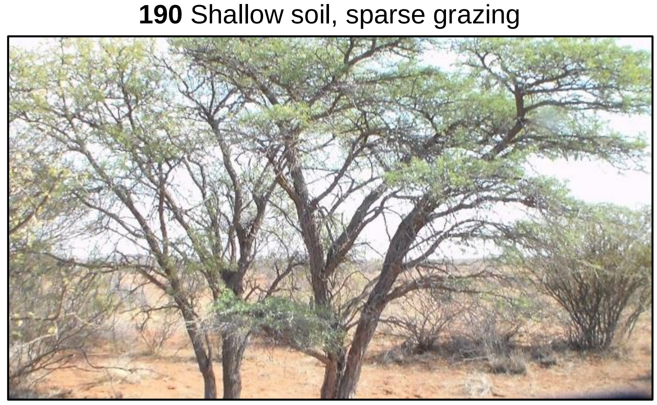
132 Earth dam, hard carbonate surface

186 Shallow soil, stone surface

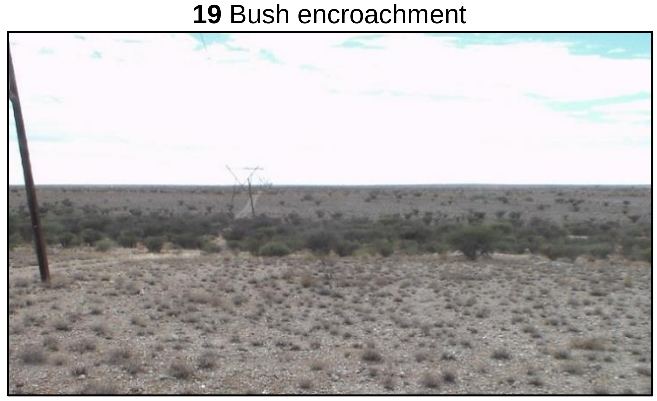
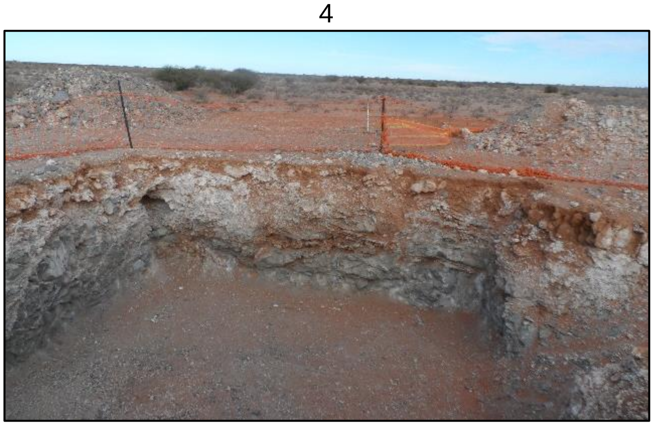
190 Shallow soil, sparse grazing



194



244 Collector station

Alternative a	Alternative b
	
13 Plooysburg 40cm, sheet erosion	**24** Shallow soil, construction transmission line
	
10 Shallow soil, sparse vegetation	**19** Bush encroachment
	
4	**15** Shallow soil, crossing drainage line
	
1 Foundation transmission pole	**265** Shallow soil, rock outcrop

27 Shallow soil, Substation

250 *Acacia Erioloba,* line turns east

Figure 12: Photos along the grid connection alternative routes

10. ASSESSMENT OF PROPOSED DEVELOPMENT

The development proposed is to construct a commercial photovoltaic (PV) solar energy facility (SEF) on ± 320 ha agricultural land. The approximate area that each component of the SEF will occupy is summarised in Table 4.

Table 4: Components of the development

SEF Component	**Estimated Area**	**% of Development Area (320 ha)**	**% of Farm Area** 4829.8239 ha
PV Structures/modules	±250 ha	78%	5.17%
Internal roads	±12 ha	3.75%	0.006%
Auxiliary buildings	±1 ha	0.3%	0.0002%
Substation	±1 ha	0.3%	0.0002%
Other	±5 ha	1.65%	0.001%

From the estimate above, the potential impacts that the facility may have on agricultural development of the farm, are:

10.1 Loss of agricultural land

The total size of the farm is 4829.8239 ha**,** with a carrying capacity of 32 ha /LSU, so 151 large stock units are the maximum animals allowed for sustained grazing on the farm.

The proposed PV facility will have a footprint of 320 ha, which means a loss of 10 large stock units.

10.2 Erosion and change of drainage patterns

With the construction, the removal of vegetation makes the area vulnerable to wind and water erosion. Mitigating measures should be put in place to prevent erosion.

The Bloemsmond 5 Solar facility aims to use either driven / rammed piles, or ground / earth screws mounting systems, which will minimise the clearing of vegetation. **Error! Reference source not ound.** shows a nearby construction site where these methods are used.

Figure 13: Status of vegetation during construction of mounting systems.

To avoid the change of drainage patterns, storm water should be channelled from one side of the road to the other with the lowest risk of blockage possible. This can be accomplished with the use culverts. Figure 14 shows positions where drainage lines will be crossed by the access roads and examples of culverts to be constructed.

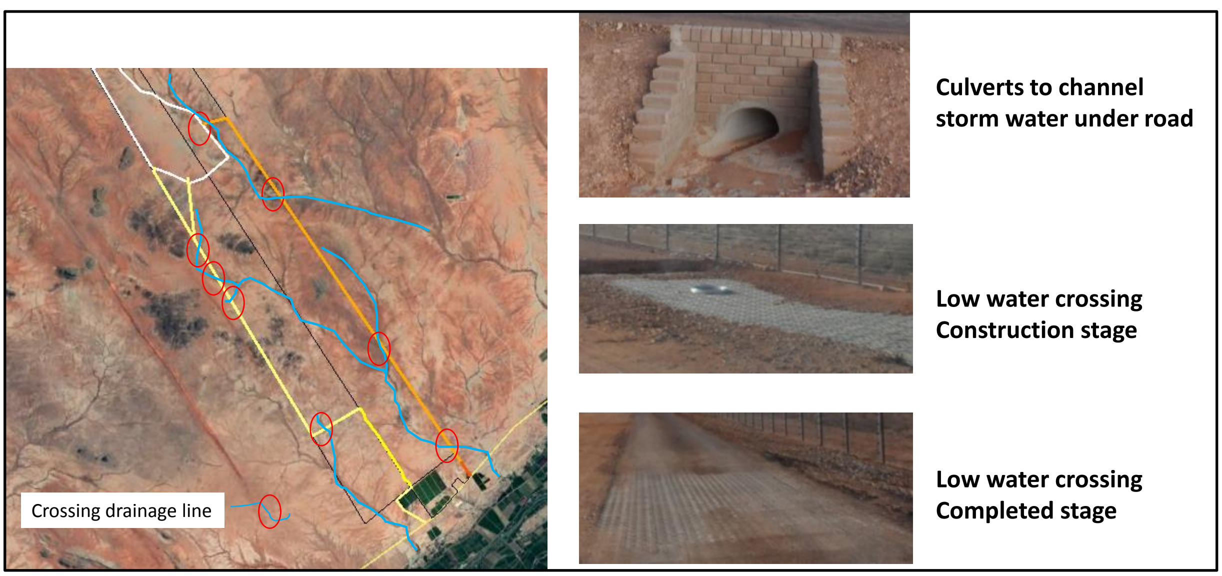


Figure 14: Sensitivity of crossing drainage line

10.3 Pollution

During construction of all the components, possibe spillages of concrete and fuel may pollute the soil.

11. POTENTIAL IMPACTS ON THE AGRICULTURAL ENVIRONMENT

11.1 Methodology to assess impacts

Potential impacts of the proposed project on agriculture were identified and evaluated. Impacts identified through the study were rated in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The duration, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) –assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) -assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long-term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5;
- The magnitude, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment
  - 2 is minor and will not result in an impact on processes
  - 4 is low and will cause a slight impact on processes
  - 6 is moderate and will result in processes continuing but in a modified way
  - 8 is high (processes are altered to the extent that they temporarily cease)
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
  - Assigned a score of 2 is improbable (some possibility, but low likelihood)
  - Assigned a score of 3 is probable (distinct possibility)
  - Assigned a score of 4 is highly probable (most likely)
  - Assigned a score of 5 is definite (impact will occur regardless of any
  - prevention measures)

- the significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the status, which will be described as either positive, negative or neutral,
- the degree to which the impact can be reversed,
- the degree to which the impact may cause irreplaceable loss of resources,
- the degree to which the impact can be mitigated.
- The significance is calculated by combining the criteria in the following formula:

S = (E+D+M)P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

- The significance weightings for each potential impact are as follows:

  - <30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
  - 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
  - >60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

11.2 Possible impacts during construction

Soil pollution with contaminants during the construction phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the construction of all facets of the facility: laydown area, concrete foundations of the auxiliary buildings, inverter stations subterranean cabling, main access and internal service roads.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium Term (2)	Very short (1)
Magnitude	Low (4)	Minor(2)
Probability	Probable (3)	Probable(3)
Significance	**Low (21)**	**Low (12)**
Status (Positive or negative)	Negative	Negative
Reversibility	Partly reversible	Fully reversible
Irreplaceable loss of Resources	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: Refuelling normally takes place in the laydown area. Proactive measures must be taken which include constructing of a designated area where refuelling can take place. This area must have		

an impervious floor with low wall that will keep the spillage inside. This area should be cleaned with absorbent material on a regular basis. The use of cut-off drains must be incorporated to divert upslope clean storm water around the site into a natural drainage system. On the down slope, polluted water must be collected via a cut-off drain into a leachate collection and recovery system. When spillage accidently takes place, it should be removed and replaced with unpolluted soil. The clean soil can be sourced from excavations nearby. The polluted soil must be piled at a temporary storage facility with a firm waterproof base and is protected from inflow of storm water. It must have an effective drainage system to a waterproof spillage collection area. Contaminated soil must be disposed of at a hazardous waste storage facility.
Cumulative impacts: No, site-bound
Residual Risks: Yes, it is impossible to clear the affected area completely.

The establishment of the PV Solar facility will be done at the expense of agricultural land. The area to be lost for agricultural development would be 320ha in size. This includes the area under PV panels, internal service roads and temporary laydown area.		
	Without mitigation	**With mitigation**
Extent	Local – Regional (3)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (39)**	**Low (20)**
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of Resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: The general objective is to position the PV facilities on the lowest potential soil and not in places that may have impact on agricultural activities, drainage lines and places with a sensitive nature, such as protected tree species. Existing road alignments are followed and roads upgraded for use during the lifespan of the facility. With the appropriate planning, the same lifestyle can be maintained during the existence of the facility.		
Cumulative impacts: Impact is low due to agricultural potential of the locally. With increasingly adding of facilities, the impact will become more of significance if not mitigated. .		
Residual Risks: No, after decommissioning this impact will be reversed when rehabilitation has been completed.		

The construction of a PV Solar facility will cause impairment of the land capability with the potential risk of erosion		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (6)	Low (4)
Probability	Probable (3)	Probable (3)

Significance	**Medium(30)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: Clear trees and bushes selectively, leaving grass un-disturbed. Use mechanised machinery when installing posts to eliminate need for foundations. Construct on alternate strips to combat possible erosion.		
Cumulative impacts: No cumulative impacts are expected to occur, as all impacts will be site bounded.		
Residual Risks: No. Effected areas will be rehabilitated, as the impact will only be applicable during construction phase.		

The establishment of the PV Solar facility may alter drainage patterns with construction and cause erosion		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (2)	Long term (2)
Magnitude	Low (2)	Low (2)
Probability	Probable (2)	Probable (2)
Significance	**Low(12)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: Establish structures on the contour. Use grass strips to regulate flow speed		
Cumulative impacts: No, all impacts will be site bounded.		
Residual Risks: No. Effected areas will be rehabilitated when operation has ceased.		

11.3 Possible impacts during operational phase

Soil pollution with contaminants during the operational phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the maintenance of the facility.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long Term (4)	Long Term (4)
Magnitude	Low (2)	Minor(2)
Probability	Probable (2)	Probable(2)
Significance	**Low (14)**	**Low (14)**
Status (Positive or negative)	Negative	Negative
Reversibility	Partly reversible	Fully reversible

Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: Refuelling normally takes place in the workshop of the control building. A designated area for refuelling must be constructed with an impervious floor and low wall that will keep the spillage inside. Any spillage must be cleaned with absorbent material as soon as possible and disposed into clearly marked containers. Where spillage takes place, contaminated soil must be excavated and replaced with unpolluted soil. The contaminated soil should be collected by a licenced landfill contractor.		
Cumulative impacts: No, site-bound.		
Residual Risks: Yes, It is impossible to clear the affected area completely.		

The establishment of the PV Solar facility will be done at the expense of agricultural land. Area to be lost for agricultural development would be 320 ha in size. This includes the area under PV panels, internal service roads and temporary laydown area.		
	Without mitigation	**With mitigation**
Extent	Local – Regional (3)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	improbable (2)
Significance	**Medium (39)**	**Low (20)**
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: The general objective is to position the PV facilities on the lowest potential soil and not in places that may have impact on agricultural activities, drainage lines and places with a sensitive nature. Existing road alignments are followed and roads upgraded for use during the live span of facility. With the appropriate planning, the same live style can be achieved during the lease period of the facility from the land so occupied by the facility.		
Cumulative impacts: Impact is low due to agricultural potential of the locally. With increasingly adding of facilities, the impact will become more of significance if not mitigated. .		
Residual Risks: No, after decommissioning this impact will be reversed when rehabilitation has been completed.		

11.4 Possible impacts during decommissioning phase

All components of the facility should be dissembled and roads demolished. Rehabilitation should focus on:

- Demolish and removal of structures
- Demolish related roads
- Establish cultivation environment
- Stabilisation of erosion

- Reinstall camp fences and stock watering

Soil pollution with contaminants during the decommissioning phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the decommissioning of all facets of the facility: laydown area, demolished concrete foundations of the auxiliary buildings, inverter stations subterranean cabling, main access and internal service roads.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium Term (2)	Very short (1)
Magnitude	Low (4)	Minor(2)
Probability	Probable (3)	Probable(3)
Significance	**Low(21)**	**Low (12)**
Status (Positive or negative)	Negative	Negative
Reversibility	Partly reversible	Fully reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: Refuelling normally takes place in the workshop of the control building. A designated area for refuelling must be constructed with an impervious floor and low wall that will keep the spillage inside. Any spillage must be cleaned with absorbent material as soon as possible and disposed into clearly marked containers. Where spillage takes place, contaminated soil must be excavated and replaced with unpolluted soil. The contaminated soil should be collected by a licenced landfill contractor.		
Cumulative impacts: No, site-bound.		
Residual Risks: Yes, It is impossible to clear the affected area completely.		

12. CUMULATIVE IMPACT ASSESSMENT

There are various renewable energy projects being built along the Gariep buffer, inter alia on the two neighbouring farms Dyasonsklip and Mc Taggarts. These are shown on Figure 15.

To assess the cumulative impacts, maps showing drainage, land capability and land cover are used to identify possible impacts that may accumulate on similar developments within a 30 km radius from this facility – see figure 16.

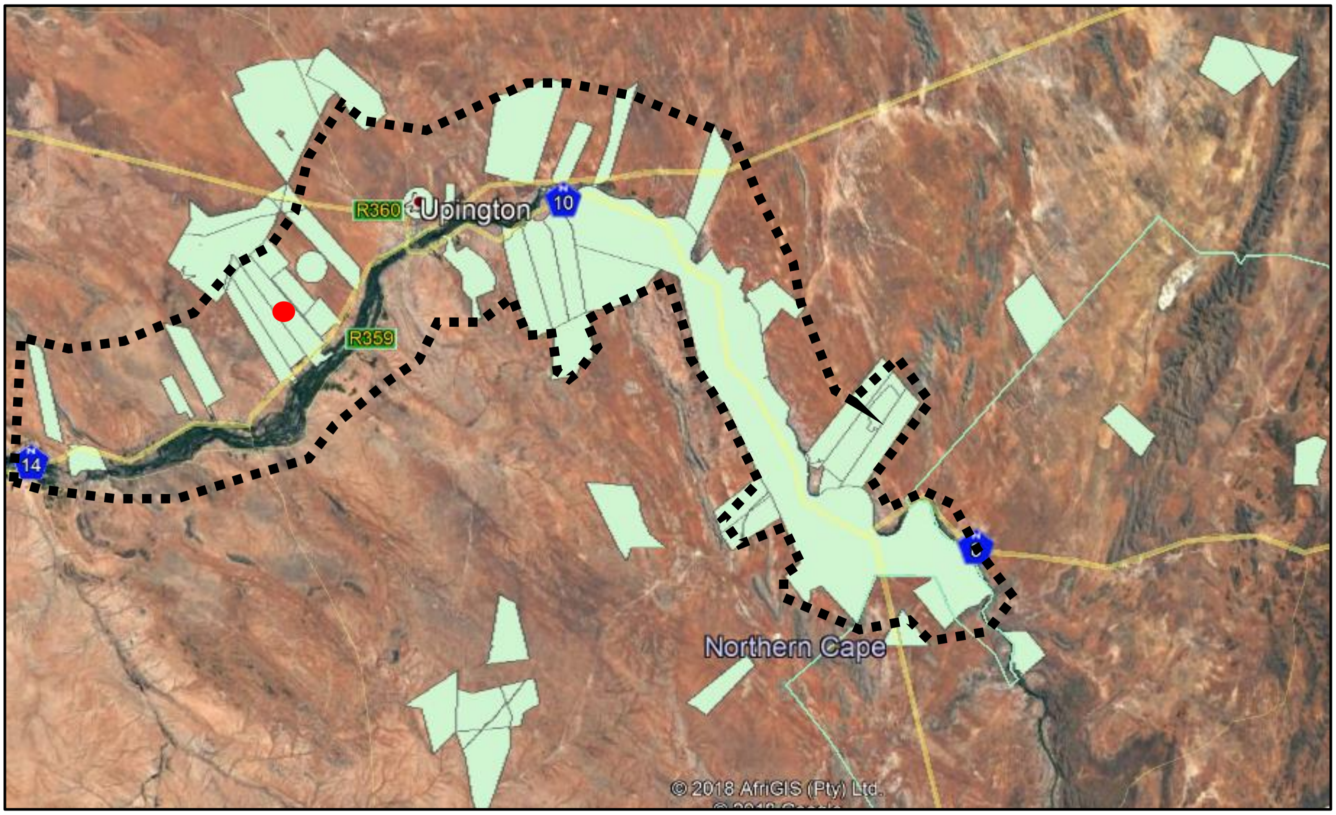


Figure 15: Cumulative impact overview

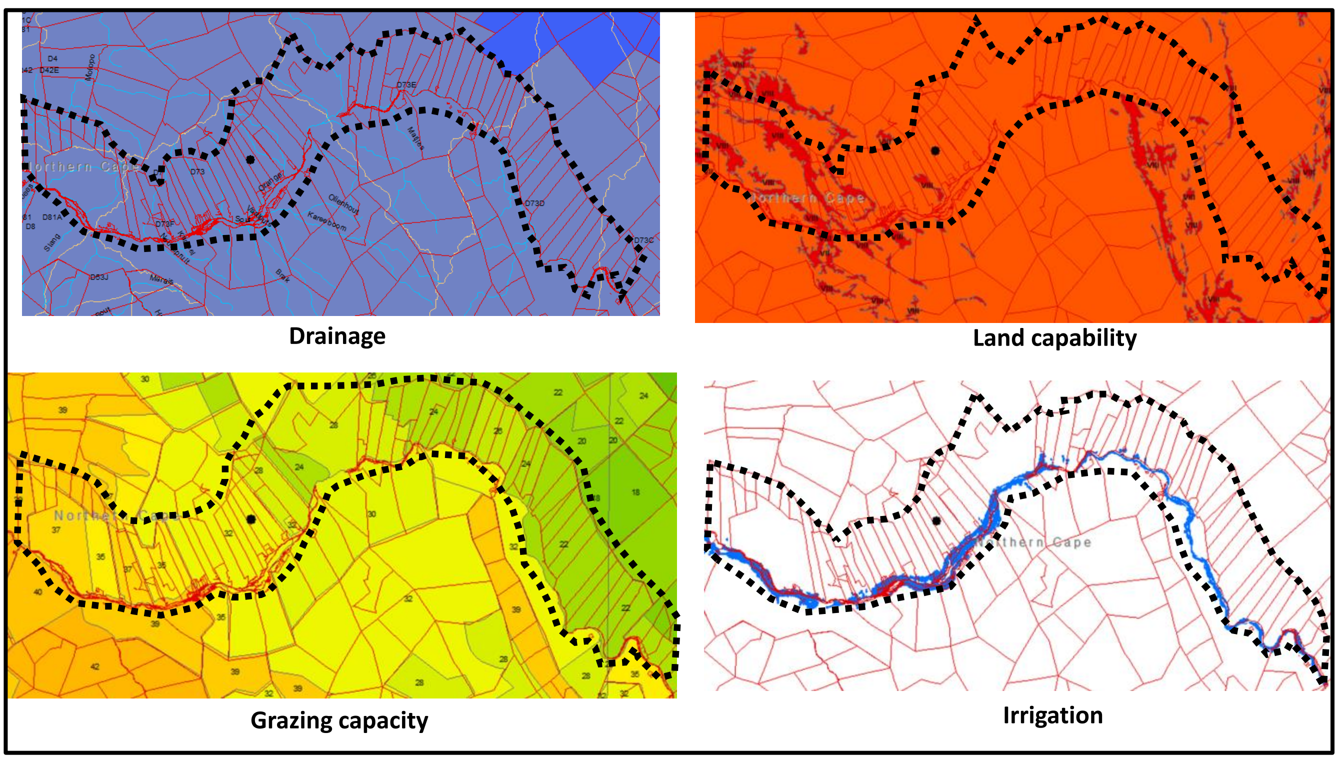


Figure 16: Thematic maps related to Drainage, Land Capability, Grazing Capacity and Irrigation

When investigating the cumulative impact of similar developments, the most common concerns are

- Loss of agricultural land;
- Altering drainage patterns; and
- Changing agricultural character to industrial

12.1 Loss of agricultural land

In Figure 16 the irrigation map shows the cadastral outlay of farms bordering the Gariep River. Each farm has river frontage. The blue buffer shows applied irrigation and also represent land cultivated with the extent of these farms used for extensive grazing

High potential soils are not expected in this region because of the low annual rainfall, high evaporation rate and extreme temperatures. Soils formed under these conditions have little movement of soluble nutrients and insoluble clay particles in the soil profile, restricting the adsorption of nutrients that would be available to plants. The soil is thus low in nutrient availability and has a low response to fertilizer input.

Calcium is another dissolved product of rock that will remain in the soil profile and form a cemented soil when water evaporates in arid conditions. This soil layer limits water movement, root development and poses a mechanical restriction for cultivation.

Cultivation can only done when the soil is ameliorated to enhance effective soil depth and equipped with an irrigation system

The land capability map shows a potential of Capability VII for most of the affected area restricting its use largely to grazing, woodland or wildlife;

The size of the property is approximately 4000 ha. According to the grazing map the carrying capacity ranges from 22 ha/LSU to 32 ha/LSU. With this grazing capacity, the average farm unit has the potential of a 150 LSU

12.2 Altering drainage patterns

The facility will be located in a low rainfall area with level topography and on soil with a very fast infiltration rate, from which a low runoff is expected.

The drainage map shows that only four seasonal rivers are west of Upington and none to the east.

The effect of facilities on the flow direction of the surface runoff will be low. This is because of the multiple drainage lines, each with a small catchment area that will not result in high concentration of runoff water before it can be discharged in the primary drainage line.

12.3 Changing agricultural character to industrial

The land cover has changed over the last years. Previously vineyards were only established south of the N14. Now new vineyards and packaging facilities and outlets for produce appear on the northern side. The agricultural character became more industrial. The facility will have low visibility, being established 10 km from the N14.

Possible impacts

The quantity of available soil for agricultural production decreases as result of the footprints of these facilities. The quality of soil decreases in the way the construction of these structures alters the workability of the soil. This includes the physical deformation in the soil profile.		
	Overall impact of proposed project considered in isolation	**Cumulative impact of the projects in the area**
Extent	Local – Regional (1)	Regional(2)
Duration	Long Term (4)	Long Term (4)
Magnitude	Low(4)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (36)**
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of Resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: Ensure that most infrastructure features are erected on transformed or non-arable land. Implement stormwater management as an integral part of planning and as a guideline for the positioning of structures. Use existing roads and conservation structures to the maximum in the planning and operation phases. Rehabilitate disturbed areas as soon as possible after construction. .		

Clearing of vegetation increases flow speed and a lower infiltration tempo increases silt transport.		
	Overall impact of proposed project considered in isolation	**Cumulative impact of the projects in the area**
Extent	Local (1)	Regional(2)
Duration	Long Term (4)	Long Term (4)
Magnitude	low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (30)**
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: Erosion and sediment control with proper water run-off control planning.		

Chemicals, hazardous substances and waste used or generated during live span of the facility accumulate and Pollute soil will become contaminated		
	Overall impact of proposed project considered in isolation	**Cumulative impact of the projects in the area**
Extent	Local (1)	Regional(2)
Duration	Long Term (4)	Long Term (4)
Magnitude	low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (30)**
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: Appropriate handling and storage of chemicals and hazardous substances and waste should be done.		

13. ENVIRONMENTAL MANAGEMENT PROGRAMME

The following should be included in the Environmental Management Programme:

Objective: Prevent and clean up soil pollution		
Project components	• PV energy facility • Substation; • Access roads; • Power line; • All other infrastructure (site camp, batching plant etc.).	
Potential impact	Pollution of soil by fuel, cement and other toxic materials	
Activity/risk source	Soil will become contaminated	
Mitigation: Target/Objective	All solid waste must be collected at a central location at each construction site and stored temporary until it can be removed to an appropriate landfill site in the vicinity. The target should be to minimise spillages and soil contamination.	
Mitigation: Action/control	**Responsibility** Construction manager Maintenance team	**Timeframe** Lifespan of facility
Performance Indicator	No spillages	
Monitoring	Regular inspections of terrain and various infrastructure units.	

Objective: Conservation of soil		
Project components	• PV energy facility • Substation; • Access roads; • Power line; • All other infrastructure (site camp, batching plant etc.).	
Potential impact	Erosion of revegetated land	
Activity/risk source	Soil get unusable and unproductive	
Mitigation: Target/Objective	Apply conservation measures.	
Mitigation: Action/control	**Responsibility** Construction Manager Maintenance team Environmental manager	**Timeframe** Lifespan of facility
Performance Indicator	No water run-off problems / erosion	
Monitoring	Regular inspections of terrain	

14. CONCLUSION

With reference to applicable sections of the Regulations for Renewable energy in terms of Act 70 of 1970 & Act 43 of 1983, it can be stated that the proposed site will not suffer major agricultural impacts by the development. The reasons include aspects such as soil potential, geology, climate, loss of cultivating land and stock farming and other possible impacts.

The site does not have high potential soil because of the low annual rainfall, high evaporation rate and extreme temperatures. Soils formed under these conditions have little movement of soluble nutrients and insoluble clay particles in the soil profile, restricting the adsorption of nutrients that would be available to plants. The soil is thus low in nutrient availability and has a low response to fertilizer input.

Due to the limiting conditions, the site is classified as Class VII capability, in terms of which it is unsuited for cultivation and restricts utilisation to grazing, woodland or wildlife.

The land is currently used for game and livestock farming. The internal fencing is in the process of demolition, which indicates that farming with game would be the primary activity.

With a farm size of 4829.82 ha and carrying capacity of 32 ha per large stock unit (LSU), only 150 LSU can be carried on this farming unit. Breeding with exotic game such as Sable would be more profitable.

The alignment of access roads and grid connection will have a low impact on the environment if the required mitigation is applied.

The findings of this study indicate that the proposed power facility will have minimal impacts on agriculture, locally and on site, and will have very little influence on the current commercial farming.

Christo Lubbe

C R LUBBE 26 June 2019
AGRICULTURAL SPECIALIST

LIMITATIONS

This Document has been provided subject to the following limitations:

(i) This Document has been prepared for the particular purpose outlined in it. No responsibility is accepted for its use in other contexts or for other purpose.

(ii) CR Lubbe did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. Conditions may exist which were undetectable at the time of this study. Variations in conditions may occur from time to time.

(iii) Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted for incomplete or inaccurate data supplied by others.

(iv) This Document is provided for sole use by the client and its professional advisers and is therefore confidential. No responsibility for the contents of this Document will be accepted to any person other than the Client.

REFERENCES

AGIS, 2015. Agricultural Geo-Referenced Information System.

Ashman MR and Puri G, 2002. *Essential Soil Science*. Blackwell, Oxford.

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

Macintosh EK, 1983. *Rocks, Minerals and Gemstones of Southern Africa*. Struik, Cape Town

Munsell Color, 2009. *Munsell Soil-Color Charts*. Munsell, Washington.

Soil Classification Working Group, 1991. *Soil Classification: A Taxonomic System for South Africa.* Department of Agricultural Development, Pretoria.

Thomas V, Moll E and Grant R, 2008. *Sappi Tree Spotting: Cape –From Coast to Kalahari.* Jacana, Johannesburg

Van der Walt, HvH and Van Rooyen, TH, 1995. *A Glossary of Soil Science*. Soil Science Society of SA, Pretoria

Van Oudtshoorn F, 1994. *Gids tot Grasse van Suid-Afrika*. Briza, Arcadia

KEY QUALIFICATIONS:

National Higher Diploma in Agriculture (Irrigation), Technikon Pretoria, 1982
Certificate in Stereoscopic Interpretation, Geology and Resource Classification and Utilisation, Department of Agriculture, 1979
National Diploma in Agriculture, Technikon Pretoria, 1976

OTHER EDUCATION:

Certificate in Turf Grass Management, Technikon Pretoria, 1987
Certificate in Landscape Management, Technikon Pretoria, 1988
Cultivated pastures (Mod 320), University of Pretoria, 1995
FSC Auditors Course (Woodmark, UK), Sappi Ltd, 2003
NOSA Health and Safety Certificate, 1996
Certificate of Competence: Civil Designer - Design Centre and Survey and Design (Knowledge Base, August 2005)

EMPLOYMENT RECORD:

July 2006 to date	**CR LUBBE** Self employed Involved in various projects (see project related experience).	
June 2004-June 2006	**Gauteng Department of Agriculture Conservation and Environment** (Component: Technology Development and Support) **Acting Assistant Director: Resource Planning and Utilization**	**Johannesburg, SA**
Jan 1997 – May 2004	**CR LUBBE** **Self employed** Involved in various projects (See Project related experience below)	**Pretoria, SA**
1980 to 1996	**Technikon Pretoria** **Lecturer** Teaching Agricultural Engineering and Land Use Planning subjects. Teaching included practical courses, examination and moderation	**Pretoria, SA**
1974 - 1979	**Department of Agriculture (Transvaal Region)** **Senior Extension Technician** Farm Planning, Surveying, Design of soil conservation systems, Agricultural Extension.	**Carolina and Ermelo, SA**

SUMMARY OF EXPERIENCE

Has 42 years of experience in planning and managing natural resources to ensure optimal utilisation, without exploiting such resources to the detriment of future generations.

Fourteen years experience as a soil consultant, doing mainly soil surveys, terrain classification and agricultural potential studies. Reports include a variety of maps and GIS aspects thus play a large role in these surveys and studies.

Seventeen years of lecturing agricultural engineering subjects: Soil Conservation Techniques I, II and III, which dealt with the surveying, design and drawing of soil conservation structures; Farm Planning, which dealt with optimal resource utilization and Agricultural Mechanization, which dealt with the implements and machinery used to mechanize farming.

Ten years experience in the survey, design and supervising the construction of soil conservation structures in the agricultural field, mainly for farm planning.

PROJECT RELATED EXPERIENCE

PROJECTS UNDERTAKEN IN INDIVIDUAL CAPACITY

Cape EA **Apr 2015**
Agricultural Impact Assessment : EIA for the Construction and Operation of two Photovoltaic Power Stations at Kathu in the Northern Cape.

Savannah Environmental **Mar 2015**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Wind Farm near Moorreesburg, Western Cape.

Department of Agriculture, Forestry and Fisheries **Mar 2015**
Eastern Cape Land Capability Verification Survey

Department of Agriculture, Forestry and Fisheries **Dec 2014**
Western Cape Land Capability Verification Survey

Cape EA **Aug 2014**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Upington (RE Cap 5)in the Northern Cape.

Cape EA **Aug 2014**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Postmasburg (RE Cap 5)in the Northern Cape.

Cape EA **Aug 2014**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Upington (Joram) in the Northern Cape.

Cape EA **Aug 2014**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Copperton (RE Cap 5) in the Northern Cape.

Cape EA **Aug 2014**
Agricultural Impact Assessment : EIA for the Establishment of a Cemetery at Zoar, near Ladismith in the Western Cape. .

Cape EA **Aug 2014**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Copperton (RE Cap 5) in the Northern Cape.

Macroplan **Jun 2014**
Agricultural Impact Assessment: Application for rezoning of Agricultural land at Upington (Sweet Sensation), Northern Cape

Macroplan **Mar 2014**
Agricultural Potential Study: Application for change of land use at Upington (McTaggarts), Northern Cape

Agricultural Development Corporation **Jan to March 2014**
Design of Feedlot infrastructure and stock watering systems for Kenana Sugar in Sudan.

Cape EA **Nov 2013**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station in the Richtersveld, Western Cape.

Cape EA **Jul 2013**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Upington in the Northern Cape.

Cape EA **Oct 2012**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station near Danielskuil in the Northern Cape.

Senter360 **Oct 2012**
Agricultural Potential Study for a Food Security Development Units in the Democratic Republic of the Congo.

Africa Livestock Project Development Consortium **Aug 2012**
Agricultural Impact Assessment for the Construction and Operation of a Beef Cattle Handlings Facility for a Sugar Company in Northern Sudan

Van Zyl Environmental Consultants **Mar 2012**
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station in the Northern Cape.

Bushveld Eco Services **Nov 2011**
Design and cost estimate of a stock watering system in the Lephalale disctrict.

WSM Leshika **Sep 2011**
Soil suitability survey for two new upcoming farmers at Vhuawela & Tshoga in the Limpopo Province.

National Department of Agriculture **Aug 2011**
Soil survey investigating soil potential for change of land use at the Levendal Development in the Paarl district, Western Cape.

Van Zyl Environmental Consultants **Mar 2011**
Agricultural Impact Assessment : EIA for the Construction and Operation of four Photovoltaic Power Stations in the Northern Cape.

WSM Leshika **Nov 2010**
Potential assessments and land use plans for four new upcoming farmers in the Limpopo Province.

FP Botha **Apr 2010**
Potential assessments and land use plans for various new Limpopo agricultural development hubs

Golder Associates Africa (Pty) Ltd **May 2009 – Apr 2010**
Potential assessments and Landuse plans for the resettlement of land tenants at Mafube Coal Mine in the Belfast district of the Mpumalanga Province

Sappi **Vryheid, RSA**
Undertook reconnaissance soil surveys on various plantations and farms in the Vryheid and Piet Retief districts to establish forestation potential and evaluation for species choice (covering a total area of 5173 ha).

Environmentek, CSIR **Nelspruit, RSA**
Undertook soil and terrain classification surveys on the Jessievale (8313 ha) and New Agatha (1 700 ha) plantations.

Safcol (Komatieland) **Limpopo Province**
Undertook environmental, soil and terrain classification surveys on the Thatevondo (4 500 ha), Mafela (920 ha) and Mmamatola (1 263 ha) plantations.

Measured Farming **Gabon, Swaziland & RSA**
Undertook soil and terrain classification surveys on Ranch Lope and Ranch Suba in Gabon, Kubuta Farm in Swaziland and on the farms Madikwe in the Limpopo Province and Stoffelsrus in the Free State, South Africa.

Loxton Venn and Associates **Potgietersrus, RSA**
Assess comparative soils and area for relocating Village Ga-Sekhaolelo on Overysel 815LR to Rooibokfontein 812LR and Village Ga-Puka on Swartfontein 818 LR to Armoed on Potgietersrus Platinum Mine.

Department of Water Affairs and Forestry **Gauteng**
GPS survey and alien identification for mapping of Jukskei and Swartspruit areas, as part of the Working for Water Program.

Sustainable Forestry Management Ltd **Limpopo and Mpumalanga**
Participated in a due diligence audit on various SAFCOL plantations in the Limpopo and Mpumalanga Provinces as part of the preparation of a British company's tender to purchase these plantations.

Mustek Engineering **Ghana**
Survey to provide a detailed inventory of the forest resources in 17 specified Forest Reserves in Ghana to develop a practical and operationally sound methodology for monitoring the natural forest resources in Ghana, based on satellite imagery for the Ghana Forestry Commission.

Afrigis Environmental Solutions, Pretoria
Various Soil Surveys and Landuse Plannings – Domestic and Neighbouring Countries

Rural Integrated Engineering, Pretoria
Various Soil Surveys and Landuse Plannings

Africa Land-Use Training, Modimole
Lectures at Basic Farm Planning Course (Limpopo and Gauteng)

Appendix B

Declaration of Independence

CR Lubbe was appointed by Bloemsmond 5 (Pty) Ltd via Cape Environmental Assessment Practitioners (Pty) Ltd, the EAP, to conduct an independent agricultural assessment study for the proposed Bloemsmond 5 PV Power Plant in the Northern Cape.

He is not a subsidiary or in any way affiliated to Bloemsmond 5 (Pty) Ltd.

CR Lubbe also does not have any interest in secondary developments that may arise from the authorisation of the proposed project.

Christo Lubbe

CR Lubbe

26 June 2019