Agricultural Potential Assessment for the Grid Connection Infrastructure for the Great Karoo Cluster of Renewable Energy Facilities

Ubuntu Local Municipality, Northern Cape

January 2022

Client

Prepared by:

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Report Name	**Agricultural Potential Assessment for the Grid Connection Infrastructure for the Great Karoo Cluster of Renewable Energy Facilities**
Submitted to	**Savannah Environmental**
Report Reviewer	**Andrew Husted**
	Mr. Andrew Husted is an aquatic ecologist, specializing in freshwater systems and wetlands, who graduated with a MSc in Zoology. He, is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Mr Husted is an Aquatic, Wetland and Biodiversity Specialist with 12 years' experience in the environmental consulting field. In addition to his ecological working experience, Andrew has experience in agricultural and soil assessments, this includes the consideration of land uses and land cover.
Report Writer	**Ivan Baker**
	Ivan Baker is Cand. Sci Nat registered (119315) in environmental science and geological science. Ivan is a wetland and ecosystem service specialist, a hydropedologist and pedologist that has completed numerous specialist studies ranging from basic assessments to EIAs. Ivan has carried out various international studies following FC standards. Ivan completed training in Tools for Wetland Assessments with a certificate of competence and completed his MSc in environmental science and hydropedology at the North-West University of Potchefstroom.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

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Declaration

I, **Ivan Baker** declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Ivan Baker

Soil Specialist

The Biodiversity Company

January 2022

1 Introduction

Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a 132kV central collector substation and a 132kV double circuit powerline on a site located approximately 35 km south-west of Richmond and 80 km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province. The collector substation that comprises both the Eskom switching station and the IPP's substation is proposed on Portions 0 and 1 of Farm Rondavel 85. One grid corridor has been considered for assessment and placement of the 132kV double circuit powerline.

- Portion 0 of Farm Annex Rondavel 86;
- Portion 1of Farm Uit Vlugt Fontein 265;
- Portion 0 of Farm Wynandsfontein 91;
- Portion 1 of Farm Wynandsfontein 91;
- Portion 3 of Farm Vlekfontein 90;
- Portion 0 of Farm Burgersfontein 92;
- Portion 0 of Farm Nieuwe Fontein 89;
- Portion 1 of Farm Nieuwe Fontein 89;
- Portion 1 of Farm Rondavel 85;
- Portion 0 of Farm Rondavel 85;
- Portion 0 of Farm Kleinfontein 93;
- Portion 1 of Farm Bult & Rietfontein 96; and
- Remaining Extent of Portion 3 of Farm Schietkuil.

The entire extent of the site falls within the Central Corridor of the Strategic Transmission Corridors. The grid connection infrastructure is known as the Great Karoo Electrical Grid Infrastructure (EGI). The Biodiversity Company was appointed by Savannah Environmental (Pty) Ltd (Savannah) to undertake a freshwater ecology baseline and impact for the Great Karoo EGI.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017), as amended, of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the published Government Notices (GN) 320 in terms of NEMA, dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation" (Reporting Criteria).

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making.

1.1 Project Description

The development of the 132kV central collector substation and 132kV powerline is required to enable the connection for the Great Karoo Cluster of Renewable Energy Facilities, which comprises three (3) 100MW solar photovoltaic (PV) energy facilities, and two (2) 140MW wind farms, to the national grid for the evacuation of the generated electricity. The connection point into the national grid will be the existing Eskom Gamma Substation.

The projects which the proposed grid connection infrastructure will facilitate the grid connection for are known as:

- Angora Wind Farm;
- Merino Wind Farm;
- Nku Solar PV Energy Facility;
- Moriri Solar PV Energy Facility; and
- Kwana Solar PV Energy Facility.

Details of the proposed grid connection infrastructure are provided in the table below:

Corridor width (for assessment purposes)	**One grid connection corridor has been identified for the assessment and placement of the grid connection infrastructure. The grid connection corridor comprises a 1km wide powerline corridor to allow for avoidance of environmental sensitivities, and suitable placement within the identified preferred corridor. Therefore, the entire corridor is being proposed for the development provided the infrastructure remains within the assessed corridor and environmental sensitivities within this corridor are avoided.**
Powerline capacity	580MVA at 132kV (double-circuit)
Tower height	Up to 32m
Powerline servitude width	Up to 40m
Length of powerline corridor	Collector Sub – Gamma ~ 37.5km
Development footprint of the Collector Substation (including the Eskom switching station)	1000mx700m
Capacity of the Collector Substation	580MVA at 132kV

1.2 Scope of Work

The following tasks were completed in fulfilment of the terms of reference for this assessment:

- To conduct a soil assessment which includes a description of the physical properties which characterise the soil within the proposed area of development of the relevant portions of the affected properties;
- Using the findings from the soil assessment to determine the existing land capability/potential and current land use of the entire surface area of the relevant portions of the project area;
- To determine the sensitivity of the baseline findings;
- The soil classification was done according to the Taxonomic Soil Classification System for South Africa, 1991. The following attributes must be included at each observation:
    - Soil form and family (Taxonomic Soil Classification System for South Africa, 1991);

  - Soil depth;
  - Estimated soil texture;
  - Soil structure, coarse fragments, calcareousness;
  - Buffer capacities;
  - Underlying material;
  - Current land use; and
  - Land capability.
- To complete an impact statement;
- Discussing the feasibility of the proposed activities;
- Confirmation that no agricultural segregation will take place and that all options have been considered to avoid segregation; and
- Recommend relevant mitigation measures to limit all associated impacts.

1.3 Limitations

The following limitations are relevant to this agricultural compliance statement;

- It has been assumed that the extent of the properties to be assessed together with the locations of the proposed components are correct and final;
- The assessment area was based on the area provided by the client and any alterations to the route and/or missing GIS information pertaining to the assessment area would have affected the area surveyed; and
- The handheld GPS used potentially could have inaccuracies up to 5 m. Any and all delineations therefore could be inaccurate within 5 m.

2 Expertise of the Specialists

2.1 Andrew Husted

Mr. Andrew Husted is an aquatic ecologist, specializing in freshwater systems and wetlands, who graduated with a MSc in Zoology. He is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Mr Husted is an Aquatic, Wetland and Biodiversity Specialist with 12 years' experience in the environmental consulting field. In addition to his ecological working experience, Andrew has experience in agricultural and soil assessments, this includes the consideration of land uses and land cover.

2.2 Ivan Baker

Ivan Baker is Cand. Sci Nat registered (119315) in environmental science and geological science. Ivan is a wetland and ecosystem service specialist, a hydropedologist and pedologist that has completed numerous specialist studies ranging from basic assessments to EIAs. Ivan has carried out various international studies following FC standards. Ivan completed training in Tools for Wetland Assessments with a certificate of competence and completed his MSc in environmental science and hydropedology at the North-West University of Potchefstroom.

3 Literature Review

3.1 Land Capability

According to Smith (2006), the capability of land concerns the wise use of land to ensure economical production on a sustained basis, under specific uses and treatments. The object of land classification is the grouping of different land capabilities, to indicate the safest option for use, to indicate permanent hazards and management requirements. These land capability classes decrease in capability from I to VIII and increase in risk from I to VIII. DAFF (2017) further defines land capability as "*the most intensive long-term use of land for purposes of rainfed farming, determined by the interaction of **climate, soil** and **terrain**.*

DAFF (2017) has further modelled the land capability on a rough scale for the entire of South Africa and has divided these results into 15 classes (see Table 3-1). Terrain, climate and soil capability was used as the building blocks for this exercise to ensure a national land capability data set.

Table 3-1 Land Capability (DAFF, 2017)

Land Capability Class (DAFF, 2017)	Description of Capability
1	Very Low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	
14	Very High

	15

It is worth noting that this nation-wide data set has some constraints of its own. According to DAFF (2017), inaccuracies and the level of detail of these datasets are of concern. Additionally, the scale used to model these datasets are large (1:50 000 to 1:100 000) and is not suitable for farm level planning. Furthermore, it is mentioned by DAFF (2017) that these datasets should not replace any site-based assessments given the accuracies perceived.

4 Methodology

The pedology assessment was conducted using the Provincial and National Departments of Agriculture recommendations. The assessment was broken into two phases. Phase 1 was a desktop assessment to determine the following:

- Historic climatic conditions;
- The base soils information from the land type database (Land Type Survey Staff, 1972 - 2006); and
- The geology for the proposed project site.

Phase 2 of the assessment was to conduct a soil survey to determine the actual agricultural potential. During this phase the current land use was also surveyed.

4.1 Desktop Assessment

As part of the desktop assessment, baseline soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types.

4.2 Agricultural Potential Assessment

Land capability and agricultural potential will be determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes.

Land capability is divided into eight classes and these may be divided into three capability groups. Table 4-1 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use and sensitivity increases from class I to class VIII (Smith, 2006).

Table 4-1 Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use	Land Capability Groups

I	W	F	LG	MG	IG	LC	MC	IC	VIC	
II	W	F	LG	MG	IG	LC	MC	IC		**Arable Land**
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						
VI	W	F	LG	MG						**Grazing Land**
VII	W	F	LG							
VIII	W									**Wildlife**

W - Wildlife	**MG - Moderate Grazing**	**MC - Moderate Cultivation**
F- Forestry	**IG - Intensive Grazing**	**IC - Intensive Cultivation**
LG - Light Grazing	**LC - Light Cultivation**	**VIC - Very Intensive Cultivation**

Land capability has been classified into 15 different categories by DAFF (2017) which indicates the national land capability category and associated sensitivity related to soil resources. Given the fact that ground truthing and DSM exercises have indicated anomalies in the form of high sensitivity soil resources (which was not indicated by the DAFF (2017) raster file), the ground-truthed baseline delineations and sensitivities were used for this assessment rather than that of DAFF (2017).

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 4-2. The final land potential results are then described in Table 4-3. These land potential classes are regarded as the final delineations subject to sensitivity, given the comprehensive addition of climatic conditions as those relevant to the DAFF (2017) land capabilities. The main contributors to the climatic conditions as per Smith (2006) is that of Mean Annual Precipitation (MAP), Mean Annual Potential Evaporation (MAPE), mean September temperatures, mean June temperatures and mean annual temperatures. These parameters will be derived from Mucina and Rutherford (2006) for each vegetation type located within the relevant project area. This will give the specialist the opportunity to consider micro-climate, aspect, topography etc.

Table 4-2 The combination table for land potential classification

Land capability class	**Climate capability class**							
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7

VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 4-3 The Land Potential Classes.

Land potential	Description of land potential class
L1	Very high potential: No limitations. Appropriate contour protection must be implemented and inspected.
L2	High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L3	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L4	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.
L5	Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall.
L6	Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L7	Low potential: Severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L8	Very low potential: Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable

4.3 Climate Capability

According to Smith (2006), climatic capability is determined by taking into consideration various steps pertaining to the temperature, rainfall and Class A-pan of a region. The first step in this methodology is to determine the Mean Annual Precipitation (MAP) to Class A-pan ratio.

Table 4-4 Climatic capability (step 1) (Scotney et al., 1987)

Climatic Capability Class	Limitation Rating	Description	MAP: Class A-pan Class
C1	None to Slight	Local climate is favourable for good yields for a wide range of adapted crops throughout the year.	0.75-1.00
C2	Slight	Local climate is favourable for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperature increase risk and decrease yields relative to C1.	0.50-0.75
C3	Slight to Moderate	Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops.	0.47-0.50
C4	Moderate	Moderately restricted growing season due to the occurrence of low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3.	0.44-0.47
C5	Moderate to Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops at risk of some yield loss.	0.41-0.44
C6	Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops that frequently experience yield loss.	0.38-0.41
C7	Severe to Very Severe	Severely restricted choice of crops due to heat and moisture stress.	0.34-0.38
C8	Very Severe	Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.	0.30-0.34

In the event that the MAP: Class A-pan ratio is calculated to fall within the C7 or C8 class, no further steps are required, and the climatic capability can therefore be determined to be C7 or C8.

In cases where the above-mentioned ratio falls within C1-C6, steps 2 to 3 will be required to further refine the climatic capability.

Step 2

Mean September temperatures;

- <10℃ = C6;
- 10 - 11℃ = C5;
- 11 - 12℃ = C4;
- 12 - 13℃ = C3; and
- >13℃ = C1.

Step 3

Mean June temperatures;

- <9℃ = C5;
- 9 - 10℃ = C4;
- 10 - 11℃ = C3; and
- 11 - 12℃ = C2.

4.4 Current Land Use

A generalised land-use will be derived for the larger project area considering agricultural productivity.

- Mining;
- Bare areas;
- Agriculture crops;
- Natural veld;
- Grazing lands;
- Forest;
- Plantation;
- Urban;
- Built-up;
- Waterbodies; and
- Wetlands.

5 Desktop Findings

5.1 Climate

This region's climate is characterised by rainfall during autumn and summer months which peaks at a Mean Annual Precipitation (MAP) ranging from 180 to 430 mm (from west to east respectively). This area is characterised by a high frost occurrence rate ranging from just below 30 to 80 days per year (Mucina and Rutherford, 2006). The mean minimum and maximum temperatures in Middelburg area -7.2℃ and 36.1℃ for July and January respectively (also see Figure 5-1 for more information).

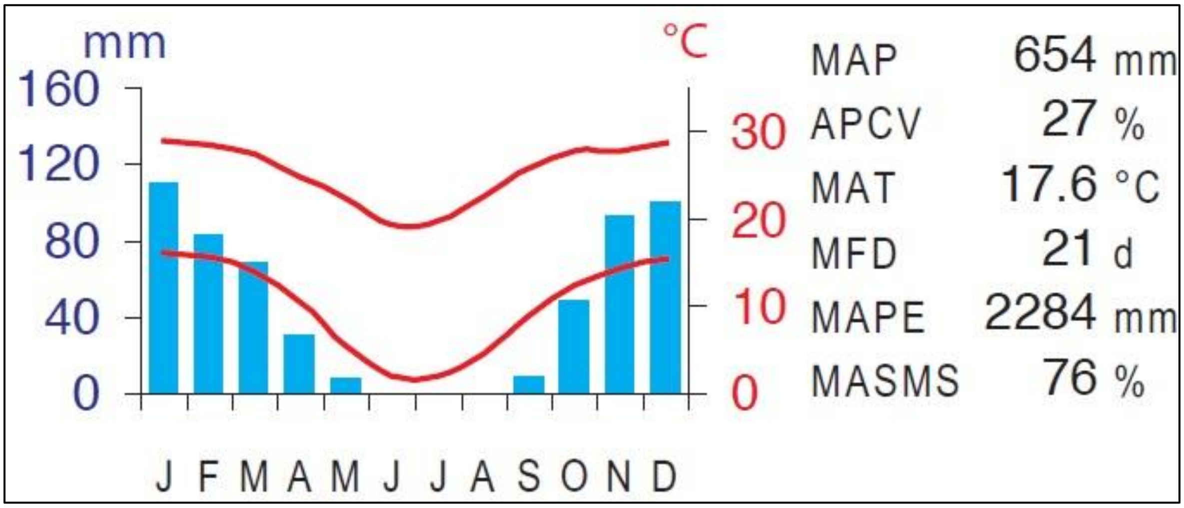

Figure 5-1 Climate for the region

5.2 Soils and Geology

The geology of this area is characterised by sandstones and mudstones from the Beaufort Group (including the Tarkastad and Adelaide Subgroups) which supports pedocutanic and prismacutanic diagnostic horizons. Dominant land types include Fb and Fc land types (Mucina and Rutherford, 2006).

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Da 76, Da 147, Fb 485, Fb 488, Ib 397 land types (see Figure 5-2). The Da land type is characterised by prismacutanic and/or pedocutanic horizons with the possibility of red apedal B-horizons occurring. The Fb land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is generally present within the entire landscape. The Ib land type consists of miscellaneous land classes, including rocky areas with miscellaneous soils.

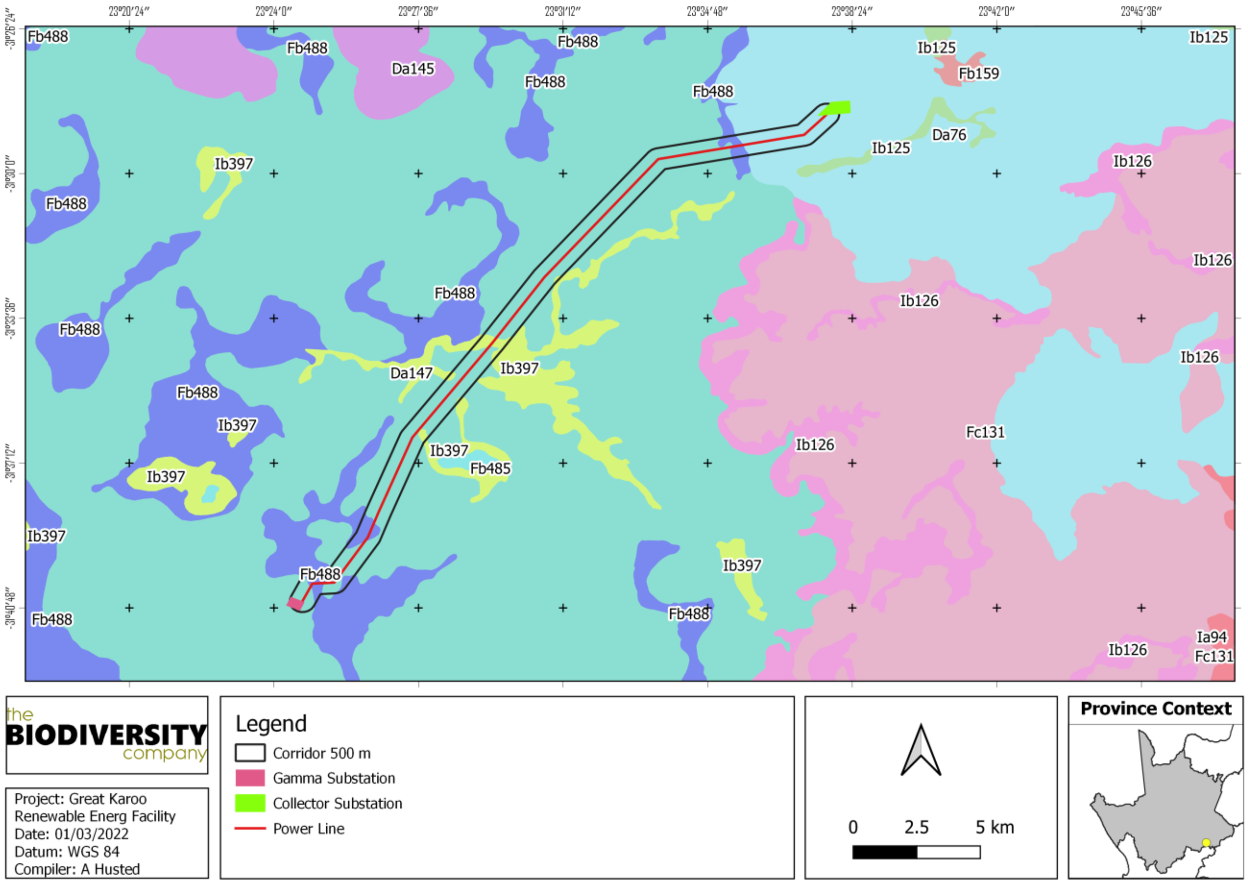

Figure 5-2 Land Types present within the project area

The land terrain units for the featured land types are illustrated from Figure 5-3 to Figure 5-6 with the expected soils listed in Table 5-1 to Table 5-4.

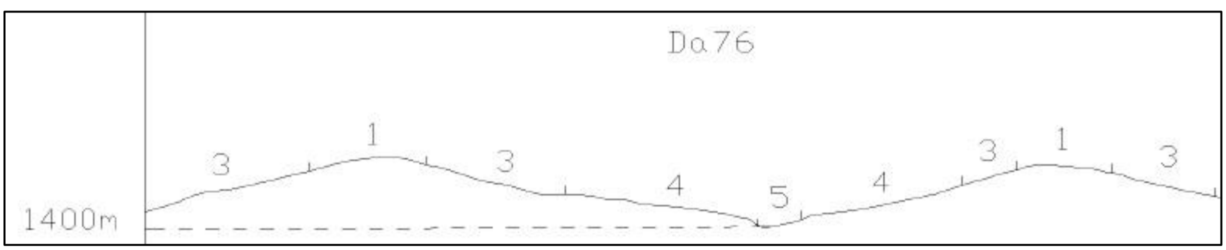

Figure 5-3 Illustration of land type Da 76 terrain unit (Land Type Survey Staff, 1972 - 2006)

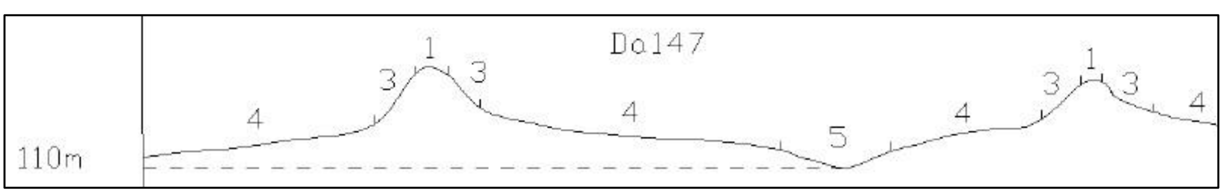

Figure 5-4 Illustration of land type Da 147 terrain unit (Land Type Survey Staff, 1972 - 2006)

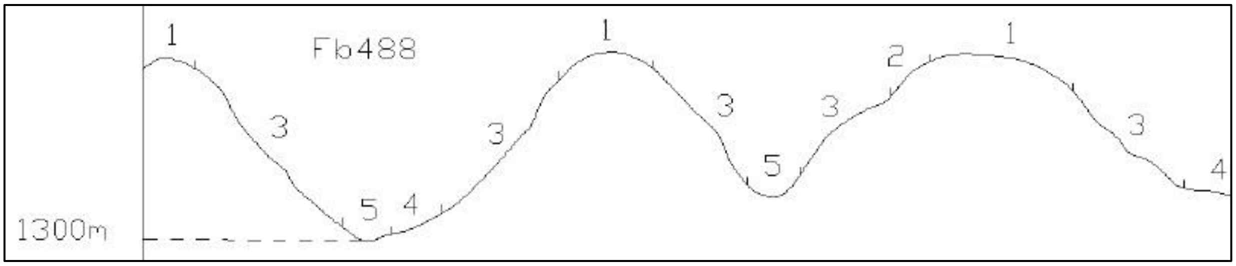

Figure 5-5 Illustration of land type Fb 488 terrain unit (Land Type Survey Staff, 1972 - 2006)

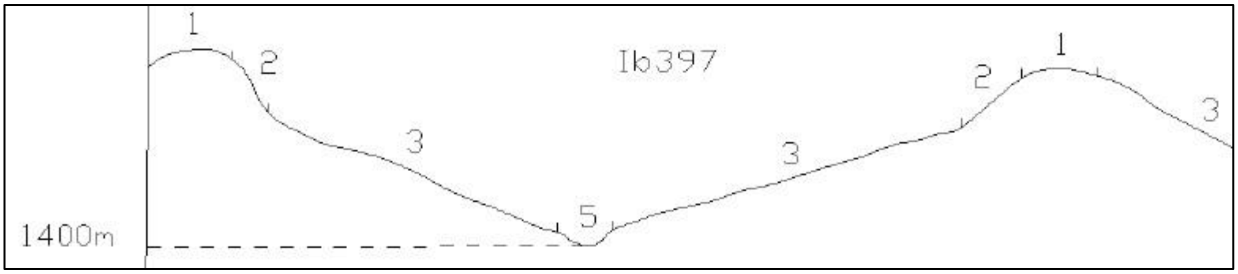

Figure 5-6 Illustration of land type Ib 397 terrain unit (Land Type Survey Staff, 1972 - 2006)

Table 5-1 Soils expected at the respective terrain units within the Da 76 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (2%)		**3 (8%)**		**4 (70%)**		**4 (20%)**	
Mispah	40%	Mispah	40%	Swartland	45%	Valsrivier	35%
Swartland	45%	Swartland	45%	Hutton	25%	Swartland	35%
Hutton	15%	Hutton	15%	Valsrivier	15%	Oakleaf	20%
		Mispah	40%	Mispah	10%	Dundee	5%
				Sterkspruit	5%	Sterkspruit	5%

Table 5-2 Soils expected at the respective terrain units within the Da 147 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (5%)		**3 (15%)**		**4 (60%)**		**4 (20%)**	
Mispah	50%	Mispah	25%	Swartland	30%	Valsrivier	30%
Bare Rock	30%	Swartland	25%	Oakleaf	20%	Oakleaf	25%
Swartland	10%	Bare Rock	20%	Valsrivier	20%	Streambeds	20%
Glenrosa	10%	Glenrosa	20%	Hutton	15%	Mispah	15%
		Hutton	10%	Mispah	10%	Hutton	10%
				Glenrosa	5%		

Table 5-3 Soils expected at the respective terrain units within the Fb 488 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units									
1 (18%)		2 (2%)		3 (60%)		4 (10%)		5 (10%)	
Bare Rock	40%	Bare Rock	100%	Mispah	35%	Mispah	30%	Oakleaf	60%
Mispah	40%			Swartland	20%	Swartland	20%	Bare Rock	15%
Hutton	10%			Hutton	20%	Oakleaf	20%	Mispah	15%
Glenrosa	10%			Bare Rock	15%	Glenrosa	10%	Swartland	10%
				Glenrosa	10%	Hutton	10%		
						Bare Rock	10%		

Table 5-4 Soils expected at the respective terrain units within the Ib 397 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (10%)		2 (5%)		3 (80%)		5 (5%)	
Bare Rock	80%	Bare Rock	100%	Bare Rock	75%	Bare Rock	50%
Mispah	10%			Mispah	10%	Hutton	20%
Hutton	5%			Hutton	5%	Mispah	20%
Glenrosa	5%			Swartland	5%	Swartland	5%
				Glenrosa	5%	Oakleaf	5%

5.3 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure 5-7. Most of the project area is characterised by a slope percentage between 0 and 20%, with some smaller patches within the project area characterised by a slope percentage up to 64%. This illustration indicates a non-uniform topography with alternating hills and steep cliffs surrounding flatter areas. The DEM of the project area (Figure 5-8) indicates an elevation of 1 195 to 1 479 Metres Above Sea Level (MASL).

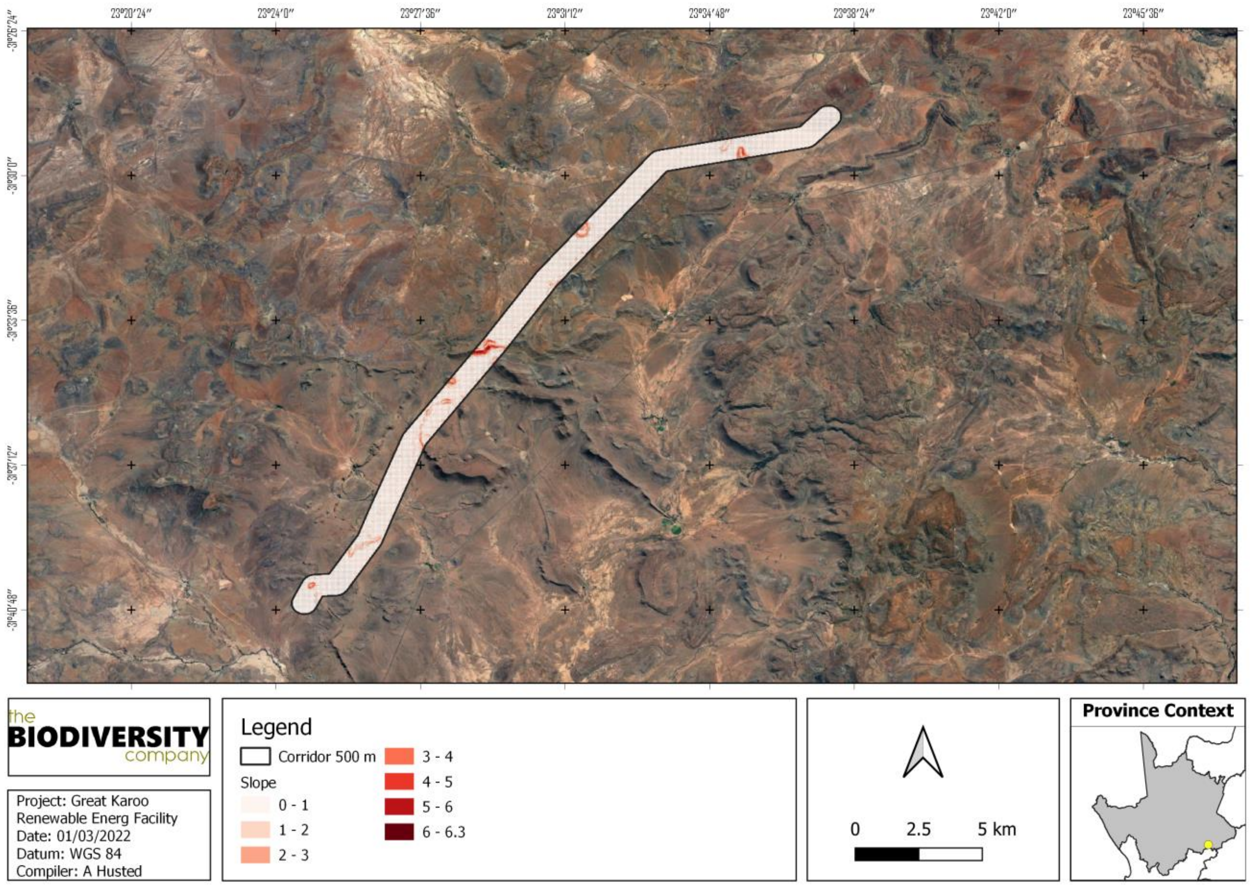

Figure 5-7 The slope percentage calculated for the project area

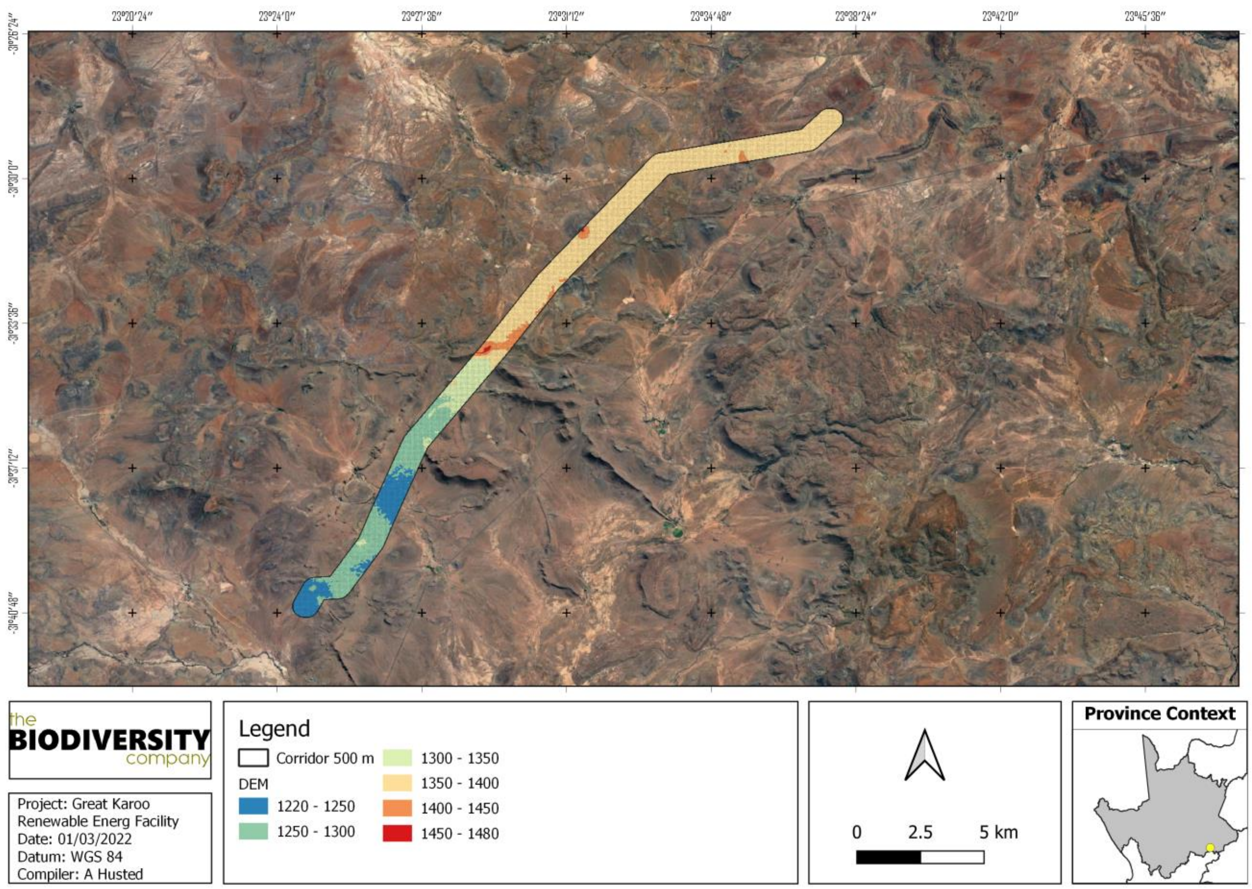

Figure 5-8 The DEM generated for the project area

6 Results and Discussion

6.1 Baseline Findings

Various soil forms were identified throughout the project area, on which only the most sensitive soil forms will be focussed on, namely the Tubatse, Oakleaf and Bethesda soil forms (see Figure 6-1). These soil forms are characterised by an orthic topsoil on top of a neocutanic horizon. The Tubatse and Bethesda soil forms are characterised by a lithic and hard rock horizon underneath the neocutanic horizons respectively with the Oakleaf being characterised by a deep neocutanic horizon.

Orthic topsoils are mineral horizons that have been exposed to biological activities and varying intensities of mineral weathering. The climatic conditions and parent material ensure a wide range of properties differing from one orthic topsoil to another (i.e., colouration, structure etc) (Soil Classification Working Group, 2018).

The neocutanic horizon is associated with recent depositions and unconsolidated soils. Any soil form can develop out of a neocutanic horizon, depending on the climatic and topographical conditions). Some properties pertaining to other diagnostic soil horizons will be present within a Neocutanic horizon but will lack main properties necessary to classify the relevant soil type (Soil Classification Working Group, 2018).

For the Lithocutanic horizon, *in situ* weathering of rock underneath topsoil results in a well-mixed soil-rock layer. The colour, structure and consistency of this material must be directly related to the parent material of the weathered rock. The Lithocutanic horizon is usually followed by a massive rock layer at shallow depths. Hard rock, permeable rock and horizontally layered shale usually is not associated with the weathering processes involved with the formation of this diagnostic horizon. The hard rock layer disallows infiltration of water or root systems and occur in shallow profiles. Horizontally layered, hard sediments without evidence of vertical seems fall under this category.

The land capability of the above-mentioned soil has been determined to have a land capability class of “III” and a climate capability level 8 given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. The combination between the determined land capabilities and climate capabilities results in a land potential “L6”. The “L6” land potential level is characterised by very restricted potential. Regular and/or severe limitations are expected due to soil, slope, temperatures or rainfall. This land potential is regarded as non-arable.

Figure 6-1 Examples of soil horizons identified on-site. A) Neocutanic horizon. B) Transition between neocutanic and lithic horizon

6.2 Sensitivity Verification

The following land potential level has been determined;

- Land potential level 6 (this land potential level is characterised by very restricted potential. Regular and/or severe limitations are expected due to soil, slope, temperatures or rainfall. This land potential is regarded as non-arable.

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which eight potential land capability classes are located within the proposed footprint area's assessment corridor, including;

- Land Capability 1 to 5 (Very Low to Low); and
- Land Capability 6 to 8 (Low/Moderate to Moderate Sensitivity).

The baseline findings and the sensitivities as per the Department of Agriculture, Forestry and Fisheries (DAFF, 2017) national raster file concur with one another. It therefore is the specialist's opinion that the land capability and land potential of the resources in the regulated area is characterised by a maximum of "Moderate" sensitivities (see Figure 6-2), which conforms to the requirements of an agricultural compliance statement only.

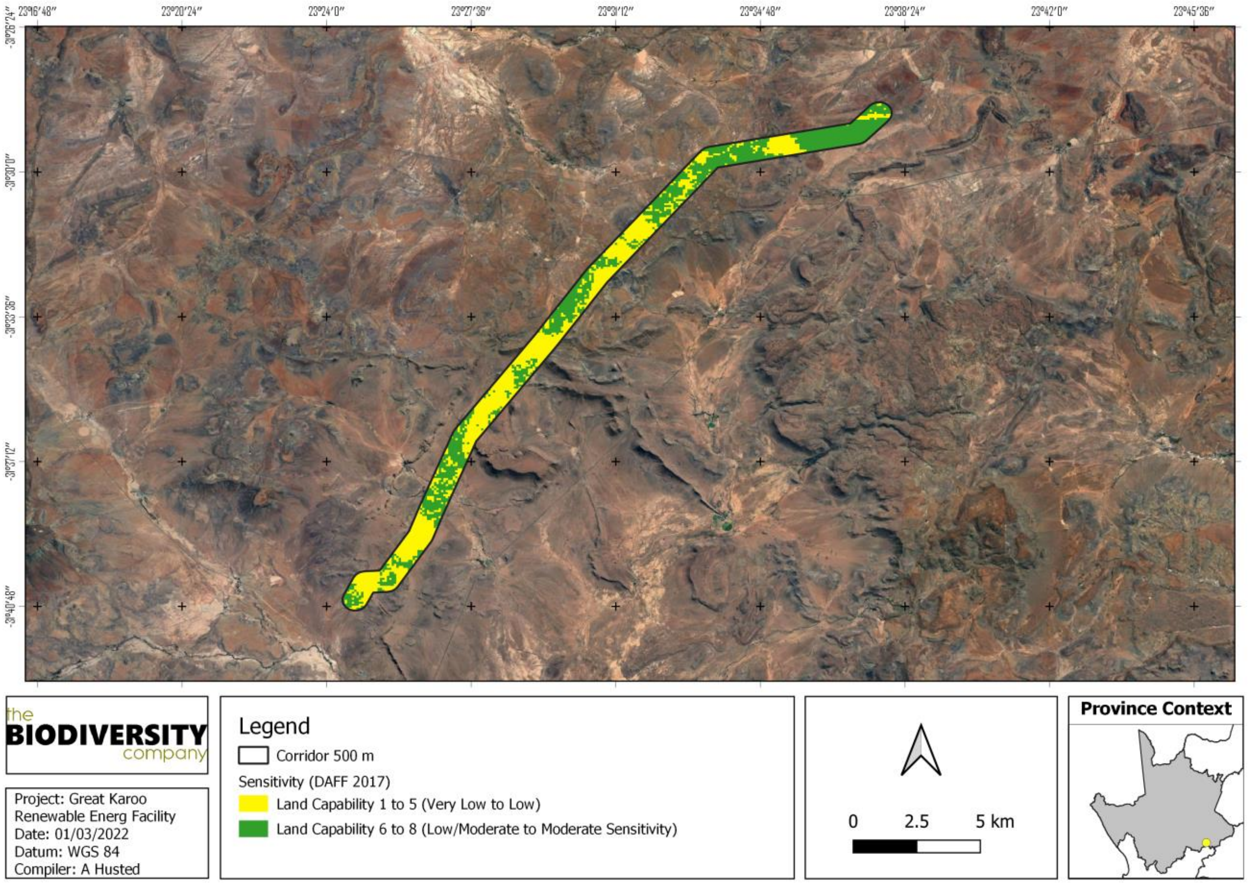

Figure 6-2 Land Capability Sensitivity (DAFF, 2017)

7 Impact Statement

The impact assessment will consider the calculated sensitivities associated with the soil resources expected to be impacted upon by the relevant components. This impact assessment will purely focus on the impacts expected towards natural resources (in specific, the soil and associated land capability).

7.1 Construction Phase

During the construction phase, heavy vehicles (trucks) will be used to transport the pylons associated with the proposed powerline infrastructure. The pylons will be installed into the soil surface with a minor footprint area. A larger footprint area will however be disturbed by heavy vehicles during the construction phase whilst erecting pylons, which is expected to be associated with an extremely short duration. The development of the substation will require soil to be stripped and cleared for the footprint area, resulting in a loss of resources which will be continued into the operational phase of the project.

It is evident from the impact calculations in Table 7-1 that “Low” pre- and post-mitigation significance ratings are expected. The main mitigation objective would be to limit the area to be impacted, especially in regard to heavy vehicle movement. The ultimate post-mitigation significance rating has also been calculated to be “Low”.

Table 7-1 Impact assessment related to the loss of land capability during the construction phase of the proposed powerline

Nature: Loss of land capability		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Short Term (2)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (3)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: **See Section 8**		
Residual Impacts:		
Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures be strictly adhered to.		

7.2 Operational Phase

During the operational phase, limited impacts are foreseen. Maintenance of vegetation as well as the occasional maintenance of powerline servitude will have to be carried out throughout the life of the project. It is expected that these maintenance practices can be undertaken by means of manual labour while using existing roads. Overland flow dynamics are expected to be affected slightly in the event that erosion originates from the base of pylons and from the substation.

Considering the low magnitude of impacts as well as the low sensitivity of soil resources in the area, limited impacts are expected. Therefore, regardless of the duration of this phase, only “Low” significance ratings are expected. By monitoring erosion while maintenance is carried out and reporting any erosion, a post-mitigation significance rating of “Low” will be achieved.

Table 7-2 Impact assessment related to the loss of land capability during the operational phase of the proposed powerline area

Nature: Loss of land capability		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long Term (4)	Long Term (4)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: **See Section 8**		
Residual Impacts:		
Limited residual impacts will be associated with these activities, assuming that all prescribed mitigation measures be strictly adhered to.		

7.3 Cumulative Impacts

Cumulative impacts within the proposed powerline servitude and its surroundings have been determined to be low. Soil resources in the area have been affected to some degree by means of erosion, although to a lesser degree. Furthermore, no agricultural segregation has taken place in recent history by means of any development.

Table 7-3 Impact assessment related cumulative impacts

Nature: Loss of land capability		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and the proposed projects in the area**
Extent	Low (2)	Low (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No

7.4 Specialist Opinion

It is the specialist's opinion that the baseline findings concur with the land capabilities identified by means of the DAFF (2017) desktop findings in regard to land capability sensitivities. No "High" land capability sensitivities were identified within proximity to any of the proposed activities. Considering the lack of sensitivity and the measures expected to be set in place in regard to stormwater management and erosion control, it is the specialist's opinion that all activities will have an acceptable impact on agricultural productivity. Furthermore, no measures in regard to moving components in their micro-setting were required to avoid or minimise fragmentation and disturbances of agricultural activities.

8 Recommendations and Mitigation

8.1 General Mitigation

General mitigations will ensure the conservation of all soil resources, regardless of the sensitivity of resources and the intensity of impacts.

- Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks;
- Proper invasive plant control must be undertaken quarterly; and
- All excess soil (soil that are stripped and stockpiled to make way for foundations) must be stored, and continuously rehabilitated to be used for rehabilitation of eroded areas.

8.2 Restoration of Vegetation Cover

Restoring vegetation cover is the first step to successful rehabilitation. Vegetation cover decreases flow velocities and minimises erosion.

8.2.1 Ripping Compacted Areas

All areas outside of the footprint areas that will be degraded (by means of vehicles, laydown yards etc.) must be ripped where compaction has taken place. According to the Department of Primary Industries and Regional Development (Agriculture and Food) (2017), ripping tines must penetrate to just below the compacted horizons (approximately 300 – 400 mm) with soil moisture being imminent to the success of ripping. Ripping must take place within 1-3 days after seeding, and also following a rain event to ensure a higher moisture content.

To summarise;

- Rip all compacted areas outside of the developed areas that have been compacted;
- This must be done by means of a commercial ripper that has at least two rows of tines; and
- Ripping must take place between 1 and 3 days after seeding and following a rainfall event (seeding must therefore be carried out directly after a rainfall event).

8.3 Specialist Recommendation

The proposed activities may proceed as have been planned without the concern of loss of high sensitivity land capabilities or agricultural productivity.

9 Conclusion

Various soil forms were identified within the project area with the most sensitive soils being classified as the Tubatse, Oakleaf and Bethesda soil forms. These soil forms have been determined to be associated with one land capability, namely LCIII. This land capability class was then further refined to a land potential level 6 by comparing land capability of climatic capabilities of the project area.

This land potential level was used to determine the sensitivities of soil resources. Only “Low” sensitivities were determined throughout the project area by means of baseline findings. Considering the low sensitivities associated with land potential resources, it is the specialist’s opinion that the proposed activities will have an acceptable impact on soil resources and that the proposed activities should proceed as have been planned.

10 References

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