Scoping Report for the Great Karoo Renewable Energy Project – Merino Wind Farm

Ubuntu Local Municipality, Northern Cape

August 2021

CLIENT

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Report Name	**Scoping Report for the Great Karoo Renewable Energy Project – Merino Wind Farm**
Reference	**Merino Wind Farm**
Submitted to	savannah environmental
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.
Report Writer / Reviewer	**Andrew Husted** Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
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.

DECLARATION

I, Andrew Husted, 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.

Andrew Husted

Freshwater Ecologist

The Biodiversity Company

August 2021

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

Pedologist

The Biodiversity Company

August 2021

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List of Acronyms

ARC	Agricultural Research Council
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Areas
CR	Critically Endangered
DEM	Digital Elevation Model
EAP	Environmental Assessment Practitioner
EN	Endangered
ESA	Ecological Support Areas
ETS	Ecosystem threat status
FEPA	Freshwater Ecosystem Priority Areas
GN	Government Notices
HGM	Hydrogeomorphic
IS	Importance and Sensitivity
ISCW	Institute for Soil Climate and Water
LT	Least Threatened
MAP	Mean annual precipitation
MAPE	Mean Annual Potential Evaporation
MASL	Metres Above Sea Level
NASA	National Aeronautics and Space Administration
NEMA	National Environmental Management Act
NEM:BA	National Environment Management Biodiversity Act
NWA	National Water Act
NWCS	National Wetland Classification Systems
NWM5	National Wetland Map 5 (NWM5)
ONA	Other Natural Areas
PES	Present Ecological Status
QGIS	Quantum geographic information system
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SAGA	System for Automated Geoscientific Analyses
SANBI	South African National Biodiversity Institute
ToR	Terms of Reference
UNFCC	The United Nations Framework Convention on Climate Change
VU	Vulnerable
WEF 2	Merino Wind Farm
WMA	Water Management Areas

1 Introduction

Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure 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 project is planned as part of a larger cluster of renewable energy projects, which include three (3) 100MW PV facilities (known as the Moriri Solar PV, Kwana Solar PV, and Nku Solar PV), an additional 140MW Wind Energy Facility (known as the Angora Wind Farm), as well as grid connection infrastructure connecting the renewable energy facilities to the existing Eskom Gamma Substation.

The Biodiversity Company was appointed by Savannah Environmental (Pty) Ltd (Savannah) to undertake a scoping level assessment for the Great Karoo Cluster of Renewable Energy Facilities, including the Merino Wind Farm (WEF2), which this scoping report makes specific reference to.

Wetland and soil (agricultural potential) components have both been included for this scoping assessment.

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 at a scoping level, enabling informed decision making.

1.1 Project Description

A preferred project site with an extent of ~29 909 ha and a development area of ~5 516 ha within the project site has been identified by Great Karoo Renewable Energy (Pty) Ltd as a technically suitable area for the development of the Merino Wind Farm with a contracted capacity of up to 140MW that can accommodate up to 45 turbines. The development area consists of the three (3) affected properties, which include:

- Portion 1 of Farm Rondavel 85;
- Portion 0 of Farm Rondavel 85;
- Portion 0 of Farm Vogelstruisfontein 84; and
- Portion 9 of Farm Bult & Rietfontein 96.

The Merino Wind Farm project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 140MW:

- Up to 45 wind turbines with a maximum hub height of up to 170 m. The tip height of the turbines will be up to 250 m;
- Concrete turbine foundations to support the turbine hardstands;
- Inverters and transformers;
- Temporary laydown areas which will accommodate storage and assembly areas;
- Cabling between the turbines, to be laid underground where practical;
- A temporary concrete batching plant;

- 33/132kV onsite facility substation;
- Underground cabling from the onsite substation to the 132kV collector substation;
- Electrical and auxiliary equipment required at the collector substation that serves that wind energy facility, including switchyard/bay, control building, fences, etc;
- Battery Energy Storage System (BESS);
- Access roads and internal distribution roads; and
- Site offices and maintenance buildings, including workshop areas for maintenance and storage.

The wind farm is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Merino Wind Farm under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Merino Wind Farm set to inject up to 140MW into the national grid.

1.2 Scope of Work

The principle aim of the assessment was to provide information to determine any level of risk posed by the proposed wind farm in regard to local wetland and soil attributes. This was achieved through the following:

- A desktop assessment of all relevant national and provincial datasets. If available, municipal datasets were also considered;
- Completion of a desktop level impact assessment with supporting mitigation measures;
- Presentation of specialist Terms of Reference (ToR) for the impact phase of the process.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment has only been completed at a desktop level. It is assumed all datasets and information considered for the assessment is representative of the area and is well suited for the intended purposes of this scoping report;
- This assessment has only considered wetlands (freshwater habitats) and soil; and
- No decommissioning phase impacts have been considered for this project. The life of operation is 20 – 25 years.

1.4 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements relevant to biodiversity and conservation in the Northern Cape Province

Region	Legislation / Guideline
International	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
National	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)

	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, GN 320 of Government Gazette 43310 (March 2020)
	The Environment Conservation Act (Act No. 73 of 1989)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Water Act (NWA) (Act No. 36 of 1998)
	Municipal Systems Act (Act No. 32 of 2000)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
Provincial	Northern Cape Nature Conservation act no. 9 of 2009
	Northern Cape Planning and Development Act no. 7 of 1998

1.4.1 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations, as amended in April 2017, state that prior to certain listed activities taking place, an environmental authorisation application (EA) process needs to be followed. This could follow either the Basic Assessment (BA) process or the Scoping and EIA process, depending on the scale of the impact. A Scoping and EIA process is being undertaken for the project.

GN 350 was gazetted on the 20 March 2020, which has replaced the requirements of Appendix 6 of the EIA Regulations in respect of certain specialist reports. These regulations provide the criteria and minimum requirements for specialist's assessments, in order to consider the impacts on soil for activities which require EA.

1.4.2 National Water Act (NWA, 1998)

The Department of Human Settlements Water and Sanitation (DHSWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The NWA allows for the protection of water resources, which includes the:

- Maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- Prevention of the degradation of the water resource; and
- Rehabilitation of the water resource.

A watercourse means;

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse, unless it is authorised by the DHSWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DHSWS in terms of Sections 21 (c) and (i) of the NWA.

2 Receiving Environment

The project area falls within the Ubuntu Local Municipality which forms part of the Pixley Ka Seme District in the Northern Cape Province. The area is approximately 30 km south west of Richmond, traversed by the national route N1.

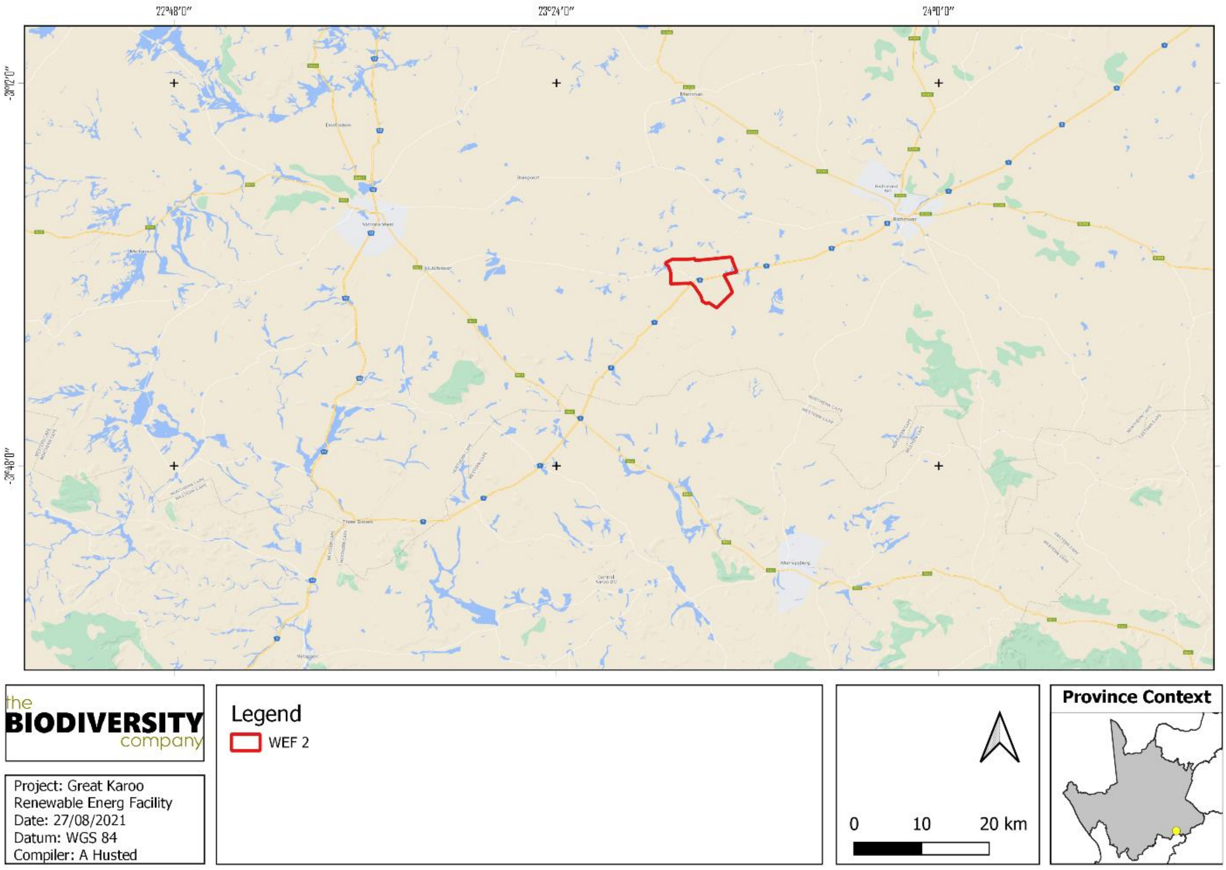

Figure 2-1 The location of the project area in relation to the general setting

2.1 Wetlands

2.1.1 Catchment

The project area extends into two Water Management Areas (WMA), namely the (Lower) Orange WMA (WMA 6) and the Mzimvubu-Tsitsikamma WMA (WMA 7). The locally affected quaternary catchments include D61A, D61D and L21B.

2.1.2 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e. ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel *et al.,* 2011).

Figure 2-2 shows the location of the project area in relation to wetland FEPAs. Based on this information, non-priority systems are located within the extent of the project area.

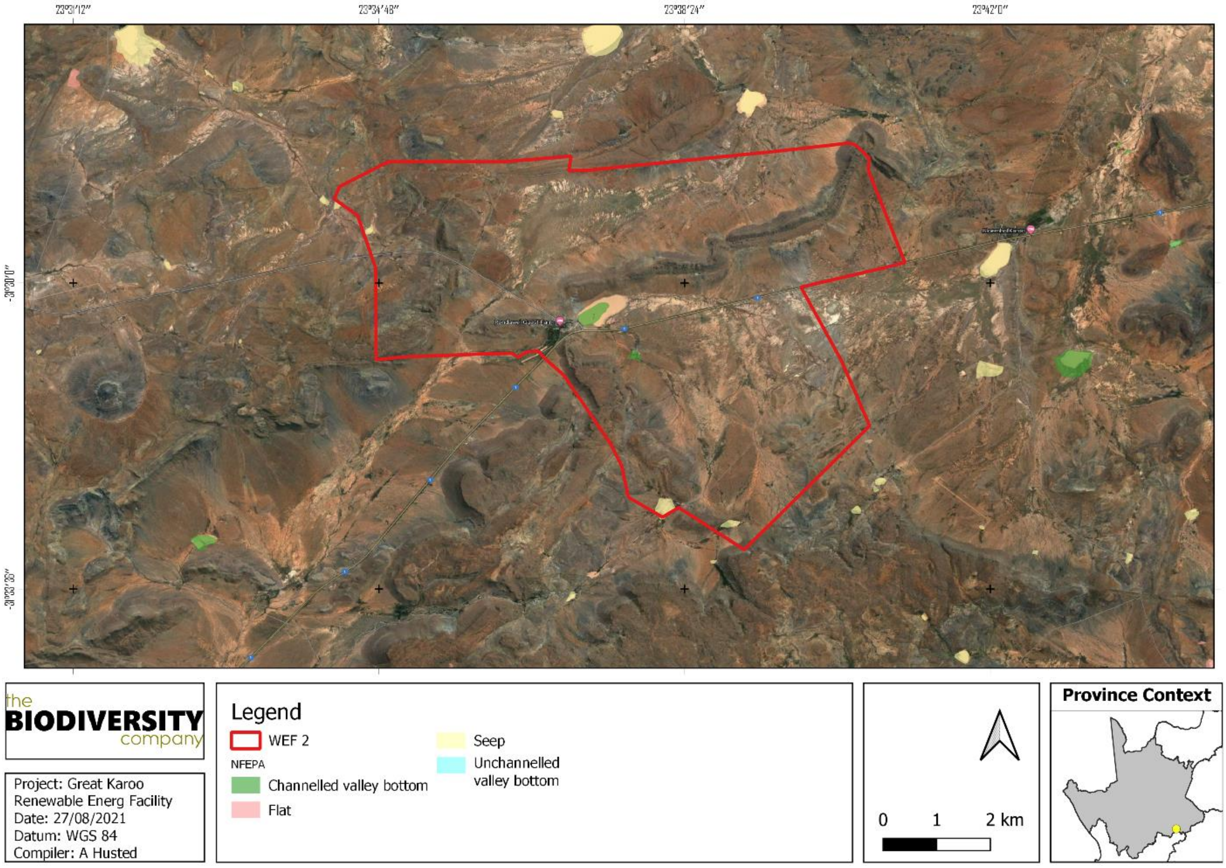

Figure 2-2 The location of NFEPA wetlands in relation to the project area

2.1.3 National Wetland Map 5

The National Wetland Map 5 (NWM5) spatial data was published in October 2019 (Deventer *et al*. 2019), in collaboration with the South African National Biodiversity Institute (SANBI), with the specific aim of spatially representing the location, type and extent of wetlands in South Africa. The data represents a synthesis of a wide number of official watercourse data, including rivers, inland wetlands and estuaries. This database does not recognise the presence of any wetlands within the extent of the project area. However, areas classified as “rivers” are extensive throughout the project area.

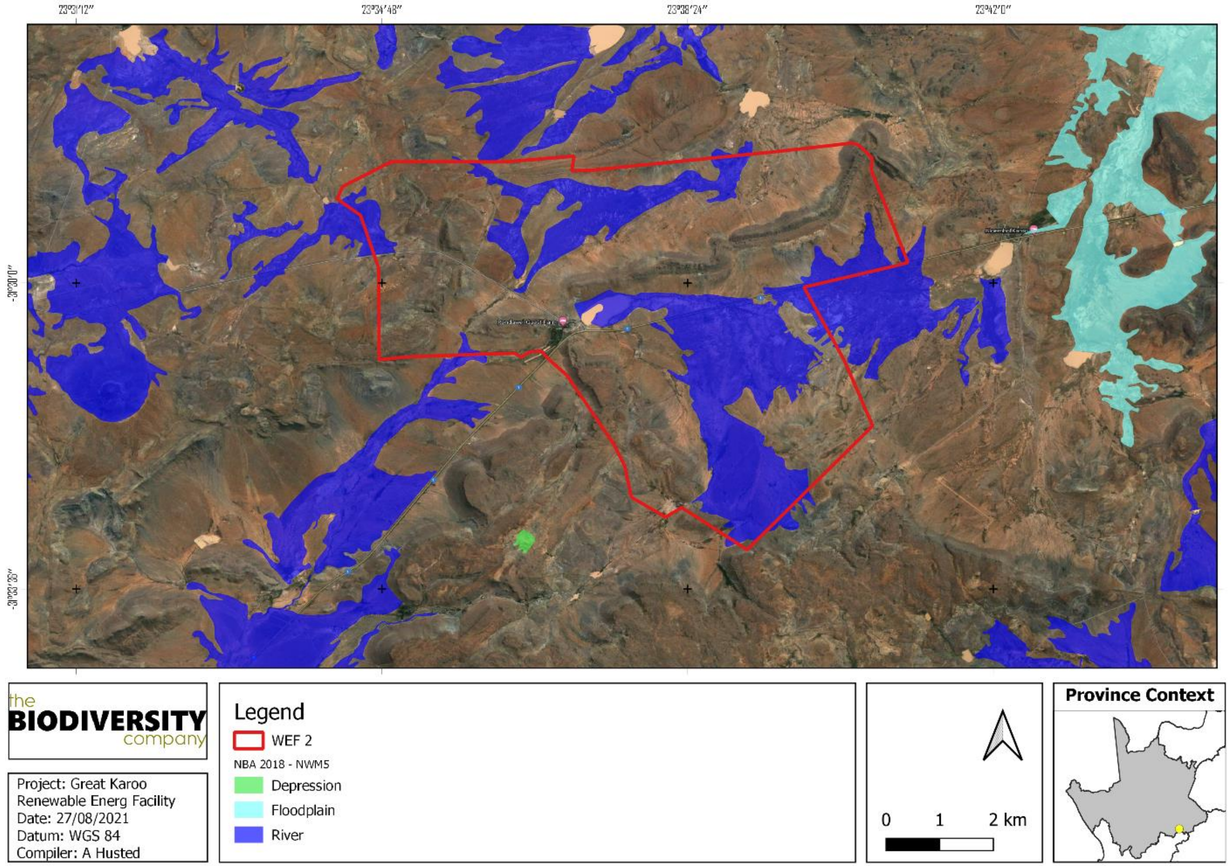

Figure 2-3 Map illustrating the NWM5 for the project area

2.1.4 Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT, with CR, EN and VU ecosystem types collectively referred to as ‘threatened’ (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). No wetlands are present within the extent of the project area.

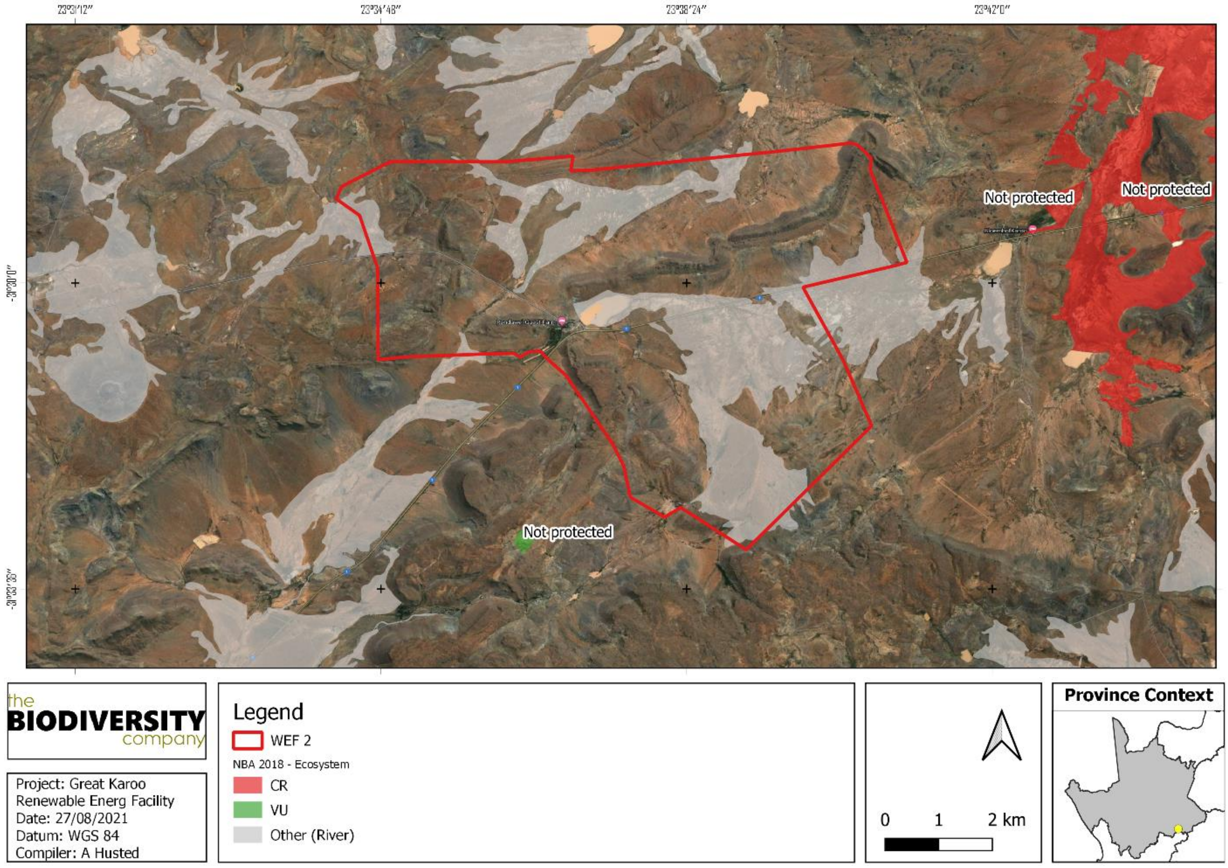

Figure 2-4 Map illustrating ecosystem threat status of wetland ecosystems

2.1.5 Critical Biodiversity Areas and Ecological Support Areas

The Northern Cape Department of Environment and Nature Conservation has developed the Northern Cape CBA Map which identifies biodiversity priority areas for the province, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole.

Figure 2-5 shows the project area superimposed on the Terrestrial CBA map. The project area overlaps with a CBA One (CBA 1), Other Natural Areas (ONA) and an ESA area.

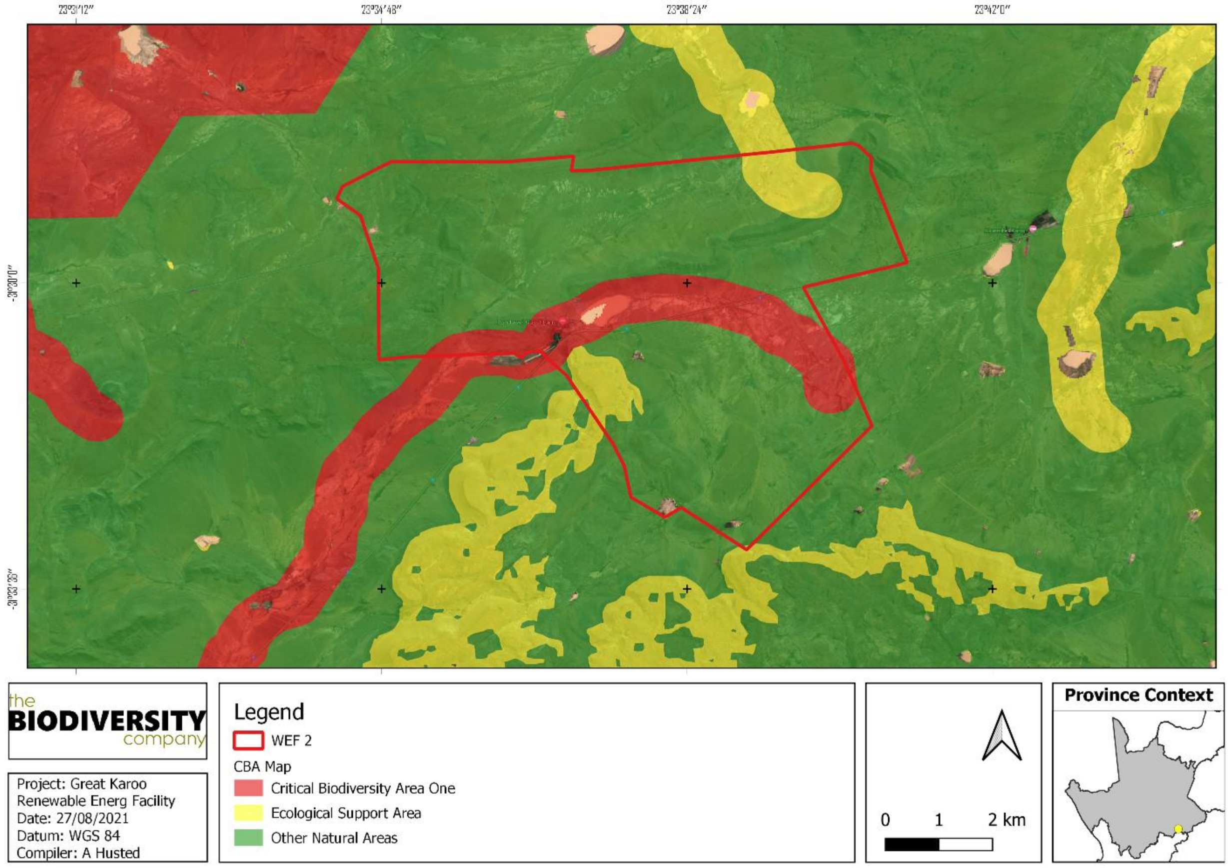

Figure 2-5 Map illustrating the locations of CBAs in the project area

2.1.6 Vegetation Type

The project area is situated within two vegetation types; the Eastern Upper Karoo (NKu 4) and the Upper Karoo Hardeveld (NKu 2), according to Mucina & Rutherford (2006) (Figure 2-6).

The Eastern Upper Karoo vegetation type is distributed across the Northern Cape, Eastern Cape and Western Cape Provinces. The vegetation type is characterised by flats and gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the west, Besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast), dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera Aristida and Eragrostis.

The Upper Karoo Hardeveld vegetation type is distributed across the Northern, Western and Eastern Cape Provinces. The vegetation type is characterised by steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones supporting sparse dwarf Karoo scrub with drought-tolerant grasses of genera such as Aristida, Eragrostis and Stipagrostis.

The conservation status for both vegetation types is Least Threatened.

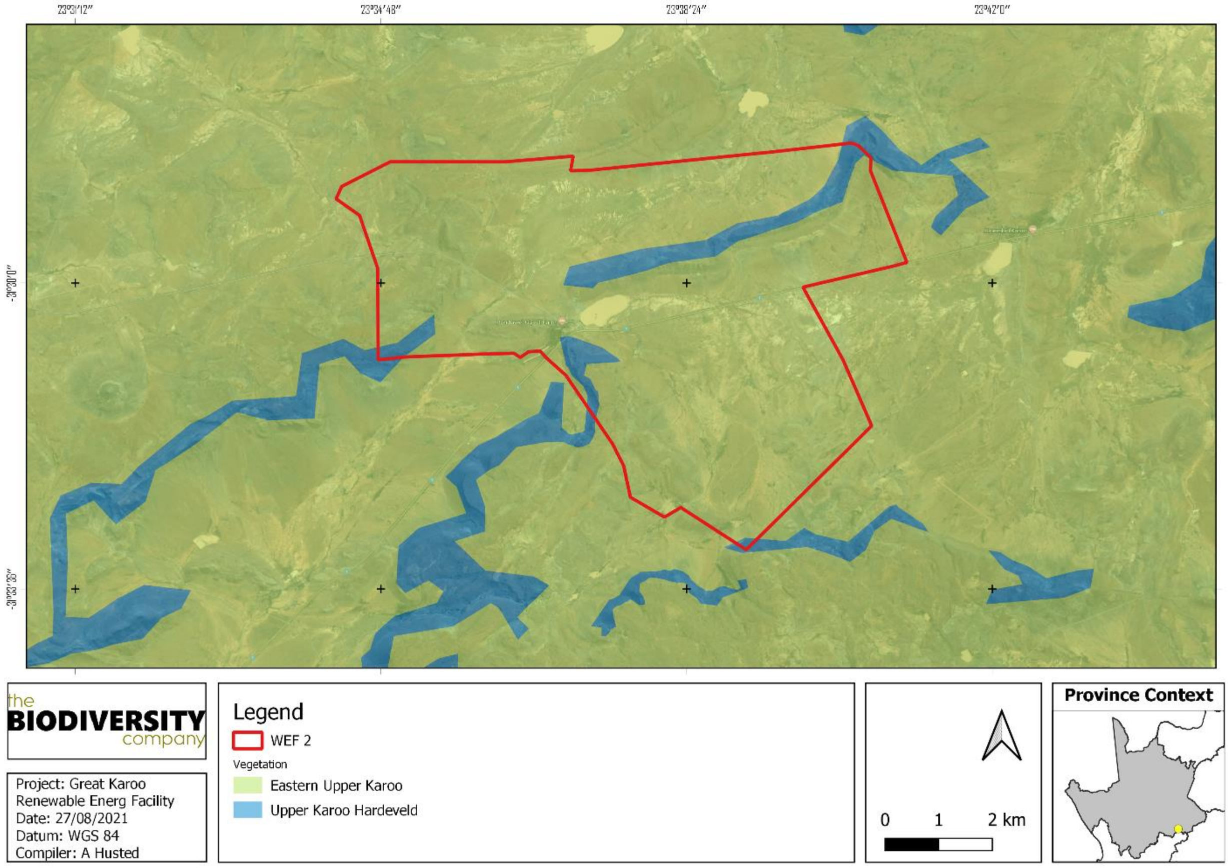

Figure 2-6 Project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2017).

2.1.7 Sensitivity

The Northern Cape does not currently prescribe any buffers for freshwater resources, and due to this the method described by Macfarlane et al. (2017) has been used. Based on this method, a buffer width of 45 m for the construction and operation phases is recommended. Owing to the fact that some watercourses in the area are classified as Critically Endangered (CR) and Endangered (EN) (Figure 2-7), and also considering the presence of areas indicated as CBA 1, the buffer width of 45 m is deemed suitable.

The aquatic biodiversity theme sensitivity as indicated in the screening report indicates predominantly “Very High” sensitivity, with isolated areas of “Low” sensitivity (Figure 2-8). These “Very High” sensitivities are attributed to the presence of wetlands, rivers and priority area quinary catchments.

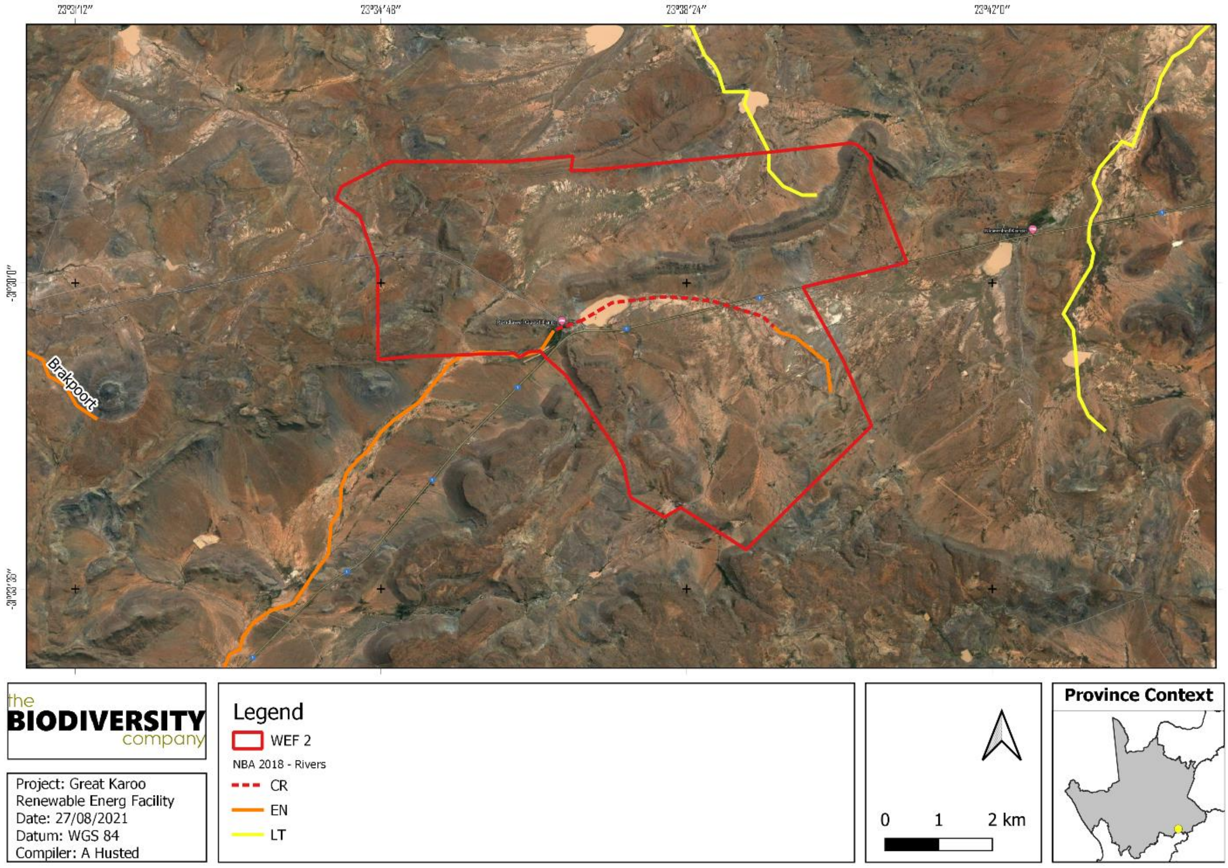

Figure 2-7 The threat status for local river systems

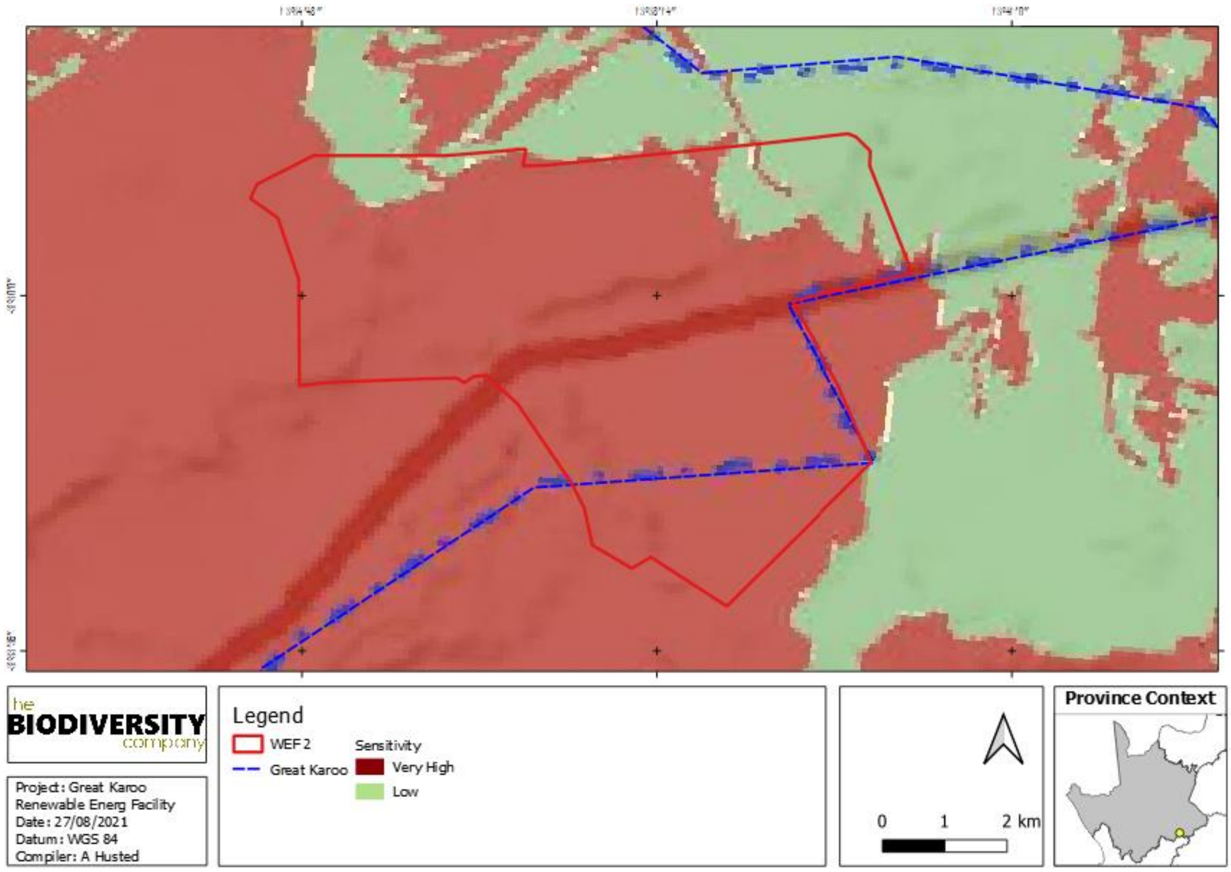

Figure 2-8 The aquatic biodiversity theme sensitivity classification

2.2 Land Capability

As part of the desktop assessment, 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 the division of land into land types. In addition, a Digital Elevation Model (DEM) as well as the slope percentage of the area was calculated by means of the National Aeronautics and Space Administration (NASA) Shuttle Radar Topography Mission Global 1 arc second digital elevation data by means of Quantum geographic information system (QGIS) and System for Automated Geoscientific Analyses (SAGA) software.

2.2.1 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 the area are -7.2℃ and 36.1℃ for July and January respectively (also see Figure 2-9 for more information).

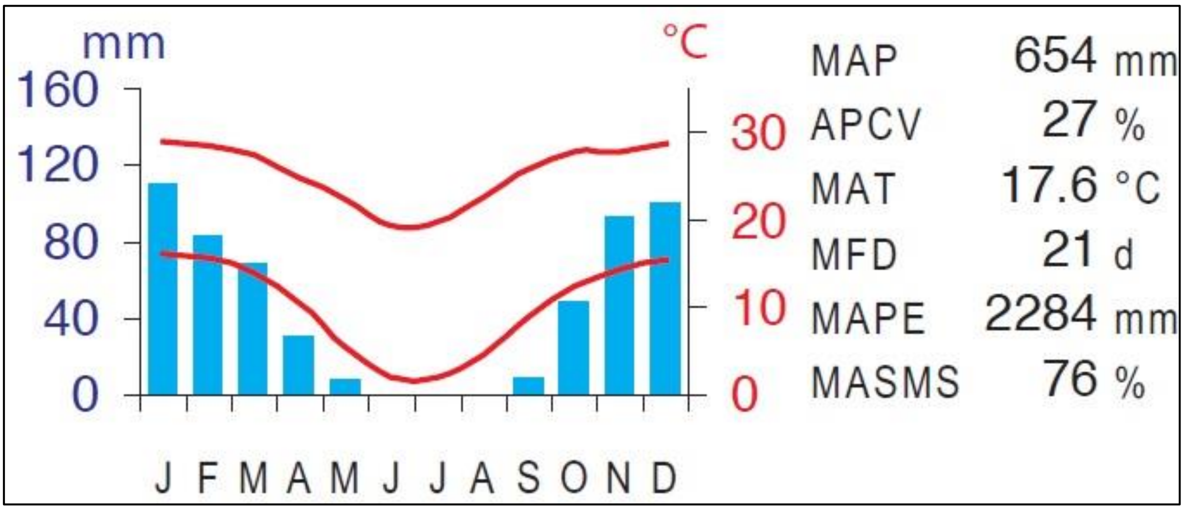

Figure 2-9 Climate for the region

2.2.2 Geology and Soil

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, Fc 131, Fb 488, Ib 125, Fb 126 and Fb 397 land types (see Figure 2-10). 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. The Fc land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is rare or absent within this land type in upland soils but generally present in low-lying areas.

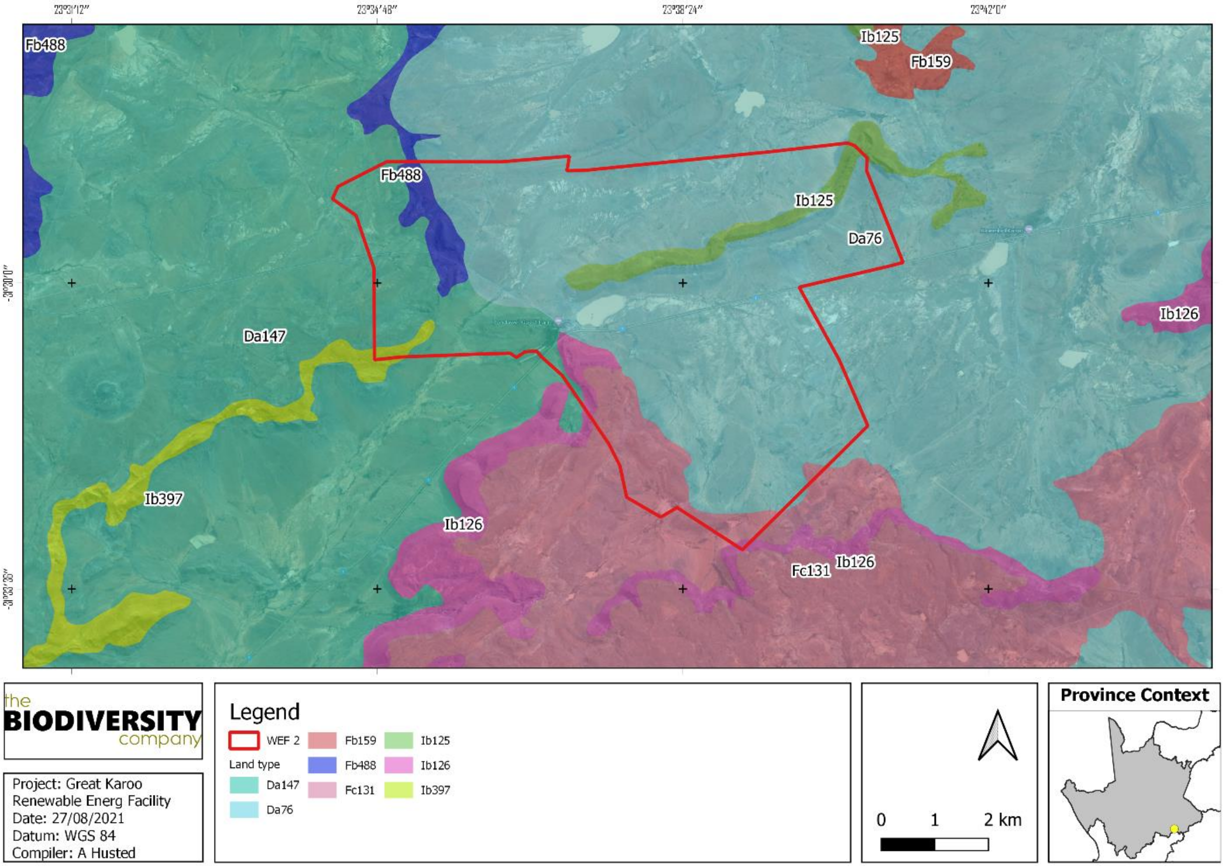

Figure 2-10 Land Types present within the project area

The land terrain units for the featured land types are illustrated from Figure 2-11 to Figure 2-17 with the expected soils listed in Table 2-1 to Table 2-7.

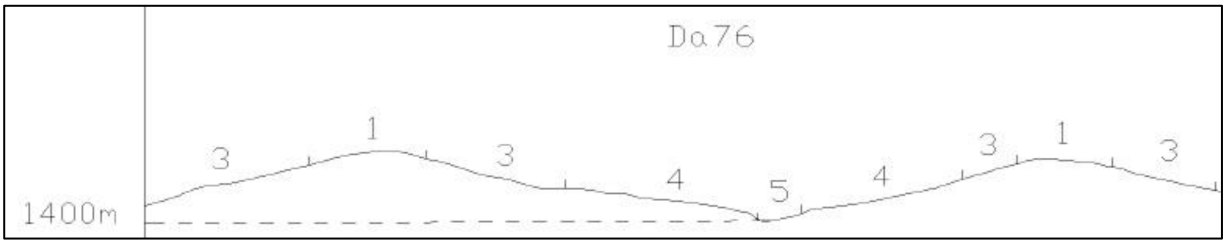

Figure 2-11 Illustration of land type Da 76 terrain unit (Land Type Survey Staff, 1972 - 2006)

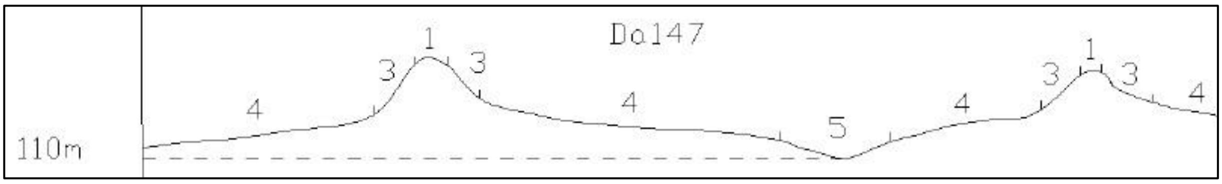

Figure 2-12 Illustration of land type Da 147 terrain unit (Land Type Survey Staff, 1972 - 2006)

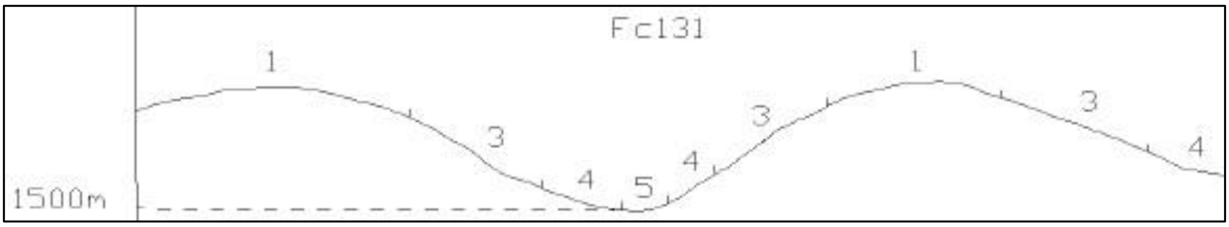

Figure 2-13 Illustration of land type Fc 131 terrain unit (Land Type Survey Staff, 1972 - 2006)

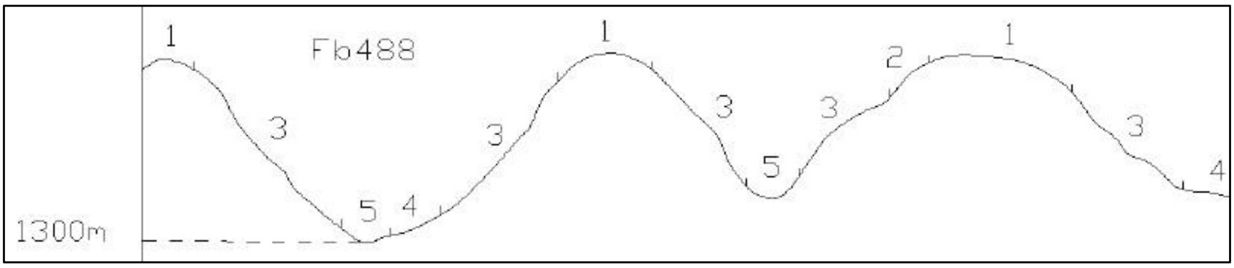

Figure 2-14 Illustration of land type Fb 488 terrain unit (Land Type Survey Staff, 1972 - 2006)

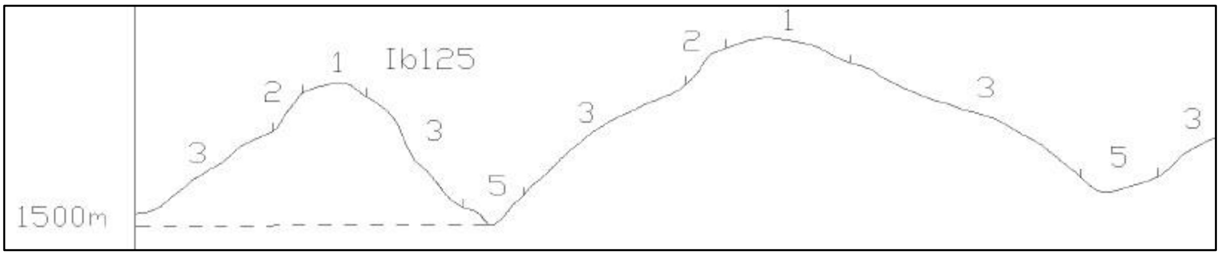

Figure 2-15 Illustration of land type Ib 125 terrain unit (Land Type Survey Staff, 1972 - 2006)

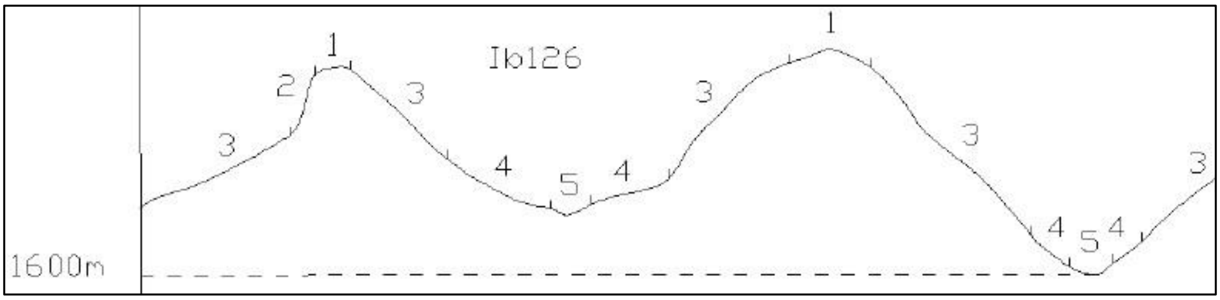

Figure 2-16 Illustration of land type Ib 126 terrain unit (Land Type Survey Staff, 1972 - 2006)

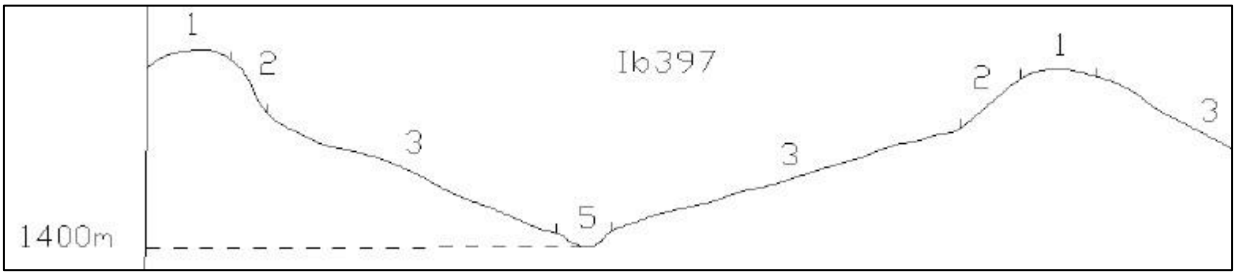

Figure 2-17 Illustration of land type Ib 397 terrain unit (Land Type Survey Staff, 1972 - 2006)

Table 2-1 ***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 2-2 ***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 2-3 ***Soils expected at the respective terrain units within the Fc 131 land type (Land Type Survey Staff, 1972 - 2006)***

Terrain Units							
1 (15%)		**3 (40%)**		**4 (30%)**		**5 (15%)**	
Mispah	50%	Mispah	45%	Mispah	25%	Valsrivier	35%
Bare Rock	25%	Hutton	15%	Valsrivier	20%	Oakleaf	25%
Hutton	10%	Bare Rock	15%	Oakleaf	20%	Mispah	20%
Glenrosa	5%	Glenrosa	10%	Hutton	15%	Glenrosa	5%
Swartland	5%	Swartland	5%	Swartland	10%	Dundee	5%
Shortlands	5%	Shortlands	5%	Glenrosa	5%	Estcourt	5%
		Clovelly	5%	Clovelly	5%	Inhoek	5%

Table 2-4 ***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 2-5 ***Soils expected at the respective terrain units within the Ib 125 land type (Land Type Survey Staff, 1972 - 2006)***

Terrain Units							
1 (20%)		**2 (5%)**		**3 (73%)**		**5 (2%)**	
Hutton	30%	Bare Rock	100%	Bare Rock	70%	Bare Rock	60%
Bare Rock	20%			Mispah	10%	Hutton	10%
Mispah	20%			Hutton	10%	Mispah	10%
Swartland	20%			Swartland	5%	Valsrivier	8%
Glenrosa	10%			Glenrosa	5%	Glenrosa	5%
						Dundee	5%
						Oakleaf	2%

Table 2-6 ***Soils expected at the respective terrain units within the Ib 126 land type (Land Type Survey Staff, 1972 - 2006)***

Terrain Units									
1 (20%)		**2 (5%)**		**3 (70%)**		**4 2%)**		**5 (3%)**	
Bare Rock	60%	Bare Rock	100%	Bare Rock	65%	Oakleaf	30%	Valsrivier	45%
Mispah	25%			Mispah	20%	Valsrivier	15%	Oakleaf	40%
Glenrosa	5%			Glenrosa	5%	Bare Rock	10%	Inhoek	5%
Swartland	5%			Swartland	3%	Glenrosa	10%	Sterkspruit	5%
Hutton	5%			Hutton	2%	Swartland	10%	Estcourt	5%
						Inhoek	10%		
						Mispah	5%		
						Hutton	5%		
						Sterkspruit	5%		

Table 2-7 ***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%

2.2.3 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure 2-18. 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 82%. This illustration indicates a non-uniform topography with alternating hills and steep cliffs surrounding flatter areas at high elevation. The DEM of the project area (Figure 2-19) indicates an elevation of 1 340 to 1 480 Metres Above Sea Level (MASL).

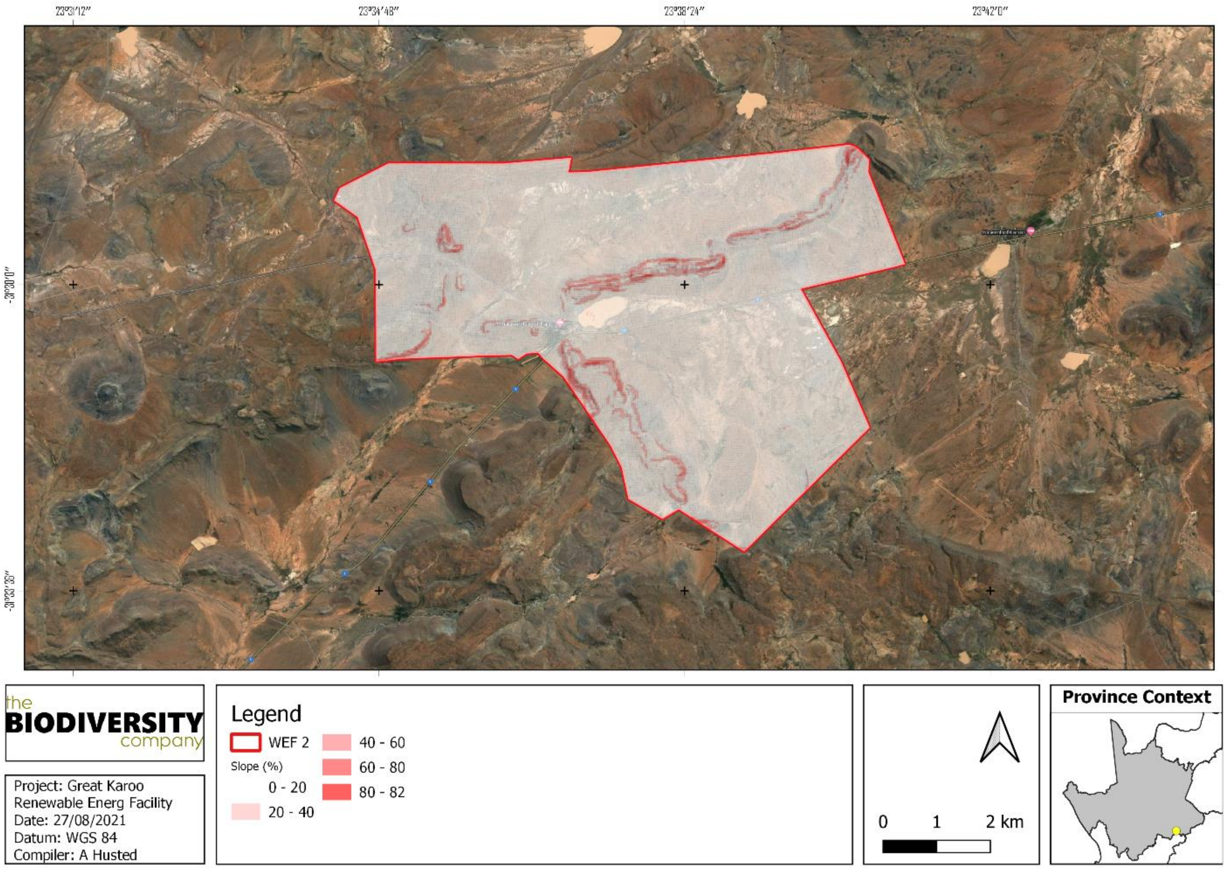

Figure 2-18 The slope percentage calculated for the project area

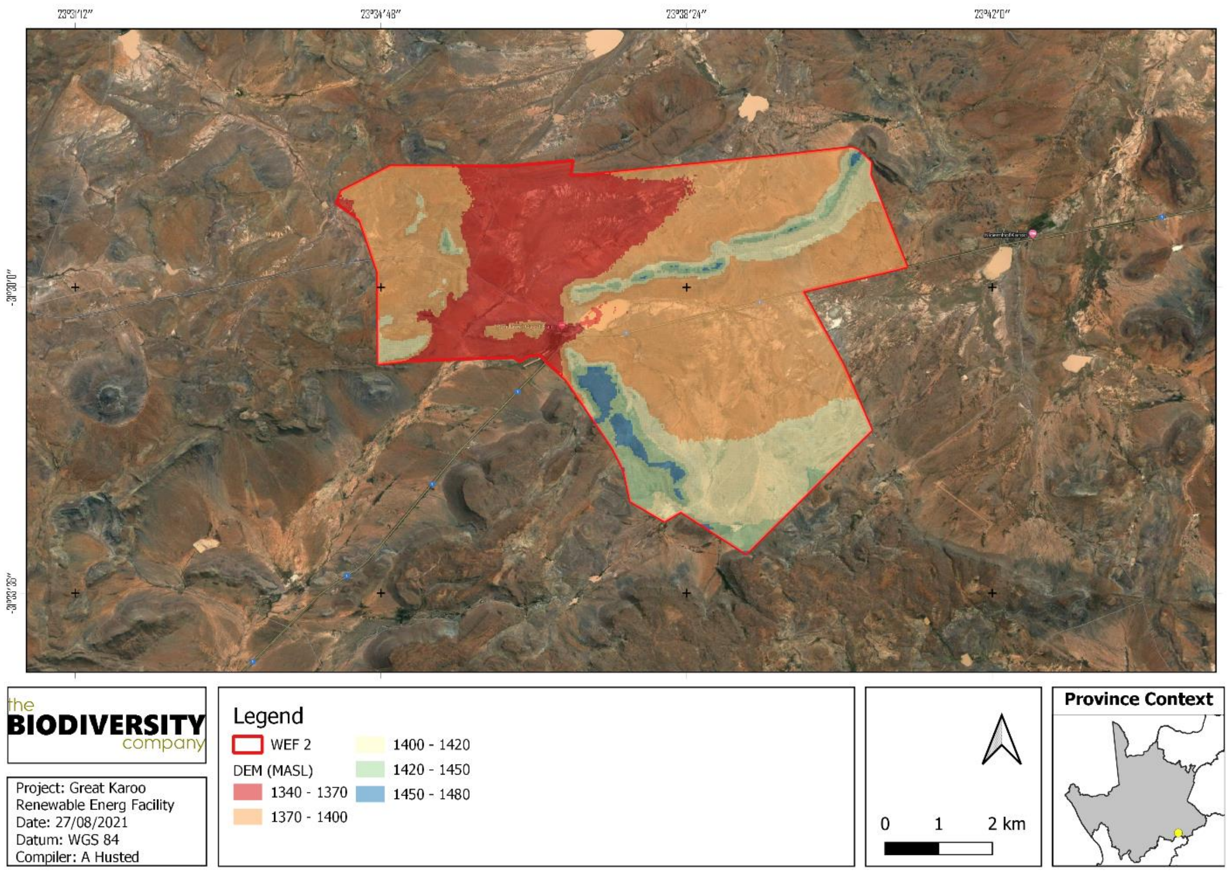

Figure 2-19 The DEM generated for the project area

2.2.4 Sensitivity

The agriculture theme sensitivity as indicated in the screening report indicates predominantly a combination of “Low” and “Medium” sensitivities, with isolated areas of “High” sensitivity (Figure 2-20). It is worth noting that no “High” sensitivity areas were identified within the project area.

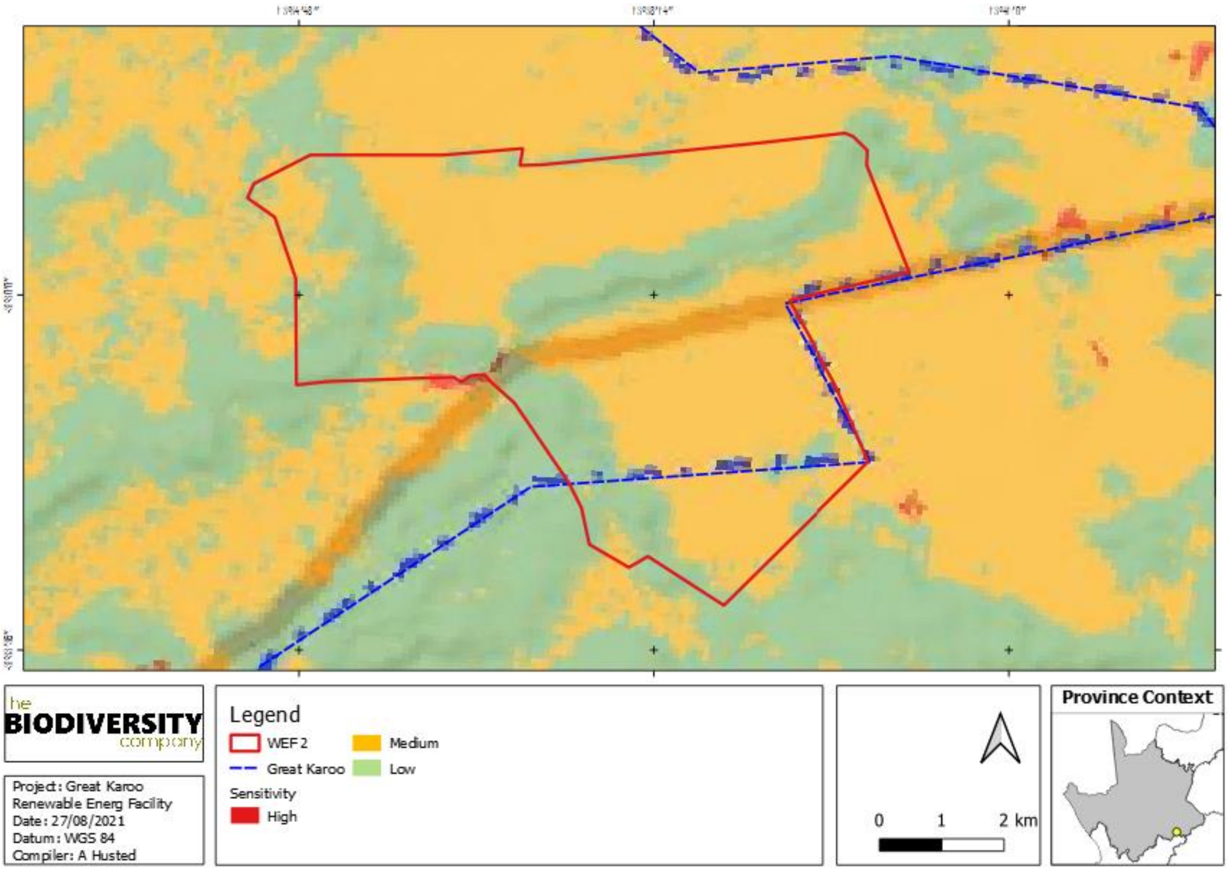

Figure 2-20 The agriculture theme sensitivity

3 Terms of Reference

3.1 Wetland Assessment

3.1.1 Wetland Identification and Mapping

The National Wetland Classification Systems (NWCS) developed by the SANBI was considered for this assessment. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels. In addition, the method also includes the assessment of structural features at the lower levels of classification (Ollis et al., 2013).

The wetland areas are delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 3-1. The outer edges of the wetland areas were identified by considering the following four specific indicators, the:

- Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
    - The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile due to prolonged and frequent saturation; and
- Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

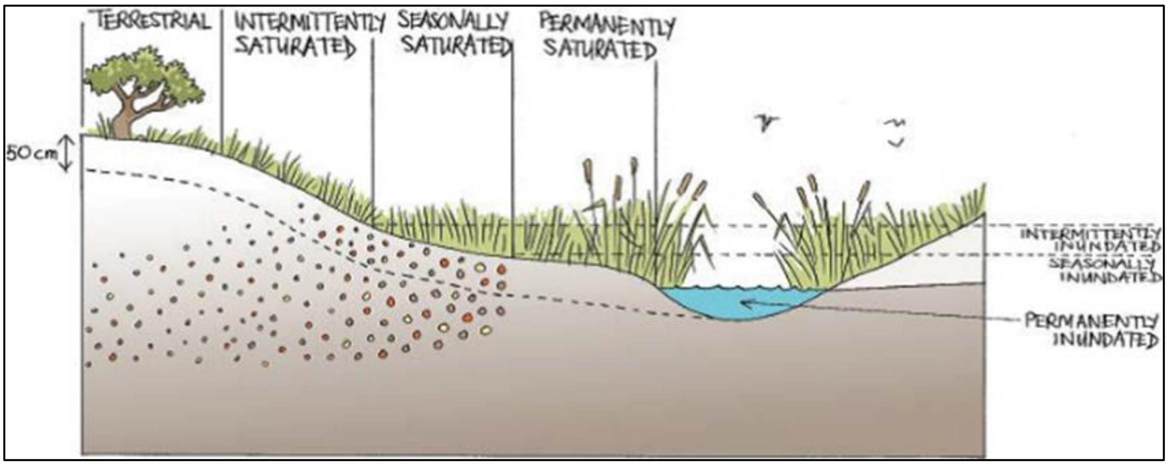

Figure 3-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al., 2013).

3.1.2 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands and humans. EcoServices serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze et al. 2008). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 3-1).

Table 3-1 Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

3.1.3 Present Ecological Status

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 3-2.

Table 3-2 The Present Ecological Status categories (Macfarlane et al., 2009)

Impact Category	Description	Impact Score Range	PES
None	**Unmodified, natural**	**0 to 0.9**	**A**
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	Critical Modification. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

3.1.4 Importance and Sensitivity

The importance and sensitivity of water resources is determined to establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category, as listed in Table 3-3 (Rountree and Kotze, 2013).

Table 3-3 Description of Ecological Importance and Sensitivity categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	**A**
High	2.1 to 3.0	**B**
Moderate	1.1 to 2.0	**C**
Low Marginal	< 1.0	**D**

3.1.5 Determining Buffer Requirements

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane et al., 2014) was used to determine the appropriate buffer zone for the proposed activity.

3.2 Land Capability

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 3-4 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 3-4 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	Arable Land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						Grazing Land
VI	W	F	LG	MG						
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 the DAFF (2017) which indicates the national land capability category and associated sensitivity related to soil resources.

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 3-5. The final land potential results are then described in Table 3-6. 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 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 a relevant project area. This will give the specialist the opportunity to consider micro-climate, aspect, topography etc.

Table 3-5 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 3-6 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

3.2.1 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 MAP to Class A-pan ratio.

Table 3-7 Climatic capability (step 1) (Smith, 2006)

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
- >13℃ = C1

Step 3

Mean June temperatures;

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

3.2.2 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.

4 Impact Assessment

Figure 4-1 presents the preliminary layout for the proposed facility, which has been considered for the scoping level impact assessment. This assessment has considered both direct and indirect risks to the wetland and soil attributes for the area.

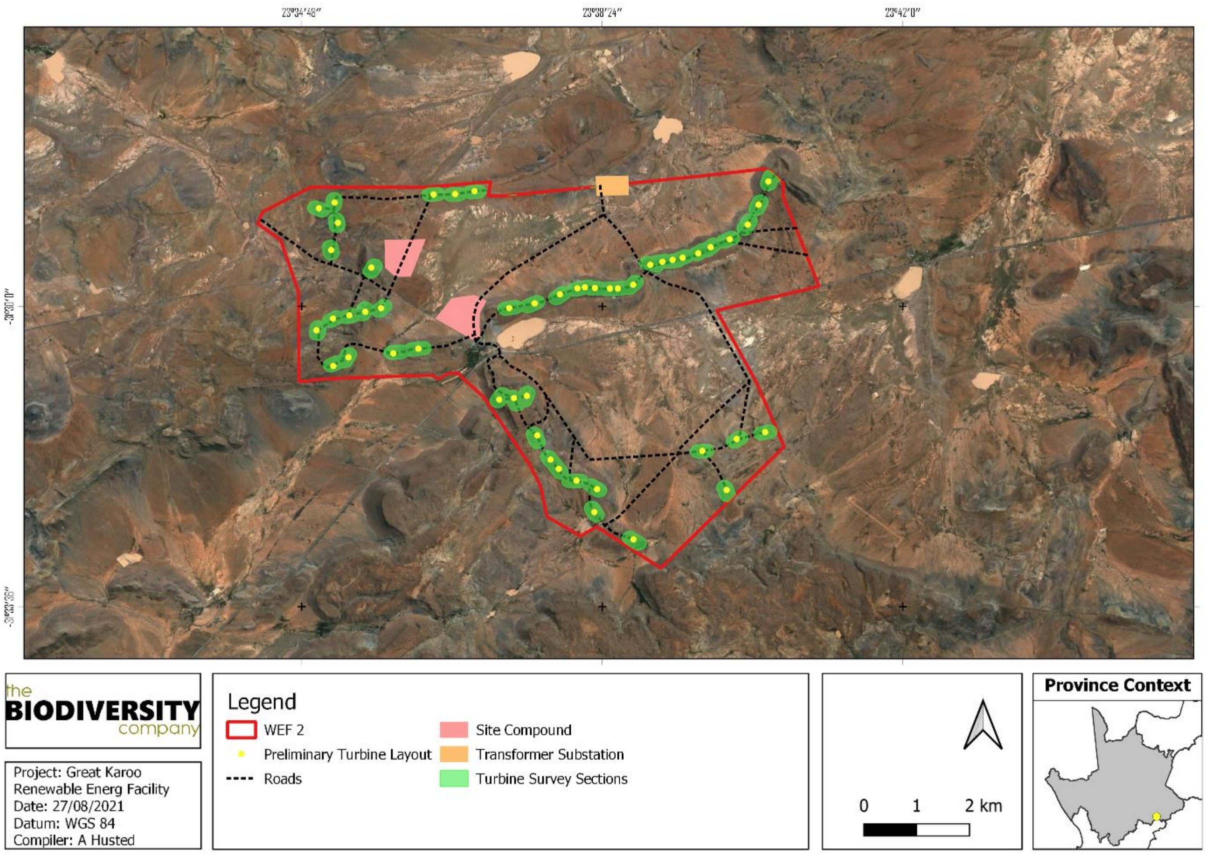

Figure 4-1 Preliminary layout for the proposed facility

4.1 Impact Assessment Method

The assessment of the significance of direct, indirect and cumulative impacts was undertaken using the method as developed by Savannah. The assessment of the impact considers the following, the:

- Nature of the impact, which shall include a description of what causes the effect, what will be affected, and how it will be affected;
- Extent of the impact, indicating whether the impact will be local or regional;
- Duration of the impact, very short-term duration (0-1 year), short-term duration (2-5 years), medium-term (5-15 years), long-term (> 15 years) or permanent;
- Probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable, probable, highly probable or definite;
- Severity/beneficial scale, indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit); severe/beneficial (long-term impact that could be mitigated/long-term benefit); moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit); slight; or have no effect;
- Significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high;
- Status, which will be described as either positive, negative or neutral;
- Degree to which the impact can be reversed;
- Degree to which the impact may cause irreplaceable loss of resources; and

- Degree to which the impact can be mitigated.

4.2 Wetland Impact Assessment

Limited natural wetland areas are expected for the project area. The available data suggests the presence of drainage features, dams, and extensive Section A river networks. The dams are artificial and regarded as man-made features. These dams are not expected to be characterised by hydromorphic properties or hydrophytic vegetation. These systems, considering their artificial nature are assigned an overall low sensitivity.

A network of drainage features, comprising channels and networks are expected for the area. These systems are characterised by terrestrial soils with hydromorphic properties completely being absent. The overall sensitivity of these systems is also expected to be low. Nevertheless, these systems should be granted some level of protection considering the roles that these systems play in ensuring the functionality of the Section A river systems.

Areas indicated as river systems at a desktop level have been classified as Section A river systems due to the expected dominance of alluvial soils and riparian vegetation within and surrounding the direct channel. Section A river systems are characterised by zero-baseflow conditions given the fact that the zone of saturation is not in contact with the base of the stream channel (DWAF, 2005). A Section A system is the least sensitive of the three (section A, B and C) systems in regard to water yield from catchments and is often also referred to as a non-perennial system. The overall sensitivity of these systems is moderate to moderately high.

Table 4-1 Scoping evaluation table summarising the impacts identified to wetlands

Impact Wetland disturbance / loss			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance / degradation / loss to wetland soils or vegetation due to the construction of the facility and associated infrastructure, such as crossings	Direct impacts: » Disturbance / degradation / loss to wetland soils or vegetation Indirect impacts: » Loss of ecosystem services	Regional	Water resources and buffer area
Increased erosion and sedimentation & contamination of resources	Direct impacts: » Erosion and structural changes to the systems Indirect impacts: » Sedimentation & contamination of downstream reaches	Regional	None identified at this stage
Description of expected significance of impact The development of the area could result in the encroachment into water resources and result in the loss or degradation of these system, most of which are functional and provide ecological services. Water resources are also likely to be traversed by roads and other linear infrastructure which might create a barrier to flow and biotic movement across the systems. These disturbances could also result in the infestation and establishment of alien vegetation would affect the functioning of the systems. Earthworks will expose and mobilise earth materials which could result in sedimentation of the receiving systems. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota. It is anticipated to increase stormwater runoff due to the hardened surfaces and the crossings will result in an increase in run-off volume and velocities, resulted in altered flow regimes. The changes could result in physical changes to the receiving systems caused by erosion, run-off and also sedimentation, and the functional changes could result in changes to the vegetative structure of the systems. The reporting of surface run-off to the systems could also result in the contamination of the systems, transporting (in addition to sediment) diesel, hydrocarbons and soil from the operational areas.			
Gaps in knowledge & recommendations for further study » This is completed at a desktop level only. » Identification, delineation and characterisation of water resources.			

» Undertake a functional assessment of systems where applicable. » Determine a suitable buffer width for the resources. **Recommendations with regards to general field surveys** » Field surveys to prioritise the development areas, but also consider the 500 m regulation area. » Beneficial to undertake fieldwork during the wet season period.

4.2.1 Cumulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general wetland loss and transformation resulting from other activities in the area (Table 4-2).

Table 4-2 Cumulative wetland impact assessment

Impact Wetland disturbance / loss			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance / degradation / loss to wetland soils or vegetation due to the construction of the facility and associated infrastructure, such as crossings	Direct impacts: » Disturbance / degradation / loss to wetland soils or vegetation Indirect impacts: » Loss of ecosystem services	Regional	Water resources and buffer area
Increased erosion and sedimentation & contamination of resources	Direct impacts: » Erosion and structural changes to the systems Indirect impacts: » Sedimentation & contamination of downstream reaches	Regional	None identified at this stage
Description of expected significance of impact The expected post-mitigation risk significance for the project in isolation is expected to be low, but in consideration of the larger Great Karoo Renewable Energy Project the overall cumulative impact is expected to be medium. This is expected owing to the fact that the larger project extends into two WMAs and three quaternary catchment areas			
Gaps in knowledge & recommendations for further study » This is completed at a desktop level only. » Identification, delineation and characterisation of water resources. » Undertake a functional assessment of systems where applicable. » Determine a suitable buffer width for the resources. **Recommendations with regards to general field surveys** » Field surveys to prioritise the development areas, but also consider the 500 m regulation area. » Beneficial to undertake fieldwork during the wet season period.			

4.3 Soil Impact Assessment

Considering the occurrence of various soil forms that are commonly associated with high land capabilities, it is likely that areas with high land capability sensitivity do occur within the project area. However, due to the poor climatic capability, the ultimate land potential is more likely to be low.

Table 4-2 Scoping evaluation table summarising the impacts identified to soils

Impact Loss of land capability			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**

Compaction/soil stripping/transformation of land use which leads to loss of land capability	Direct impacts: » Loss of soil / land capability Indirect impacts: » Loss of land capability	Regional	None identified at this stage
Description of expected significance of impact The development of the area could result in the encroachment into areas characterised by high land potential properties, which can ultimately result in the loss of land capability. These disturbances could also result in the infestation and establishment of alien vegetation, which in turn can have a detrimental impact on soil resources. Earthworks will expose and mobilise earth materials which could result in compaction and/or erosion. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of soil resources, which could affect the salinity or pH of the soil, which can render the fertility of the soil unable to provide nutrition to plants. During the operational phase, the impacts associated with the substation and collector sub will be easily managed by best "housekeeping" practices.			
Gaps in knowledge & recommendations for further study » This is completed at a desktop level only. » Identification and delineation of soil forms. » Determine of soil sensitivity. **Recommendations with regards to general field surveys** » Field surveys to prioritise the development areas.			

4.3.1 Cumulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general loss of high-quality land capability areas (Table 4-4).

Table 4-4: Cumulative soil impact assessment

Impact Loss of land capability			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Compaction/soil stripping/transformation of land use which leads to loss of land capability	Direct impacts: » Loss of soil / land capability Indirect impacts: » Loss of land capability	Regional	None identified at this stage
Description of expected significance of impact The expected post-mitigation risk significance is expected to be low, and the overall cumulative impact is therefore expected to be low. The expected post-mitigation risk significance for the project in isolation is expected to be low, but in consideration of the larger Great Karoo Renewable Energy Project the overall cumulative impact is expected to be medium.			
Gaps in knowledge & recommendations for further study » This is completed at a desktop level only. » Identification and delineation of soil forms. » Determine of soil sensitivity. **Recommendations with regards to general field surveys** » Field surveys to prioritise the development areas.			

5 Conclusion

5.1 Wetlands

The extent of natural wetland areas expected for the project area is limited. Wetlands that are expected for the area are considered to be in largely to seriously modified ecological state. Desktop information suggests the presence of drainage features, dams, and also extensive Section A river networks. It is apparent from the data that the Section A river systems are extensive, and these have been assigned a moderate to moderately high sensitivity.

The expected post-mitigation risk significance for the project in isolation is expected to be low, but in consideration of the larger Great Karoo Renewable Energy Project the overall cumulative impact is expected to be medium. This is expected owing to the fact that larger project extends into two WMAs and three quaternary catchment areas.

5.2 Land Capability

Various soil forms are expected throughout the project area, of which some are commonly associated with high land capabilities. Even though the soil depth, texture and permeability of these soils ensure high land capability, the climatic capability of the area often reduces the land potential considerably. Therefore, very few areas characterised by “High” land potential are expected.

Considering the lack of sensitivity, together with holistic mitigation measures, it has been determined that none of the aspects scored during the impact assessment (post-mitigation) are associated with any scores higher than “Low”. It is recommended that the site assessment to be conducted for focus areas that potentially are characterised by greater micro-climates (i.e. aspect) and low laying areas characterised by deep soils.

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