SOL INVICTUS (PTY) LTD

PROPOSED SOL INVICTUS 132KV OVERHEAD POWERLINE NEAR AGGENEYS, NORTHERN CAPE PROVINCE

SOIL AND AGRICULTURAL POTENTIAL STUDY

2021-08

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PROJECT NO.: 41102909
DATE: 2021-08

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1 INTRODUCTION

WSP in Africa (WSP), a wholly owned affiliate of WSP Global Inc., has been appointed to undertake a Soil and Agricultural Potential Assessment for the establishment of a proposed 132 kilovolt (kV) Overhead Powerline (OHPL) for the Sol Invictus Photovoltaic Solar Energy Facility (PVSEF) cluster near Aggeneys, in the Northern Cape Province.

The aim of this assessment is to provide descriptions of the soil forms and their distribution within the project area, and to determine the typical soil properties, as well as current land use, land capability and soil potential. A soils potential impact assessment was also carried out and associated mitigation measures recommended. This Soil and Agricultural Potential Assessment forms part of the basic assessment process being undertaken in terms of the National Environmental Management Act (Act 107 of 1998), as amended (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations, 2014, as amended, in support of the application for Environmental Authorisation for the proposed 132kV OHPL.

This report was prepared by Ms Karen King, a professional hydrologist and soil scientist (Pr.Sci.Nat, M.Sc.). Ms King has 15 years' work experience, and specialises in agricultural studies, soil science and related risk assessments and management plans, as well as mining hydrology, mine water balance calculations, water resources planning, Water Use License Applications, catchment-scale hydrological modelling, flood studies, storm water management planning, wetland delineation, and water research.

2 SITE DESCRIPTION AND LAND USE

The proposed Project is located in the Namakwa District Municipality of the Northern Cape Province, with portions of the OHPL in the Khâi Ma and Local Municipality Nama Khoi Local Municipalities. The Project area is located approximately 5km south-west of the town of Aggeneys. at the closest point, and approximately 22km south-west at the furthest point.

The proposed powerline traverses the following properties:

- Portion 2 of the Farm Aggeneys 56 (Aggeneis Substation)
- Portion 1 of the Farm Aggeneys 56
- Portion 2 of the Farm Zuurwater 62
- Portion 6 of the Farm Zuurwater 62
- Portion 5 of the Farm Zuurwater 62
- Portion 14 of the Farm Taaibosmond 66
- Portion 6 of the Farm Taaibosmond 66
- Portion 5 of the Farm Taaibosmond 66 (incl. Collector Substation for Sol Invictus Solar PVSEF)

Most of the project area is used for extensive sheep farming, but no sheep were seen during the site visit as the site is very sandy and dry and the sheep had been moved to a farm with more available food.

The project area falls within the Springbok Renewable Energy Development Zone (REDZ) and Northern Strategic Transmission Corridor (STC).

3 PROJECT DESCRIPTION

The proposed project includes the following grid connection infrastructure, to connect the authorised Sol Invictus PVSEF to the national grid.

- A collector substation to be located at the Sol Invictus PVSEF site;

- A 22.7km 132kV overhead power line (steel single or double structure with kingbird conductor) spanning between the Sol Invictus PVSEF collector substation and the Aggeneis substation;
- Extension of the Aggeneis substation, including a 400kV busbar extension, 400/132kV 500MVA transformer and 132kV busbars.

The servitude generally associated with 132kV power lines will be up to 40m wide. The expected construction phase will be up to 24 months in duration, during which standard overhead line construction methodology will be employed.

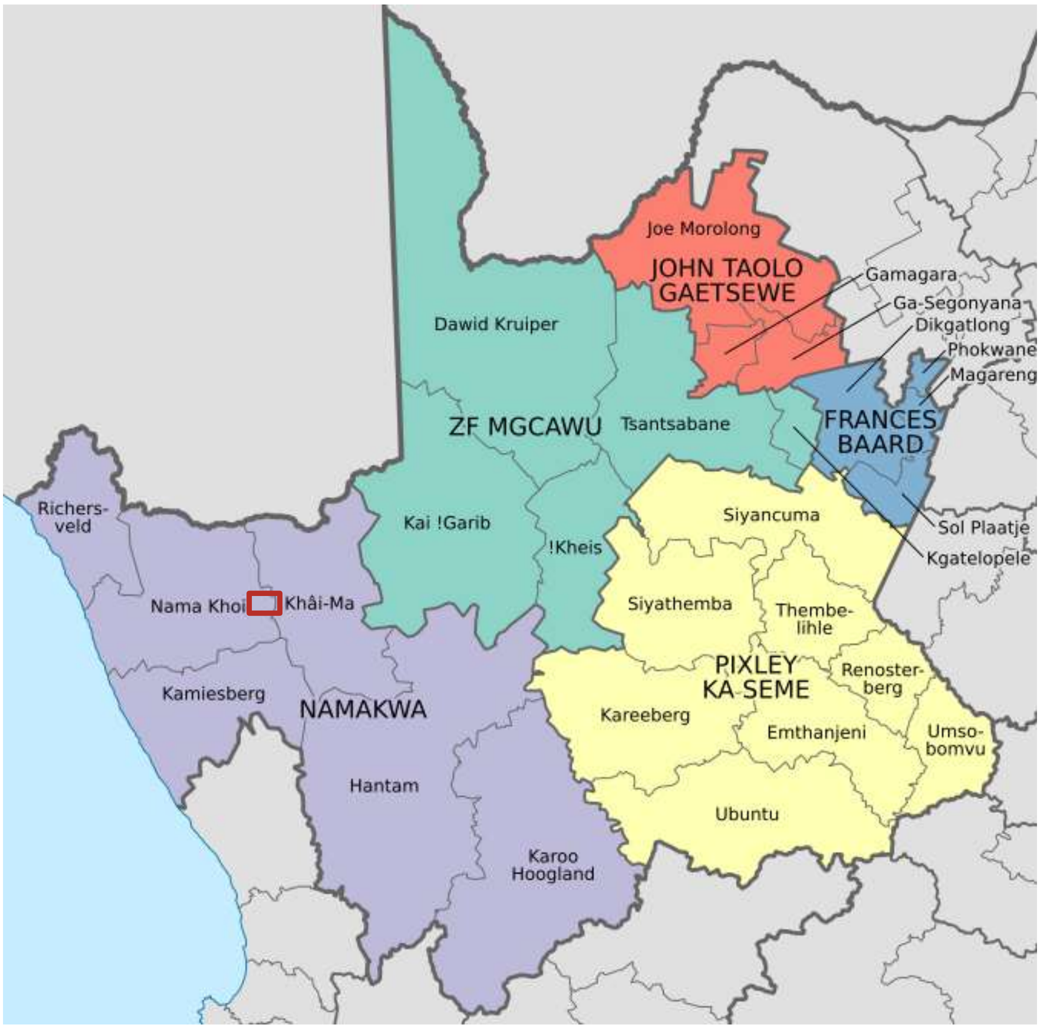

Figure 1: Regional Setting of the site

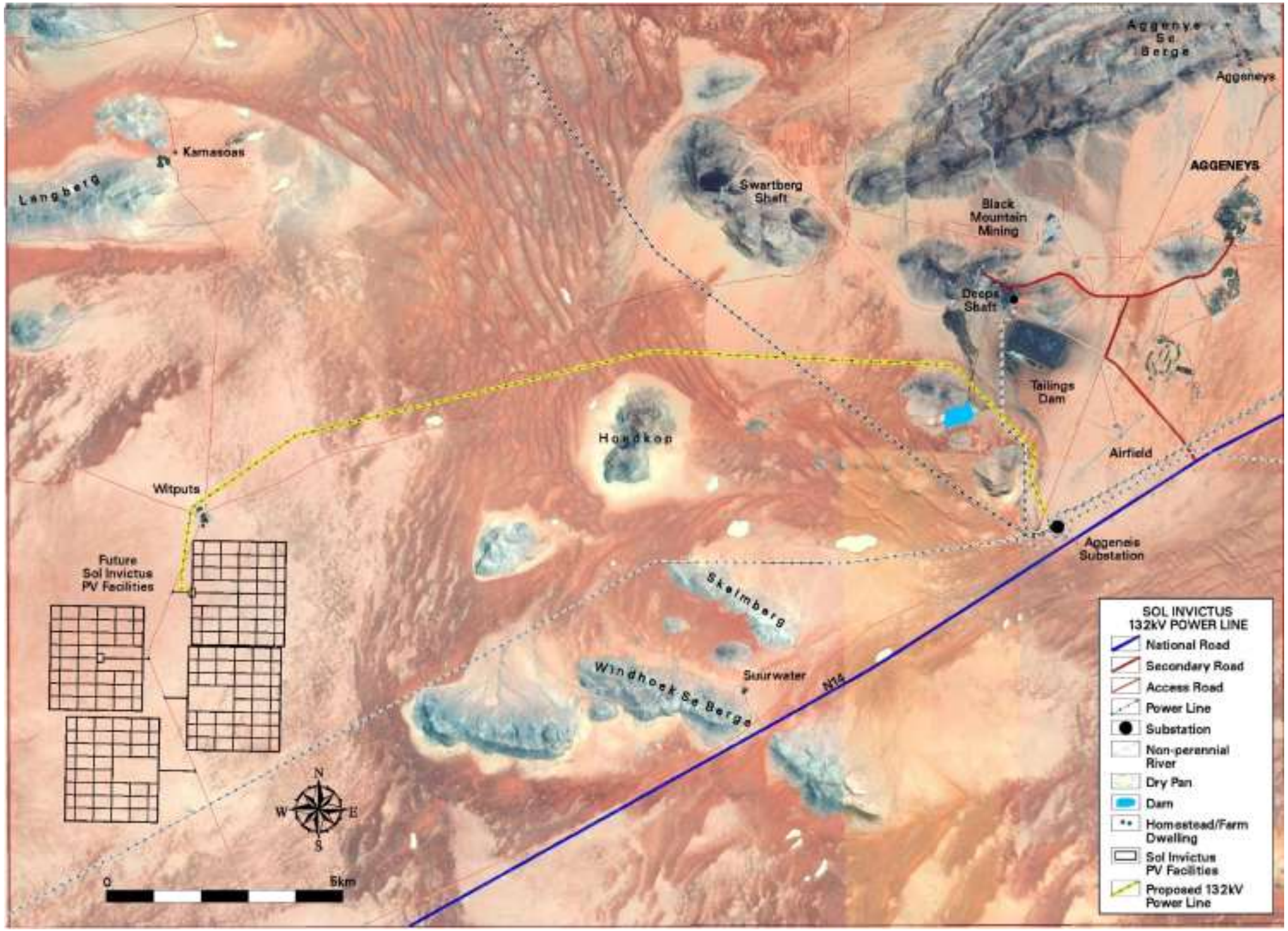

Figure 2: Locality Setting of the Site (source: LOGIS, 2021)

4 BASELINE RECEIVING ENVIRONMENT

This section describes the baseline environment of the site, which provides a fundamental understanding of the soil environment.

4.1 CLIMATE

The site falls within a summer rainfall region. Mean Annual Precipitation in the region ranges from 100 to 520 mm per annum, making this a very dry area. In Aggeneys itself, average, variable annual rainfall is around 112 mm, the majority of which falls between January and April. The lowest recorded annual rainfall (11 mm) was measured in 1992, while the wettest year (220 mm) was recorded in 2006. Average temperatures range between 15 °C and 38 °C in summer and between 0 °C and 18 °C in winter. The low rainfall leads to very low runoff volumes (<5%) owing to the sandy soils of the area.

4.2 LAND COVER

The majority of the soil on site is bare. The positioning of the structureless, red sands that cover the site is largely determined by wind. Where driving tracks have been created on the site, soil modification can be seen, but the majority of the site soils have not been anthropogenically modified. Primary vegetation on site comprises grassy, dwarf shrubland and sandy grassland.

4.3 GEOLOGY

The central portion of this structurally complex region is underlain by a series of pelitic and psammitic metasediments, termed the Bushmanland Group. The hills and mountains in the area contain some of the most diverse and complex geology in Southern Africa, including some of the richest known concentrations of copper, lead and zinc. The structureless sands that dominate the region overlie hard rock.

5 METHODOLOGY

5.1 DESKTOP ASSESSMENT

A desktop assessment was undertaken for the site. This included assessing relevant past environmental reports, site characteristics using GIS and aerial imagery, and soils databases.

5.2 SITE ASSESSMENT

A site visit was conducted on the 3rd and 4th of August 2021. A survey of the study area was undertaken on foot, using a hand-held bucket auger to identify soil forms present. Current activities at the site were also noted, and specific areas of land use were noted. A hand-held GPS was used to record the location of each auger point.

5.3 SOIL CLASSIFICATION

5.3.1 WORLD REFERENCE BASE CLASSIFICATION SYSTEM

The soils identified in the field were classified by form in accordance with the World Reference Base for Soil Resources (WRB, 2006). This is the international standard taxonomic soil classification system endorsed by the International Union of Soil Sciences (IUSS). It was developed by an international collaboration coordinated by the International Soil Reference and Information Centre (ISRIC) and sponsored by the IUSS and the Food and Agricultural Organisation (FAO) via its Land & Water Development division. It replaces the previous FAO soil classification. The WRB borrows heavily from modern soil classification concepts, including United States Department of Agriculture (USDA) soil taxonomy, the legend for the FAO Soil Map of the World 1988, the *Référentiel Pédologique* and Russian concepts. The classification is based mainly on soil morphology as an expression of pedogenesis. A major characteristic of the USDA soil taxonomy system is that climate is not part of the system, except insofar as climate influences soil profile characteristics. As far as possible, diagnostic criteria match those of existing systems, so that correlation with national and previous international systems is as straightforward as possible. The WRB is meant for correlation of national and local systems.

5.3.2 SOUTH AFRICAN CLASSIFICATION SYSTEM

The soils identified in the field were also classified by form in accordance with the South African soil taxonomic system (Soil Classification Working Group, 1991) as a great deal of information is available about the various South African soil forms. In this way, more information could be given about the characteristics of the types of soils identified in the field. All South African soil forms fall within 12 soil types; Duplex (marked accumulation of clay in the B horizon), Humic (intensely weathered, low base status, exceptional humus accumulation), Vertic (swelling, cracking, high activity clay), Melanic (dark, structured, high base status), Silicic (Silica precipitates as a dorbank horizon), Calcic (accumulation of limestone as a horizon), Organic (peaty soils where water inhibits organic breakdown), Podzolic (humic layer forms beneath an Ae or E), Plinthic (fluctuating water table causes iron re-precipitation as ferricrete), Oxidic (iron oxides weather and colour soils), Hydromorphic (reduced lower horizons) and Inceptic (young soils - accumulation of unconsolidated material, rocky B or disturbed) soils.

5.4 SOIL CAPABILITY ASSESSMENT

The area's soils capability was assessed and mapped, based on the results of the classification study. The South African land capability classification system by Scotney *et al*. (1987) was used to identify and map land capability and soil potential (**Table 1**). This system is useful in that it is able to quickly provide an overview of the agricultural capability and limitations of the soils in question, and is useful for soil capability comparisons.

Table 1: Land Capability Classification System (Scotney *et al.*, 2014)

Land Capability Group	Land Capability Class	Increased intensity of use									Limitations
Arable	I	W	F	LG	MG	IG	LC	MC	IC	VIC	No or few limitations. Very high arable potential. Very low erosion hazard
	II	W	F	LG	MG	IG	LC	MC	IC	-	Slight limitations. High arable potential. Low erosion hazard
	III	W	F	LG	MG	IG	LC	MC	-	-	Moderate limitations. Some erosion hazards
	IV	W	F	LG	MG	IG	LC	-	-	-	Severe limitations. Low arable potential. High erosion hazard.
Grazing	V	W	-	LG	MG	-	-	-	-	-	Water course and land with wetness limitations
	VI	W	F	LG	MG	-	-	-	-	-	Limitations preclude cultivation. Suitable for perennial vegetation
	VII	W	F	LG	-	-	-	-	-	-	Very severe limitations. Suitable only for natural vegetation
Wildlife	VIII	W	-	-	-	-	-	-	-	-	Extremely severe limitations. Not suitable for grazing or afforestation.

W - Wildlife
F - Forestry
LG - Light grazing
MG – Moderate grazing
IG - Intensive grazing
LC - Light cultivation
MC - Moderate cultivation
IC - Intensive cultivation.
VIC – Very intensive cultivation

5.5 IMPACT ASSESSMENT METHODOLOGY

5.5.1 ASSESSMENT OF IMPACTS

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in **Table 2**

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

Table 2: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	0 – 30	31 to 60	61 – 100		
Environmental Significance Rating (Negative (-))	**Low (-)**	**Moderate (-)**	**High (-)**		
Environmental Significance Rating (Positive (+))	**Low (+)**	**Moderate (+)**	**High (+)**		

5.5.2 IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion.

Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 3**.

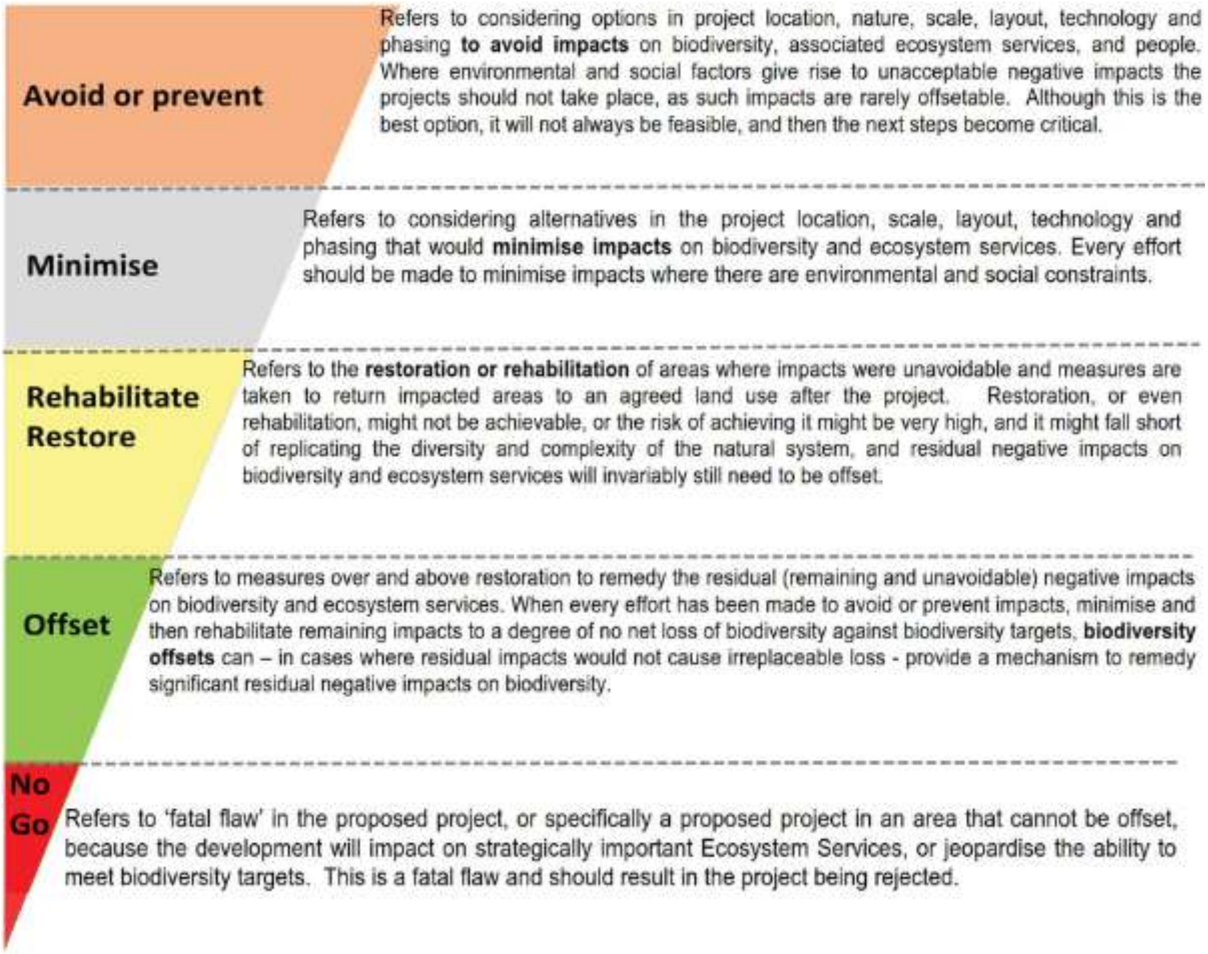

Figure 5: Mitigation Sequence/Hierarchy

6 RESULTS AND DISCUSSION

6.1 SOIL FORM IDENTIFICATION AND CLASSIFICATION

A site walkover was undertaken by the specialist from the 3rd to the 4th of August to identify the soil forms within the study area. Typically, one would auger to a depth of 1.2m or to refusal, for classification purposes, but the vast majority of the soils at the site were too sandy to remain in an auger bucket and the attempted auger holes fell in on themselves as the auger was removed from the soil. Other soils identified were too shallow to fill half a bucket.

Four soil forms were identified within the project area, as presented in **Figure 3**. These have been classified according to the South African and WRB taxonomic systems and described below.

6.1.1 NAMIB / ARENOSOLS

Some of the red, sandy dune soils that dominate the site were very stony, especially those nearer the base of rocky outcrops, and some devoid of stones altogether (see **Table 3** (soil type 1) and **Figure 3**). The red colour can be attributed to oxides of iron that accumulate through weathering and colour the soils - uniformly if the conditions are well drained and aerated, as is the case at the Sol Invictus site. The red colour signifies conditions that are warm, dry, and not significantly affected by organic matter. These soils fall within the Namib soil form according to the South Africa taxonomic system and within the form Arenosols within the WRB system.

The Namib soil form describes deep sands. Sandy Arenosols are typical of desert areas, beach areas and inland dunes, and areas with highly weathered sandstone. These soils lack any significant soil profile development. They exhibit only a partially formed surface horizon (uppermost layer) that is low in humus, and they are bereft of subsurface clay accumulation. They are excessively permeable, have a very low nutrient content and are found in arid regions.

6.1.2 MISPAH / LEPTOSOLS

The soils at the base of the rocky outcrops were very shallow; 1-2cm to refusal (see **Table 3** (soil type 2) and **Figure 3**). These soils fall within the soil form Mispah according to the South Africa taxonomic system, and within the form Leptosols within the WRB system.

The Mispah soil form is characterised by a shallow Orthic A-horizon over hard rock. Mispah soil comprises horizontally orientated, hard, fractured sediments which do not have distinct vertical channels containing soil material. Leptosols are described as shallow to very shallow soils underlain by a rock layer. These soils have a low water-holding capacity owing to their lack of depth and gravelly nature.

6.1.3 HUTTON / FERRALSOLS

The soils identified within depressions in the landscape were 30-40cm deep, powdery soils with limited macrostructure (see **Table 3** (soil type 3) and **Figure 3**). While these depressions clearly contain water at times, as seen by the surface cracking of the soils, these soils are not wet enough for long enough periods of the year to exhibit any typical signs of soil wetness such as mottling or gleying. These soils thus fall into a terrestrial soil group and can be classified as Hutton soils, according to the South Africa taxonomic system, and fall within the form Ferralsols, within the WRB system.

The Hutton soil form is characterised by an Orthic A horizon over a red apedal B horizon over unspecified material. The Hutton soil form falls into the South African Oxidic soil group. These soils develop as oxides of iron accumulate through weathering and colour the soils - uniformly if the conditions are well drained and aerated, as is the case at the Sol Invictus site. The red colour of hematite signifies conditions that are warm, dry, and not significantly affected by organic matter. Ferralsols are yellow or – as in this case – red weathered soils whose colours result from an accumulation of metal oxides, particularly iron and aluminium (from which the name of the soil group is derived).

6.1.4 WITBANK / ANTHROSOLS

The final soil form identified at the site is what is called a Witbank in the South Africa taxonomic system and falls within the form Anthrosols within the WRB system (see **Table 3** (soil type 4) and **Figure 3**). These soils vary widely in appearance, can be found in any environment, and have in common that their properties are strongly affected by human interference.

The soil forms identified at each location are shown in **Table 3**.

Table 3: Soil Forms within the project area

Soil Type	In-field Observations	Photographs	Soil Form
1	Too sandy to remain within an auger - holes fell in on themselves. Some very stony, some devoid of stones altogether.	 	Namib / Arenosol

Soil Type	In-field Observations	Photographs	Soil Form
2	Soils at the base of the rocky outcrops were very shallow – 1-2cm to refusal.	 	Mispah / Leptosols

Soil Type	In-field Observations	Photographs	Soil Form
3	These depressions contain water at times, but the soils are not wet enough for long enough periods to exhibit signs of wetness.	 	Hutton / Ferralsols

Soil Type	In-field Observations	Photographs	Soil Form
4	Areas of soils very strongly affected by human interference. On site, these were created owing to limited vehicular paths and housing.	 	Witbank / Anthrosols

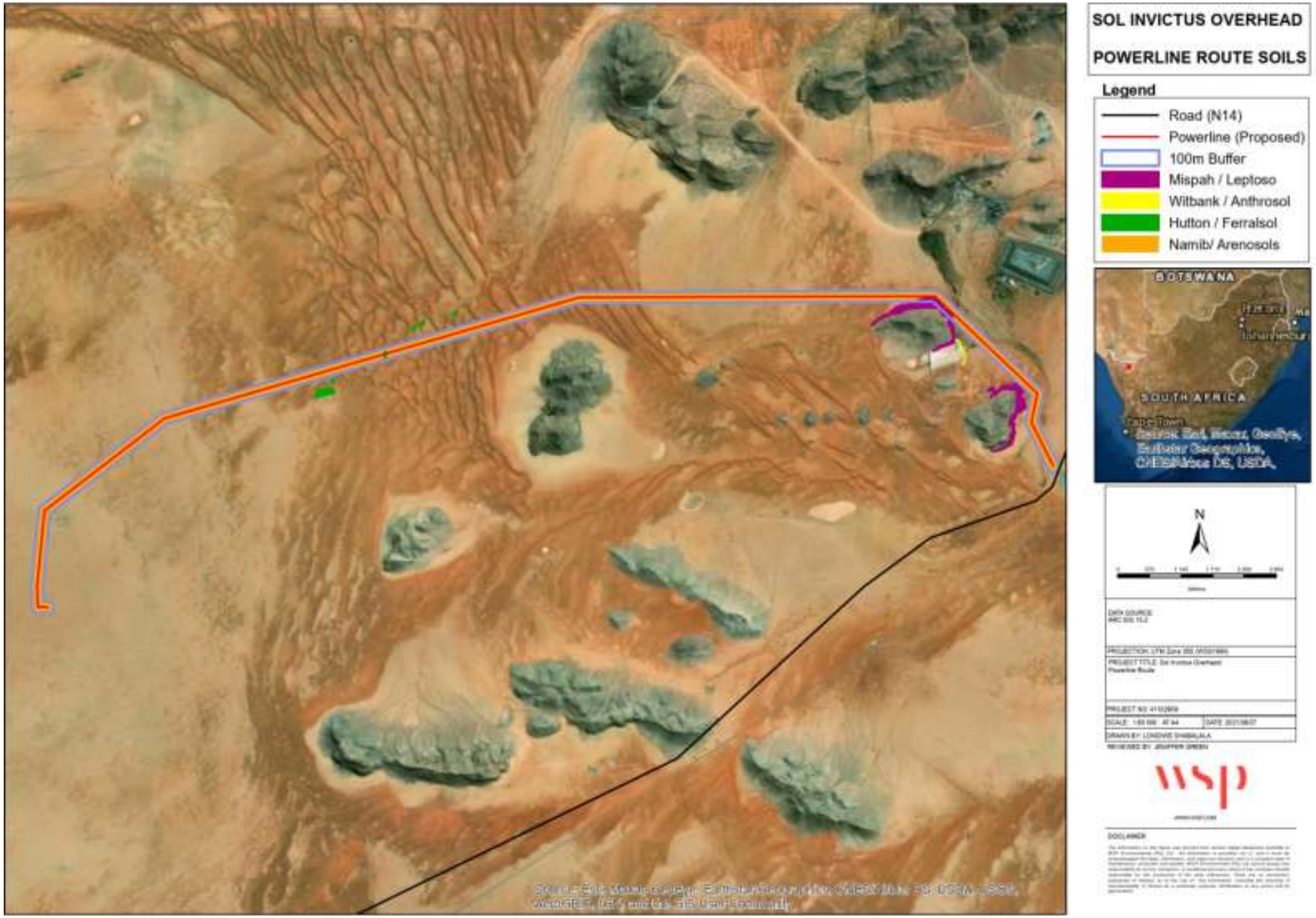

Figure 3: Map depicting dominant soil forms in the study area

Figure 4: Mispah, Witbank and Namib soils in the study area

Figure 5: Hutton and Namib Soils in the study area

6.2 SOIL CAPABILITY ANALYSIS

Land capability is the inherent capacity of land to be productive under sustained use and specific management methods. The land capability of an area is the combination of the inherent soil properties and the climatic conditions as well as other landscape properties, such as slope and drainage patterns that may have resulted in the development of wetlands, as an example.

Using the South African soil classification guidelines (Scotney *et al.*, 1987), the land capability of the Namib soils / Arenosols was established as Land Capability Group 'Grazing' and Land Capability Class VII, as they have Very Severe Limitations, are Only Suitable for Natural Vegetation, and can be used for (in order of increased intensity of use) 'Wildlife, Forestry and Light Grazing' (**Table 1**, Scotney *et al.*, 1987). These sandy dunes are easily moved from place to place by the wind, comprise no topsoil, comprise very low water holding potential and are very low in nutrients. Further to this, the site is in a very dry area.

The land capability of the Hutton soils / Ferralsols was established as Land Capability Group 'Arable Soils' and Land Capability Class IV, as they have 'Severe limitations' and 'High erosion hazards' and can be used for (in order of increased intensity of use) 'Wildlife, Forestry, Light Grazing, Moderate Grazing, Intensive Grazing and Light Cultivation' (**Table 1**, Scotney *et al.*, 1987). In the context of this site, however, the Huttons have a very thin Orthic A horizon (topsoil), are only found in the limited depression areas identified on site. The area is extremely dry, and irrigation of these few, scattered depressions would not be viable.

The land capability of the Mispah soils / Leptosols was established as Land Capability Group 'Grazing' and Land Capability Class VII, as they have Very Severe Limitations, are Only Suitable for Natural Vegetation, and can be used for (in order of increased intensity of use) 'Wildlife, Forestry and Light Grazing' (**Table 1**, Scotney *et al.*, 1987). In the context of this site, some of the Mispahs could sustain limited natural vegetation for light grazing and some would be too shallow.

The land capability of the Witbank soils / Anthrosols was established as Land Capability Class 'Grazing' and Land Capability Class VII, as they have Very Severe Limitations, are Only Suitable for Natural Vegetation, and can be used for (in order of increased intensity of use) 'Wildlife, Forestry and Light Grazing' (**Table 1**, Scotney *et al.*, 1987).

In the context of the overall site, the land capability would be best described as a Class 'Grazing' with Very Severe Limitations and Only Suitable for Natural Vegetation, owing to the site predominantly consisting of the Namib soil form and the low rainfall in the area. Furthermore, this would need to be extensive, well managed grazing for the site to remain sustainable as a source of grazing land.

6.3 IMPACT ASSESSMENT

The following potential soil-related impacts were identified as applicable in terms of the proposed project.

- Erosion
- Change in surface profile
- Change in land use
- Change in land capability
- Soil Contamination

The assessment of impact significance considers pre-mitigation as well as implemented of post-mitigation scenarios. Due to the nature of the project, the actual footprint of each pole/pylon infrastructure has a small localised, impact. Additionally, existing access / jeep tracks are to be utilized as much as possible throughout the project area, thereby reducing the extent of new access tracks required. Additionally, the fact that the project area occurs within a Renewable Energy Development Zone (REDZ) reduces the significance of impacts.

The potential impacts associated with the construction and operation of the site are assessed and discussed in the following sections, along with identification of recommended mitigation measures. The soil protection strategies identified are taken from the International Finance Corporation (World Bank) Environmental, Health and Safety Guidelines for Mining, 2007 (IFC, 2007). These guidelines are applicable to projects outside of the mining sphere and can be used to guide proposed construction activities at the site. Furthermore, the project is to be undertaken in line with the generic EMPr relevant to applications for the development or expansion of overhead electricity transmission and distribution infrastructure, and all listed and specified activities necessary for the realisation of such infrastructure.

6.3.1 CONSTRUCTION PHASE

This phase refers to the period when construction of the proposed infrastructure is built/installed. This phase usually has the largest direct impact on soils and land capability.

This phase includes site preparation prior to construction activities, involving vehicular movement (transportation of construction materials) and the removal of vegetation within the development footprint and associated disturbances to soil, and access to the site. Site preparation is followed by installation of the support structures and spanning of the powerline cable. This phase entails the drilling of holes / excavation of pits for the support structures, leading to stockpiling and exposure of loose soils, as well as movement of construction equipment and personnel within the project area.

The following potential impacts were considered on soils and land capability within the project area.

IMPACT REF 1: WIND EROSION

Movement of vehicles, mobile plant and equipment, as well as earthworks required for establishment of support structures could result in increased loose material being exposed.

Wind erosion is already an ongoing, inevitable process associated with dune sands. The probability of the process occurring, with or without mitigation, is thus definite, the change is considered irreversible once eroded, and the duration is considered indefinite (i.e. will continue beyond the life of the project). Within the context of the impact assessment rating methodology, these aspects push the calculated significance rating up dramatically to indicate an impact of ‘high’ negative significance, yet the significance in comparison to the current situation is not high. It is the specialist's opinion that this significance value should be ‘low’ with mitigation. Mitigation should focus on limiting earthworks and vehicle movement to demarcated paths and areas, as well as limiting the duration of the construction activities where possible.

Potential Impact: **Wind Erosion**	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	3	2	5	5	5	75	High	(-)	High
With Mitigation	1	1	5	5	5	48	Moderate	(-)	High
Mitigation and Management Measures									

— Limit earthworks and vehicle movement to demarcated paths and areas.
— Limit the duration of construction activities where possible, especially those involving earthwork / excavations.
— Access roads associated with the development should have gradients or surface treatment to limit erosion, and road drainage systems should be accounted for.
— Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces must be re-vegetated or stabilised as soon as is practically possible.
— During periods of strong winds, stockpiles must be covered with appropriate material (e.g. cloth, tarpaulin etc.).

IMPACT REF 2: CHANGE IN SURFACE PROFILE

Earthworks required for establishment of support structures, as well as establishment of access tracks, could result in the change of surface profile within the project area.

A change in the surface profile is inevitable with earthworks, permanent in duration, definite and cannot be mitigated against. Even though the extent of the impact is very small, within the context of the impact assessment rating methodology the calculated significance is a ‘moderate’ negative. Despite this, it is the specialist's opinion that the significance of this change in surface profile in the context of this project is ‘low’.

It is however noted that excavations (if required) will be limited to the pole positions (i.e. establishment area for support structures).

Potential Impact: **Change in surface profile**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	1	1	5	5	5	**60**	**Moderate**	(-)	High
With Mitigation	1	1	5	5	5	**60**	**Moderate**	(-)	High
Mitigation and Management Measures									
— Not mitigatable.									

IMPACT REF 3: CHANGE IN LAND USE

Clearance of vegetation on site and establishment of infrastructure will result in some change of land use within the project area.

The land is currently used for low intensity grazing. The proposed project will result in a change in land use to host powerline pylons, so there is a change in land use, albeit this change will be limited to the pylon bases, as the area between the powerline pylons can still be used for grazing. The degree of alteration is very high (i.e. complete change in land use) at the base of each pylon, however, in this context, change in the project area is deemed low. However, the change will definitely take place and will be irreversible for the duration of the project life (i.e. the impact will take place in the construction phase but will remain as long as the project infrastructure is in place).

Even though the extent is small and impact magnitude is low, within the context of the impact assessment rating methodology the calculated significance is a 'moderate' negative. With implementation of mitigation measures, that include limited disturbance and removal of vegetation, the impact remains 'moderate'. It is however the specialist's opinion that the significance of this change in land use is low, as the current land use is very limited.

Potential Impact: **Change in land use**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	2	1	5	4	5	**60**	**Moderate**	(-)	High
With Mitigation	1	1	5	4	5	**55**	**Moderate**	(-)	High
Mitigation and Management Measures									
— Limit earthworks and vehicle movement to demarcated paths and areas. — Limit removal of vegetation to demarcated areas only. — Rehabilitate disturbed areas as soon as practicable following disturbance thereof.									

IMPACT REF 4: CHANGE IN LAND CAPABILITY

The movement of mobile plant / equipment could result in compaction / disturbance of soils and associated change in land capability. Furthermore, the areas where the pylons will be placed will no longer be capable of supporting growth of vegetation for grazing activities. The degree of alteration is very high (i.e. complete loss of land capability) at the base of each pylon, however in the context change in the project area the alteration is deemed low. However, the change will definitely take place and will be irreversible for the duration of the project life (i.e. the impact will take place in the construction phase but will remain as long as the project infrastructure is in place).

Even though the extent small and impact magnitude is low, within the context of the impact assessment rating methodology the calculated significance is a 'moderate' negative. With implementation of mitigation measures, that include limited disturbance and removal of vegetation, the impact remains 'moderate'. It is however the specialist's opinion that the significance of this change in land capability is low, as the current land capability is very limited.

Potential Impact: **Change in land capability**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	2	1	5	4	5	**70**	**High**	(-)	High
With Mitigation	1	1	3	4	5	**60**	**Moderate**	(-)	High
Mitigation and Management Measures									
— Limit earthworks and vehicle movement to demarcated paths and areas. — Limit removal of vegetation to demarcated areas only.									

IMPACT REF 5: SOIL CONTAMINATION

Movement of vehicles and plant / equipment on site could result in leaks, spills of hazardous materials, such as fuels, oils, chemicals, and so forth. Contaminated soil is expensive to rehabilitate and contamination entering the soils of the project area infiltrate into the ground as well as migrate from site during rainfall events. With the implementation of mitigation measures, the probability and duration of the impact can be reduced, thereby reducing the potential impact from a 'moderate' negative to 'low'.

Potential Impact: **Soil Contamination**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	3	1	3	5	4	**56**	**Moderate**	(-)	High
With Mitigation	3	1	3	2	2	**18**	**Low**	(-)	High
Mitigation and Management Measures									
In order to limit soil contamination during the construction phase: — On-site vehicles should be well-maintained, — Drip trays should be placed under stationary vehicles / plant; — On-site pollutants/hazardous materials should be contained in a bunded area and on an impermeable surface; — Ensure proper control of dangerous substances entering the site; — Adequate disposal facilities should be provided, and — A non-polluting environment should be enforced.									

6.3.2 OPERATION PHASE

This phase refers to the period operation and maintenance period of the OHPL (i.e. following commissioning through project life). As indicated above, the identified impacts to soil take place during the construction phase but the impact is felt throughout the operation phase. The impact for the operation phase is therefore equivalent to the impacts identified above.

7 CONCLUSIONS

The predominant land use within the project area is limited, extensive grazing. The soils identified (Namib / Arenosols; Mispa / Leptosols; Hutton / Ferralsols and Witbank / Anthosols) have different characteristics, however, the predominant land capability of the site was deemed to be Class VII; Grazing, and it is suitable only for light, extensive (widespread) grazing and natural vegetation. This is owed primarily to the site being dominated by the Namib soil form / Arenosols in the form of red sand dunes, and the low rainfall in the area.

The more easily mitigatable risk identified to the soils at the site is contamination. Change in land use, land capability and erosion can be mitigated against to a very limited extent on such sandy, structureless soils. The inevitable changes in the surface profile, as a result of the development, cannot be mitigated against. Implementation of mitigation measures will be most important during the construction phase.

It is the specialist's opinion that, as a result of the impact assessment methodology rating, the significance of the impacts identified are assessed to be higher than anticipated. Additionally, no fatal flaws are evident for the proposed project and mitigation measures, as described in this report, can be implemented to reduce the significance of the risk to an overall acceptable level.

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APPENDIX

A SPECIALIST CV

APPENDIX

A-1 *TITLE*