Agricultural Compliance Statement for the proposed Jersey Solar Power Plant Project

Ventersdorp, North West Province, South Africa

October 2022

Client

ENVIRONAMICS

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Report Name	**Agricultural Compliance Statement for the proposed Jersey Solar Power Plant Project**
Reference	Jersey Solar Power Plant
Submitted to	ENVIRONAMICS
Report Reviewer	**Andrew Husted** 
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Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

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Document Guide

According to the Government Notice 320 dated 20 March 2020 and the 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, the following criteria is applicable to that of an agricultural compliance statement.

Requirement	Reference
Specialist Details and CV	Appendix A
Locality of the proposed activity	Section 2
Sensitivity verification	Section 5.2
Acceptability of impacts towards agricultural production capability associated with proposed activities	Section 6
Declaration of specialist(s)	Page vi
Project components with 50 m regulated area superimposed to that of the agricultural sensitivities of the screening tool	Section 5.2
Confirmation from specialist that mitigation to avoid fragmentation has been considered	Section 6
Statement from specialist regarding the acceptability and approval of proposed activities	Section 6
Conditions to acceptability of proposed activities	
Probability of land being returned to current state after decommissioning	N/A
Monitoring requirements and/or any inclusions into EMPr	N/A
Assumptions and uncertainties	Section 3.4

DECLARATION

I, **Matthew Mamera** 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.

Matthew Mamera

Soil Scientist

The Biodiversity Company

October 2022

1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a basic soil and agricultural compliance assessment for the proposed Jersey Solar Power Plant (SPP) and infrastructure project. The proposed project involves the development of a 250MW solar facility and associated infrastructure located near Ventersdorp, North-West Province. The project area is found 29 km south-west of Ventersdorp and 21 km east of Roodepoort.

The approach adopted for the assessment has taken cognisance of the recently published Government Notice 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".

This report aims to present and discuss the findings from the soil resources identified within the 50 m regulated area. The report will also identify the soil suitability and land potential of these soils, the land uses within the assessment area and the risks associated with the proposed solar renewable development project.

1.2 Site Information and Technical Details

The following information (Table 1-1) is as per the technical information provided by Environamics:

Table 1-1 Site information

Description of affected farm portion	Solar Power Plant Portion 1 of the Farm Illmasdale No. 70 Portion 2 of the Farm Illmasdale No. 70
Province	North West
District Municipality	Dr Kenneth Kaunda District Municipality
Local Municipality	JB Marks Local Municipality
Ward numbers	31
Closest towns	Ventersdorp is located approximately 27km southwest of the proposed development.
21 Digit Surveyor General codes	Solar Power Plant Portion 2 of the Farm Illmasdale No. 70 T0IQ00000000007000001 Portion 2 of the Farm Illmasdale No. 70 T0IQ00000000007000002 Power Line Remainder of the farm Illmasdale No. 70 T0IQ00000000007000001 T0IQ00000000007000002
Type of technology	Photovoltaic solar facility
Structure Height	Panels ~6m, buildings ~ 6m, power line ~32m and battery storage facility ~8m height
Battery storage	Within a 4-hectare area

Surface area to be covered (Development footprint)	Approximately 600 ha
Laydown area dimensions (EIA footprint)	Assessed 600 ha
Structure orientation	The panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.
Generation capacity	Up to 350 MW
Expected production	415 MW

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce up to 350MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted at a northern angle in order to capture the most sun or using one-axis tracker structures to follow the sun to increase the Yield.

- Wiring to Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33KV to 132KV to 275KV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is 480V and this is fed into step up transformers to 132kV. An onsite substation will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid via the proposed power line. It is expected that generation from the facility will tie in with the Hera / Watershed 275kV HV Feeder Overhead Line to the existing Eskom Pluto 400kV/275KV/22KV MTS Substation. The connection options will be assessed within the same 200m wide (up to 550m wide in some instances) grid connection corridor. The Jersey SPP will inject up to 350MW into the National Grid. The installed capacity will be approximately 415MW (Refer to Figure 1-1).

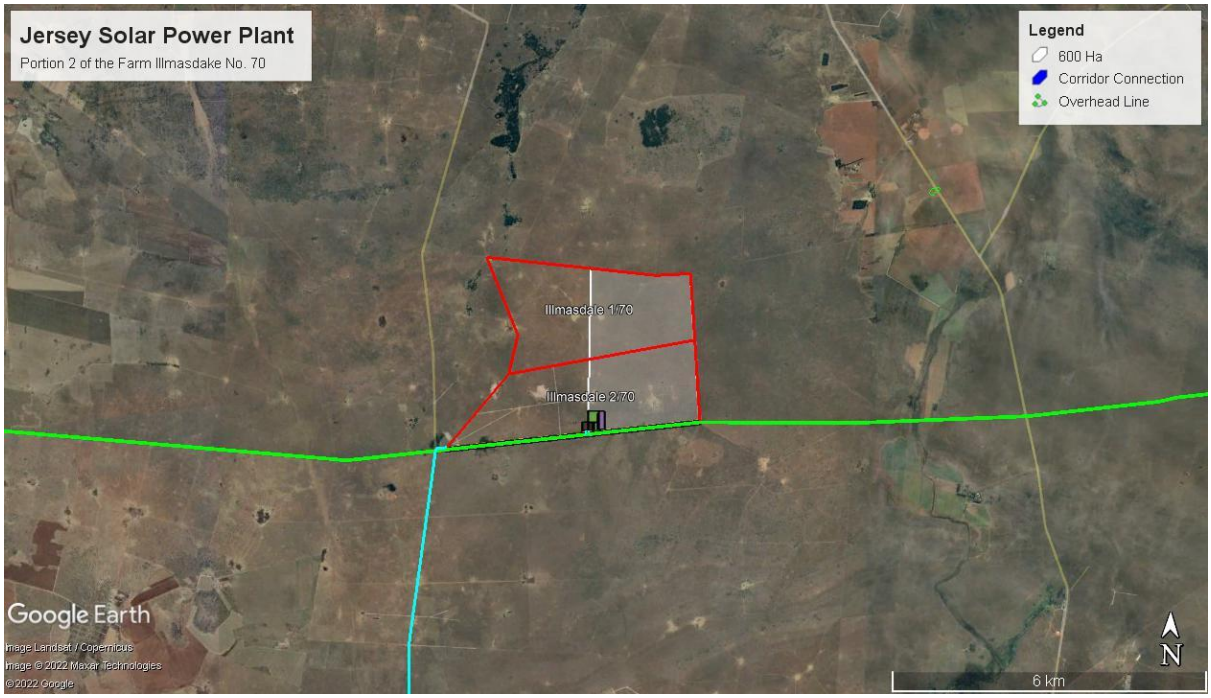

Figure 1-1 Map illustrating the proposed site

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4 m underground as far as practically possible.
- Supporting Infrastructure – The supporting infrastructure such as the auxiliary buildings will be situated in an area measuring up to 4 ha.
- Battery storage – A Battery Storage Facility with a maximum height of 8 m and a maximum volume of 1,740 m^3 of batteries and associated operational, safety and control infrastructure.
- Roads – Access to the facility will be obtained from the N14 to the south of the site and via another unnamed road to the north of the site. An internal site road network will also be required to provide access to the solar field and associated infrastructure. The access and internal roads will be constructed within a 25- meter corridor. Access Points: coordinates 26°17'27.04"S; 27° 3'0.28"E and 26°10'23.40"S; 27° 2'51.09"E.
- Fencing – For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a height of 2.5 meters will be used.

1.3 Consideration of Alternatives

The DEAT 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives namely, the no-go, location, activity, and design alternatives. It is however, important to note that the regulation and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and EAP, which in some instances culminates in a single preferred project proposal. An initial site assessment was conducted by the developer the affected properties and the farm portions were found favorable due to its proximity to grid connections, solar radiation, ecology and relative flat terrain. These factors were then taken into consideration and avoided as far as possible.

The following alternatives were considered in relation to the proposed activity and all specialists should also make mention of these:

No-go alternative

This alternative considers the option of 'do nothing' and maintaining the status quo. The site is currently zoned for agricultural and mining land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for agricultural purposes. The potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost if the status quo persist.

Location alternatives

No other possible sites were identified on Portion 2 of the Farm Illmasdale No. 70. This site is referred to as the preferred site. Some limited sensitive features occur on the site. The size of the site makes provision for the exclusion of any sensitive environmental features that may arise through the EIA proses.

Technical alternatives: Powerlines

Two connection options are available. It is expected that generation from the facility will connect to the national grid via the existing Eskom Hera/Watershed 275kV or Pluto/Watershed 275kV Overhead Line. The grid connection route will be assessed within a 200m wide (up to 550m wide in some instances) corridor. The Project will inject up to 350MW into the National Grid. The installed capacity will be approximately 415MW.

Battery storage facility

It is proposed that a nominal up to 500 MWh Battery Storage Facility for grid storage would be housed in stacked containers, or multi-storey building, with a maximum height of 8m and a maximum volume of 1,740m^3 of batteries and associated operational, safety and control infrastructure. Three types of battery technologies are being considered for the proposed project: Lithium-ion, Sodium-sulphur or Vanadium Redox flow battery. The preferred battery technology is Lithium-ion.

Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the base load and peak power generation market and therefore can compete directly with fossil fuel sources of power generation and offer a truly sustainable electricity supply option.

Design and layout alternatives

Design alternatives will be considered throughout the planning and design phase and specialist studies are expected to inform the final layout of the proposed development.

Technology alternatives

There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon (Mono-facial and Bi-facial) and thin film. The technology that (at this stage) proves more feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels, due to it being non-reflective, more efficient, and with a higher durability. However, due to the rapid technological advances being made in the field of solar

technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project.

1.4 Scope of Work

According to the National Web based Environmental Screening Tool, the proposed development is located within the "Low to Medium" sensitivity land capability area. The protocols for minimum requirements (DEA, 2020)[1] stipulates that in an event that a proposed development is located within "Low" or "Medium" sensitivities, an agricultural compliance statement will be sufficient. It is worth noting that according to these protocols, a site inspection will still need to be conducted to determine the accuracy of these sensitivities. After acquiring baseline information pertaining to soil, terrain and climate features within the 50 m regulated areas, it is the specialist's opinion that the soil forms and associated land capabilities concur with the sensitivities stated by the screening tool. Therefore, only an agricultural compliance statement will be compiled. This includes:

- The feasibility of the proposed activities;
- Confirmation about the "Low" and "Medium" sensitivities;
- The effects that the proposed activities will have on agricultural production in the area;
- A map superimposing the proposed footprint area, a 50 m regulated area as well as the sensitivities pertaining to the screening tool;
- Confirmation that no agricultural segregation will take place and that all options have been considered to avoid segregation;
- The specialist's opinion regarding the approval of the proposed activities; and
- Any potential mitigation measures described by the specialist to be included in the EMPr.

1.5 Expertise of the Specialists

1.5.1 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 13 years' experience in the environmental consulting field.

1.5.2 Matthew Mamera

Matthew Mamera is a Cand. Sci Nat registered (116356) in natural and agricultural sciences recognized in Soil Science. Matthew is a soil and hydropedology specialist with experience in soil, pedology, hydropedology, water and sanitation management and land contamination and has field experience and numerous peer reviewed scientific publications in international journals. Matthew completed his M.Sc. in soil science, hydropedology and water management at the University of Fort Hare, Alice. He is also a holder of a PhD in Soil Science, Hydropedology, Water and Sanitation obtained at the University of the Free State, Bloemfontein. Matthew is also a member of the Soil Science Society of South Africa (SSSSA).

2 Project Area

The proposed Jersey PV facility Project area is found 29 km south-west of Ventersdorp and 21 km east of Roodepoort, North-West Province. The proposed area is also in proximity to the towns of Merindol and

[1] A site identified by the screening tool as being of 'High" or "Very High" sensitivity for agricultural resources must submit a specialist assessment unless the impact on agricultural resources is from an electricity pylon (item 1.1.2).

Goedgevonden. The area is located approximately 13 km west of the R30 road, 26 km north of the R509 road and 15 km south of the N14 road (Figure 2-1). The surrounding land use includes watercourses, livestock and game farming.

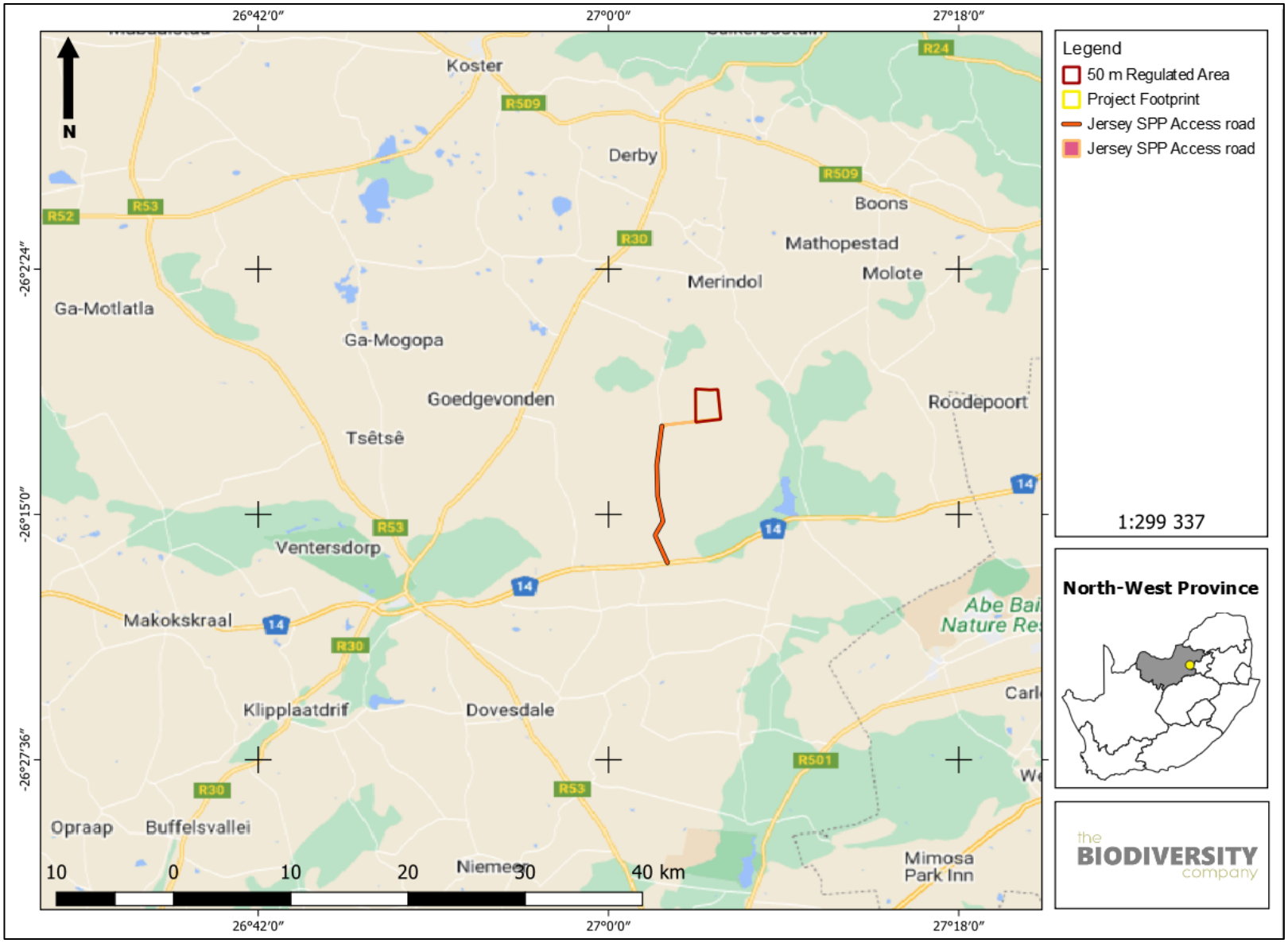

Figure 2-1 Locality map of the project area

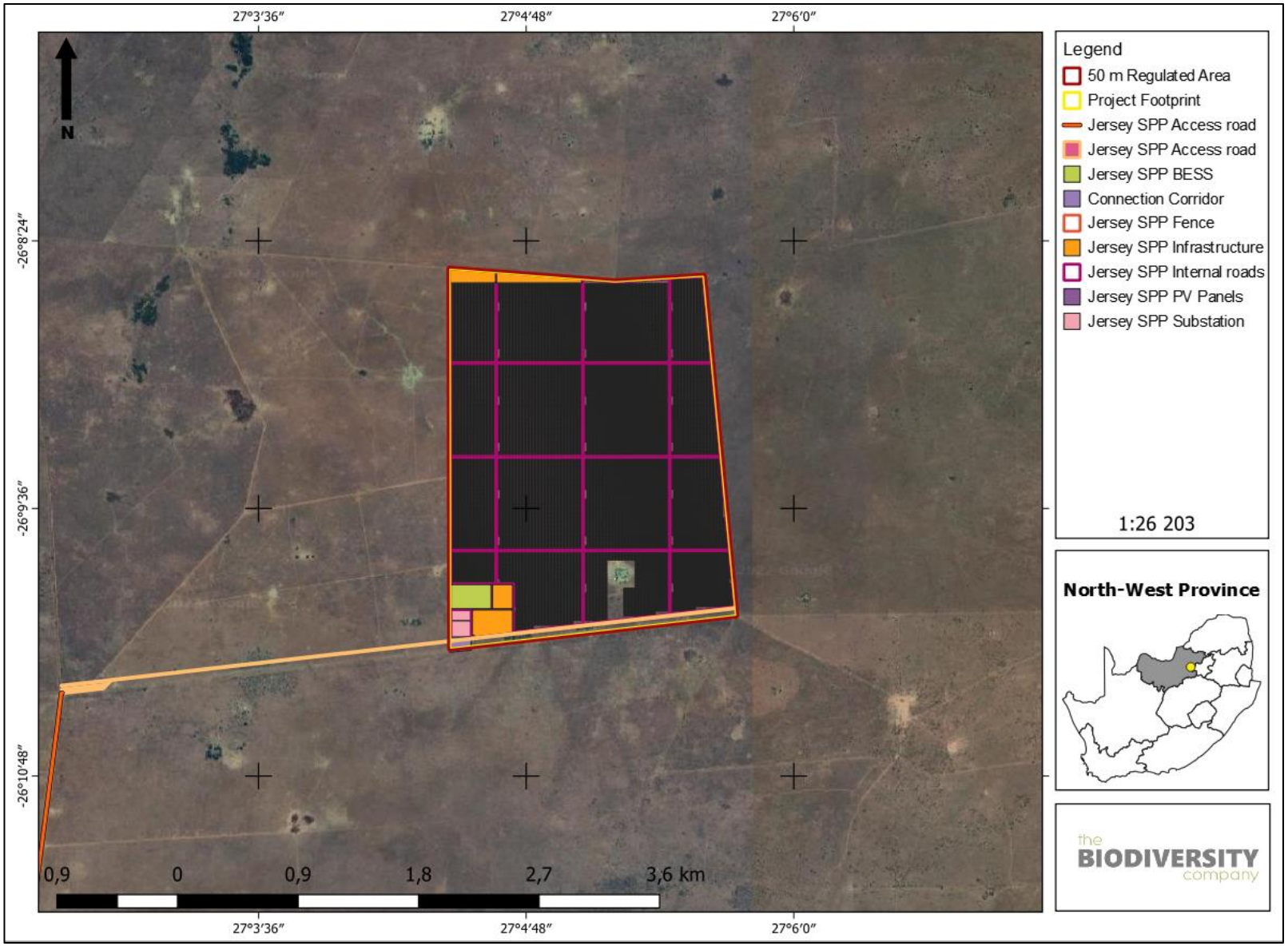

Figure 2-2 Layout of the project area

3 Methodology

3.1 Desktop Assessment

As part of the desktop assessment, baseline soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types. In addition, a Digital Elevation Model (DEM) as well as the slope percentage of the area was calculated by means of the NASA Shuttle Radar Topography Mission Global 1 arc second digital elevation data by means of QGIS and SAGA software.

3.2 Field Survey

An assessment of the soils present within the project area was conducted during the field survey in October 2022. The site was traversed on foot. A soil auger was used to determine the soil form/family and depth. The soil was hand augured to the first restricting layer or 1,5 m. Soil survey positions were recorded as waypoints using a handheld GPS. Soils were identified to the soil family level as per the “Soil Classification: A Taxonomic System for South Africa” (Soil Classification Working Group, 2018). Landscape features such as existing open trenches were also helpful in determining soil types and depth.

3.3 Land Capability

Given the nature of the compliance statement and the fact that baseline findings correlate with the screening tool’s sensitivities, land capability was solely determined by means of the National Land Capability Evaluation Raster Data Layer (DAFF, 2017). Land capability and land potential will also briefly be calculated to match to that of the screening tool to ultimately determine the accuracy of the land capability sensitivity from the DAFF, (2017) sensitivities.

Land capability and agricultural potential will briefly 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 3-1 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use increases from class I to class VIII (Smith, 2006).

Table 3-1 Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	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**					

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 3-2. The final land potential results are then described in Table 3-3.

Table 3-2 The combination table for land potential classification

Land capability class	Climate capability class							
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 3-3 The Land Potential Classes.

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

3.4 Limitations

The following limitations are relevant to this agricultural compliance statement:

- The handheld GPS used potentially could have inaccuracies up to 5 m. Any and all delineations therefore could be inaccurate within 5 m; and
- No heavy metals have been assessed nor fertility been analysed for the relevant classified soils.

4 Project Area

4.1 Soils and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006) the project assessment area footprint falls within the Fa 16 land type. The Fa 16 land type is mostly predominated by Hutton, Glenrosa and Mispah soil forms with also the occurrence of bare rocky areas and other associated soils also occurring throughout the terrains, following the South African soil classification working group (1990). The Fa land types are characterised with shallow profiles and occurrence of rocky areas. Lime is rare or absent in the entire landscape. The terrain units and expected soils for the Fa 16 land type are presented in Figure 4-1 and Table 4-1, respectively.

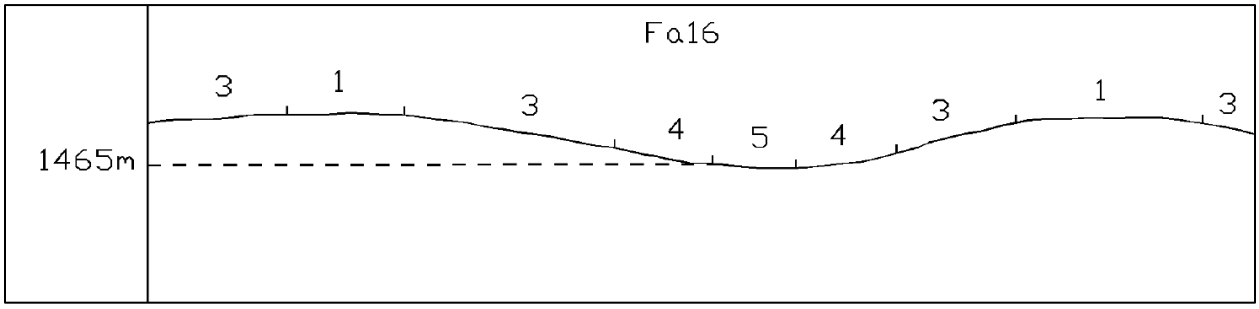

Figure 4-1 Illustration of land type Fa 16 terrain units (Land Type Survey Staff, 1972 – 2006)

Table 4-1 Soils expected at the respective terrain units within the Fa 16 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units									
1 (24%)		**2 (1%)**		**3 (60%)**		**4 (10%)**		**50 (5%)**	
Bare rock	67%	Bare rock	98%	Glenrosa	88%	Hutton	50%	Hutton	50%
Glenrosa	33%	Glenrosa	20%	Mispah	8%	Mispah	25%	Glenrosa	20%
				Hutton	4%	Glenrosa	25%	Milkwood	20%
								Mispah	10%

4.2 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure 4-2. Most of the regulated area is characterised by a slope percentage between 0 to 6% with some irregularities in areas with slopes reaching 9%. This illustration indicates a non-uniform topography with occurrence of some sloping areas being present. The Digital Elevation Model (DEM) of the project area (Figure 4-3) indicates an elevation of 1 529 to 1 561 Metres Above Sea Level (MASL).

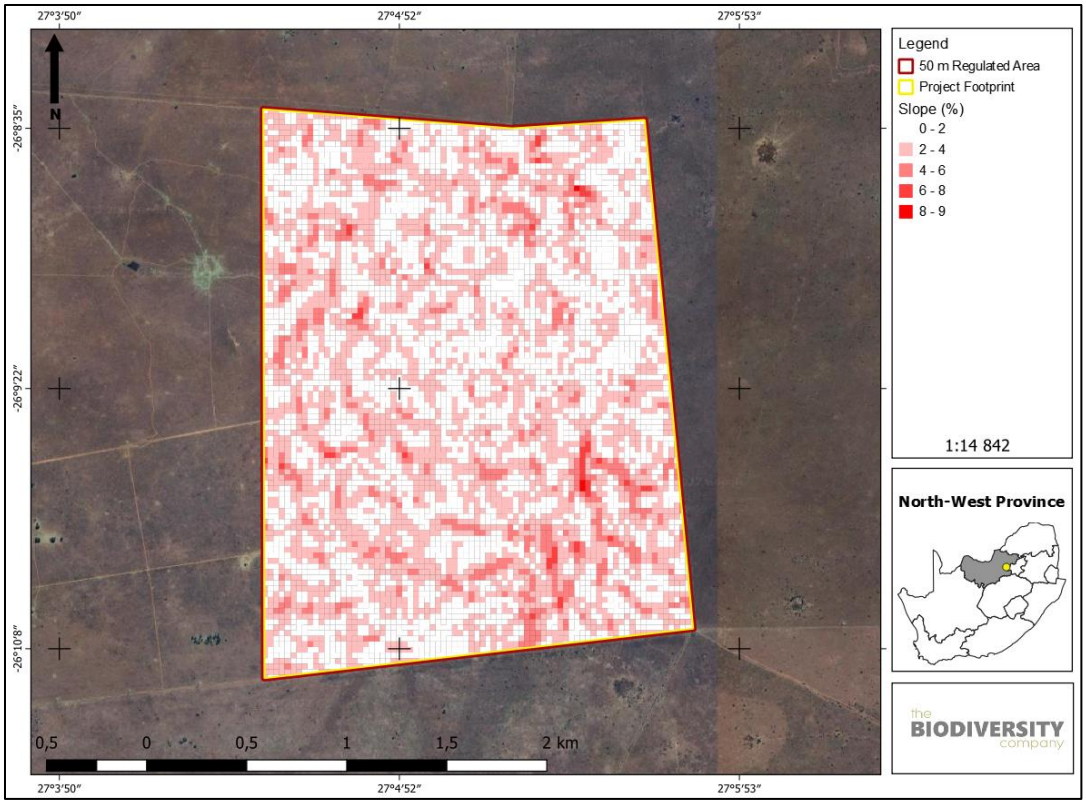

Figure 4-2 Slope percentage map for the project area

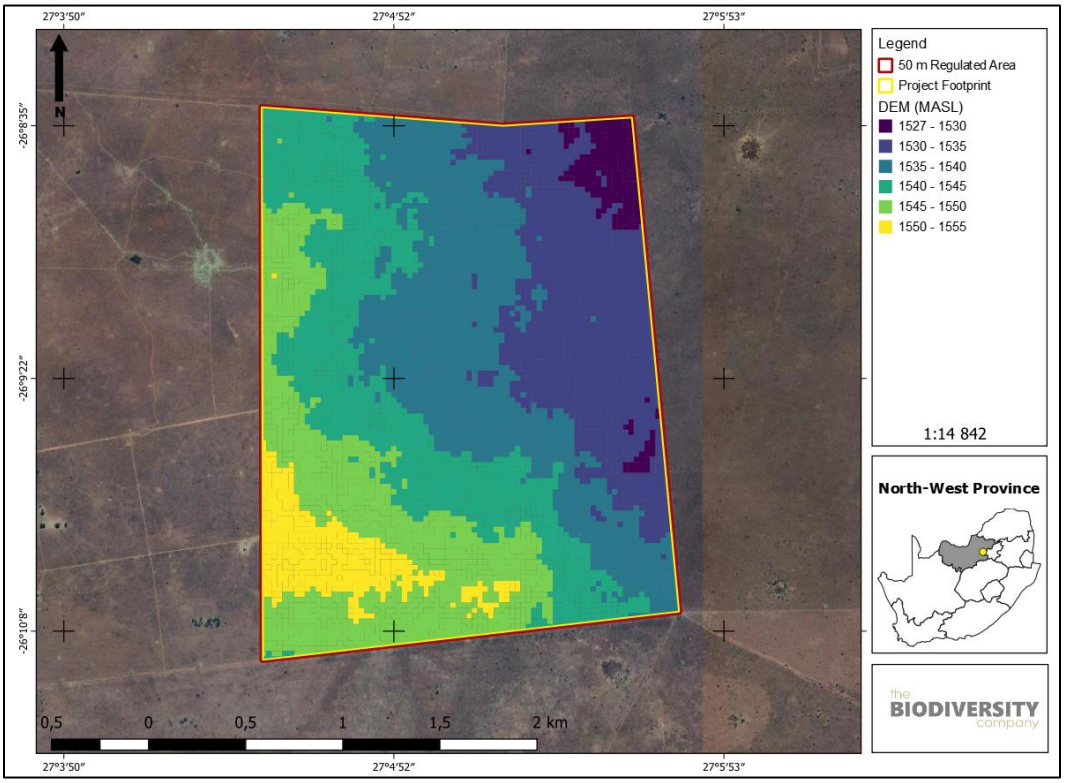

Figure 4-3 Digital Elevation Model of the project area (metres above sea level)

5 Results and Discussion

5.1 Baseline Findings

The most sensitive soil forms identified within the project area is the Vaalbos and Hutton soil forms, with other associated soils also occurring in the assessment footprint area. The Hutton soil form consists of an orthic topsoil horizon on top of a thick red apedal subsurface diagnostic horizon. The Vaalbos soil form consist of an orthic topsoil on top of a red apedal horizon underlain with a hard-rock substratum below (see Figure 5-1).

The land capability of the above-mentioned soils has been determined to have a land capability class of “III” with a climate capability level 8 given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. The combination between the determined land capabilities and climate capabilities results in land potential “L6”. The “L6” land potential level is characterised by a *very restricted potential. Regular and/or severe limitations that occur due to soil, slope, temperatures or rainfall*. *These areas are non-arable*. The “L6” land potential is characterized with a “Low to Moderate sensitivity” following the soil baseline findings.

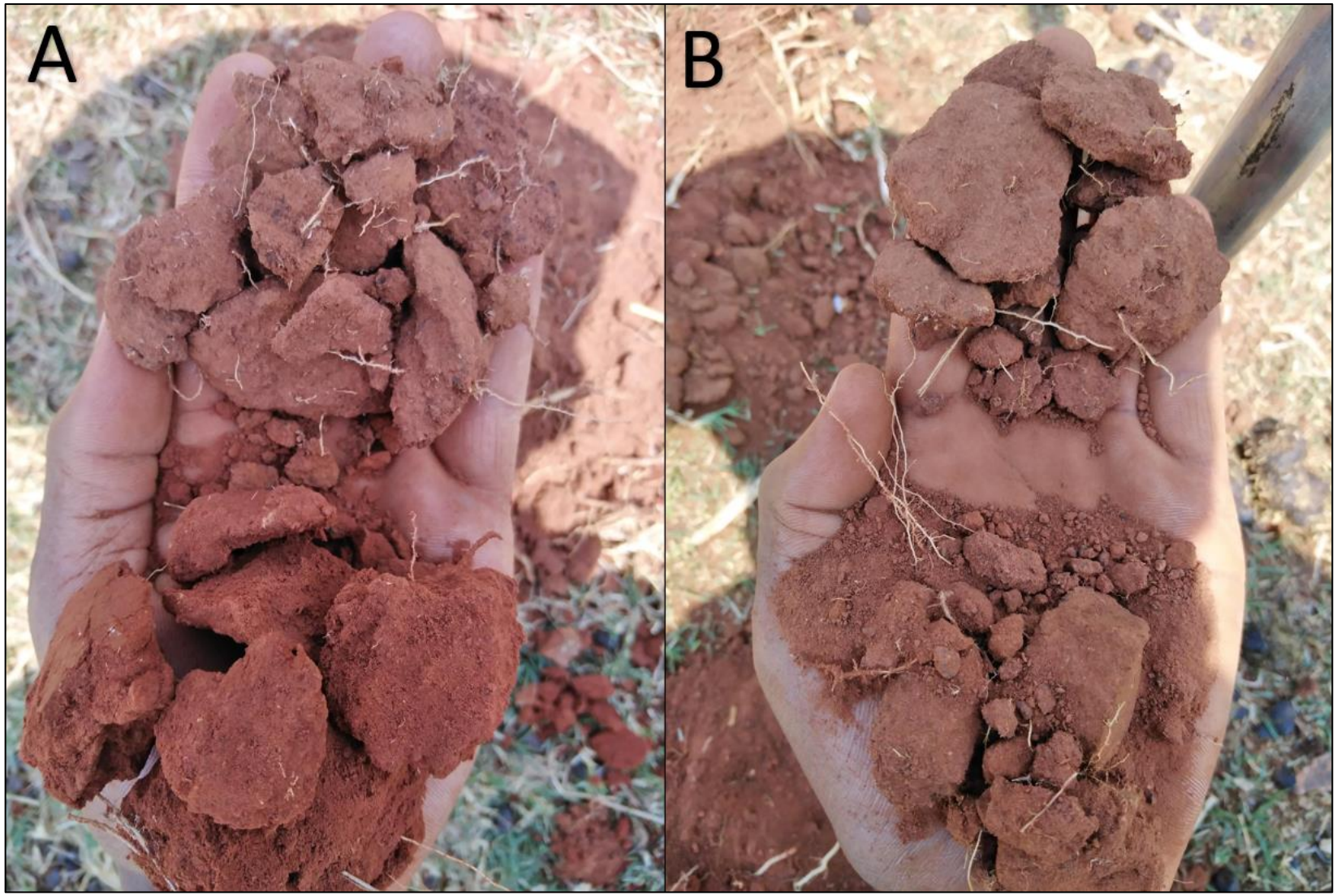

Figure 5-1 ***Soil forms with an Orthic topsoil and Red apedal diagnostic horizon below; A) Hutton soil form, B) Vaalbos soil form with a hard-rock substratum below the red apedal horizon.***

5.2 Sensitivity Verification

The following land potential levels have been determined;

- Land potential level 6 (this land potential level is characterised by a very restricted potential. Regular and/or severe limitations occur due to soil, slope, temperatures or rainfall. Non arable);

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which ten potential land capability classes are located within the project area assessed for development, including;

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

The baseline findings and the sensitivities as per the Department of Agriculture, Forestry and Fisheries (DAFF, 2017) national raster file concur with one another. The proposed Jersey SPP project is mostly characterised with “Low” to “Moderate” land capability sensitivities. Some portions in the project area fall within “Very Low to Low” sensitivities (see Figure 5-2). There is no segregation of crop fields with high agricultural potential within the assessment area for the project. Moreover, most common soils identified within the project area are shallow and rocky which can limit most cropping practices. It therefore is the specialist’s opinion that the land capability and land potential of the resources in the assessment area is characterised by “Low” to “Moderate” sensitivities (see Figure 5-2), which conforms to the requirements of an agricultural compliance statement only. The proposed Jersey SPP facility will have minimum impacts on the available land resources in the area.

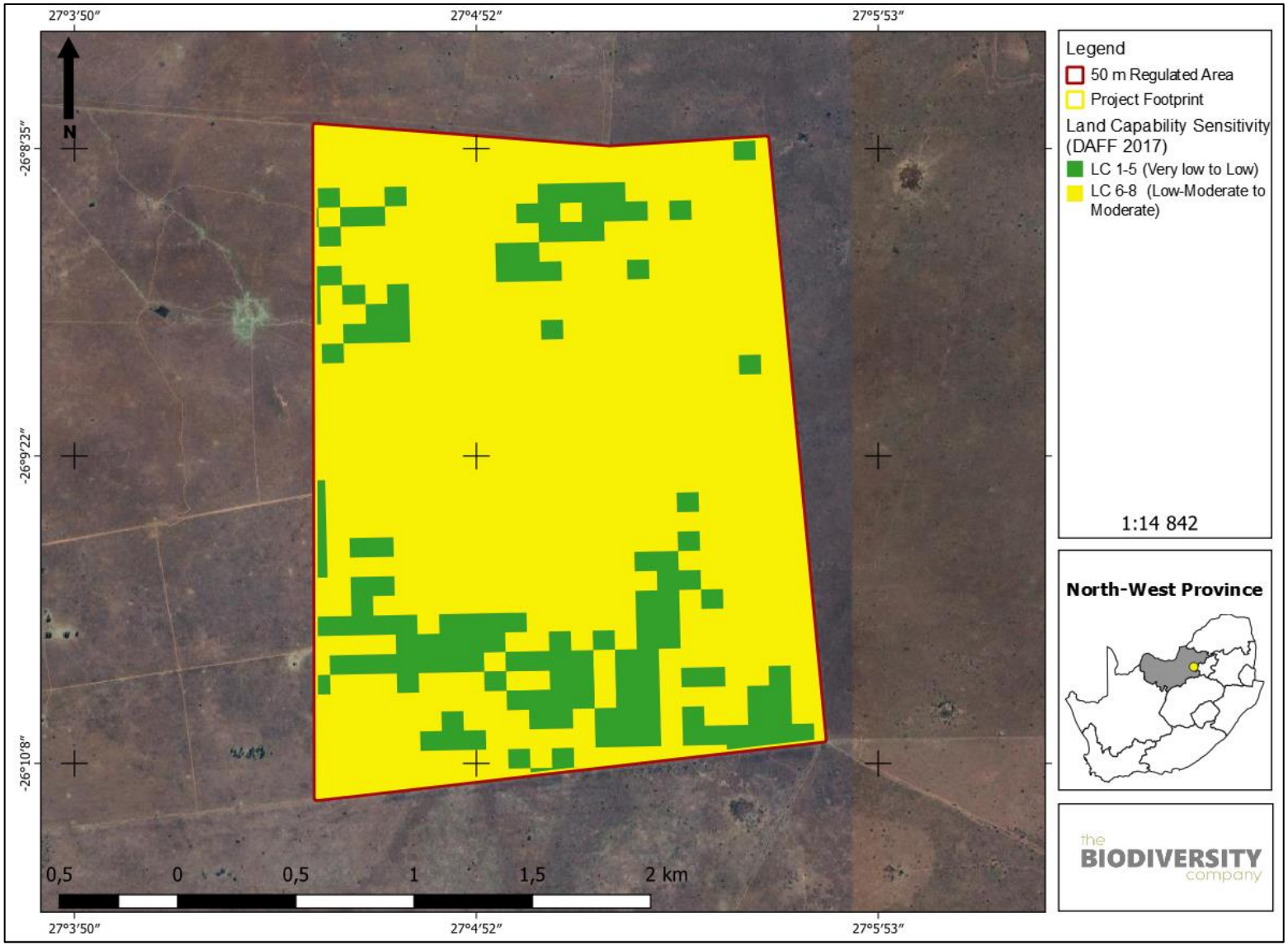

Figure 5-2 Land Capability Sensitivity (DAFF, 2017)

6 Conclusion

The most sensitive soil forms identified within the project area is the Vaalbos and Hutton soil forms. The land capability sensitivities (DAFF, 2017) indicate land capabilities with “Very Low to Moderate” sensitivities, which correlates with the findings from the baseline assessment. The overall sensitivity of the assessment area is categorized as “Low” which also conforms to the DEA, (2022) agricultural sensitivity themes.

The project area is associated with non-arable lands. The available climate limits crop production significantly. The harsh climatic conditions are associated with low annual rainfall and high evapotranspiration potential demands of the area, which consequently result into a very restricted choice of crops due to the heat and moisture stress. The area is not favourable for most cropping practices, which corresponds to the current livestock and game farming activities in the area.

It is the specialist’s opinion that the proposed Jersey SPP project and associated infrastructure will have limited impacts on the agricultural production ability of the land. There is no segregation of any crop fields with a high production capability within the project assessment area. It is, therefore, the specialist`s recommendation that the proposed Jersey SPP project and associate infrastructure may be favourably considered for development with no significant impacts expected to occur. And therefore, no specific mitigation measures are required to be implemented.

7 References

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