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Soil and Agricultural Potential Scoping Report for the Proposed San Solar PV Facility

Submitted by TerraAfrica Consult cc

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03 January 2022

Details of the Specialist

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Declaration of Independence

I, Mariné Pienaar, hereby declare that TerraAfrica Consult, an independent consulting firm, has no interest or personal gains in this project whatsoever, except receiving fair payment for rendering an independent professional service.

I further declare that I was responsible for collecting data and compiling this report. All assumptions, assessments and recommendations are made in good faith and are considered to be correct to the best of my knowledge and the information available at this stage.

TerraAfrica Consult cc represented by M Pienaar
03 January 2021

1. INTRODUCTION

Terra-Africa Consult cc was appointed by Savannah Environmental (Pty) Ltd to conduct a Scoping Phase soil and agricultural assessment as part of the Scoping and Environmental Impact Assessment process for the proposed San Solar PV Facility. The developer of the proposed project is San Solar Energy Facility (Pty) Ltd. The San Solar PV facility, a photovoltaic (PV) solar energy facility and associated infrastructure, is proposed to be developed on a site located approximately 16km north west of Kathu in the Northern Cape Province (refer to Figure **1**). The site is located east of Deben and is accessible via the R380 provincial route which branches off the N14 National Road, approximately 3km south of Kathu. The study area falls within the Gamagara Local Municipality within the John Taolo Gaetsewe District Municipality.

The solar PV facility will be developed on the Remaining extent of the Farm Wincanton 472 and comprise several arrays of PV panels and associated infrastructure with a contracted capacity of up to 100MW.

A facility development area, which will include the PV facility, BESS and a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line will be identified within the study area considered in the Scoping phase.

2. TERMS OF REFERENCE

The terms of reference applicable to the soil and agricultural potential scoping assessment include the following:

- Conduct a desktop assessment of the baseline soil and agricultural properties for the proposed development area and access road route
- Identify site sensitivities to the proposed project pertaining to the soil properties, associated land capabilities and the agricultural potential of the project area following the analysis of desktop data.
- Determine whether the proposed San Solar PV facility development area falls within any High Potential Agricultural Areas of the Northern Cape.
- Provide a preliminary site sensitivity rating following the data analysis and identify no-go areas for the process of micro-siting of the infrastructure associated with the proposed projects.
- Identify potential impacts that will be caused by the projects and that will have to be assessed as part of the detail study phase.
- Identify a plan of study that will include the methodology to be followed during the detailed soil and agricultural potential impact assessment that will form part of the final EIA report that will be submitted.

3. METHODOLOGY

The proposed project site was superimposed on five data sets to describe high-level baseline characteristics and to determine the anticipated sensitivities of the properties to the development. The data sets are:

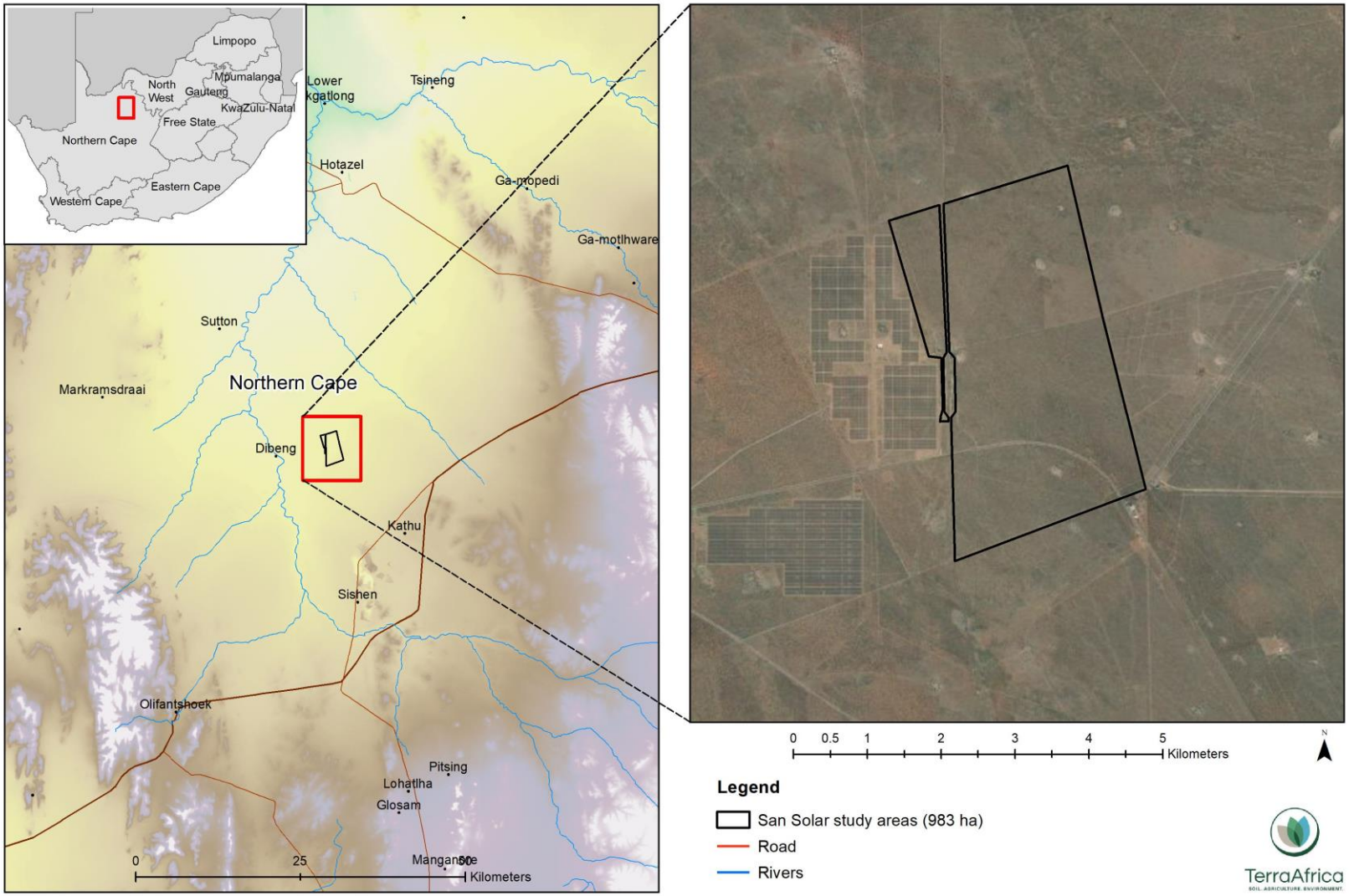


Figure 1 Locality of the proposed San Solar PV facility

- Land type data for the project assessment zone 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 entails the division of land into land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units.
- The Refined Land Capability Evaluation Raster Data for South Africa that was developed using a spatial evaluation modelling approach (DALRRD, 2016).
- The long-term grazing capacity for South Africa 2018 that present the long term grazing capacity of an area with the understanding that the veld is in a relatively good condition (South Africa, 2018).
- The Northern Cape Field Crop Boundaries show crop production areas may be present within the development area. The field crop boundaries include rainfed annual crops, non-pivot and pivot irrigated annual crops, horticulture, viticulture, old fields, small holdings and subsistence farming (DALRRD, 2019).
- The High Potential Agricultural Areas for Cultivation: Northern Cape Province, 2019 are large, relatively homogeneous areas of land within the province regarded as having high potential and capability to contribute towards food production in both the province and the country (DALRRD, 2019).

4. RESULTS OF DESKTOP ASSESSMENT

4.1 Land type classification

The entire development area as well as the area bordering on it, falls within Land Type Ag110 (see Figure 3). Land Type Ag110 consists of only two terrain units i.e. Terrain units 4 and 5 (Figure 2), both with slope ranging between 0 and 2%. This land type represents shallow, rocky soil profiles of the Mispah and Hutton forms that range in depth between 0.02m and 0.3m. The Mispah soils consist of orthic topsoil with sandy to sandy-loam texture the overlies solid rock or fractured rock. The Hutton soils consist of a thin orthic horizon overlying a red apedal subsoil horizon that is limited in depth by either lithic material or fractured rock. Approximately 20% of the toe-slopes and 5% of the valley bottoms consist of deeper Hutton soils that range in depth between 0.45 and 0.90m. Depth limiting materials consist of rock and hardpan carbonate horizons.

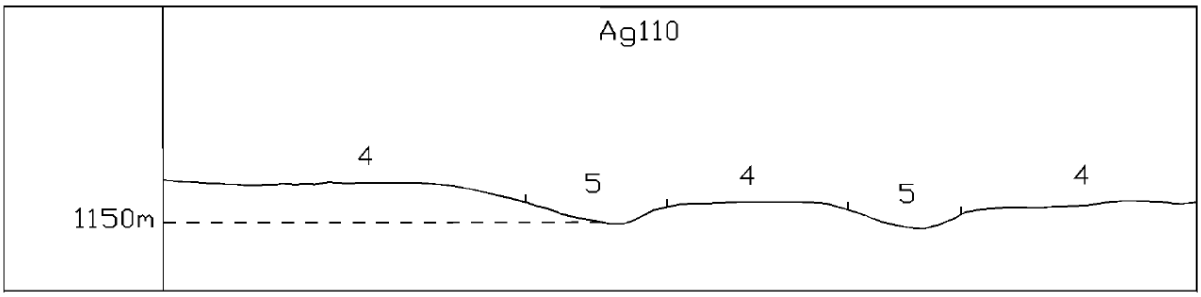


Figure 2 Terrain form sketch of Land Type Ag110

Approximately 90% of the area covered by Land Type Ag110 consists of toe-slope positions (Terrain unit 4) while valley bottoms (Terrain unit 5) make up the remaining 10%. The valley bottoms may consist of approximately 3% stream beds.

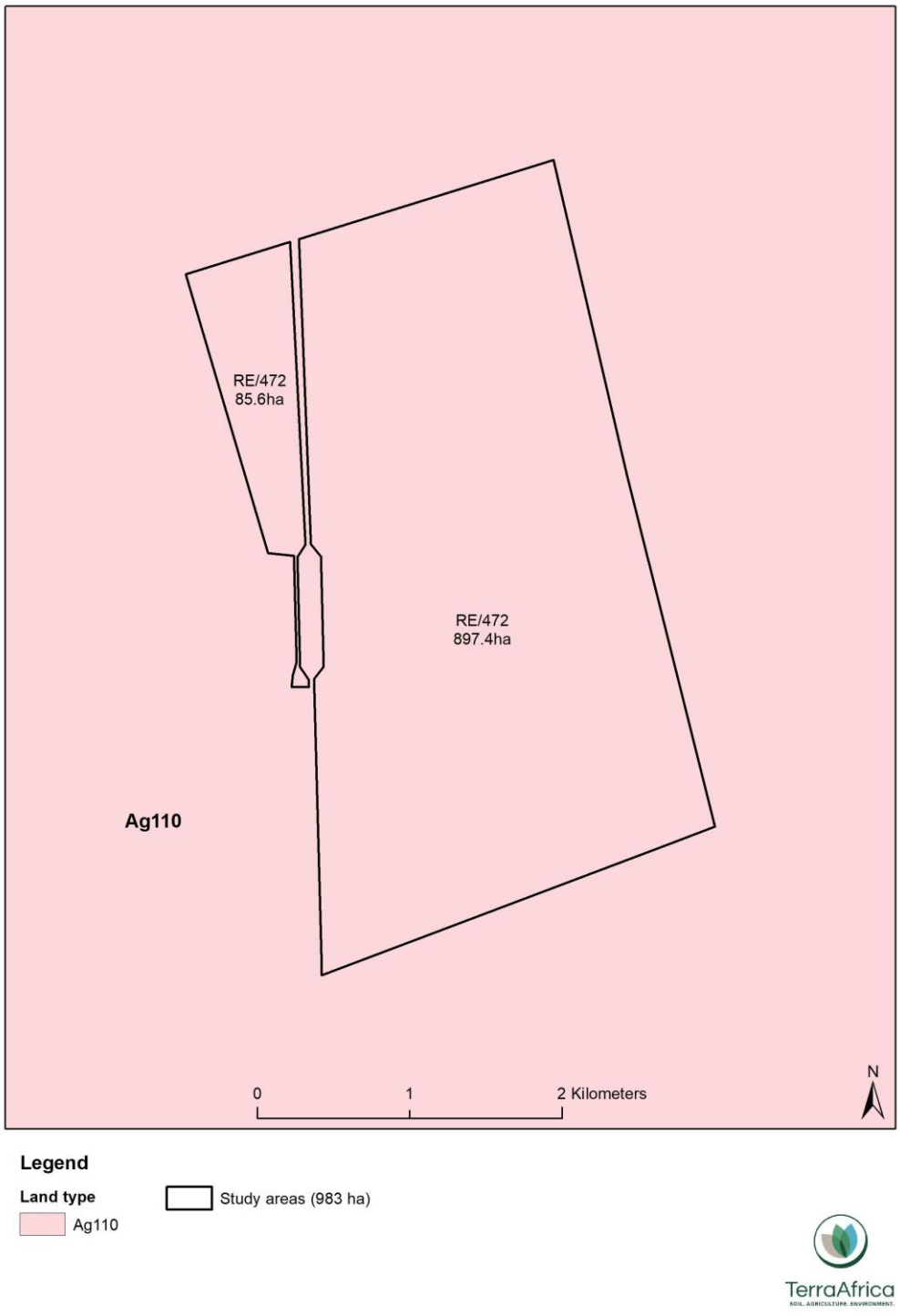


Figure 3 Land type classification of the proposed San Solar PV facility development area

4.2 Land capability

The proposed San Solar PV facility consists mainly of land Low (Class 05) land capability with small areas of Low-Moderate (Class 06) land capability present over the entire area (refer to

Figure 4). Two very small areas of land with Low-Very low (Class 04) land capability is present west of the western boundary of the development area. Both the land capability classes within the development area, are indicative that the area is suitable for livestock grazing and is considered not suitable for arable agriculture under rainfed conditions.

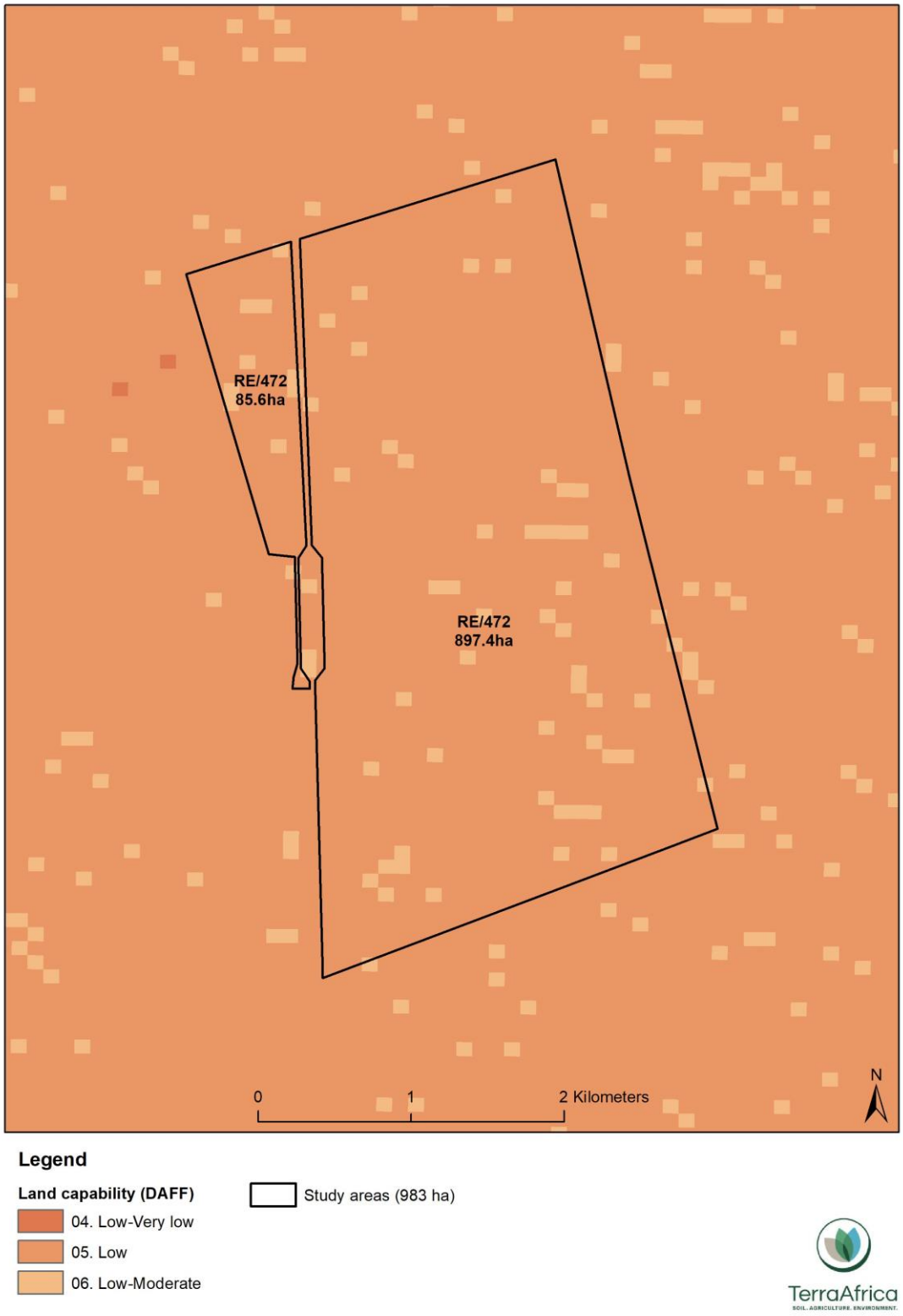


Figure 4 Land capability classification of the San Solar PV facility development area (DALRRD, 2016)

4.3 Field crop boundaries

The position of field crops around the proposed San Solar PV facility development area, is illustrated in **Figure 5**. There are no field crop boundaries within this area. The nearest crop field boundaries are approximately 15km away to the northwest of the development area and according to this data, consist of fields with rainfed annual crops or planted pastures. Other crop fields with either rainfed crops or planted pastures are located 20km south-east and 25km north-east of the development area. Following this data, there is no risk that rainfed or irrigated crop production will be affected by the proposed development.

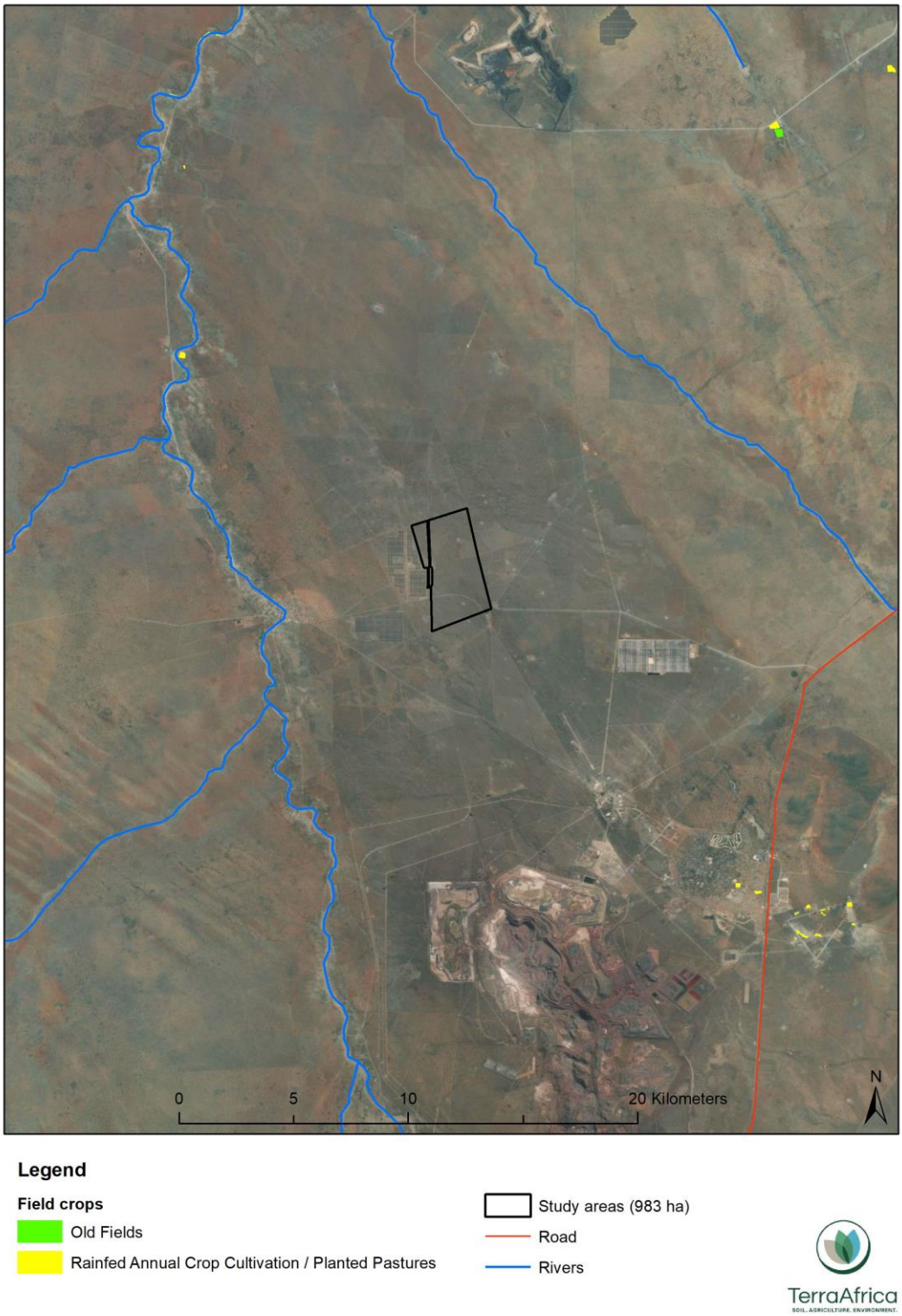


Figure 5 Locality of field crops around the development area of the proposed San Solar PV facility (Crop Estimates Consortium, 2019)

4.4 Grazing capacity

The ideal grazing capacity of a specified area is an indication of the long-term production potential of the vegetation layer growing there to maintain an animal with an average weight of 450 kg (defined as 1 Large Stock Unit (LSU)) with an average feed intake of 10 kg dry mass

per day over the period of approximately a year. This definition includes the condition that this feed consumption should also prevent the degradation of the soil and the vegetation. The grazing capacity is therefore expressed in a number of hectares per LSU (ha/LSU) (South Africa, 2018).

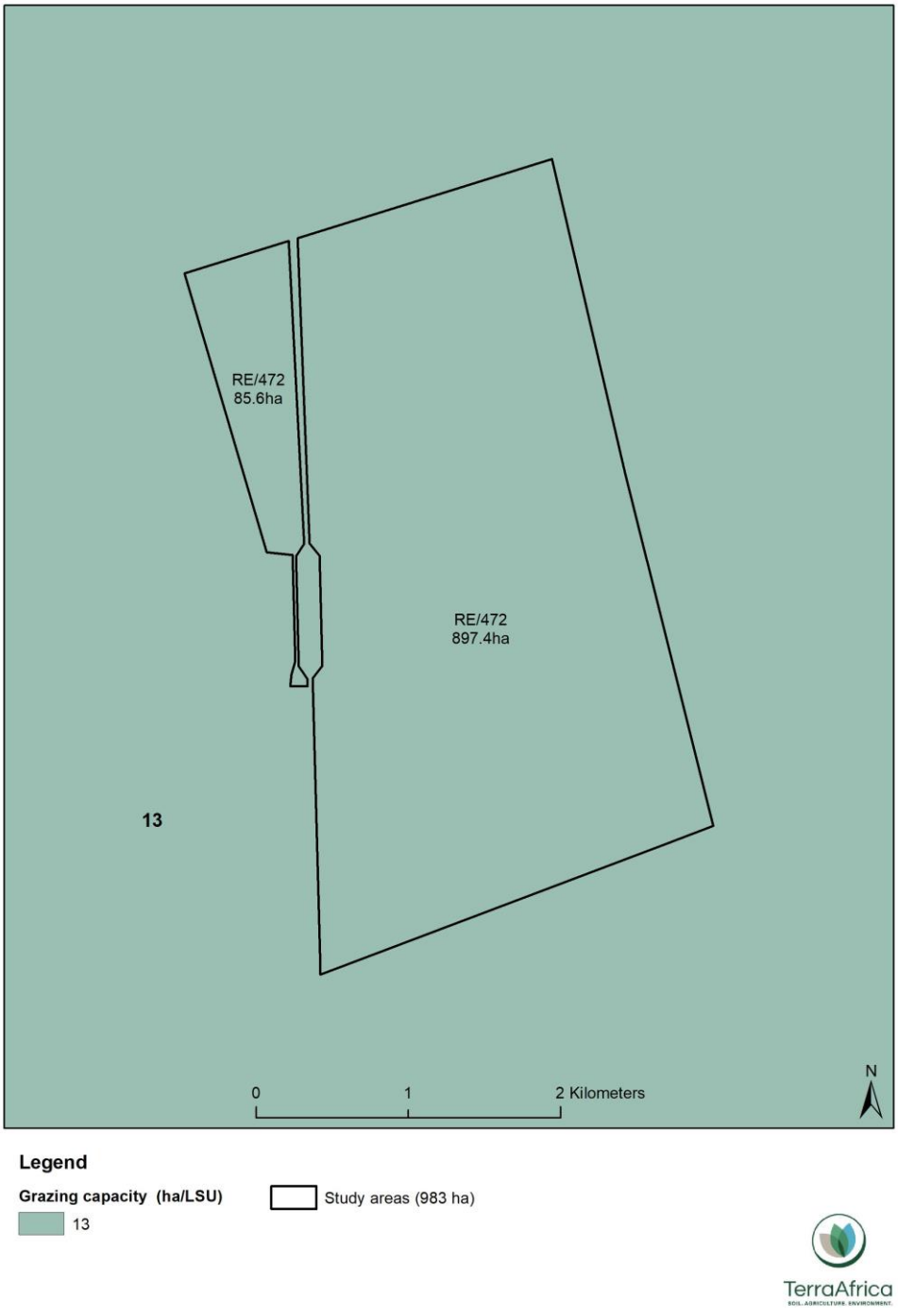


Figure 6 Long-term grazing capacity of the proposed San Solar PV facility development area (South Africa, 2018)

Following the metadata layer obtained from DALRRD, the grazing capacity of the entire San Solar PV facility development area, is 13 ha/LSU. (**Error! Reference source not found.**). This is considered as low-moderate grazing capacity that requires herd and pasture management to avoid land degradation. Since the proposed infrastructure within the development area will

be fenced off, it will no longer be available for livestock grazing. It is likely that the final development footprint will be smaller than the areas assessed for the Scoping Phase of the Environmental Authorisation process and the total loss in available grazing will be calculated for the EIA report.

5. PRELIMINARY SENSITIVITY ANALYSIS

For the preliminary sensitivity analysis, both the desktop data analysed in Section 4 as well as the High Potential Agricultural Areas for Cultivation: Northern Cape Province, 2019 (DALRRD, 2019) are considered. The land type data indicates that the development area consists mainly of shallow Mispah and Hutton soils in a flat to very slightly undulating landscape. The soils are 0.3m deep or shallower.

The shallow soil depth in the semi-arid climate of the development area, combinedly translate into land with mostly Low (Class 05) land capability. Only small pockets of land have slightly better land capability that is Low-Moderate (Class 06). There are no crop fields within the development area and the nearest area with a few small crop fields, are located 15km north-west of the development area. Even though the area is suitable for livestock farming, the long-term grazing of the entire development area is 13 ha/LSU. This is considered low-moderate grazing potential and livestock numbers must be strictly controlled, especially during periods of drought, to avoid overgrazing and land degradation.

The low agricultural potential of the site is further confirmed by the absence of any High Potential Agricultural Areas (HPAAs) in the vicinity of the development area. The nearest HPAAs are 170km away in a south-eastern and south-western direction (refer to Figure 7). These HPAAs are associated with irrigation schemes and the availability of water that can be used for irrigation.

Following the data analysis above, the entire San Solar PV facility development area, is therefore considered to have Low agricultural sensitivity to the proposed development. The sensitivity of the development area, is illustrated in

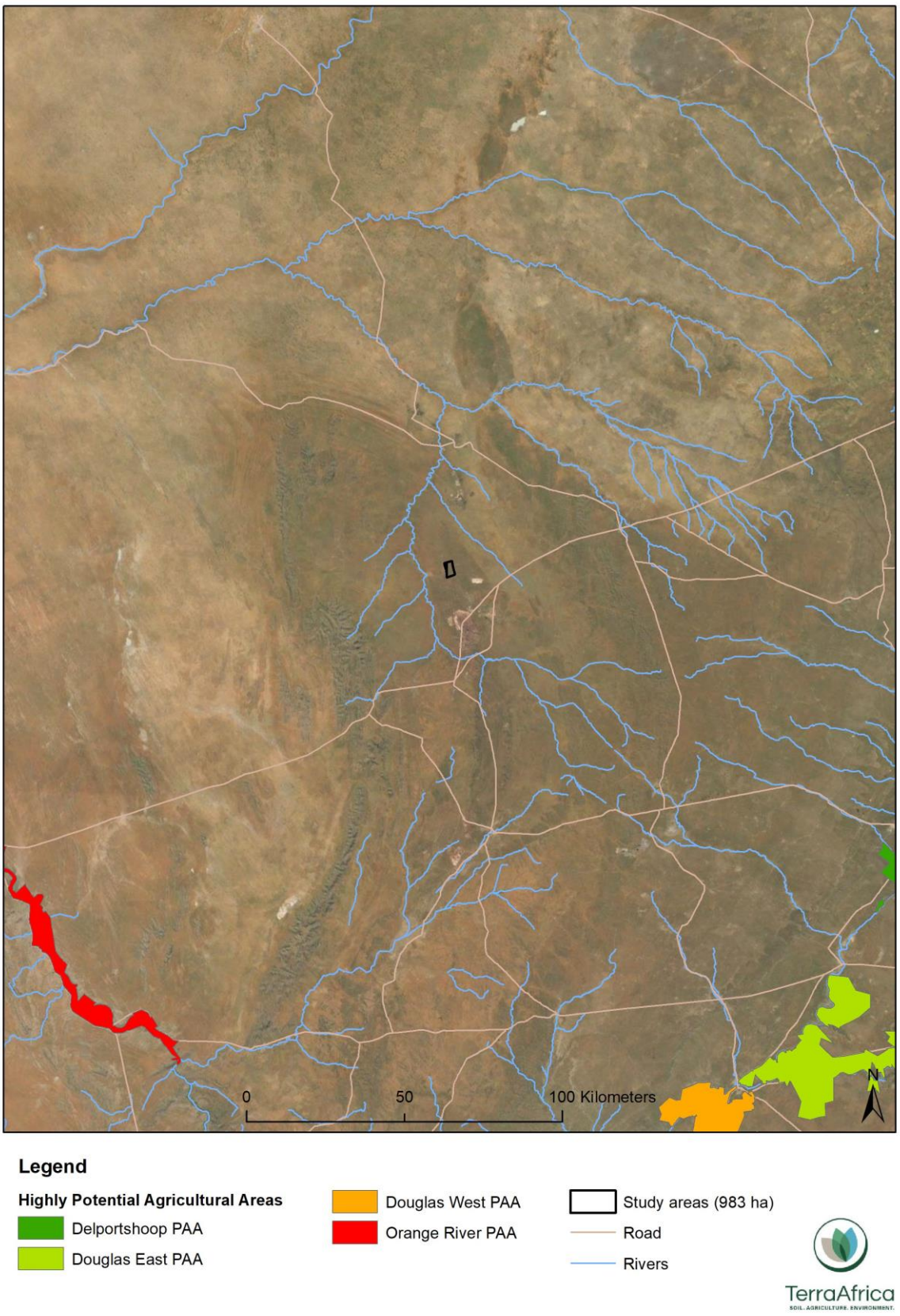


Figure 7 Position of the San Solar PV facility development area in relation to High Potential Agricultural Areas of the Northern Cape Province (DALRRD, 2019)

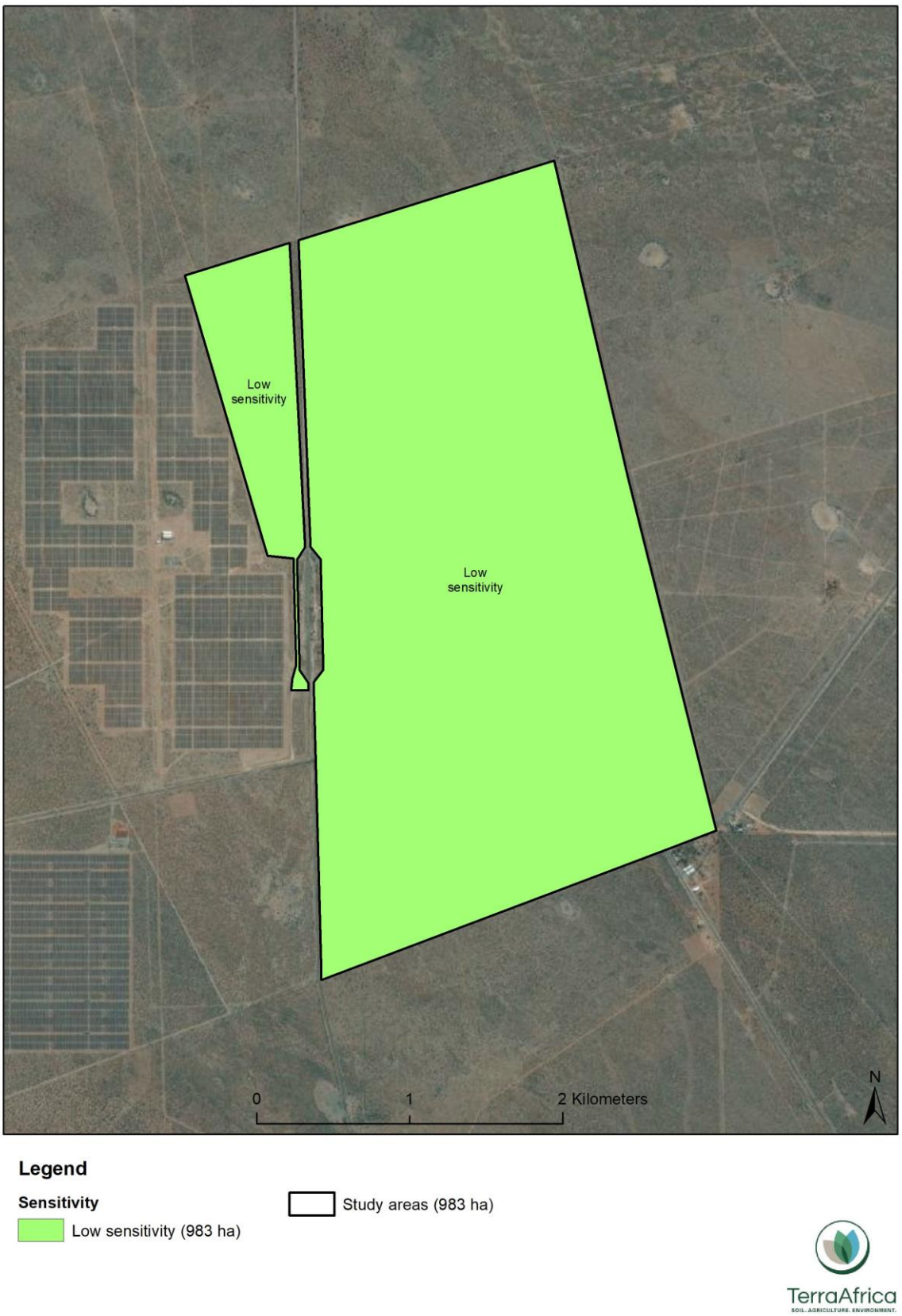


Figure 8 Agricultural sensitivity of the San Solar PV facility development area

6. POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

6.1 Project description

A facility development area, which will include the PV facility, BESS and a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line will be identified within the study area considered in the Scoping phase. The infrastructure associated with this 100MW PV facility includes:

- PV modules and mounting structures
- Inverters and transformers
- Cabling between the panels, to be laid underground where practical.
- Battery Energy Storage System (BESS)
- Site and internal access roads (up to 8m wide)
- Laydown area.
- Operation and Maintenance buildings including a gate and security building, control centre, offices, warehouse, and workshop areas for maintenance and storage.
- Grid connection solution including a 132kV facility substation to be connected via a Loop-in-Loop out (LILO) connection to the Umtu 132kV overhead power line (located ~5km east of the site).

The development area will be larger than the area needed for the construction of a 100MW PV facility and will provide the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities by the development footprint. To avoid areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the development footprint within which the infrastructure of San Solar PV facility and its associated infrastructure will be located will be fully assessed during the EIA Phase.

6.2 Potential impacts of the proposed San Solar PV facility

The anticipated impacts of the proposed project on soil are soil compaction, erosion, soil pollution and the loss of soil fertility from the topsoil horizons to be stripped and stockpiled during the construction phase. The anticipated impact on agricultural potential is the loss of grazing areas where livestock can be produced.

The only impact on land use will be the change of land use from cattle farming to that of renewable energy generation. The cumulative impact on land use is that portions of land that were previously used for agriculture in the region are converted into alternative land uses. There are already three other solar facilities that have been constructed in the broader area that will cumulatively reduce the areas currently available for agriculture.

Below follows a description of the impacts anticipated:

6.2.1 Potential impacts on agricultural production

Impact Loss of areas of grazing areas where livestock can be produced			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Areas where the PV modules and other infrastructure will be constructed, will no longer be available for livestock production.	Negative	Local	None
Description of expected significance of impact The sites have largely Low-Moderate land capability and is used for livestock production. The expected significance of this impact is Medium.			
Gaps in knowledge & recommendations for further study The final layout of the infrastructure, especially the need for additional access roads, will determine the size of the areas to be lost. Once the final layout is available, the impacts can be assessed in detail.			

6.2.2 Potential impacts on soil

Impact Soil compaction			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Soil compaction will occur wherever construction vehicles and equipment will traverse the site and where the PV modules and other long-term infrastructure will be erected.	Negative	Local	None
Description of expected significance of impact Wherever the impact occurs (where heavy vehicles traverse) the impact is expected to be of medium significance during the construction phase. Once construction is finalised, areas that are affected by compaction outside of the development footprint, must be rehabilitated.			
Gaps in knowledge & recommendations for further study The exact footprint will be determined for the EIA phase and it is recommended that existing roads be used for the transport of equipment as far as possible to limit soil compaction.			

Impact: Soil erosion			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Wherever construction activities will result in bare soil surfaces, these surfaces prone to loss of soil particles as a result of wind and water movement	Negative	Local	None
Description of expected significance of impact The impact is expected to be of medium significance.			
Gaps in knowledge & recommendations for further study • Soil texture and soil organic carbon analysis results of the EIA phase will be used to calculate the erodibility of soils within the development footprint.			

Impact: Loss of soil fertility through disturbance of in situ horizon organisation			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
In any area where topsoil will be stripped for construction purposes, the soil horizons will be mixed and the mixture may have lower soil fertility than before it was stripped.	Negative	Local	None
Description of expected significance of impact Low to moderately low significance			
Gaps in knowledge & recommendations for further study The final results of the EIA phase soil classification survey will be used to develop guidelines for topsoil stripping and stockpile management during the construction phase.			

Impact: Soil chemical pollution			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Oil and fuel spillages as well as waste generation during the project cycle will result in soil chemical pollution.	Negative	Local	None
Description of expected significance of impact The significance of this impact is moderate to high.			
Gaps in knowledge & recommendations for further study The only knowledge gap is an project description that includes detail of activities and materials that may result in soil pollution during the different project phases.			

6.2.1 Potential impacts on land use

Impact: Change in land use			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
The proposed project will change the current land use from agriculture to energy generation	Neutral/Positive	Local	None
Description of expected significance of impact The proposed project may have a moderate to major positive impact on the current land use and in the worst case, have a neutral impact.			
Gaps in knowledge & recommendations for further study The economic viability of livestock farming within the development area, will be calculated during the detail study phase.			

7. PLAN OF STUDY

Once the infrastructure layout has went through the final process of micro-siting based on the recommendations of this report and other reports, the site visit will be conducted for the

purpose of on-site verification. The survey will include soil classification according to the Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018).

The landowners and/or land users will be consulted individually for discussion of the productivity and employment data associated with the areas that will impacted by the proposed development. The discussion will also address the limitations and risks of livestock production in the area in order to compare it to renewable energy production. This will be used to consider the acceptability of the project.

The report will be prepared in alignment with all the relevant NEMA regulations as well as General Notice 320 of 2020 that specifically address Agricultural Compliance reporting for the renewable energy sector.

8. CONCLUSION

Following the desktop analysis of available data, it is concluded that the proposed development of the San Solar PV facility, will affect land with Low agricultural sensitivity. No no-go areas have been identified for the proposed project from the perspective of soil and agricultural resource conservation.

It is anticipated that the proposed project will have very limited impact on the soil properties and land capability while the land use will change from livestock farming to generation of renewable energy. It is therefore my professional opinion that the project is an acceptable project for the area from a soils and agricultural perspective and that there are no fatal flaws to the authorisation of this project. The detailed assessment and subsequent reporting will provide in-depth detail on all these aspects.

9. LIST OF REFERENCES

Crop Estimates Consortium, 2019. *Field crop boundary data layer (NC province)*, 2019. Pretoria. Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Land Reform and Rural Development, 2019. *High potential agricultural areas 2019 – Spatial data layer*, *Northern Cape Province*, 2021. Pretoria.

Department of Agriculture, Land Reform and Rural Development, 2016. *National land capability evaluation raster data: Land capability data layer*, 2016. Pretoria.

Land Type Survey Staff, 1972 – 2006. *Land Types of South Africa data set*. ARC – Institute for Soil, Climate and Water. Pretoria.

South Africa (Republic), 2018. *Long-term grazing capacity for South Africa*: Data layer. Government Gazette Vol. 638, No. 41870. 31 August 2018. Regulation 10 of the Conservation of Agricultural Resources Act (CARA): Act 43 of 1983. Pretoria. Government Printing Works.

The Soil Classification Working Group, 2018. *Soil Classification – Taxonomic System for South Africa.* Dept. of Agric., Pretoria.

APPENDIX 1 – LAND TYPE DATA SHEET OF LAND TYPE AG110

LAND TYPE / *LANDTIPE* : **Ag110**

CLIMATE ZONE / *KLIMAATSONE* : 5S

Area / *Oppervlakte* : 170410 ha

Estimated area unavailable for agriculture

Beraamde oppervlakte onbeskikbaar vir landbou : 4370 ha

Occurrence (maps) and areas / *Voorkoms (kaarte) en oppervlakte :*

2722 Kuruman (84930 ha) 2822 Postmasburg (85480 ha)

Inventory by / *Inventaris deur :*

J F Eloff & S W J Idema

Modal Profiles / *Modale profiele :*

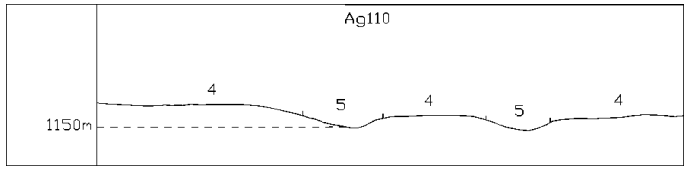
None / Geen

Terrain unit / *Terreineenheid*	4	5
% of land type / *% van landtipe*	90	10
Area / *Oppervlakte (ha)*	153369	17041
Slope / *Helling (%)*	0 - 2	0 - 1
Slope length / *Hellingslengte (m)*	1000 - 5000	50 - 5000
Slope shape / *Hellingsvorm*	Z	Z
MB0, MB1 (ha)	30674	852
MB2 - MB4 (ha)	122695	16189

Soil series or land classes *Grondseries of landklasse*	**Depth** *Diepte* (mm)	MB	ha	%	ha	%	**Total** *Totaal* ha	%	**Clay content %** *Klei-inhoud %* A	E	B21	Hor	**Texture** *Tekstuur* Class / *Klas*	**Depth limiting material** *Diepte-beperkende materiaal*
Roodepoort Hu30, Mangano Hu33	20-300	3	84353	55	9373	55	93726	55.0	2-6		4-8	B	fiSa	ka,R
Kalkbank Ms22, Loskop Ms12	0-300	3	30674	20	6305	37	36979	21.7	6-15			A	fiSa-LmSa	ka
Mangano Hu33	450-900	1	23005	15	511	3	23517	13.8	4-8		6-15	B	srfiSa-LmfiSa	R,ka
Shorrocks Hu36	450-700	1	7668	5	341	2	8009	4.7	8-15		15-25	B	srfiSaLm-SaClLm	R,ka
Mispah Ms10, Muden Ms20	0-300	3	7668	5			7668	4.5	6-15			A	fiSa-LmSa	R
Stream beds/Stroombeddings		4			511	3	511	0.3						

Terrain type / *Terreintipe :* A2

Terrain form sketch / *Terreinvormskets*



For an explanation of this table consult LAND TYPE INVENTORY (table of contents)

Ter verduideliking van hierdie tabel kyk LANDTIPE - INVENTARIS (inhoudsopgawe)

Geology: Surface limestone, alluvium and red wind-blown sand of Tertiary to Recent age with a few occurrences of amygdaloidal andesitic lava (Ongeluk Formation).

Geologie: Oppervlakkalksteen, alluvium en rooi waaisand van Tersiere tot Resente ouderdom met enkele voorkomste van amandelhoudende andesitiese lawa (Formasie Ongeluk).