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SOIL. AGRICULTURE. ENVIRONMENT.

Agricultural Scoping Report for the Proposed Kiara Cluster PV Facilities

Submitted by TerraAfrica Consult cc

Mariné Pienaar

23 June 2022

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1. INTRODUCTION

Terra-Africa Consult cc was appointed by Savannah Environmental (Pty) to conduct the Agricultural Assessment for the proposed development of seven solar PV facilities near the town of Lichtenburg in North West Province. The assessment forms part of the Scoping and Environmental Impact Assessment process required for Environmental Authorisation (EA) of the renewable energy projects.

The Applicant, Voltalia South Africa (Pty) Ltd, is proposing the construction of seven (7) PV solar energy facilities & a grid connection to be assessed through separate Environmental Impact Assessment (EIA) processes and to be known as the Kiara PV 1, Kiara PV 2, Kiara PV 3, Kiara PV 4, Kiara PV 5, Kiara PV 6 and Kiara PV 7 facilities. The proposed seven solar PV projects are collectively referred to as the Kiara Cluster.

The projects are proposed to be located on a site approximately 16km north-east of the town of Lichtenburg in the North West Province. The solar PV facilities will comprise several arrays of PV panels and associated infrastructure and will range from a contracted capacity of 120MW to 130MW. The development area is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality (refer to **Figure 1**). The site is accessible via an existing gravel road which provides access to the development area.

The development area for the PV facilities and associated infrastructure will be located on the following properties:

- Portion 2 of the Farm Hollaagte No. 8
- Remaining Extent of the Farm Hollaagte No. 8

The size of the development footprint of each individual PV project as well as its position within the larger development area, is shown in **Figure 2**.

2. DETAILS OF THE SPECIALIST

The report is prepared by Mariné Pienaar of TerraAfrica Consult CC. Mariné is a scientist registered with the South African Council for Natural Scientific Professions (SACNASP) and is specialised in the fields of Agricultural Science and Soil Science. Her SACNASP Registration Number is 400274/10 (see Appendix 2 – Curriculum Vitae of Specialist). Mariné holds a BSc. degree in Agricultural Science (with specialisation in Plant Production) from the University of Pretoria and a MSc. Degree in Environmental Science from the University of the Witwatersrand. She has consulted in the subject fields of soil, agriculture, pollution assessment and land use planning for the environmental sector of several African countries including Botswana, Mozambique, Democratic Republic of Congo, Liberia, Ghana and Angola. She has also consulted on the soil and agricultural assessment of a gas infrastructure project in Afghanistan. The full details and contact details of the specialist is attached as Appendix 1 – Specialist Declaration of Independence.

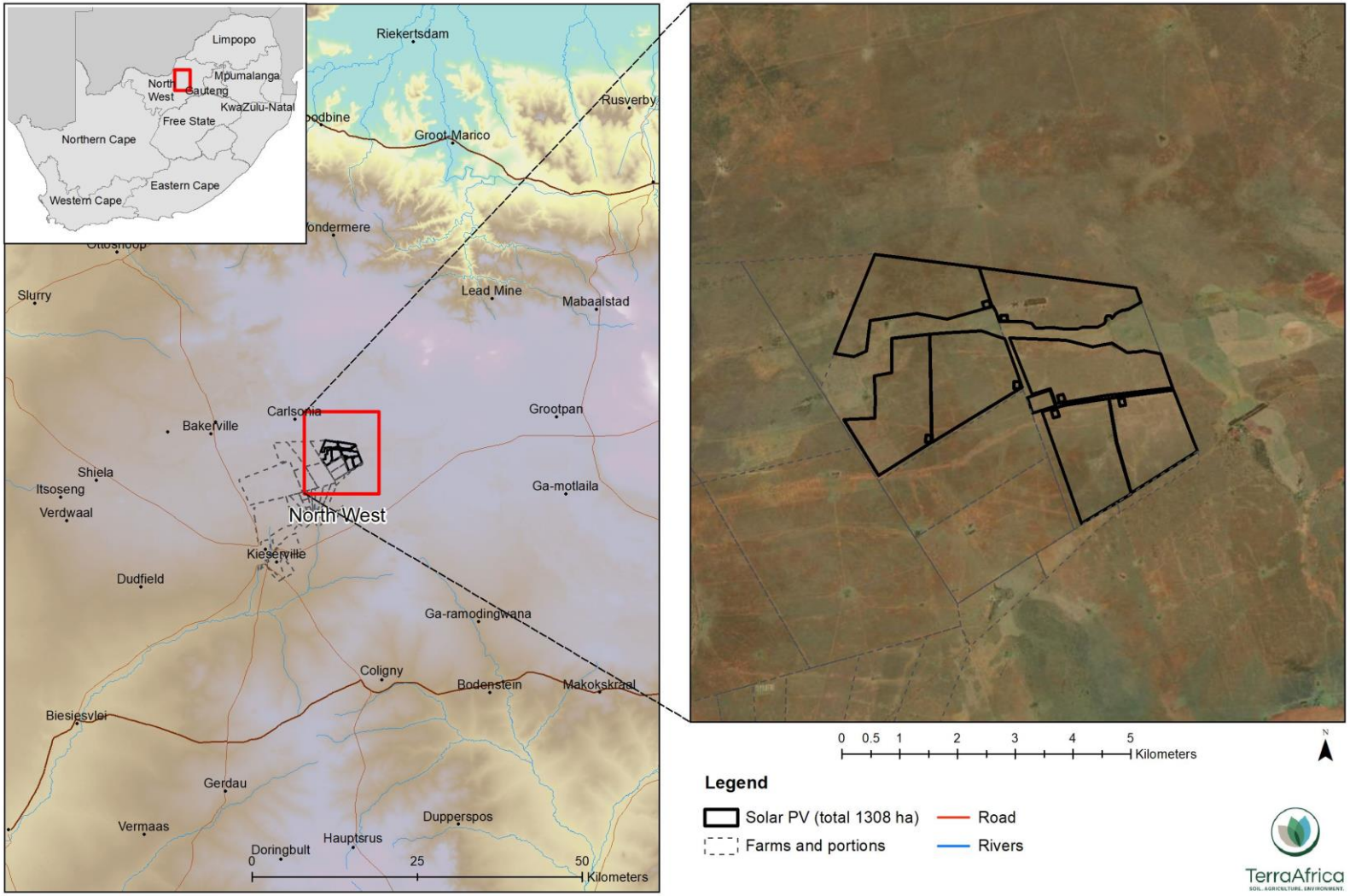

Figure 1: Locality of the Kiara Cluster development area where seven proposed PV projects will be developed

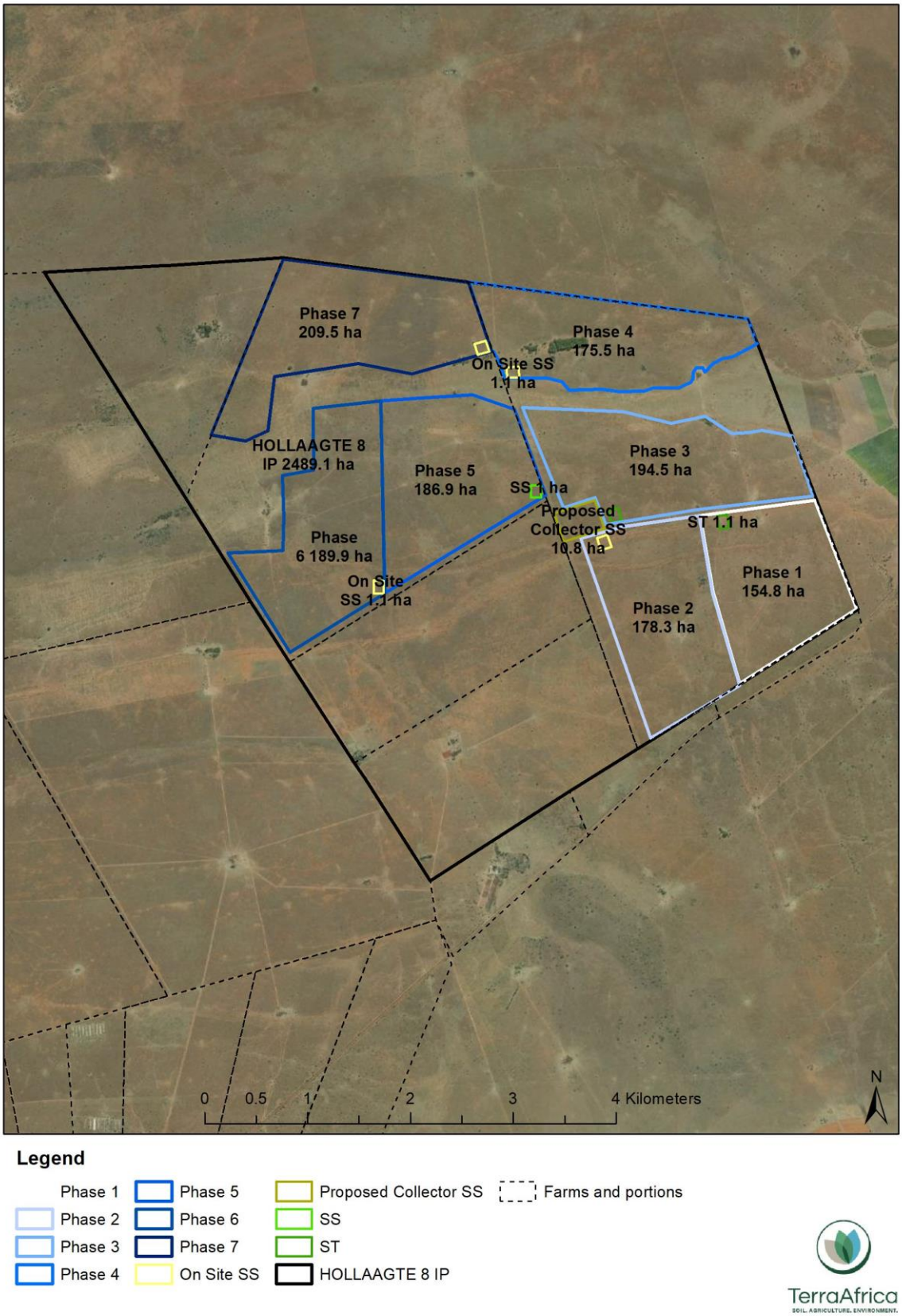

Figure 2: Footprints of the proposed Kiara Cluster PV facilities within the development area

3. 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 Kiara Cluster development area falls within any High Potential Agricultural Areas of the North West province.
- 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.
- Comply with the Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources by onshore wind and/or solar photovoltaic energy generation facilities where the electricity output is 20 megawatts or more, gazetted on 20 March 2020 in GN 320 (in terms of Sections 24(5)(A) and (H) and 44 of NEMA, 1998).

4. METHODOLOGY

The proposed assessment areas of the seven PV facilities were 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:

The data sets are:

- 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 North West 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: North West 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).

5. RESULTS OF DESKTOP ASSESSMENT

5.1 Land type classification

The entire development areas of five of the seven the PV projects, consist of Land Type Fa 11. These PV projects are Phase 1, Phase 2, Phase 3, Phase 5 and Phase 6. The two northern PV project areas, i.e., Phase 4 and Phase 7, consist of Land Type Fa11 in the southern parts of both areas and Land Type Fa10 in the northern parts. The area south of the total development area consists of Land Type Fa11 while the area north of the entire area, consists of Land Type Fa10. Each of the land types present are described below and the complete land type data sheets, are attached as Appendix C. The position of the land types for each area, is shown in **Figure 4**.

5.1.1 Land Type Fa11

The terrain forms of Land Type Fa11 are depicted in **Figure 3**. The crests and mid-slopes (Terrain units 1 and 3) are dominated by soil of the Glenrosa and Mispah forms. The rest of this land type consists of yellow-brown and red apedal (structureless) soil either underlain by unspecified material or by plinthic material (either soft or hard plinthite) along the toe-slopes and valley bottoms (Terrain units 4 and 5, respectively). According to the land type charts, 40 to 50% of foot slope and valley bottom positions consist of these deeper soil forms. The valley bottoms might potentially consist of a hydromorphic soil form that may have wetland potential. The slope of the terrain is very flat with Terrain unit 3 having the steepest slope (between 2% and 5%). The clay content of the topsoil horizons are estimated to range between 10% and 25% while subsoil clay content is estimated to range between 13% and 40%.

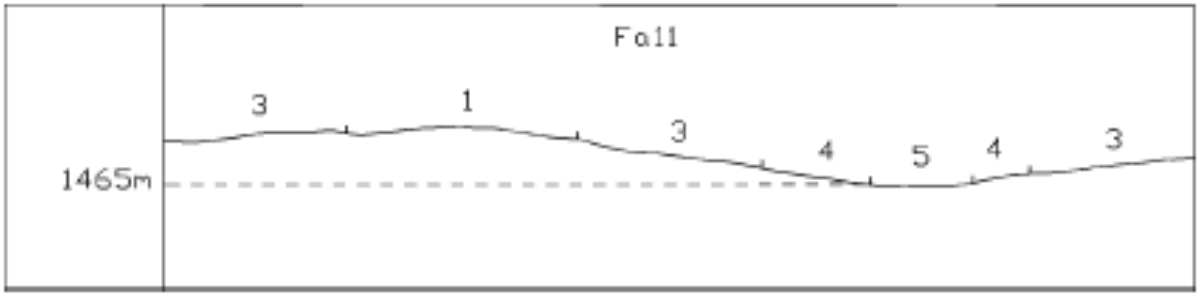

Figure 3: Terrain form sketch of Land Type Fa11

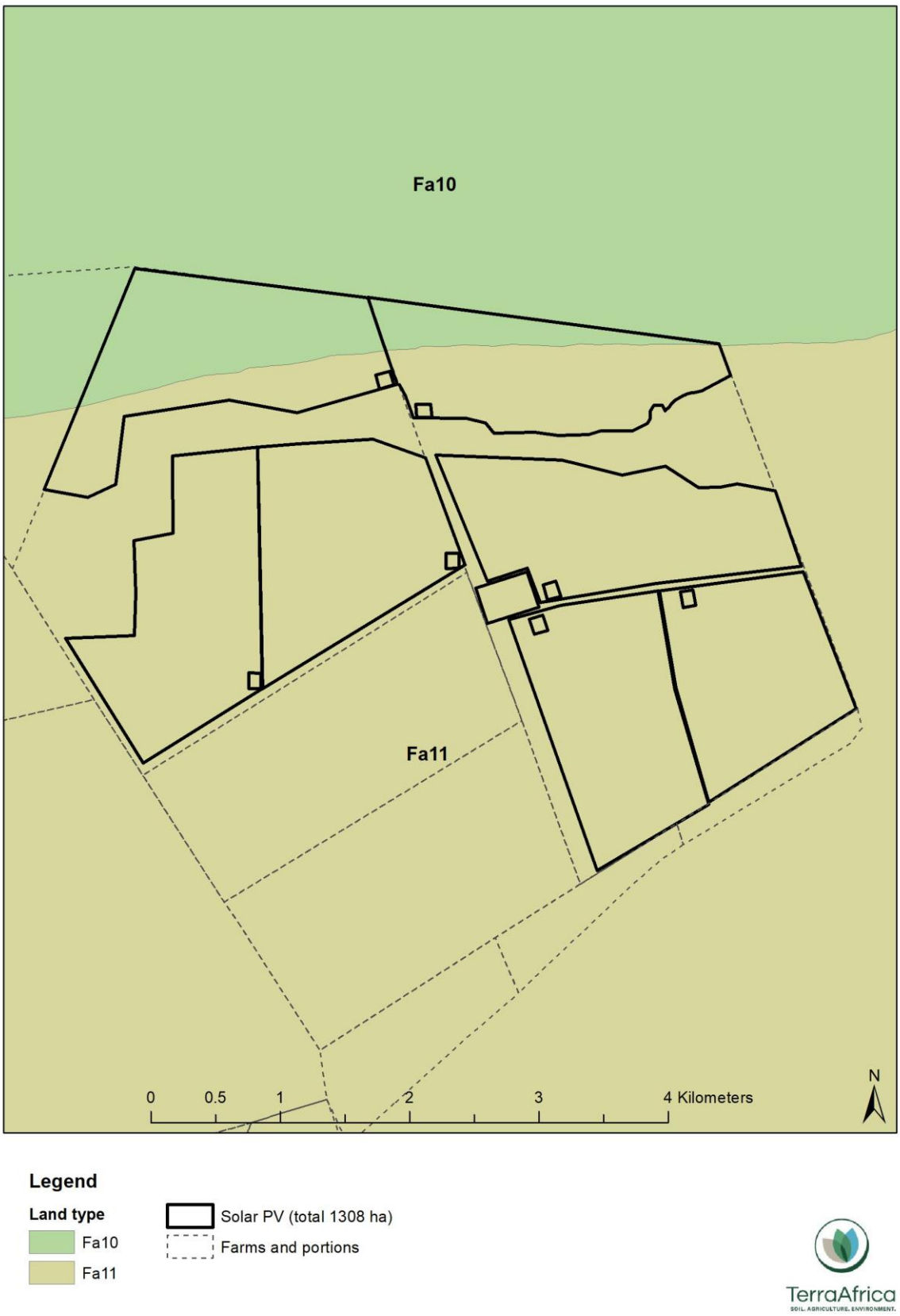

Figure 4: Land type map of the proposed seven Kiara Cluster PV facilities

4.1.2 Land Type Ba10

In comparison to Land Type Fa11, Land Type Ba10 is present at lower elevation with the valley bottoms typically found at 1200 m.a.s.l. Land Type Ba10 consists of four different terrain units that are illustrated in **Error! Reference source not found.**. The crests (Terrain unit 1) are approximately 10% of the total land type area and is flat to slightly sloped (slope of 0 to 4%). The toe-slopes occupy the largest area of this land type (around 50%) and consist of 70% shallow to medium deep profiles of the Hutton and Clovelly forms. Other soil forms include the Glencoe and Estcourt forms. The valley bottoms (Terrain unit 5) are found at 10% of the total land type area and consists mainly of Estcourt soils but may also include Oakleaf soils and stream beds.

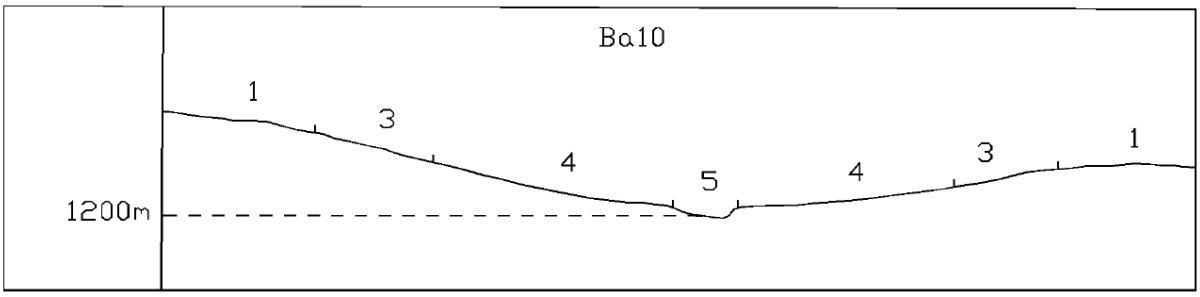

Figure 5 Terrain form sketch of Land Type Ba10

5.2 Land capability classification

The land capability classification of the seven solar PV development areas according to the DALRR raster data (DALRRD, 2016), is shown in **Figure 6**.

The largest part of five seven the PV areas, i.e., Phase 1, Phase 2, Phase 3, Phase 5 and Phase 6, consists of land with Class 06 and Class 07 (Low-Moderate) land capability. The Phase 4 and Phase 7 development areas have between 40% to 60% land with Low (Class 05) land capability along the northern boundaries of the development areas. The areas along the southern boundaries have land with Low-Moderate (Class 07) land capability.

All the PV areas have a few small areas of Moderate (Class 08) and Moderate-High (Class 09) land capability are scattered through the middle of the development area. The largest continuous area of land with Moderate-High (Class 09) land capability, is present along the southern boundary of the Phase 4 area.

The land capability classification of the entire development area is therefore dominated by land that have limited to no suitability for rainfed crop production that is better suited to livestock production or natural areas.

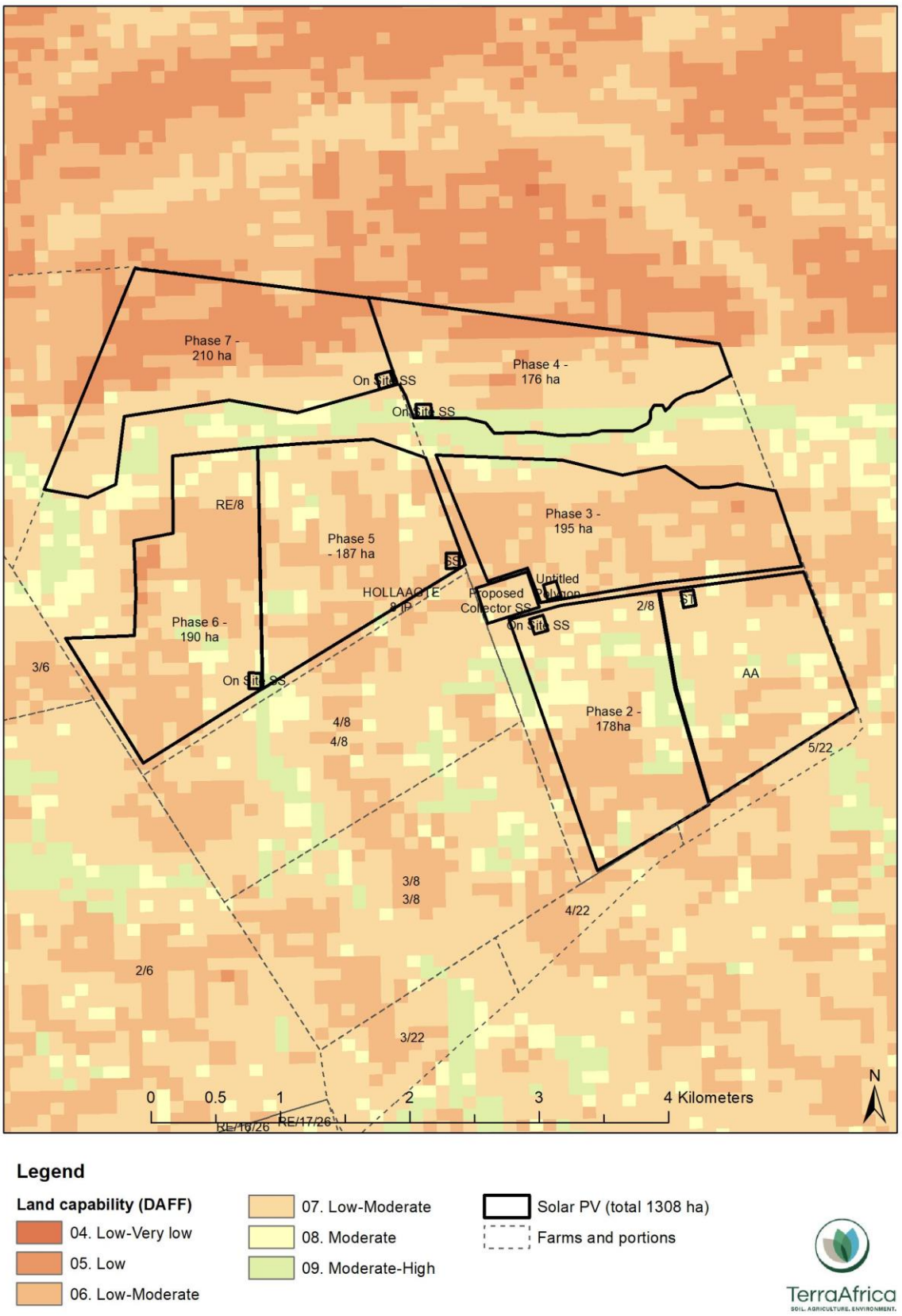

Figure 6: Land capability map of the proposed Kiara Cluster PV facilities (data source: DALRRD, 2016)

5.3 Agricultural production

The current agricultural production within the development areas of the seven PV facilities were determined by using a combination of the field crop boundary data (Crop Estimates Consortium, 2019) and the long-term grazing capacity of the area (South Africa, 2018).

The grazing capacity of all seven the development areas is homogeneous and indicated as 8 ha/LSU (refer to **Figure 7**), which is moderate grazing potential. It is lower than the wetter, eastern parts of the country such as Mpumalanga where the grazing capacity ranges from 4 to 6 ha/LSU. However, it is higher than drier areas in the western parts of South Africa, such as the Kalahari. Grazing capacity in the Kalahari ranges between 11 and 17 ha/LSU. The grazing capacity of the Karoo is much lower than that, with some areas having grazing capacity as low as 70ha/LSU.

The crop field boundaries raster data shows that there are no crop fields within any of the seven development areas (refer to **Figure 8**). The nearest crop fields to the proposed development areas are located just east of the eastern boundaries of the Phase 1 and Phase 3 PV development areas. These crop fields consist of rainfed annual crop production and/or planted pastures. Four centre pivot irrigation areas are also located between 1.5 and 3 km east of the eastern boundaries of the Phase 1 and Phase 3 areas. More crop fields with rainfed annual crops and a few centre pivot irrigation areas, are located 6km or further directly south of the proposed Kiara PV Cluster development area.

5.4 High Potential Agricultural Areas

To determine whether the proposed development of the seven PV facilities within the Kiara Cluster will affect any High Potential Agricultural Areas (HPAAs) delineated within the North West Province, the development areas were depicted in relation to these areas (see **Figure 9**).

Category A areas have the highest priority for conservation, followed by Category B areas and then Category C areas. Differentiation is also made between areas with irrigated and rainfed agriculture. Although large areas are delineated as HPAAs, not all within the area may be used for irrigated or rainfed agriculture.

None of the seven proposed facilities are part of any HPAA. The nearest HPAA to the proposed Kiara Cluster PV development area, is a Category B rainfed agricultural area located about 3km south of the development area. A Category B HPAA is located further away, approximately 7.5km west of the western boundary of the larger Kiara Cluster development area.

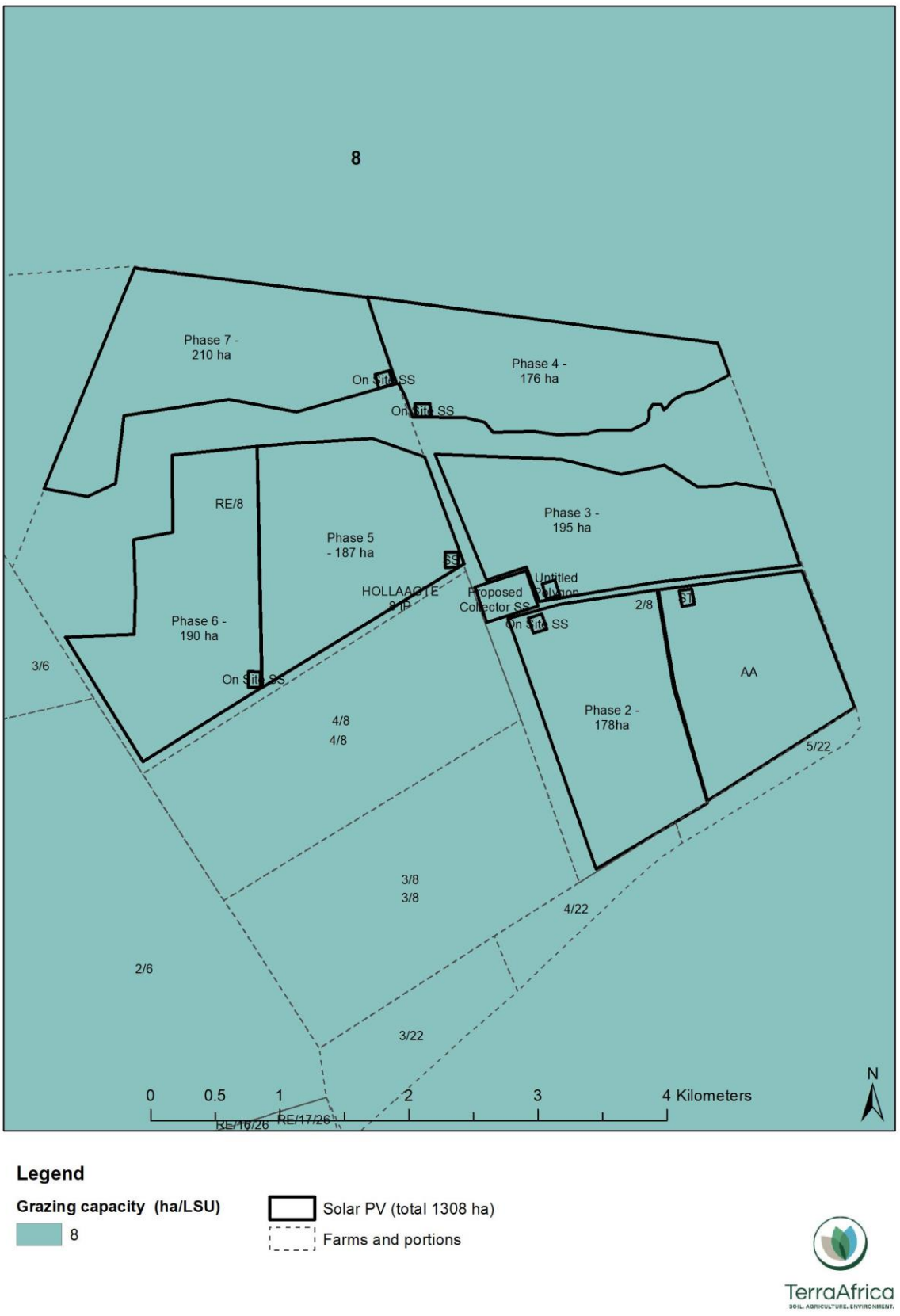

Figure 7 Grazing capacity of the proposed Kiara Cluster PV facilities (data source: South Africa, 2018)

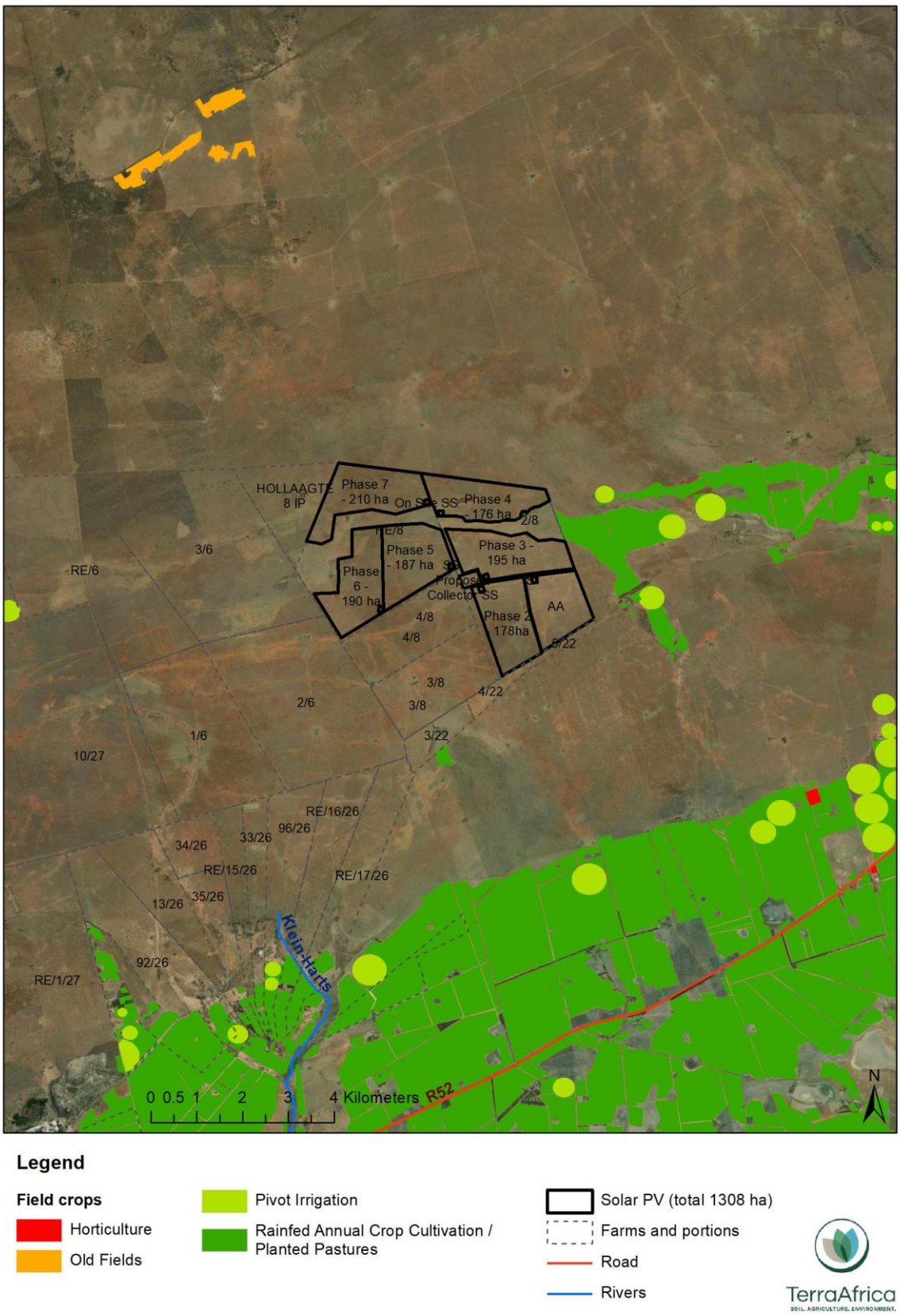

Figure 8 Field crop boundaries of the proposed Kiara Cluster PV facilities (data source: Crop Estimates Consortium, 2019)

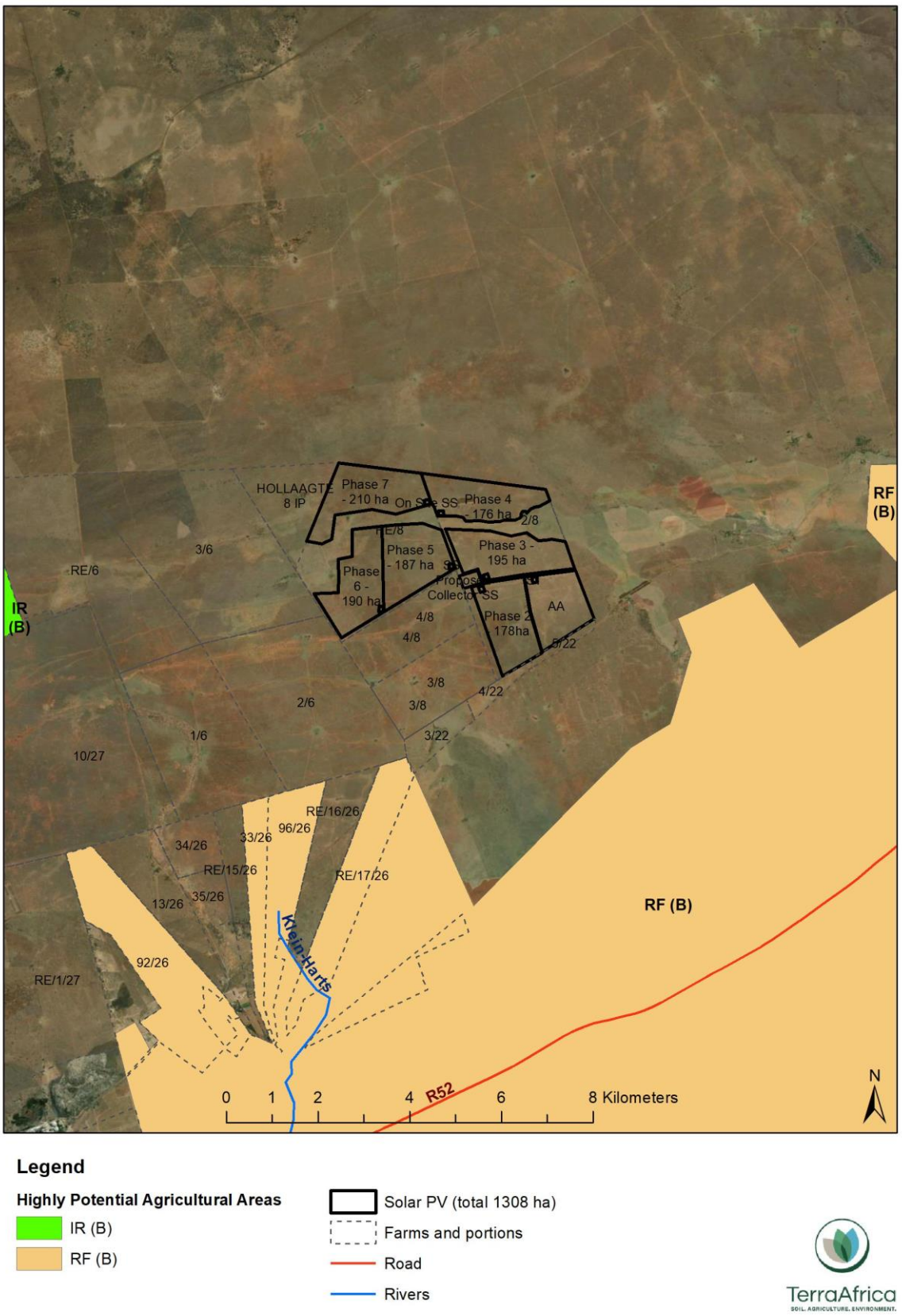

Figure 9 The seven development areas of the proposed Kiara Cluster PV facilities in relation to High Potential Agricultural Areas (DALRRD, 2019)

6. PRELIMINARY SENSITIVITY ANALYSIS

Considering the desktop data discussed in **Section 5** above, the site has been assigned a preliminary sensitivity rating (see **Figure 10**). In addition to the data discussed, the author's knowledge of the area around the site where soil and classification surveys have been conducted since 2018, has also informed the sensitivity rating.

The entire development area of the seven proposed solar PV facilities, have Low, Medium and High agricultural sensitivity to the proposed development. Six of the seven development areas (Phase 1, Phase 2, Phase 3, Phase 4, Phase 5 and Phase 6) have mostly Low and Medium sensitivity with only small to very small areas of High sensitivity. The Phase 7 development area has only Low and Medium agricultural sensitivity.

The sensitivity rating was assigned with the reasoning that areas with Moderate-High land capability will have Moderate-High to High agricultural potential and may be suitable for rainfed crop production. However, the absence of any crop field boundaries in the areas indicated that the sites are likely used for livestock grazing. Even though the area may be suitable for irrigated farming, none of the seven development areas has any irrigation infrastructure or field crop boundaries associated with irrigated agriculture.

During the detailed study for the EIA phase, the sensitivity rating of each facility's development area, will be refined based on the soil classification and verified land capability of the area.

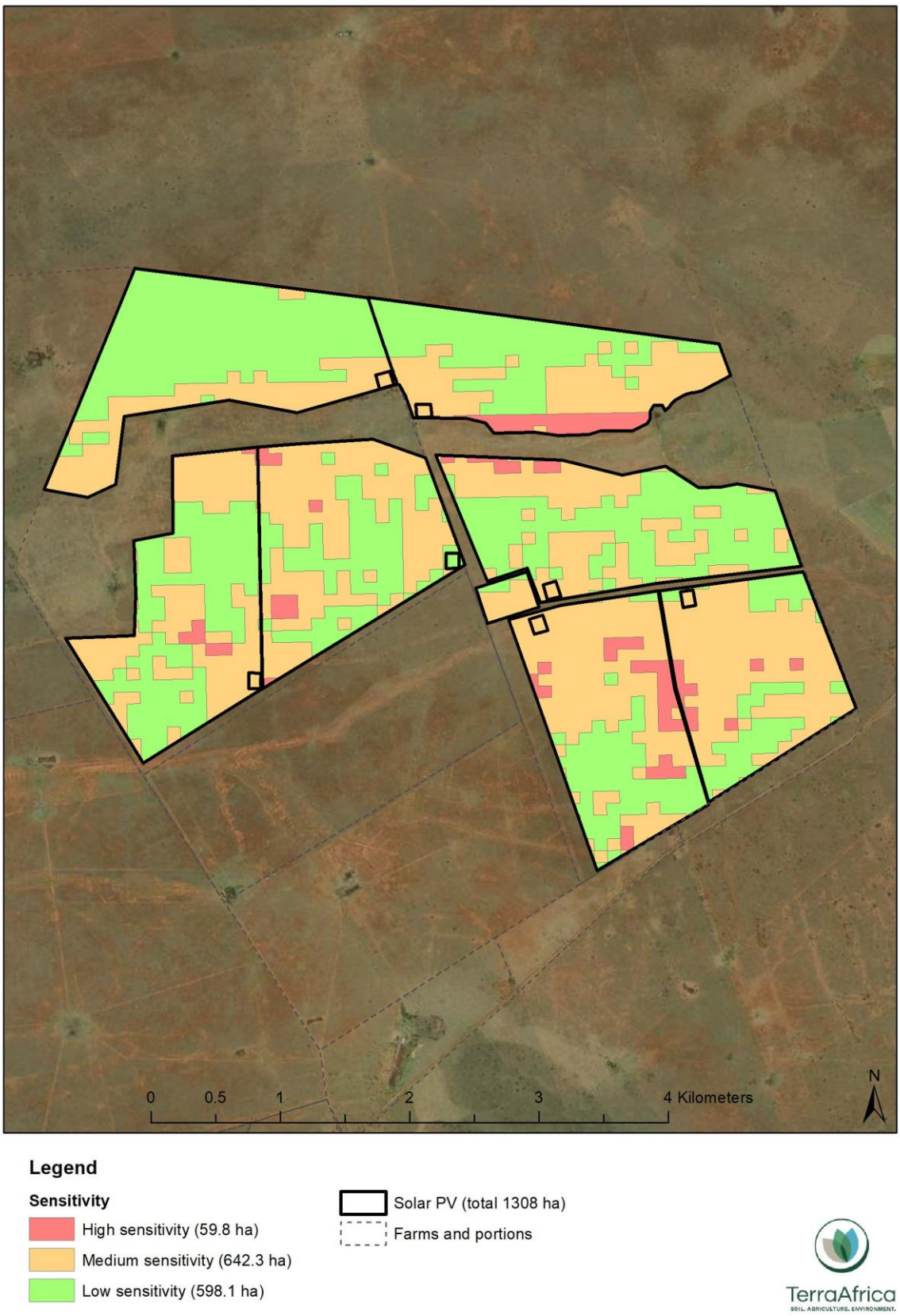

Figure 10 Agricultural sensitivity of the proposed Kiara Cluster PV facilities

7. POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

7.1 Project description

The solar PV facilities will comprise several arrays of PV panels and associated infrastructure and will range from a contracted capacity of 120MW to 130MW. The infrastructure associated with the PV facilities includes:

- PV modules and mounting structures
- Inverters and transformers
- Battery Energy Storage System (BESS)
- Site and internal access roads (up to 8m wide)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- Temporary and permanent laydown area
- Grid connection solution will include:
    - 33kV/132kV substation/switching station

7.2 Potential impacts of the proposed solar PV facilities

The three sites have similar baseline conditions and the same impacts on soil and agriculture are anticipated. Below follows a description of the potential impacts.

7.2.1 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.			

7.2.2 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.

8. PLAN OF STUDY

Once the infrastructure layout has gone 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 reports 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. A separate report will be compiled for each proposed PV facility.

9. CONCLUSION

Following the desktop analysis of available data, it is concluded that the proposed development of the seven PV facilities of the Kiara PV Facilities Cluster, will mostly affect land with Low and Medium agricultural sensitivity. While no no-go areas have been identified, it is recommended that areas with High sensitivity be avoided where possible during the final infrastructure layout planning. However, it is likely that the on-site verification during EIA process may find that the High sensitivity areas have lower sensitivity for it is not used for any rainfed or irrigated crop production. None of the proposed development areas overlap with delineated High Potential Agricultural Areas within the larger area where the projects will be located.

It is anticipated that the proposed project will have limited impact on the soil properties and land capability while the land use will change from livestock farming to generation of renewable energy. The detailed assessment and subsequent reporting will provide in-depth detail on all these aspects.

10. LIST OF REFERENCES

Crop Estimates Consortium, 2019. *Field crop boundary data layer (NW 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*, *North West Province*, 2021. Pretoria.

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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 A: DECLARATION OF INDEPENDENCE

DECLARATION OF THE SPECIALIST

Note: Duplicate this section where there is more than one specialist.

I MARINÉ PIENAAR as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that:

- In terms of the general requirement to be independent:
  - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity; or
  - am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 of the NEMA EIA Regulations has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- In terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- I have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any Report, plan or document prepared or to be prepared as part of the application; and
- I am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations.

Signature of the EAP: Date: 2022-01-07

TERRA AFRICA CONSULT CC

Name of company (if applicable):

FORM NO. BAR10/2019

APPENDIX B: CURRICULUM VITAE OF SPECIALIST

MARINÉ PIENAAR

Specialist Scientist

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linkedin.com/in/marinepienaar

Wolmaransstad,
South Africa

EXPERTISE

Soil Quality Assessment

Soil Policy and Guidelines

Agricultural Agro-Ecosystem Assessment

Sustainable Agriculture

Data Consolidation

Land Use Planning

Soil Pollution

Hydropedology

EDUCATION

MASTER'S DEGREE
Environmental Science
University of Witwatersrand
2010 – 2018

BACHELOR'S DEGREE
Agricultural Science
University of Pretoria
2001 – 2004

PROFESSIONAL PROFILE

I contribute specialist knowledge on agriculture and soil management to ensure long-term sustainability of projects in Africa. For the past thirteen years, it has been my calling and I have consulted on more than 200 projects. My clients include environmental and engineering companies, mining houses, and project developers. I enjoy the multi-disciplinary nature of the projects that I work on and I am fascinated by the evolving nature of my field of practice. The next section provide examples of the range of projects completed. A comprehensive project list is available on request.

PROJECT EXPERIENCE

Global Assessment on Soil Pollution

Food and Agricultural Organisation (FAO) of the United Nations (UN)

Author of the regional assessment of Soil in Sub-Saharan Africa. The report is due for release in February 2021. The different sections included:

- Analysis of soil and soil-related policies and guidelines for each of the 48 regional countries
- Description of the major sources of soil pollution in the region
- The extent of soil pollution in the region and as well as the nature and extent of soil monitoring
- Case study discussions of the impacts of soil pollution on human and environmental health in the region
- Recommendations and guidelines for policy development and capacitation to address soil pollution in Sub-Saharan Africa

Data Consolidation and Amendment

Range of projects: Mining Projects, Renewal Energy

These projects included developments where previous agricultural and soil studies are available that are not aligned with the current legal and international best practice requirements such as the IFC Principles. Other projects are expansion projects or changes in the project infrastructure layout. Tasks on such projects include the incorporation of all relevant data, site verification, updated baseline reporting and alignment of management and monitoring measures.

Project examples:

- Northam Platinum's Booysendal Mine, South Africa
- Musonoi Mine, Kolwezi District, Democratic Republic of Congo
- Polihali Reservoir and Associated Infrastructure, Lesotho
- Kaiha 2 Hydropower Project, Liberia
- Aquarius Platinum's Kroondal and Marikana Mines

MARINÉ PIENAAR

Specialist Scientist

PROFESSIONAL MEMBERSHIP

South African Council for Natural Scientific Professions (SACNASP)

Soil Science Society of South Africa (SSSSA)

Soil Science Society of America (SSSA)

Network for Industrially Contaminated Land in Africa (NICOLA)

LANGUAGES

English (Fluent)

Afrikaans (Native)

French (Basic)

PRESENTATIONS

There is spinach in my fish pond
TEDx Talk
Available on YouTube

♦

Soil and the Extractive Industries
Session organiser and presenter
Global Soil Week, Berlin (2015)

♦

How to dismantle an atomic bomb
Conference presentation (2014)
Environmental Law Association (SA)

PROJECT EXPERIENCE (Continued)

Agricultural Agro-Ecosystem Assessments

Range of projects: Renewable Energy, Industrial and Residential Developments, Mining, Linear Developments (railways and power lines)

The assessments were conducted as part of the Environmental and Social Impact Assessment processes. The assessment process includes the assessment of soil physical and chemical properties as well as other natural resources that contributes to the land capability of the area.

Project examples:

- Mocuba Solar PV Development, Mozambique
- Italthai Railway between Tete and Quelimane, Mozambique
- Lichtenburg PV Solar Developments, South Africa
- Manica Gold Mine Project, Mozambique
- Khunab Solar PV Developments near Upington, South Africa
- Bomi Hills and Mano River Mines, Liberia
- King City near Sekondi-Takoradi and Appolonia City near Accra, Ghana
- Limpopo-Lipadi Game Reserve, Botswana
- Namoya Gold Mine, Democratic Republic of Congo

Sustainable Agriculture

Range of projects: Policy Development for Financial Institutions, Mine Closure Planning, Agricultural Project and Business Development Planning

Each of the projects completed had a unique scope of works and the methodology was designed to answer the questions. While global indicators of sustainable agriculture are considered, the unique challenges to viable food production in Africa, especially climate change and a lack of infrastructure, in these analyses.

Project examples:

- Measurement of sustainability of agricultural practices of South African farmers – survey design and pilot testing for the LandBank of South Africa
- Analysis of the viability of avocado and mango large-scale farming developments in Angola for McKinsey & Company
- Closure options analysis for the Tshipi Borwa Mine to increase agricultural productivity in the area, consultation to SLR Consulting
- Analysis of risks and opportunities for farm feeds and supplement suppliers of the Southern African livestock and dairy farming industries
- Sustainable agricultural options development for mine closure planning of the Camutue Diamond Mine, Angola

MARINÉ PIENAAR

Specialist Scientist

PROFESSIONAL DEVELOPMENT

Contaminated Land Management 101 Training
Network for Industrially Contaminated Land in Africa
2020

Intensive Agriculture in Arid & Semi-Arid Environments
CINADCO/MASHAV R&D Course, Israel
2015

World Soils and their Assessment Course
ISRIC – World Soil Information Centre, Netherlands
2015

Wetland Rehabilitation Course
University of Pretoria
2010

Course in Advanced Modelling of Water Flow and Solute Transport in the Vadose Zone with Hydrus
University of Kwazulu-Natal
2010

Environmental Law for Environmental Managers
North-West University Centre for Environmental Management
2009

PROJECT EXPERIENCE (Continued)

Soil Quality Assessments

Range of projects: Rehabilitated Land Audits, Mine Closure Applications, Mineral and Ore Processing Facilities, Human Resettlement Plans

The soil quality assessments included physical and chemical analysis of soil quality parameters to determine the success of land rehabilitation towards productive landscapes. The assessments are also used to understand the suitability for areas for Human Resettlement Plans

Project examples:

- Closure Planning for Yoctolux Colliery
- Soil and vegetation monitoring at Kingston Vale Waste Facility
- Exxaro Belfast Resettlement Action Plan Soil Assessment
- Soil Quality Monitoring of Wastewater Irrigated Areas around Matimba Power Station
- Keaton Vanggatfontein Colliery Bi-Annual Soil Quality Monitoring

REFERENCES

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APPENDIX C: LAND TYPE DATA SHEETS

LAND TYPE / *LANDTIPE* ..... : **Fa11**

CLIMATE ZONE / *KLIMAATSONE* ..... : 11S

Area / *Oppervlakte* ..... : 41880 ha

Estimated area unavailable for agriculture

Beraamde oppervlakte onbeskikbaar vir landbou : 1100 ha

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

2524 Mafikeng (430 ha) 2526 Rustenburg (10140 ha)

2624 Vryburg (2070 ha) 2626 Wes-Rand (29240 ha)

Inventory by / *Inventaris deur :*

R W Bruce

Modal Profiles / *Modale profiele :*

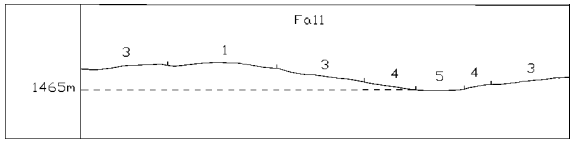
None / Geen

Terrain unit / *Terreineenheid* ..... :	1	3	4	5
% of land type / *% van landtipe* ..... :	25	60	10	5
Area / *Oppervlakte (ha)* ..... :	10470	25128	4188	2094
Slope / *Helling (%)* ..... :	0 - 2	2 - 5	1 - 2	0 - 1
Slope length / *Hellingslengte (m)* ..... :	400 - 600	800 - 1200	400 - 600	40 - 60
Slope shape / *Hellingsvorm* ..... :	Y	Z-Y	Z-X	X
MB0, MB1 (ha) ..... :	1256	11810	2094	1675
MB2 - MB4 (ha) ..... :	9214	13318	2094	419

Soil series or land classes *Grondseries of landklasse*	**Depth** *Diepte* (mm)	MB	ha	%	ha	%	ha	%	ha	%	**Total** *Totaal* ha	%	**Clay content %** *Klei-inhoud %* A	E	B21	Hor	**Texture** *Tekstuur* Class / *Klas*	**Depth limiting material** *Diepte-beperkende materiaal*
Soil-rock complex																		
Grond-rotskompleks:																		
Rock/Rots		4	1675	16	1759	7	712	17	126	6	4272	10.2						
Mispah Ms10, Klipfontein Ms11, Platt Gs14, Glenrosa Gs15, Trevanian Gs17	100-150	3	7538	72	11559	46	1382	33	293	14	20772	49.6	10-20			A	meSaLm-LmSa	so,R,hp
Msinga Hu26, Clansthal Hu24, Lichtenburg Hu23	250-1200+	0	1256	12	11810	47	2094	50	838	40	15998	38.2	10-25		13-30	B	meSaLm-SaClLm	R,so
Devon We22, Newport Cv27, Southwold Cv26, Avalon Av26, Chinyika Wo21	250-1200+	0							838	40	838	2.0	20-40		20-40	A	SaClLm-SaCl	sp

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: Dolomite and chert belonging to the Chuniespoort Group; chert gravels are abundant on middle and footslopes including valley bottoms.

Geologie: Dolomiet en chert van die Groep Chuniespoort; chertgruise is volop op middel- en voethange, asook valleivloere.

LAND TYPE / *LANDTIPE*..... : Bc11

CLIMATE ZONE / *KLIMAATSONE* ..... : 11S

Area / *Oppervlakte* ..... : 32540 ha

Estimated area unavailable for agriculture
Beraamde oppervlakte onbeskikbaar vir landbou : 1000 ha

Terrain unit / *Terreineenheid*	:	4	5
% of land type / *% van landtipe*	:	95	5
Area / *Oppervlakte (ha)*	:	30913	1627
Slope / *Helling (%)*	:	0 - 2	0 - 1
Slope length / *Hellingslengte (m)*	:	1300 - 1700	50 - 100
Slope shape / *Hellingsvorm*	:	Z-Y	Z-X
MB0, MB1 (ha)	:	30913	1627
MB2 - MB4 (ha)	:	0	0

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

2524 Mafikeng (9100 ha) 2624 Vryburg (15830 ha)

2626 Wes-Rand (7610 ha)

Inventory by / *Inventaris deur :*

R W Bruce

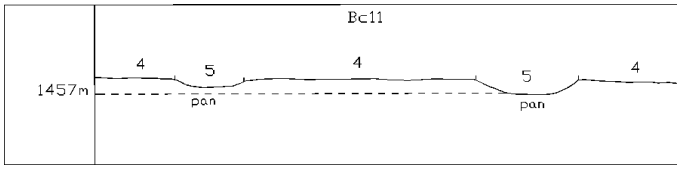
Modal Profiles / *Modale profiele :*

P113

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*
Rietvlei We12, Sibasa We13	500-700	0	:	9892	32			9892	30.4	15-25		30-40	B	fiSaClLm	B2gc
Shorrocks Hu36, Msinga Hu26	>1200	0	:	8037	26			8037	24.7	14-18		18-25	B	fiSaLm-SaClLm	R,so
Soetmelk Av36, Avalon Av26	900-1200	0	:	5255	17			5255	16.2	15-18		18-25	B	fiSaLm-SaClLm	B2gc
Lonetree Bv26, Bainsvlei Bv36	900-1100	0	:	4946	16			4946	15.2	15-18		18-25	B	fiSaLm-SaClLm	B2gc
Lichtenburg Hu23, Mangano Hu33	>1200	0	:	1546	5			1546	4.8	9-12		12-15	B	LmfiSa-SaLm	R,so
Leslie Gc36, Glencoe Gc26	500-700	0	:	1237	4			1237	3.8	15-18		18-25	B	fiSaLm-SaClLm	hp
Sterkspruit Ss26	200-250	0	:			976	60	976	3.0	18-25		35-40	A	fiSaLm-SaClLm	B2
Rensburg Rg20	700-900	0	:			651	40	651	2.0	30-50			A	fiSaCl-Cl	G

Terrain type / *Terreintipe :* A1

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: Thick aeolian sand on the Chuniespoort Group. In places calcrete underlies solums. Small pans occupy 5% of the land type.

Geologie: Dik eoliese sand op die Groep Chuniespoort.Kalkreet kom soms onder solums voor.Klein panne beslaan 5% van die landtipe.