Soil Compliance Statement for the proposed Zibulo Overhead Powerline (OHPL) Project

Victor Khanye and Emalahleni District Municipalities, Mpumalanga Province, South Africa

August 2023

CLIENTS

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax : +27 86 527 1965

www.thebiodiversitycompany.com

Report Name	**Soil Compliance Statement for the proposed Zibulo OHPL Project**
Submitted to	EIMS ENVIRONMENTAL IMPACT MANAGEMENT SERVICES
Report Reviewer	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 13 years' experience in the environmental consulting field.
Report Writer	**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. He is a holder of a PhD in Soil Science, Hydropedology, Water and Sanitation obtained at the University of the Free State, Bloemfontein. Matthew completed his M.Sc. in Soil science, Hydropedology and Water management at the University of Fort Hare, Alice. Matthew is also a member of the Soil Science Society of South Africa (SSSSA).
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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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.

Dr Matthew Mamera

Soil Scientist

The Biodiversity Company

August 2023

1 Introduction

The Biodiversity Company (TBC) was commissioned to conduct a soil compliance report for the proposed Zibulo Overhead Powerline (OHPL) project. The proposed project involves the development of a 7km kingbird line that stretches from Cologne substation to Zibulo North Shaft substation and a 10.5 km (option 1) or 15 km (option 2) Kingbird 132KV line that stretches from Modiri substation to Zibulo North Shaft substation. The proposed project is located approximately 6.6 km south of Kendal Power Station and approximately 14.5 km Southwest of Ogies, Mpumalanga, South Africa.

The approach adopted for the assessments 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”. The National Web based Environmental Screening Tool (DFFE, 2023) has characterised the agricultural theme sensitivity of the area as “Low to Medium”.

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 Zibulo Overhead Powerline (OHPL).

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.1 Scope of Work

The following scope of work is applicable:

- 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 areas, 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 management programme.

2 Project Area

The project area falls under the Nkangala District Local Municipality, Emalahleni Municipality, Mpumalanga. The project area is located approximately 6.6 km south of Kendal Power Station and approximately 14.5 km Southwest of Ogies. The proposed project area is also approximately 6.7 km south of the R555 regional road, 16 km north of the R580 national road and 12 km south of the N12 national road (see Figure 2-1). The surrounding land uses include grazing, waterbodies, game farming and mining activities.

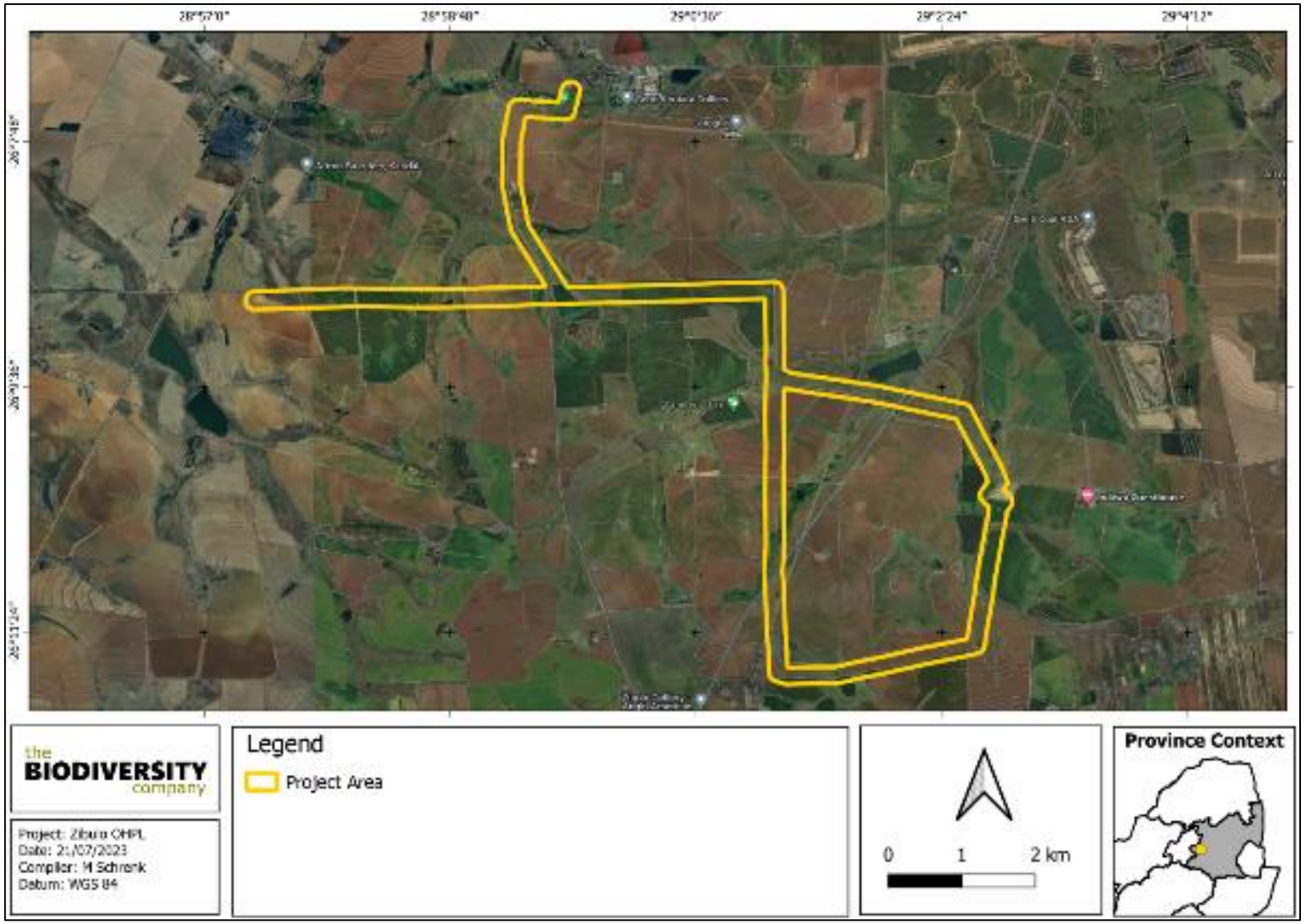


Figure 2-1 Locality map of the project area

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 July 2023. 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 0.5 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 (DAFF, 2017).

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

The land capability of the proposed footprint was compared to the National Land Capability which was refined in 2014- 2016. The National Land Capability methodology is based on a spatial evaluation modelling approach and a raster spatial data layer consisting of fifteen (15) land capability evaluation values (Table 3-4), usable on a scale of 1:50 000 – 1:100 000 (DAFF, 2017). The previous system is based on a classification approach, with 8 classes (Table 3-1).

Table 3-4 National Land Capability Values (DAFF,2017)

Land Capability Evaluation Value	Land Capability Description
1	Very low
2	
3	Very Low to Low
4	

5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	
14	Very High
15	

3.4 Limitations

The following limitations are relevant to this agricultural potential assessment:

- 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 Climate

The project area falls within the Eastern Highveld Grassland vegetation. The area is characterised by summer rainfall with very dry winters. The MAP of area is about 650-900 mm with an overall average of 726 mm. Frost fairly frequent in winter from 13 to 42 days, but higher at higher elevation (Mucina & Rutherford, 2006). The mean average temperature for the project area ranges with the maximum temperatures of 25°C in summer and minimum temperature of 1 °C for February and July respectively (see Figure 4-1).

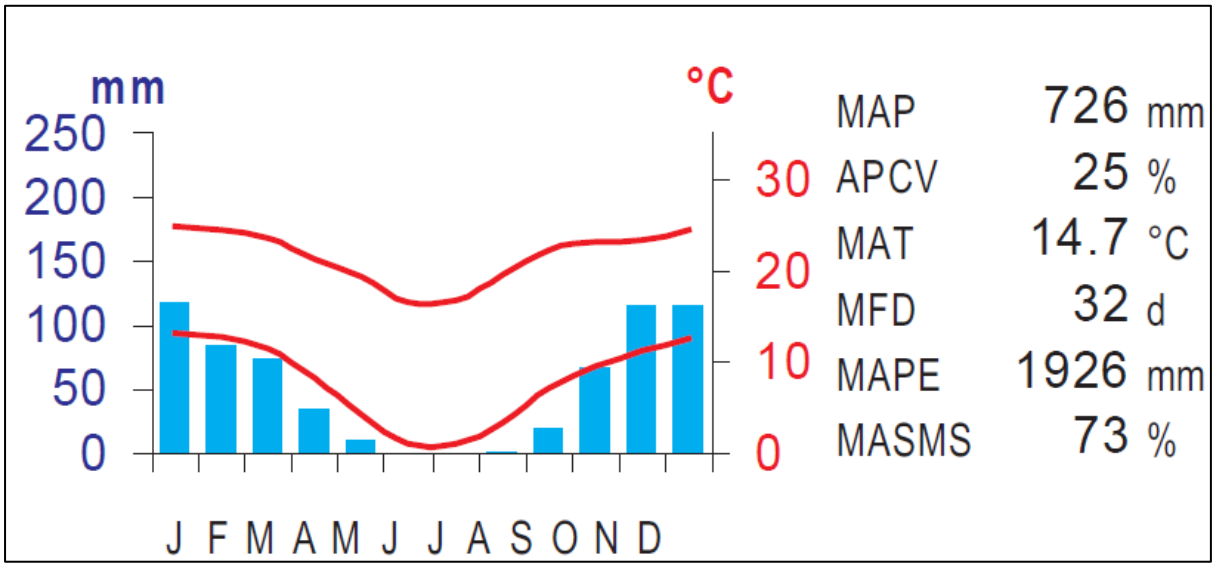


Figure 4-1 Summarised climate for the region (Mucina & Rutherford, 2006)

4.2 Soils and Geology

The geology of the area is characterised with shales and sandstones of the Madzaringwe formation (Karoo Supergroup). According to the land type database (Land Type Survey Staff, 1972 - 2006) the assessment corridor to be focused on falls within the Ab 9 and Ba 4 land type (see Figure 4-4). The Ab 9 land type mostly consist of Hutton and Rensburg soil forms and rocky areas according to the SA soil classification working group (1990) with the possibility of other soils occurring throughout. The Ba 4 land type is characterised with Hutton, Longlands and Katspruit soil forms with also the occurrence of other associated soil forms found the terrain. The Ab land types is commonly associated to red and yellow, freely drained soils. These soils have a dystrophic and mesotrophic base status. The Ba land types mainly have plinthic catena in the terrain and usually duplex and margalitic soils are rare in the upper lying landscapes. These soils are also characterised by a dystrophic and mesotrophic base status. The terrain units and expected soils for the Ab 9 land type is illustrated in **Error! Reference source not found.** and **Error! Reference source not found.**; the Ba 4 land types in Figure 4-3 and Table 4-2 respectively.

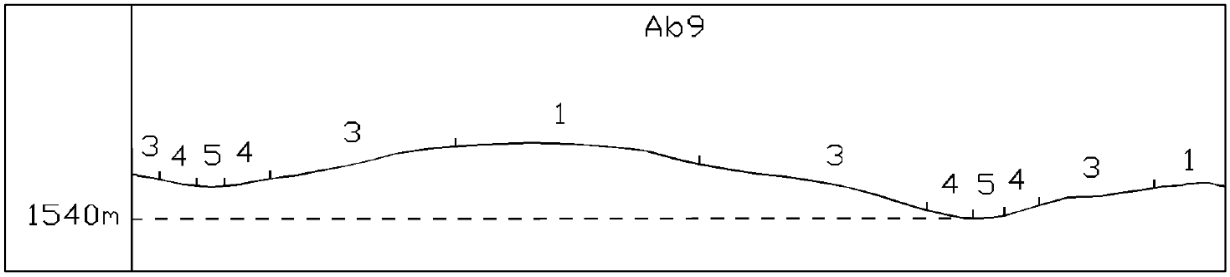


Figure 4-2 Illustration of land type Ab 9 terrain units (Land Type Survey Staff, 1972 – 2006)

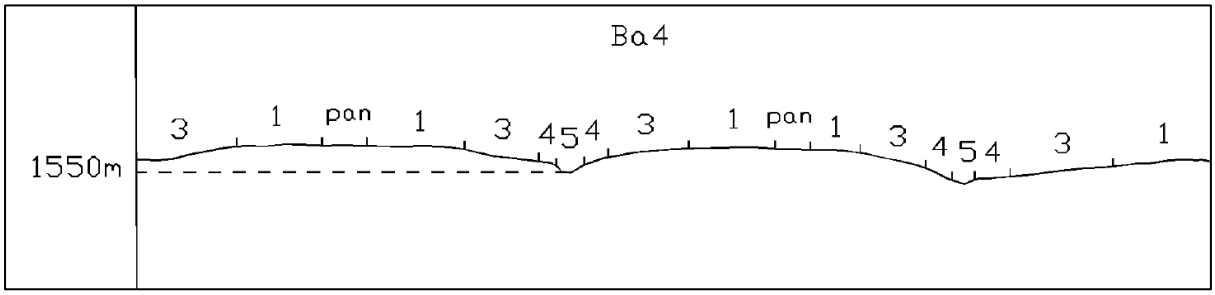


Figure 4-3 Illustration of land type Ba 4 terrain units (Land Type Survey Staff, 1972 – 2006)

Table 4-1 Soils expected at the respective terrain units within the Ab 9 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (30%)		**3 (55%)**		**4 (10%)**		**5 (5%)**	
Hutton	65%	Bare Rocks	80%	Hutton	30%	Rensburg	80%
Swartland	25%	Avalon	10%	Valsrivier	20%	Arcadia	20%
Bare Rocks	5%	Swartland	10%	Arcadia	20%		
Bainvlei	5%	Bare Rocks	5%	Swartland	10%		
		Valsrivier	5%	Avalon	5%		
		Bainslvei	5%	Bainsvlei	5%		
		Bonheim	5%				
		Mayo	5%				

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

Terrain Units							
1 (45%)		**3 (40%)**		**4 (10%)**		**5 (5%)**	
Hutton	35%	Hutton	50%	Longlands	40%	Katspruit	40%
Pans	20%	Avalon	15%	Avalon	30%	Longlands	30%
Avalon	10%	Longlands	10%	Clovelly	20%	Rensburg, Willowbrook	20%
Wasbank	10%	Wasbank	5%	Wasbank	5%	Cartref	10%
Glencoe	10%	Glencoe	5%	Cartref	5%		
Clovelly	5%	Clovelly	5%				
Cartref	5%	Cartref	5%				
Mispah	5%	Swartland	5%				

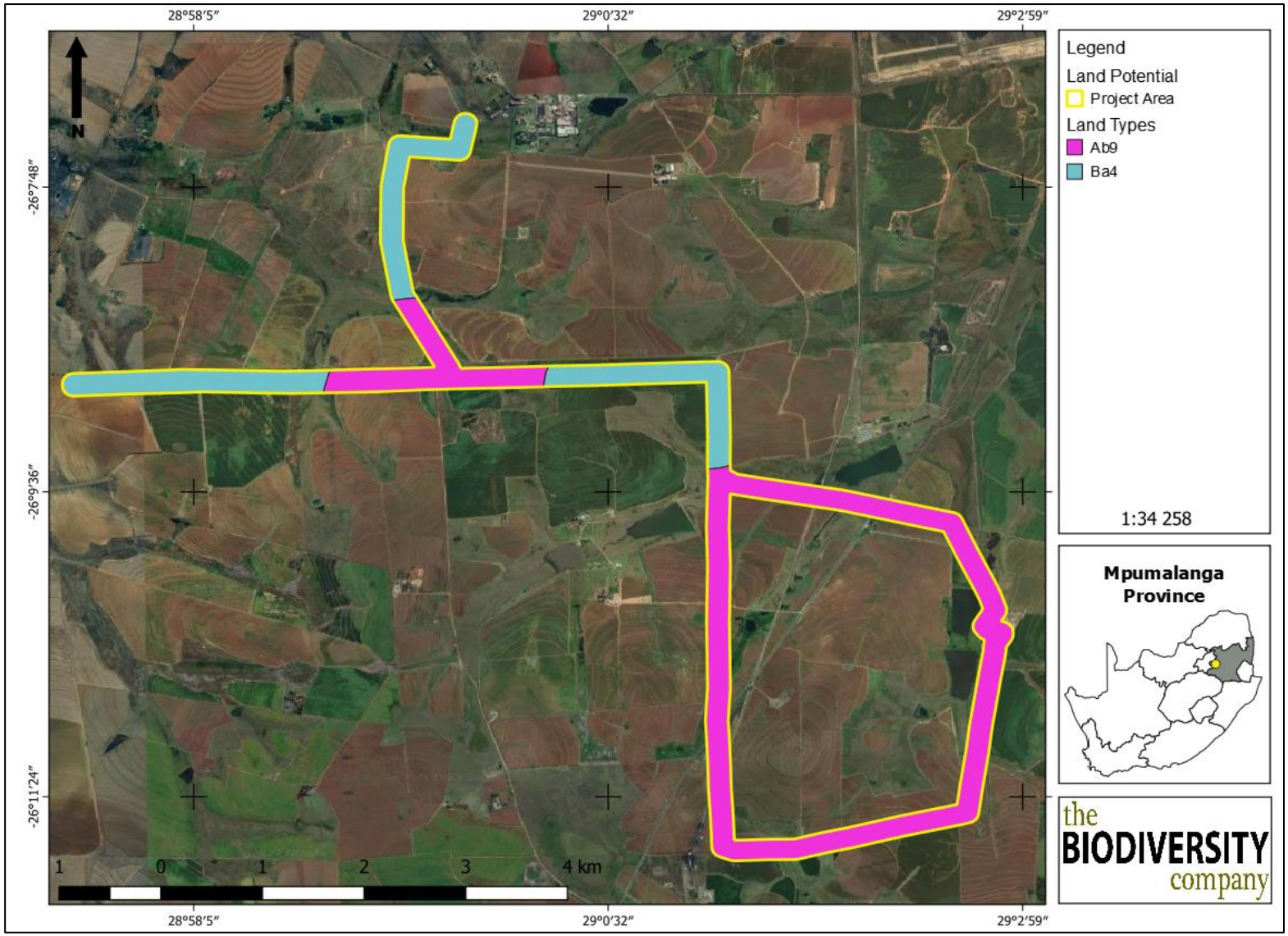


Figure 4-4 Land type distribution within the proposed project area

4.3 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure 4-5. Most of the regulated area is characterised by a slope percentage between 0 - 5% with some few irregularities in areas with slopes reaching above 21%. This illustration indicates a uniform topography with occurrence of a few steep sloping areas being present associated to the tailings stockpiles. The Digital Elevation Model (DEM) of the project area (Figure 4-6) indicates an elevation of 1 578 to 1 636 Metres Above Sea Level (MASL).

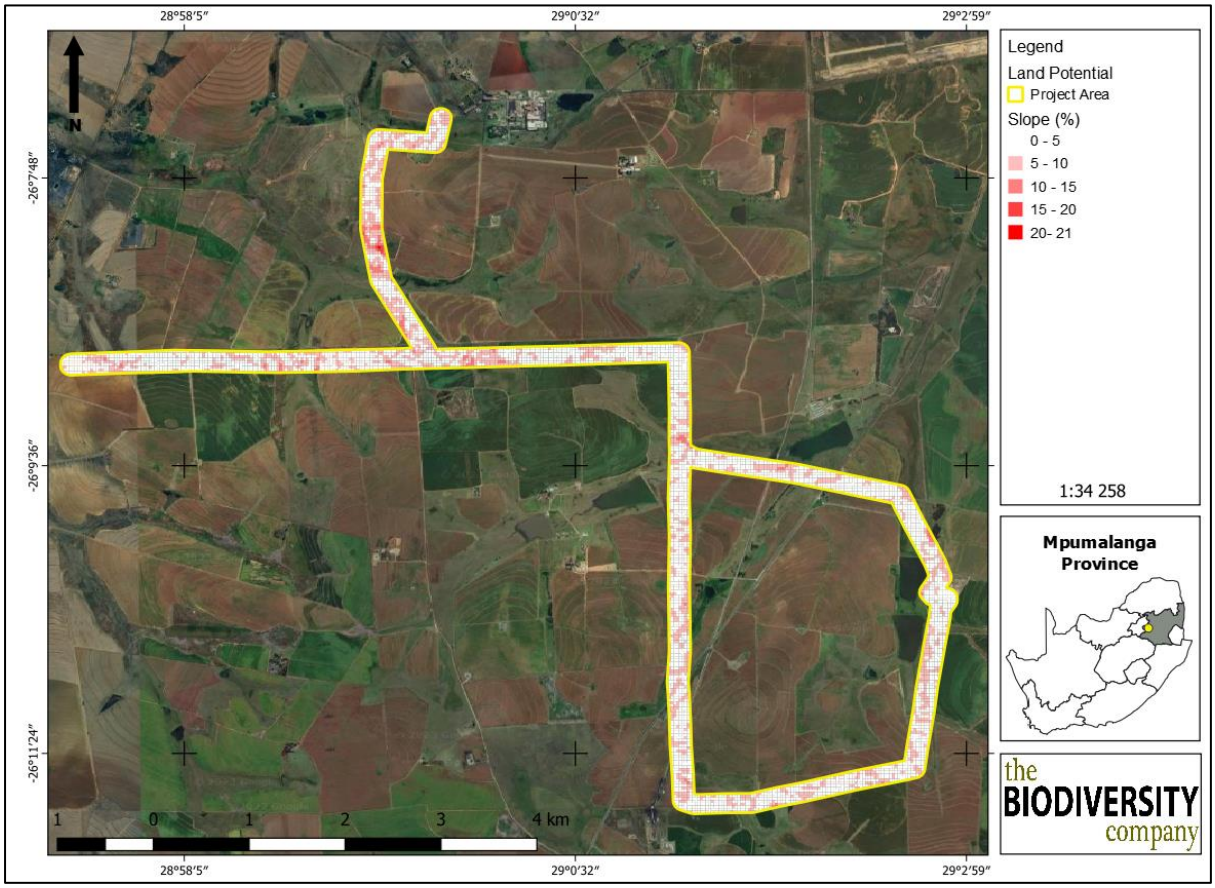


Figure 4-5 Slope percentage map for the project area

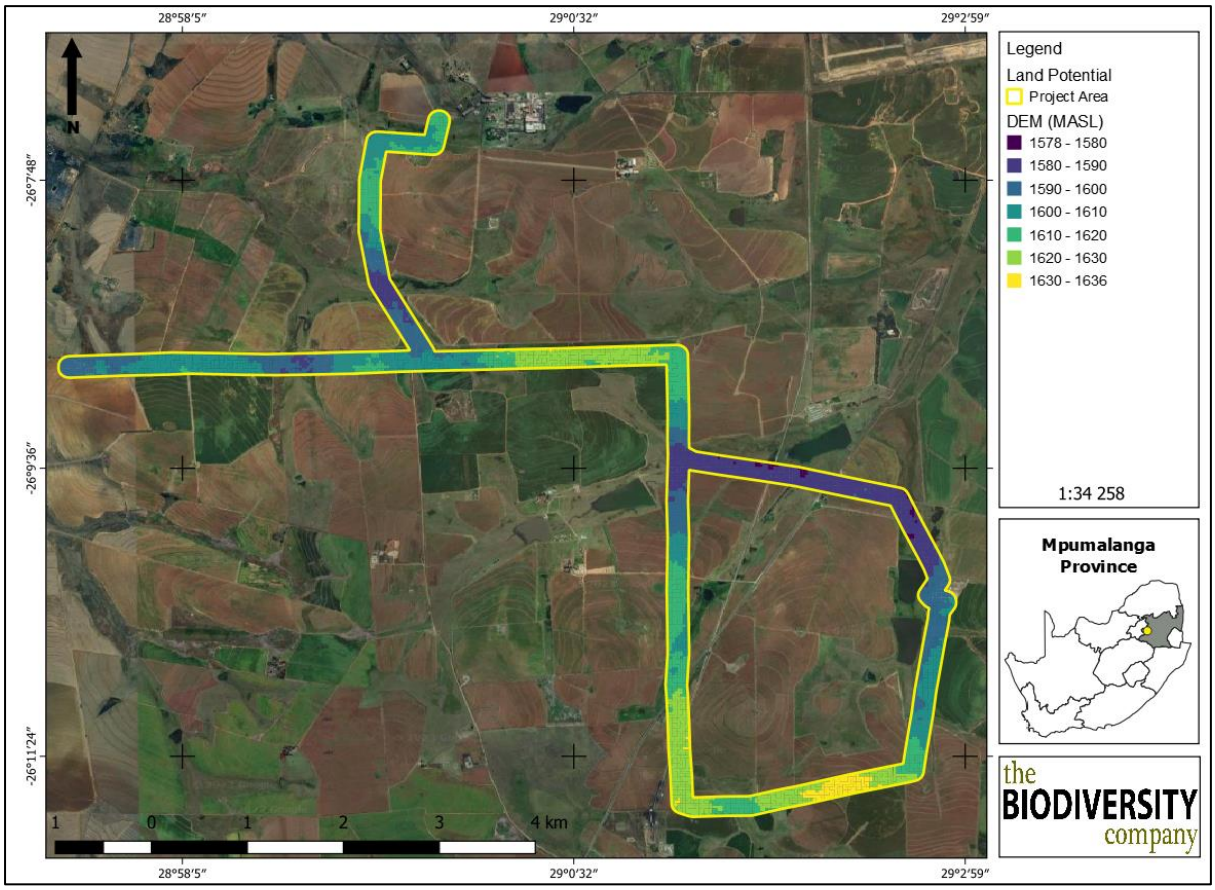


Figure 4-6 Digital Elevation Model of the project area (Metres Above Sea Level)

5 Results and Discussion

5.1 Baseline Findings

The three most sensitive soils forms which were identified in the proposed project area include, Hutton Bainsvlei and Avalon soil forms. The Hutton soil form consists of an orthic topsoil horizon on top of a thick red apedal horizon below. The Bainsvlei soil form consists of an orthic topsoil horizon on top of a thick red apedal horizon with a soft plinthic horizon below. The Avalon soil form has an orthic topsoil with a yellow-brown apedal subsurface horizon with a soft plinthic horizon below. Other associated less sensitive soils identified in the project area includes the Sepane, Valsrivier, Swartland, Westleigh and Katspruit soil forms (see Figure 5-1 to Figure 5-4). The Valsrivier soil form has an orthic topsoil horizon on top of a thick pedocutanic horizon. The Sepane soil form has an orthic topsoil horizon underlain with a pedocutanic horizon with a gley horizon below. The Swartland soil form has an orthic topsoil horizon with a pedocutanic horizon with a lithic horizon below. The Westleigh soil form has an orthic topsoil on top of a soft plinthic horizon with a gley horizon below. The Katspruit soil form has an orthic topsoil horizon with a gley horizon below. The project area is dominated by apedal soils, which are characterised with freely drained red and yellow soils and duplex soils with high clays contents. The high clay soils are usually hard to work with for most activities.

The above-mentioned most sensitive soil forms have been determined to have a land capacity class of “III”, “IV” and “V” with a climate capacity level 7 given the Low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. The combination between the determined land capability class and climate capability results in land potential “L5” and “Vlei” (See Figure 5-5). The “L5” land potential level is characterised by restricted potential due to the severe limitations as a result of the soil, slope, temperature, or rainfall. This area is characterised with a “Low to Medium” sensitivity.

Figure 5-1 ***Soil forms found within the proposed project area; A) Orthic topsoil horizon with a red apedal horizon; B&C) Yellow-Brown apedal horizon D) Soft plinthic horizon with Gley horizon; E&F) Pedocutanic subsurface horizon with Lithic subsurface horizon. G) Gley horizon below.***

Figure 5-2 ***A) Mottles present in saturated profiles; B) Iron and Manganese nodules in a soft plinthic; C) Saprolithic partially weathered material in a lithic horizon.***

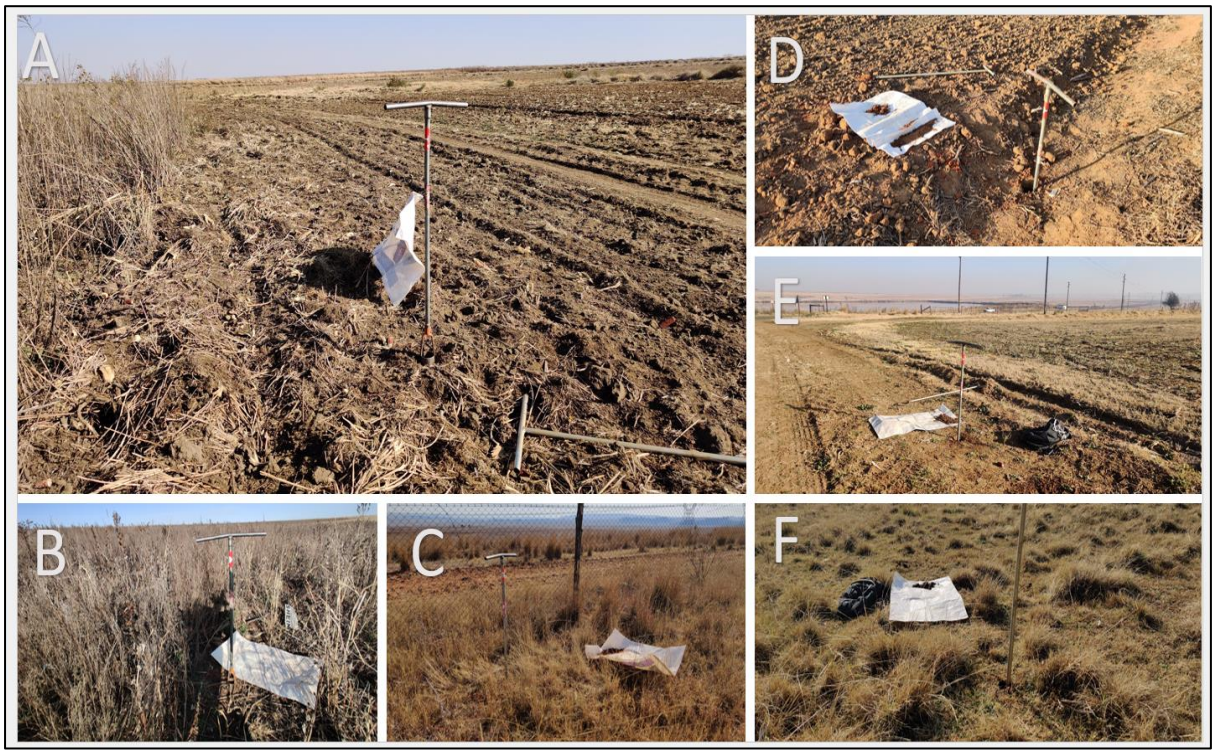


Figure 5-3 ***A-D) General landscape of the project area with the identified soil forms.***

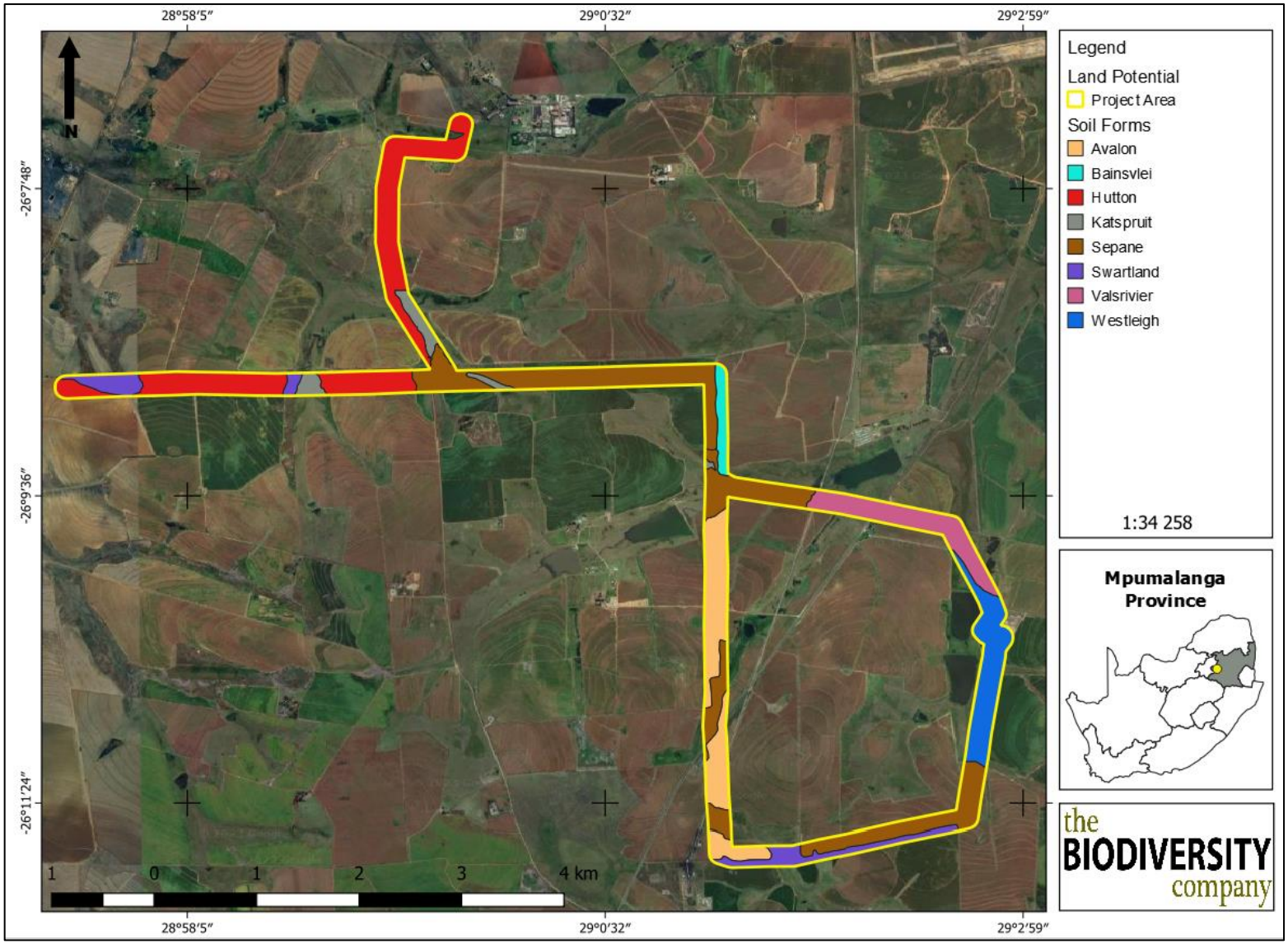


Figure 5-4 Dominant soil forms distribution identified in the project area.

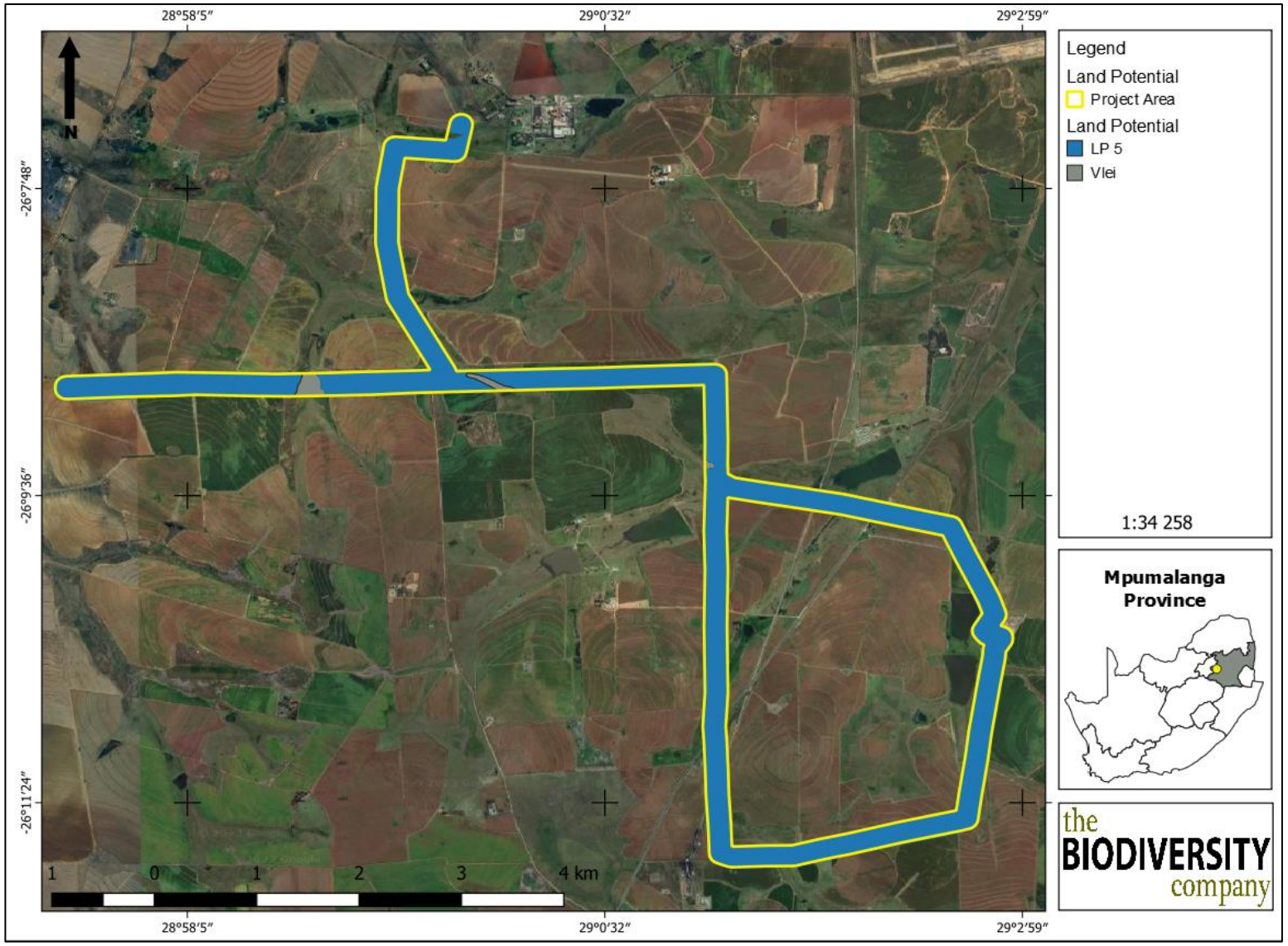


Figure 5-5 Land Potential of the soil forms identified in the project area.

5.2 Sensitivity Verification

The following land potential level has been determined;

- Land potential level 5 (this land potential is characterised by a restricted land potential. Severe limitations due to soil, slope, temperatures, or rainfall).

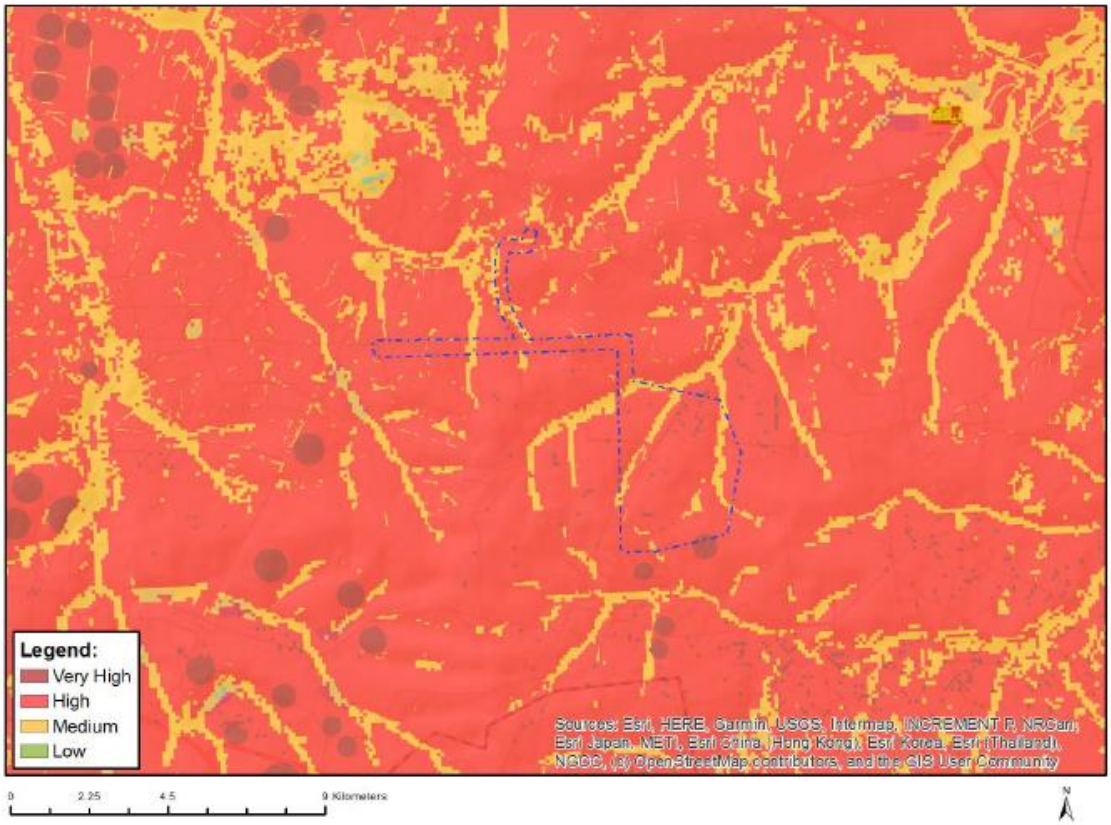
Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which ten potential land capability classes are located within the proposed footprint area's assessment corridor, including;

- Land Capability 1 to 5 (Very Low to Low Sensitivity);
- Land Capability 6 to 8 (Low/Moderate to Moderate Sensitivity) and;
- Land Capability 9 to 10 (Moderate High Sensitivity).

The baseline findings and the Land Capability sensitivity as per the Department of Agricultural, Forestry and Fisheries (DAFF, 2017) national raster file concur with one another in most areas. The proposed project area is characterised with a "Moderately to Moderate High" sensitivity category land capability sensitivity (DFFE screening tool, 2023; Figure 5-6 to Figure 5-7). A few areas are associated with "High" to "Very High" sensitivity. The verified soil baseline findings dispute these few isolated areas which were identified as identified as "High" to "Very High" which are associated to the Sepane, Valsrivier and Swartland soil forms. These duplex soil forms are characterised with a limited land capability potential. Based on the site-verified soil findings these soils have a "Moderate" sensitivity due to the high clay contents that significantly limit cropping practices. The available harsh climatic conditions also restrict most cropping practices, thus overall, the area can be categorized as "Medium" sensitivity which the specialist also agrees with, based on the site-verified baseline findings, moreover, the proposed powerline project is a linear development which conforms to the requirements of an agricultural compliance statement only.

Crop field areas with "High" agricultural sensitivities were also identified within the 50 m regulated area (see Figure 5-8). Therefore, there is segregation of active productive agricultural lands or crop fields within the proposed project area. Areas with active cultivated fields or high potential lands can be treated as no-go areas. In the event avoidance is not feasible for the project, the stakeholders can also obtain consent for use of those areas or engage with the landowners for appropriate compensation for use of these areas for the project.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Old Fields;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Old Fields;Land capability;09. Moderate-High/10. Moderate-High
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
Very High	Land capability;11. High/12. High-Very high/13. High-Very high/14. Very high/15. Very high
Very High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;11. High/12. High-Very high/13.

Figure 5-6 Map of the relative Agricultural Theme Sensitivity for the proposed project area generated by the Environmental Screening Tool

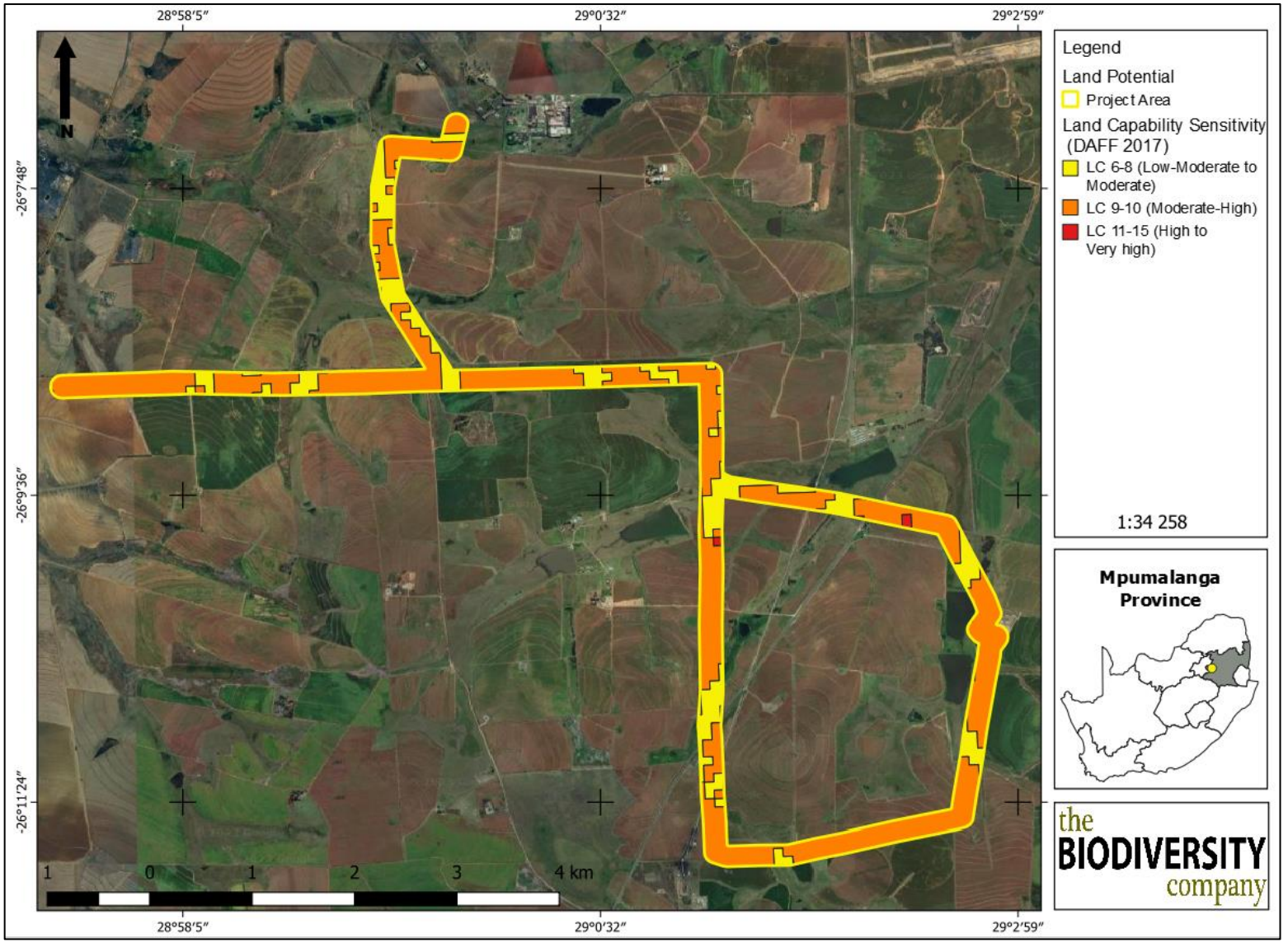


Figure 5-7 The land capability sensitivity for the proposed project area (DAFF, 2017)

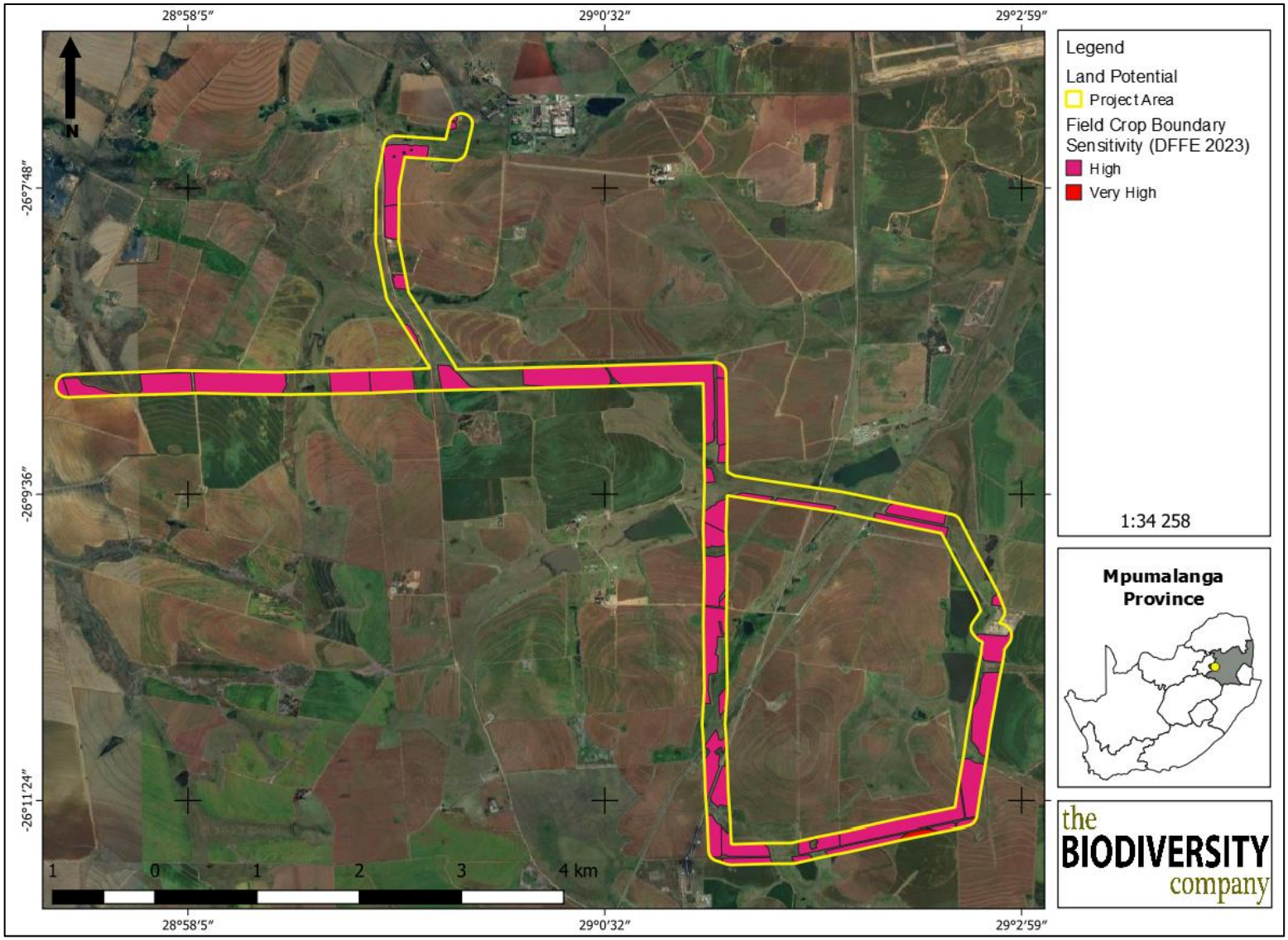


Figure 5-8 The Crop Boundary sensitivity for the proposed project area (DFFE, 2023)

6 Conclusion

Three dominant soil forms were identified in the proposed project area, the more sensitive forms identified within the assessment area include, the Hutton, Bainsvlei and Avalon soil forms. Other associated soils which were identified within the project area includes, the Sepane, Valsrivier, Swartland, Westleigh and Katspruit soil forms. The baseline findings and land capability sensitivity concur with each other, in most areas indicating a “Moderate to Moderate High” land capability sensitivity. The specialist disputes, some areas which were identified with a “High to Very High” sensitivity to a revised classification being “Moderate” sensitivity as these soils are characterized with soils with a restricted potential for cropping activities following the verified soil baseline findings. Overall, the area can be classified as “Medium” following the verified soil baseline findings on site.

Furthermore, the available climate also limits crop production significantly. The climatic conditions are associated with low annual precipitation and high evapotranspiration potential demands of the area, which might not be favourable for most cropping practices.

Considering the moderate to moderate high sensitivities associated with the land potential resources and linear development of the project, it is the specialist’s opinion that the proposed activities will have an acceptable impact on soil resources. Such impacts as soil erosion losses, loss of potential land capability, spillages and soil compaction will be limited. The direct, permanent, physical footprint of the development that has any potential to interfere with agriculture, is restricted to pylon bases with a limited impact.

Areas with actively cultivated areas with high production agricultural resources were also identified in the corridors (Figure 6-1). Such areas can be treated as no-go areas to preserve these active agricultural crop fields, associated with soils with high potentials. If relocating is not feasible, then appropriate compensation can be agreed upon during a stakeholder process. It is therefore the specialist`s recommendation that the project and associated infrastructure can be favourably considered as have been planned.

6.1 Management Measures

An Agricultural Compliance Statement is not required to complete an impact assessment, but where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr must be provided as the overall impacts are expected to be low for the project (see Table 8-1 in appendix). The following measures are provided:

- Vegetation clearance must be restricted to areas authorised for development;
- Land clearing and preparation may only be undertaken immediately prior to construction activities and within authorised areas;
- A stormwater management plan must be developed and implemented for the project; and
- If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.

6.2 Specialist Statement

The proposed PV development area will have an acceptable negative impact on the agricultural production capability of the area. The proposed development can be favourably considered for authorisation. The following serves to substantiate this statement:

- The land capability of the area ranges from very low to moderate high;
- The agricultural potential of the area ranges from low to moderate;

- The delineated crop fields for the PV area are not cultivated;
- The agricultural sensitivity for the PV area is medium.

6.3 Statement Conditions

Development of the crop fields is permissible, and it is recommended that alternative crops perhaps be considered for the developed PV areas, if feasible. An agreement between the applicant and landowner must be completed for the development of the crop areas, despite these areas not being actively cultivated.

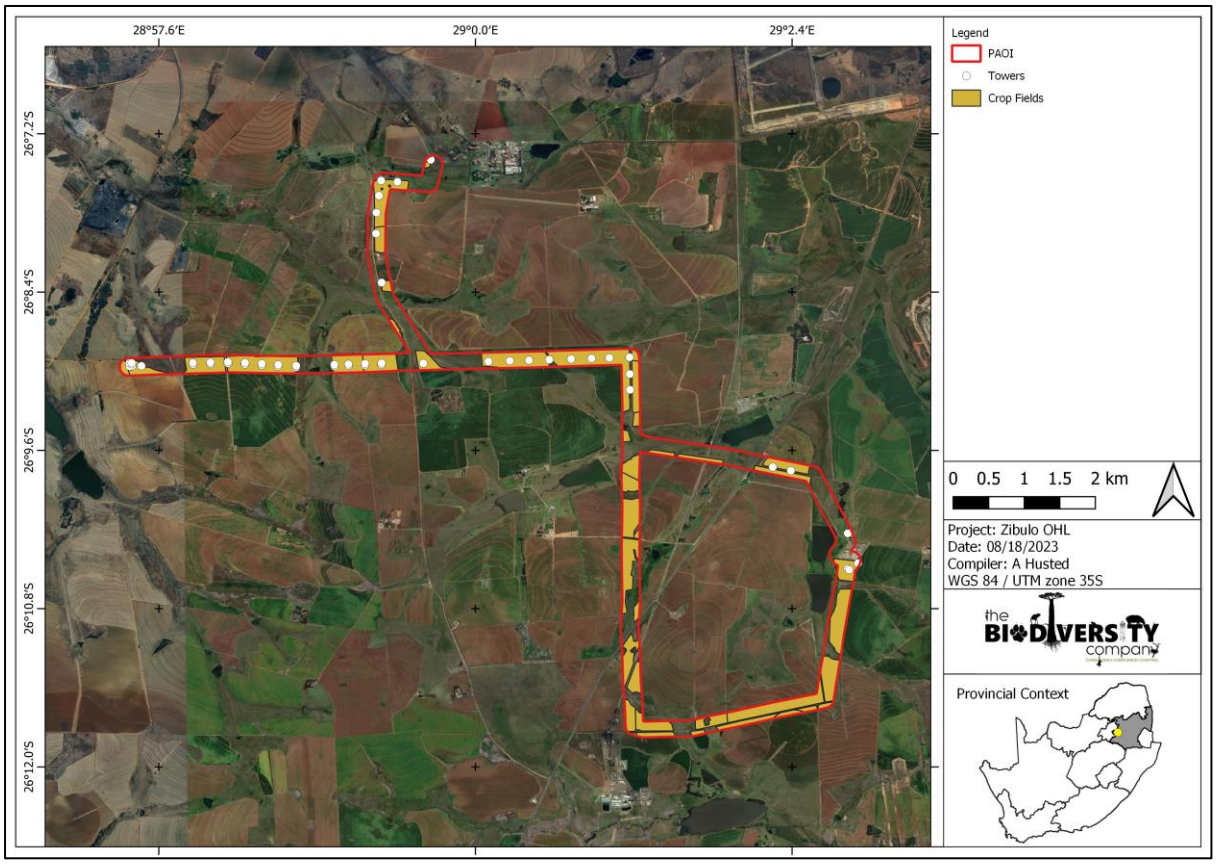


Figure 6-1 The towers located in designated crop fields

7 References

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8 Appendix: Impact Assessment

Table 8-1 Impact assessment related to the loss of the land capability during the Zibulo OHPL planning, construction, operation, decommissioning and rehabilitation phases.

		Pre-Mitigation							Post Mitigation								Priority Factor Criteria			
Impact	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Loss of land capability, Soil compaction Soil erosion, Land degradation	Planning	-1	1	1	1	2	1	-1,25	-1	1	1	1	1	1	-1	Low	1	1	1,00	-1
	Construction	-1	3	3	3	3	3	-9	-1	2	2	2	3	3	-6,75	Medium	2	3	1,38	-9,28125
	Operation	-1	2	3	2	3	2	-5	-1	2	2	2	2	2	-4	Low	2	3	1,38	-5,5
	Decommissioning	-1	2	2	2	3	3	-6,75	-1	2	2	1	3	2	-4	Low	2	2	1,25	-5
	Rehab and closure	-1	2	2	2	2	2	-4	-1	2	2	1	2	1	-1,75	Low	1	2	1,13	-1,96875