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SITE SENSITIVITY VERIFICATION REPORT

FOR THE

PROPOSED HERCULES SOLAR CLUSTER PROJECT – HARTEBEEST HOEK SOLAR PV1, EMTHANJENI LOCAL MUNICIPALITY, NORTHERN CAPE

APPLICANT:	HERCULES SOLAR PV1 PROJECT MANAGER: LLOYD BARNES & ANDREW PEARSON
ENVIRONMENTAL CONSULTANT:	SHARPLES ENVIRONMENTAL SERVICES CC BETSY DITCHAM (EAPASA REG: 1480) MADELEINE KNOETZE (EAPASA REG: 3230)
SES REFERENCE NUMBER:	12/HERC/EIA/SSVR/04/24
DFFE PROJECT REFERENCE:	TBC
DATE:	30 APRIL 2024

Contents

LIST OF FIGURES

List of Tables

1. INTRODUCTION

Sharples Environmental Services cc (SES) has been appointed by Hartebeest Hoek Solar PV1 to undertake the environmental impact assessment (EIA) in accordance with the National Environmental Management Act, 1998 (Act 107 of 1998), as amended, in terms of the Environmental Impact Assessment (EIA) Regulations of 2014, as amended (GNR 326 of 2017), for the Proposed Hercules Solar PV Cluster Project on the Remainder of Portion 6 of the Farm Riet Fountain, the Remainder of Portion 28 of the Farm Roodekraal and Remainder Portion 31 of the Farm Hartebeest Hoek (Hanover Major Division), Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape.

This application pertains specifically to the proposed Hartebeest Hoek Solar PV1 development, which will form part of the Hercules Solar PV Cluster. The proposed development will be located on a portion of the remainder of the Farm Riet Fountain 6 (Hanover Major Division) and will have an extent of 686 ha. The extent of the development footprint will be approximately 669 ha and the farm will have an output capacity of 303 MW. In addition to impacting the remainder of the Farm Riet Fountain 6, the external access road of the proposed development will be located within the boundaries of the remainder of the farm Hartebeest Hoek 31.

The proposed site is located within the Emthanjeni Local Municipality in the Northern Cape. Located toward the North of the N10-Highway, the proposed development site is easily accessible therefrom. The site is bordered by the R388 to the far west, and the railway line to the far east, with a minor portion potentially occurring to the north of the railway line.

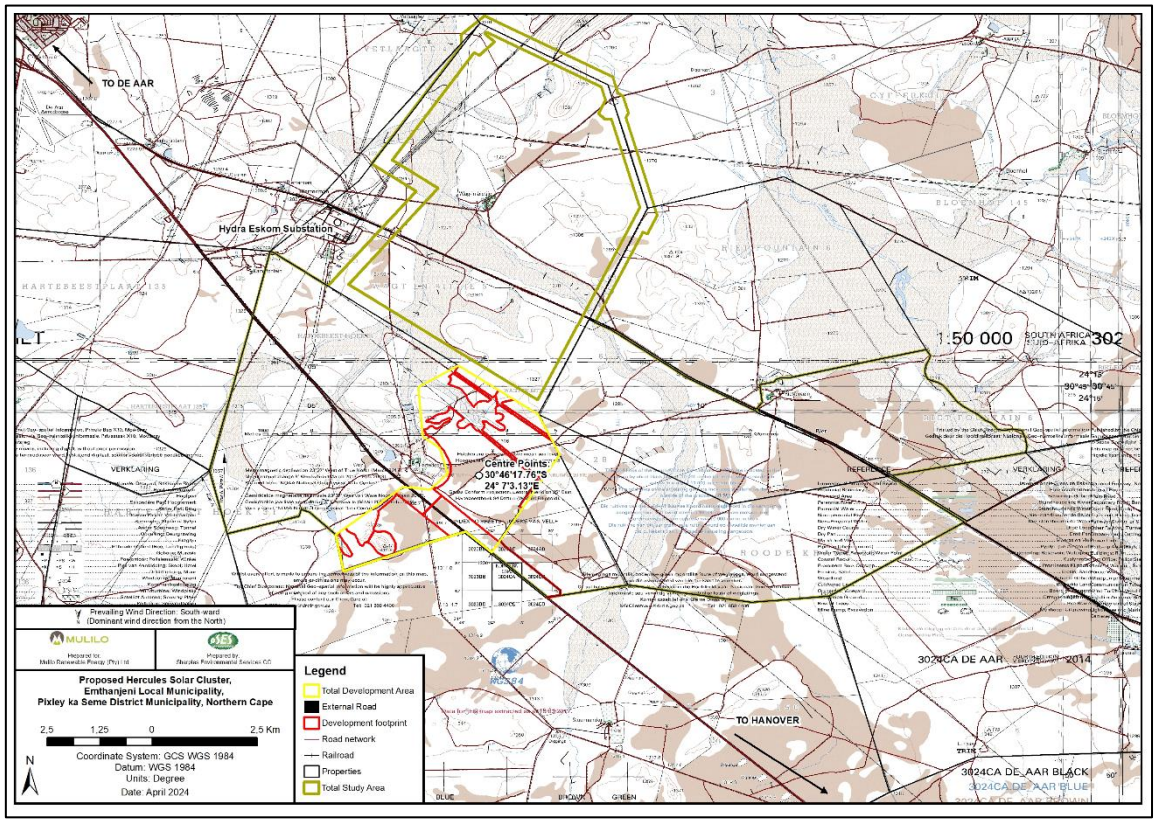


Figure 1: Locality Map.

A sensitivity screening tool report was produced using the Department of Forestry, Fisheries and the Environment's (DFFE) Web-based National Environmental Screening Tool. This Site Sensitivity Verification Report (SSVR) reports on the ground truthing undertaken to verify the indicated sensitivity ratings of the screening report, and to motivate why some of the specialist studies recommended by the screening report, will not be undertaken for the proposed development.

The initial site inspection for this report was undertaken on the 03rd of August 2022 by Environmental Assessment Practitioner's (EAP's), Mr. John Sharples, Mrs. Betsy Ditcham and Ms. Ameesha Sanker.

Additional site inspections were conducted by and planned for by, the various specialists as follows:

- Aquatic – 17 – 21 October 2022
- Agriculture – No site verification was undertaken by this specialist
- Avifaunal – 17 – 21 October 2022
- Animal Species - 17 – 21 October 2022
- Terrestrial Biodiversity – 17 – 21 October 2022
- Botanical - 17 – 21 October 2022
- Visual – 9 September 2022
- Socio-Economic – No site verification was undertaken by this specialist – A site visit will be undertaken as part of the Impact Assessment Phase.
- Archaeological and heritage – 21-24 September 2022

1.1. Description of the proposed activity

Table 1: Property Details of Proposed Development Location

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	RIET FOUNTAIN	6	0	30°44'21.77S	24°11'32.54E	Farm
2	HARTEBEEST HOEK	31	0	30°46'2.99S	24°4'33.4E	Farm

The Mulilo Renewable Projects Developments' proposal include:

Hercules Solar PV Cluster: (Approximately 1 330 MW)

- 8 individual farms with output capacities ranging between 303 MW and 405 MW , each to obtain a separate EA. (i.e. Hartebeest Hoek Solar PV1, Jupiter Solar PV,, etc.)
- 132kV Grid connections. The point of connection and connection voltage is to be determined.
- The 8 PV projects are proposed to be developed across the 3 properties, i.e. RE/6 – Riet Fountain; RE/28 – Roodekraal and RE/31 – Hartebeest Hoek.

Basic preliminary design details for the proposed Hartebeest Hoek Solar PV1 (303 MW) development entails the following:

- Solar Field
    - Solar Arrays: PV modules
    - Single axis tracking technology maximum height of 5m (aligned north-south);

- Solar module mounting structures comprised of galvanised steel and aluminium;
- Foundations which will likely be drilled and concreted into the ground; and
- Solar measurement and weather stations.
- Central/string Inverters and MV transformers in in field
- DC coupled Battery Energy Storage system (BESS) containers distributed through PV field located adjacent to inverters
    - Lithium Ion battery Cells, Modules, Racks and containers
    - Power Conversion Equipment
    - Battery Management System
    - Energy Management System

- Associated Infrastructure
    - Medium Voltage (MV =22/33 kV) overhead powerlines and underground cables;
    - MV Collector stations
    - Access road;
    - Internal gravel roads;
    - Fencing;
    - General maintenance area;
    - Storm water channels and berms;
    - Water storage tanks and pipelines;
    - Temporary work area during the construction phase (i.e. laydown area).
    - O&M buildings, store

- Project IPP Substation;
    - 132kV substation 200m x 200m
    - HV transformer
    - Substation Control Building
    - HV metering, Scada and protection building
    - MV collector switchgear buildings
    - Compensation equipment (Filters capacitors reactors statcoms)

- AC coupled BESS installation (400m x 400m) at project substation and laydown area:
    - Solid Sate Battery technology- either Lithium-Ion or Sodium Sulphide (NaS)
    - Battery Cells, Modules, Racks and containers
    - Power Conversion Equipment
    - Battery Management System
    - Energy Management System
    - MV transformers
    - MV cabling and collector stations
    - Fencing
    - Offices, workshop
    - Fire Protection systems

The grid connection infrastructure for the proposed development will entail (which will be handed over to Eskom):

- Onsite Switching Station (SS), adjacent to the IPP Substation.

- 132kV Overhead Power Line (OHPL) – 30m height from the switching station, with a length of <15km to a yet to be determined connection point.
    - Extension of the 132kV Busbar at the MTS
    - 132kV Feeder Bay at the MTS
    - Extension of the 400kV Busbar at the MTS

  Installation of a new 400/132kV Transformer and bay at the MTS.

2. FINDINGS OF THE SCREENING TOOL

The National Sector Classification Category selected to produce the Screening Tool Report, dated 13 December 2022:

Utilities Infrastructure | Electricity | Generation | Renewable | Solar | PV

PLEASE NOTE: Sensitive Species (SS) were identified by the screening tool and have been named in this report. Due to the sensitive nature of these species, this site sensitivity verification report, and the information contained within this report, **is not to be made public**.

2.1. Wind and solar developments

Table 2 below indicates the wind and solar developments with an approved Environmental Authorisation or Application under consideration within 30km of the proposed development area.

Table 2: Wind and Solar Developments within 30 km of the Proposed Development Area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	14/12/16/3/3/2/382/1/AM4	Solar PV	Approved	5.7
2	12/12/20/2250/2/AM5	Solar PV	Approved	0
3	12/12/20/2250/4/AM3	Solar PV	Approved	8.6
4	14/12/16/3/3/2/382/7	Solar PV	Approved	5.7
5	12/12/20/2250/3/AM3	Solar PV	Approved	6.2
6	14/12/16/3/3/2/382/5/A1	Solar PV	Approved	5.7
7	14/12/16/3/3/2/382/1/A1	Solar PV	Approved	5.7
8	14/12/16/3/3/2/382/3/A2	Solar PV	Approved	5.7
9	12/12/20/2177	Solar PV	Approved	5.4
10	12/12/20/2250/1/AM1	Solar PV	Approved	0
11	12/12/20/2500/AM2	Solar PV	Approved	18.5
12	12/12/20/2463/1/AM3	Wind	Approved	17.6
13	12/12/20/2250/3	Solar PV	Approved	6.2
14	12/12/20/2025	Solar - CSP	Approved	17.3
15	14/12/16/3/3/1/2569	Solar PV	Approved	6.7
16	14/12/16/3/3/2/382/3/AM4	Solar PV	Approved	5.7
17	12/12/20/2250/2	Solar PV	Approved	0
18	12/12/20/2250/5	Solar PV	Approved	13
19	12/12/20/2463/1/AM5	Wind	Approved	17.6
20	14/12/16/3/3/2/382/4/AM3	Solar PV	Approved	5.7
21	12/12/20/2500/AM5	Solar PV	Approved	18.5
22	14/12/16/3/3/2/382/A1	Solar PV	Approved	5.7
23	14/12/16/3/3/2/2167	Solar PV	Approved	23.5
24	12/12/20/2250	Solar PV	Approved	0
25	12/12/20/2250/4/A1	Solar PV	Approved	8.6
26	12/12/20/2048/3	Solar PV	Approved	15.8
27	14/12/16/3/3/2/382/AM4	Solar PV	Approved	5.7
28	12/12/20/2313/AM2	Solar PV	Approved	4.4
29	12/12/20/2048/4	Solar PV	Approved	15.8
30	14/12/16/3/3/2/382/5/AM3	Solar PV	Approved	5.7
31	12/12/20/2025/1	Solar - CSP	Approved	17.3
32	14/12/16/3/3/1/2508	Solar PV	Approved	5.4
33	12/12/20/2025/2	Solar PV	Approved	17.3
34	12/12/20/2250/2/AM2	Solar PV	Approved	0
35	12/12/20/2463/1/A2	Wind	Approved	17.6

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
36	12/12/20/2048/2	Solar PV	Approved	15.8
37	14/12/16/3/3/2/382/3/AM3	Solar PV	Approved	5.7
38	12/12/20/2498/AM3	Solar PV	Approved	13.5
39	12/12/20/2250/2/AM3	Solar PV	Approved	0
40	12/12/20/2025/2/A	Solar PV	Approved	17.3
41	14/12/16/3/3/2/382/4/A1	Solar PV	Approved	5.7
42	12/12/20/2250/2/A1	Solar PV	Approved	0
43	14/12/16/3/3/2/382/3	Solar PV	Approved	5.7
44	12/12/20/2252/2/AM4	Solar - CSP	Approved	0
45	14/12/16/3/3/2/2156	Solar PV	Approved	2.9
46	14/12/16/3/3/2/382/2/AM1	Solar PV	Approved	5.7
47	12/12/20/2463/1/AM4	Wind	Approved	17.6
48	14/12/16/3/3/2/998	Solar PV	Approved	17.7
49	12/12/20/2500	Solar PV	Approved	18.5
50	12/12/20/2048/1	Solar PV	Approved	15.8
51	12/12/20/2250/5/AM2	Solar PV	Approved	13
52	14/12/16/3/3/2/382/2/AM2	Solar PV	Approved	5.7
53	14/12/16/3/3/2/2157	Solar PV	Approved	8.6
54	12/12/20/2250/1/AM2	Solar PV	Approved	0
55	12/12/20/2498	Solar PV	Approved	13.5
56	14/12/16/3/3/2/2155	Solar PV	Approved	6.2
57	14/12/16/3/3/1/2323	Solar PV	Approved	3.5
58	12/12/20/2250/1	Solar PV	Approved	0
59	12/12/20/2500/AM3	Solar PV	Approved	18.5
60	14/12/16/3/3/2/382/1	Solar PV	Approved	5.7
61	12/12/20/2463/2	Wind	Approved	17.6
62	14/12/16/3/3/2/382/6	Solar PV	Approved	5.7
63	12/12/20/2258/4	Solar PV	Approved	23.1
64	12/12/20/2463/1	Wind	Approved	25.3
65	14/12/16/3/3/1/2585	Solar PV	Approved	5.7
66	12/12/20/2177/AM1	Solar PV	Approved	5.4
67	12/12/20/2498/A1	Solar PV	Approved	13.5
68	14/12/16/3/3/2/382/1/AM5	Solar PV	Approved	5.7
69	12/12/20/2463/2/AM2	Wind	Approved	29.3
70	12/12/20/2250/2/AM4	Solar PV	Approved	0
71	12/12/20/2250/4/AM2	Solar PV	Approved	8.6
72	14/12/16/3/3/2/382/2	Solar PV	Approved	5.7
73	12/12/20/2250/4/AM4	Solar PV	Approved	8.6
74	14/12/16/3/3/1/2557	Wind	Approved	0
75	12/12/20/2463/1/2	Wind	Approved	17.6
76	12/12/20/1651	Wind	Approved	3.5
77	14/12/16/3/3/2/382/AM3	Solar PV	Approved	5.7
78	12/12/20/1651/A2	Wind	Approved	3.5
79	14/12/16/3/3/2/382/4	Solar PV	Approved	5.7
80	14/12/16/3/3/2/382/5	Solar PV	Approved	5.7
81	12/12/20/2250/4	Solar PV	Approved	8.6
82	12/12/20/1673	Solar PV	Approved	18.5
83	12/12/20/2500/AM6	Solar PV	Approved	18.5
84	12/12/20/2499/AM8	Solar PV	Approved	5.8
85	14/12/16/3/3/2/382/6/AM3	Solar PV	Approved	5.7
86	14/12/16/3/3/2/382/1/AM3	Solar PV	Approved	5.7
87	12/12/20/2250/5/A1	Solar PV	Approved	13
88	14/12/16/3/3/1/2329	Wind	Approved	24.5
89	14/12/16/3/3/2/382/4/A3	Solar PV	Approved	5.7
90	14/12/16/3/3/2/2267	Solar PV	Approved	13.6

2.2. Environmental Management Frameworks

No intersections with EMF areas found.

2.3. Relevant Development Incentives, Restrictions, Exclusions or Prohibitions

The following development incentives, restrictions, exclusions, or prohibitions apply to the proposed site and are indicated in the figure below:

- Strategic Transmission Corridors: According to the data obtained from the DFFE, the proposed developments will be located within the Central corridor.

2.4. Environmental Sensitivities

The following summary of the development footprint environmental sensitivities is identified by the screening report. Only the highest sensitivity is indicated. The environmental sensitivities for the proposed development footprint as identified by the screening report, are only indicative.

and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Table 3: Summary of Specialist Assessments Identified

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme			X	
Animal Species Theme		X		
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Avian Theme				X
Civil Aviation (Solar PV) Theme				X
Defense Theme				X
Landscape (Solar) Theme		X		
Palaeontology Theme	X			
Plant Species Theme				X
RFI Theme	X			
Terrestrial Biodiversity Theme	X			

3. SITE VERIFICATION

The initial site inspection was undertaken on the 3rd of August 2022, by EAP's: Mr John Sharples, Mrs Betsy Ditcham and Miss Ameesha Sanker, of Sharples Environmental Services. Additional site inspections were conducted by the various specialists as follows:

- Aquatic – 17 – 21 October 2022
- Agriculture – No site verification was undertaken by this specialist
- Avifaunal – 17 – 21 October 2022
- Animal Species - 17 – 21 October 2022

- Terrestrial Biodiversity – 17 – 21 October 2022
- Botanical - 17 – 21 October 2022
- Visual – 9 September 2022
- Socio-Economic – No site verification was undertaken by this specialist – A site visit will be undertaken as part of the Impact Assessment Phase.
- Archaeological and heritage – 21-24 September 2022

3.1. Agriculture

Screening Tool: The report indicates that the land capability is medium to high, resulting in the **Medium** sensitivity rating and recommends that an Agricultural Impact Assessment be conducted.

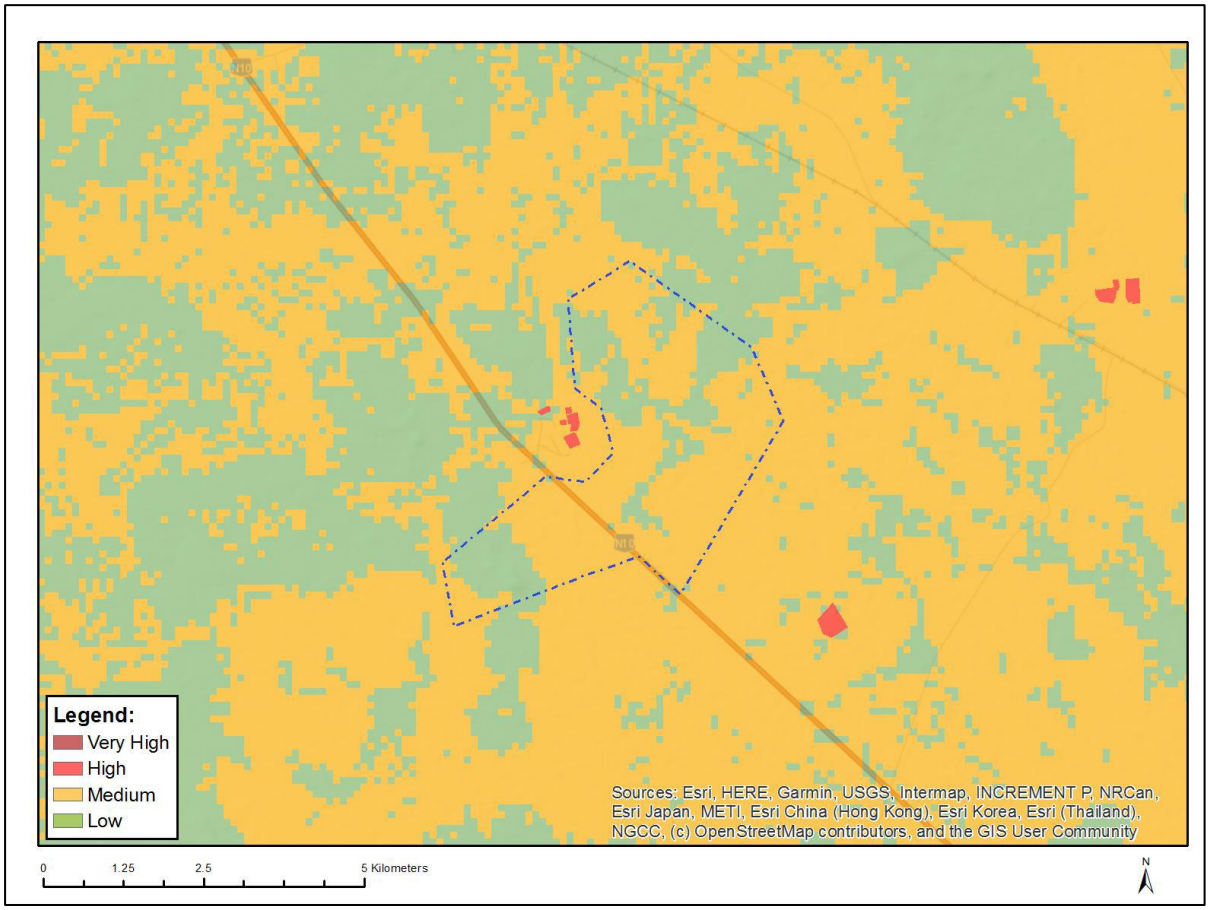


Figure 2: Relative Agricultural Theme Sensitivity Map

Sensitivity Features

Sensitivity	Feature(s)
Low	Land capability;01. Very low/02. Very low/03. Low-Very low/04. Low-Very low/05. Low
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

Observation on Site - by the EAP:

As depicted in Figure 3 and Figure 4, there is no evidence of agricultural crops or past evidence of such a land use. However, the farm portions to the east and west of the N10, were utilized predominantly for game farming, and included Gemsbok, Wildebeest and Springbok. Some areas were also utilized for sheep and cow grazing. The land is predominantly flat – lowly undulating, with some areas of inclined rocky outcrops. The vegetation is typical of Karoo vegetation, that dominates the Northern Cape. The site currently has various electrical towers and transmission lines as depicted in Figure 5.

Figure 3: Drone footage of proposed landscape.

Figure 4: Depicting the natural landscape.

Figure 5: Existing transmission lines.

Observation - by the Specialist: Mr Johann Lanz undertook the verification report for the proposed development. Agricultural potential is generally calculated based on the land capability of a proposed development site. Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land, based on its soil, climate and terrain. Higher land capability values (≥8 to 15) are likely to be land suitable for crop production, while lower values are only likely to be suitable as non-arable grazing land. The verification of agricultural sensitivity of the power line route has very little relevance to this assessment because the agricultural impact of a power line is usually negligible, regardless of the agricultural sensitivity of the land which it traverses.

According to the DFFE's Screening tool, there are small, isolated patches of cropland across the project area that are associated with farmsteads. These are classified as areas of high agricultural sensitivity because of their cultivation status. These areas are however highly likely to be avoided by the proposed facility infrastructure anyway, regardless of agricultural impact, because they are near farmsteads. In addition, the dataset used to identify croplands is outdated. The verified and updated indication of which lands should be classified as croplands is given the Figure 6 below. The other lands as indicated in figure attached as part of the DFFE Screening tool, are no longer used as cropland and so should not be classified as high agricultural sensitivity because of it.

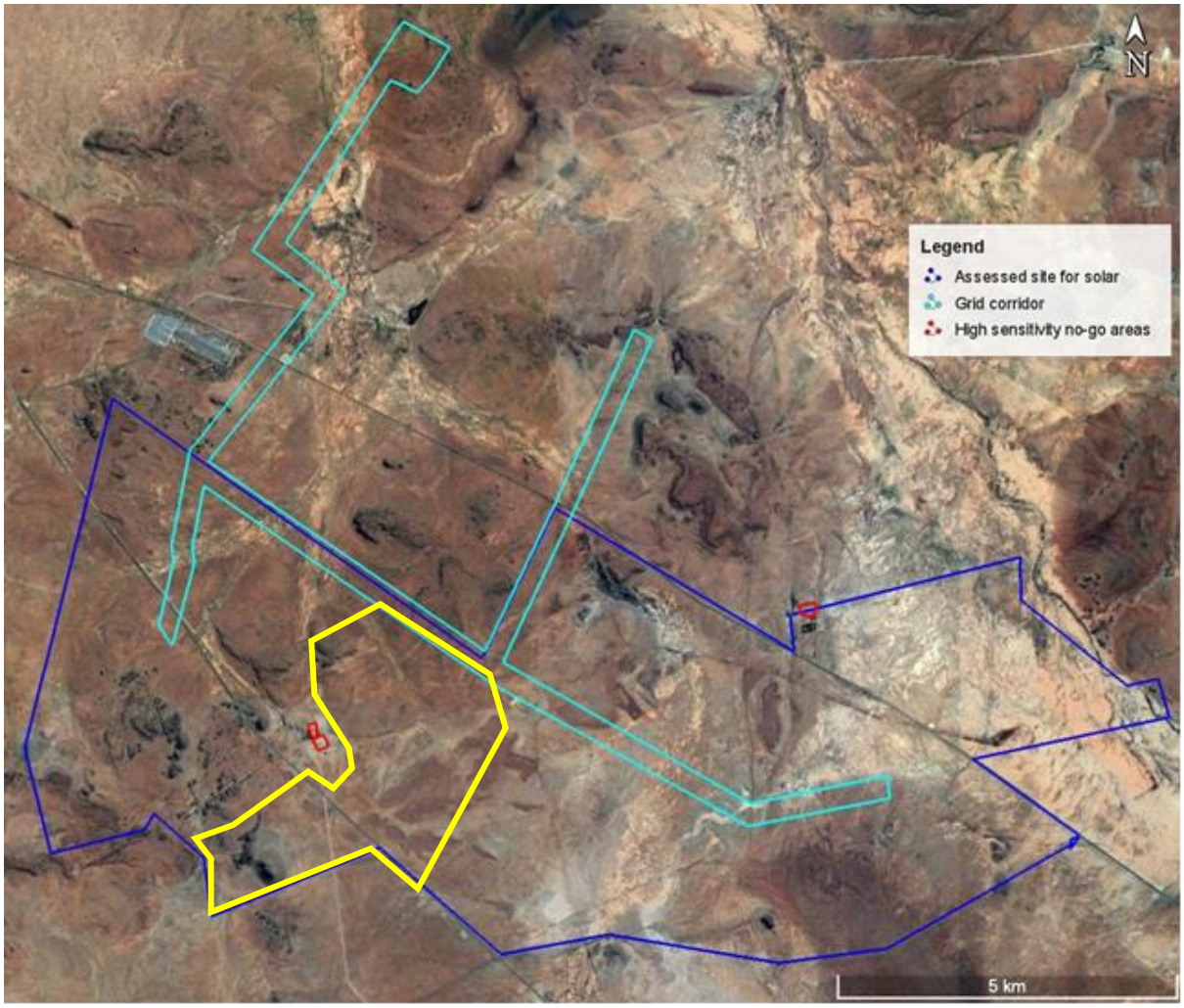


Figure 6. No-go Agricultural areas - verified and confirmed croplands located within boundaries of the Hercules Solar PV Cluster, with the extent of the proposed Hartebeest Hoek Solar PV1 indicated in Yellow.

This site sensitivity verification verifies the portions of the site that are indicated as cropland in Figure 6 above as being of high agricultural sensitivity and the rest of the site as being of medium and low agricultural sensitivity. The verified high agricultural sensitivity areas are agricultural no-go areas for solar development. The medium and low agricultural sensitivity of the rest of the site is confirmed because the climate data proves the area to be arid, and therefore of limited land capability. Moisture availability is entirely insufficient for viable crop production without irrigation.

The site has low agricultural potential, predominantly because of climate constraints. As a result of the constraints, the land is limited to low-capacity grazing. The entire site was verified in this assessment as being of medium and low sensitivity for impacts on agricultural resources, except for small, isolated patches of cultivation that are associated with farmsteads and are confirmed as high agricultural sensitivity, no-go areas for solar development (Figure 6).

Three potential mechanisms of negative agricultural impact were identified as occupation of land, soil erosion and degradation, and dust generation. Two potential mechanisms of positive agricultural impact were identified as increased financial security for farming operations, and improved security against stock theft and other crime. All of these are likely to have low impact on future agricultural production potential and are therefore assessed as having low significance.

The conclusion of this assessment is that the agricultural impact of the proposed development is acceptable because it offers a valuable opportunity for renewable energy facilities to be integrated with agricultural production in a way that provides benefits to agriculture and leads to low loss of future agricultural production potential. This is substantiated by the following points:

- the development will occupy land that is of very limited land capability, which is totally insufficient for crop production. There is not a scarcity of such agricultural land in South Africa and its conservation for agricultural production is not therefore a priority.
- The amount of agricultural land use by the development is within the allowable development limits prescribed by the agricultural protocol. These limits reflect the national need to conserve valuable agricultural land and therefore to steer, particularly renewable energy developments, onto land with low agricultural production potential.
- All renewable energy development in South Africa decreases the need for coal power and thereby contributes to reducing the large agricultural impact that open cast coal mining has on highly productive agricultural land throughout the coal mining areas of the country.

From an agricultural impact point of view, it is recommended that the development be approved.

Conclusion: Mr Johann Lanz, a registered SACNASP professional, has been appointed to undertake the site verification and determine the specialist input required. The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions, other than recommended mitigation.

During public participation the Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform, will be included as Stakeholders.

3.2. Landscape and Visual

The **Screening Tool** indicated that a Landscape/Visual Impact Assessment be conducted – no visual sensitivity rating is provided.

Observation on Site - by the EAP: Given the relatively flat topography, the site is visible from the N10 (Figure 7), therefore a visual impact assessment would be required. Given the change of landscape to accommodate renewable energy sites is very common in the surrounding farm portions across the Northern Cape, such as the wind turbines that can be seen in the distance, the EAP believes that this impact can be managed efficiently through strategic mitigation measures.

Figure 7: The N10 depicted between the two farm portions.

Observation on Site - by the Specialist: Mr. David Gibbs was appointed as the Visual and landscape specialist who provided a characterisation of the proposed development site and identified the preliminary expected impacts of the proposed development activities.

According to the findings of the visual impact baseline study indicated that the site is very typical of the Cape Karoo rural cultural landscape. Although fenced, the sites character is continuous with the local landscape context and broader landscape setting, where fences and overhead powerlines provide textures to the landscape, rather than created boundaries thereto. Although relatively intact, the site has already absorbed the existing electrical gridline infrastructure without substantial loss of character, due to the site of the proposed development site.

The landscape is of good quality and includes certain features of character and identity which have been interpreted as visual indicators for planning and design response. Visual thresholds are provided, however, by the dolerite koppies and ridges which characterize this environment. Whereas the site is within a rural cultural landscape, the koppies lend a certain 'wilderness' character as elements within the middle distance and background. Three homesteads, Kampfontein, Hartebeeshoek and Riet Fountain, are located within close proximity to the proposed development areas.

The specialist identified the geographic landmarks (distant dolerite koppies and ridges), the continuity of the agricultural landscape across the Northern Cape and the Great Karoo rural cultural landscape character as the regional setting of the proposed development site.

Continuity of the landscape and vegetation across cadastral boundaries, views across the rural landscape and Geographic landmarks (middle distance from the dolerite koppies) as the local visual setting. The farmsteads, werf and curtilage, farms dams and drainage lines and foreground koppies and ridges were identified as the site setting.

The following visual boundaries have been identified (as seen in Figure 8) as landscape features on site:

- N10-highway – 300 m buffer (on either sides) (light blue)
- Railway line – 250 m buffer (on either sides) (light blue)
- Visually prominent koppies and ridelines (purple)
- Three homesteads with a 500 m buffer (red and green indicators)
- Watercourses (light blue outlines)

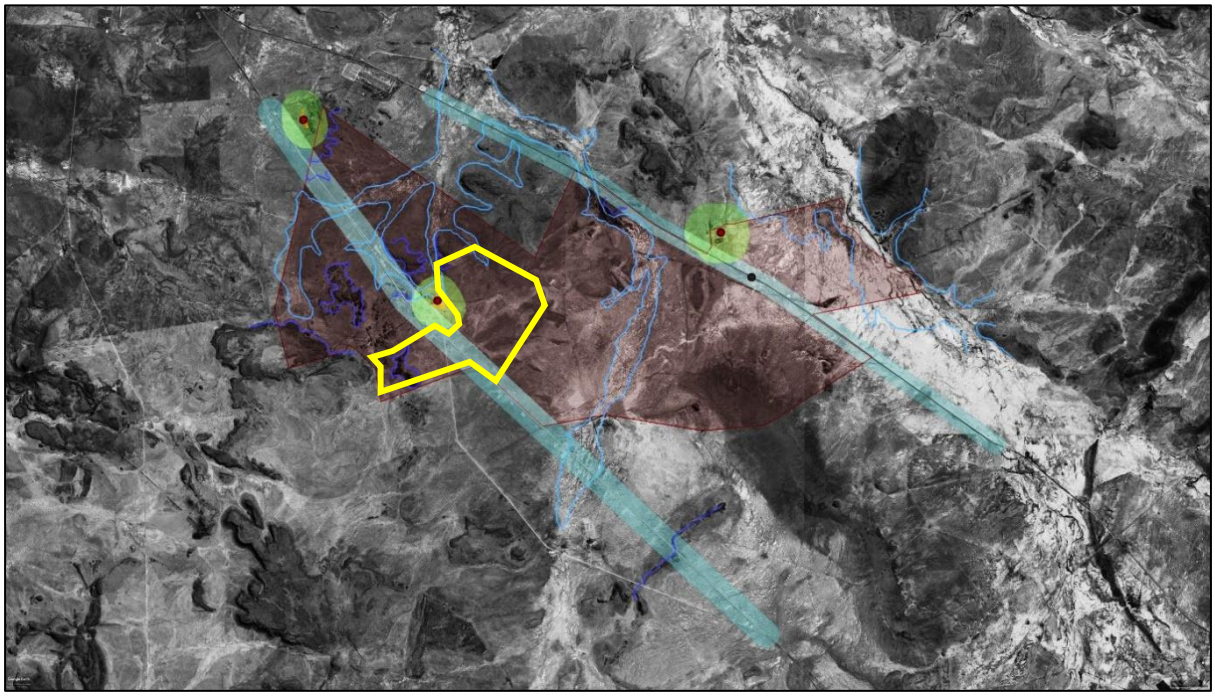


Figure 8: Relative Animal Species Theme Sensitivity Map

The visual specialists recommend that the proposed development draw reference from the set of visual indicators for planning and design response and that the site-planning be refined with consideration to place-making, supported by the development of a detailed landscape plan during the detailed design phase (for implementation).

Conclusion: From a visual impact perspective, the development is permissible, at least in principle, and by responding to the visual indicators, the layout can be manoeuvred to minimize visual intrusion into the landscape and to maximize a comfortable 'fit'.

From a visual point of view, the major receptors identified within close proximity to the proposed Hartebeest Hoek Solar PV1 development would be the Railway line running along the northern boundary of the development area the watercourses running partially through the site and the ridge located within the boundaries of the Hartebeest Hoek Solar PV1 development. However, the development footprint of the proposed development avoids all of the sensitive receptors and their associated buffers.

An appropriately registered/experienced professional will be appointed to undertake the undertake the impact assessment.

3.3. Animal Species

Screening Tool: The report indicates that the animal sensitivity rating is **High** and recommends an Animal Species Assessment be conducted.

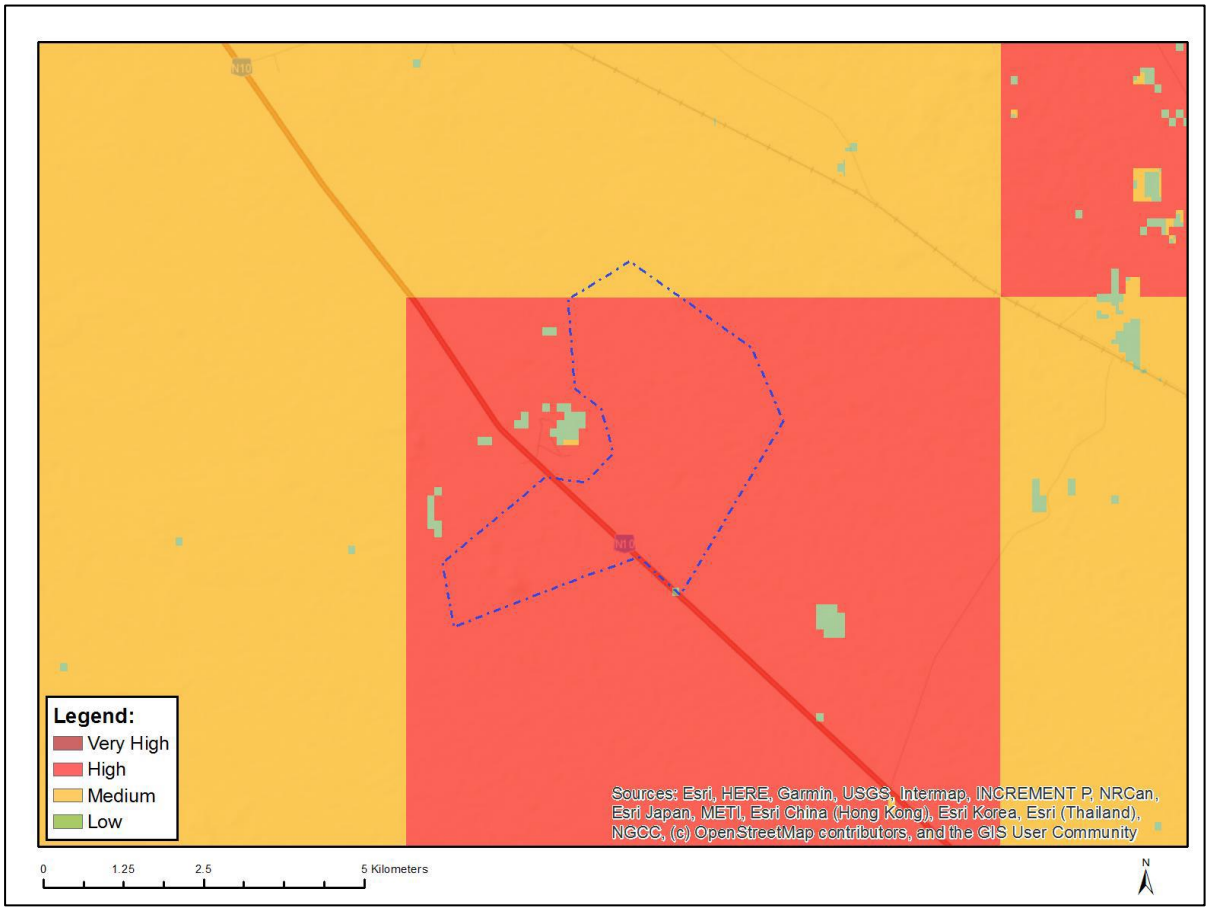


Figure 9: Relative Animal Species Theme Sensitivity Map

Sensitivity Features

Sensitivity	Feature(s)
High	Aves-*Neotis ludwigii*
Medium	Aves-*Neotis ludwigii*
Medium	Aves-*Aquila rapax*
Low	Subject to confirmation

The following descriptions provide insight into the habitat and distribution of the relevant faunal species, indicated by the DFFE screening tool report.

High – Aves – *Neotis Ludwigii*

- Common Name: Ludwig's Bustard
- IUCN Status: Endangered (Population decreasing)
- Habitat: Ludwig's Bustard occurs in the flat, open, semi-arid shrublands of the Succulent Karoo, Nama Karoo and Namib (Allan 1994). It is tolerant of a variety of habitats and, depending on rainfall, may be found in the western grasslands of Free State and Eastern Cape, the southern Kalahari and cultivated fields and pastures (Allan 1994).
- Distribution: Ludwig's Bustard is near-endemic to the region occurring in western Namibia and western South Africa, with scattered records from south-western Angola, Botswana and western Lesotho. It occurs predominantly in the dry Karoo region of western South Africa, extending eastwards into Free State, southwards into Eastern Cape and Western Cape provinces and northwards into Northern Cape

Medium – Aves – *Aquila Rapax*

- Common Name: Tawny Eagle
- IUCN Status: Endangered
- Habitat: Tawny Eagles are found in lightly wooded savannah and thornveld, as well as semi-desert (Simmons 1997), but avoid dense forest and highlands.
- Distribution: The Tawny Eagle is widespread throughout sub-Saharan Africa (Ferguson-Lees and Christie 2001). In southern Africa, it is largely concentrated in protected areas in the north-east and central parts of the region (Simmons 1997), which is confirmed by more recent SABAP2 data. The species is well represented in the IBA network, with Kruger National Park having the highest reporting rates, followed by Kgalagadi Transfrontier Park in Northern Cape and the northern KwaZulu-Natal parks of Ndumo, Mkuze, Hluhluwe-iMfolozi and the iSimangaliso Wetland Park.

Observation on Site - by the EAP: The farm portions to the east of the N10, were utilized predominantly for game farming, and included Steenbok, Gemsbok, Wildebeest and Springbok. Some areas were utilized for sheep and cow grazing.

The EAP confirms the sighting of multiple bird species, including the Blue Crane (*G. paradisea*), (IUCN Red List Status: Vulnerable), as well as evidence of a raptor carcass below the existing powerlines (Figure 10).

Figure 10: Evidence of raptor carcass.

Other animal sightings included:

- Two potential Riverine Rabbits (*Bunolagus monticularis*), (IUCN Red List Status: Critically Endangered) or hares were seen by the EAPs. According to the iNaturalist app, the Scrub Hare (*Lepus saxatilis*), (IUCN Red List Status: Least Concern) and Cape Hare (*Lepus capensis*), (IUCN Red List Status: Least Concern), have been noted to be spotted within the De Aar area.
- Porcupine spines were found on site, in close proximity to what is believed to be a porcupine burrow (as depicted in Figure 11), therefore the Cape Porcupine (*Hystrix africaeaustralis)* is believed to be present on site (IUCN Red List Status: Least Concern).
- Two Aardwolfs (*Proteles cristatus*), (IUCN Red List Status: Least Concern), were seen on site, toward the northern portions of the proposed site extent, to the east of the N10.
- A caracal (*Caracal caracal*) was spotted on site, (IUCN Red List Status: Least Concern).

Figure 11: Porcupine spine and burrow sighted.

Observation on Site - by the Specialist: The Biodiversity Company was appointed for the to undertake the animal species scoping for the proposed developments to evaluate the impacts on the sensitive features as indicated in the summary table above. It should be noted that the specialist appointed to undertake this scoping report has, at the time of compiling this report, not been to site. The site visit was planned for 17-21 October 2022.

Through the scoping phase of the sensitivities of the site, the following observations were made:

- **Amphibians:** Based on the IUCN Red List Spatial Data and FrogMap, 13 amphibian species are expected to occur within the area. No amphibian SCCs are expected to occur within the area.
- **Reptiles:** Based on the IUCN Red List Spatial Data and the ReptileMAP database, 32 reptile species are expected to occur within the area. One species is regarded as threatened:
    - ***Psammobates tentorius* (Tent Tortoise)**
      Listed as NT on a regional and global basis. It occurs in the arid regions of South Africa and Namibia (IUCN, 2017). Known threats include road mortality, veld fires, electrocution by livestock/game fences, and overgrazing from domestic livestock (IUCN, 2017). The presence of arid habitat within the project area contributes to a **high likelihood of occurrence** for this species.

- **Mammals:** The IUCN Red List Spatial Data lists 56 mammal species that could be expected to occur within the area. This list excludes large mammal species that are normally restricted to protected areas. Six of these expected species are regarded as threatened. Of these six SCCs, two have a low likelihood of occurrence based on the lack of suitable habitat in the project area.
    - ***Aonyx capensis* (Cape Clawless Otter)**
      The most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water (IUCN, 2017). It is

mostly threatened by riverine habitat destruction due to bush clearing, deforestation, overgrazing, siltation, draining of wetlands or water extraction or denudation of riparian vegetation (IUCN, 2017). This species has a **high likelihood of occurrence** based on the presence of rivers in the project area.

- ***Felis nigripes* (Black-footed cat)**
  Eendemic to the arid regions of southern Africa (IUCN, 2017). This species is naturally rare, has cryptic colouring, is small in size and is nocturnal. These factors have contributed to a lack of information on this species (IUCN, 2017). The highest densities of this species have been recorded in the more arid Karoo region of South Africa (IUCN, 2017). The arid habitat in the project area can be considered to be somewhat suitable for the species and has a **moderate likelihood of occurrence**.

- ***Leptailurus serval* (Serval)**
  Occurs widely through sub-Saharan Africa, except for tropical rainforest and the Saharan desert (IUCN, 2017). Servals occupy dense, well-watered grassland and reedbeds and are always near water (Apps, 2012). Outside of protected areas in southern Africa, their habitats are destroyed by agriculture and forestry developments (Apps, 2012). The lack of grassland and reedbed habitat in the project area contributed to a **low likelihood of occurrence** for this species.

- ***Panthera pardus* (Leopard)**
  Wide habitat tolerance and are quite adaptable to human encroachment and crop-farming areas (Apps, 2012). It is mostly nocturnal, although it can be seen during the day, especially in protected areas (Apps, 2012). The Leopard's ability to adapt to anthropogenic activities and the presence of mountainous areas around the project area contributed to a **moderate likelihood of occurrence** in the project area for this species.

- ***Parahyaena brunnea* (Brown Hyaena)**
  Endemic to southern Africa (IUCN, 2017). This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna (IUCN, 2017). Given its known ability to persist outside of formally protected areas the species has a **moderate likelihood of occurrence**.

- ***Poecilogale albinucha* (African Striped Weasel)**
  occurs from southwestern Uganda and Kenya to the Western Cape in South Africa (IUCN, 2017). It lives in moist grassland or open woodland with soils suitable for digging burrows (Apps, 2012). In southern Africa, this species is generally rare and the main threat is habitat destruction, due to tree plantations, crops and overgrazing (Apps, 2012). African Striped Weasels are also being heavily exploited so that their body parts can be used in traditional charms and magic (Apps, 2012). The lack of open woodland or moist grassland habitat in the project area contributed to a **low likelihood of occurrence** for this species.

- **Avifaunal:** The SABAP2 Data lists 176 avifauna species that could be expected to occur within the area. Fourteen of these expected species are regarded as threatened. Three

of these SCCs species have a low likelihood of occurrence due to a lack of suitable habitat and food sources in the project area.

- ***Anthus crenatus* (African Rock Pipit)**
  Is endemic to southern Africa, occurring in South Africa, Lesotho and possibly eSwatini (IUCN, 2017. The African Rock Pipit is mostly found near steep rocky habitats with scattered shrubs and grassy areas, and in Lesotho it prefers foothills (IUCN, 2017). Possible threats include afforestation and climate change (IUCN, 2017). The presence of suitable habitat (mountainous areas) near the project area has contributed to a **high likelihood of occurrence** for this species.
- ***Aquila rapax* (Tawny Eagle)**
  Has a widespread distribution in sub-Saharan Africa, with additional scattered populations occurring in North Africa, the Middle East and South Asia (IUCN, 2017). It lives in dry open habitats, woodlands and savannas (IUCN, 2017). Population declines in southern Africa occur on farmlands, most likely due to the consumption of poisonous carcasses and accidental drowning in water reservoirs (IUCN, 2017). Tawny Eagles are also killed by accidental poisoning and collisions with powerlines (IUCN, 2017). The presence of suitably dry open habitat in the project area contributed to a **high likelihood of occurrence** for this species.

- ***Aquila verreauxii* (Verreaux's Eagle)**
  Has a wide global distribution, occurring in several countries in Africa and the Middle East (IUCN, 2017). This species lives in remote, mountainous, rocky areas, savannas and semi-desert (IUCN, 2017). Any area where Rock Hyraxes occur in substantial numbers will be occupied by Verreaux's Eagles (IUCN, 2017). Threats in southern Africa include persecution as well as a decline in Rock Hyrax numbers due to hunting for food and skins (IUCN, 2017). The presence of suitable habitat within the project area contributed to a **moderate likelihood of occurrence** for this species.

- ***Calidris ferruginea* (Curlew Sandpiper)**
  A resident of Africa which migrates to the Russian Federation during the breeding season (IUCN, 2017). During the winter, the Curlew Sandpiper prefers a wide variety of coastal habitats such as brackish lagoons, tidal mudflats and sandflats, estuaries, saltmarshes and rocky shores. Inland habitats include the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). In southern Africa, it is threatened by habitat degradation and disturbance by tourists (IUCN, 2017). The presence of wetlands in the project area contributed to a **moderate likelihood of occurrence** for this species.

- ***Ciconia nigra* (Black Stork)**
  Has a very wide global distribution across Africa, Europe and Asia (IUCN, 2017). It inhabits old, undisturbed open forests and forages in shallow streams, pools, marshes, swampy areas, damp meadows, flood-plains, pools in dry riverbeds and grasslands (IUCN, 2017). In South Africa, Black Storks usually avoid large water bodies and dense forest, but non-breeding individuals will sometimes frequent the estuaries of tidal rivers (IUCN, 2017). The main threat of this species is habitat degradation, and other threats include fatal collisions with powerlines and overhead cables (IUCN, 2017). The presence of suitable foraging habitat (wetlands) in the project area contributed to a **moderate likelihood of occurrence** for this species.

- ***Eupodotis caerulescens* (Blue Korhaan)**
  Near-endemic to South Africa, with its distribution extending only marginally into western Lesotho (IUCN, 2017). It prefers to live in open, fairly short grassland and a mixture of grassland and karoo dwarf-shrubland within 1 km of water, with termite mounds and few to no trees (IUCN, 2017). It forages in agricultural areas such as old and fallow cropland, pastures and winter cultivation (IUCN, 2017). The main threat to Blue Korhaans is habitat loss, mainly driven by agricultural development (IUCN, 2017). The presence of suitable habitat in the project area contributed to a **high likelihood of occurrence** for this species.

- ***Falco biarmicus* (Lanner Falcon)**
  Native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). Their diet is mainly composed of small birds such as pigeons and francolins (IUCN, 2017). The lack of suitable habitat in the project area contributed to a **low likelihood of occurrence** for this species.

- ***Grus paradisea* (Blue Crane)**
  Near-endemic to South Africa, with populations also found in Namibia and Lesotho (IUCN, 2017). During the breeding season, it is found in habitats dominated by grasses or sedges, near natural and man-made water sources, as well as lowland agricultural areas (IUCN, 2017). During the non-breeding season, it is seen in short, dry, natural grasslands, and the Karoo and Fynbos biomes (IUCN, 2017). Threats include accidental poisoning in agricultural areas, habitat loss through afforestation and potentially habitat degradation caused by climate change (IUCN, 2017). The lack of suitable grassland habitat in the project area contributed to a **low likelihood of occurrence** for this species.

- ***Gyps coprotheres* (Cape Vulture)**
  Found in southern Africa, where it prefers protected areas and woody vegetation for foraging and steep cliffs for roosting (IUCN, 2017). Various threats are leading to a decline in this species' population numbers, including poisoning (deliberate and accidental), collision with cables, wind farm developments, habitat loss and unsustainable harvesting for traditional uses (IUCN, 2017). The lack of protected areas within 5 km of the project area as well as the lack of woody vegetation in and around the project area contributed to a **low likelihood of occurrence** for this species.

- ***Heterotetrax vigorsii* (Karoo Korhaan)**
  Classified as NT on a regional level and is endemic to southern Africa, occurring in South Africa, Namibia and Lesotho (IUCN, 2017). It mainly occurs in shrubland, but is also found in some modified habitats (IUCN, 2017). Possible threats to this species are climate change and severe weather (IUCN, 2017). The presence of shrubland habitat in the project area contributed to a **high likelihood of occurrence** for this species.

- ***Neotis ludwigii* (Ludwig's Bustard)**
  Occurs in the Karoo and Nama-Karoo biomes of southern Africa, occurring in the south-west of Angola, western Namibia and in large parts of South Africa (IUCN, 2017). It lives in open lowland and upland plains with grass and light thornbush, sandy open shrub veld and semi-desert in the arid and semi-arid Nama-Karoo and Karoo biomes (IUCN, 2017). The main threat of Ludwig's Bustard is collision with overhead powerlines, and other threats include deliberate hunting, accidental capture in snares set for mammals, poisoning and human disturbance (IUCN, 2017). The presence of suitable Nama-Karoo habitat in the project area contributed to a **high likelihood of occurrence** for this species.

- ***Phoenicopterus roseus* (Greater Flamingo)**
  Distributed from West Africa eastward throughout the Mediterranean to South West and South Asia, and throughout sub-Saharan Africa (IUCN, 2017). It prefers shallow eutrophic water bodies such as saline lagoons, saltpans and large saline or alkaline lakes (IUCN, 2017). However, it is also found frequenting sewage treatment pans, inland dams, estuaries and coastal waters (IUCN, 2017). The lack of suitable habitat within the project area contributed to a **low likelihood of occurrence** for this species.

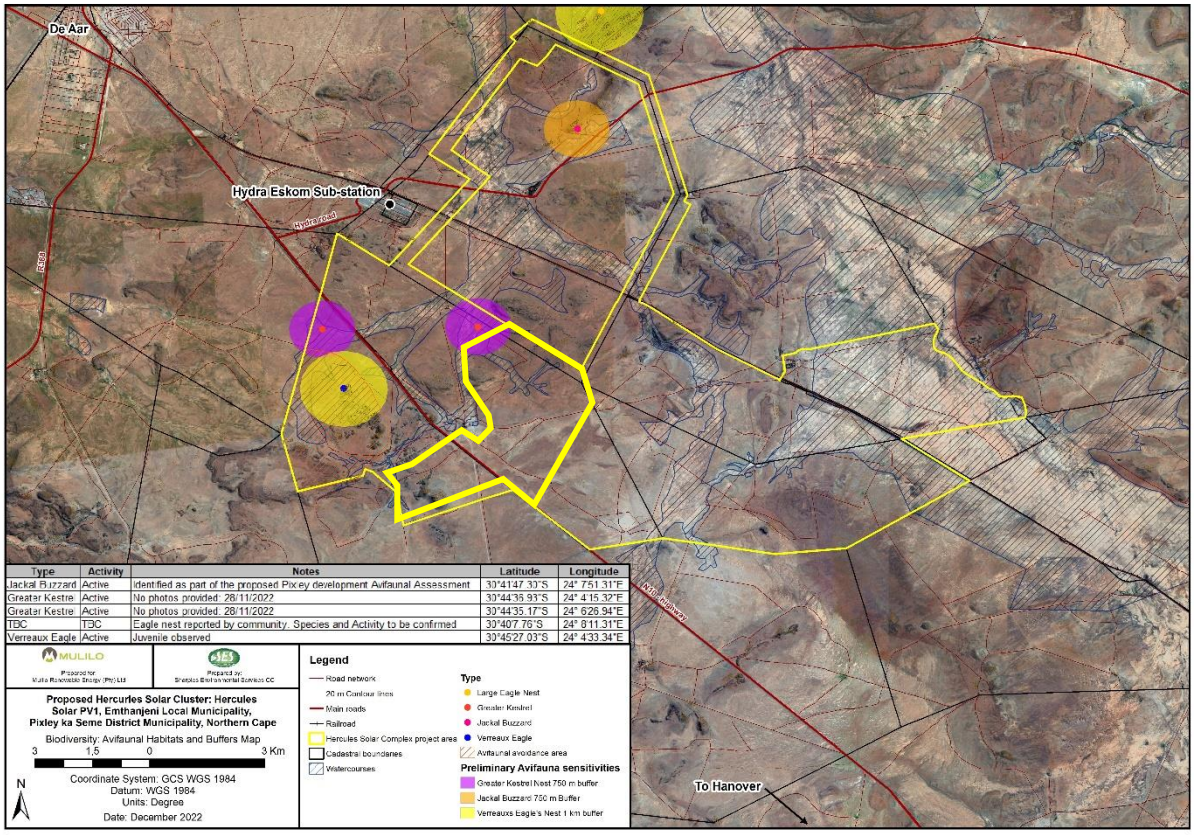
- ***Polemaetus bellicosus* (Martial Eagle)**
  Listed as EN on a regional scale and on a global scale (IUCN, 2017). This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017). The presence of suitable habitat in the project area contributed to a **high likelihood of occurrence** for this species.

- ***Sagittarius serpentarius* (Secretarybird)**
  Occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna (IUCN, 2017). It is also found in agricultural areas and sub-desert (IUCN, 2017). It mainly eats insects (86% of diet) but will also prey on rodents and other mammals, lizards, snakes, eggs, young birds and amphibians (IUCN, 2017). This species has a **high likelihood of occurrence** in within the study area.

During the site survey period, seventeen (17) mammalian species were recorded to have been present on-site. This was either done so based on physical observations or through the presence of visual tracks and signs. Of these species observed on site, only the Mountain Reedback were of conservation importance. During the site verification survey, four (4) amphibian species of Least Concern were also observed.

During the site visit numerous bird species were identified on site, of the various species identified, 3 different bird nests were highlighted by the appointed specialists. Subsequently, the recommended buffers were placed around these nests:

- 1km buffer around the Verreaux Eagle's nests.
- 750m buffer around the Kestrel Nest and Jackal Buzzard.



Type	Activity	Notes	Latitude	Longitude
Jackal Buzzard	Active	Identified as part of the proposed Pixley development Avifaunal Assessment	30°41'47.30"S	24° 7'51.31"E
Greater Kestrel	Active	No photos provided: 28/11/2022	30°44'35.93"S	24° 4'15.32"E
Greater Kestrel	Active	No photos provided: 28/11/2022	30°44'35.17"S	24° 6'26.94"E
TBC	TBC	Eagle nest reported by community. Species and Activity to be confirmed	30°40'7.76"S	24° 8'11.31"E
Verreaux Eagle	Active	Juvenile observed	30°45'27.03"S	24° 4'33.34"E

Figure 12: Nests identified on site including their associated buffer areas.

Conclusion: Both avifaunal species identified through the DFFE screening tool was identified by the appointed specialist as being SCC with a high likelihood of occurrence on site. During the site visit, the appointed specialist identified numerous mammalian and reptilian species none of which were of conservation importance. Multiple nests of avifaunal species of conservation importance were identified on site, however none of these nests, or their associated buffers will be impacted upon by the proposed Hartebeest Hoek Solar PV1 development.

An appropriately registered SACNASP professional, has been appointed to undertake the site verification for the avifaunal and animal species listed as SCC's, and to determine the specialist input required. SANBI will be included as an I&AP.

3.4. Aquatic Biodiversity

Screening Tool: The report indicates that the site's Aquatic Biodiversity is of **Very High** sensitivity and that an Aquatic Biodiversity Impact Assessment should be completed.

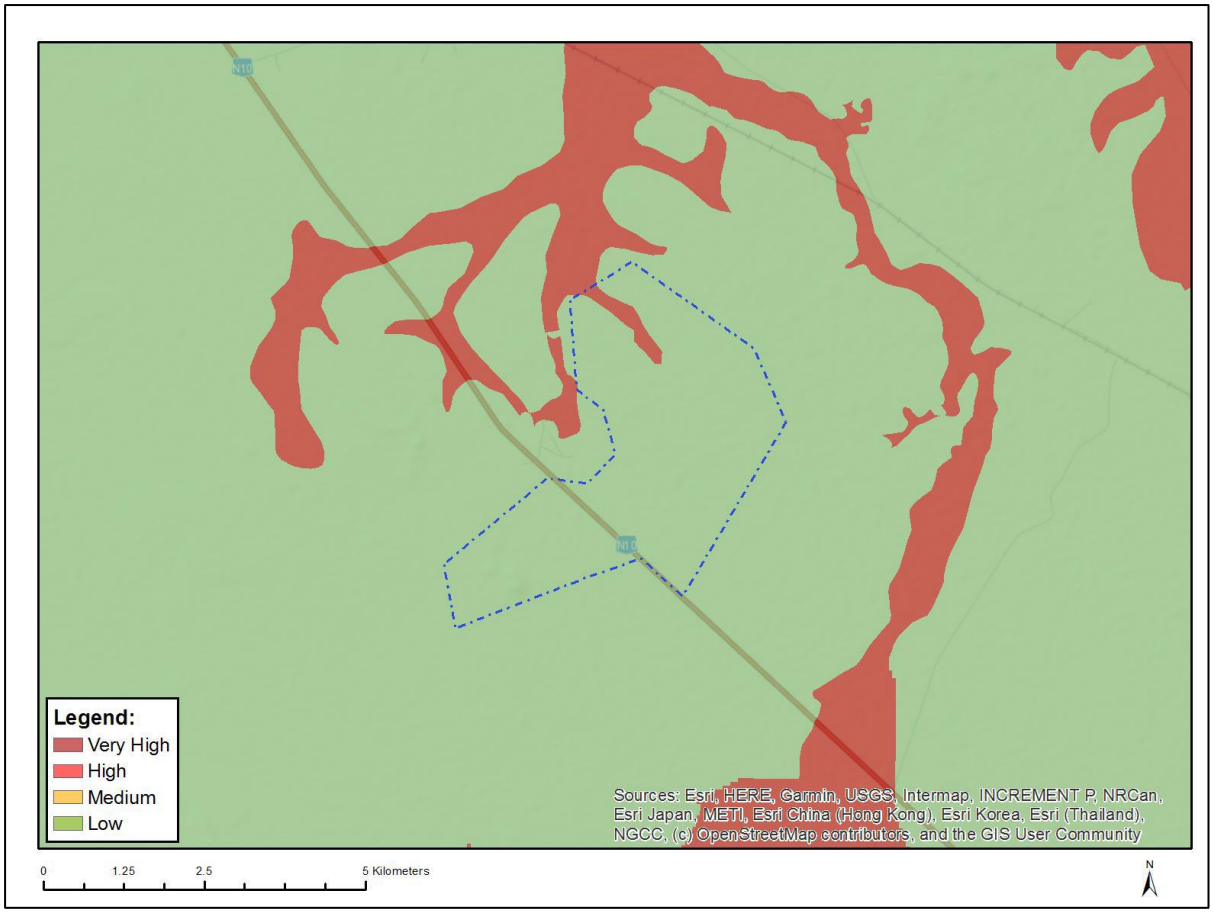


Figure 13: Relative Aquatic Biodiversity Theme Sensitivity Map

Sensitivity Features

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Wetlands_(River)

Observation on Site - by the EAP: Evidence of areas experiencing seasonally wet conditions were seen on site, drainage areas and aquatic features (dams) were indicated by the landowners, who further advised that the average rainfall was actually 300mm, however in the last year rainfall averaged at around 620mm.

Figure 14: Aquatic feature present on site.

The drainage areas tended to have sporadic rather than dense vegetation growth, and exposed soils (given the drier conditions).

Observation on Site by - the Specialist: The Biodiversity Company was appointed to undertake the aquatic sensitivity scoping for the proposed developments to evaluate the impacts on the sensitive features as indicated in the summary table above. It should be noted that the specialist appointed to undertake this scoping report has, at the time of compiling this report, not been to site. The site visit was planned for 17-21 October 2022.

The project area is located within the Brak River, D62D quaternary catchment, within the Orange Water Management Area (WMA 6) (NWA, 2016), and Nama Karoo Ecoregion (Figure 4 8, Kleynhans et al., 2005). The main watercourse that drains the project area is the upper reaches of the Brak River [Sub-Quaternary Reaches (SQRs D62D-5391 and D62D-5332)], a non-perennial river system with an associated low-density network of non-perennial and ephemeral tributaries falling adjacent to and within the project area footprint. The Brak River then flows in a north westerly direction joining the Orange River approximately 174 km (as the crow flies) downstream of the project area.

Due to the limited land and water use modification within the project related catchment areas, the SQRs were considered largely natural to moderately modified at a desktop level (DWS, 2014). Ephemeral watercourses of the arid regions such as the Karoo are typically dependent on groundwater discharge and are particularly vulnerable to changes in hydrology and are known to be slow to recover from any impacts.

According to the specialist's input, the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer et al., 2019; Skowno et al., 2019). The project area overlaps with two EN rivers and one LT river (Figure 15).

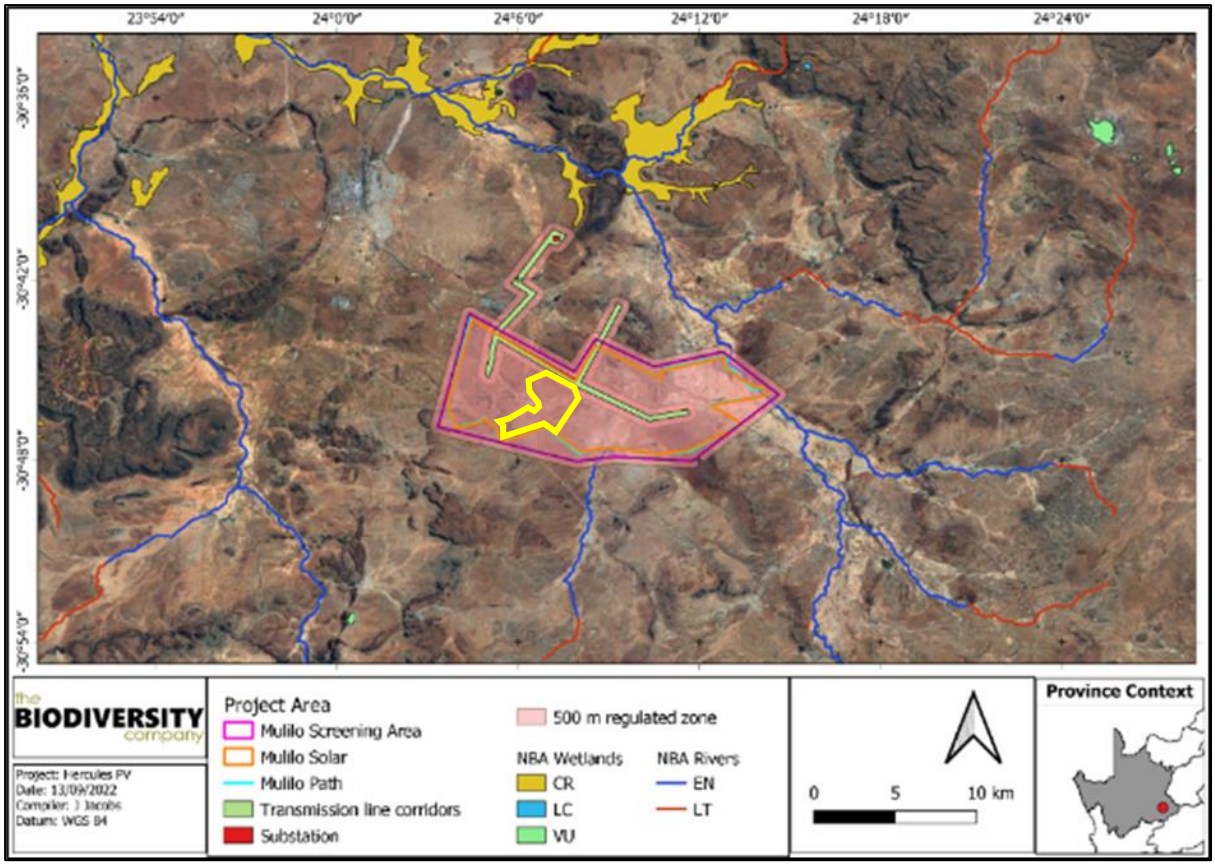


Figure 15: Aquatic feature present on site.

Resource Water Quality Objectives:

The Brak River does not have RWQOs specific to this system therefore, the RWQOs for the nearest downstream watercourses serves as the allocated RWQOs to be monitored against. The Brak River drains into the Orange River in close proximity to site OS08 on the Orange River at Prieska (Orange River Quaternary Catchment D72A) (DWAF, 2009). The RWQOs for the watercourses downstream of the project area are presented in Table 4 and results from the aquatic assessment were compared to these RWQOs. The Present Ecological Status (PES) of OS08 is moderately modified (class C), while the Recommended Ecological Category (REC) to be maintained is a largely natural (class B). The Ecological Importance and Sensitivity Category for this catchment is rated as Moderate.

Table 4. Resource Water Quality Objectives of the closest downstream point.

RWQO site code	Study Unit	Quaternary Catchment	Hydro ID	Electrical Conductivity	Present Ecological State	Management Class	Recommended Ecological Category
Orange River (OS08)	Prieska	D72A	D7H002	550 µS/cm	C	A	B

National Freshwater Ecosystem Priority Area Status (NFEPAs)

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver et al., 2011). The FEPAs are intended to be conservation support tools and

envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel et al., 2011).

Figure 16 shows that the project area's 500 m regulated zone overlaps with several classified NFEPA wetlands as well as several unclassified NFEPA wetlands. The project area also overlaps with an NFEPA river.

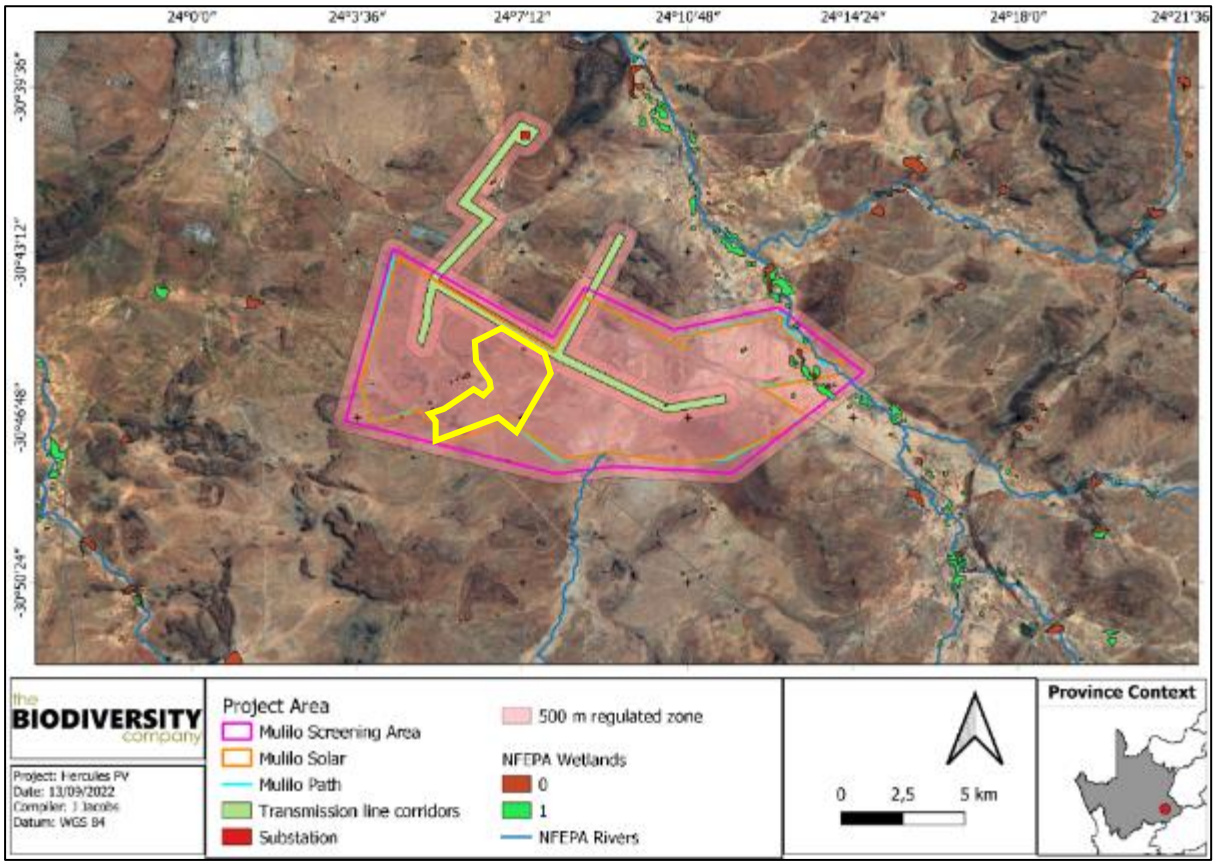


Figure 16: National Freshwater Priority Areas within the 500 m regulated zone.

The figure below provides a representation of the watercourses delineated on site following the site verification done by the appointed specialist. As part of the mitigation proposed by the specialist, a 50 m buffer was recommended around all watercourses. The boundaries of the proposed Hartebeest Hoek Solar PV1 development will see to the interception of a tributary of these watercourses. However, the proposed development footprint will avoid these areas.

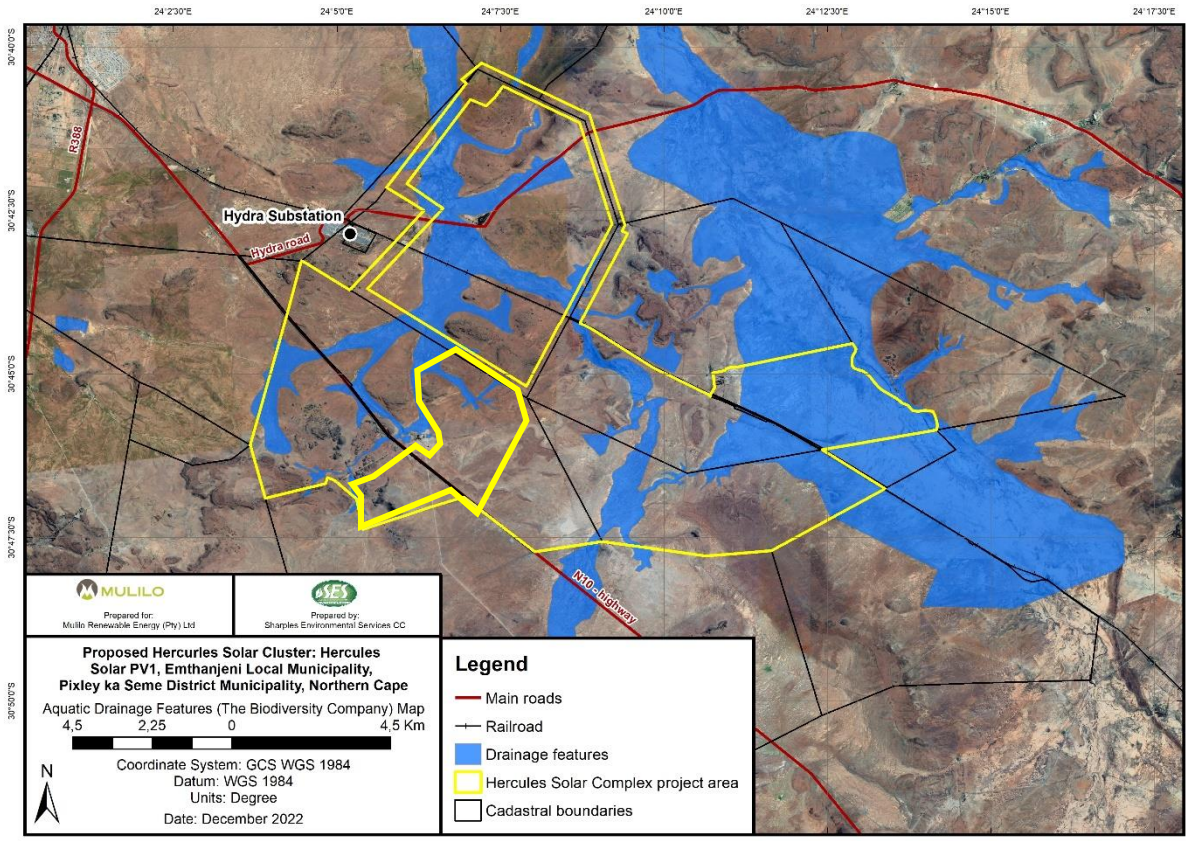


Figure 17: Aquatic delineation of the watercourses within the study area (The Biodiversity Company, 2022).

Conclusion: According to specialist findings, numerous watercourses were identified within the site. The extent of these watercourses will be determined once the site verification has been done. The specialist recommended a 50m buffer around all watercourses delineated within the study areas. A tributary of the watercourses has been delineated within the full extent of the proposed Hartebeest Hoek Solar PV1 development. However, the proposed development footprint will avoid all watercourses and their associated buffers. An appropriately registered SACNASP professional, will be appointed to undertake the site verification for the aquatic biodiversity theme, and will determine the specialist input required. DWS will be included as an I&AP.

3.5. Archaeological and Cultural Heritage

Screening Tool: The report indicates the site's Archaeological and Cultural Heritage significance is of **Low** Sensitivity. The screening tool suggest that an Archaeological and Cultural Heritage Impact Assessment be completed – no further information provided regarding features.

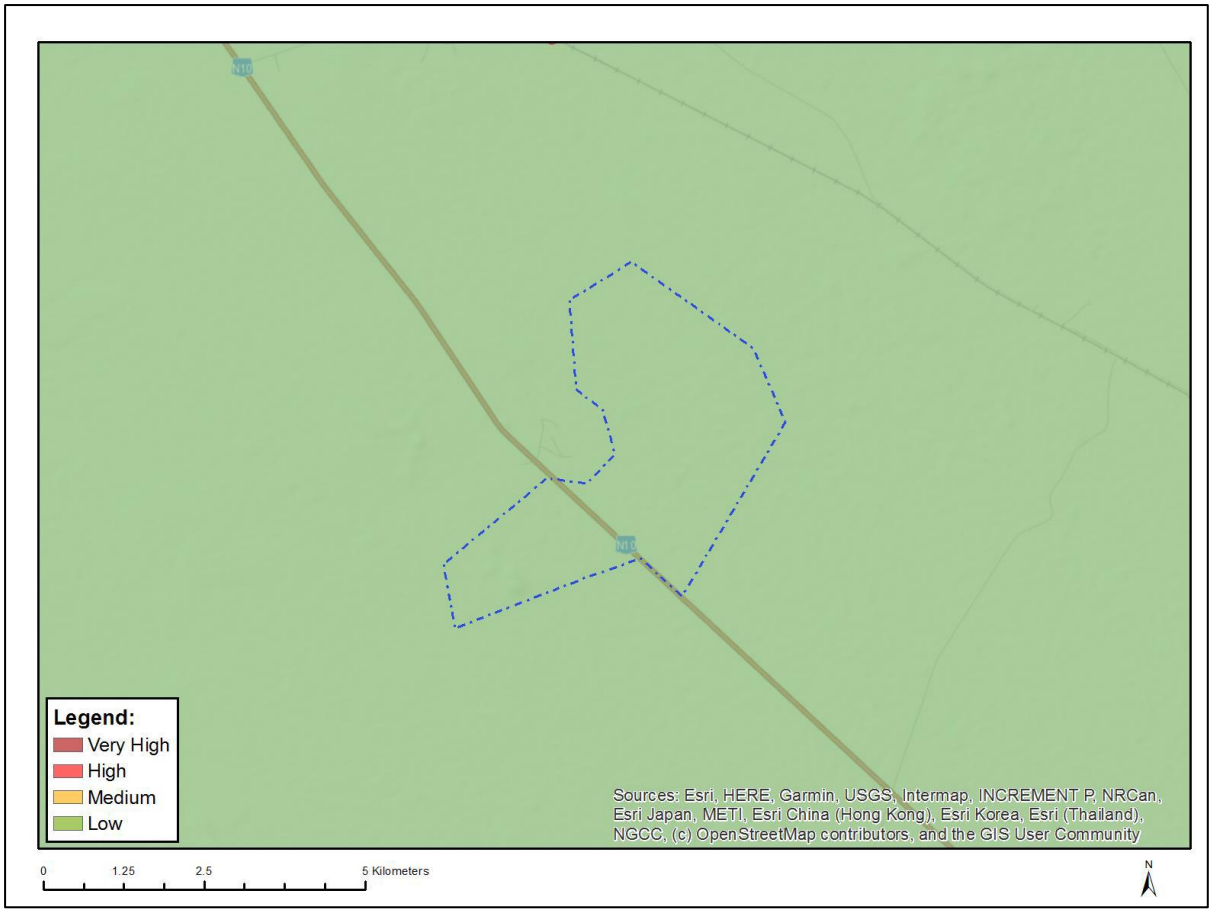


Figure 18: Relative Archaeological and Cultural Heritage Sensitivity Map

Observation on Site - by the EAP: The site does contain areas of inclined rocky in-situ outcrops, predominantly igneous dolerite**.** Given that these areas have not been significantly modified the potential for heritage resources must be explored. A heritage and archaeological specialist will be appointed.

Observation on Site - by the Specialist: An initial archaeological and heritage survey of the farm portions that make up the proposed development site was undertaken by ACO Associates cc between 21-24 September 2022, the results of the which tally with much of what is known about archaeological and heritage potential of the De Aar area.

The Karoo has been occupied by people for hundreds of thousands of years as testified by the vast "litter" of stone artefacts that blanket the land and which range from heavily weathered Early (ESA) and Middle Stone Ages (MSA) lithics dating back as much as half a million years ago to the more recent Later Stone Age (LSA) artefacts deposited within the last 30,000 years.

Our understanding of the pre-colonial archaeology of the Upper Karoo is founded on the early work by two of the fathers of South African archaeology, John Goodwin and Clarence van Riet Lowe (Goodwin and Van Riet Lowe, 1929). This was substantially enhanced in large part by an exhaustive archaeological survey of a portion of the Zeekoe River Valley, south of De Aar, by Prof Garth Sampson (1985). Between 1979 and 1981 a team of archaeologists working on the Zeekoe Valley Archaeological Project (ZVAP), intensively surveyed 4,954 km^2 of the Zeekoe River drainage, between the Sneeuberg in the south and Hanover in the north, recording more than 14,000 sites and archaeological stone tool occurrences (Sampson, 1985) (Figure 19).

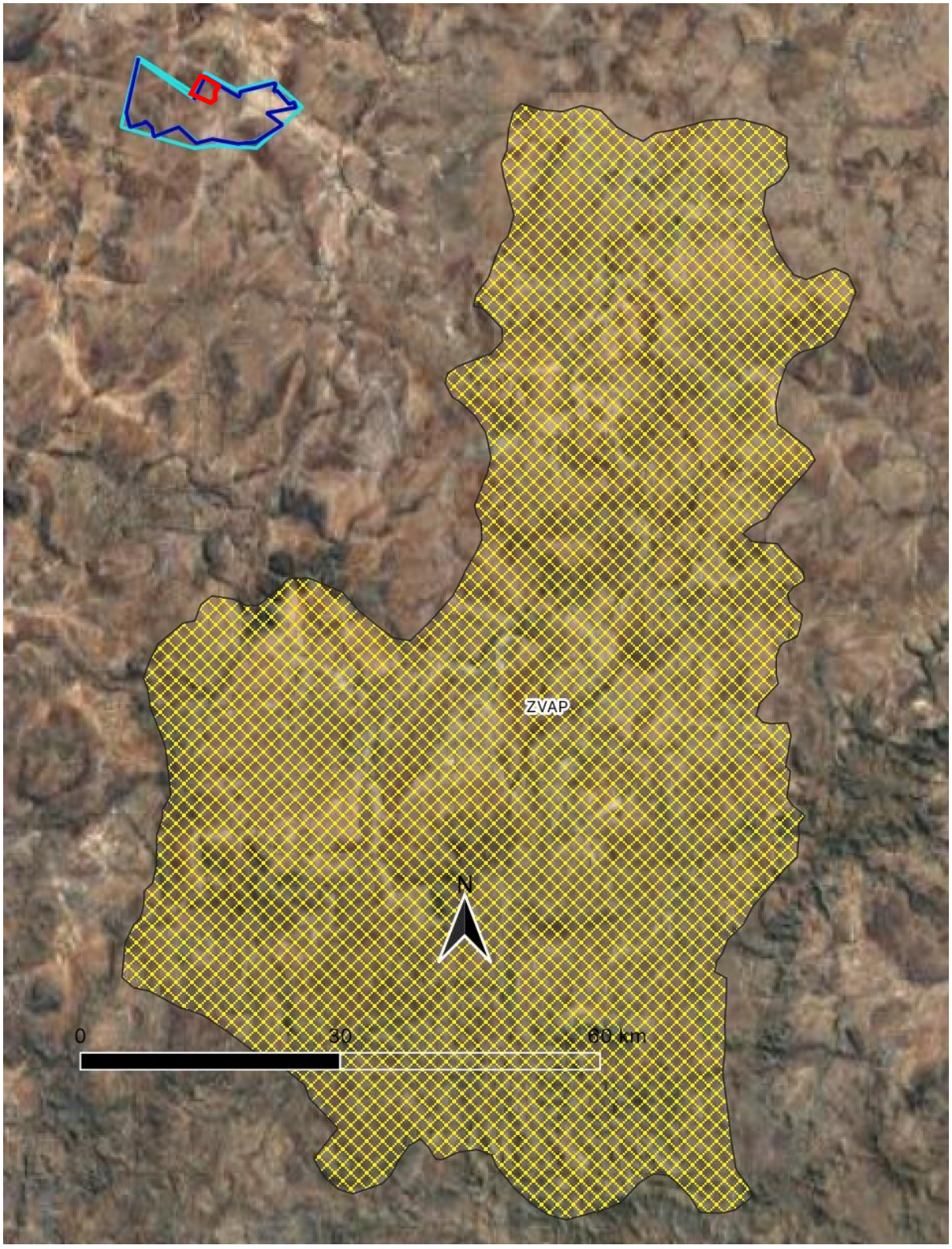


Figure 19: Extent of the area surveyed for the Zeekoe Valley Archaeological Project (ZVAP), with the location of the Hercules SPV project site shown at top left.

The ZVAP recorded a long sequence of archaeological material in the Upper Karoo indicating the occupation of the region by our forebears since the ESA Acheulian, through multiple MSA

phases, four LSA phases to herder sites, many with low stone-walled kraals and Khoekhoe-like, thin-walled ceramics, dating to within the last 2,000 years (Sampson 1985, 2015:3).

Since the completion of the ZVAP a large number of development-led archaeological impact assessments have been conducted in the Upper Karoo. These include several mainly WEF projects proposed around Noupoort (see Anderson, 2014; Booth, 2011a, 2011b; Booth and Sanker, 2012a, 2012b, 2012c; Hart et al, 2017a, 2017b; Orton, 2014; Van Schalkwyk, 2012) and Murraysburg (see Hart and Almond, 2015), and numerous SPV and WEF projects around De Aar, immediately proximate to the south of the Hercules SPV project area (see, for example, Kaplan, 2010; Bekker, 2012a, 2012b; Fourie, 2012; Kruger, 2012; Huffman, 2013; Orton & Webley, 2013; Fourie, 2014, Gribble and Euston-Brown, 2020, 2021; Webley and Orton, 2011) (Figure 20).

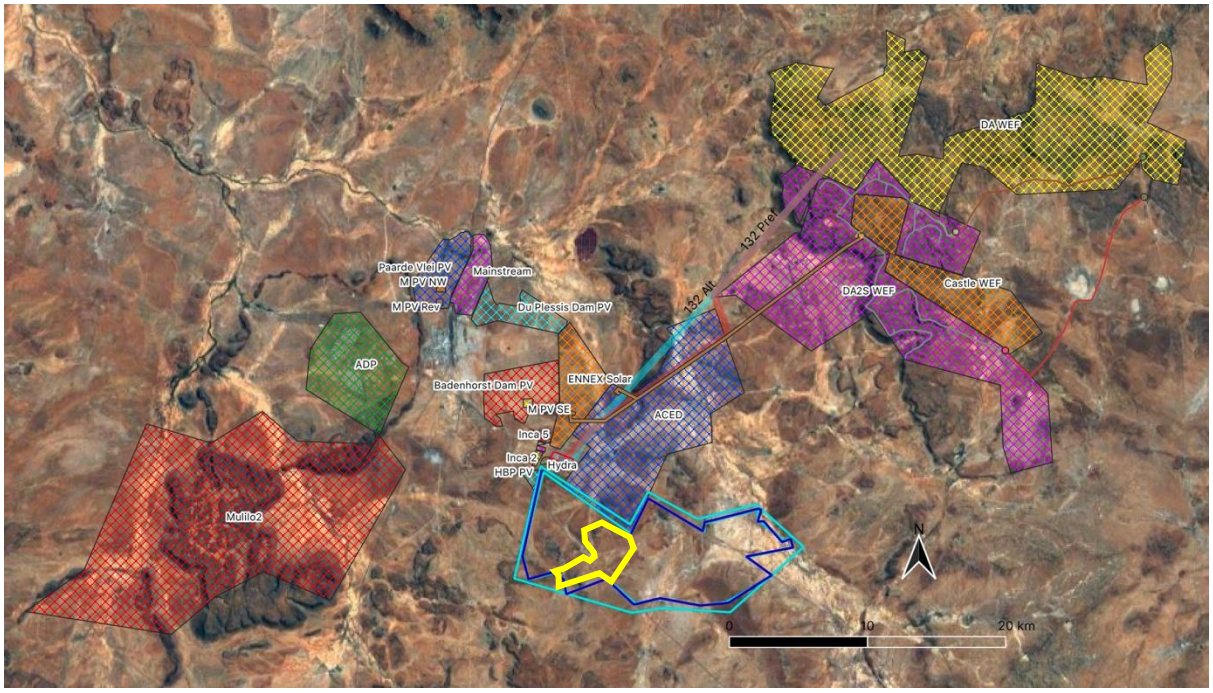


Figure 20: The Hercules SPV project area (blue polygon) shown in relation to other wind and solar projects around De Aar for which heritage assessments have been conducted.

The ZVAP results and those from the recent impact assessment surveys referred to above have allowed the development of a good understanding of the pre-colonial, Stone Age archaeology of this area of the Karoo and of the likely locations and distribution of sites of different periods within the landscape.

Due to the geology of the Karoo, caves and rock shelters are very rare. This means that most pre-colonial archaeology is found on open sites and comprises principally stone artefacts. Ostrich eggshell is sometimes preserved, and occasionally pottery on sites that are less than 2,000 years old, but bone and other organic material is rarely preserved on Karoo sites, except in rare, stratified contexts.

The rarity of organic archaeological material in this area means that dating of sites and material can be difficult, but the ZVAP noted an important correlation between stone tool age and the patina on the hornfels, the fine-grained metamorphic rock also called lydianite and indurated shale which is the dominant Stone Age raw material used in the Karoo. The ZVAP found that lithics patinated dark brown to yellow = ESA; red = MSA; grey to grey brown = LSA (Lockshoek); light brown/tan = LSA (Interior Wilton); and black = LSA (Smithfield). This culture-

history sequence forms a basis for identifying stone tool industries and historic occupations over the entire region (Huffman, 2013).

Dolerite, in the form of dykes and sills, plays a significant role in the archaeology of the Karoo. Not only is it the source of hornfels, which occurs in the contact zone between intrusive magma and shale beds, but these dolerite intrusions also served as foci for pre-colonial campsites, and provided the palettes for the rock engravings that largely replace painted rock art in this cave- and rock shelter-poor environment (Huffman, 2013; Palaeo Field Services, 2014).

With respect to the archaeological sequence of the Upper Karoo as we understand it from the results of the ZVAP and other studies, Sampson (1985) reported that ESA Acheulian sites tend to cluster close to sources of tool-making stone raw material, rather than close to sources of water and are generally to be found on the flats rather than on ridges and hills. This means that these sites and artefacts are often buried under the more recent sediments and, as a result, ESA lithics and sites have seldom been reported by the various surveys undertaken in the region.

The many MSA artefact occurrences in the region are almost exclusively open sites, and tend to be visible as dense clusters of lithics in erosion features along stream banks, as scatters of tools on the edges of pans and at the base of small hills or koppies, or as a wide and persistent scatter or "litter" of lithics across the landscape, which are particularly visible on gravel lag surfaces where the overlying coversands have been removed by erosion (Sampson, 1985)

Thousands of LSA sites have been recorded in the region and these are attributed to the ancestors of the San peoples and, after 2,000 years ago, to Khoekhoen pastoralists (Sampson (1985; Webley and Orton, 2011). As with the MSA sites, the LSA material is generally found in the open due to the scarcity of rock shelters and often comprise large scatters of stone tools.

Although there are a number of temporal subdivisions of the LSA which are described below, the San in general were nomadic hunter-gatherers who moved between temporary campsites, re-occupying some places from time to time. As a result, LSA sites in this region, often contain more than one industry (Sampson, 1972; 1974).

The earliest phase of the LSA dates to around 10,000 years ago and is described by Sampson (1985) as the Lockshoek. In broad terms, the Lockshoek is one of the terminal Pleistocene / early Holocene, non-microlithic industries that belong to the Oakhurst complex and it is the oldest archaeological unit (about 12 000 to 8000 years ago) that can be confidently associated with the San (i.e. Bushmen). The entire Later Stone Age sequence afterwards is commonly credited to ancestral San (Deacon, 1984; Huffman, 2013). The Lockshoek is characterised by large sidescrapers, frontal scrapers, endscrapers, thick backed adzes and a wide variety of ground stone implements and sites are overwhelmingly found near water points (Webley and Orton, 2011).

The Lockshoek is followed by the Interior Wilton which Sampson (1985) describes as including small convex scrapers, adzes, drills, reamers, as well as ceramics in its final phase. Unlike the Lockshoek, Interior Wilton sites are found on hills and ridges with commanding views of rivers and valleys (Webley and Orton, 2011).

The Interior Wilton is followed by the Smithfield which is characterised by abundant endscrapers made on elongated flakes, often with extensive trimming down the margins. Sampson's Smithfield is generally associated with ceramics (Webley and Orton, 2011). In a typical Karoo setting, Smithfield surface sites are concentrated on low dolerite hills and ridges, but not in the mountains or out on the flats. They occur in dense clusters each composed of several sites no more than a few hundred metres apart. Most clusters are found near

waterholes on adjacent hills or ridges and clusters near both water and hornfels quarries tend to contain more sites. Clusters form around hornfels quarries only rarely. Sites with ceramics cluster tightly on the landscape, mainly near waterholes, and are assumed to be the residues of camps (Sampson, 1984).

The introduction of pastoralism (sheep, goats and, later, cattle) roughly 2,000 years along with the arrival of the Khoekhoen may have resulted in changes in land use. The Khoekhoen followed a transhumant lifestyle, and are likely to have utilized the grazing opportunities of the Karoo on a seasonal basis (Webley and Orton, 2011).

The ACO survey of the project site recorded no ESA sites or material, but did note the presence of a good deal of MSA lithic material widely spread across the across the proposed development site, and a number of more discrete open LSA sites.

Engravings and Rock Art

As indicated above, painted rock art is the exception rather than the rule in the Karoo, and in its stead there are rock engravings on the black patinated dolerite boulders that are so characteristic of the region.

These engravings were created by the San and their ancestors over the past 10,000 years or more and are what Deacon (1997) describes as an enduring reminder not only of the creative skills of the artists, but also of their beliefs and rituals (Parkington et al, 2008).

Rock engravings and paintings in the Northern Cape and Karoo vary across time in terms of technique, form and content, both between and within sites. Hairline engravings are the oldest, while the scraped and pecked techniques are at least partly coeval. Finger paintings, where they occur, are late, and the recent scratched engravings probably date from the nineteenth century and include modem inscriptions and vandalism (Morris, 1988).

The South African Rock Art Digital Archive (SARADA) (http://www.sarada.co.za) is an online database of collections of rock art information and records from the African continent held by both institutions and individuals. SARADA holds a number of records of rock engravings near De Aar, and the ACO survey of the project site recorded three clusters of engravings on the farm portions involved.

Historical Archaeology and the Built Environment

The most recent archaeological layer in the Karoo landscape relates to the historical occupation of the area by stock farmers of European descent from the late 18th century. These European pastoralists, were highly mobile – hence the name trekboers – moving between winter and summer grazing on and off the Great Escarpment. Land ownership was informal and only became regulated after the implementation of the quitrent system of the 19th century used by the Government to control the lives and activities of the farmers. However, judging by the kinds of artefacts and structures found on the landscape, many of the farms in the Upper Karoo are likely to have been used before land was formally granted or loaned in the early 19th century (Sampson and Sampson, 1994).

The town of De Aar was established on the farm of that name at the site of an important railway junction created by the Cape Government Railways in the last two decades of the 19th century on the line between the Kimberley diamond fields and Cape Town. In 1899 the Friedlander brothers, who ran a trading store and hotel at the junction, purchased the farm and after the end of the South African War surveyed the land for the establishment of a town. The municipality was created a year later (***https://en.wikipedia.org/wiki/De_Aar***).

The ACO survey noted the presence of historical artefacts (ceramics, glass, metal, etc.) at various places across the development sites, usually in association with stone structures such as the remains of small circular shepherd's huts, stone kraals, and around the farmsteads on the various farm portions.

Conclusion: The initial ACO survey of the development site indicates that the low archaeological and cultural heritage sensitivity rating in the Screening Tool report is not an accurate reflection of the sensitivity of the development site, and that the sensitivity rating would be more appropriately pegged at moderate, with some areas (the rock engraving sites) of very high sensitivity. As is often the case with the Screening Tool, the results it provides reflect the fact that relatively small areas of South Africa have been subject to comprehensive archaeological surveys, are that primary site data to populate the Screening Tool is generally very limited. In other words, areas are indicated to be of low sensitivity, not because there is no archaeology there, but because they have not be surveyed and there is thus no data available about their archaeological potential.

As part of the proposed development footprint, all ridges, sills and outcrops as identified by both the visual and the biodiversity specialists have been avoided. An appropriately registered/experienced professional, will be appointed to undertake the site verification for the Heritage and Archaeological themes, and will undertake the necessary applications to SAHRA, which is a statutory commenting body and will be included as an I&AP.

3.6. Palaeontology

The **Screening Tool** indicated that a Palaeontology Impact Assessment must be completed due to the **Very High** sensitivity rating.

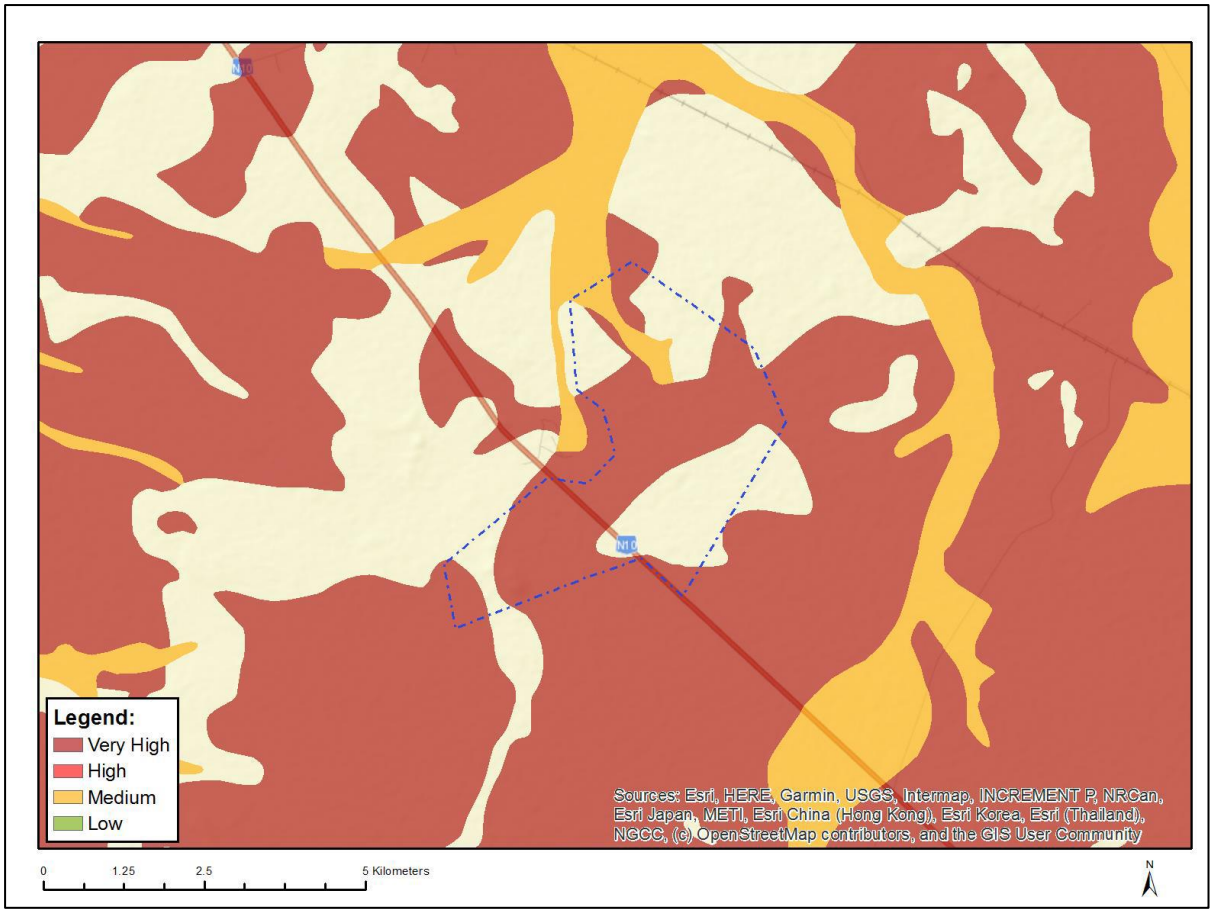


Figure 21: Relative Palaeontology Theme Sensitivity

Sensitivity Features

Sensitivity	Feature(s)
Medium	Features with a Medium paleontological sensitivity
Very High	Features with a Very High paleontological sensitivity

Observation on Site - by the EAP: The site does contain areas of inclined rocky in-situ outcrops, predominantly of a sedimentary in nature**.** Given that these areas have not been significantly modified the potential for fossil remains must be explored. A palaeontologist will be appointed.

Observation on Site - by the Specialist: Dr Gideon Groenewald was commissioned by ACO Associates to produce an initial, desk-based palaeontological assessment of the development site.

This assessment was based on Dr Groenewald 's previous work on projects in the De Aar area, his personal knowledge of the geology of the region and on a desktop literature survey of recent palaeontological research in the Karoo Basin.

The project area is underlain by Permian aged sedimentary rocks of the Adelaide Subgroup of the Beaufort Group as well as Jurassic aged dolerite of the Karoo Supergroup (Figure 22).

Limited areas are underlain by Quaternary aged calcrete and Large parts of the study area are covered in relatively thick (2m) colluvial sediments that covers potentially productive fossils horizons.

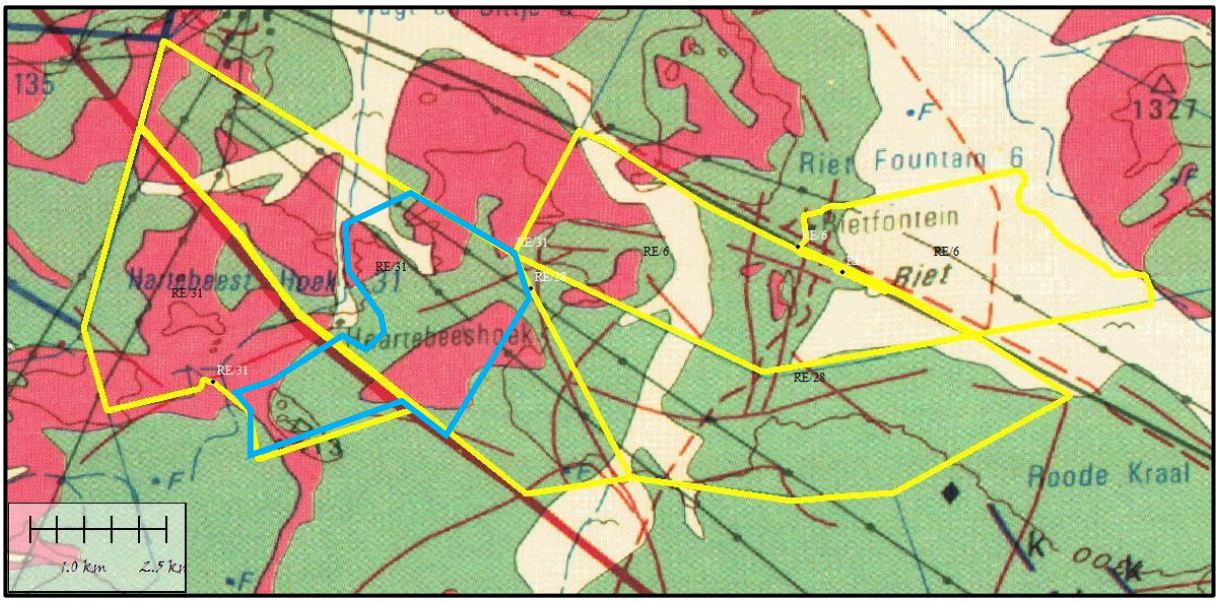


Figure 22: Geology of the study area. The farms are underlain by sedimentary rocks of the Adelaide Subgroup, dolerite and alluvium.

The Adelaide Subgroup, which extends across the southern Karoo Basin, is the lowest subgroup of the Beaufort Group and consists of a variety of rock types, including fine-grained sandstone, siltstone and mudstone. Mudstones are generally greenish (or blueish) grey, and greyish-red, interbedded with yellow sandstones and siltstones. In the western part of the basin, the Adelaide Subgroup comprises the Abrahamskraal and Teekloof formations, with the former characterised by the presence of a number of cherty beds and less red mudstone relative to the overlying Teekloof Formation (SACS, 1980). In the eastern areas it comprises the Abrahamskraal, Middleton and Balfour formations (Smith, 2020). The depositional environment of the Adelaide Subgroup formations is interpreted as a high sinuosity meandering river environment controlled by the northward warping of the foreland Karoo Basin.

The Hercules project area straddles the boundary between the two regions, where the transition from the western subdivision of the Adelaide Subgroup to the eastern subdivision is prominent and the consensus is that the dominant lithological unit of the region is the Balfour Formation

The characteristics of the Balfour Formation is best summarised in unpublished discussions of David Groenewald (pers comm 2021):

> *"The base of the arenaceous Oudeberg Member is used as the lower boundary of the Balfour Formation (SACS, 1980). This is followed by the argillaceous Daggaboersnek Member, the arenaceous Ripplemead Member (previously Barberskrans) and the argillaceous Elandsberg and Palingkloof members (Viglietti, 2016).*
>
> *Catuneanu and Elango (2001) undertook sedimentological work on the Balfour Formation in the Fort Beaufort area of the Eastern Cape and, while they did not assess the lithostratigraphy, they identified six, unconformity-bound third-order fluvial depositional sequences. The upper Palingkloof Member constitutes a very significant red and brightly coloured mudstone unit in the southern and central part of the Basin and can be correlated with the Harrismith Member in the north-eastern part of the Basin..*

The best terrestrial record of the Permian-Triassic boundary is considered to be preserved within this unit, which constitutes almost the entire Lystrosaurus Assemblage Zone (Botha and Smith, 2006; Smith and Botha-Brink, 2014; Smith et al., 2012; Smith and Ward, 2001).

No outcrops of this member or the Lystrosaurus Assemblage Zone fossils have been recorded from the present study area to date but are present to the west".

The palaeontological heritage of the Adelaide Subgroup and specifically the Balfour Formation forms part of the extremely highly rated treasures of the South African Karoo. Containing evidence of one of the most significant extinction events (Permian/Triassic extinction).

This initial desktop assessment confirms that:

- The dolerite on the site contains no fossils because they do not occur in intrusive, volcanic rock. Furthermore, when igneous dykes intrude through the overlying sediments they tend to physically destroy any fossils in their paths and the heat they generate can destroy or alter fossils in the vicinity.
- Elsewhere, however, portions of the proposed development are underlain by very highly sensitive geological formations (Figure 23).
- The Quaternary sands that cover much of the development site are young enough to preserve fossils, but having been washed down slopes and streams into rivers, any fossils would have been transported from their sites of origin and their context and associations with other fossil material in the assemblage will have been lost. These sediments are moderately sensitive.

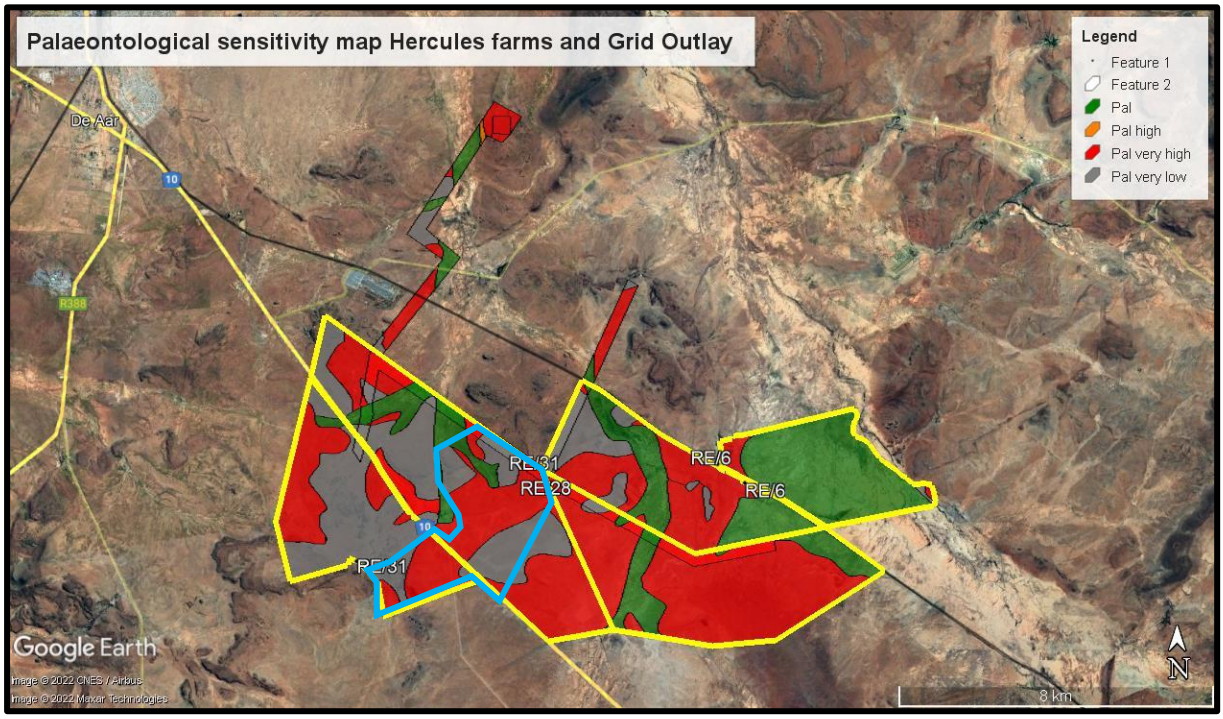


Figure 23: Palaeontological sensitivity of formations underlying the Hercules project area and routes of the distribution lines. Palaeontological sensitivity of the study area (red very high and grey very low) with large areas of very high significance covered in colluvium. Excavations of more than 1,5m in all the red areas will most probably expose significant fossils.

Conclusion: Desktop conclusions can only be confirmed during a field visit and, in the light of the large areas underlain by rocks with a very high sensitivity for palaeontological heritage a Phase 1 Palaeontological Field Assessment to inform the Heritage Impact Assessment once an initial project layout has been proposed.

An appropriately registered/experienced professional, will be appointed to undertake the site verification for the Palaeontological theme, and will contribute to the necessary applications to SAHRA, which is a statutory commenting body and will be included as an I&AP.

3.7. Avian Theme

Screening Tool: The report indicates that the site's Avian theme is of **Low** Sensitivity.

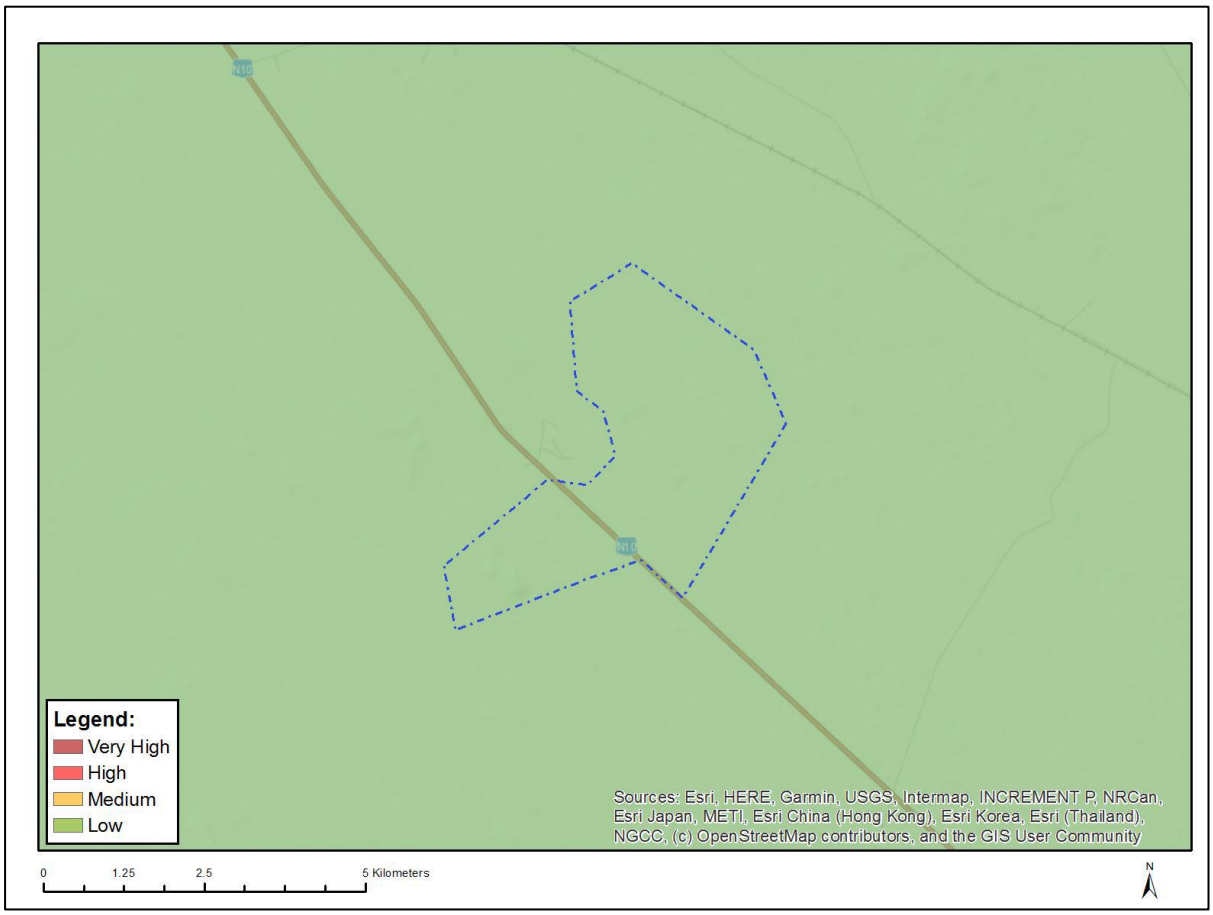


Figure 24: Relative Aviation Sensitivity Map

Observation on Site - by the EAP: The EAP confirms the sighting of multiple bird species, including the Blue Crane (*G. paradisea*), (IUCN Red List Status: Vulnerable), as well as evidence of a raptor carcass below the existing powerlines (Figure 5). No nests were observed. An Avifaunal Specialist will be appointed to undertake a site verification.

Observation on Site - by the Specialist: The Biodiversity Company was appointed for the to undertake the avian sensitivity scoping for the proposed developments to evaluate the impacts on the sensitive features as indicated in the summary table above. It should be noted that the specialist appointed to undertake this scoping report has, at the time of compiling this report, not been to site. The site visit was planned for 17-21 October 2022.

As indicated in the Animal Species Theme description, 176 anifaunal species were expected to occur within the proposed development site. Of the species, fourteen were identified as

species regarded as threatened. Based on this assessment, the following species were associated to the various likelihood of occurrences:

- **Low Likelihood of Occurrence:** *Grus paradisea, Gyps coprotheres,* and *Phoenicopterus roseus*
- **Moderate Likelihood of Occurrence:** *Aquila verreauxii, Calidris ferruginea,* and *Ciconia nigra*
- **High Likelihood of Occurrence:** *Anthus crenatus, Aquila rapax, Eupodotis caerulescens, Falco biarmicus, Heterotetrax vigorsii, Neotis ludwigii, Polemaetus bellicosus,* and *Sagittarius serpentarius.*

According to the Specialist Scoping report, the proposed development area is located within an Important Bird & Biodiversity Area (IBA). IBA's are sites with international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife South Africa, 2017). According to Birdlife South Africa (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations.

Figure 28 below indicates the locality of the Platberg-Karoo Conservancy IBA. An IBA which is important because it contributes significantly to the conservation of large terrestrial birds and raptors, such as Blue Crane (*Anthropoides paradiseus*), Ludwig's Bustard (*Neotis ludwigii*), Kori Bustard (*Ardeotis kori*), Blue Korhaan (*Eupodotis caerulescens*), Black Stork (*Ciconia nigra*), Secretarybird (*Sagittarius serpentarius*), Martial Eagle (*Polemaetus bellicosus*), Verreaux's Eagle (*Aquila verreauxii*) and Tawny Eagle (*Aquila rapax*).

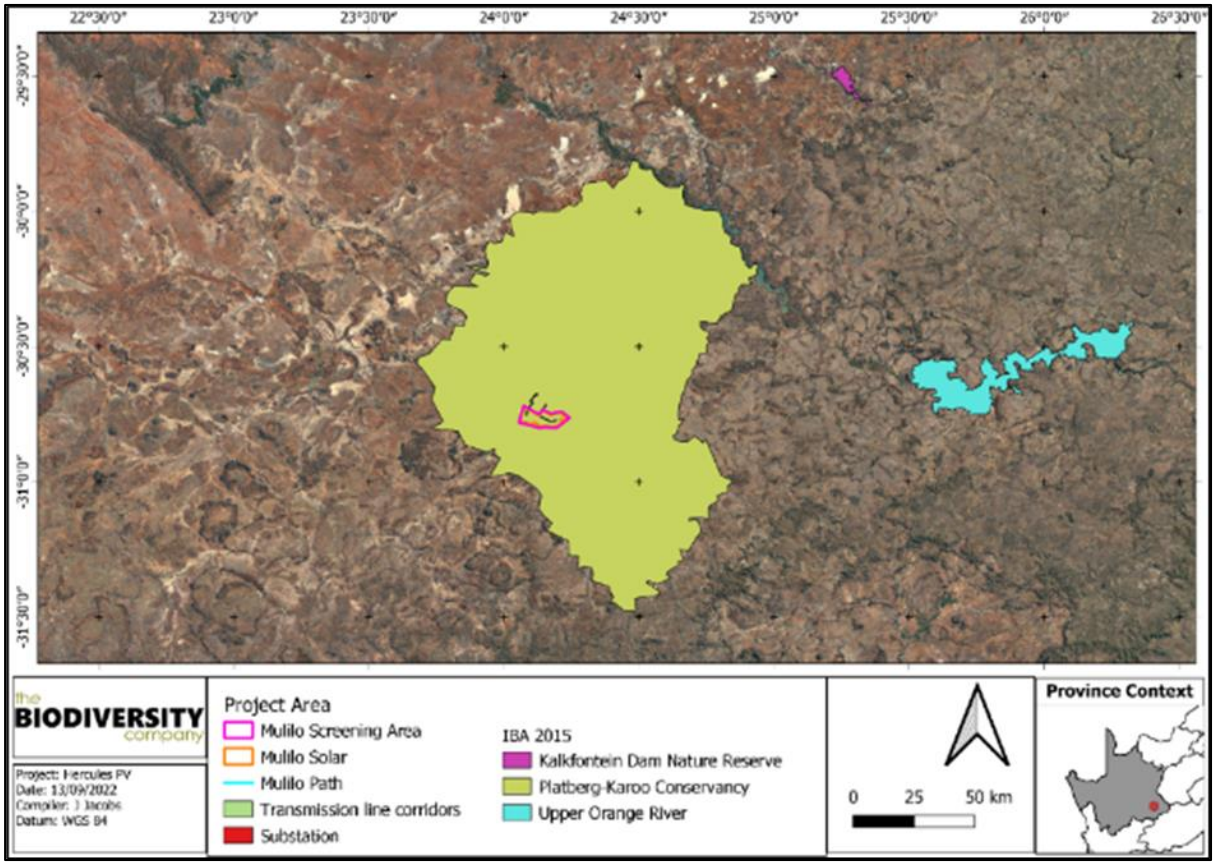


Figure 25: IBAs overlain with the study area.

During the site visit numerous bird species were identified on site, of the various species identified, 3 different bird nests were highlighted by the appointed specialists. Subsequently, the recommended buffers were placed around these nests:

- 1km buffer around the Verreaux Eagle's nests.
- 750m buffer around the Kestrel Nest and Jackal Buzzard.

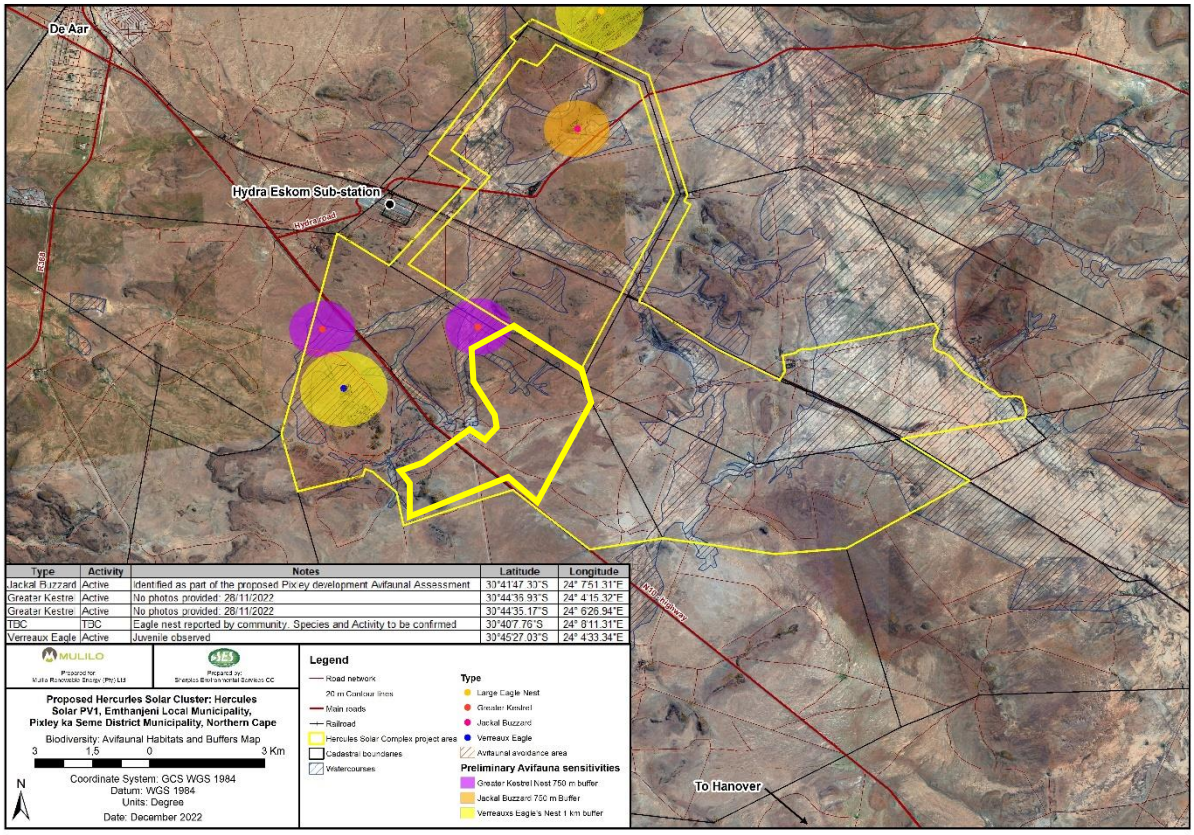


Figure 26: Nests identified on site including their associated buffer areas.

Conclusion: Multiple nests of avifaunal species of conservation importance were identified on site, however none of these nests, or their associated buffers will be impacted upon by the proposed Hartebeest Hoek Solar PV1 development.

An appropriately registered SACNASP professional, will be appointed to undertake the site verification for the avifaunal species listed as SCC's, and to determine the specialist input required. SANBI and BirdLife SA will be included as an I&AP.

3.8. Civil Aviation (Solar PV)

The **Screening Tool** indicates that the civil aviation impact is of **Medium** Sensitivity and that a Civil Aviation Assessment be conducted.

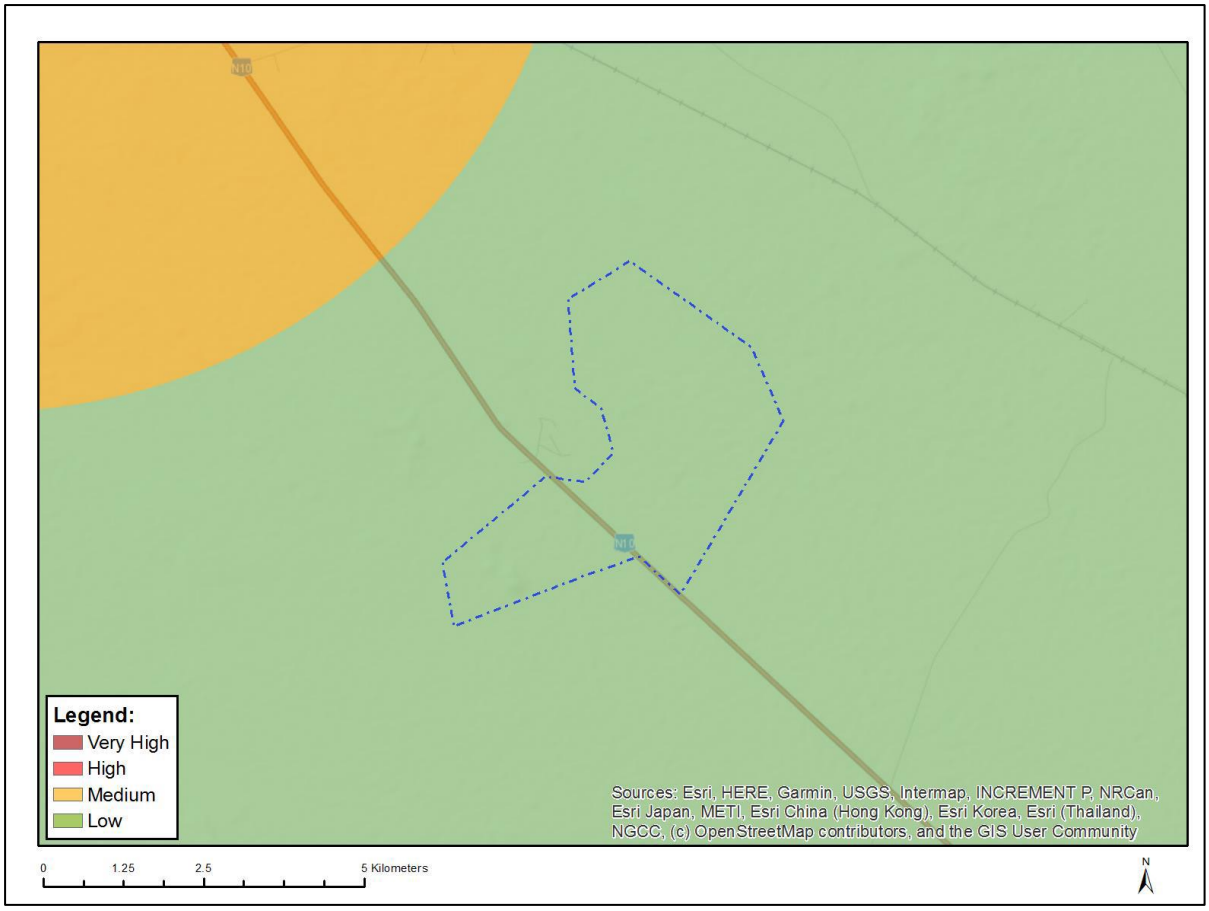


Figure 27: Civil Aviation Sensitivity Map

Sensitivity Features

Sensitivity	Feature(s)
Low	No major or other types of civil aviation aerodromes

Observation on Site – by the EAP: No airport or civil aviation aerodrome was seen from site or within the immediate area.

Conclusion: Given that many renewable energy projects have been planned within the Northern Cape, and in close proximity to the site, no further specialist input will be required. The South African Civil Aviation Authority will be included as an I&AP and we will await their response with regards to requiring specialist input.

3.9. Defence

The **Screening Tool** suggest that the defence theme is of **Low** Sensitivity, however, a Defence Assessment should be completed.

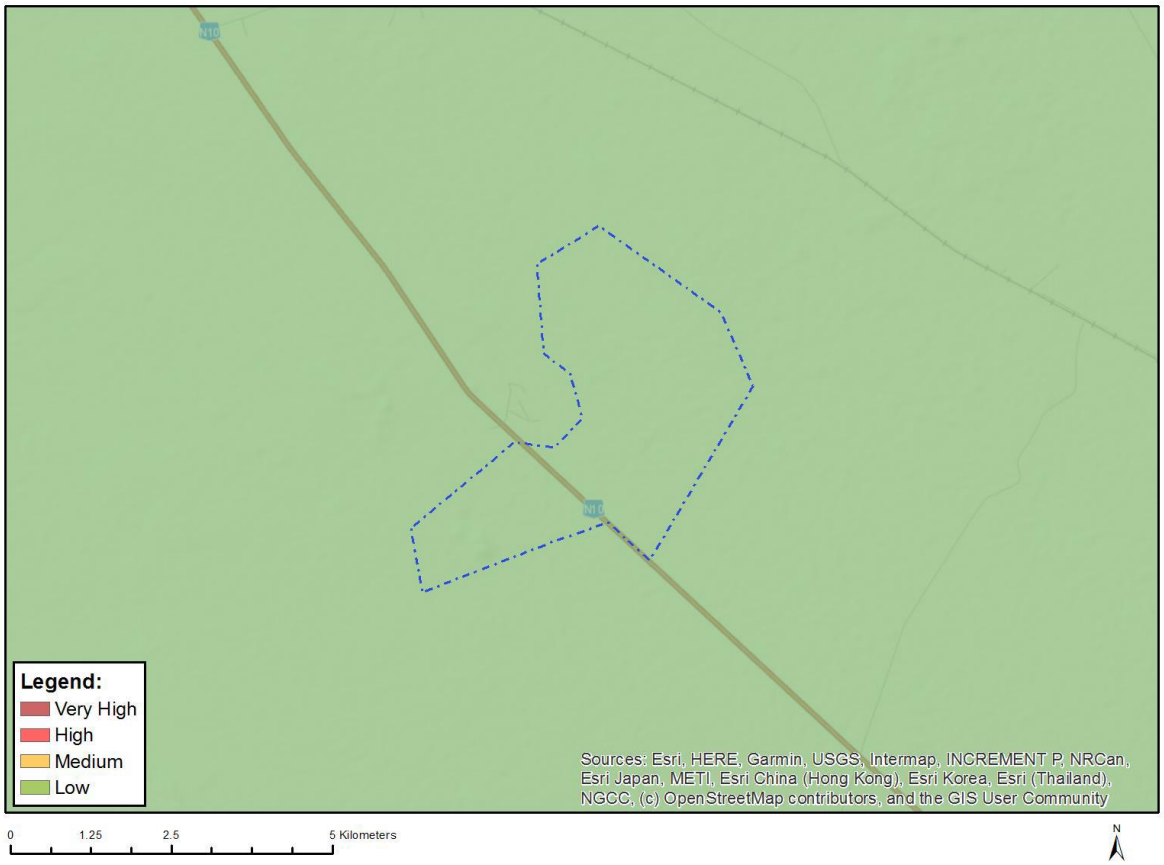


Figure 28: Defence Theme Sensitivity Map

Conclusion: No impacts on existing Defence areas were noted on the site, as such, no further action will be undertaken.

3.10. Map of Relative Landscape (Solar) Theme Sensitivity

The **Screening Tool** suggest that the relative landscape (solar) theme sensitivity is of **Very High** sensitivity.

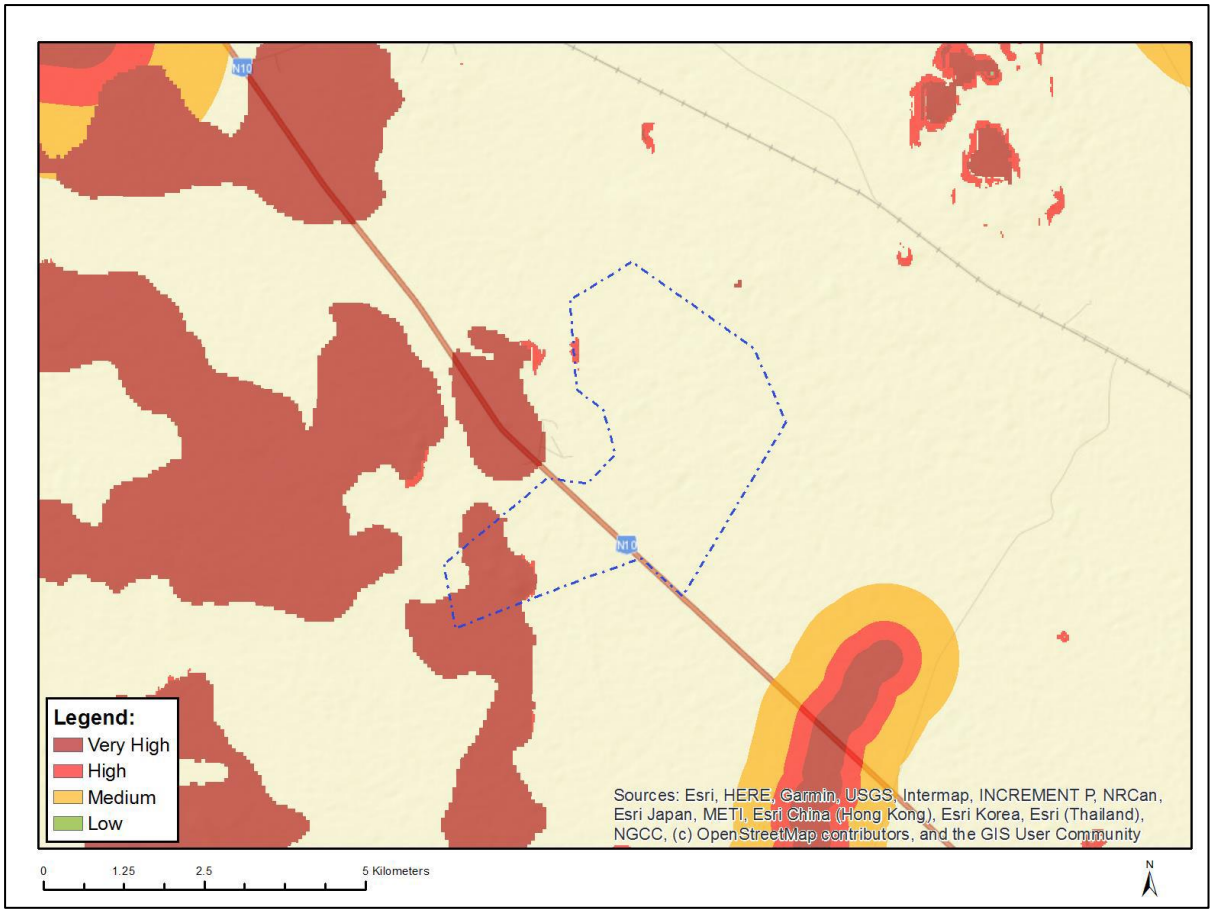


Figure 29: Relative Landscapes (Solar) Theme Sensitivity Map

Sensitivity Features

Sensitivity	Feature(s)
High	Slope between 1:4 and 1:10
Low	Slope less than 1:10
Very High	Mountain tops and high ridges
Very High	Slope more than 1:4

Observation on Site – by the EAP: Although most of the eastern portion of the site is relatively flat, there are areas of rocky inclines to the northern extent of the proposed area, and especially on the western portion of the site closest to the N10. No solar farms were seen around the site, the closest seems to be positioned approximately 12km's north-west of the site, on the northern outskirts of De Aar.

Ridges, hills, outcrops and sills have been identified by both the appointed terrestrial specialist and the visual specialist. These areas have been excluded from the development footprint of the proposed Hartebeest Hoek Solar PV1 development.

Conclusion: Technical input will be sourced from the developers appointed engineering team.

3.11. Plant Species

The **Screening Tool** indicated that the plant species theme is of **Low** Sensitivity. The tool suggests that a Plant Species Assessment be conducted.

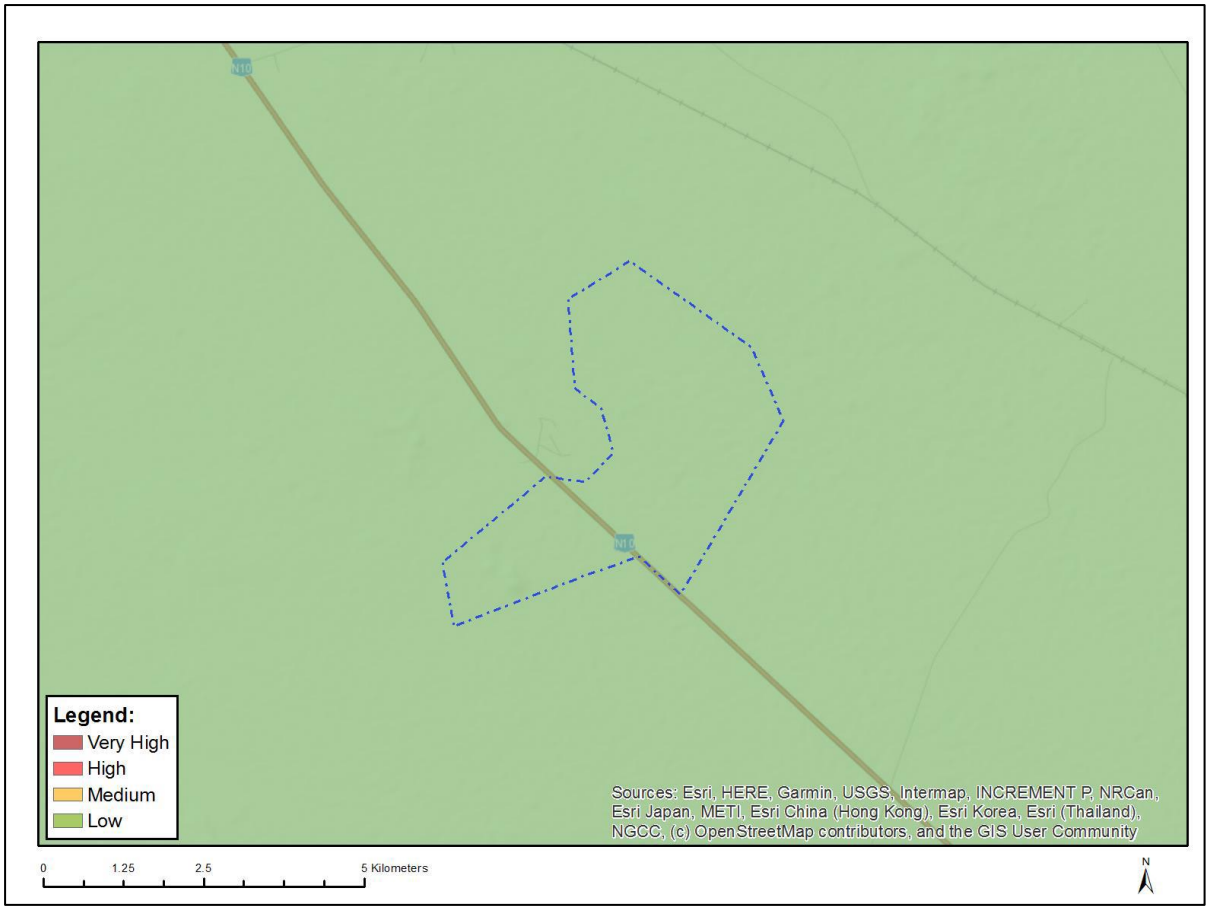


Figure 30: Plant Species Theme Map

Observation on Site - by the EAP: Multiple plant species were seen on site, and photos were recorded below. A botanical specialist will be appointed to verify the site sensitivity.

Figure 31: Plant species observed on site.

Observation on Site - by the Specialist: The Biodiversity Company was appointed for the to undertake the plant species sensitivity scoping for the proposed developments to evaluate the impacts on the sensitive features as indicated in the findings above. It should be noted that the specialist appointed to undertake this scoping report has, at the time of compiling this report, not been to site. The site visit was planned for 17-21 October 2022.

Based on the findings of Mucina & Rutherford (2006), the following biomes are present within the project area:

- *Nama-Karoo:* Nama-Karoo vegetation are characterised by a complex of extensive plains dominated by low (dwarf) shrubs (generally less than 1 m tall), intermixed with grasses, succulents, geophytes and annual forbs. Small trees can only be found along drainage lines or on rocky outcrops (Mucina & Rutherford, 2006).

The following vegetation type (in terms of the National Biodiversity Assessment (2018), based on the findings of Mucina & Rutherford (2006), is present within the project area (Figure 32):

- Northern Upper Karoo: Its landscape features consist of a flat to gently sloping landscape with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans. In terms of vegetation structure, it consists of shrubland dominated by dwarf karoo shrubs, grasses and *Senegalia mellifera* subsp. *detinens* and other low trees, especially on sandy soils in the northern parts and vicinity of the Orange River (Mucina & Rutherford, 2006).

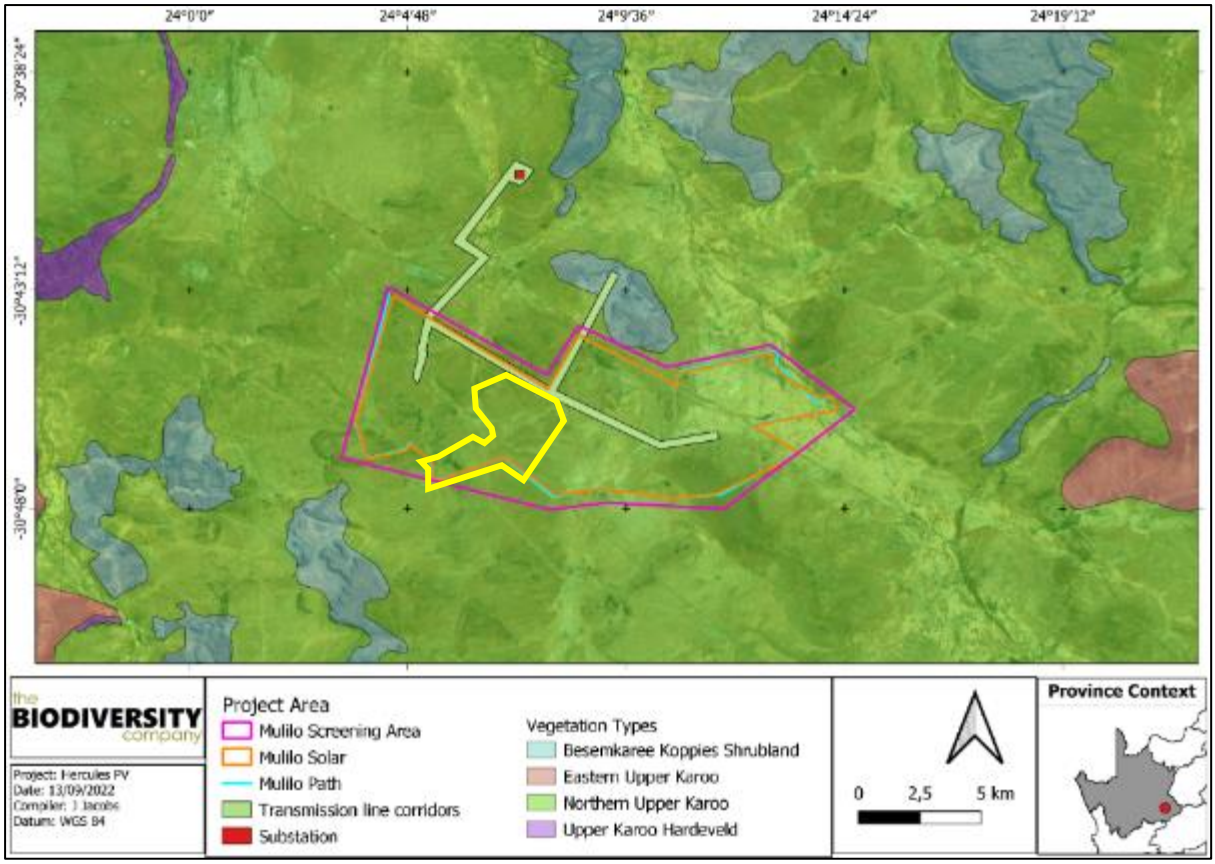


Figure 32. Map illustrating the vegetation types associated with the project area.

According to the specialist, the POSA database indicates that 332 species of indigenous plants are expected to occur within the project area. Two SCCs based on their conservation status could be expected to occur within the project area. These species include:

- *Syringodea pulchella* (IUCN: VU); and
- *Euphorbia flanaganii* (IUCN: VU).

Conclusion: An appropriately registered SACNASP professional, has been appointed to undertake the site verification in line with the Plant Species Theme, and determine the specialist input required. SANBI will be included as an I&AP.

3.12. Socio-economic Assessment

Screening Tool suggest that a Socio-economic assessment be completed.

Observation on Site by the EAP: De Aar is the closest town to the site, and it is evident that the abandoned railway line was a significant contributor to the success of this little town. Without this key element the town is in disrepair, infrastructure is not being maintained, including light poles, roads, etc. De Aar is not currently seen as a key investment location, or an area for economic growth, given that there are some large chain stores/franchises (ie. Checkers and KFC), but there's no variety or competition amongst these services from other larger names. It is clear that the employment provided by the proposed development will go a long way in providing economic value, and skills growth to De Aar's population. A socio-economic specialist will be appointed to undertake the relevant assessment, and potentially identify areas in De Aar where other social initiatives can be pursued by the developer in order to provide further community upliftment.

Observation on Site - by the Specialist: Mr. Tony Barbour was appointed to conduct the scoping socio-economic assessment for the proposed development site. During his assessment, conclusions were drawn based on a review of the relevant documents and the author's experience with undertaking SIAs for a number of renewable energy projects located in the Northern Cape.

The key findings of the Social Baseline scoping Report were based on a number of key findings described as:

- **Policy and planning issues:**
  As per the findings of the specialist's documents review, it was found that renewable energy resources is strongly supported by national, provincial and local planning documents. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all refer to and support renewable energy. The District Municipality's (PKSDM) Spatial Development Framework (SDF) and the Integrated Development Plan (IDP) and the Local Municipality's (ELM) IDP also supports the development of renewable energy.

  The development of the proposed development is therefore supported by key policy and planning documents.

- **Construction phase impacts:**
  The key positive social impact associated with the construction phase of the proposed development activities has been defined as:
  - Creation of employment and business opportunities, and the opportunity for skills development and on-site training – The construction phase of the proposed development will extend over a time period of approximately 18 months and will create approximately 350 employment opportunities, the members of the local communities in the area would be in a position to qualify for most of the low skilled and semi-skilled employment opportunities. Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. The hospitality industry in the area will also benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives, consultants and product representatives etc.) and other (non-construction) personnel involved on the project.

  Whereas the key negative social impacts associated with the construction phase of the proposed development activities have been defined as:
  - Impacts associated with the presence of construction workers on local communities - The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.
  - Impacts related to the potential influx of jobseekers - Large construction projects tend to attract people to the area in the hope that they will secure a

job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the way in which they conduct themselves can impact on the local community. The main areas of concern associated with the influx of job seekers include the impacts on the existing social networks and community structures, competition for housing (specifically low-cost housing), competition for scarce jobs and increased in incidences of crime.

- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site.
- Increased risk of grass fires associated with construction related activities that could, in turn pose, a threat to livestock, crops, wildlife and farm infrastructure. The potential risk of grass fires will be higher during the dry, windy winter months from May to October.
- Nuisance impacts, such as noise, dust, and safety, associated with construction related activities and vehicles.
- Impact on productive farmland.

A breakdown of the anticipated impacts has been provided in Table 5. This impact table is to be applied the solar farms respectively. The findings of the significance of the impact assessment have been provided based on the finding of SIAs undertaken for similar activities within the vicinity of De Aar. The findings thereof will be confirmed during the Assessment phase.

Table 5. Anticipated social impacts of the construction phase of the respective solar farms.

Impact	Significance No Mitigation/Enhancement	Significance With Mitigation/Enhancement
Creation of employment and business opportunities	Medium (Positive)	Medium (Positive)
Presence of construction workers and potential impacts on family structures and social networks	Low (Negative)	Low (Negative)
Influx of job seekers	Low (Negative)	Low (Negative)
Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Medium (Negative)	Low (Negative)
Increased risk of grass fires	Medium (Negative)	Low (Negative)
Impact of heavy vehicles and construction activities	Medium (Negative)	Low (Negative)

- **Operational phase impacts:**

The key positive social impacts associated with the operational phase of the proposed development activities have been defined as:

- The establishment of infrastructure to improve energy security and support renewable sector – The proposed developments will reduce the carbon footprint associated with energy generation, specifically when compared to South Africa's current reliance on coal powered energy to meet the majority of its energy needs and in context of the success of the REIPPPP.
- Creation of employment opportunities - Each PV SEF will create in the region of 20 full time employment opportunities during the operational phase, of which 70% will be unskilled, 25% semi-skilled 25%, and 5% skilled 5%. Most of the unskilled and low skilled workers will be local residents of De Aar.
- Benefits for local landowners - The proponent will enter into rental agreements with the affected landowners for the use of the land for the establishment of the proposed solar farms. In terms of the rental agreement the affected landowner will be paid an annual amount dependent upon the area affected. The additional income will reduce the risk to his livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs.
- Benefits associated with socio-economic contributions to community development - The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions (linked to Community Trusts) are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area.

The key negative social impacts associated with the operation phase of the proposed development activities have been defined as:

- Visual impacts and associated impacts on sense of place - The proposed developments will have the potential to impact on the areas existing rural sense of place. Based on an initial assessment of the location the potential impact on the areas sense of place associated with each individual Solar PV farm is likely to be limited. This will be confirmed by the appointed VIA.
- Potential impact on property values - The potential visual impacts associated with the proposed solar PV farms have the potential to impact on property values. Based on the results of a literature review undertaken for wind farms the potential impact on property values in rural areas is likely to be limited.
- Potential impact on tourism - The potential visual impacts associated with the proposed developments have the potential to impact on tourism facilities and tourism in the area. Based on the findings of the literature review there is limited evidence to suggest that the proposed developments would impact on the tourism in the PKSDM and ELM at a local and regional level. The potential impact on local tourism facilities in the vicinity of the sites will be confirmed during the Assessment Phase.

A breakdown of the anticipated impacts has been provided in Table 6. This impact table is to be applied the solar farms respectively. The findings of the significance of the impact assessment have been provided based on the finding of SIAs undertaken for similar activities within the vicinity of De Aar. The findings thereof will be confirmed during the Assessment phase.

Table 6. Anticipated social impacts of the operational phase of the respective solar farms.

Impact	Significance No Mitigation/Enhancement	Significance With Mitigation/Enhancement
Establish infrastructure to generate renewable energy	Moderate (Positive)	Moderate (Positive)
Creation of employment and business opportunities during maintenance	Low (Positive)	Medium (Positive)
Benefit associated with community trust	Moderate (Positive)	High (Positive)
Benefits for landowners	Low (Positive)	Medium (Positive)
Visual impact and impact on sense of place	Low-Moderate (Negative)	Low-Moderate (Negative)
Impact on property values	Low-Moderate (Negative)	Low-Moderate (Negative)
Impact on tourism	Low-Moderate (Negative)	Low-Moderate (Negative)

- **Decommissioning phase impacts:**
  The number of jobs lost will be in the region of 20 for each PV SEF. The impacts associated with the loss of jobs during the decommissioning phase can be affectively mitigated. With mitigation the significance is likely to be **Low Negative**.

- **Cumulative impacts:**
  Cumulative impact on sense of place. It will be difficult to mitigate the visual impact on the areas sense of place. The significance will be informed by the Visual Impact Assessment.
  Cumulative impact on local services and accommodation. With effective mitigation the impact significance is likely to be **Low Negative**.
  Cumulative impact on local economy. With enhancement the impact significance is likely to the be **High Positive.**

- **No-development option:**
  The No-Development option would represent a lost opportunity for South Africa to improve energy security and supplement its current energy needs with clean, renewable energy. Given South Africa's current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant negative social cost.

Conclusion: Based on the findings of the Social Scoping Assessment the establishment of Hercules Solar PV Cluster and associated infrastructure will create employment and business opportunities for locals in the Municipality during both the construction and operational phase of the project. Based on other simi.ar projects all of the potential negative impacts, with the exception of the impact on sense of place, can also be effectively mitigated.

The regulations require a minimum ownership of 2.5% by local communities in IPP projects as a procurement condition. This is to ensure that a substantial portion of the investments has been

structured and secured as local community equity. An individual community's dividends earned will depend on the terms of each transaction corresponding with the relevant equity share. To date all shareholding for local communities have been structured through the establishment of community trusts. The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. Based on other similar projects the significance of this impact is likely to be **High Positive**. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The establishment of the proposed Hercules Solar PV Cluster and associated infrastructure including a battery energy storage system (BESS) is therefore supported by the findings of the Social Scoping Assessment.

A socio-economic specialist will be appointed to undertake the refined impact assessment.

3.13. Relative RFI Theme Sensitivity

The **Screening Tool** suggests that RFI is of **Very High** sensitivity and that a RFI assessment be conducted.

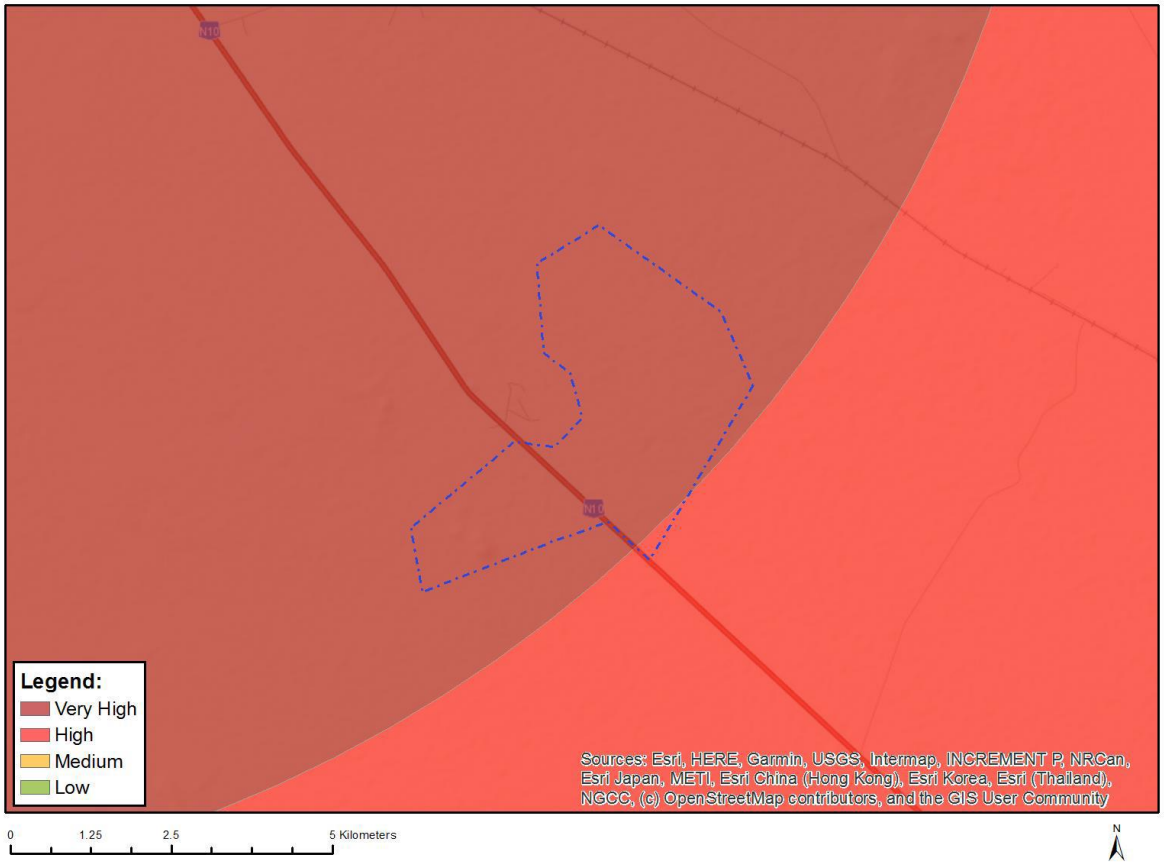


Figure 33: Relative RFI Theme Sensitivity Map

Sensitivity Features

Sensitivity	Feature(s)
Very High	Less than 18 km form a Weather Radar installation

Observation on Site - by the EAP: No weather radar installations were seen from the site.

Conclusion: At the time of the compilation of this report, a specialist was not specifically appointed to undertake the evaluation of the impacts on the existing infrastructure. The South African Astronomy Observatory (SARAO) will be consulted throughout the S&EIAR phases to provide written comments on the proposed developments.

3.14. Terrestrial Biodiversity

The **Screening Tool** suggest that the Terrestrial Biodiversity theme is of a **Very High** sensitivity and that a Terrestrial Biodiversity Impact Assessment be conducted.

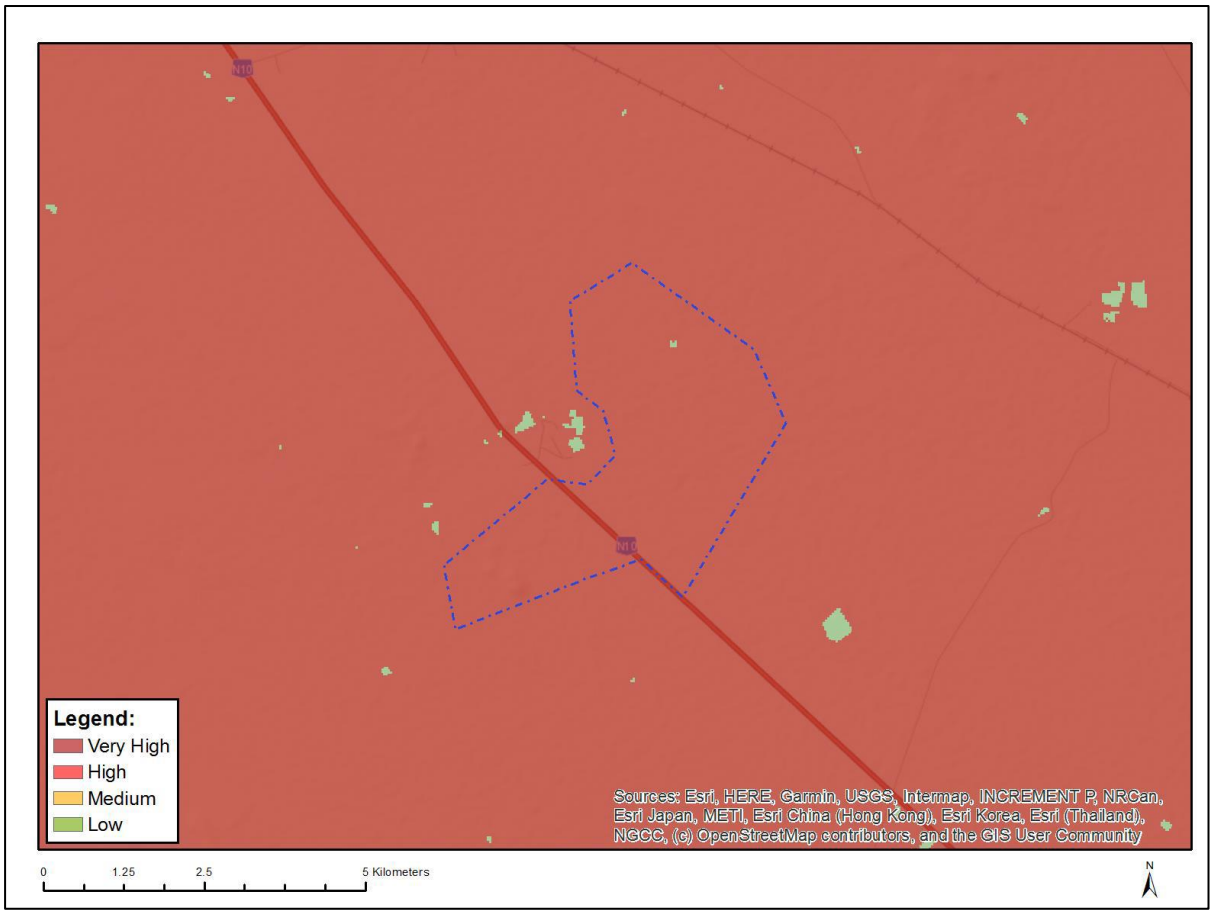


Figure 34: Relative Terrestrial Biodiversity Theme Sensitivity Map

Sensitivity Features

Sensitivity	Feature(s)
Very High	Ecological support area

Observation on Site - by the EAP: Multiple animal species (listed under the Animal Species Theme) were seen on site, amongst the dense and fairly undisturbed vegetation, indicating a healthy ecosystem. Furthermore, the farmers indicated the drainage areas and seasonal watercourses across the site.

Observation on Site - by the Specialist: The Biodiversity Company was appointed for the to undertake the terrestrial biodiversity scoping report for the proposed developments to evaluate the impacts on the sensitive features as indicated in the summary table above. It should be noted that the specialist appointed to undertake this scoping report has, at the time of compiling this report, not been to site. The site visit was planned for 17-21 October 2022.

Northern Cape Biodiversity Spatial Plan

The findings of the Terrestrial Scoping section in terms of the sensitivities listed above were observed through the Northern Cape Biodiversity Spatial Plan (BSP) (2016). The purpose of the Northern Cape BSP (2016) is to inform land-use planning and development on a provincial scale and to aid in natural resource management. One of the outputs is a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely CBA1 areas, CBA2 areas, ESA areas and Other Natural Areas (ONAs) based on biodiversity characteristics, spatial configuration, and requirements for meeting targets for both biodiversity patterns and ecological processes.

The proposed Hartebeest Hoek Solar PV1 development will be entirely located within an Ecological Support Area.

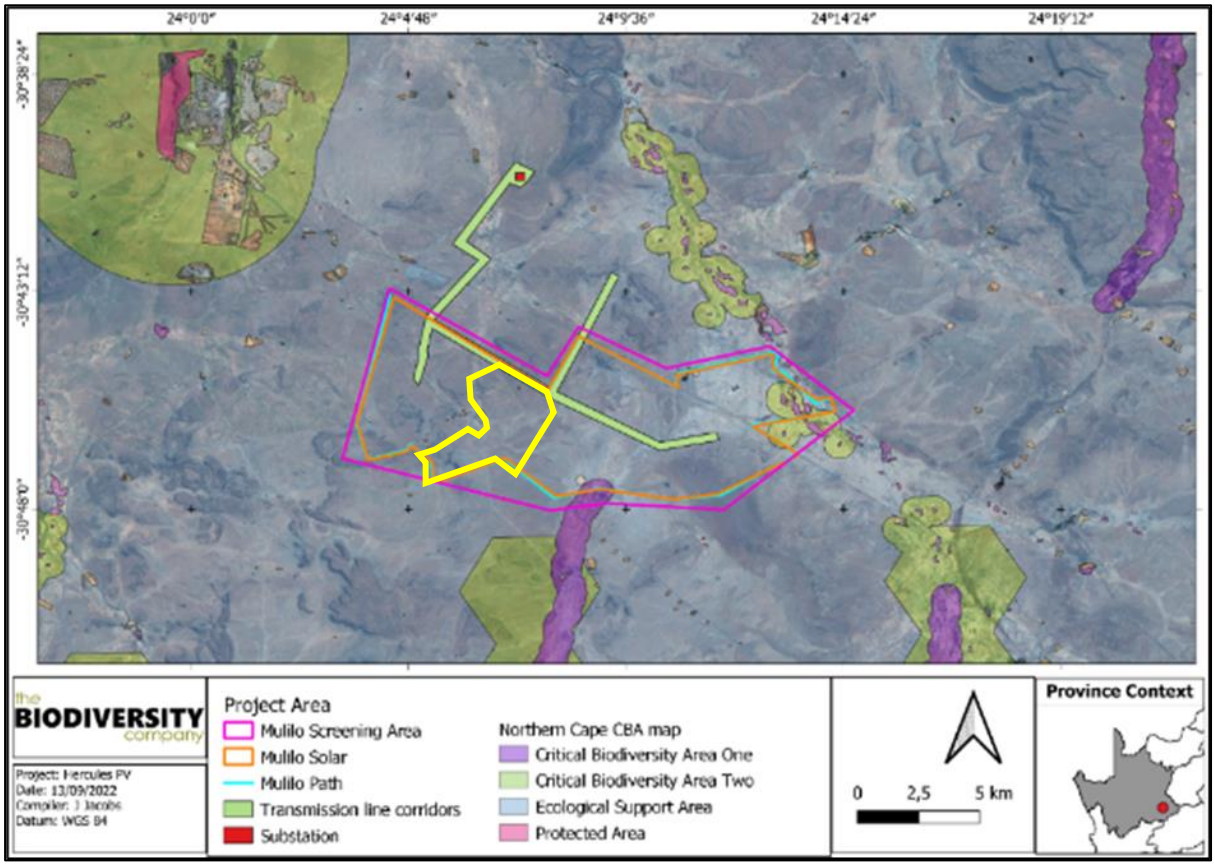


Figure 35: Map illustrating the locations of the CBAs and ESAs within the site.

Ecosystem Treat status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in

good ecological condition. According to the spatial dataset the proposed project overlaps with a LC ecosystem.

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed project overlaps mainly with a NP ecosystem, and partially the corridor with a PP ecosystem (Figure 36).

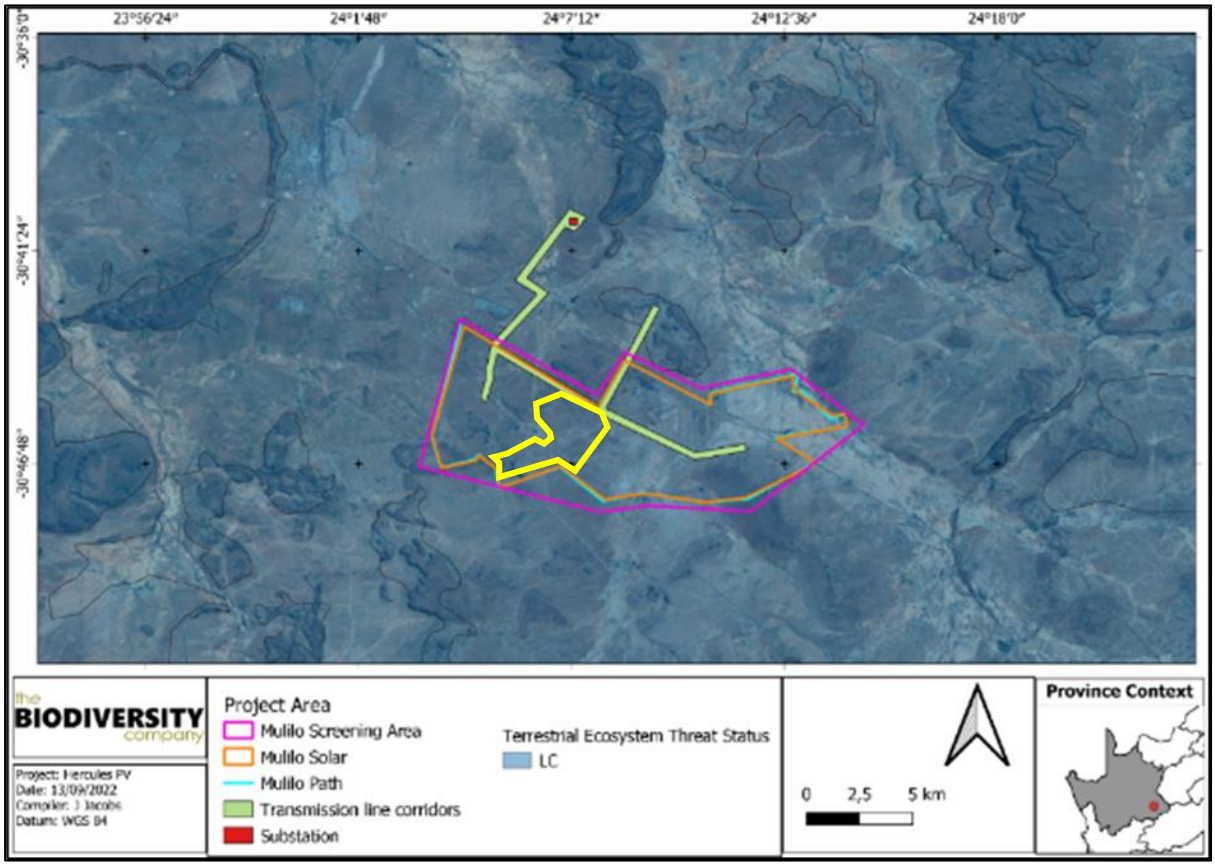


Figure 36: Map illustrating the extent of the Ecosystem Threat in within proximity to the site.

Protected areas and the National Protected Area Expansion Strategy

According to the protected area spatial datasets from SAPAD (2022) and SACAD (2022), the project area does not overlap with any protected areas or conservation areas. The nearest protected area, De Aar Nature Reserve, is located 16 km North-West from the project area (Figure 37). Thus, the project area is located outside of the 5 km Protected Area Buffer Zone of the nearest protected area.

National Protected Area Expansion Strategy 2016 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. The project area does not overlap with any NPAES areas (Figure 37).

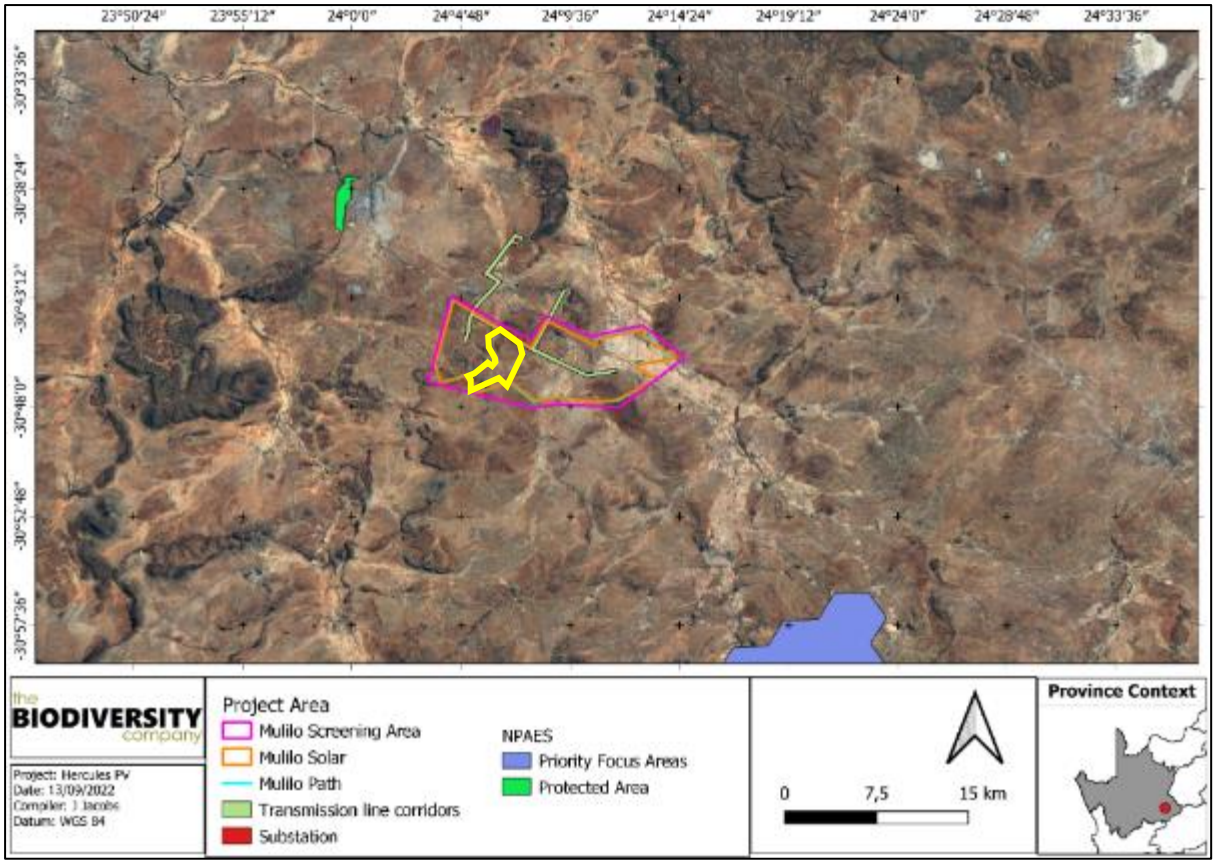


Figure 37: Map illustrating the locations of the Protected areas and Priority Focus Areas.

Conclusion: An appropriately registered SACNASP professional will be appointed to undertake a site visit and to determine the appropriate assessment to address the relevant sensitivity. SANBI will be included as an I&AP as part of the Environmental processes.

4. SUMMARY OF SPECIALIST STUDIES' APPLICABLE

Approximately 9 specialist studies will be undertaken.

Suggest Specialist Assessment	Applicability to the Proposal	Protocol
Agricultural Compliance Statement	Yes	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_WindAndSolar_Agriculture_Assessment_Protocols.pdf
Landscape and Visual Impact Assessment		https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
Archaeological and Cultural Heritage Impact Assessment		https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf

Palaeontology Impact Assessment		https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
Terrestrial Biodiversity Impact Assessment		https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_Protocols.pdf
Aquatic Biodiversity Impact Assessment		https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
Civil Aviation Assessment	No	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Civil_Aviation_Installations_Assessment_Protocols.pdf
Defense Assessment	No	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Defence_Installations_Assessment_Protocols.pdf
RFI Assessment	No	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
Geotechnical Assessment	No	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
Socio-Economic Assessment	Yes	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
Plant Species Compliance Statement		https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
Animal Species Assessment		https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Animal_Species_Assessment_Protocols.pdf

Technical input will be supplied by the engineering team.

5. CONCLUSION

From the findings of this report, SES proposes that the below recommended specialist inputs, will be sufficient to address the site sensitivities:

- Agricultural Compliance Statement
- Landscape and Visual Impact Assessment
- Archaeological and Cultural Heritage Impact Assessment
- Palaeontology Impact Assessment
- Terrestrial Biodiversity Impact Assessment
- Aquatic Biodiversity Impact Assessment
- Socio-Economic Assessment
- Plant Species Compliance Statement
- Animal Species Assessment

The aforementioned relevant specialist assessments will be undertaken and will contribute to the Scoping and Environmental Impact Assessment Report. Following consultation with the competent authority, additional assessments may be advised and undertaken.

All assessments will be undertaken in line with the protocols as promulgated for the respective themes. The requirements of the protocols have been incorporated into the Terms of References of the various specialists.