HERITAGE IMPACT ASSESSMENT

(REQUIRED UNDER SECTION 38(8) OF THE NHRA (No. 25 OF 1999)

For the Karroid PV Project, Upington, Northern Cape Province

Type of development:

Solar Development

Client:

Karroid PV (Pty) Ltd

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Project Reference:

2026

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APPROVAL PAGE

Project Name	Karroid PV
Report Title	Heritage Impact Assessment Karroid PV Project, Upington, Northern Cape Province
Authority Reference Number	To be allocated
Report Status	Final Report
Applicant Name	Karroid PV (Pty) Ltd

	Name	Qualifications and Certifications	Date
Archaeologist	Jaco van der Walt	MA Archaeology ASAPA #159 APHP #114	April 2020
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Date	Report Reference Number	Description of Amendment

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REPORT OUTLINE

Appendix 6 of the GNR 326 EIA Regulations published on 7 April 2017 provides the requirements for specialist reports undertaken as part of the environmental authorisation process. In line with this, Table 1 provides an overview of Appendix 6 together with information on how these requirements have been met.

Table 1. Specialist Report Requirements.

Requirement from Appendix 6 of GN 326 EIA Regulation 2017	Chapter
(a) Details of - (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Section a Section 12
(b) Declaration that the specialist is independent in a form as may be specified by the competent authority	*Declaration of Independence*
(c) Indication of the scope of, and the purpose for which, the report was prepared	Section 1
(cA)an indication of the quality and age of base data used for the specialist report	Section 3.4 and 7.1.
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	9
(d) Duration, Date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3.4
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 8 and 9
(g) Identification of any areas to be avoided, including buffers	Section 9
(h) Map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Section 8
(I) Description of any assumptions made and any uncertainties or gaps in knowledge	Section 3.7
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity **including identified alternatives on the environment** or activities;	Section 9
(k) Mitigation measures for inclusion in the EMPr	Section 9 and 10
(l) Conditions for inclusion in the environmental authorisation	Section 9 and 10
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 9 and 10
(n) Reasoned opinion - (i) as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 10.2
(o) Description of any consultation process that was undertaken during the course of preparing the specialist report	Section 6
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Refer to BA report
(q) Any other information requested by the competent authority	Section 10

Executive Summary

HCAC was appointed to conduct a Heritage Impact Assessment of the proposed Karroid PV on the Remaining Extent of farm Geel Kop 456 located between Upington and Keimoes. This PV facility forms part of seven other facilities planned for the same farm. The aim of the assessment is to understand the heritage character of the area and to assess the impact of the proposed development on these non-renewable resources. The study area was assessed on a desktop level that informed an archaeological predictive model highlighting area of low, medium and high expectations. The field survey was conducted as a non-intrusive pedestrian survey focusing on areas of high and medium expectation but also confirming the presence of sites in low expectation areas.

The study area is characterised by Aeolian sand on top of a calcrete substrata with knee-high grass cover and shrubs. Next to drainage lines and higher-lying areas, the calcrete is exposed, and palimpsests of widespread background scatter of mainly Middle Stone Age (MSA) and to a lesser extent Later Stone Age (LSA) lithics area found in a deflated context. Similar widespread occurrences were recorded in the immediate area (Gaigher 2013, Fourie 2014 and Van der Walt 2015, 2019 a and b). These artefacts are referred to as background scatter (Orton 2016) and generally of low heritage significance. An Early Stone Age (ESA) site was recorded next to a raw material outcrop. Artefact density is low but diagnostic artefacts included bifacial handaxes, cores and flakes. The lack of any other substantial ESA finds on the farm or neighbouring farms means that this site is of low to medium significance.

According to the SAHRA paleontological sensitivity map, the area is of moderate paleontological sensitivity and an independent study was conducted by Prof Marion Bamford. The study recommended that a Fossil Chance Find Protocol should be added to the EMPr.

The impact of the proposed project on heritage resources is considered acceptable with the correct mitigation measures in place. It is therefore recommended that the proposed project can commence provided that the recommendations in this report are adhered to as part of the EMPr and based on the approval of SAHRA.

Recommendations:

- Surface sampling and analysis of artefacts are recommended at Waypoint 113 (ESA site) to ensure that the technology is adequately described.
- Compilation of a development heritage management plan for the entire Geel Kop Farm RE 456 prior to construction;
- Implementation of a chance find procedure for both the archaeological and palaeontological components.

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Declaration of Independence

Specialist Name	Jaco van der Walt
Declaration of Independence	I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations (as amended), that I: • I act as the independent specialist in this application; • I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, and will not engage in, conflicting interests in the undertaking of the activity; • I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; • All the particulars furnished by me in this form are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.
Signature	
Date	20/04//2020

a) Expertise of the specialist

Jaco van der Walt has been practising as a CRM archaeologist for 15 years. He obtained an MA degree in Archaeology from the University of the Witwatersrand focusing on the Iron Age in 2012 and is a PhD candidate at the University of Johannesburg focussing on Stone Age Archaeology with specific interest in the Middle Stone Age (MSA) and Later Stone Age (LSA). Jaco is an accredited member of ASAPA (#159) and have conducted more than 500 impact assessments in Limpopo, Mpumalanga, North West, Free State, Gauteng, KZN as well as he Northern and Eastern Cape Provinces in South Africa.

Jaco has worked on various international projects in Zimbabwe, Botswana, Mozambique, Lesotho, DRC Zambia, Guinea and Tanzania. Through this he has a sound understanding of the IFC Performance Standard requirements, with specific reference to Performance Standard 8 – Cultural Heritage.

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ABBREVIATIONS

AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BGG Burial Ground and Graves
BIA: Basic Impact Assessment
CFPs: Chance Find Procedures
CMP: Conservation Management Plan
CRR: Comments and Response Report
CRM: Cultural Resource Management
DEA: Department of Environmental Affairs
EA: Environmental Authorisation
EAP: Environmental Assessment Practitioner
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact Assessment Practitioner
EMP: Environmental Management Programme
ESA: Early Stone Age
ESIA: Environmental and Social Impact Assessment
GIS Geographical Information System
GPS: Global Positioning System
GRP Grave Relocation Plan
HIA: Heritage Impact Assessment
LIA: Late Iron Age
LSA: Late Stone Age
MEC: Member of the Executive Council
MIA: Middle Iron Age
MPRDA: Mineral and Petroleum Resources Development Act
MSA: Middle Stone Age
NEMA National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NID Notification of Intent to Develop
NoK Next-of-Kin
PRHA: Provincial Heritage Resource Agency
SADC: Southern African Development Community
SAHRA: South African Heritage Resources Agency

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations and must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological site (remains of human activity over 100 years old)
Early Stone Age (~ 2.6 million to 250 000 years ago)
Middle Stone Age (~ 250 000 to 40-25 000 years ago)
Later Stone Age (~ 40-25 000, to recently, 100 years ago)
The Iron Age (~ AD 400 to 1840)
Historic (~ AD 1840 to 1950)
Historic building (over 60 years old)

1 Introduction and Terms of Reference:

HCAC has been contracted by Karroid PV (Pty) Ltd to conduct a Heritage Impact Assessment of the proposed Karroid PV development footprint. The report forms part of the Basic Assessment (BA) and Environmental Management Programme Report (EMPR) for the project located in the Northern Cape Province (Figure 1 -3).

The aim of the study is to survey the proposed development footprint to understand the heritage character of the study area. It serves to assess the impact of the proposed project on non-renewable heritage resources and to submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. It is also conducted to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999). The report outlines the approach and methodology utilised before and during the survey, which includes: Phase 1, review of relevant literature; Phase 2, the physical surveying of the area on foot and by vehicle; Phase 3, reporting the outcome of the study.

During the survey, MSA and LSA lithics were recorded. General site conditions and features on sites were recorded by means of photographs, GPS locations, and site descriptions. Possible impacts were identified, and mitigation measures are proposed in the following report. SAHRA as a commenting authority under section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) requires all environmental documents, complied in support of an Environmental Authorisation application as defined by NEMA EIA Regs section 40 (1) and (2), to be submitted to SAHRA. As such, the Basic Assessment report and its appendices must be submitted to the case as well as the EMPr, once it is completed by the Environmental Assessment Practitioner (EAP).

1.1 Terms of Reference

Field study
Conduct a field study to: (a) locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points of sites/areas identified as significant areas; c) determine the levels of significance of the various types of heritage resources affected by the proposed development.

Reporting
Report on the identification of anticipated and cumulative impacts the operational units of the proposed project activity may have on the identified heritage resources for all 3 phases of the project; i.e., construction, operation and decommissioning phases. Consider alternatives, should any significant sites be impacted adversely by the proposed project. Ensure that all studies and results comply with the relevant legislation, SAHRA minimum standards and the code of ethics and guidelines of ASAPA. To assist the developer in managing the discovered heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999).

1.2 Project Description

The project comprises a solar development as indicated in Table 2 and Table 3. The powerline grid layout is indicated on maps in the report but are only for contextual purposes as the grid will be assessed in a separate BAR.

Table 2: Project Description

Type of development	100MW Solar Energy Facility
Size of farm and portions	The Remaining Extent of Geel Kop Farm No 456; Total Property Size: 4117.3628 ha
Magisterial District	Registration Division of Gordonia RD, ZF Mgcawu District Municipality, Northern Cape Province
1: 50 000 map sheet number	2821 CA
Central co-ordinate of the development	28°36'32.41"S 21° 0'56.58"E

Table 3: Infrastructure and project activities

Type of development	Solar Development
Project size	Development footprint is approximately 240 ha
Project Components	Solar photovoltaic (PV) with either of fixed-tilt-, single-axis tracking- or dual-axis tracking- mounting structures. PV structures/ modules: Laydown area: ± 3-5 ha Internal roads ± 6.5 ha Auxiliary buildings: ± 1 ha Facility substation: up to 0.5 ha

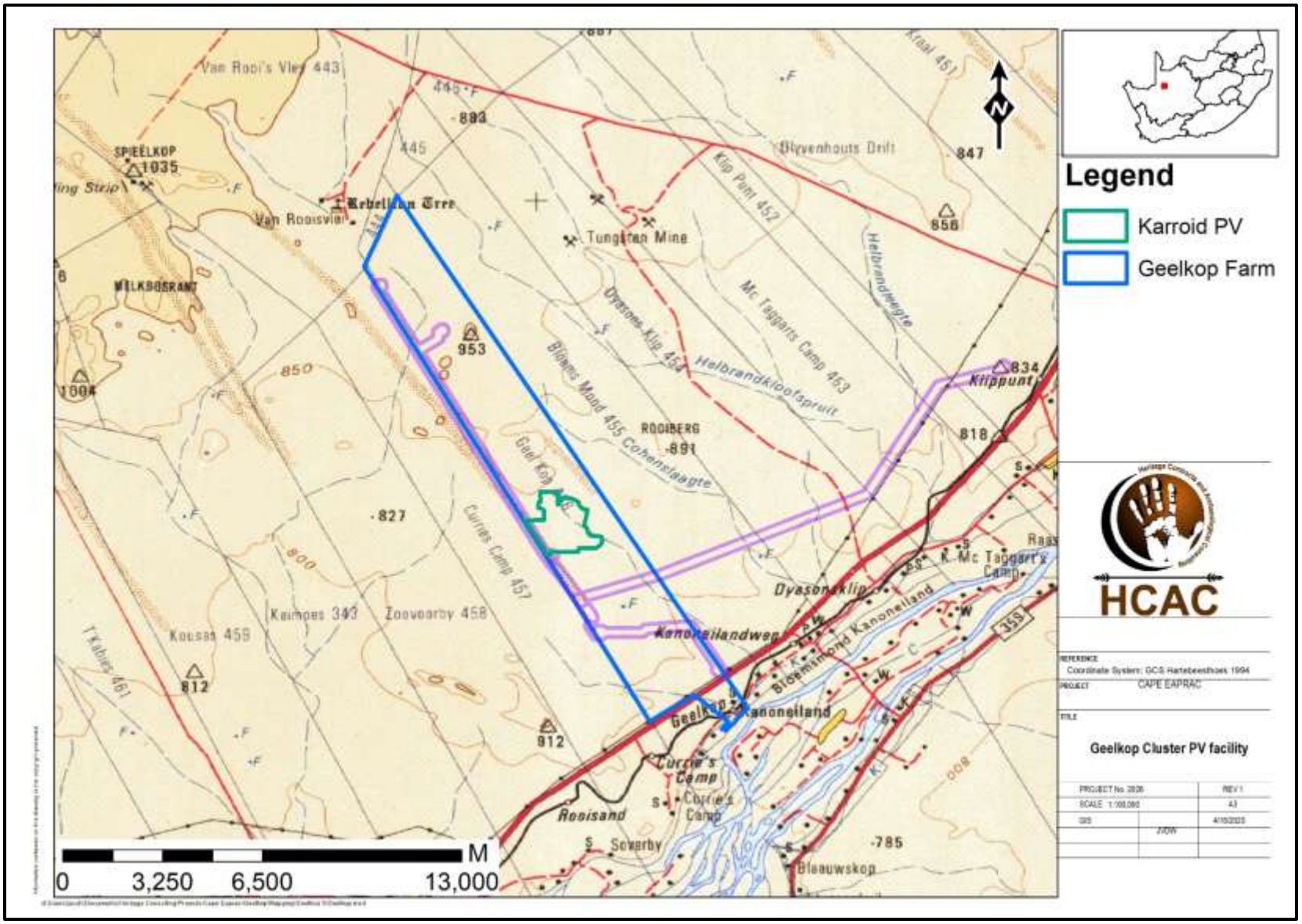


Figure 1. Regional setting (1: 250 000 topographical map) of the farm Geel Kop RE 456.

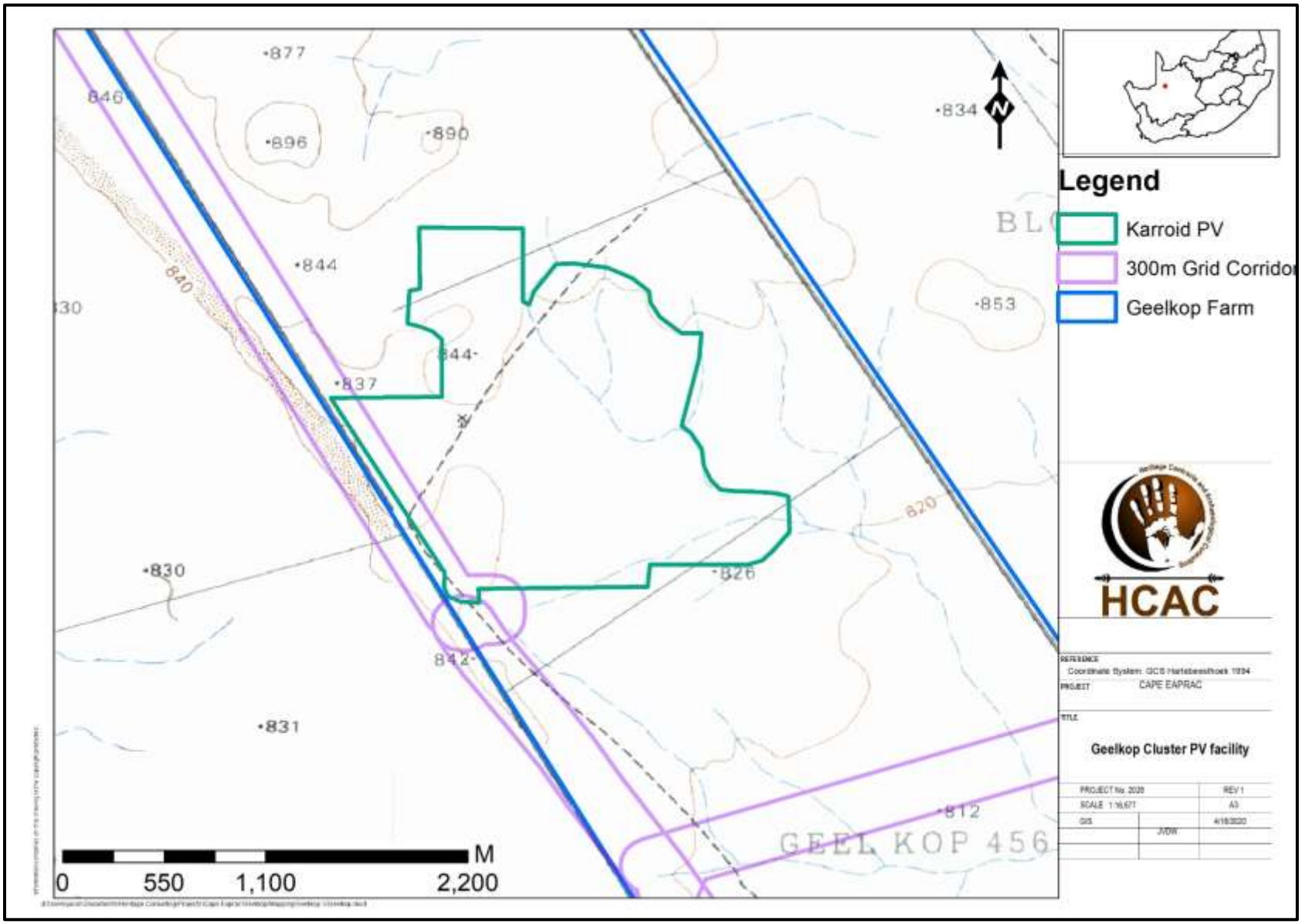


Figure 2: Local setting (1:50 000 topographical map).

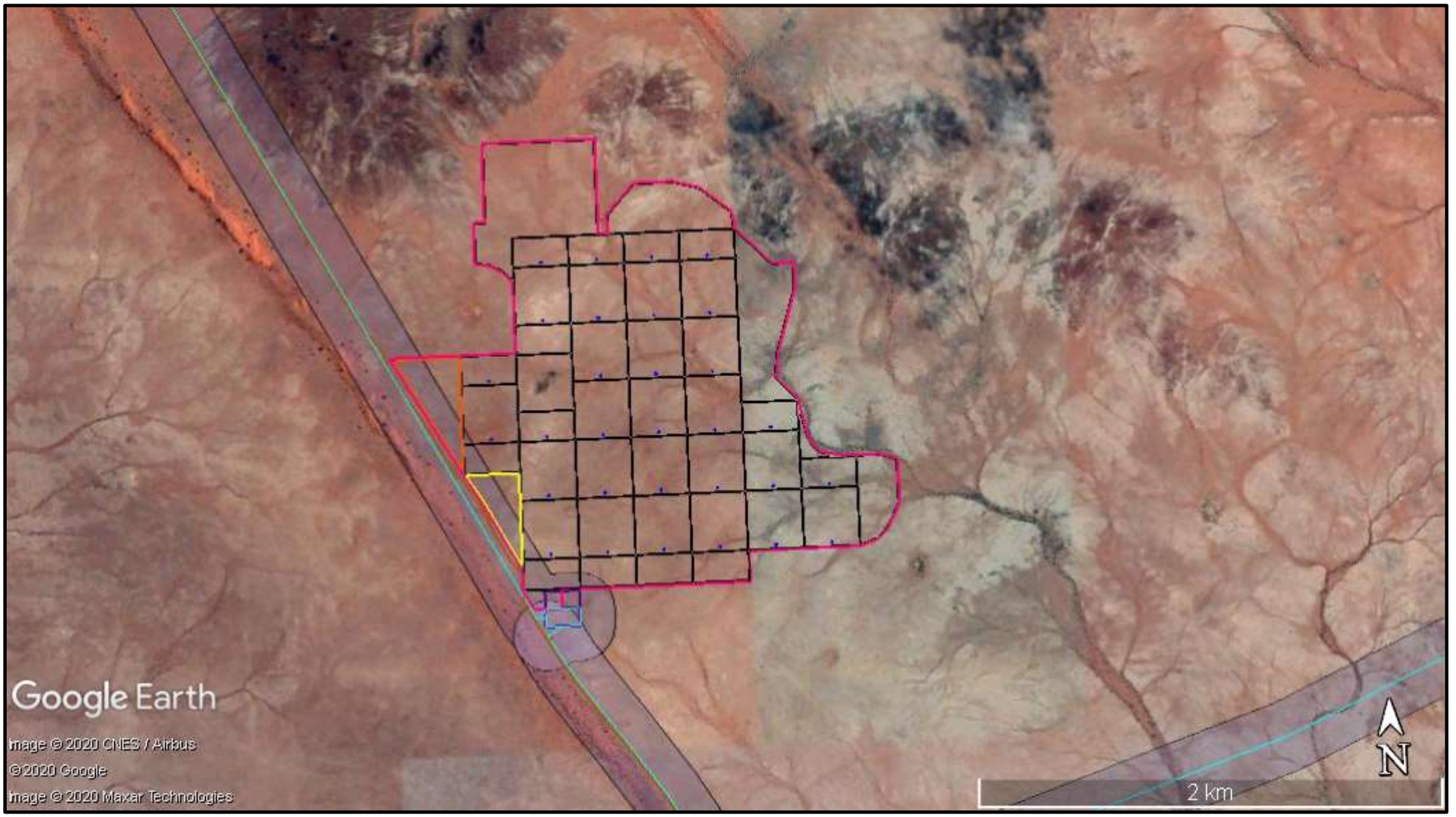


Figure 3. Satellite image indicating the proposed PV layout and grid corridor (Google Earth 2020).

2 LEGISLATIVE REQUIREMENTS

The HIA, as a specialist sub-section of the EIA, is required under the following legislation:

- National Heritage Resources Act (NHRA), Act No. 25 of 1999)
- National Environmental Management Act (NEMA), Act No. 107 of 1998 - Section 23(2)(b)
- Mineral and Petroleum Resources Development Act (MPRDA), Act No. 28 of 2002 - Section 39(3)(b)(iii)

A Phase 1 HIA is a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of heritage specialist input is to:

- Identify any heritage resources, which may be affected;
- Assess the nature and degree of significance of such resources;
- Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- Assess the negative and positive impact of the development on these resources; and
- Make recommendations for the appropriate heritage management of these impacts.

The HIA should be submitted, as part of the impact assessment report or EMPr, to the PHRA if established in the province or to SAHRA. SAHRA will ultimately be responsible for the professional evaluation of Phase 1 AIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 AIA reports and additional development information, as per the impact assessment report and/or EMPr, to be submitted in duplicate to SAHRA after completion of the study. SAHRA accepts Phase 1 AIA reports authored by professional archaeologists, accredited with ASAPA or with a proven ability to do archaeological work.

Minimum accreditation requirements include an Honours degree in archaeology or related discipline and three years post-university CRM experience (field supervisor level). Minimum standards for reports, site documentation and descriptions are set by ASAPA in collaboration with SAHRA. ASAPA is based in South Africa, representing professional archaeology in the SADC region. ASAPA is primarily involved in the overseeing of ethical practice and standards regarding the archaeological profession. Membership is based on proposal and secondment by other professional members.

Phase 1 AIA's are primarily concerned with the location and identification of heritage sites situated within a proposed development area. Identified sites should be assessed according to their significance. Relevant conservation or Phase 2 mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Conservation or Phase 2 mitigation recommendations, as approved by SAHRA, are to be used as guidelines in the developer's decision-making process.

Phase 2 archaeological projects are primarily based on salvage/mitigation excavations preceding development destruction or impact on a site. Phase 2 excavations can only be conducted with a permit, issued by SAHRA to the appointed archaeologist. Permit conditions are prescribed by SAHRA and includes (as minimum requirements) reporting back strategies to SAHRA and deposition of excavated material at an accredited repository.

In the event of a site conservation option being preferred by the developer, a site management plan, prepared by a professional archaeologist and approved by SAHRA, will suffice as minimum requirement. After mitigation of a site, a destruction permit must be applied for with SAHRA by the applicant before development may proceed.

Human remains older than 60 years are protected by the National Heritage Resources Act, with reference to Section 36. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36[5]) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in this age category, located inside a formal cemetery administrated by a local authority, require the same authorisation as set out for graves younger than 60 years, in addition to SAHRA authorisation. If the grave is not situated inside a formal cemetery, but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws, set by the cemetery authority, must be adhered to.

Human remains that are less than 60 years old are protected under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning; or in some cases, the MEC for Housing and Welfare. Authorisation for exhumation and reinternment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. To handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

3 METHODOLOGY

3.1 Literature Review

A brief survey of available literature was conducted to extract data and information on the area in question to provide general heritage context into which the development would be set. This literature search included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS).

3.2 Genealogical Society and Google Earth Monuments

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located; these locations were marked and visited during the fieldwork phase. The database of the Genealogical Society was consulted to collect data on any known graves in the area.

3.3 Public Consultation and Stakeholder Engagement:

Stakeholder engagement is a key component of any EIA process; it involves stakeholders interested in, or affected by the proposed development. Stakeholders are provided with an opportunity to raise issues of concern (for the purposes of this report only heritage-related issues will be included). The aim of the public consultation process was to capture and address any issues raised by community members and other stakeholders during key stakeholder and public meetings. The process involved:

- Placement of advertisements and site notices
- Stakeholder notification (through the dissemination of information and meeting invitations);
- Stakeholder meetings undertaken with I&APs;
- Authority Consultation
- The compilation of a Basic Assessment Report (BAR).
- The compilation of a Comments and Response Report (CRR).

3.4 Site Investigation

Two professional archaeologists undertook the site investigation as an adaptive, non-intrusive survey, predominantly by a vehicular and pedestrian survey along the proposed linear infrastructure and pedestrian survey of the larger impact area. The aims of the field study are to:

- Survey the proposed project area to ground truth assumptions of the predictive model (Section 8.1) to confirm its accuracy and applicability in order to locate, identify, record, photograph and describe sites/areas of archaeological, historical or cultural interest;
- Identified heritage resources (sites or areas identified as significant) were recorded as waypoints using handheld GPS and documented through written and photographic records. The survey paths were recorded as GPS track logs;
- Determine the levels of significance of the various types of heritage resources expected in the project area.

Table 4: Site Investigation Details

	Site Investigation
Date	The farm Geel kop 456 RE was surveyed from 4 – 11 March 2020.
Season	Summer – vegetation cover in the study area is knee high hampering archaeological visibility. The study area was however sufficiently covered (Figure 11) to adequately record the range of heritage resources.

3.5 Site Significance and Field Rating

Section 3 of the NHRA distinguishes nine criteria for places and objects to qualify as 'part of the national estate' if they have cultural significance or other special value. These criteria are:

- Its importance in/to the community, or pattern of South Africa's history;
- Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;
- Sites of significance relating to the history of slavery in South Africa.
- The presence and distribution of heritage resources define a 'heritage landscape'. In this landscape, every site is relevant. In addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire project area, or a representative sample, depending on the nature of the project. In the case of the proposed project, the local extent of its impact necessitates a representative sample and only the footprint of the areas demarcated for development were surveyed. In all initial investigations, however, the specialists are responsible only for the identification of resources visible on the surface. This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The following criteria were used to establish site significance with cognisance of Section 3 of the NHRA:
    - The unique nature of a site;
    - The integrity of the archaeological/cultural heritage deposits;
    - The wider historic, archaeological and geographic context of the site;
    - The location of the site in relation to other similar sites or features;
    - The depth of the archaeological deposit (when it can be determined/is known);
    - The preservation condition of the sites; and
    - Potential to answer present research questions.
- In addition to this criteria field ratings prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purpose of this report (Table 5) The recommendations for each site should be read in conjunction with section 9 of this report.

Table 5. Field Rating and Heritage Significance

FIELD RATING	***GRADE***	***SIGNIFICANCE***	***RECOMMENDED MITIGATION***
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP. A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP. B)	-	Medium significance	Recording before destruction
Generally Protected C (GP. C)	-	Low significance	Destruction

3.6 Impact Assessment Methodology

The criteria below are used to establish the impact rating on sites:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0-1 years), assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years), assigned a score of 2;
  - medium-term (5-15 years), assigned a score of 3;
  - long term (> 15 years), assigned a score of 4; or
  - permanent, assigned a score of 5;
  - The **magnitude**, quantified on a scale from 0-10 where; 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
  - The **probability of occurrence**, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where; 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
  - The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
  - the **status**, which will be described as either positive, negative or neutral.
  - the degree to which the impact can be reversed.
  - the degree to which the impact may cause irreplaceable loss of resources.
  - the *degree* to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:
S=(E+D+M) P
S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability
The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e., where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e., where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- 60 points: High (i.e., where the impact must have an influence on the decision process to develop in the area).

3.7 Limitations and Constraints of the study

The authors acknowledge that the brief literature review is not exhaustive on the literature of the area. Due to the subsurface nature of archaeological sites, the possibility exists that some features or artefacts may not have been discovered/recorded during the survey and the depth of the deposit of known heritage sites cannot be accurately determined. Similarly, the possible occurrence of unmarked graves and other cultural material cannot be excluded. This report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys. Due to the considerable extent of the larger study area as well as possible lay out changes associated with the PV facility the entire farm could not be surveyed in detail to complete this assessment within reasonable parameters. In order to mitigate this limitation an archaeological predictive model was developed to refine the study area for in field assessments and to inform recommendations. This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.

4 DESCRIPTION OF SOCIO-ECONOMIC ENVIRONMENT

According to Census 2011, Kai !Garib Local Municipality has a total population of 65 869 people, of whom 62,2% are coloured, 28,3% are black African, 6,3% are white, and 0,8% are Indian/Asian. The other population groups make up the remaining 2,3%. In this municipality, 34,6% of households are headed by females. Of those aged 20 years and older, 8,7% have completed primary school, 39,1% have some secondary education, 15,5% have completed matric, and 3,9% have some form of higher education, while 9,0% of those aged 20 years and older have no form of schooling. 30 949 people are economically active (employed or unemployed but looking for work), and of these, 10% are unemployed. Of the 19 375 economically active youth (15 – 35 years) in the area, 10% are unemployed.

5 DESCRIPTION OF THE PHYSICAL ENVIRONMENT:

The farm Geel Kop RE 456 is located approximately 10 km north-east of Keimoes and to the north-west of the Orange River. There are various shallow drainage lines draining the study area that will be avoided by the PV facility. The drainage lines are mostly flowing in a south easterly direction to a non-perennial stream that flows into the Orange River

The climate can be described as arid to semi-arid with rainfall occurring from November to April. The study area is currently used for grazing and falls within a Savannah Biome as described by Mucina et al. (2006) with the vegetation described as Bushmanland Arid Grassland.

The study area is in a rural area marked by agricultural and renewable energy developments. The topography of the area is undulating characterised by Aeolian sand on top of a calcrete substrata with knee-high grass cover after the rains and shrubs (Figure **4**:General site conditions.Figure 4). The Lithology of the impact area is characterised by dark grey to leucocratic, equigranular to porphyritic granite, granodiorite, charnockite, minor diorite (Figure 5) consisting of dark-weathering, fine- to medium-grained, inequigranular (locally porphyritic) charnockitic adamellite (1:1,000,000 Geological Map) Karroid PV is located towards the centre portion of the Farm Geelkop with a higher elevation than the southern portion (Figure 6).

Figure 4:General site conditions.

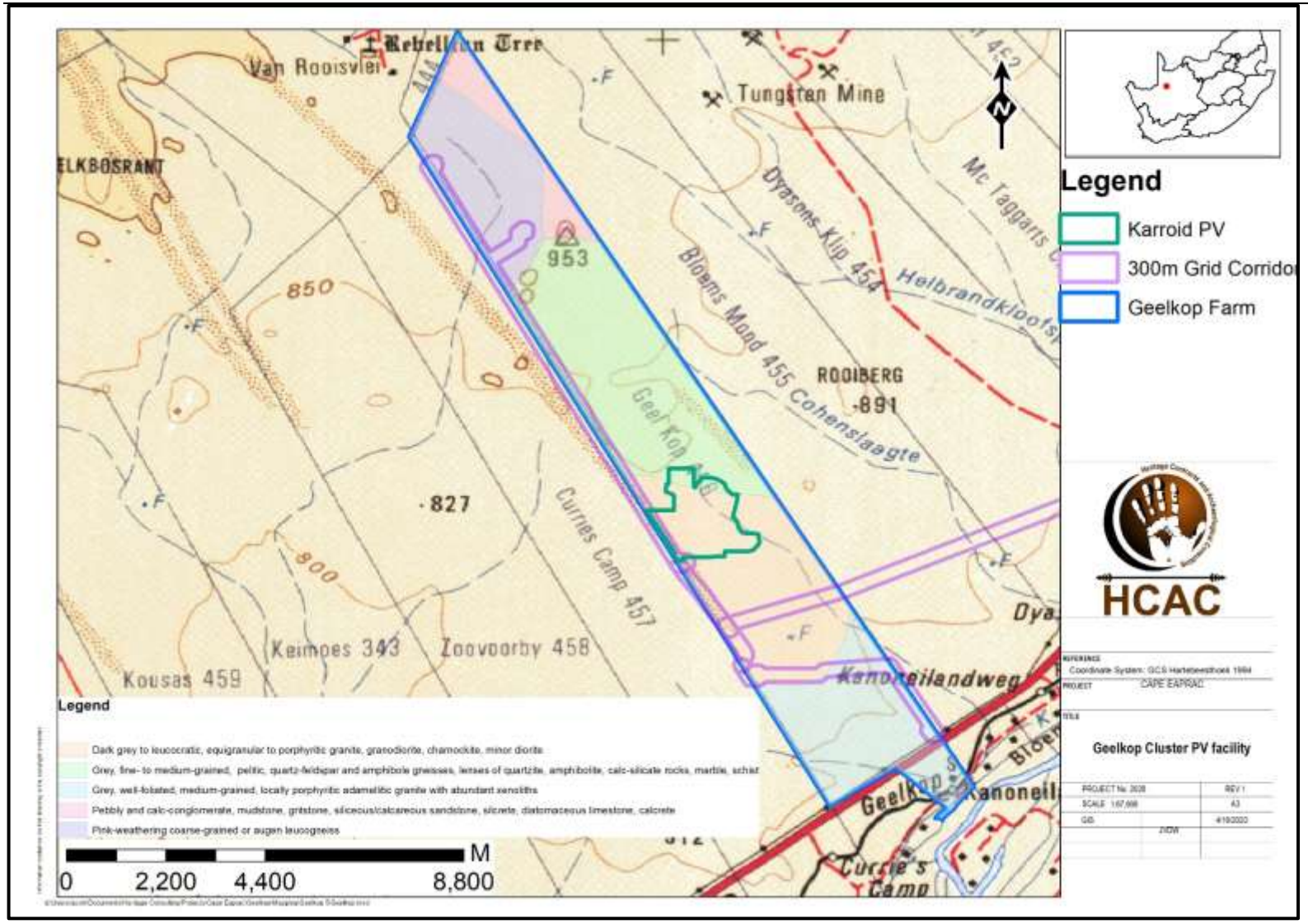


Figure 5. Lithology of the study area.

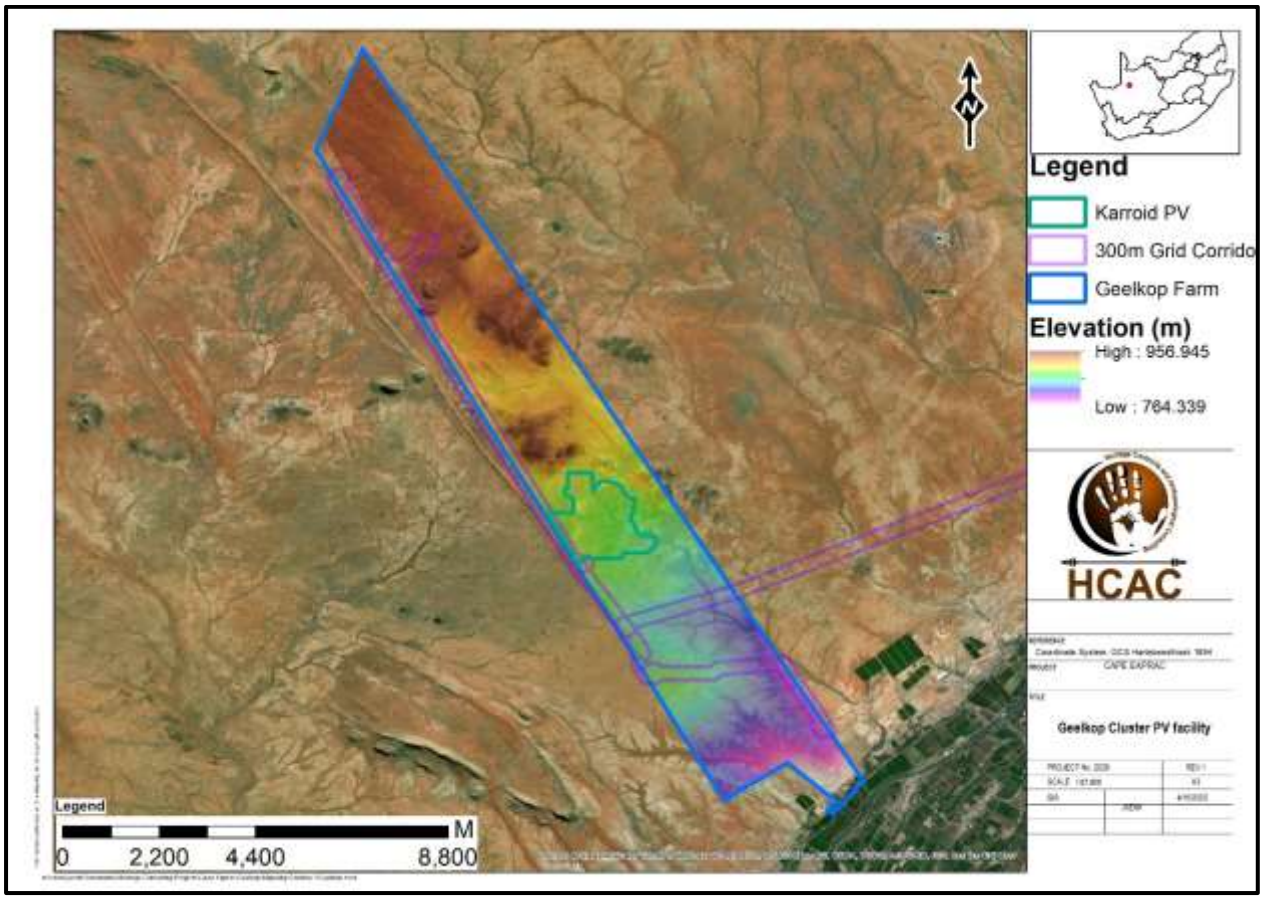


Figure 6. Elevation of the area of interest.

6 RESULTS OF PUBLIC CONSULTATION AND STAKEHOLDER ENGAGEMENT:

Adjacent landowners and the public at large were informed of the proposed activity as part of the EIA process. Site notices and advertisements notifying interested and affected parties were placed at strategic points and in local newspapers as part of the process.

7 LITERATURE REVIEW/ BACKGROUND STUDY:

7.1 SAHRIS

Several previous heritage studies were conducted in the general study area (SAHRIS) mostly to the east of the study area. The following CRM studies were consulted for this report:

Author	Year	Project	Findings
Van der Walt, J.	2011	Archaeological Impact Assessment For the proposed S Kol Photovoltaic Plant. Keimoes, Northern Cape	MSA Scatters, an Old Wagon Road and historical Mining Trenches
Gaigher, S.	2012	Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province	Stone Age Artefacts
Gaigher, S.	2013	Heritage Impact Assessment (HIA) Report, EIA Phase for the Proposed Sirius Solar Project near Upington in the Northern Cape Province	Stone Age Artefacts
Morris, D.	2013	Proposed development of Phase 2 and Phase 3 of the Upington Solar Thermal Plant on Portion 3 of the farm McTaggart's Camp 453 near Upington. Scoping Phase Input.	No sites of significance
Morris, D.	2013	RE Capital 3 Solar Development on the property Dyasons Klip west of Upington, Northern Cape: Scoping phase Heritage Input	No sites of significance
Morris, D.	2013	RE Capital 3 Solar Development on the property Dyasons Klip west of Upington, Northern Cape: Archaeological Impact Assessment – proposed 'central' development footprint	Stone Age Scatter and ruins of historical dwellings.
Fourie, W.	2014	Proposed Rooipunt Solar Power Park near Upington, KAI !GARIB Municipality, Northern Cape Province. Heritage Impact Assessment	Stone age, Herder and historical mining sites.
Morris, D.	2014	Proposed development of Phase 2 and Phase 3 of the Upington Solar Thermal Plant on Portion 3 of the farm McTaggart's Camp 453 near Upington. HIA	Tungsten mining infrastructure and Stone Age scatters.
Van der Walt, J.	2015	Archaeological Impact Assessment For the proposed AEP Bloemsmond Solar 2 PV project, Keimoes, Northern Cape	MSA Scatters
Hollman, J.& Fourie, W.	2016	Powerlines for Proposed Rooipunt Solar Thermal Power Park Project Near Upington, ZF Mgcawu District Municipality, Northern Cape Province Heritage Impact Assessment	Abandoned Mine infrastructure
Van der Walt, J	2019 a	Heritage Impact Assessment Sirius Solar PV Project 4, Upington, Northern Cape Province	Stone Age Scatters, Historical Tungsten Mining as well as Labourer housing and a stone cairn.
Van der Walt, J	2019 b	Heritage Impact Assessment Sirius Solar PV Project 3, Upington, Northern Cape Province. Unpublished report.	Stone Age Scatter and Tungsten Mining Trenches
Van der Walt, J	2019 c	Heritage Impact Assessment Bloemsmond 3 PV Project, Upington, Northern Cape Province	Stone Age sites as well as a stone cairn
Van der Walt, J	2019 d	Heritage Impact Assessment Bloemsmond 4 PV Project, Upington, Northern Cape Province	Stone Age and Historical Find spots
Van der Walt, J	2019 e	Heritage Impact Assessment Bloemsmond 5 PV Project, Upington, Northern Cape Province	Stone Age Sites, Stone packed features and historical features.
Van der Walt, J	2019 f	Heritage Impact Assessment Bloemsmond Grid Connection Project, Upington, Northern Cape Province	Stone age and historical features as well as tungsten mining trenches.

7.1.1 Genealogical Society and Google Earth Monuments

No known gravesites are indicated close to the study area, but burial sites (especially pre-colonial burial sites) can be expected anywhere on the landscape.

7.2 General History of the area

7.2.1 Archaeology of the area

7.2.1.1 Stone Age History

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. Each of these phases contains sub-phases or industrial complexes, and within these, we can expect regional variation regarding characteristics and time ranges. For Cultural Resources Management (CRM) purposes, it is often only expected/ possible to identify the presence of the three main phases.
Yet sometimes the recognition of cultural groups, affinities or trends in technology and/or subsistence practices, as represented by the sub-phases or industrial complexes, is achievable (Lombard 2011). The three main phases can be divided as follows:

- Later Stone Age; associated with Khoi and San societies and their immediate predecessors. Recently to ~30 thousand years ago
- Middle Stone Age; associated with Homo sapiens and archaic modern humans. 30-300 thousand years ago.
- Earlier Stone Age; associated with early Homo groups such as Homo habilis and Homo erectus. 400 000-> 2 million years ago.

The region is well-known as one that produced the largest sample (n = 56) of prehistoric skeletons in South Africa (Morris 1995). Excavated in 1936, known as the 'Kakamas Skeletons', and currently housed in the National Museum in Bloemfontein, they are considered the 'type' specimens of Khoi morphology (1992). Grave locations can be expected along the Gariep (perhaps up to 35 km from its shore) and on the Gariep Islands between Upington and the Augrabies Falls. They are often marked with stone burial cairns, dug into the alluvial soil or into degraded bedrock above the alluvial margin. Graves can be isolated or grouped in small clusters, sometimes containing up to eight graves (Morris 1995).

Burial cairns can be elaborately formed, some with upright stones in their centres, but they are often disturbed. Cairns from near the Gariep Islands are often characterised by their high conical shapes, and the grave shafts filled with stones. Those closer to Augrabies Falls, however, graves are low and rounded with ashes in the grave shaft. The placing of specularite or red ochre over the body was common, but other grave goods are rare (Morris 1995).

Where dating was possible, most of the skeletons were dated to the last 200 years-or-so, but association with archaeological material from up to about 1200 years old is possible. The grave sites show parallels to those of recent Khoi populations (Morris 1995).

Apart from the grave locations, archaeological sites of this period in the region have been further divided into the following three industries.

Doornfontein sites are mostly confined to permanent water sources. The assemblages contain a consistently large complement of thin-walled, grit-tempered, well-fired ceramics with thickened bases, lugs, bosses, spouts, and decorated necks or rims. Lithics are often produced on quartz and dominated by coarse irregular flakes with a small or absent retouched component (Beaumont *et al.* 1995; Lombard & Parsons 2008; Parsons 2008). Late occurrences contain coarser potsherds with some grass temper, a higher number of iron or copper objects, and large ostrich eggshell beads. These assemblages are mostly associated with the Khoi (Beaumont *et al.* 1995).

Swartkop sites can be almost contemporaneous with, or older than, the Doornfontein sites. They are usually characterised by many blades/bladelets and backed blades. Coarse undecorated potsherds, often with grass temper, and iron objects are rare. These sites are remarkably common throughout the region. They usually occur on pan or stream-bed margins, near springs, bedrock depressions containing seasonal water, hollows on dunes, and on the flanks or crests of koppies (Beaumont *et al.* 1995; Parsons 2008). Some of these sites are also associated with stone features, such as ovals or circles, that may represent the bases of huts, windbreaks or hunter's hides (Jacobson 2005; Lombard & Parsons 2008; Parsons 2004). These sites are linked to the historic /Xam communities of the area who usually followed a hunter-gatherer lifeway (Deacon 1986, 1988; Beaumont et al. 1995).

Wilton assemblages are distinguished by a significant incidence of cryptocrystalline silicates (mainly chalcedony) and contain many formal tools such as small scrapers, backed blades and bladelets. A regional variation of the Wilton in the area is often referred to as the Springbokoog Industry (Beaumont *et al.* 1995).

A few heavily patinated Later Stone Age clusters that include large scrapers may represent Oakhurst-type aggregates (Beaumont *et al*. 1995).

7.2.1.2 The Middle Stone Age

Previous collections of stone tools in the region include artefacts with advanced prepared cores, blades and convergent flakes or points. Most of the scatters associated with the Middle Stone Age have a 'fresh' or un-abraded appearance. They appear to be mostly associated with the post-Howiesons Poort (MSA 3) or MSA 1 sub-phases (Beaumont et al. 1995).

Substantial Middle Stone Age sites seem uncommon. However, where archaeological sites were excavated, such as a farm west of the study area, on Zoovoorbij 458, a Middle Stone Age assemblage was excavated beneath Later Stone Age deposits (Smith 1995). This shows that, although not always visible on the surface, the landscape was inhabited during this phase. The large flake component of the lower units of Zoovoorbij Cave has Levallois-type preparation on the striking platforms, reinforcing their Middle Stone Age context.

7.2.1.3 The Earlier Stone Age

Stone artefacts associated with this phase, based on their morphology, seem moderately to heavily weathered. Scatters may include long blades, cores (mainly on dolerite), and a low incidence of formal tools such as handaxes and cleavers. Clusters with distinct Acheulean characteristics have been recorded in the area (Beaumont *et al.* 1995).

7.2.2 Anglo-Boer War

The discovery of diamonds and gold in the Northern provinces had very important consequences for South Africa. After the discovery of these resources, the British, who at the time had colonized the Cape and Natal, had intensions of expanding their territory into the northern Boer republics. This eventually led to the Anglo-Boer War, which took place between 1899 and 1902 in South Africa, and which was one of the most turbulent times in South Africa's history. Even before the outbreak of war in October 1899 British politicians, including Sir Alfred Milner and Mr. Chamberlain, had declared that should Britain's differences with the Z.A.R. result in violence, it would mean the end of republican independence. This decision was not immediately publicized, and as consequence republican leaders based their assessment of British intentions on the more moderate public utterances of British leaders. Consequently, in March 1900, they asked Lord Salisbury to agree to peace on the basis of the status quo ante bellum. Salisbury's reply was a clear statement of British war aims. (Du Preez 1977).

In March 1900 Boer forces had taken Prieska, Kenhardt, Kakamas and Upington, attracting rebel support in the process. British columns were able to recapture the towns, and the invasion had ended by June 1900. Local militias, including the Border Scouts (Upington), Bushmanland Borderers (Kenhardt) and Namaqualand Border Scouts (from the west) were established and patrolled the area.

7.2.3 Historical Context

It was necessary to use a wide range of sources in order to give an accurate account of the history of the area in which the farm Geelkop No. 456 RE is located. Sources included secondary source material, maps and archival documents.

7.2.3.1 The area under investigation

Figure 7. Gordonia District map dating to 1900. The farm Geel Kop 456 RE is indicated by a blue outline.

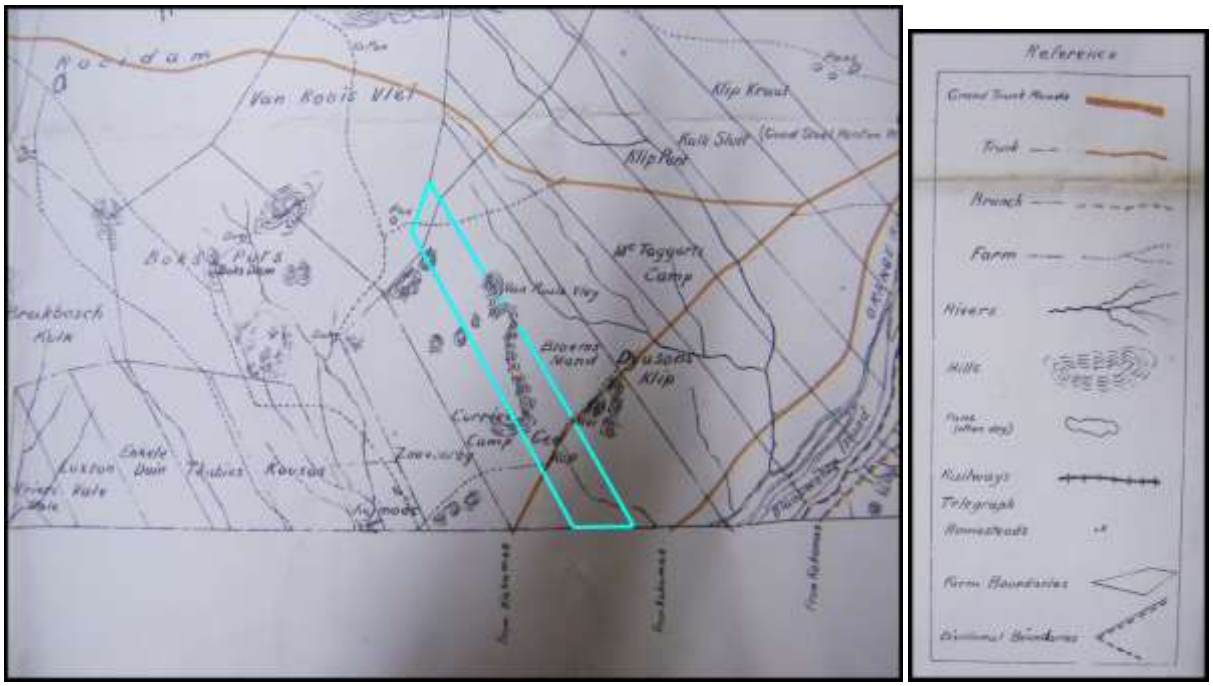


Figure 8. Upington district map dating to 1908.

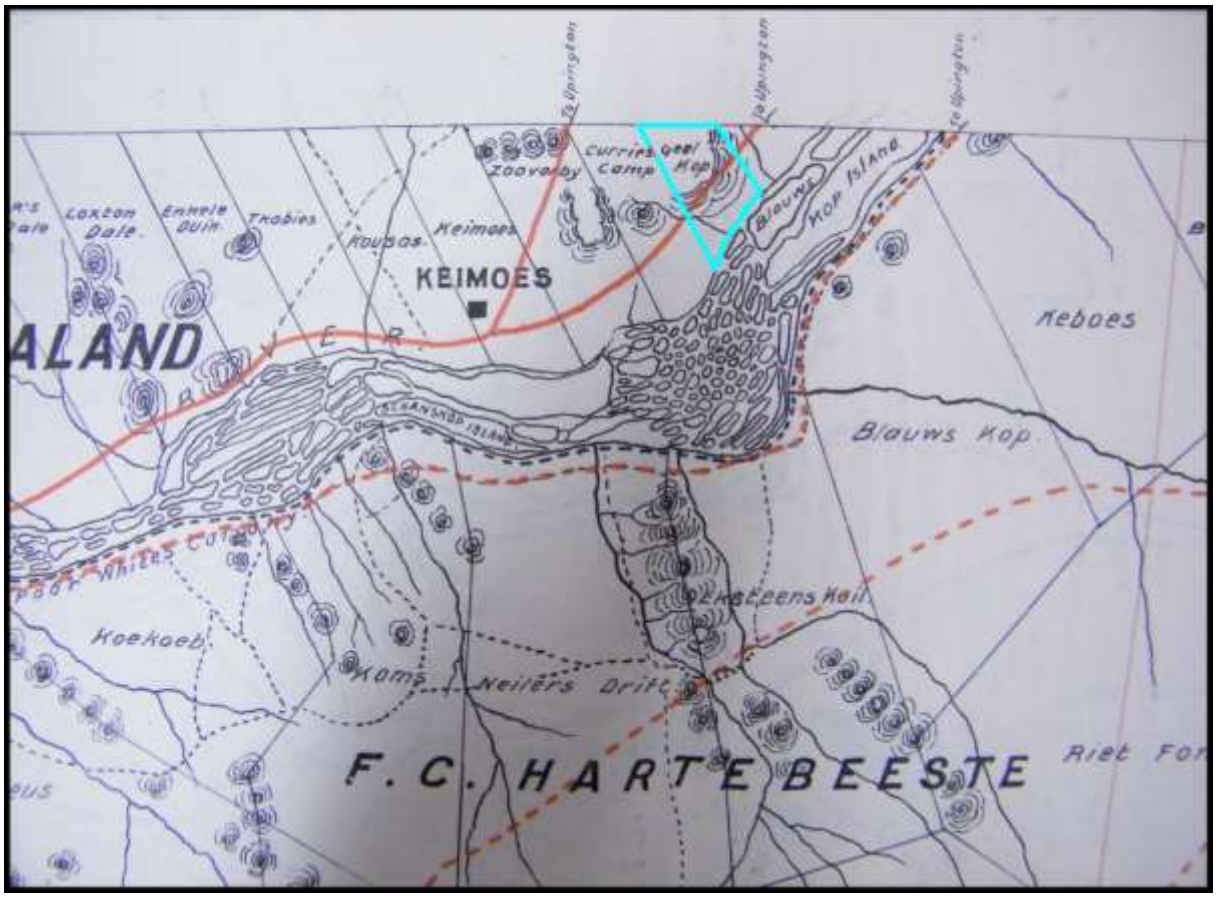


Figure 9. Undated Kenhardt District Map, drawn up by the Intelligence Division at the time. This shows that Geelkop formed part of both the Gordonia and Kenhardt districts. One can see that Geelkop is situated adjacent to, and to the northwest of the Blauws and Kop Islands, on the Orange River.

7.2.3.2 A Brief History of Human Settlement in the Gordonia Area

Some of the earliest known people to have lived in the Kakamas region were the Nameiqua people who lived at !Nawabdanas (today known as Renosterkop) during the late eighteenth century. In 1778 Hendrik Jacob Wikar and in 1779 Colonel R.J. Gordon came in contact with these people. The following descriptions of the Nameiqua and other groups of people that lived in this area are based on the accounts of Wikar and Gordon.

Although reference is made to the fact that Europeans started to move into this territory from at least the 1760s onwards, the first literate person to visit and describe the people living along the Orange River was H.J. Wikar. Wikar deserted the service of the Dutch East India Company and fled to the interior in 1775. He presented a report on his findings of the people he encountered in the interior to the Governor of the Cape with the hope that he would be pardoned and that he could return to live in the colony. In his report, Wikar, referred to the Khoi of the Orange River as Eynikkoa / Eynicqua. He divided them into four separate groups: the Namnykoa / Namikoa, who lived on the islands above the Augrabies Falls, the Kaukoa and the Aukokoa higher up the river close to Kanoneiland and the Gyzikoas in the vicinity near the present day Upington. Although these groups were closely related, the Gyzikoas were intermixed genetically and culturally with Bantu-speaking peoples from the northeast. Wikar also recorded the presence of a group of people who he called the “Klaare Kraal” people. This group of people was apparently “a strong Bushman Kraal of about twenty huts but with no cattle” (Morris, 1992).

Another European traveller that visited the same region was Colonel R.J. Gordon, who met a group of people called the Anoe Eys, roughly translated as “bright kraal” people. Gordon recorded that this group of “Bushmen catch fish and live by hunting, digging pits to trap rhinoceros at the side of the river.” Morris feels it reasonable that Wikar’s “Klaare Kraal” people and Gordon’s “bright kraal” people are the same group (Morris, 1992). Gordon went on to describe other people living along the river too and although the spelling of the names of the various group differ between these two early travellers it can be assumed that they are indeed speaking and describing the same groups of people.

In 1813 Reverend John Campbell travelled down the Orange River and met a group of people near the Augrabies Falls but was surprised by the few inhabitants that now lived in the area. This was mainly because of a period of severe drought and there was very little water in the area to support large human settlements. In 1824 another traveller, George Thompson rode through the central Bushmanland and reached the confluence of the Hartebeest and Orange Rivers very close to the modern Kakamas. According to his writings the whole area was deserted except for a small group of !Kora close to the Falls (Morris, 1992).

The Renosterkop settlement was on one of the large islands in the Orange River. Geographically the area that the Orange River flows through from Upington to the Augrabies Falls is characterized by the river splitting into various loops thus forming islands in the river (Moolman, 1946). The settlement consisted of ten mat huts that housed about five to six people each. The Nameiqua herded cattle, sheep and to a lesser extend goats. Cattle were their most prized possession, both economically and ritually. They were also excellent hunters and would display the heads of rhino, hippo and buffalo in the centre of the settlement (Morris & Beaumont, 1991). The Nameiqua people were not the only people that stayed in the area. Away from the river in areas less suitable for pastoralism lived groups such as the Noeeis, Eieis and the /Xam. These groups lived mainly from hunting and gathering. The relationships between the various groups of people that lived in this area were “peripheral” and involved “varying degrees of clientship during certain seasons, with limited exchange in items such as pots”. The Khoi peoples would sometimes also take San wives. Around the area of Upington lived the Geissiqua (Twin-folk) people. This was a mixed group of Korana-BaTlhaping (Tswana) group who were in regular contact with Tswana Iron Age communities to the northeast. This group of people would seemingly once a year trade with the tribes living along the river and who traded in items, such as, tobacco, ivory spoons, bracelets, knives, barbed assegais and smooth axes (Morris & Beaumont, 1991).

In the period leading up to the First Koranna War in 1869 the northwards trek of people of mixed descent and the white farmers into the vicinity of the Orange River provided the Koranna (!Kora) people with opportunistic opportunities to steal cattle from these new settlers and flee to islands located in the river. It was inevitable that this would lead to armed conflict between these groups (De Beer, 1992). The First Koranna War was in 1869 and a second war took place from 1878 to 1879. After the second war many of the people of mixed descent went to settle north of the river. Reverend Scröder advocated for the Cape government to allow these people to go and settle in the area and from a buffer zone between the white settlers and the black tribes to the north of the Cape Colony (De Beer, 1992).

7.2.3.3 The Development of the Gordonia Area: The Orange River Irrigation Systems, Keimoes And Kakamas

The irrigation of the Orange River has been central to the economic existence of the area in the vicinity of Upington since the 1880s. To the north of the river lies the Kalahari and to the south lies “Bushmanland”, these two areas being some of the driest land in South Africa (Legassick, 1996). According to Legassick the first person to irrigate the Orange River was one Abraham September, from whose lead the Dutch Reformed Church missionary Reverend C.H.W. Scröder and John H. Scott, the Special Magistrate for the Northern Border, stationed at Upington, would have gotten the idea to start irrigating the river on a much larger scale (Legassick, 1996).

The first 81 farms to be given out to the north of the Orange River from Kheis (opposite the present Groblershoop) to the Augrabies Falls were allocated almost exclusively to people of mixed descent in 1882. The farms bordering on the river measured in sizes ranging from 4000 to 10 000 morgen, these farms were “laid out on the basis of half an hour’s ride along the river and two and a half hours’ ride away from the river into the ‘back country’”. Once the irrigation canal was completed these farms were further divided into “water-erven” for irrigation and “dry-erven” for establishing buildings and the like (Legassick, 1996).

The district of Gordonia was established on 30 September 1885 and formed part of British Bechuanaland. It was only administrated as part of British Bechuanaland from April 1889. In 1891 the first census in the area recorded 735 whites, 1429 “aboriginal natives” and 3121 “other coloured persons” living in the area (Legassick, 1996).

When writing a history on the area in which Geelkop No. 456 is situated, it is necessary by implication to look at the histories of the surrounding towns. This farm is located very close to the town Keimoes, and is situated about 13 kilometres to the east of Kakamas and 24 kilometres to the west of Upington.
Christiaan H. W. Scröder was a missionary from the Nederduits Gereformeerde Kerk in Upington, and knew all the islands and areas alongside the Orange River, stretching from his missionary station, far to the east and the west along the riverbank. He was an important figure with regards to the foundation of both the towns of Keimoes and Kakamas. Interestingly, the name Keimoes means “large eye”, and an eye appears on the coat of arms of the town, which was created in 1960 (De Beer, 1992). When Scröder first came to Upington in July 1883, there were already people in the area of Keimoes that used irrigation and planted fields. It is possible that the proficient Mr Scott, who was at that time the only person in the area who understood the art of channelling water to other areas, directed this irrigation project in 1882. By 1883 it was necessary to build a second furrow for irrigation, and this was done under the vigilance of C. H. W. Scröder. These furrows contributed to the advancement of the town and in the following years many families started moving to the area (De Beer, 1992).

By 1886, the committee in charge of the settlement realized the necessity of building a school for the inhabitants of Gordonia. In 1887 a school was opened, with Pieter Rossouw as its first teacher. The school was closed again in 1899, due to the start of the Anglo-Boer War (De Beer, 1992). The construction on the church at Keimoes was started in 1888 and was completed in 1889. During the construction of the church,

Scröder lived in Keimoes. The church can still be seen next to the main street running through Keimoes (De Beer, 1992).

In the 1880's, white people moved to the Keimoes area for the first time. Among the first of the white farmers who lived in the area, was Robert Frier. Between 1889 and 1899, more and more white people started moving to the Gordonia area and by 1900 some 13 Afrikaner families had settled at Keimoes (De Beer, 1992). After the Anglo-Boer War, many farmers were forced to move to other areas, in search of greener pastures after their farms and livelihoods were destroyed during the war. Settling next to the Orange River was an obvious choice, due to the possibility of irrigating one's crops. Many of the farmers who came to the Gordonia area opted rather to settle in Keimoes than in Kakamas, since it was only possible to buy land in the former town. When farmers did not have the means to buy properties of their own, they often became *bywoners* to other landowners, paying a rent to live and work on the land. By 1910, Keimoes had its own hotel, prison, court and police service (De Beer, 1992). In 1951, Keimoes opened its own power station and candlelight was abruptly replaced by electricity (De Beer, 1992).
The town of Kakamas has an interesting origin. It was first developed as a labour colony to help uplift poor whites in the Gordonia area. This was possible due to the proximity of the town to the Orange River, which is one of the few rivers in the country that are large and regular enough to serve as a source for irrigation (Rossouw, 1939). One of the main players behind the foundation of what would at first be known as the Kakamas Labour Colony, was one Reverent B. P. J. Marchand. Marchand was a young preacher of the Nederduits Gereformeerde Kerk (NGK), and was especially concerned with the founding of schools for the children of poor white forestry workers in the Knysna area during the 1880's. Marchand realized that, in order to make it possible for more poor white children to attend school, these families would have to be concentrated into one area. At this time many white people in the Gordonia area had been impoverished due to a drought in 1896 and the outbreak of Rinderpest in 1897 in the Northern Cape Colony (Moolman, 1946). Hence the idea of the Kakamas Labour Colony was born. Despite criticism from some of the older leaders of the church, who described Marchand's ideas as "kasteelen van een onervaren enthusiast" (the dreams of an inexperienced enthusiast), he was able to gather support from the Northern Cape community. Marchand drew his inspiration for the creation of a labour colony from Germany, where the Government had used similar schemes to uplift their poor (Rossouw, 1939).

The missionary, Christiaan H. W. Scröder, from the NGK in Upington was able to indicate a place where it would be possible to build successful irrigation works, and to found the town of Kakamas (Rossouw, 1939). In 1898, a notice appeared in the newspaper "De Kerkbode", that the irrigation works for the Kakamas Labour Colony would be opened on the 3rd of July of that year, on the farm Neus. Having heard of the new settlement, poor white families streamed in from the surrounding areas. Many of these families had been ruined by the droughts of the years before. By 1937, the Kakamas Labour Colony had developed into a settlement comprising a total area of 142 000 morgen, with 3 700 morgen under irrigation, 138 000 morgen of grazing and a total of 627 plots (Rossouw, 1939). The following is noted in the 1945 Report of the Commission of Enquiry into the Kakamas Labour Colony; "The pluck and tenacity of the original settlers were amazing. Without any training, working under difficulties of climate and without practically any means at their disposal, by the labour of their own hands they transformed a wilderness into a flourishing settlement".

7.2.4 Historical overview of the ownership and development of the farm Geelkop No. 456

*Note that there is also a farm by the name of Geelkop Pan in the Gordonia district. This is a different farm.

7.2.4.1 General features of the farm area

A map of the Upington district, dating back to 1908 (Figure **8**), could be found at the National Archives of South Africa. Some interesting information regarding roads, transport and other features of the Upington District was provided on the map. This gives one an interesting view of what life might have been like in the farm area at around the turn of the century. The following facts are provided:

- Roads : Generally, very sandy and bad. The frequented roads, owing to being cut up by traffic, are often worse than those shown as unfrequented. The roads crossing the main range of hills in the eastern part of the sheet are generally very rough and passable only with difficulty by lightly loaded wagons.
- Drifts: The Orange River is impassable for wheeled transport except at the drifts shown. These drifts are only practicable when the river is low, i. e.: usually from May to October. When the river rises the only crossing is the “pont” at Upington.
- Transport: Donkey and ox wagons. The former is by far the more common; usual span 18 animals.
- Water: Rainfall very uncertain and usually very small. Pans and dams do not last for more than three months after rains. Water is generally scarce in the S. W. corner of the sheet but elsewhere a good supply is generally obtainable at all farmhouses.
- Fuel: Generally scarce except along the banks of the Orange River.
- Grazing: Generally scarce except on the sand dunes, where there is good grazing after rain.

One can therefore conclude that the area, in which the farm Geelkop No. 456 was located, was a dry and inhospitable area to settle in by 1908 and especially in areas further away from the Orange River.

7.2.4.2 Mining potential

In 1929, one G. P. Snyman wrote to the Secretary of Mines in Pretoria. Having learnt that one Dr S. H. Haughton would pay a visit to the district of Gordonia for prospecting purposes, he enquired whether Haughton would be able to visit the farm Geelkop, situated 18 miles from Upington on the Kakamas railway line. Snyman noted that miles of magnetic steel, super-phosphate, mica and several other minerals, such as lime, had been discovered on the farm. Having read the letter, Haughton replied in writing that he was not visiting the Gordonia area, but that he had visited it a few years previously. He described the farm Geelkop as being situated to the north of the Orange River and extending for some 12 miles in a north north western direction past the Roois Vlei Trig. Beacon and to the east of the Zoovoorby hills. According to him, no detailed geological survey had been made on the farm up until that time. He however indicated that he could not understand Snyman’s assertion that he had found super-phosphate on the farm Geelkop.

7.2.4.3 Postal service

Since September 1944, a post office had been operating from the farm Geelkop. The mail was conveyed by rail three times a week to Upington, which was located 20 miles from the farm. In 1963, the Postmaster General no longer deemed the existence of the post office justifiable. It was decided that the post office would be closed and that it would be arranged for the public’s mails to be collected at Kanoneiland or Keimoes, which was located only seven miles from there.

7.2.4.4 Flood problems

It seems that, by 1948, one Mr. G. van Schalkwyk was the owner of the property No. 123, Kanoneiland. In this year, there were some complaints, due to the fact that Van Schalkwyk had built a wall on his property that caused other areas of Kanoneiland, as well as the farm Geelkop, to flood in times of heavy rains. There were several natural riverbeds in the area, of which some others had also been filled up. Van Schalkwyk had built the wall in order to attempt to stop floodwater flowing through his property.

7.2.4.5 Rebellion Tree

One historical monument that could be of interest is Rebellion Tree, located to the north of the farm Geelkop (Figure 1). It marks the Rebellion of 1914 in which many Afrikaners opposed the plan of the South African government to invade German South-West Africa at the commencement of World War I (Van Vollenhoven 2012). The site is a Provincial Heritage site. A coordinate was extracted from archival maps and the site is located at approximately 20.941241 and -28.501932.

7.2.4. Cultural Landscape of the area

The larger area is utilised mostly for extensive sheep and game farming with man-made elements such as shallow pans, fences, wind pumps and cement water reservoirs. Increasing numbers of solar projects now characterise the landscape. The area is vast and open with limited infrastructure and sparse, low-growing vegetation with widespread occurrences of Stone Age material. Evidence of early 20th century mining (mining trenches and old mining equipment) has been recorded on the property and on surrounding properties possibly related to tungsten mining. The landscape within the direct proximity of the site is however visually dominated by the 200m high CSP structure, east of the study area (Figure 10).

Figure 10. Existing solar development adjacent to the study area.

8 FINDINGS OF THE ASSESSMENT

This report only focuses on the Karroid PV footprint (Figure 1 -3) that was surveyed on foot and by vehicle. The study area is characterised by several drainage lines, Aeolian sand on top of a calcrete sub strata with sparse grass cover and shrubs. The area marked for the solar facility measures approximately 240 hectares on the larger property that measures approximately 4117.3628 ha. Due to possible future lay-out changes and the considerable extent of the property a field survey of the entire farm was not feasible and therefore an archaeological predictive model was developed to refine the study area for in-field assessment to mitigate this limitation and inform recommendations (Section 9).

8.1 Predictive Model

The extent of the greater study area has been identified as a constraint in Section 3.7. To mitigate against this, a predictive model was developed for the farm Geel Kop 456 RE, considering existing Landscape Use paradigms (Table 6), to identify areas with the greatest archaeological potential or sensitivity.

Table 6. Brief summary of main Land Use Paradigms

	Focal Point or Land Form	Key Sources
ESA	Standing water	Klein 2000
	Spring eyes & seasonal seeps	Sampson 1998
	Raw material	Kuman 2003
	Raw Material & water	Hallinan & Parkington 2017
	Water (stenotopic)	Deacon 1998
	Focal Points like kopjes for vantage points and shelter and alluvial gravels for raw material	Le Baron *et al.* 2010
	Avoiding Water. Focussing on raw material	Sampson1985 & 2001
	Raised hilltop locations for observing animals or other groups	Candel & Connard 2012
MSA	Raw material & accessible supply of water	de la Pena et al., 2016
	Along major Rivers, rocky areas and higher topography	Hallinan & Parkington 2017
	Ephemeral River Bed	Marks 2015
	Spring eyes & seasonal seeps	Sampson 1998
LSA	Widespread	Deacon 1998
	Ephemeral River Bed	Marks 2015
	On pan or stream-bed margins, near springs, bedrock depressions containing seasonal water, hollows on dunes, and on the flanks or crests of koppies	Beaumont *et al.* 1995

The Predictive Model for the study area (Graphically represented in Figure 14) based on the landscape use outlined above also took into account the ecological sensitivity maps (that include focal points highlighted in Table 6) for the area and included the following natural criteria (Table 7):

- Elevation;
- Drainage Lines; and
- Exposed Calcrete.

Table 7. Natural criteria and GIS Methodology

Criteria	Description and GIS Methodology
Elevation	The distribution of Stone Age sites in the impact area occurs at higher elevations above the flat plains roughly between 828 – 841 m. GIS data sourced from a private third party provided elevation data for the Digital Elevation Model (DEM) with a two-meter accuracy. This PV facility is located in the southern portion of the farm with the lowest elevation (Figure 6). From a landscape approach the micro topography for the PV facility is important, although this area is relatively flat, elevated areas occur that is archaeologically speaking of interest and the field survey concentrated on these areas (Figure 11 and Figure 12).
Drainage Lines	The importance of water sources in this barren area is highlighted in Table 6. Spatial data sourced from the client and field verified by the ecological specialists provided the location of watercourses and pans (Figure 13. The ArcGIS "Buffer Wizard" tool was utilised to delineate a 25 m buffer around these features (Figure 14).
Exposed Calcrete	Studies in the area showed that palimpsest of Stone Age Material occur in areas where the underlying calcrete protrudes through quaternary sands (Van der Walt 2011, 2015, 2019 a, b, c d, e and f). These white patches are easily distinguishable on Landsat images of the area obtained from a third party. These areas were digitalized and overlaid on the study area.

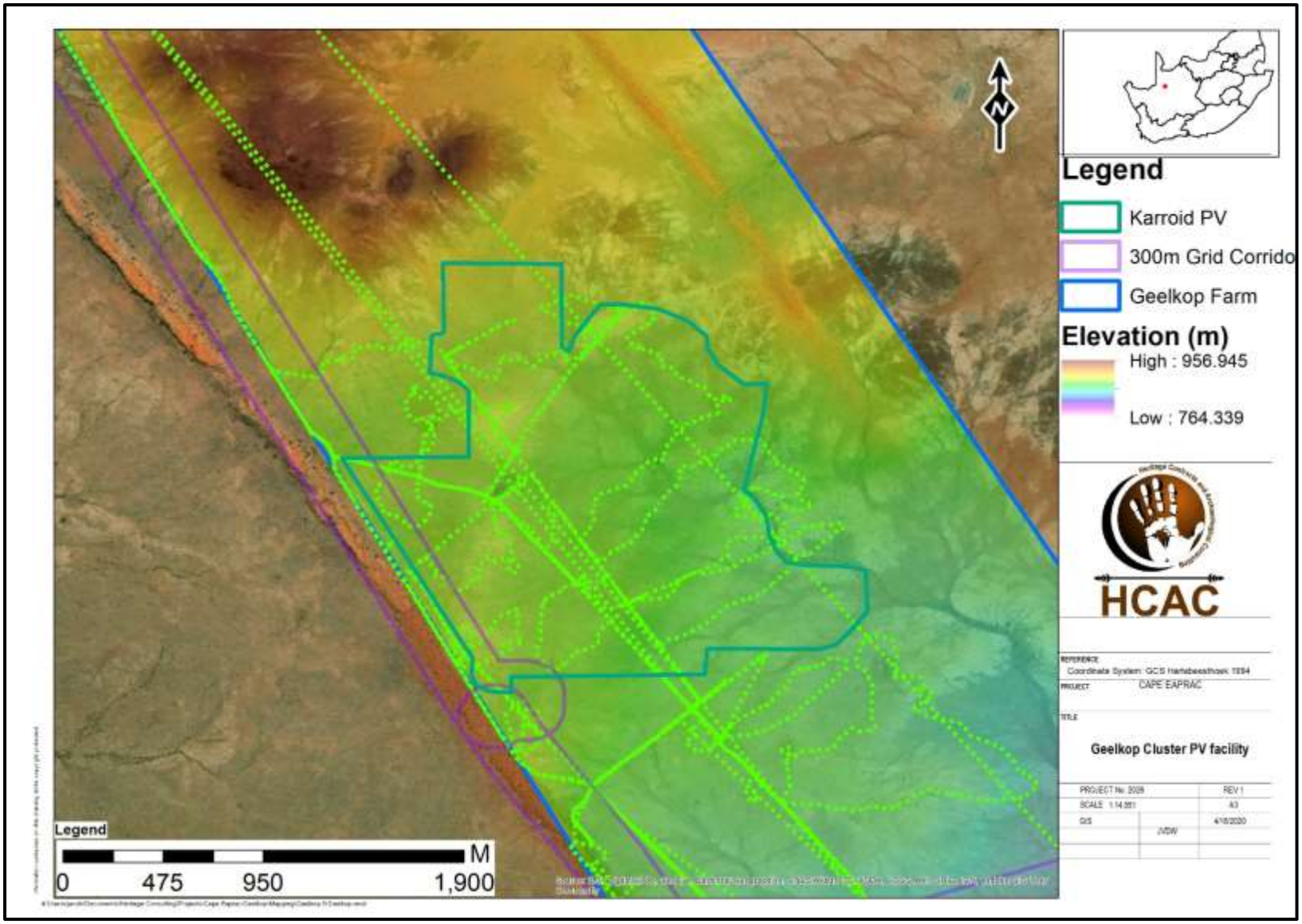


Figure 11. Tracklogs of the survey in green.

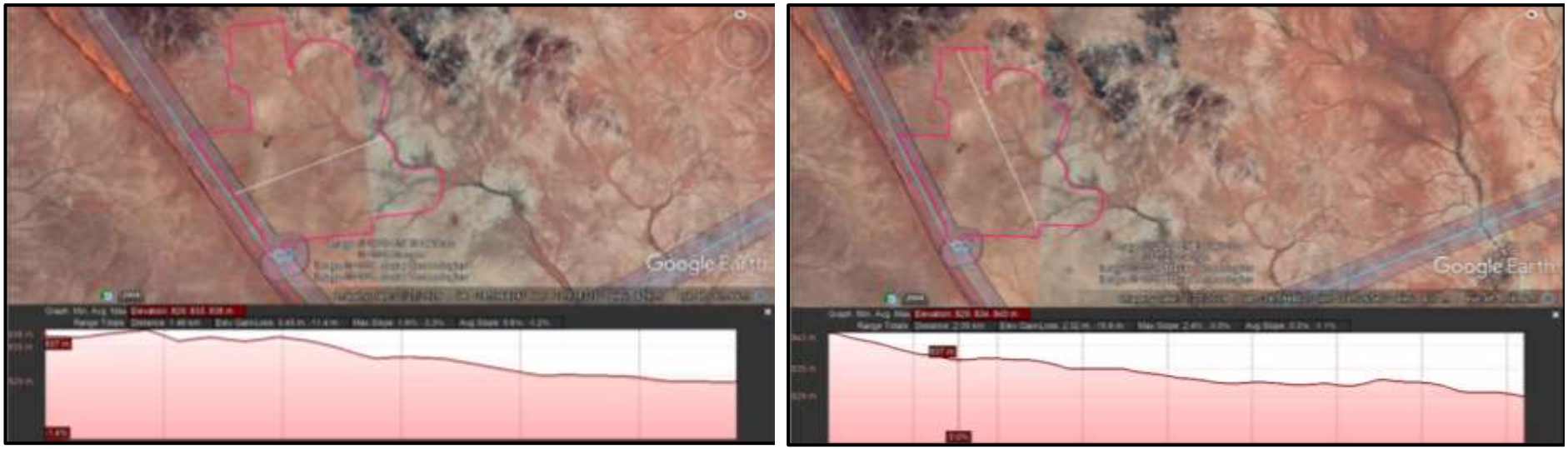


Figure 12: East to west and north to south elevation profile showing elevated ridges in the study area.

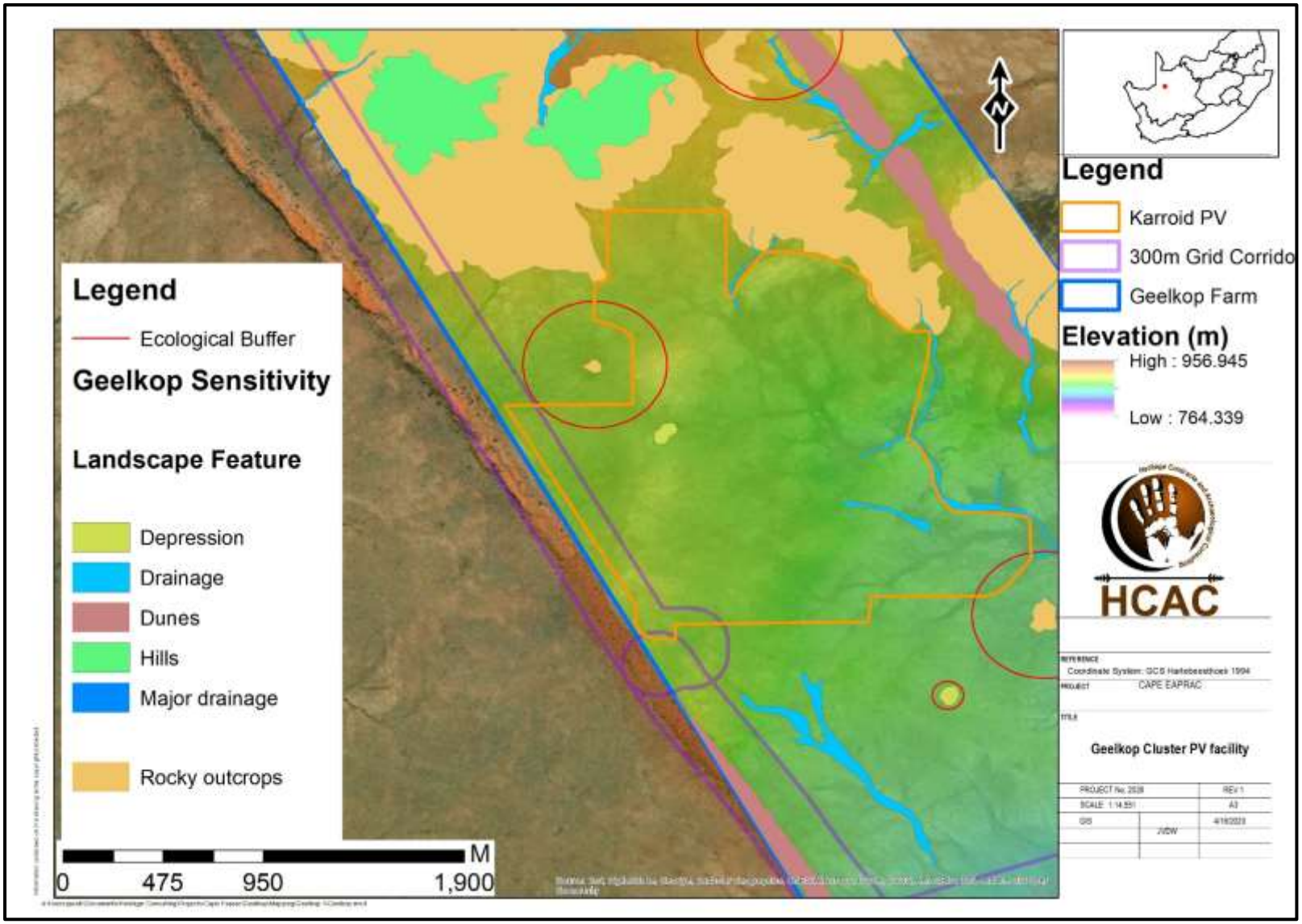


Figure 13. Environmental sensitivities.

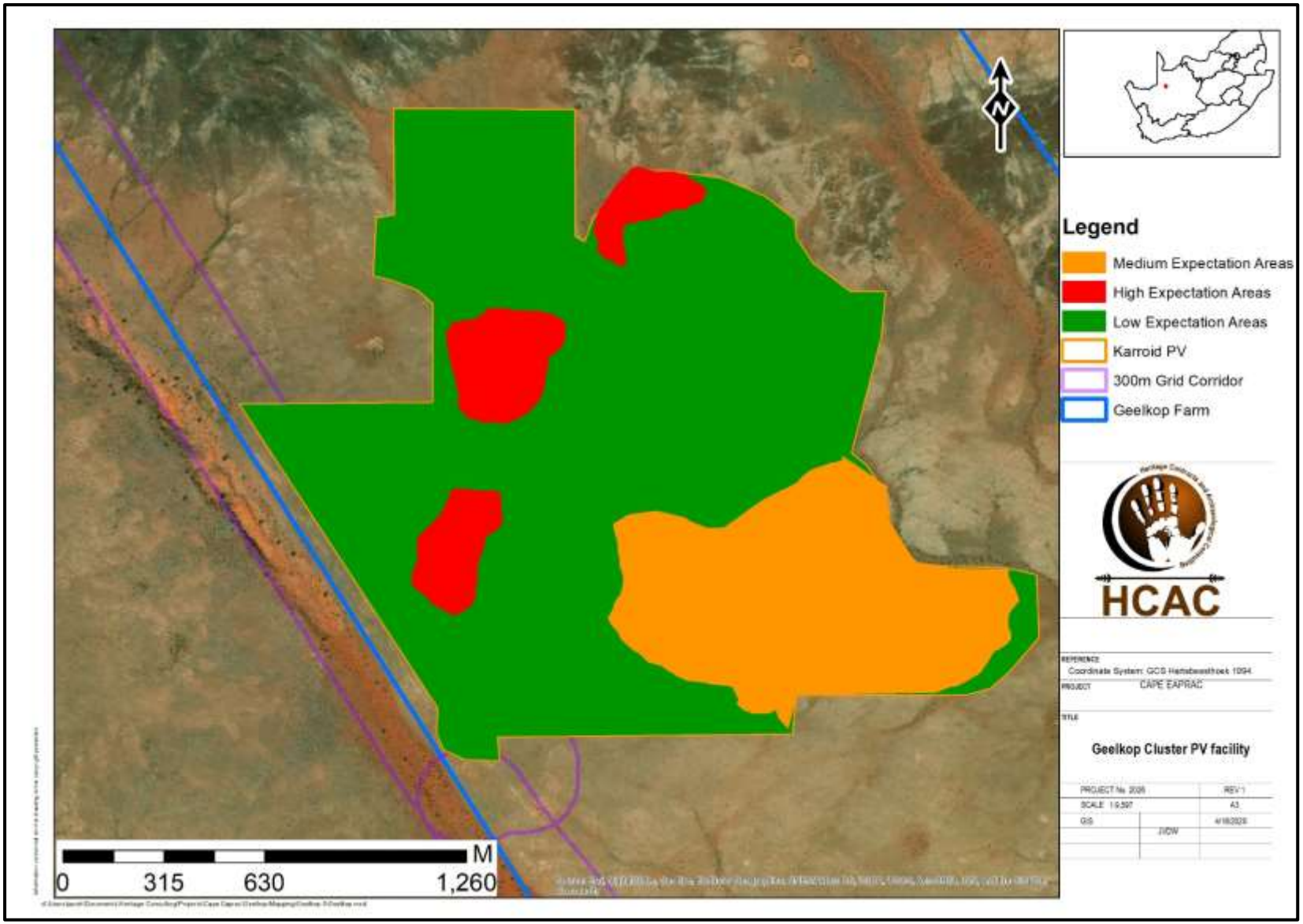


Figure 14. Graphic representation of the Predictive Model.

8.2 Field based findings in terms of the NHRA

During the survey a total of 8 localities were recorded (**Error! Reference source not found.**). These localities consist of observation points mapped as Heritage Features but does not necessarily represent sites unless otherwise indicated.
These observations are discussed in terms of the national estate as defined by the NHRA and described below.

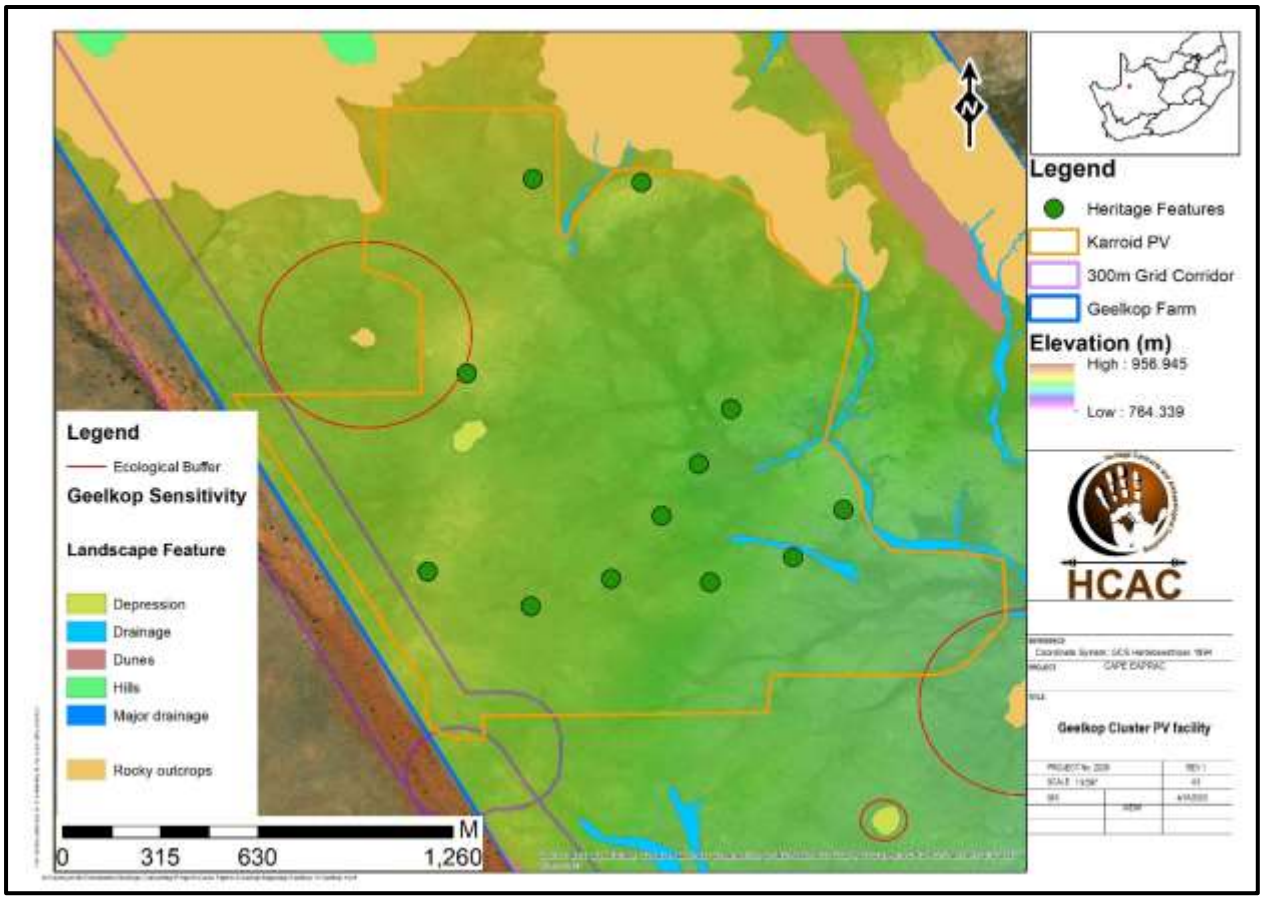


Figure 15. Location of recorded heritage features in the PV footprint in relation to environmental sensitivities.

8.2.1 Built Environment (Section 34 of the NHRA) / Historical artefacts

No standing structures older than 60 years occur in the study area. A single find spot comprising a Martini Henry soft shell (Figure **16**) and lead sealed can Figure **17**) was recorded. These shells date to the late 1890's before the Boers started to use 7mm Mausers. These scattered, isolated features require no further mitigation.

Label	Longitude	Latitude	Description	Elevation	Heritage Significance
117	21° 00' 29.6749" E	28° 35' 14.8452" S	Historical, Martini soft shell. Lead sealed can	836,895508	Low significance Field Rating GP C

Figure 16. Martini Henry soft shell

Figure 17. Lead sealed can

8.2.2 Archaeological resources (Section 35 of the NHRA)

Widespread occurrences of background scatter of mainly Middle Stone Age artefacts and to a lesser extent Later Stone Age flakes and cores were recorded. A Single Early Stone Age site was recorded next to a raw material outcrop. Co-ordinates were taken where either diagnostic tools were observed or areas of higher density scatters. Low density Stone Age scatters (between 3 - 5 artefacts per m²) were recorded as heritage features. Scatters higher than 5 artefacts per m² are labelled as sites but none were noted in the study area. Scatters with densities less than 2 artefacts per m² were not recorded as they occur throughout the study area. Individual occurrences were not point plotted unless they were considered to be diagnostic artefacts.

The proposed predictive model was considered accurate with the majority of recorded points found in areas of high and medium expectation with a limited number of features in areas of low expectation (Figure 18). The density and distribution of artefacts are much lower than areas to the south closer to the Orange River and are mostly found where calcrete is exposed (**Error! Reference source not found.**) in higher lying areas in deflated contexts.

Several of the artefacts show signs of cortex indicating the use of locally available raw material in the form of Jaspilite clasts scattered throughout the area. One ESA site was recorded consisting of a low density (less than 3 artefacts per m²) scatter marked by an Acheulean handaxe and large flakes on Diorite or Dolerite. The scatter was found next to an outcrop of the raw material and therefore recorded a site. A larger site of higher significance is on record to the north but outside of the proposed PV facility, recorded as WPT 115 & 116 (Figure 26). The oldest Acheulean in South Africa is estimated to date to around 1.7 to

1.4 Ma at Sterkfontein (Kuman & Clarke 2000), but most other known sites are thought to be younger than 1 Ma, most likely less than 600 ka (Kuman *et al*. 2005).

MSA diagnostic tools (mostly produced on Jaspilite, banded iron stone and quartzite) include unifacial points and blades with some lateral retouch. Based on size and morphology, these could indicate the presence of people on the landscape between ~ 66 000 and 45 000 ago, during archaeological phases known as the post-Howieson's Poort and late-Middle Stone Age (Lombard 2011).

No ceramics and few diagnostic LSA artefacts were recorded, although based on size (microlithic) smaller artefacts, especially those on quartz were recorded as LSA (Jaspilite was also used as raw material). LSA diagnostic tools consisted of thumbnail scrapers on Quartz and bladelet cores suggesting a Wilton occupation dating between ~ 4 000 and 8 000 ago (Lombard *et al.* 2012). This classification is tentative and require a larger sample to verify.

This background scatter of artefacts is not unique, according to Beaumont *et al* (1995) "thousands of square kilometres of Bushmanland are covered by a low-density lithic scatter" and similar occurrences is well recorded in the area (Gaigher 2013, Fourie 2014, van der Walt 2019 a, b, c, d, e and f).

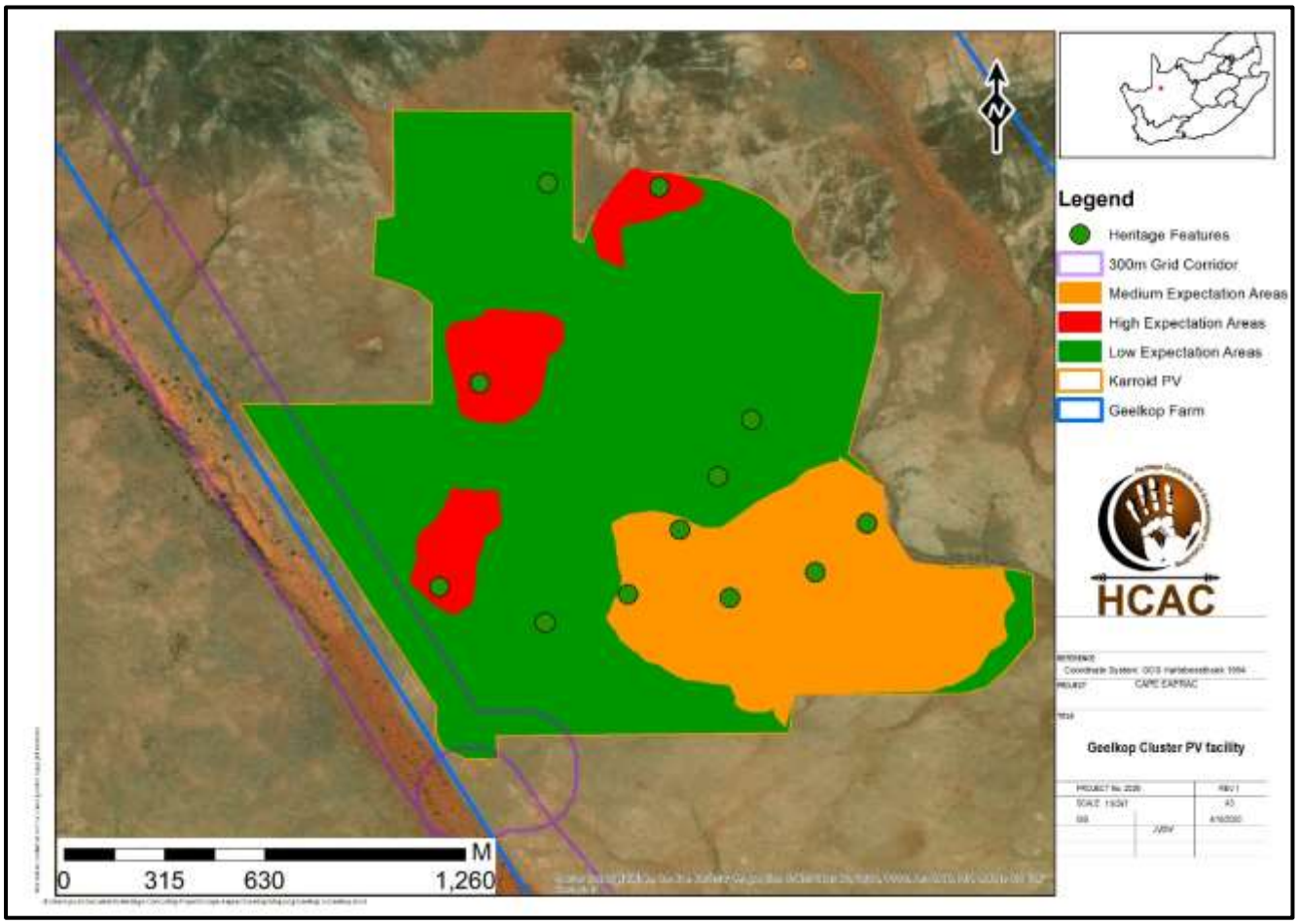


Figure 18. Predictive model vs sites.

Table 8. Archaeological Observation points

Label	Longitude	Latitude	Description	Elevation	Heritage Significance
112	21° 00' 07.2613" E	28° 35' 55.5073" S	MSA, Low density flakes on Jaspelite on exposed calcrete	841,904907	Low significance Field Rating GP C
113	21° 00' 18.0720" E	28° 35' 59.1431" S	ESA core, flake and Acheulean hand axe on Diorite/Dolerite. Plenty raw material and more artefacts possible. Artefacts in deflated context, located directly on calcrete with no stratigraphy.	834,648254	Medium Significance Field Rating GP B
114	21° 00' 11.3723" E	28° 35' 34.8107" S	LSA Bladelet core on Jaspelite, possibly Wilton	837,404053	Low significance Field Rating GP C
118	21° 00' 45.5399" E	28° 35' 54.0167" S	Miscellaneous flakes on Jaspelite on exposed calcrete	828,677002	Low significance Field Rating GP C
470	21° 00' 26.4709" E	28° 35' 56.2846" S	Exposed calcrete area with a variety of lithics on Jaspilite and Quartzite mostly MSA and to lesser degree LSA	831,9	Low significance Field Rating GP C
471	21° 00' 18.2845" E	28° 35' 14.4204" S	Area of exposed calcrete with a low density of miscellaneous artefacts. No diagnostic tools recorded, faceted striking platforms characteristic of MSA. Smaller miscellaneous artifacts mostly on Jaspilite indicate LSA association.	837,67	Low significance Field Rating GP C
472	21° 00' 31.7449" E	28° 35' 49.6715" S	Exposed calcrete area with a variety of lithics on Jaspilite and Quartzite mostly MSA and to lesser degree LSA	829,74	Low significance Field Rating GP C
473	21° 00' 35.6220" E	28° 35' 44.2681" S	Area of exposed calcrete with a low density of miscellaneous artefacts. No diagnostic tools recorded, faceted striking platforms characteristic of MSA. Smaller miscellaneous artifacts mostly on Jaspelite indicate LSA association.	828,54	Low significance Field Rating GP C
474	21° 00' 38.9953" E	28° 35' 38.5225" S	Exposed calcrete area with a variety of lithics on Jaspilite and Quartzite mostly MSA and to lesser degree LSA	831,18	Low significance Field Rating GP C
478	21° 00' 50.7888" E	28° 35' 49.0273" S	Area of exposed calcrete with a low density of miscellaneous artefacts. No diagnostic tools recorded, faceted striking platforms characteristic of MSA. Smaller miscellaneous artifacts mostly on Jaspilite indicate LSA association.	824,93	Low significance Field Rating GP C
479	21° 00' 36.8245" E	28° 35' 56.6268" S	Exposed calcrete area with a variety of lithics on Jaspilite and Quartzite mostly MSA and to lesser degree LSA	830,22	Low significance Field Rating GP C

Figure 19. General site conditions at Waypoint 113.

Figure 20. Hand Axe at Waypoint 113.

Figure 21. Large flake at Waypoint 113.

Figure 22. Core at Waypoint 113.

Figure 23. Jaspelite and Quartzite LSA artefacts.

Figure 24. LSA scraper on fine grained material.

8.2.3. Burial Grounds and Graves (Section 36 of the NHRA)

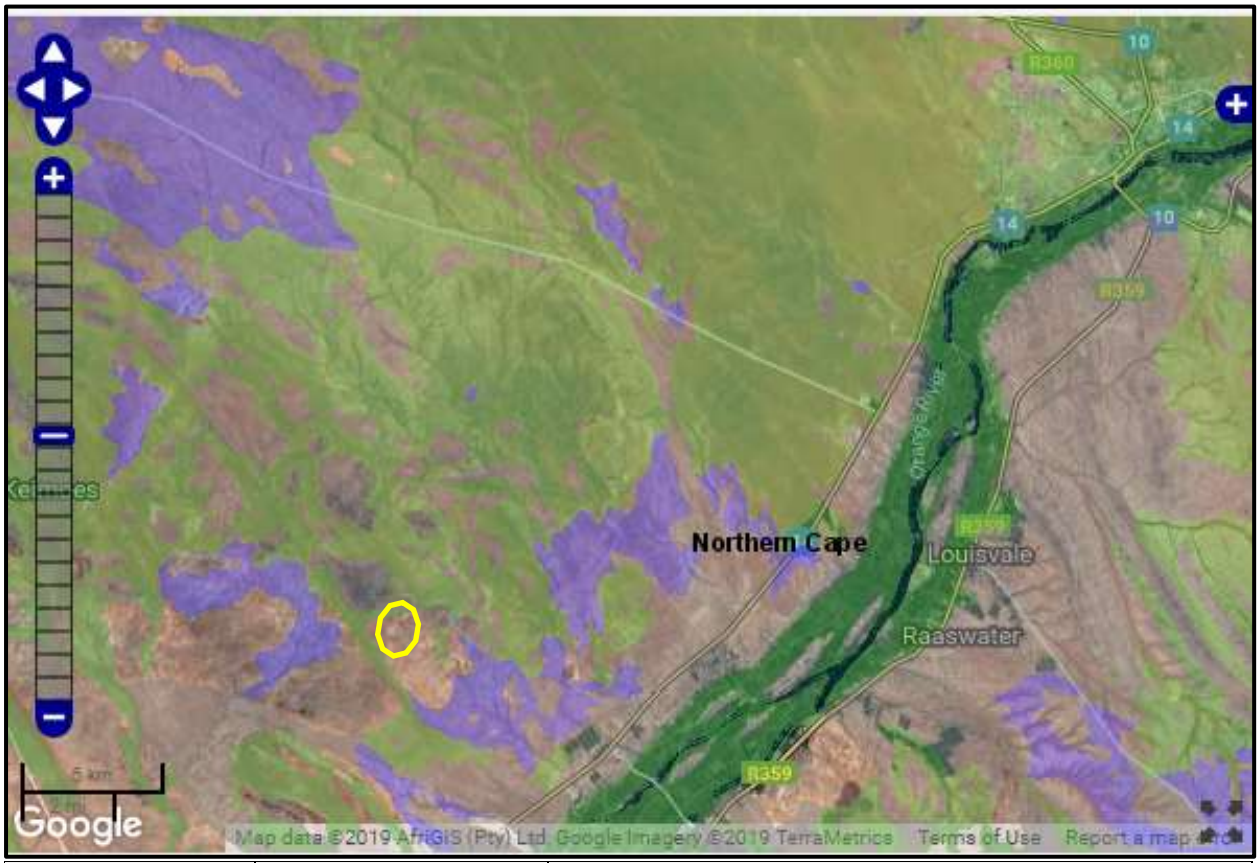
In terms of Section 36 of the Act no graves or burial sites were recorded in the impact area. If any graves are located in future they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation.

8.2.3 Cultural Landscapes, Intangible and Living Heritage.

The cultural landscape of the greater study area is characterised by agricultural developments as well as adjacent renewable energy developments (Figure 10) and the project will not impact on significant viewscapes. However due to the large cluster of PV developments on the farms Geelkop, Bloemsmond and Dyasonsklip the cultural landscape of the greater area will be changed from predominantly vacant agricultural areas to PV facilities with associated infrastructure and additional powerline connections.

8.2.4 Paleontological Resources

According to the SAHRA paleontological sensitivity map the area is of moderate sensitivity (Figure 25Figure **25**). The paleontological component was addressed in an independent study (Bamford 2020). The study concluded that the Karroid PV site lies on the Tertiary calcretes or Aeolian sands of the Quaternary Gordonia Formation. There is very small chance that fossils may occur beneath the sands, if any have been trapped in palaeo-pans or palaeo-dunes, although no such feature is evident. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr: if fossils are found once excavations have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.



Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 25.Paleontological sensitivity of the approximate study area (indicated by a yellow polygon) as indicated on the SAHRIS paleontological sensitivity map.

8.2.5 Battlefields and Concentration Camps

No Battlefield sites were identified in the project site.

8.3 Potential Impact

Impacts are primarily on archaeological material in the form of lithics by the proposed PV layout (Figure 26). These lithics consist of a widespread surface scatter of MSA and to a lesser extent LSA artefacts in deflated contexts on top of a calcrete substrata. This background scatter of artefacts is not unique, according to Beaumont *et al* (1995) “thousands of square kilometres of Bushmanland are covered by a low-density lithic scatter” and similar occurrences is well recorded in the area (Gaigher 2013, Fourie 2014, van der Walt 2019 a,b,c,d,e and f) and is seen as of low heritage significance. A Single ESA site was recorded next to a raw material outcrop. The ESA of the area has not been described in detail in the reviewed literature. The site can contribute to the archaeological database of this area and is of medium significance and will require mitigation. The impact on the background scatter by the proposed development is considered to be of low significance.

Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. The area is rich in terms of the low density background scatter of lithics present and taking in consideration existing impacts by renewable energy developments in the wider area and the addition of six other planned PV facilities on the farm the cumulative impact is regarded as slightly higher, mitigation measures employed in areas with higher density artefacts (Bushmanland PV & Duneveld PV) will sufficiently mitigate this aspect.

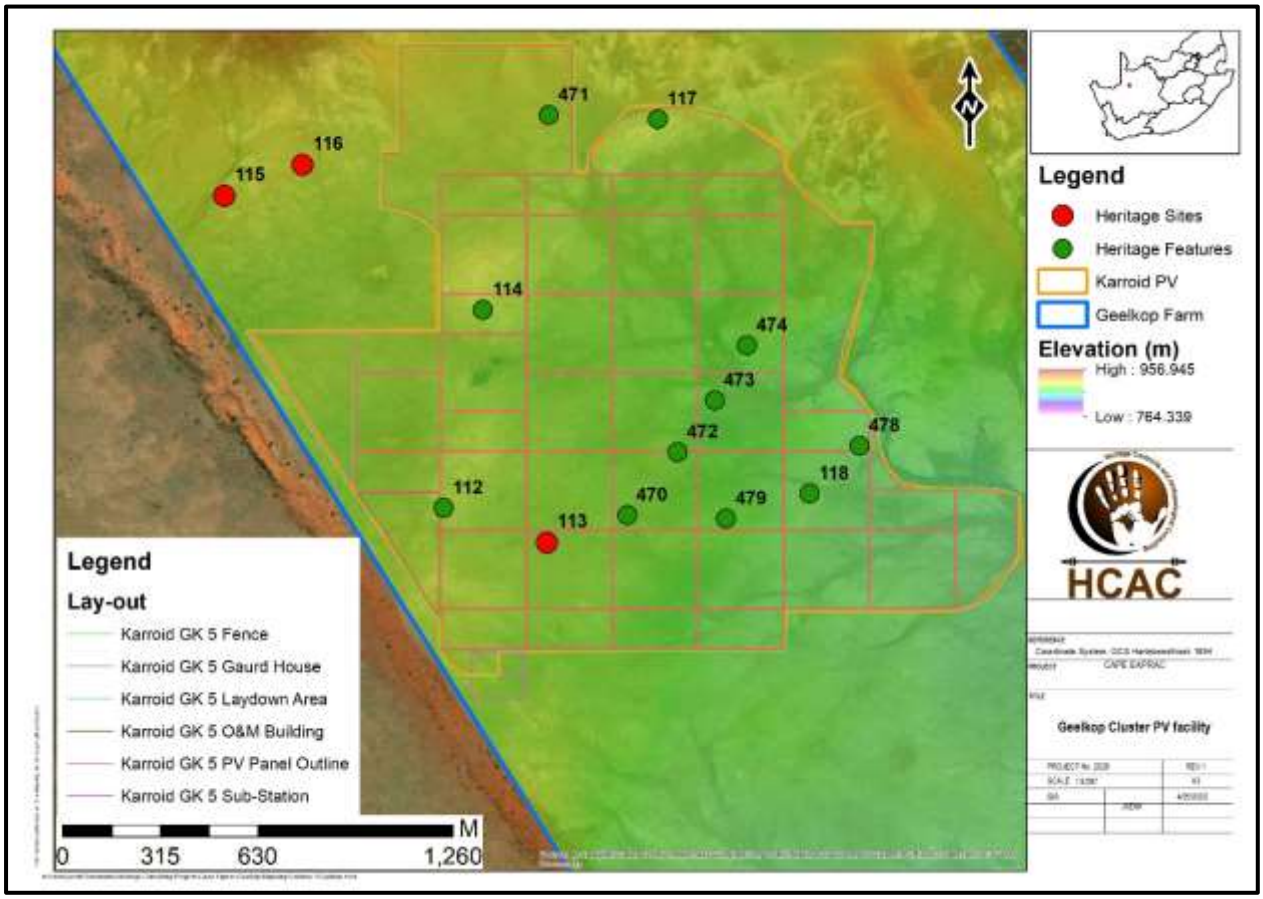


Figure 26. Site distribution map.

8.3.1 Pre-Construction phase:

It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure needed for the construction phase. These activities can have a negative and

irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

8.3.2 Construction Phase

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

8.3.3 Operation Phase:

No impact is envisaged for the recorded heritage resources during this phase.

Table 9. Impact table – Archaeological heritage resources.

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.		
	Without mitigation	**With mitigation (Preservation/ excavation of site)**
Extent	Site specific (1)	Site specific (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (3)
Probability	Probable (3)	Probable (2)
Significance	**27 (Low)**	**27 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: Surface sampling is recommended at Waypoint 113 (ESA site) to ensure that the technology is adequately described. A Chance Find Procedure and Development Heritage Management plan should be implemented for the project during the pre-construction and construction phase. The area should be monitored during construction by the ECO.		
Residual Impacts: If sites are destroyed this results in the depletion of archaeological record of the area and even though surface features can be avoided or mitigated, there is a chance that completely buried sites would still be impacted but this cannot be quantified. However, if sites are recorded and preserved or mitigated this adds to the record of the area.		

8.4 Cumulative Impacts

Considering the existing impacts by renewable energy developments in the wider area and the addition of six other planned PV facilities, the cumulative impact on resources is higher, but this can be mitigated to an acceptable level. In order to mitigate the loss of large-scale low-density Stone Age lithics mitigation measures employed in areas with higher density artefacts will sufficiently mitigate this aspect.

Table 10. Cumulative impacts of the project

Nature: The development of the project and other renewable energy developments within the area may result in disturbance of surfaces and/or sub-surfaces and may destroy, damage, alter, or remove from its original position archaeological material or objects.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (3)
Probability	Probable (3)	Probable (3)
Significance	**27 (Low)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings	High	High

9 CONCLUSION AND RECOMMENDATIONS

This report only focuses on the Karroid PV footprint characterised by several drainage lines (although the PV lay out avoids the drainage line features), Aeolian sand on top of a calcrete sub strata with sparse grass cover and shrubs. The area marked for the solar facility measures approximately 240 hectares on the larger property that measures approximately 4117.3628 ha. Due to possible future lay-out changes and the considerable extent of the property a field survey of the entire farm was not feasible and therefore an archaeological predictive model was developed to refine the study area for in-field assessment to mitigate this limitation and inform recommendations.

The predictive model was considered accurate with the majority of recorded points found in areas of high and medium expectation with a limited number of features in areas of low expectation (Figure 17). The density and distribution of artefacts are much lower than areas to the south closer to the Orange River and artefacts are mostly found where calcrete is exposed (Figure 24), in higher lying areas in deflated contexts.

One ESA site was recorded consisting of a low density (less than 3 artefacts per m^2) scatter marked by an Acheulean handaxe, core and large flakes on Diorite or Dolerite. The scatter was found next to an outcrop of the raw material and therefore recorded a site. A larger site of higher significance is on record to the north **but outside** of the proposed PV facility (Figure 26). The oldest Acheulean in South Africa is estimated to date to around 1.7 to 1.4 Ma at Sterkfontein (Kuman & Clarke 2000), but most other known sites are thought to be younger than 1 Ma, most likely less than 600 ka (Kuman *et al.* 2005).

MSA diagnostic tools (mostly produced on fine grained material like banded iron stone and quartzite) include Levallois unifacial points & blades. Based on size and morphology, these could indicate the presence of people on the landscape between ~ 66 000 and 45 000 ago, during archaeological phases known as the post-Howieson's Poort and late-Middle Stone Age (Lombard 2011).

No ceramics and few diagnostic LSA artefacts were recorded, although based on size (microlithic) smaller artefacts, especially those on quartz were recorded as LSA (Jaspilite was also used as raw material). The various bladelet cores and numerous scrapers suggest a Wilton occupation dating between ~ 4 000 and 8 000 ago (Lombard *et al.* 2012). This classification is tentative and require a larger sample to verify.

This background scatter of artefacts is not unique, according to Beaumont *et al* (1995) "thousands of square kilometres of Bushmanland are covered by a low-density lithic scatter" and similar occurrences is well recorded in the area (Gaigher 2013, Fourie 2014, van der Walt 2019 a,b,c,d,e and f). The Stone Age Scatter is not as dense in the impact area for the Karroid PV Facility and therefore the cumulative impact by the projects can be mitigated by surface sampling at the other sites including the Bushmanland PV.

Key findings of the study include:

- A Single ESA site was recorded next to a raw material outcrop. Very little is known regarding the ESA occupation of the area and the recorded site can add to the record of Acheulian occupation in this area and is of medium significance.

- Widespread lithic scatters dating to the MSA and LSA are found in deflated context, often where calcrete is exposed in higher lying areas and drainage lines. The Stone Age Scatter is not as dense in the impact area for the Karroid PV Facility as areas to the south and therefore the cumulative impact by the Geel Kop RE 456 PV Facilities can be mitigated by the recommended surface sampling at the Bushmanland and Duneveld PV site.

- No graves were recorded but graves can occur anywhere on the landscape. If any graves are located in future they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation;

- According to the SAHRA paleontological sensitivity map, the area is of moderate paleontological sensitivity and an independent study was conducted by Prof Marion Bamford. The study recommended that a Fossil Chance Find Protocol should be added to the EMPr.

The impact of the proposed project on heritage resources is considered acceptable with the correct mitigation measures in place. It is therefore recommended that the proposed project can commence provided that the recommendations in this report are adhered to as part of the EMPr and based on the approval of SAHRA.

Recommendations:

- Surface sampling is recommended at Waypoint 113 (ESA site) to ensure that the technology is adequately described.

- Compilation of a development heritage management plan for the entire Geel Kop Farm RE 456 prior to construction;

- Implementation of a chance find procedures for both the heritage and paleontological components as outlined below.

9.1 Chance Find Procedures

The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below.

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.
- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

-

Monitoring Programme for Palaeontology – to commence once the excavations begin.

1. The following procedure is only required if fossils are seen on the surface and when excavations commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones
4. This information will be built into the EMP's training and awareness plan and procedures.
5. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
6. If there is any possible fossil material found by the developer/environmental officer/miners then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
7. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
8. If no good fossil material is recovered then no site inspections by the palaeontologist will not be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
9. If no fossils are found and the excavations have finished then no further monitoring is required.

9.2 Reasoned Opinion

The impact of the proposed project on heritage resources is considered to be of low significance. Therefore, the project is considered to be acceptable from a heritage perspective based on approval from SAHRA. Furthermore, the socio-economic benefits also outweigh the possible impacts of the development with the correct mitigation measures (i.e. chance find procedure) implemented for the project.

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11 APPENDICES:

Appendix A

Curriculum Vitae of Specialist

Jaco van der Walt
Archaeologist

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Education:

Particulars of degrees/diplomas and/or other qualifications:

Name of University or Institution:		University of Pretoria
Degree obtained	**:**	BA Heritage Tourism & Archaeology
Year of graduation	**:**	2001
Name of University or Institution:		University of the Witwatersrand
Degree obtained	**:**	BA Hons Archaeology
Year of graduation	**:**	2002
Name of University or Institution	**:**	University of the Witwatersrand
Degree Obtained	**:**	MA (Archaeology)
Year of Graduation	:	2012
Name of University or Institution:		University of Johannesburg
Degree	**:**	PhD
Year	:	Currently Enrolled

EMPLOYMENT HISTORY:

2011 – Present:	**Owner – HCAC (Heritage Contracts and Archaeological Consulting CC)**.
2007 – 2010 :	**CRM Archaeologist,** Managed the Heritage Contracts Unit at the University of the Witwatersrand.
2005 - 2007:	**CRM Archaeologist**, Director of Matakoma Heritage Consultants
2004:	**Technical Assistant**, Department of Anatomy University of Pretoria
2003:	**Archaeologist**, Mapungubwe World Heritage Site
2001 - 2002:	**CRM Archaeologists,** For R & R Cultural Resource Consultants, Polokwane
2000:	**Museum Assistant**, Fort Klapperkop.

Countries of work experience include:

Republic of South Africa, Botswana, Zimbabwe, Mozambique, Tanzania, The Democratic Republic of the Congo, Lesotho and Zambia.

SELECTED PROJECTS INCLUDE:

Archaeological Impact Assessments (Phase 1)

Heritage Impact Assessment Proposed Discharge Of Treated Mine Water Via The Wonderfontein Spruit Receiving Water Body Specialist as part of team conducting an Archaeological Assessment for the Mmamabula mining project and power supply, Botswana

Archaeological Impact Assessment Mmamethlake Landfill

Archaeological Impact Assessment Libangeni Landfill

Linear Developments

Archaeological Impact Assessment Link Northern Waterline Project At The Suikerbosrand Nature Reserve

Archaeological Impact Assessment Medupi – Spitskop Power Line,

Archaeological Impact Assessment Nelspruit Road Development

Renewable Energy developments

Archaeological Impact Assessment Karoshoek Solar Project

Grave Relocation Projects

Relocation of graves and site monitoring at Chloorkop as well as permit application and liaison with local authorities and social processes with local stakeholders, Gauteng Province.

Relocation of the grave of Rifle Man Maritz as well as permit application and liaison with local authorities and social processes with local stakeholders, Ndumo, Kwa Zulu Natal.

Relocation of the Magolwane graves for the office of the premier, Kwa Zulu Natal

Relocation of the OSuthu Royal Graves office of the premier, Kwa Zulu Natal

Phase 2 Mitigation Projects

Field Director for the Archaeological Mitigation For Booysendal Platinum Mine, Steelpoort, Limpopo Province. Principle investigator Prof. T. Huffman

Monitoring of heritage sites affected by the ARUP Transnet Multipurpose Pipeline under directorship of Gavin Anderson.

Field Director for the Phase 2 mapping of a late Iron Age site located on the farm Kameelbult, Zeerust, North West Province. Under directorship of Prof T. Huffman.

Field Director for the Phase 2 surface sampling of Stone Age sites effected by the Medupi – Spitskop Power Line, Limpopo Province

Heritage management projects

Platreef Mitigation project – mitigation of heritage sites and compilation of conservation management plan.

MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS:

- Association of Southern African Professional Archaeologists. Member number 159

  Accreditation:
  - Field Director Iron Age Archaeology
  - Field Supervisor Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation
- Accredited CRM Archaeologist with SAHRA
- Accredited CRM Archaeologist with AMAFA
- Co-opted council member for the CRM Section of the Association of Southern African Association Professional Archaeologists (2011 – 2012)

PUBLICATIONS AND PRESENTATIONS

- A Culture Historical Interpretation, Aimed at Site Visitors, of the Exposed Eastern Profile of K8 on the Southern terrace at Mapungubwe.
  - J van der Walt, A Meyer, WC Nienaber
  - Poster presented at Faculty day, Faculty of Medicine University of Pretoria 2003
- 'n Reddingsondersoek na Anglo-Boereoorlog-ammunisie, gevind by Ifafi, Noordwes-Provinsie. South-African Journal for Cultural History 16(1) June 2002, with A. van Vollenhoven as co-writer.
- Fieldwork Report: Mapungubwe Stabilization Project.
  - WC Nienaber, M Hutten, S Gaigher, J van der Walt
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2004
- A War Uncovered: Human Remains from Thabantšho Hill (South Africa), 10 May 1864.
  - M. Steyn, WS Boshoff, WC Nienaber, J van der Walt
  - Paper read at the 12th Congress of the Pan-African Archaeological Association for Prehistory and Related Studies 2005
- Field Report on the mitigation measures conducted on the farm Bokfontein, Brits, North West Province .
  - J van der Walt, P Birkholtz, W. Fourie
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2007
- Field report on the mitigation measures employed at Early Farmer sites threatened by development in the Greater Sekhukhune area, Limpopo Province. J van der Walt
  - Paper read at the Southern African Association of Archaeologists Biennial Conference 2008
- Ceramic analysis of an Early Iron Age Site with vitrified dung, Limpopo Province South Africa.
  - J van der Walt. Poster presented at SAFA, Frankfurt Germany 2008

- Bantu Speaker Rock Engravings in the Schoemanskloof Valley, Lydenburg District, Mpumalanga (*In Prep)*
    - J van der Walt and J.P Celliers
- Sterkspruit: Micro-layout of late Iron Age stone walling, Lydenburg, Mpumalanga. W. Fourie and J van der Walt. A Poster presented at the Southern African Association of Archaeologists Biennial Conference 2011
- Detailed mapping of LIA stone-walled settlements' in Lydenburg, Mpumalanga. J van der Walt and J.P Celliers
    - Paper read at the Southern African Association of Archaeologists Biennial Conference 2011
- Bantu-Speaker Rock engravings in the Schoemanskloof Valley, Lydenburg District, Mpumalanga. J.P Celliers and J van der Walt
    - Paper read at the Southern African Association of Archaeologists Biennial Conference 2011
- Pleistocene hominin land use on the western trans-Vaal Highveld ecoregion, South Africa, Jaco van der Walt.
    - J van der Walt. Poster presented at SAFA, Toulouse, France. Biennial Conference 2016

REFERENCES:

1. Prof Marlize Lombard — Senior Lecturer, University of Johannesburg, South Africa
   E-mail: mlombard@uj.ac.za
2. Prof TN Huffman — Department of Archaeology Tel: (011) 717 6040
   University of the Witwatersrand
3. Alex Schoeman — University of the Witwatersrand
   E-mail:Alex.Schoeman@wits.ac.za