HERITAGE IMPACT ASSESSMENT

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

For the Kiwano Solar PV Plant, Battery Energy Storage System, Substation and 132 KV Powerline near Upington, Northern Cape Province

Type of development:

Renewable Energy

Client:

Zitholele Consulting (Pty) Ltd

Applicant:

Eskom

Report prepared by:

Beyond Heritage
Private Bag X 1049
Suite 34
Modimolle
0510
Tel: 082 373 8491
Fax: 086 691 6461
E-Mail: jaco@heritageconsultants.co.za

Report Author:
Mr. J. van der Walt
Project Reference:
Project number 2287
Report date:
June 2022
Revised August 2022

APPROVAL PAGE

Project Name	Kiwano BESS and PV project
Report Title	Heritage Impact Assessment for the Kiwano Solar PV Plant, Battery Energy Storage System, Substation and 132 KV Powerline near Upington, Northern Cape Province
Authority Reference Number	TBC
Report Status	Draft Report
Applicant Name	Eskom Holdings SOC Ltd

Responsibility	Name	Qualifications and Certifications	Date
Fieldwork and reporting	Jaco van der Walt - Archaeologist	MA Archaeology ASAPA #159 APHP #114	May 2022
Palaeontologist	Prof Marion Bamford	PhD Paleo Botany	May 2022

DOCUMENT PROGRESS

Distribution List

Date	Report Reference Number	Document Distribution	Number of Copies
13 June 2022	2287	Zitholele Consulting (Pty) Ltd	Electronic Copy
		I	

Amendments on Document

Date	Report Reference Number	Description of Amendment
12 August 2022	2287	Technical amendment.

INDEMNITY AND CONDITIONS RELATING TO THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. Beyond Heritage reserves the right to modify aspects of the report including the recommendations if and when new information becomes available from ongoing research or further work in this field or pertaining to this investigation.

Although Beyond Heritage exercises due care and diligence in rendering services and preparing documents Beyond Heritage accepts no liability, and the client, by receiving this document, indemnifies Beyond Heritage against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by Beyond Heritage and by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

COPYRIGHT

The client, on acceptance of any submission by Beyond Heritage and on condition that the client pays to Beyond Heritage the full price for the work as agreed, shall be entitled to use for its own benefit:

- The results of the project;
- The technology described in any report; and
- Recommendations delivered to the client.

Should the applicant wish to utilise any part of, or the entire report, for a project other than the subject project, permission must be obtained from Beyond Heritage to do so. This will ensure validation of the suitability and relevance of this report on an alternative project.

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 site plan identifying site alternatives;	Section 8 and 9
(g) Identification of any areas to be avoided, including buffers	Section 8 and 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 1.3
(k) Mitigation measures for inclusion in the EMPr	Section 10.1
(l) Conditions for inclusion in the environmental authorisation	Section 10. 1.
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 10. 5.
(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 10.3
(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	N.A

Executive Summary

Zitholele Consulting (Pty) Ltd was appointed as the Environmental Assessment Practitioner (EAP) by Eskom Holdings SOC Ltd to undertake the required Environmental Authorisation Process for the Kiwano Solar PV Plant, Battery Energy Storage System, Substation and 132 KV Powerline near Upington, Northern Cape Province. Beyond Heritage was appointed to conduct a Heritage Impact Assessment (HIA) for the Project and the study area was assessed on desktop level and by a non-intrusive pedestrian field survey. Key findings of the assessment include:

- Widespread occurrences of Stone Age scatters were recorded in the wider area (Beaumont 2005 & 2008, Dreyer 2006, Van Ryneveld 2007a & 2007b, Van Schalkwyk 2011, Gaigher 2012, Morris 2012, Fourie 2014, van der Walt 2015, 2019 a and b). These artefacts are referred to as background scatter (Orton 2016) and generally of low heritage significance;
- The current study similarly recorded isolated Stone Age artefacts as well as a possible grave that is located outside of the development footprint;
- According to the SAHRA Paleontological sensitivity map the study area is of moderate paleontological significance, and this was addressed in an independent study by Bamford (2022);
- Two alternatives (Site A & Site B) were assessed, and both are acceptable from a heritage point of view. Site A is however the preferred alternative due to the close proximity of the potential burial site (K10) to a pipeline for Site B.

The impact to heritage resources is low and the project can commence provided that the recommendations in this report are adhered to, based on the South African Heritage Resource Authority (SAHRA) 's approval.

Recommendations:

- Implementation of a Chance Find Procedure for the project (as outlined in Section 10.2).
- The potential grave site K10 should be indicated on development plans and avoided.

.

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, 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	10/03/2022

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 focussing 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, Afghanistan, Nigeria and Tanzania. Through this, he has a sound understanding of the IFC Performance Standard requirements, with specific reference to Performance Standard 8 – Cultural Heritage.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

ASAPA: Association of South African Professional Archaeologists
BGG Burial Ground and Graves
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
EMPr: 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, 2002 (Act No. 28 of 2002)
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:

Beyond Heritage was appointed to conduct a HIA for the proposed Kiwano BESS and PV Project located ~ 27 km southwest of Upington in the Northern Cape Province (Figure 1.1 to 1.4). The Project will be located on Olyvenhouts Drift Settlement Agricultural Holding 1080 Portion 0. The report forms part of the Basic Assessment (BA) Report and Environmental Management Programme Report (EMPr) for the development.

The aim of the study is to survey the proposed development footprint to identify cultural heritage sites, document, and assess their importance within local, provincial, and national context. 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 utilized 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, isolated Stone Age artefacts and a potential grave 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) require all environmental documents, compiled in support of an Environmental Authorisation application as defined by NEMA EIA Regulations section 40 (1) and (2), to be submitted to SAHRA for commenting. Upon submission to SAHRA the project will be automatically given a case number as reference. As such the EIA report and its appendices must be submitted to the case as well as the EMPr, once it's 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

Project components and the location of the proposed renewable energy facility are outlined under Table 2 and 3.

Table 2: Project Description

Farm and Magisterial District	The proposed development will be located on Olyvenhouts Drift Settlement Agricultural Holding 1080 Portion 0. Registration Division of Gordonia RD, ZF Mgcawu District Municipality, Northern Cape Province
Central co-ordinate of the development	Site A: 28° 32.022'S & 21° 7.098'E Site B: 28° 30.186'S & 21° 7.597'E
Topographic Map Number	2821 CA

Table 3: Infrastructure and project activities

Type of development	Renewable Energy
Size of development	Less than 200 hectares
Project Components	The proposed Kiwano BESS and PV facility will include the following: • PV installation with envisaged capacity of 58 MW; • BESS installation with envisaged capacity of 40 MW / 200 MWh; • Kiwano 132 kV substation with 5 feeder bays; and • Single Twin-Tern 132 kV overhead line on a double circuit support structure, connecting Kiwano substation to Upington substation. The proposed PV facility will include the following associated infrastructure: • Total site area for PV installation up to 1,150,000m^2 (115 hectares) to allow for the construction of a PV facility with capacity of 58 MW. • Solar PV modules, up to a total of 450,000m^2 that convert solar radiation directly into electricity. • The solar PV modules will be elevated above the ground, and will be mounted on either fixed tilt systems or tracking systems. • Inverter stations, each occupying a footprint up to approximately 30m^2 with up to 60 Inverter stations installed on the site. • Below ground electrical cables with trenching - connecting PV arrays, Inverter stations, O&M buildings, and 132kV Kiwano substation. • Adequately designed foundations and mounting structures that will support the Solar PV modules and Inverter stations. • Where possible, existing roads that provide access to the Kiwano site will be used, upgraded, and extended as necessary. • A perimeter road around the site, approximately 5 m wide and 4.5 km in length. • Internal roads for access to the Inverter stations, approximately 5 m wide and 18 km total length. • Internal roads/paths between the Solar PV module rows, approximately 2-3 m wide, to allow access to the Solar PV modules for operations and maintenance activities. • Infrastructure required for the operation and maintenance of the Kiwano PV Plant installation include a Meteorological Station, O&M Building, Spares Warehouse and Workshop, Hazardous Chemical Store, Security Building, and Parking areas and roads.

	• Small diameter water supply pipeline connecting existing municipality pipeline, approximately 5 km long. • Stormwater channels. • Perimeter fencing of the Kiwano site, with access gates. • Temporary laydown area, occupying a footprint up to 100 000m^2 (10 hectares). The laydown area will be used during construction and rehabilitated thereafter. • Temporary site construction office area, occupying a footprint up to 10 000m^2 (1 hectare). This area will accommodate the offices for construction contractors during construction and rehabilitated thereafter.

1.3 Alternatives

Two alternative sites were provided for assessment namely Site A and B. The straight-line distance between the approximate centre points of Site Alternative A and B is approximately 4km and 4.3km northwest of the N14 National Road, respectively. The extent of the area assessed allows for siting of the development to minimize impacts to heritage resources.

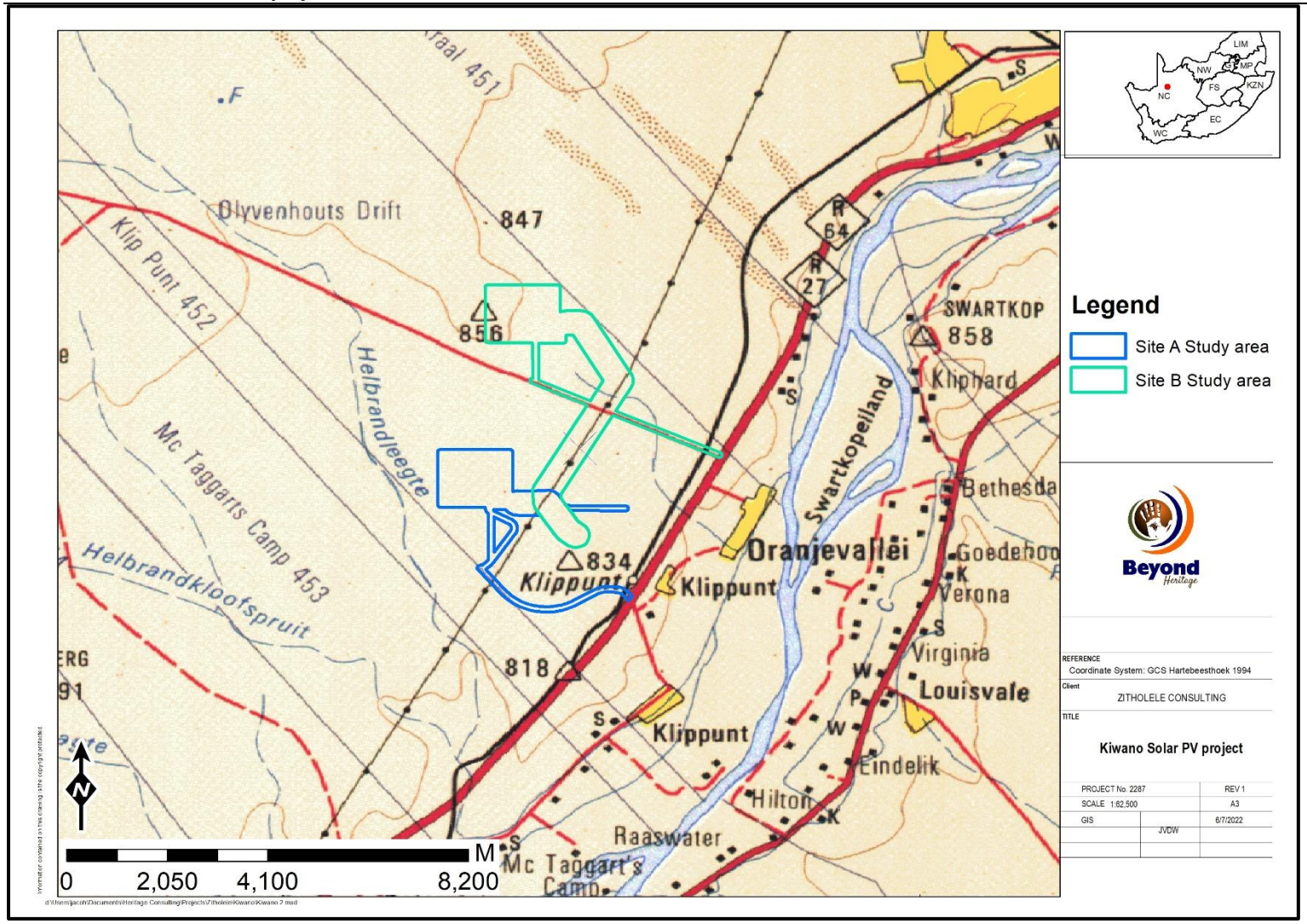


Figure 1.1. Regional setting of the Project (1: 250 000 topographical map).

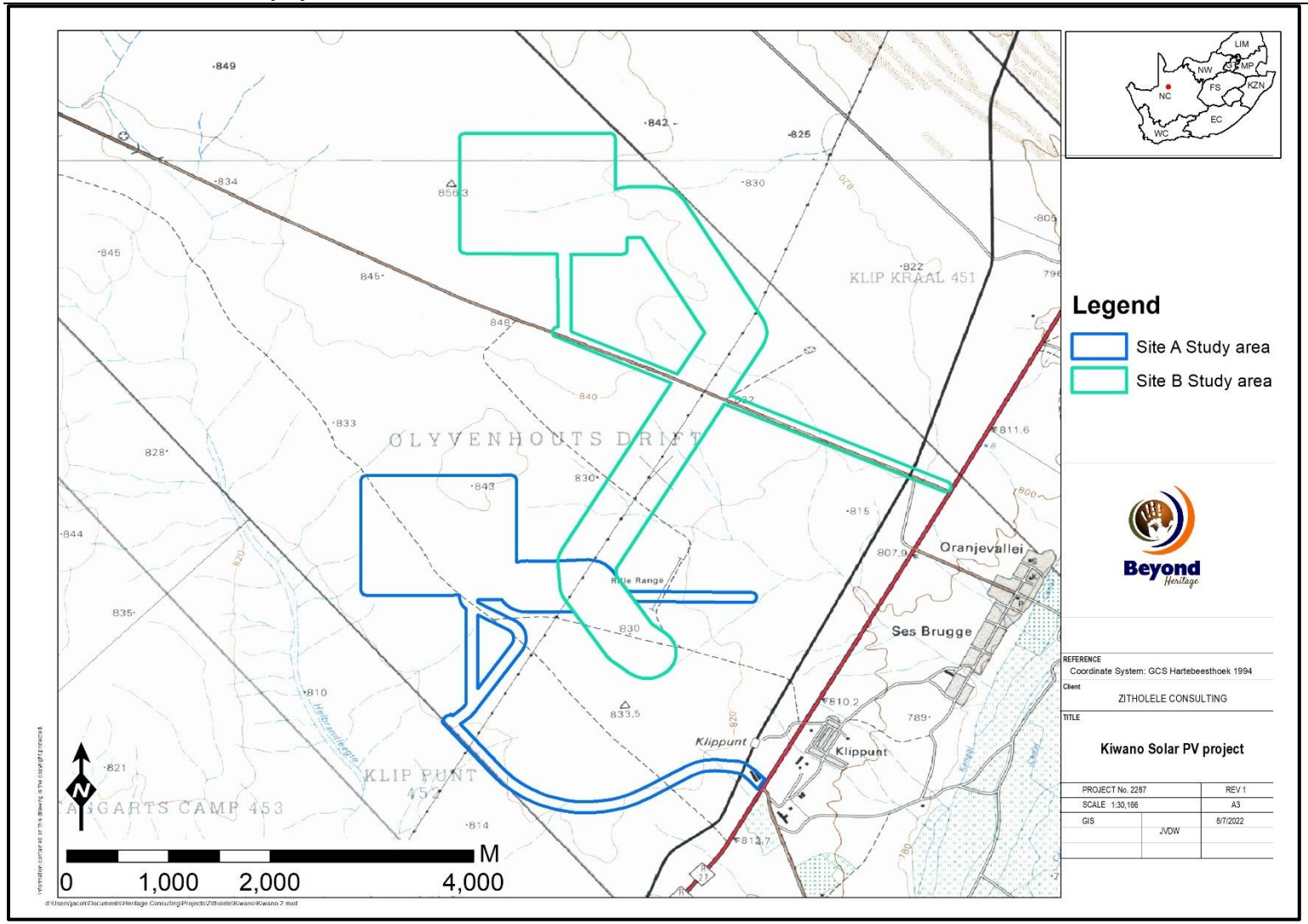


Figure 1.2. Local setting of the Project (1: 50 000 topographical map).

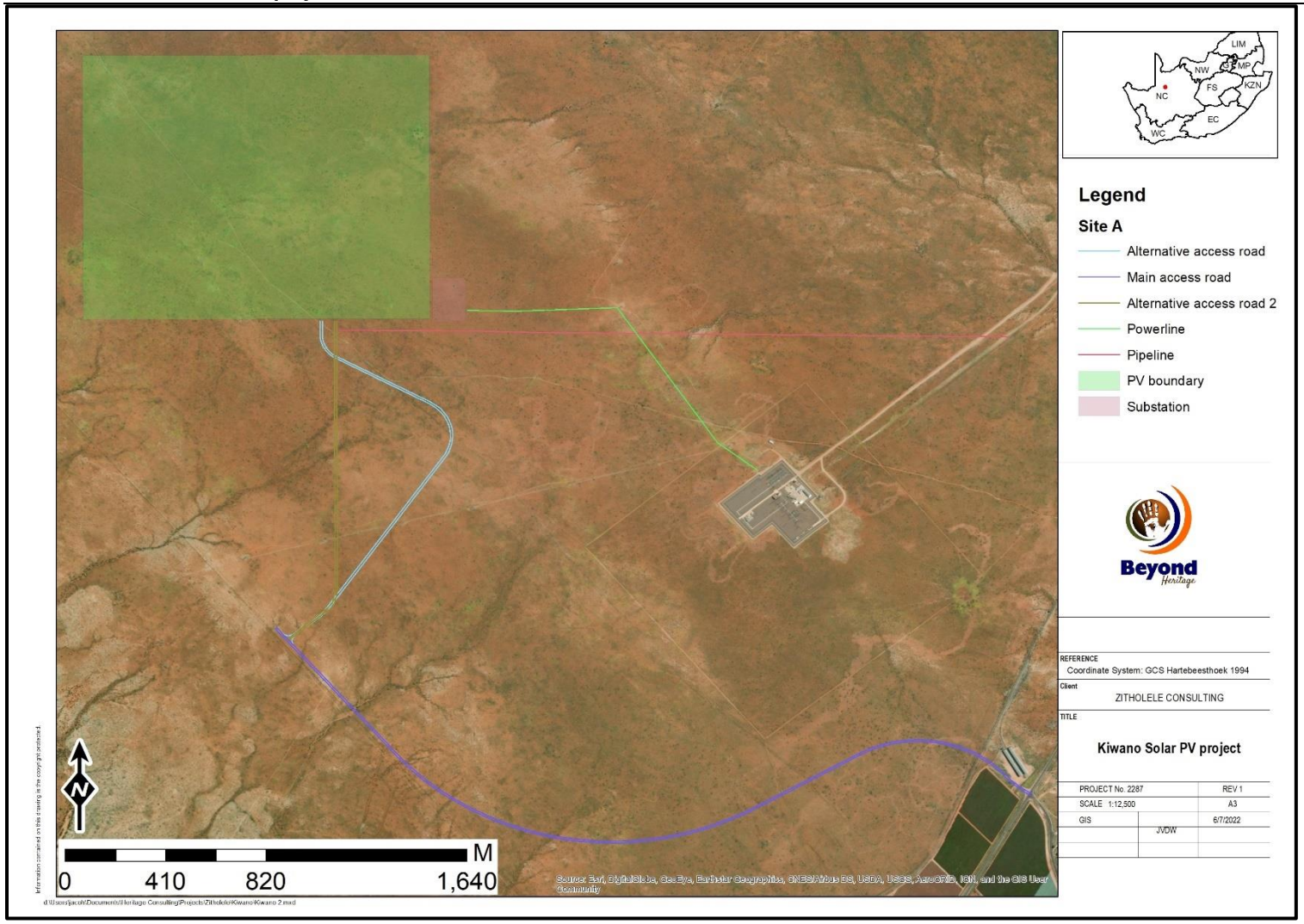


Figure 1.3. Aerial image of the development footprint and surrounds at Site A.

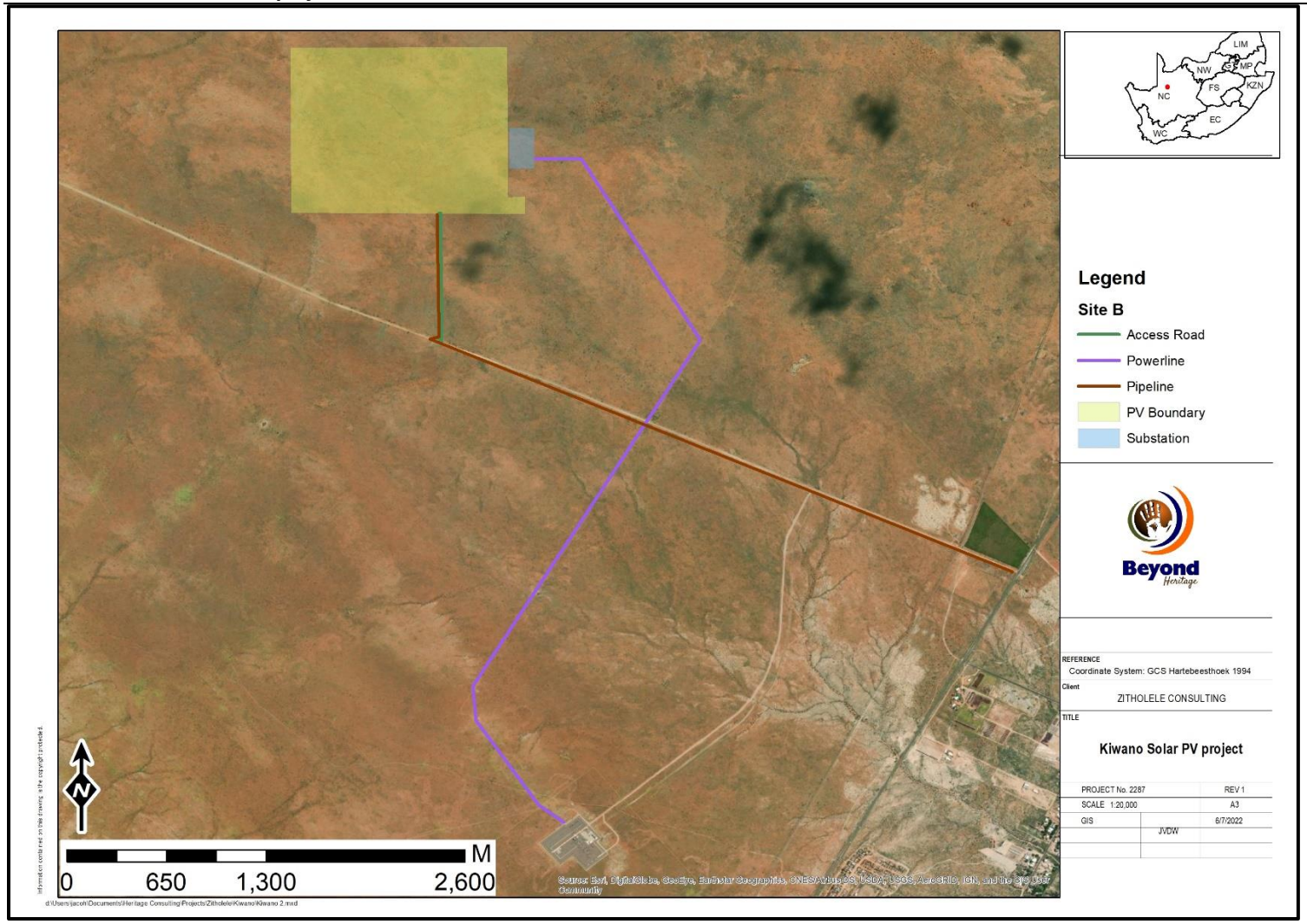


Figure 1.4. Aerial image of the development footprint and surrounds at Site B.

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 evaluation of Phase 1 HIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 HIA 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 HIA 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 3 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 HIA'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 EA 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 conducted by the EAP was to capture and address any issues raised by community members and other stakeholders during key stakeholder and public meetings.

3.4 Site Investigation

The aim of the site visit was to:

a) survey the proposed project area to 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 recorded in the project area.

Table 4. Site Investigation Details

	Site Investigation
Date	15 & 16 March and 10 May 2022.
Season	Summer – The time of year and vegetation cover did not pose a severe limitation on heritage visibility and the footprint was sufficiently covered to understand the heritage character of the area (Figure 3.1).

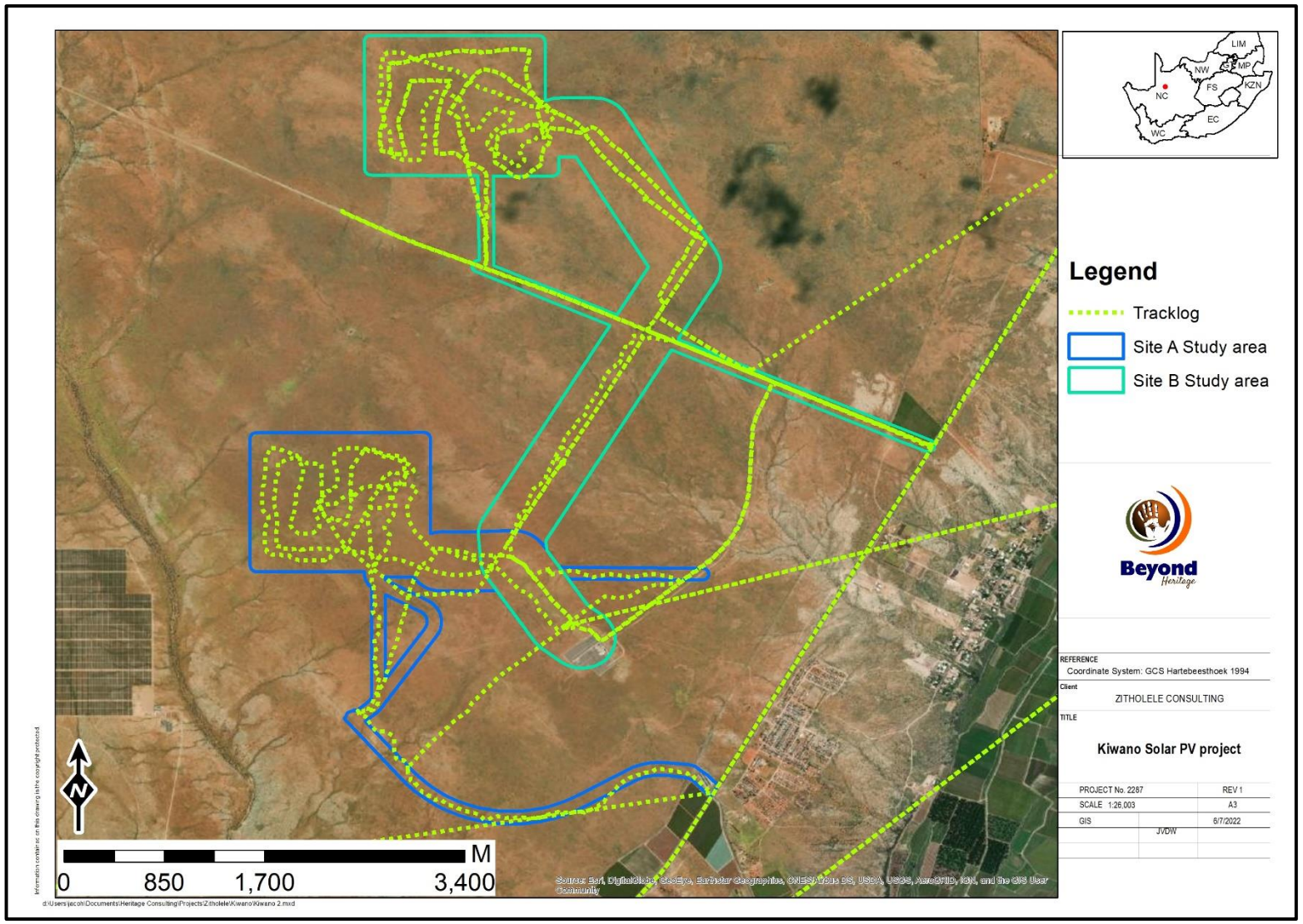


Figure 3.1. Tracklog of the survey path in green.

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. The recommendations for each site should be read in conjunction with section 10 of this report.

Table 5. Heritage significance and field ratings

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 following impact assessment methodology and rating guidelines were provided by Zitholele Consulting,

Nature of impact/risk: The type of effect that a proposed activity will have on the environment.

DIRECT, INDIRECT & CUMULATIVE

Descriptor	Definition
Direct Impact	Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
Indirect Impact	Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.
Cumulative Impact	Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

IMPACT DIRECTION

Descriptor	Definition
Positive	Environment overall will benefit from the impact/risk

Negative	Environment overall will be adversely affected by the impact/risk
Neutral	Environment overall will not be affected

SPATIAL EXTENT OF IMPACT

Extent Descriptor	Definition	Rating
Site	Impact footprint remains within the boundary of the site.	1
Local	Impact footprint extends beyond the boundary of the site to the adjacent surrounding areas.	2
Regional	Impact footprint includes the greater surrounds and may include an entire municipal or provincial jurisdiction.	3
National	The scale of the impact is applicable to the Republic of South Africa.	4
Global	The impact has global implications	5

DURATION OF IMPACT

Duration scriptor	Definition	Rating
Construction / Decommissioning phase only	The impact endures for only as long as the construction or the decommissioning period of the project activity. This implies that the impact is fully reversible.	1
Short term	The impact continues to manifest for a period of between 3 and 5 years beyond construction or decommissioning. The impact is still reversible.	2
Medium term	The impact continues between 6 and 15 years beyond the construction or decommissioning phase. The impact is still reversible with relevant and applicable mitigation and management actions.	3
Long term	The impact continues for a period in excess of 15 years beyond construction or decommissioning. The impact is only reversible with considerable effort in implementation of rigorous mitigation actions.	4
Permanent	The impact will continue indefinitely and is not reversible.	5

POTENTIAL INTENSITY OF IMPACT

Criteria for impact rating of potential intensity of a negative impact.

Potential Intensity Descriptor	Definition of negative impact	Rating
Low	Negative change with no associated consequences.	1
Moderate-Low	Nuisance impact	2
Moderate	Substantial alteration and/or reduction in environmental quality/loss of habitat/loss of heritage/loss of welfare amenity	4
Moderate-High	Severe alteration to faunal or floral populations/loss of livelihoods/individual economic loss.	8
High	Extreme alteration to human health linked to mortality/loss of a species/endemic habitat.	16

Criteria for the impact rating of potential intensity of a positive impact.

Potential Intensity Descriptor	Definition of positive impact	Rating
Low	Positive change with no other consequences.	1
Moderate-Low	Economic development	2
Moderate	Improved environmental quality/improved individual livelihoods.	4
Moderate-High	Net improvement in human welfare	8

PROBABILITY / LIKELYHOOD OF IMPACT

Likelihood Descriptor	Definition	Rating
Improbable	The possibility of the impact occurring is negligible and only under exceptional circumstances.	0,1
Very Unlikely	The possibility of the impact occurring is low with a less than 30% chance of occurring.	0,2
Unlikely	The impact has a 30% to 50% chance of occurring.	0,5
Likely	The impact has a 51% to 90% chance of occurring.	0,75
Definite	The impact has a >90% chance of occurring regardeless of preventative measures.	1

SIGNIFICANCE RATING SCALE

Score	Implications for Decision-making	Rating
< 3	The risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making. Project can be authorised with low risk of environmental degradation	Low
3 - 9	The risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated. Project can be authorised but with conditions and routine inspections. Mitigation measures must be implemented.	Moderate
10 - 20	The risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making. Project can be authorised but with strict conditions and high levels of compliance and enforcement. Monitoring and mitigation are essential.	High
21 - 26	The risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making. The project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating.	Fatally Flawed

Reversibility of the Impacts: The extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):

Descriptor	Definition

High reversibility	Impact is highly reversible at end of project life.
Moderate reversibility	Moderate reversibility of impacts.
Low reversibility	Low reversibility of impacts.
Impacts are non-reversible	The impact is permanent, i.e. this is the least favourable assessment for the environment.

Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks: The degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):

Descriptor	Definition
High irreplaceability	The project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment
Moderate irreplaceability	Moderate irreplaceability of resources
Low irreplaceability	Low irreplaceability of resources.
Resources are replaceable	The affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment.

Confidence: The degree of confidence in predictions based on available information and specialist knowledge

Descriptor	Definition
Low	EAP / Specialist has low confidence in assessment due to significant limitations such as unavailability of data or information
Medium	EAP / Specialist has medium confidence in assessment due to some limitations such as unavailability of data or information
High	EAP / Specialist has high confidence in assessment.

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 ephemeral and subsurface nature of heritage resources and pedestrian surveys, the possibility exists that some features or artefacts may not have been discovered/recorded and the possible occurrence of 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. 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

The Reviewed Integrated Development Plan – 2017 - 2022 of the Dawid Kruiper Municipality highlighted the following: "*With regards to the socio-economic characteristics of the local population, the employment rate for the Municipality is relatively high, with as much as 75% of people of working age who are actively seeking employment being able to secure a job. However, the majority of the employed population is found in elementary occupations, which require little or no skills. This is also reflected in the low education levels of the local population, with as much as 12% of the population aged 20 years and older having no form of education whatsoever. This, to some extent, constrains the development potential of the Municipality in the*

development of more advanced industries. The level of employment and type of occupations taken up by the population of the Municipality also directly affects their income levels.
The Municipality's economy is rather centred on the trade and retail sector, due to its strong tourism sector, leaving the local economy fairly vulnerable for any significant changes in this industry. It is, therefore, important that the Municipality seeks to further diversify its economy into other sectors. Furthermore, the manufacturing sector of the municipality is one of the lowest performing sectors of the local economy. This sector has the potential to generate significant growth for the region, and Dawid Kruiper Municipality is experiencing a lack of manufacturing activities. As a result, much in the municipality has to be sourced from outside of the municipal boundaries, resulting in money flowing out of the local economy. "

5 Results of Public Consultation and Stakeholder Engagement:

5.1.1 Stakeholder Identification

Adjacent landowners and the public at large were informed of the proposed activity as part of the BA process by the EAP. Site notices and advertisements notifying interested and affected parties were placed at strategic points and in local newspapers as part of the process. No heritage concerns were raised.

6 Literature / Background Study:

6.1 Literature Review (SAHRIS)

Several previous heritage studies were conducted in the general study area (SAHRIS) mostly to the west and northwest of the study area (e.g., Beaumont 2005 & 2008, Dreyer 2006, Van Ryneveld 2007a & 2007b, Van Schalkwyk 2011, Gaigher 2012, Morris 2012, Fourie 2014, van der Walt 2015, 2019 a and b). These studies identified Early, Middle and Later Stone Age assemblages as well as historical structures and artefacts. None of these sites are located within the current areas being assessed (Figure 6.1).

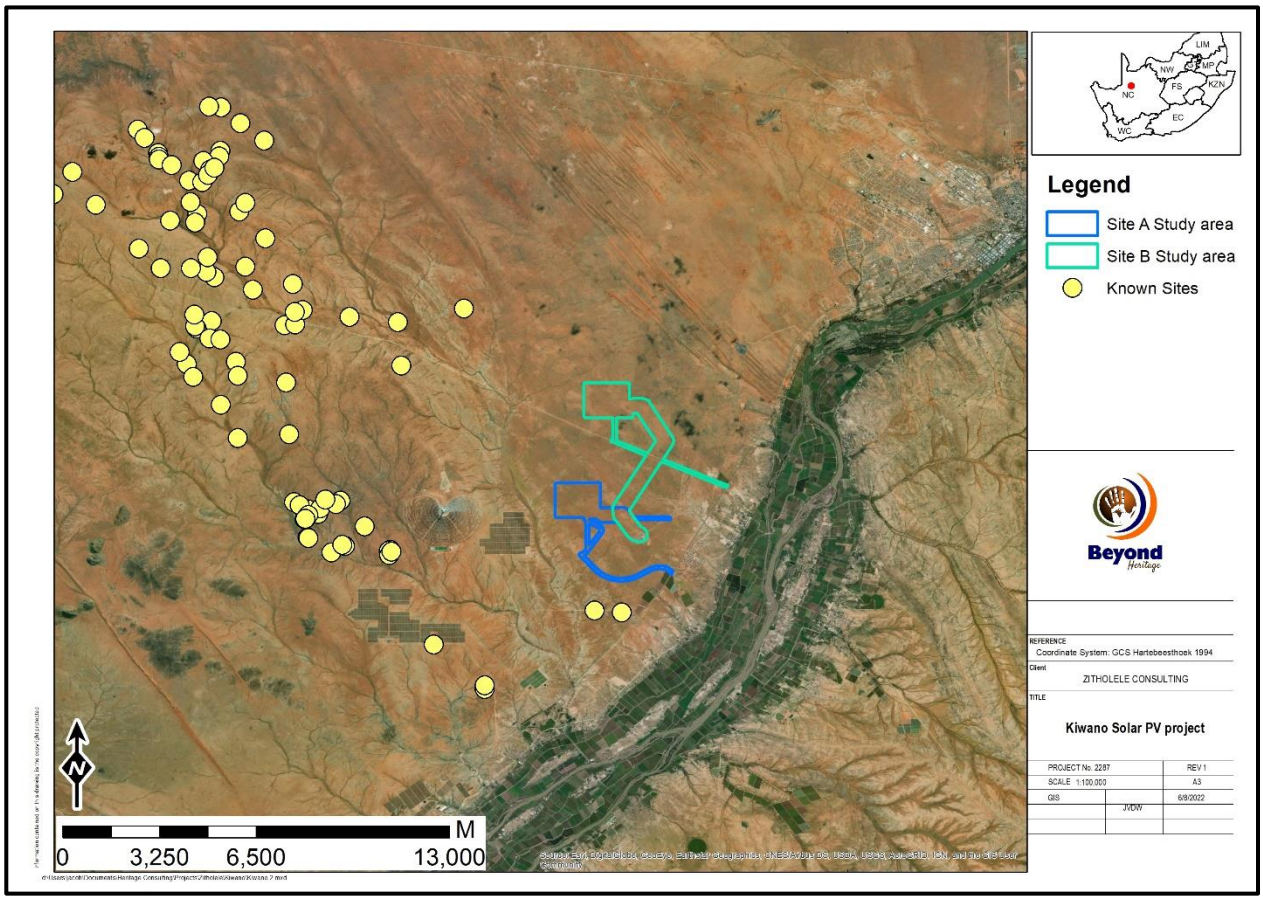


Figure 6.1. Known heritage sites in relation to the study area.

6.2. Archaeological Background to the study area.

Figure 6.2. Summary of archaeological and historical events in South Africa.

6.1.1 Stone Age History

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 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).

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 on the farm 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.

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).

6.1.2 Historical Context

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 the Basters 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 Basters went to settle north of the river. Reverend Scröder advocated for the Cape government to allow these Basters 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).

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). Moolman attributes the beginning of irrigation in this area to the Basters who he calls: "primitive pastoral people", who had "crude" ways to divert the river water to their "little gardens" (Moolman, 1946). 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 Basters in 1882. The term "Baster" refers to a group of people who have moved out of the Cape Colony to avoid social oppression and could refer to people of mixed parentage, particularly white and Khoikhoi or slave and Khoikhoi and also implies an economic category that implies the possession of property and who is culturally European (Morris, 1992). 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. The Cape government instructed the Special Magistrate appointed for the area to settle the territory with "Baster farmers" living on the southern side of the Orange River. The area was soon settled with Basters, a few whites at first largely related to the Basters by marriage and some Kora, San and Xhosa people (Legassick, 1996). 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).

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 “Basterland” 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).

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.

6.1.3. 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 Description of the Physical Environment

The topography of the area is undulating characterised by Aeolian sand on top of a calcrete sub strata with sparse grass cover and shrubs. 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 surrounded by an area mostly characterised by agricultural and renewable energy developments. General site conditions are depicted in Figure 7.1 to 7.4.

Figure 7.1. General view of the study area with adjacent solar developments visible.

Figure 7.2. Thick mantle of Aeolian sand characteristic of the study area.

Figure 7.3. General site conditions and existing electrical infrastructure.

Figure 7.4. Existing access road to the study area.

8 Findings of the Survey

8.1 Heritage Resources

According to Beaumont *et al* (1995) “thousands of square kilometres of Bushmanland are covered by a low-density lithic scatter” and are referred to as background scatter (Orton 2016), generally of low heritage significance. Stone Age scatters and isolated finds of low heritage significance were recorded during HIA’s in the area (e.g., Gaigher 2013, Fourie 2014, van der Walt 2015 and 2018). Similar isolated finds that can be attributed to background scatter were recorded in both Site A (Figure 8.1) and B (Figure 8.2). Both sites are marked by a mantle of Aeolean sand on top of a calcrete substrata and finds are mostly found where the calcrete protrudes through the sand cover. Few formal tools were noted but artefacts are mostly dating to the MSA with facetted striking platforms. One feature (K10) that could be a possible grave was recorded close to Site B. Recorded features were given the prefix K for Kiwano. The distribution of recorded features is indicated in Figure 8.1 & 8.2 and general site conditions are depicted in Figures 8.3 – 8.4 and briefly described in Table 8.

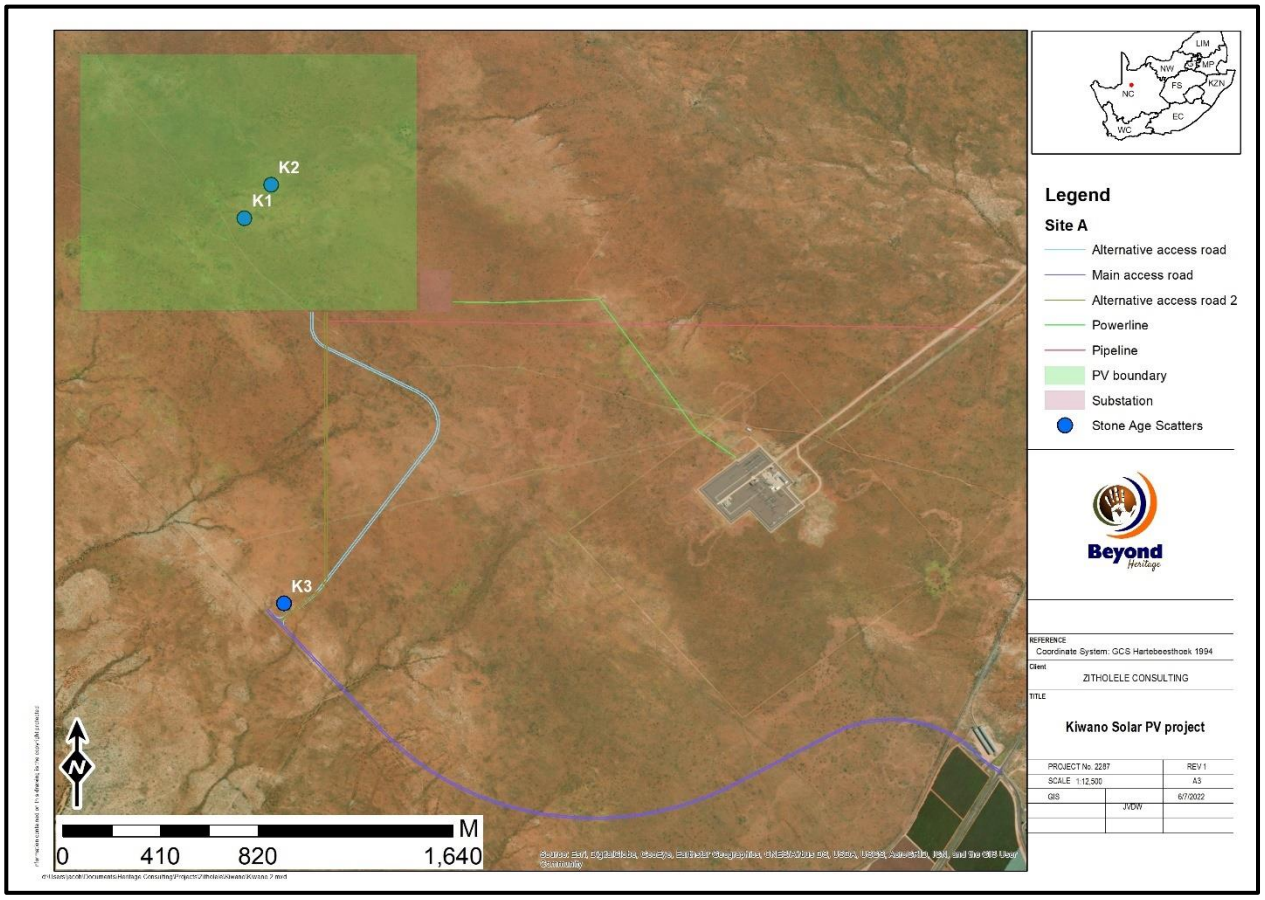


Figure 8.1. Recorded features in relation to Site A.

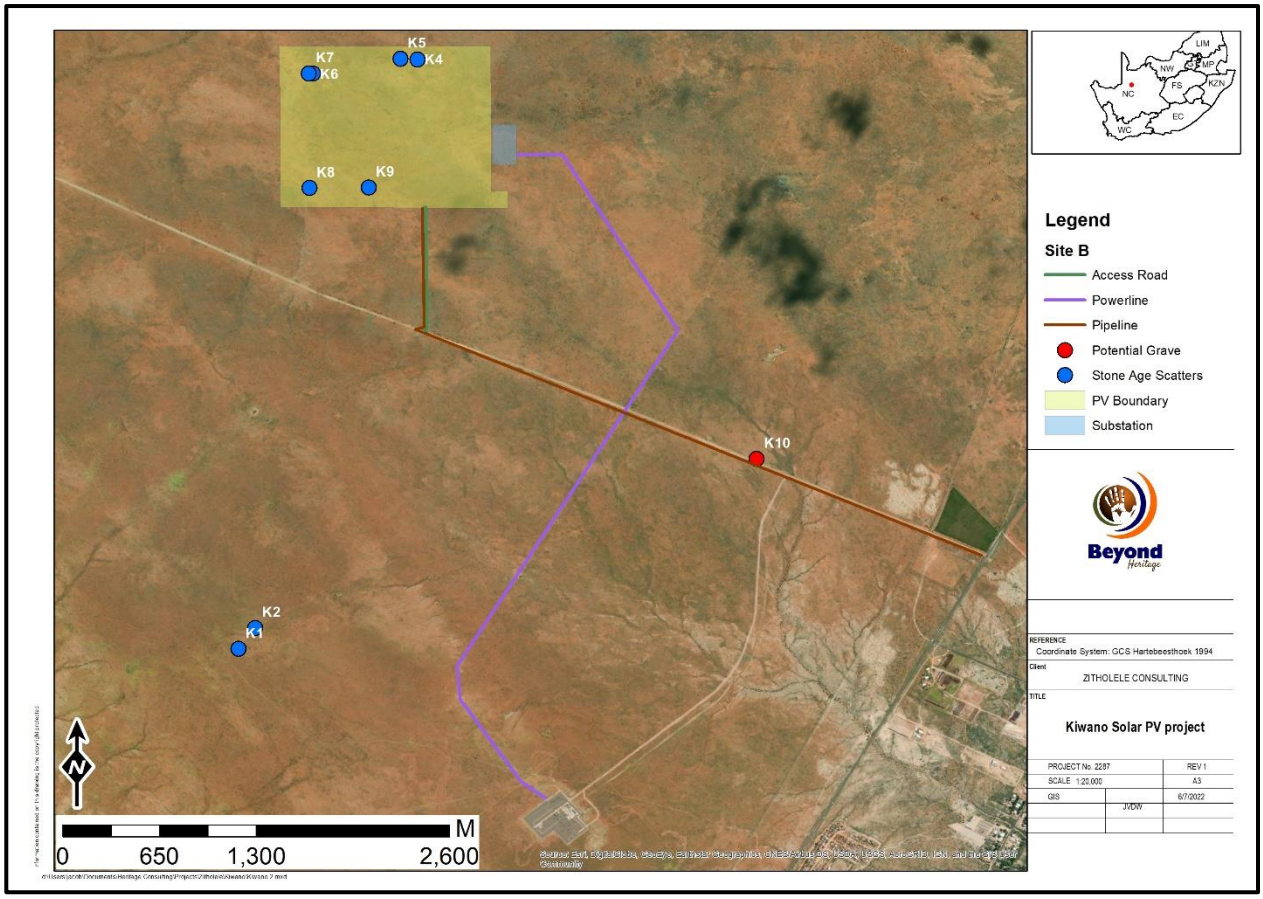


Figure 8.2. Recorded features in relation to Site B.

Table 6. Recorded features in the study area.

LABEL	LONGITUDE	LATITUDE	DESCRIPTION	Field Rating and Heritage Significance
K1	21° 07' 05.5200" E	28° 32' 05.8595" S	Broken MSA flake on banded ironstone	GP C Low Significance
K2	21° 07' 09.1525" E	28° 32' 01.3055" S	Broken MSA flake on quartzite	GP C Low Significance
K3	21° 07' 10.8948" E	28° 32' 58.3333" S	Calcrete exposure with MSA flakes outside of impact area	GP C Low Significance
K4	21° 07' 44.4972" E	28° 29' 57.4188" S	Calcrete with miscellaneous flake and a end scraper.	GP C Low Significance
K5	21° 07' 40.8361" E	28° 29' 57.2676" S	Multidirectional core	GP C Low Significance
K6	21° 07' 21.7164" E	28° 30' 00.4537" S	MSA point, broken flake and chunk on top of calcrete	GP C Low Significance
K7	21° 07' 20.8199" E	28° 30' 00.4824" S	Broken flakes with dorsal removals	GP C Low Significance
K8	21° 07' 20.9928" E	28° 30' 25.4087" S	Irregular core	GP C Low Significance
K9	21° 07' 33.8880" E	28° 30' 25.3009" S	Miscellaneous flakes on Banded Iron Stone	GP C Low Significance
K10	21° 08' 58.4485" E	28° 31' 24.4451" S	Possible grave marked by a oval cairn of river pebbles, measuring ~ 1.3 meters in diamter	GP A High Social significance

Figure 8.3. Dorsal and ventral view of isolated MSA artefacts recorded during the survey.

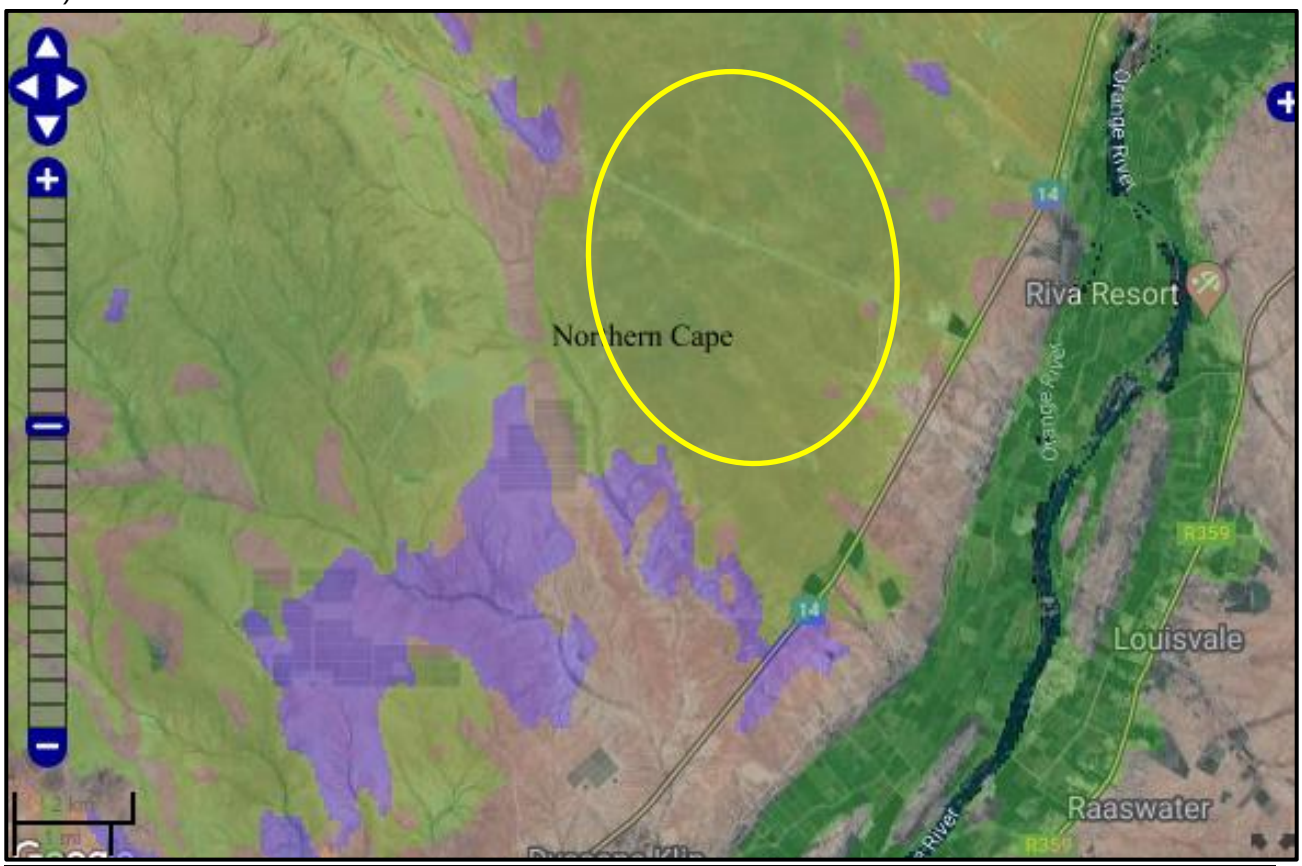
Figure 8.4. General view of the possible grave recorded at K10.

8.2 Cultural Landscape

The study area is characterised by Aeolian sand on top of a calcrete sub strata with sparse grass cover and shrubs. The larger area is utilised mostly for farming (grazing) with increasing numbers of solar projects also characterising the landscape. The area is vast and open with limited infrastructure with widespread occurrences of Stone Age material.

8.3 Paleontological Heritage

According to the SAHRA Paleontological map the study area is of moderate palaeontological sensitivity and an independent study was conducted for this aspect by Bamford (2022). The study concluded that it is extremely unlikely that any fossils would be preserved in the aeolian sands of the Gordonia Formation, Kalahari Group (Quaternary). There is a very small chance that fossils may have been trapped in features such as palaeo-pans or palaeo-springs, and buried by the aeolian sands, but no such feature is visible in the satellite imagery. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr (Bamford 2022).



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 8.5. Paleontological sensitivity of the approximate study area (yellow polygon) as indicated on the SAHRA Palaeontological sensitivity map.

9 Potential Impact

The recorded Stone Age lithics are scattered to sparsely to be of significance apart from mentioning them in this report. Based on the current lay out the possible grave is located well away from the impact area with the closest component being the proposed pipeline at Site B. The feature is shielded from impact by the existing road that is located between the identified feature and the proposed pipeline and no direct impact is expected. To ensure that no accidental damage occurs to the feature it should be indicated on development plans and avoided. Any additional effects to subsurface heritage resources can be successfully mitigated by implementing a chance find procedure. Mitigation measures as recommended in this report should be implemented during all phases of the project. Impacts of the project on heritage resources is expected to be low during all phases of the development (Table 7).

9.1.1 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. These activities can have a negative and irreversible impact on heritage features if any occur. Impacts include destruction or partial destruction of non-renewable heritage resources.

9.1.2 Construction Phase

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. Potential impacts include destruction or partial destruction of non-renewable heritage resources.

9.1.3 Operation Phase

No impacts are expected during the operation phase.

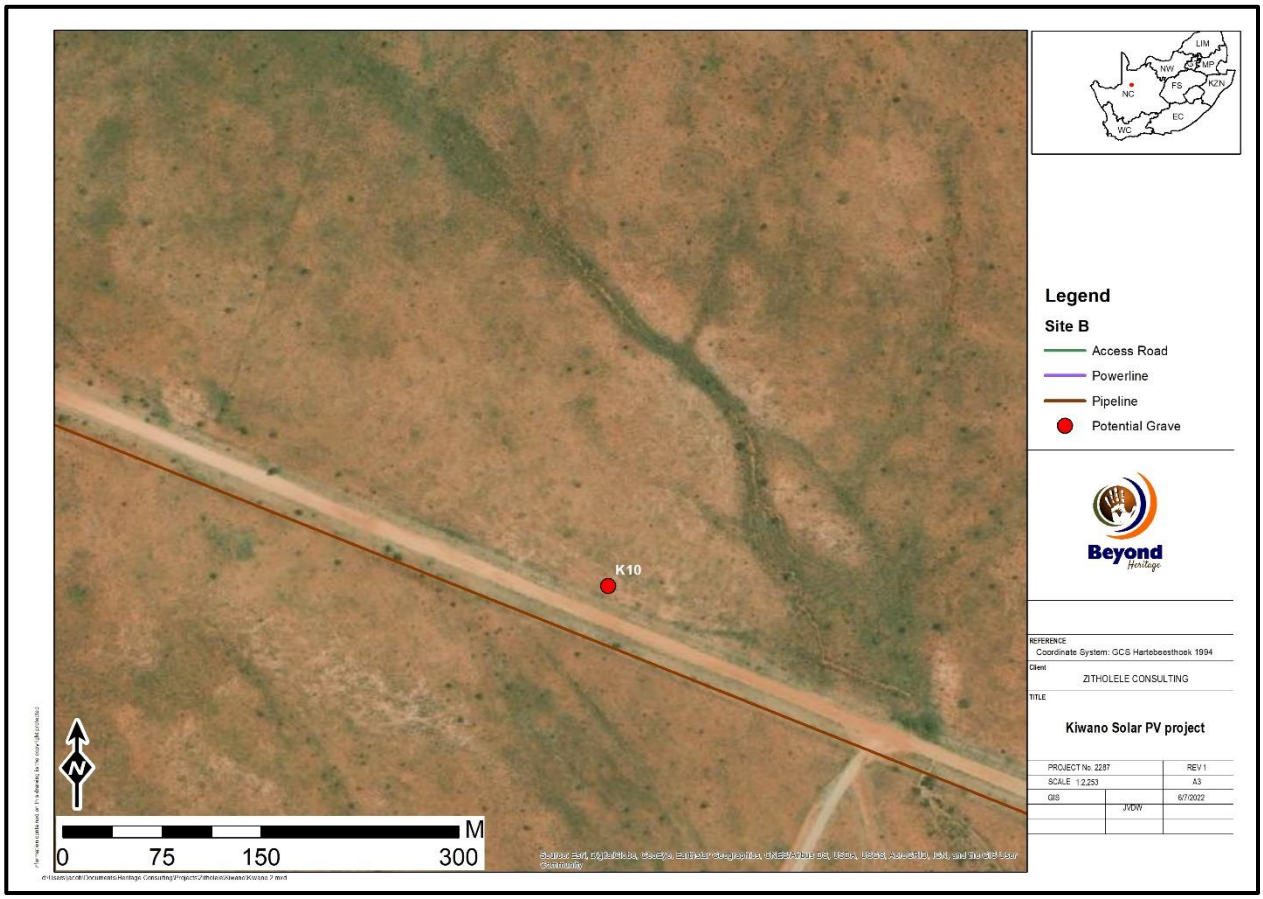


Figure 9.1. Potential burial site at K10 in relation to a proposed pipeline at Site B (~ 40 meters).

9.1.4 Impact Assessment for the Project

Table 7. Impact assessment for construction and preconstruction of the proposed project.

Impact Description		Impact type	Extent (E)	Duration (D)	Potential Intensity (P)	Likelihood (L)	Impact Rating & Significance (IR&S)	Mitigation & Management Measures
Impact	Direct Impact:	**Significance without Mitigation**						Implementation of a Chance Finds Procedure.
Impact Direction:	Negative	Existing Impact	1	5	1	0,2	1 - LOW	
Aspect:	Isolated Stone Age Artefacts	Project Impact	1	5	1	0,2	1 - LOW	
Potential Impact:		**Significance with Mitigation**						
Destruction of isolated Stone Age scatters in the project area.		Residual Impact	1	5	1	0,2	1 - LOW	
		Reversibility	Impacts are non-reversible					
		Irreplaceability	Moderate irreplaceability					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	1	5	1	0,2	1 - LOW	Widespread Stone Age background scatter occurs throughout the Northern Cape and is considered to be of low significance. The impact of the project on the isolated artefacts is considered low.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Indirect Impact:	**Significance without Mitigation**						The potential burial site (K10) should be indicated on development plans and avoided.
Impact Direction:	Negative	Existing Impact	2	5	4	0,1	1 - LOW	
Aspect:	Possible grave at K10.	Project Impact	2	5	4	0,1	1 - LOW	
Potential Impact:		**Significance with Mitigation**						
Damage or destruction to the possible grave at K10.		Residual Impact	1	5	4	0,1	1 - LOW	
		Reversibility	Impacts are non-reversible					
		Irreplaceability	High irreplaceability					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	5	4	0,1	1 - LOW	The possible grave is shielded from potential impact by existing infrastructure and no impact is expected by the project. The cumulative impact is very low.
		Confidence						

10 Conclusion and recommendations

According to Beaumont et al (1995) “thousands of square kilometres of Bushmanland are covered by a low-density lithic scatter” and are referred to as background scatter (Orton 2016), generally of low heritage significance. Stone Age scatters and isolated finds of low heritage significance were recorded during HIA’s in the area (e.g., Gaigher 2013, Fourie 2014, van der Walt 2015 and 2018) and similar, isolated finds that can be attributed to background scatter were recorded in both Site A (Figure 8.1) and B (Figure 8.2). Both sites are marked by a mantle of Aeolean sand on top of a calcrete substrata and finds are mostly found where the calcrete protrudes through the sand cover. Few formal tools were noted but artefacts are mostly dating to the MSA with facetted striking platforms. One feature (K10) that could be a possible grave was recorded close to (~40 meters) the proposed pipeline for Site B. According to the SAHRA Paleontological

sensitivity map the study area is of moderate paleontological significance, and this was addressed in an independent study by Bamford (2022) (Appendix A). The study concluded that it is extremely unlikely that any fossils would be preserved in the aeolian sands of the Gordonia Formation, Kalahari Group (Quaternary). There is a very small chance that fossils may have been trapped in features such as palaeo-pans or palaeo-springs, and buried by the aeolian sands, but no such feature is visible in the satellite imagery. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr (Bamford 2022).

Both Site alternatives (Site A & Site B) are acceptable from a heritage point of view although site A is the preferred alternative due to the close proximity of the potential burial site (K10) to a pipeline for Site B. Site B can also be developed if mitigation measures proposed are implemented around the potential burial site (K10), namely demarcation and avoidance with a 30m buffer. No adverse impact on heritage resources is expected by the project and it is recommended that the project can commence on the condition that the following recommendations (Section 10) are implemented as part of the EMPr and based on approval from SAHRA.

10.1 Recommendations for condition of authorisation

The following recommendations for Environmental Authorisation apply and the project may only proceed based on approval from SAHRA:

Recommendations:

- Implementation of a Chance Find Procedure for the project (as outlined in Section 10.2).
- The potential burial site at K10 should be indicated on development plans and avoided with a 30m buffer.

10.2 Chance Find Procedures

10.2.1 Heritage Resources

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 therefore chance find procedures should be put in place as part of the EMPr. A short summary of chance find procedures is discussed below and monitoring guidelines for this procedure are provided in Section 10.5.

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.

10.2.2 Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks 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 fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones. This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. 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.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will 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.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

10.3 Reasoned Opinion

The overall impact of the project is considered to be low and residual impacts can be managed to an acceptable level through implementation of the recommendations made in this report. The socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures are implemented for the project.

10.4 Potential risk

Potential risks to the proposed project are the occurrence of intangible features and unrecorded cultural resources (of which graves are the highest risk). This can cause delays during construction, as well as additional costs involved in mitigation and possible layout changes.

10.5 Monitoring Requirements

Day to day monitoring can be conducted by the Environmental Control Officers (ECO). The ECO or other responsible persons should be trained along the following lines:

- *Induction training:* Responsible staff identified by the developer should attend a short course on heritage management and identification of heritage resources.
- *Site monitoring and watching brief*: As most heritage resources occur below surface, all earth-moving activities need to be routinely monitored in case of accidental discoveries. The greatest potential impacts are from pre-construction and construction activities. The ECO should monitor all such activities daily. If any heritage resources are found, the chance finds procedure must be followed as outlined above.

Table 8. Monitoring requirements for the project

Heritage Monitoring					
Aspect	**Area**	**Responsible for monitoring and measuring**	**Frequency**	**Proactive or reactive measurement**	**Method**
Cultural Resources	Entire project area	ECO	Weekly (Pre construction and construction phase)	Proactively	• If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented: 1. Cease all works immediately; 2. Report incident to the Sustainability Manager; 3. Contact an archaeologist/ palaeontologist to inspect the site; 4. Report incident to the competent authority; and 5. Employ reasonable mitigation measures in accordance with the requirements of the relevant authorities. • Only recommence operations once impacts have been mitigated.

10.6 Management Measures for inclusion in the EMPr

Table 9. Heritage Management Plan for EMPr implementation

Area	Mitigation measures	Phase	Timeframe	Responsible party for implementation	Target	Performance indicators (Monitoring tool)
General project area	Implement Chance Find Procedures in case possible heritage finds are uncovered	Construction	Throughout the construction phase	Applicant EAP	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA	ECO Checklist/Report

11 References

Beaumont, P.B., Smith, A.B. & Vogel, J.C. 1995. Before the Einiqua: the archaeology of the frontier zone. In: Smith, A.B. (ed.) Einiqualand: studies of the Orange River frontier: 236-264. Cape Town: University of Cape Town Press.

Beaumont, P.B. & Morris, D. 1990. Guide to archaeological sites in the Northern Cape. Kimberley: McGregor Museum

Beaumont, P.B. 2005. Archaeological Impact Assessment at and in the Vicinity of a Quartzite Quarry on Portion 4 of the Farm Droogehout 442 near Upington.

Beaumont, P.B. 2008. Phase 1 Heritage Impact Assessment Report on a Portion of the Farm Keboes 37, near Kanoneiland, Siyanda District Municipality, Northern Cape Province.

Breton, G., Schlebusch, C. M., Lombard, M., Sjödin, P., Soodyall, H. & Jakobsson, M. (2014). Lactase persistence alleles reveal partial East African ancestry of southern African Khoe pastoralists. *Current Biology*, *24*(8), 852–858.

Dreyer, C. 2006. First Phase Archaeological and Cultural Heritage Assessment of the Proposed Concentrated Solar Thermal Plant (Csp) at the Farms Olyvenhouts Drift, Upington, Bokpoort 390 and Tampansrus 294/295, Groblershoop, Northern Cape.

Du Preez, S. J. 1977. *Peace attempts during the Anglo Boer War until March 1901.* Magister Artium thesis in History. Pretoria: University of Pretoria.

Fourie 2014. Heritage Impact Assessment for the proposed Solar Power Park for SolarReserve SA (Pty) Ltd, Farm Rooipunt 617, Gordonia RD, Siyanda District Municipal Region, Northern Cape

Gaigher, S. 2012. Heritage Impact Assessment, Basic assessment report for the proposed establishment of the grid integration infrastructure for sites 1.1, 1.2, 1.3 and 2, as part of the larger Karoshoek Valley Solar Park, on a site located 30 km East of Upington, Northern Cape Province. Unpublished report for Savannah Environmental (Pty) Ltd.

Gaigher, S. 2013. Heritage Impact Assessment (HIA) Report, EIA Phase for the Proposed Sirius Solar Project near Upington in the Northern Cape Province. Unpublished report for Savannah Environmental (Pty) Ltd.

Hocking, A. 1983. *Kaias and cocopans: the story of mining in South Africa's Northern Cape*. Johannesburg: Hollards Publishers.

Kaplan, J. 2017. Archaeological Impact Assessment, Keren Energy Keimoes Solar Energy Farm on Erf 666 Keimoes, Northern Cape

Kaplan, J. 2013.Heritage Impact Assessment Specialist Archaeological Study Proposed Low Cost Housing Project Erf 666 (Site B), Keimoes Northern Cape

Kaplan, J. 201. Archaeological Impact Assessment proposed low cost housing project Erf 666 (Site A), Keimoes.

Lastovica, E., 1982. *Bottles & Bygones: A Guide for South African Collectors*. Don Nelson.

Lombard, M. 2011. Background to the Stone Age of the Kakamas/Keimoes area for CRM purposes. Unpublished report.

Lombard, M., Wadley, L., Deacon, J., Wurz, S., Parsons, I., Mohapi, M., Swart, J. & Mitchell, P. (2012). South African and Lesotho Stone Age sequence updated (I). *South African Archaeological Bulletin*, *67*(195), 123–144.

Marais, J. J. 1977. *De Aar, Stad in wording 1902-1977*. De Aar: Feeskomitee.

Morris, D. 1994. An ostrich eggshell cache from the Vaalbos National Park, Northern Cape,South Africa. Southern African Field Archaeology 3: 55-58.

Morris, A.G. 1995. The Einiqua: an analysis of the Kakamas skeletons. In: Smith, A.B. (ed.) Einiqualand: Studies of the Orange River Frontier: 110-164. Cape Town: UCT Press.

Morris, D. 2012. Archaeological Impact Assessment for Blocuso. Unpublished report.

Mucina, L. & Rutherford, M.C. 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute. Pretoria.

National Heritage Resources Act NHRA of 1999 (Act 25 of 1999)

Orton, J. 2016. Prehistoric cultural landscapes in South Africa: a typology and discussion. *South African Archaeological Bulletin* 71: 119-129.

Parsons, I. 2000. Later Stone Age open-air sites on Bloubos, Northern Cape. Southern African Field Archaeology 9: 55-67.

Parsons, I. 2003. Lithic expressions of Later Stone Age lifeways in the Northern Cape. South African Archaeological Bulletin 58: 33-37.

Parsons, I. 2004. Stone circles in the Bloubos landscape, Northern Cape. Southern African Humanities 16: 59-69.

Parsons, I. 2007. Hunter-gatherers or herders? Reconsidering the Swartkop and Doornfontein Industries, Northern Cape Province, South Africa. Before Farming 2007/4: Article 3.

Parson, I. 2008. Five Later Stone Age artefact assemblages from the interior Northern CapeProvince. South African Archaeological Bulletin 63: 51-60.

Ross, R. 2002. *A concise history of South Africa*. Cambridge: Cambridge University Press.

SAHRA Report Mapping Project Version 1.0, 2009

Smith, A.B. 1995. Archaeological observations along the Orange River and its hinterland. In:Smith, A.B. (ed.) Einiqualand: studies of the Orange River frontier: 236-264.Rondebosch: UCT Press.

Van der Walt,J. 2015. Archaeological Impact Assessment report For the proposed AEP Bloemsmond Solar 1 PV project, Keimoes, Northern Cape. Unpublished report for Savannah Environmental (Pty) Ltd.

Van der Walt,J. 2019a. Heritage Impact Assessment Sirius Solar PV Project 3, Upington, Northern Cape Province. Unpublished report for Savannah Environmental (Pty) Ltd.

Van der Walt,J. 2019b. Heritage Impact Assessment Sirius Solar PV Project 4, Upington, Northern Cape Province. Unpublished report for Savannah Environmental (Pty) Ltd.

Van der Walt,J. 2019c. Heritage Impact Assessment Bloemsmond 3, Upington, Northern Cape Province. Unpublished report for Cape EA Prac.

Van der Walt,J. 2019d. Heritage Impact Assessment Bloemsmond 4, Upington, Northern Cape Province. Unpublished report for Cape EA Prac.

Van Ryneveld, K. 2007a. Phase 1 Archaeological Impact Assessment -Portion of the Farm Cnydas East 439, Upington District, Northern Cape,South Africa.

Van Ryneveld, K. 2007b. Phase 1 Archaeological Impact Assessment -Portion of the Farm Boksputs 118, Groblershoop District, Northern Cape, South Africa.

Van Schalkwyk, J.2011. AIA for Karoshoek Solar Park. Unpublished report.

Wagenaar, E. J. C. 1984. A Forgotten frontier zone: settlements and reactions in the Stormberg area between 1820-60. Pretoria: Government Printer, 1984.

APPENDIX A

Palaeontological Impact Assessment for the proposed Eskom Kiwano BESS and PV facility, southwest of Upington, Northern Cape Province

Desktop Study (Phase 1)

For

Beyond Heritage

03 April 2022

Prof Marion Bamford
Palaeobotanist
P Bag 652, WITS 2050
Johannesburg, South Africa
Marion.bamford@wits.ac.za

Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf
Experience: 33 years research and lecturing in Palaeontology
25 years PIA studies and over 300 projects completed

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Beyond Heritage, Modimolle, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Executive Summary

A Palaeontological Impact Assessment was requested for the Eskom Kiwano BESS and PV project on their property, southwest of Upington, Northern Cape Province. There are two options for the sites and infrastructure, Site A to the south of the road and Site B to the north of the road from the N14 north westwards to Lutzputs.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed site lies on the moderately fossiliferous aeolian sands of the Gordonia Formation (Kalahari Group, Quaternary age). Aeolian sands do not preserve fossils but might cover traps such as palaeo-pans and palaeo-springs. No such feature is visible from the satellite imagery. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, developer, environmental officer or any other designated responsible person once excavations/ drilling activities have commenced. Since the impact is low, as far as the palaeontology is concerned, the project should be authorised.

Table of Contents

1. Background

Eskom is in the process of developing and executing the distributed Battery Energy Storage System (BESS) and Photovoltaic (PV) portfolio of projects in two phases, namely BESS and PV Phase 1, and BESS and PV Phase 2.

The Kiwano BESS and PV project is part of Phase 2, and comprises an envisaged PV capacity of 58 MW, and BESS capacity of 40 MW / 200 MWh. The Kiwano BESS and PV facility will be located at the Eskom owned Kiwano site, near Upington in the Northern Cape (Figures 1-3). The Kiwano BESS and PV Project Development department requires preliminary technical information regarding the proposed project scope, equipment, and infrastructure to initiate the environmental approval processes.

At this stage, it is assumed that Eskom will execute the project utilising an EPC Contractor. The final detailed designs, layout, and construction of the PV and BESS facility will be performed by the selected EPC Contractor, and may differ to the PV and BESS facility configuration and technical information presented in this preliminary report.

A Palaeontological Impact Assessment was requested for the Kiwano BESS and PV project. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 1: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6).

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report,	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
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	Section 4
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity 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	Sections 6, 8
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies of any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A
2	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

Figure 1: Google Earth map of the general area to show the relative land marks and Site B (green) and site A (pink), south west of Upington.

Figure 2: Google Earth Map of the proposed Site A option for the Kiwano BESS and PV facility, south of the road to Lutzputs and close to the Kiwano Substation. Pale pink polygon = site boundary site; green polygon = substation; red line = access road; green line = pipeline; purple line = powerline.

Figure 3: Google Earth map of Site B alternative for the Kiwano BESS and PV facility; Green polygon = site boundary; lilac polygon = substation; green line = powerline; blue line = pipeline and purple line = access road. Note this option is north of the road to Lutzputs and farther away from the existing Kiwano Substation.

2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.
The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

3. Geology and Palaeontology

i. Project location and geological context

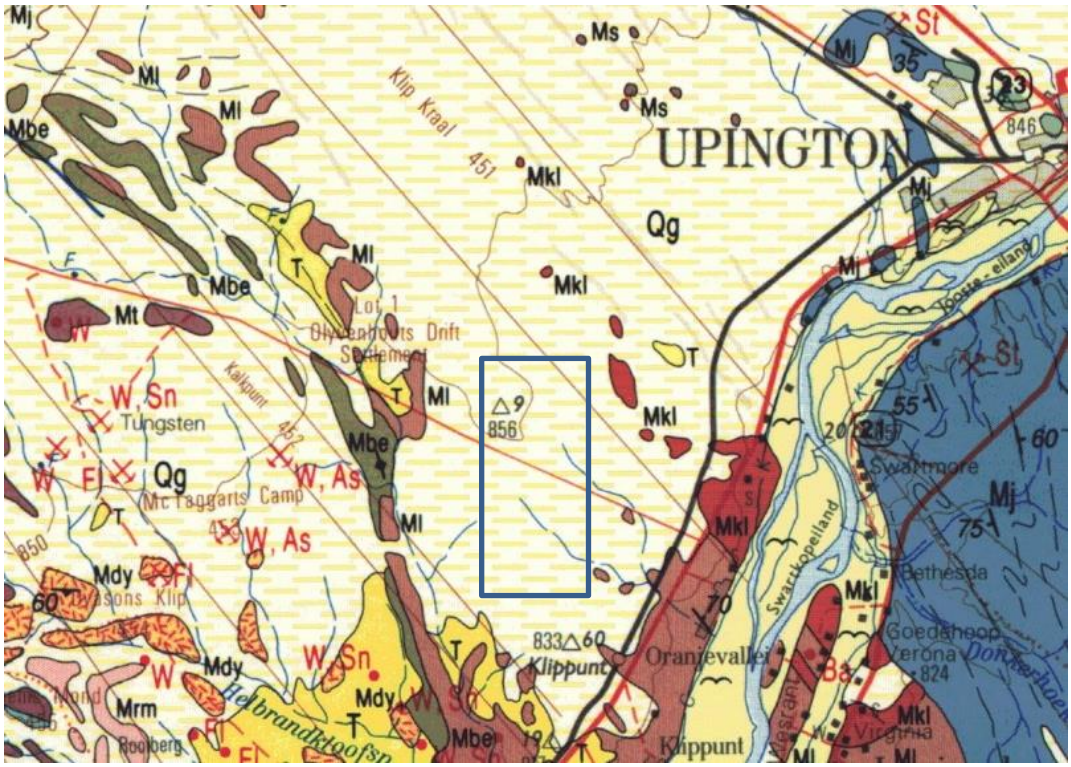


Figure 4: Geological map of the area around the Kiwano project area indicated within the blue rectangle with Site A south of the road and Site B north of the road to Lutzputs. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2820 Upington.

Table 2: Explanation of symbols for the geological map and approximate ages (Cornell et al., 2006; Partridge et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Qg	Gordonia Fm, Kalahari Group	Red-brown wind-blown sand and sand dunes	Quaternary, ca 2.5 Ma to present
T	Tertiary	Calcrete	Neogene, last 25 Ma
Ml	Louisvale Granite, Keimos Suite, Kakamas Terrane, Namaqua-Natal Province	Light grey granite	1200 - 1000 Ma
Mkl	Klipkraal Granite, Keimos Suite, Kakamas Terrane, Namaqua-Natal Province	Unfoliated, granophyric granite porphyry	1200 - 1000 Ma
Mde	Bethesda Fm, Areachap Group, Kakamas	Migmatitic, biotite-rich and aluminous gneisses	1200 - 1000 Ma

Symbol	Group/Formation	Lithology	Approximate Age
	Terrane, Namaqua-Natal Province		
Mt	Toeslaan Fm, Biesjepoort Group, Kakamas Terrane, Namaqua-Natal Province	Kinzigite gneiss	1200 - 1000 Ma

The Kiwano project lies in the Namaqua-Natal Province in the Namaqua section (Figure 4, Table 2). The Namaqua-Natal Province is a tectono-stratigraphic province and forms the southern and western boundary of the ancient Kaapvaal Craton, and extends below the Karoo Basin sediments to the south (Cornell et al., 2006). It comprises rocks that were formed during the Namaqua Orogeny (mountain-building) some 1200 – 1000 million years ago. It has been divided by geologists into a number of terranes (similar lithology and bounded by shear zones). There are three main lithologic units used to separate the terranes as well as the shear zones but still there is some debate about the terranes (ibid). Very simply, the lithologic units are older reworked rocks, juvenile rocks formed during tectonic activities and metamorphosed, and intrusive granitoids.

According to Cornell et al. (2006) the five terranes are:
A - Richtersveld Subprovince (undifferentiated terranes)
B – Bushmanland Terrane (granites)
C – Kakamas Terrane (supracrustal metapelite ca 2000 Ma
D – Areachap Terrane (supracrustal rocks and granitoids)
E – Kaaien Terrane (Keisian aged metaquartzites and deformed volcanic rocks).

The farm lies in the Kakamas Terrane and it has a more or less northwest-southeast extent, bounded on the eastern side by the Boven-Ruzgeer Shear zone and on the western side by the Hartbees River Thrust. The Namaqua-Natal Province rocks are volcanic in origin and frequently metamorphosed. (Cornell et al., 2006).

Overlying many of these rocks are loose sands and sand dunes of the Gordonia Formation, Kalahari Group of Neogene Age. The Gordonia Formation is the youngest of six formations and is the most extensive, stretching from the northern Karoo, Botswana, Namibia to the Congo River (Partridge et al., 2006). It is considered to be the biggest palaeo-erg in the world (ibid). The sands have been derived from local sources with some additional material transported into the basin (Partridge et al., 2006). Much of the Gordonia Formation comprises linear dunes that were reworked a number of times before being stabilised by vegetation (ibid).

ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 5. The site for development lies on volcanic and metamorphic rocks of the Kakamas Terrane, Namaqua-Natal Province that are dated between 1200 to 1000 Ma. This predates any body fossils, and because of their volcanic origin, they do not preserve any

fossils. There are only small outcrops of the rocks in the area but not in the project footprint. Nonetheless, they would not preserve fossils.

The aeolian sands of the Gordonia Formation do not preserve fossils because they have been transported and reworked. Such oxic environments as loose sands are not conducive to reservation because the oxygen enables fungi and invertebrates to breakdown organic matter (Cowan, 1995). However, in some regions the sands may have covered palaeo-pan or palaeo-spring deposits and these can trap fossils, and more frequently archaeological artefacts (Goudie and Wells, 1995). Usually these geomorphological features can be detected using satellite imagery. No such features are visible.

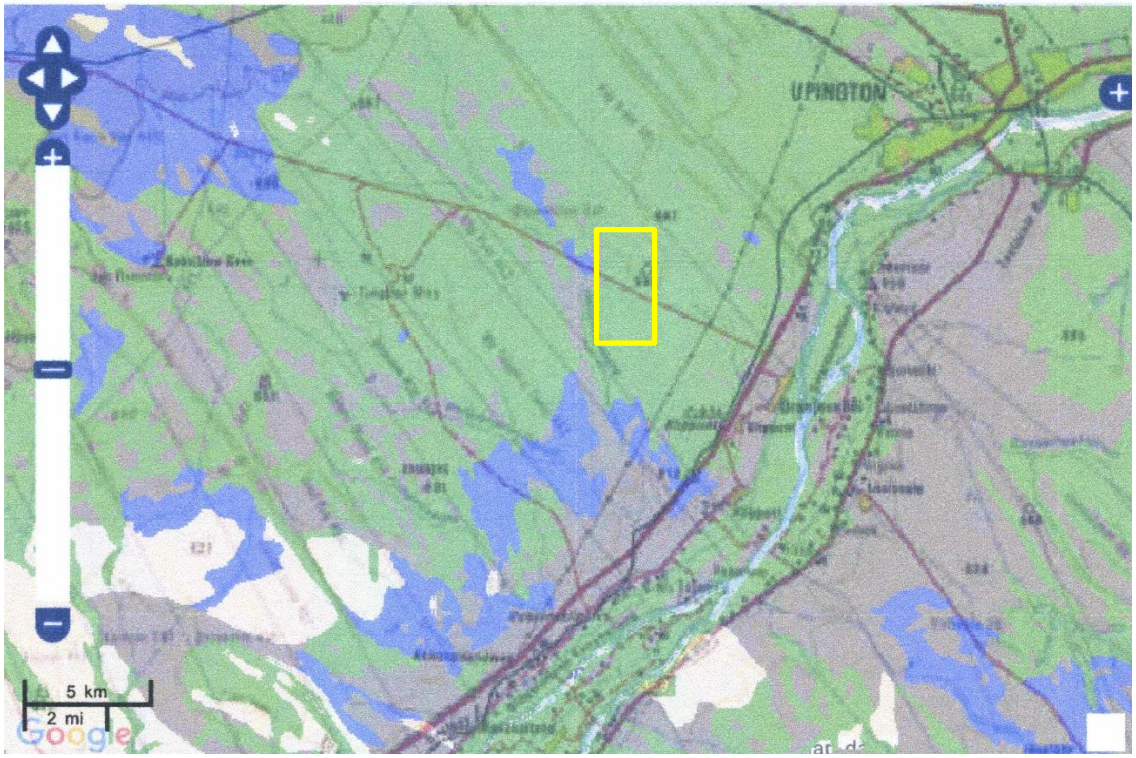


Figure 5: SAHRIS palaeosensitivity map for the site for the proposed Kiwano BESS and PV project, with Site A south of the road and Site B north of the road, shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

From the SAHRIS map above the area is indicated as moderately sensitive (green) and this applies to the Gordonia Formation aeolian sands, so a desktop study is required.

4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

Table 3a: Criteria for assessing impacts

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

Table 3b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	**H**	-
	M	-
	L	Aeolian sands do not preserve fossils; so far there are no records from the Gordonia Fm of plant or animal fossils in this region so it is very unlikely that fossils occur on the site. The impact would be negligible
	L+	-
	M+	-
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.

PART B: Assessment		
SPATIAL SCALE	L	Since the only possible fossils within the area would be fossils trapped in palaeo-pans or palaeo-springs beneath the sands, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	H	-
	M	-
	L	It is extremely unlikely that any fossils would be found in the loose soils and sands that cover the area as no pan or spring feature is evident. Nonetheless, a Fossil Chance Find Protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old to contain fossils or the wrong types, namely aeolian sand. No traps for fossils are evident from the satellite imagery. Since there is an extremely small chance that fossils from buries pans or springs may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the granites, gneisses, sandstones, shales and sands are typical for the country and do contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Gordonia Formation would not preserve fossils but might have buried traps such as palaeo-pans or palaeo-springs. No such feature is evident in the satellite imagery.

6. Recommendation

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the aeolian sands of the Gordonia Formation, Kalahari Group (Quaternary). There is a very small chance that fossils may have been trapped in features such as palaeo-pans or palaeo-springs, and buried by the aeolian sands, but no such feature is visible in the satellite imagery. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations for foundations or amenities have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. Since the impact on the palaeontological heritage would be very low, as far as the palaeontology is concerned, the project should be authorised.

7. References

Cornell, D.H., Thomas, R.J., Moen, H.F.G., Reid, D.L., Moore, J.M., Gibson, R.L., 2006. The Namaqua-Natal Province. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 325-379.

Goudie, A.S., Wells, G.L., 1995. The nature, distribution and formation of pans in arid zones. Earth Science Reviews 38, 1-69.

Partridge, T.C., Botha, G.A., Haddon, I.G., 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 585-604.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

8. Chance Find Protocol

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

1. The following procedure is only required if fossils are seen on the surface and when drilling/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 fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 6). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. 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.

7. If no good fossil material is recovered then no site inspections by the palaeontologist will 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.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

9. Appendix A – Examples of fossils from the Quaternary fluvial and pan settings

Figure 6: Photographs of fragmented and transported fossils from Quaternary deposits.

10. Appendix B – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD
January 2022

I) Personal details

Surname	:	**Bamford**
First names	:	**Marion Kathleen**
Present employment	:	Professor; Director of the Evolutionary Studies Institute. Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa
Telephone	:	+27 11 717 6690
Fax	:	+27 11 717 6694
Cell	:	082 555 6937
E-mail	:	marion.bamford@wits.ac.za ; marionbamford12@gmail.com

ii) Academic qualifications

Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.
NRF Rating: C-2 (1999-2004); B-3 (2005-2015); B-2 (2016-2020); B-1 (2021-2026)

iii) Professional qualifications

Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) Membership of professional bodies/associations

Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) – 1997+
PAGES - 2008 –onwards: South African representative

ROCEEH / WAVE – 2008+
INQUA – PALCOMM – 2011+onwards

vii) Supervision of Higher Degrees
All at Wits University

Degree	Graduated/completed	Current
Honours	13	0
Masters	11	3
PhD	11	6
Postdoctoral fellows	15	1

viii) Undergraduate teaching
Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 45 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 12-20 students per year.

ix) Editing and reviewing
Editor: Palaeontologia africana: 2003 to 2013; 2014 – Assistant editor
Guest Editor: Quaternary International: 2005 volume
Member of Board of Review: Review of Palaeobotany and Palynology: 2010 –
Associate Editor Open Science UK: 2021 -
Review of manuscripts for ISI-listed journals: 30 local and international journals
Reviewing of funding applications for NRF, PAST, NWO, SIDA, National Geographic, Leakey Foundation

x) Palaeontological Impact Assessments

Selected from the past five years only – list not complete:

- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for EnviroPro
- Skeerpoort Farm Mast 2020 for HCAC

- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for EnviroPro
- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe

xi) Research Output

Publications by M K Bamford up to January 2022 peer-reviewed journals or scholarly books: over 160 articles published; 5 submitted/in press; 10 book chapters.
Scopus h-index = 30; Google scholar h-index = 35; -i10-index = 92
Conferences: numerous presentations at local and international conferences.