

HERITAGE IMPACT ASSESSMENT

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

FOR THE PROPOSED MOPANE SOLAR PV1 RENEWABLE ENERGY GENERATION PROJECT
ON THE REMAINDER OF THE FARM DOUGLASDALE 95 IQ, LOCATED WITHIN THE JB MARKS
LOCAL MUNICIPALITY, DR KENNETH KAUNDA DISTRICT MUNICIPALITY, NORTH WEST
PROVINCE.

Type of development:

Photovoltaic Power Plant

Client:

AGES Limpopo (Pty) Ltd

Developer:

Voltalia South Africa (Pty) Ltd

Report prepared by:



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Project number 23002

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January 2023

APPROVAL PAGE

Project Name	Mopane Solar PV1 Renewable Energy Generation Project.
Report Title	Heritage Impact Assessment for the Proposed Mopane Solar PV1 Renewable Energy Generation Project on the Remainder of The Farm Douglasdale 95 IQ, Located Within The JB Marks Local Municipality, DR Kenneth Kaunda District Municipality, North West Province.
Authority Reference Number	TBC
Report Status	Draft Report
Applicant Name	Voltalia South Africa (Pty) Ltd

Responsibility	Name	Qualifications and Certifications	Date
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Amendments on Document

Date	Report Reference Number	Description of Amendment

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REPORT OUTLINE

Appendix 6 of the GNR 326 Environmental Impact Assessment (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	<i>Declaration of Independence</i>
(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, 7 and 8.
(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 5
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Refer to EIA report
(q) Any other information requested by the competent authority	N.A

Executive Summary

AGES Limpopo (Pty) Ltd was appointed as the Environmental Assessment Practitioner (EAP) by Voltalia South Africa (Pty) Ltd to undertake the required Environmental Authorisation Process for the proposed development of a Photovoltaic Solar Plant (Mopane Solar PV1) that will form part of the Mopane Solar PV Cluster Development. Beyond Heritage was appointed to conduct a Heritage Impact Assessment (HIA) for the project and the study area was assessed on a desktop level and by a non-intrusive pedestrian field survey. Key findings of the assessment include:


- The topography of the study area is undulating with no major topographic features (such as pans or shelters) that would have been focal points for human activity in antiquity. However, chert outcrops mean that readily available raw material for lithic manufacture resulted in a background scatter (Orton 2016) of expediently knapped Stone Age artefacts to be present across the area;
- During the survey no Earlier Stone Age material was noted and although few diagnostic pieces were recorded in the low-density open-air scatters, the lithics suggest human occupation of the wider area from the MSA onwards;
- The project area consists of expansive open fields with dense grass cover that are divided into large grazing camps that are mainly used for cattle and horses. These camps are fenced off with low-wire fences and have small gravel roads along the outer edges. These gravel roads resulted in cleared areas in the dense grass cover often exposing isolated Stone Age lithics;
- The palaeontological sensitivity of the study area is very high, and an independent study was conducted for this aspect (Bamford 2023). The palaeontological site visit concluded that no fossils were present in the study area and that no further palaeontological studies are required. Nonetheless, a Fossil Chance Find Protocol should be added to the EMP.

The impact on 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:

- Regular monitoring of the development footprint by the ECO to implement the Chance Find Procedure for heritage and palaeontology resources (outlined in Section 10.2) in case heritage resources are uncovered during the course of construction;
- Any changes to the layout should be subjected to a heritage walkdown prior to development.

Declaration of Independence

Specialist Name	Jaco van der Walt
Declaration of Independence	<p>I declare, as a specialist appointed in terms of the National Environmental Management Act (NEMA) (Act No 107 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations (as amended), that I:</p> <ul style="list-style-type: none"> • I act as an 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 49 A of the Act. of regulation 48 and is punishable in terms of section 24F of the Act.
Signature	
Date	11/01/2023

a) Expertise of the specialist

Jaco van der Walt has been practising as a Cultural Resource Management (CRM) archaeologist for 15 years. Jaco is an accredited member of the Association of South African Professional Archaeologists (ASAPA) (#159) and APHP #114 and have conducted more than 500 impact assessments in Limpopo, Mpumalanga, North West, Free State, Gauteng, Kwa Zulu Natal (KZN) as well as the Northern and Eastern Cape Provinces in South Africa.

Jaco has worked on various international projects in Zimbabwe, Botswana, Mozambique, Lesotho, Democratic Republic of the Congo (DRC) Zambia, Guinea, Afghanistan, Nigeria and Tanzania. Through this, he has a sound understanding of the International Finance Corporations (IFC) Performance Standard requirements, with specific reference to Performance Standard 8 – Cultural Heritage

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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
DFFE: Department of Fisheries, Forestry and Environment,
EA: Environmental Authorisation
EAP: Environmental Assessment Practitioner
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EAP Environmental 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 development of the Mopane Solar PV1 on approximately 185 hectares that will form part of the Mopane Solar PV Cluster Development. The proposed site is located ± 7 km north west of Welverdiend along the border between Gauteng and the North West Province (Figure 1.1 to 1.3). The report forms part of the Environmental Impact Assessment (EIA) 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, finds were limited to low density MSA scatters. 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 project are outlined under Table 2 and 3.

Table 2: Project Description

Project area	The project site is on the remainder of the Farm Douglasdale 95 IQ
Magisterial District	Dr Kenneth Kaunda District Municipality
Central co-ordinate of the development	-26.3727915, 27.1936876
Topographic Map Number	2627AC

Table 3: Infrastructure and project activities

Type of development	Photovoltaic (PV) Solar Power Plant
Size of development	185 hectares
Capacity (MV)	120
Project Components	<p>The proposed development (the Photovoltaic (PV) Power Plants and connection infrastructure) consists of the installation of the following equipment:</p> <ul style="list-style-type: none"> • Photovoltaic modules (mono-crystalline, poly-crystalline, or bi-facial modules) • Mounting systems for the PV arrays (single-axis horizontal trackers or fixed structures) and related foundations • Internal cabling and string boxes • DC/AC inverters • Medium voltage stations, hosting LV/MV power transformers • Medium voltage receiving station(s) • Workshops & warehouses • One on-site high-voltage substation and one high-voltage busbar with metering and protection devices • One on-site high-voltage substation with high-voltage power transformers, stepping up the voltage to 275kV and one high-voltage busbar with metering and protection devices • One on-site switching station, with one high-voltage busbar with metering and protection devices • Battery Energy Storage Systems (BESS), with a Maximum Export Capacity up to 100 MW and a 5-hour storage capacity up to 1250 MWh, with a footprint up to 2 ha, next to the on-site high-voltage substation, within the PV plant footprint / fenced areas • Electrical system and UPS (Uninterruptible Power Supply) devices • Lighting system • Grounding system • Internal roads • Fencing of the site and alarm and video-surveillance system • Water access point, water supply pipelines, water treatment facilities • Small scale patented wastewater treatment system. <p>During the construction phase, the site may be provided with additional activities which will be removed at the end of construction:</p> <ul style="list-style-type: none"> • Water access point, water supply pipelines, water treatment facilities • Prefabricated buildings • Workshops & warehouses

1.3 Alternatives

No alternatives were provided, but the area assessed allows for siting of the development to avoid impacts to heritage resources.

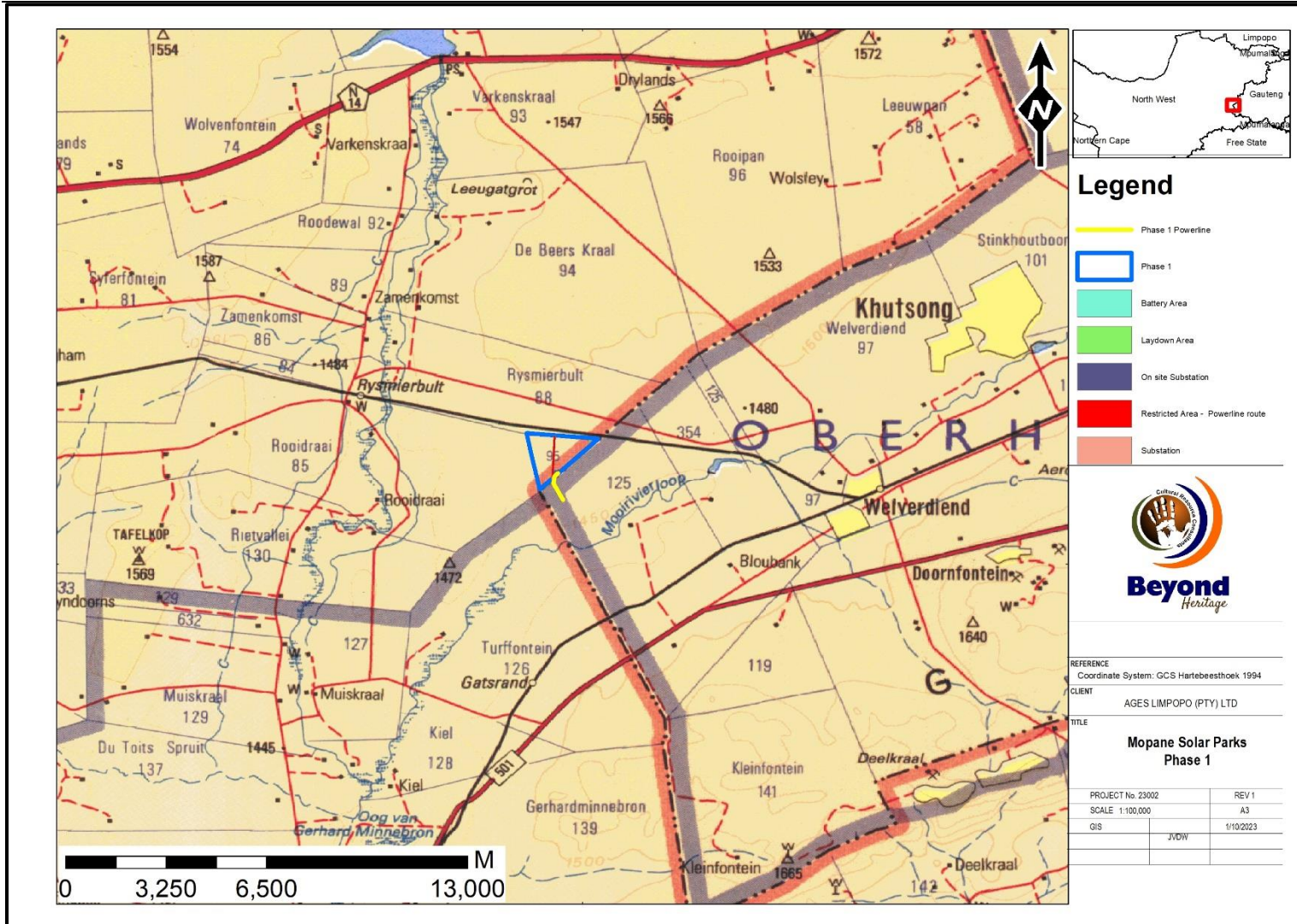


Figure 1.1. Regional setting of the project (1: 250 000 topographical map).

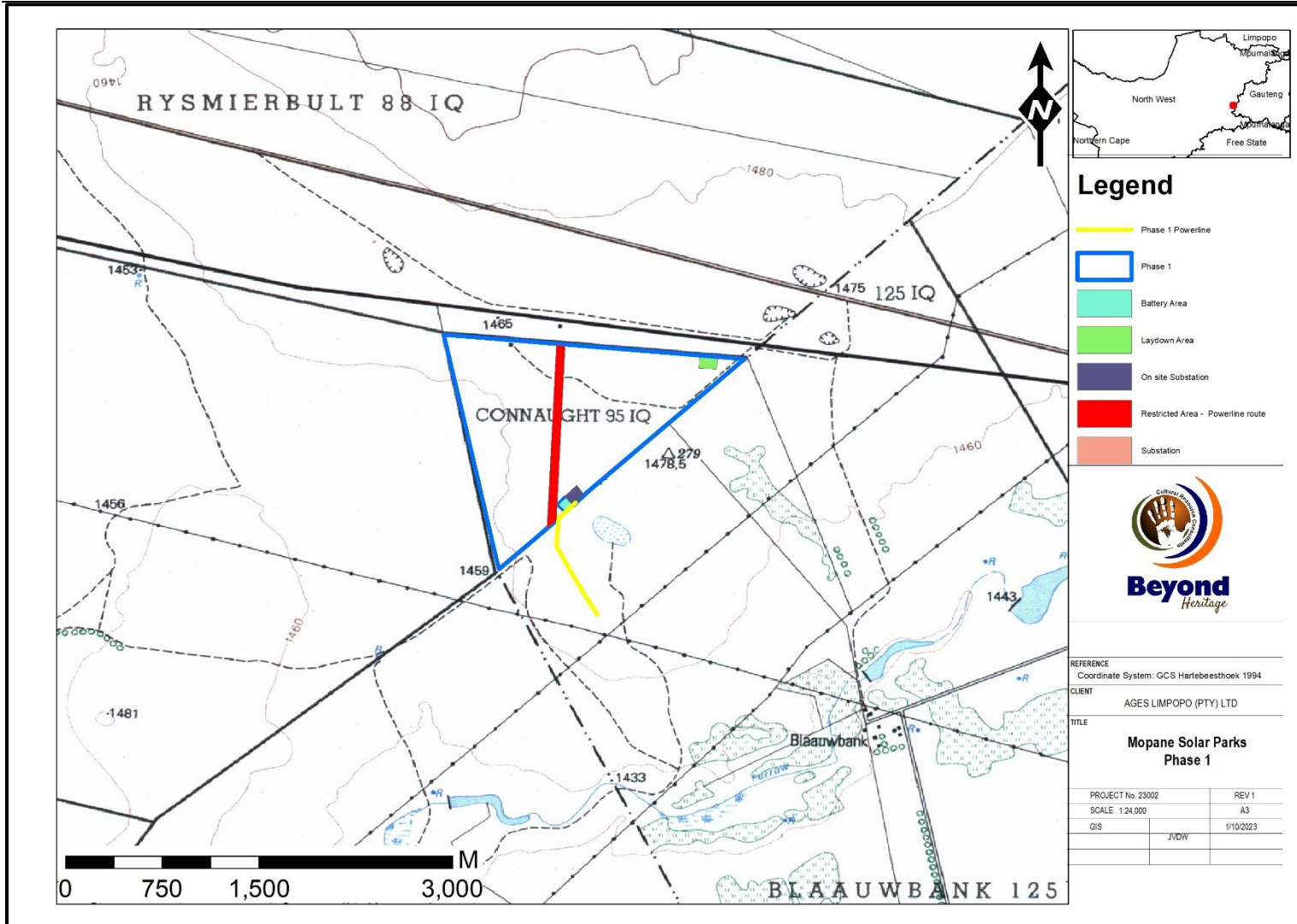


Figure 1.2. Local setting of the project (1: 50 000 topographical map).

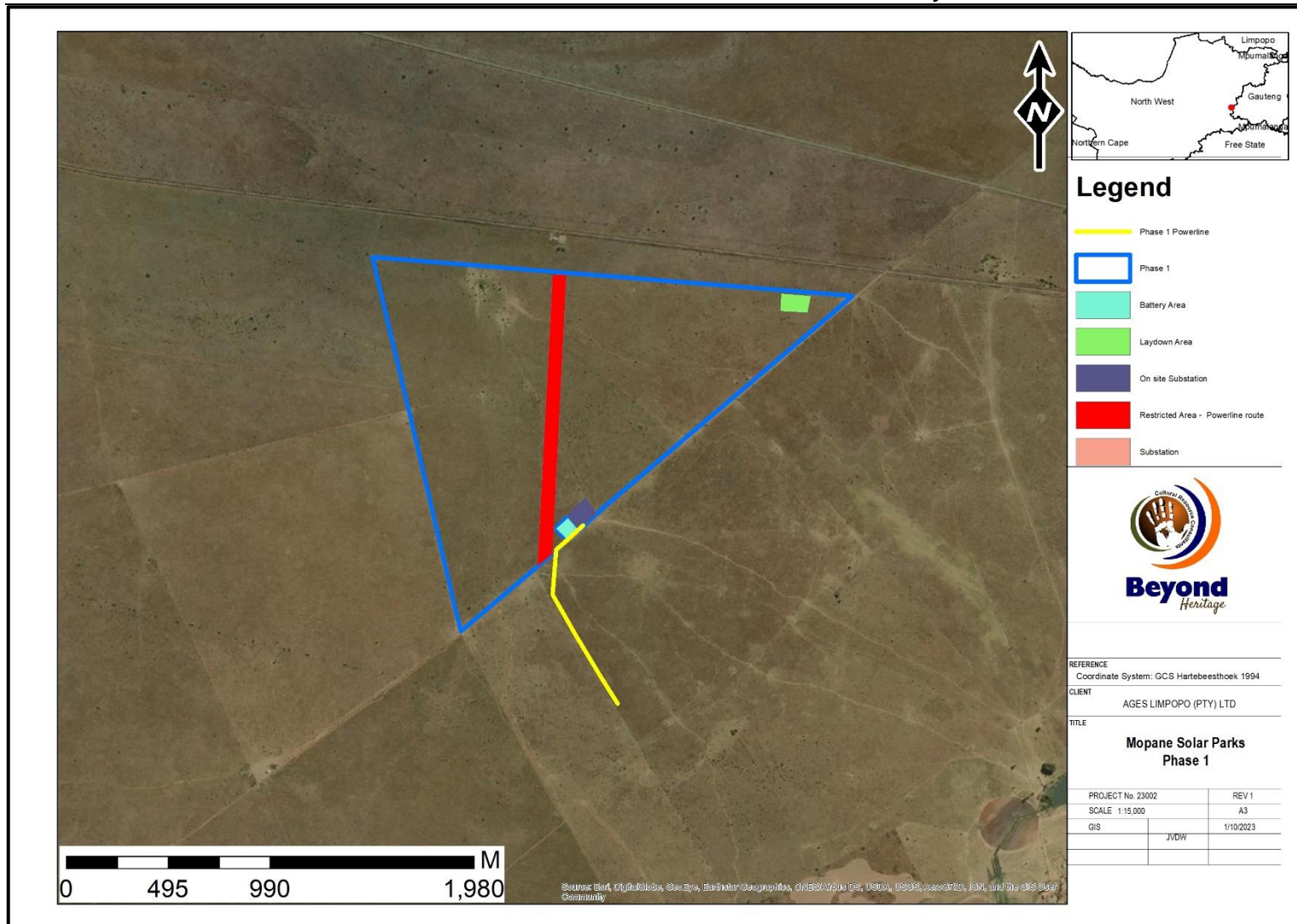


Figure 1.3. Aerial image of the study area.

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))

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 (or avoidance) of these impacts.

The HIA should be submitted, as part of the impact assessment report or EMPr, to the Provincial Heritage Resource Agency (PHRA) 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 Southern African Development Community (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 include (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 and GNR 548 as well as the SAHRA BGG Policy 2020. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (NHRA), as well as the National Health Act of 2003 and are under 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) re-instituted by Proclamation 109 of 17 June 1994 and implemented by CoGHSTA as well as the National Health Act of 2003 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. . 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 the National Health Act of 2003.

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 (conducted by the EAP) process 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 understand the heritage character of the development footprint;
- 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	20 December 2022
Season	Summer – The time of year had did influence the survey since the area is characterised by dense grass cover after the summer rains. The development footprint was however sufficiently covered to understand the heritage character of the area (Figure 3.1).

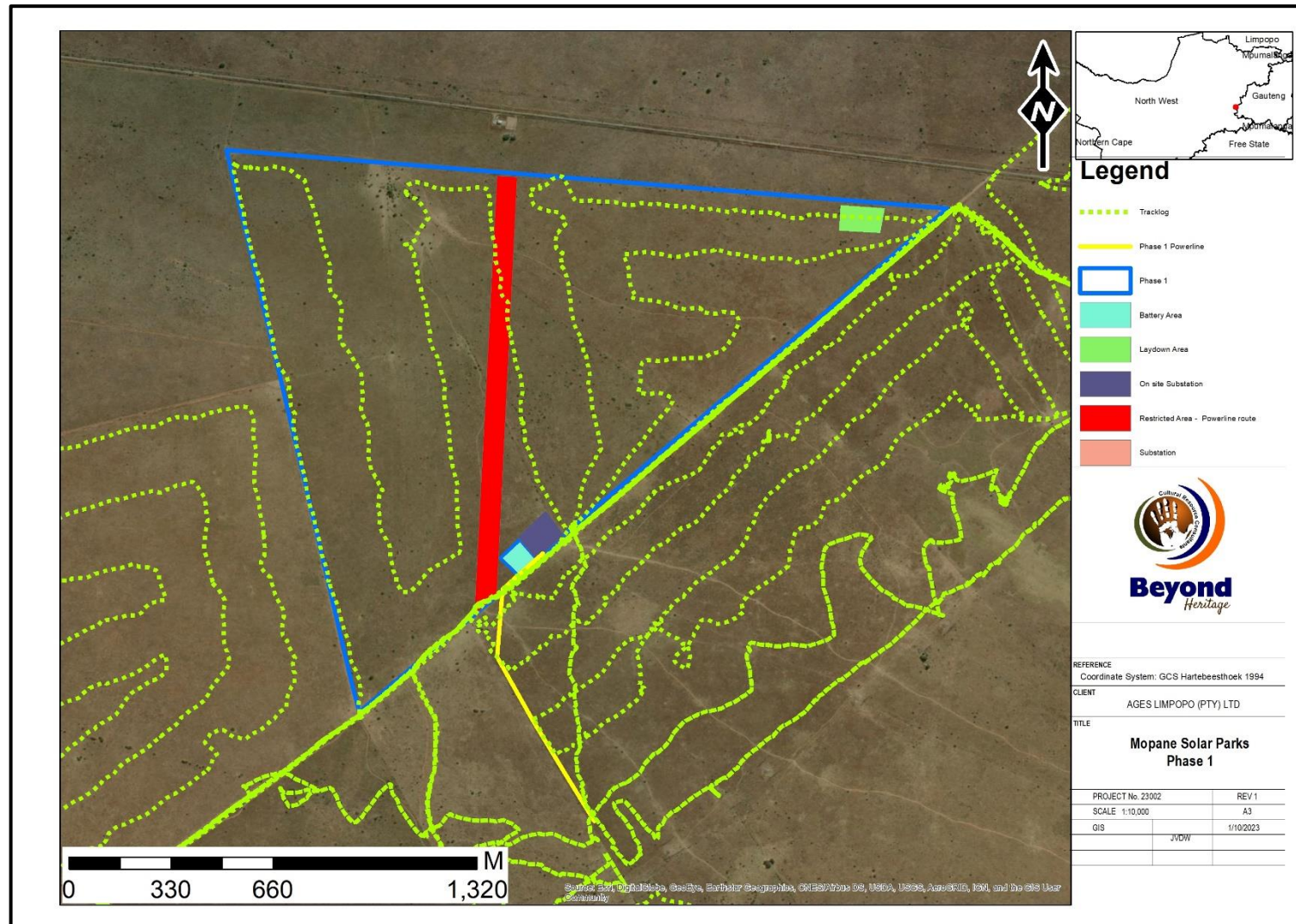


Figure 3.1. Tracklog of the survey path in green.

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 (2007), 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

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

3.6 Impact Assessment Methodology

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

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

The **significance** is calculated by combining the criteria in the following formula:

$$S=(E+D+M) P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

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

3.7 Limitations and Constraints of the study

The authors acknowledge that the brief literature review is not exhaustive on the literature of the area. Due to the subsurface nature of heritage resources, the possibility of discovery of heritage resources during the construction phase cannot be excluded. Also, dense grass cover hampered ground visibility and although unlikely informal graves could have been undetected during the field survey. This limitation is successfully mitigated with the implementation of a chance find procedure and monitoring of the study area by the ECO. 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

According to Census 2011, the population of the Dr Kenneth Kaunda District, (based on 2015 boundaries) is 695 933, increased from 599 670 in 2001 population is unevenly distributed among the three Local Municipalities and average annual growth rate of the district is 1.49%. More than half of the population (51%) is female at age 85 and older, there were more than twice as many women as men. People under 15 years of age made up over a quarter of the population (30,9%), people aged between 15 and 64 constitute more than half of the population (60,9%), and people aged 65 and older made up 8,2% of the population (www.kaundadistrict.gov.za).

5 Results of Public Consultation and Stakeholder Engagement:

5.1 Stakeholder Identification

Adjacent landowners and the public at large were informed of the proposed activity as part of the EIA 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 have been raised thus far. During the site visit the landowner (Gerhard Visser) was consulted and confirmed that they are not aware of any graves or heritage features in the proposed impact areas.

6 Literature / Background Study:

6.1 Literature Review (SAHRIS)

Few sites are known for the greater region and consist of scattered Stone Age finds, Later Iron Age stone-wall settlements, graves, and historic structures. The following Cultural Resource Management (CRM) assessments (Table 6) were conducted in the area and consulted for this report:

Table 6. CRM reports consulted for the study.

Author	Year	Project	Findings
Muroyi, R.	2020	Phase 1 Heritage Impact Assessment for the Proposed Khutsong South Ext. 8 Development, Merafong City Local Municipality, West Rand District Municipality, Gauteng Province.	No Sites
Van Schalkwyk, J.	2014	Cultural Heritage Assessment for the Libanon 132Kv Loop-in Line, Carletonville Region, Westonaria Magisterial District, Gauteng Province.	No Sites
Pistorius, J.C.C.	2019	A Phase I Heritage Impact Assessment Study for AngloGold Ashanti (PTY) Limited's Proposed Surface Pipeline and Associated Infrastructure Near Carltonville in the Gauteng Province.	No Sites
Huffman, T.N.	1994	Archaeological Survey of the East and West Driefontein Mines.	MSA and LSA artefacts, two large Iron Age stone-walled complexes, historic stone-walled features, and possible Anglo-Boer War associated structures.
Pelser, A.J.	2018	Report on a Phase 1 Archaeological Impact Assessment for the Proposed Development of 2 Kilns as Part of Corobrik Driefontein's Expansion on Portions 23 & 27 (Portions of Portion 22) of the Farm Driefontein 355IQ, Near Carletonville, Gauteng.	No Sites
Dreyer, C.	2006	First Phase Archaeological and Cultural Heritage Assessment of the Proposed Developments at the Farms Bovenste Oog 68 IQ (Mooi River), Digby Plain 63 IQ, Sommerville 62 IQ, Preston Pans 59 IQ and Dryland 64 IQ, Ventersdorp, North West Province.	Rectangular stone-walled house ruins, part of a stock kraal, prospecting holes, old mine shafts, a graveyard of about 37 graves, three graves near a cluster of rectangular stone-walls, and LIA stone-walling.
Dreyer, C.	2013	First Phase Archaeological & Heritage Investigation of the Proposed Housing & Office Developments at Boskop Dam, Potchefstroom, North West Province.	No Sites

6.1.1 Google Earth and The Genealogical Society of South Africa (Graves and burial sites)

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where archaeological and historical sites might be located. The database of the Genealogical Society of South Africa indicated no known grave sites within the study area

6.2 Archaeological Background

The archaeology of the area can be divided in three main periods namely the Stone Age, Iron Age and Historical period.

6.2.1 Stone Age

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

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

The greater region has not undergone extensive Stone Age research apart from archaeological surveys. There is thus little record of significant sites within the landscape. Stone Age scatters have however been found during a survey conducted by Huffman (1994), around the Driefontein mines. This depicts early hominid movement through the landscape however significant Stone Age sites are not prevalent. A few rock engraving sites relating to the LSA have been recorded northeast of Carletonville (Bergh 1999).

6.2.2 Iron Age

Bantu-speaking people moved into Eastern and Southern Africa about 2,000 years ago (Mitchell, 2002). These people cultivated sorghum and millets, herded cattle and small stock and manufactured iron tools and copper ornaments. Because metalworking represents a new technology, archaeologists call this period the Iron Age. Characteristic ceramic styles help archaeologists to separate the sites into different groups and time periods. The Iron Age as a whole represents the spread of Bantu speaking people and includes both the Pre-Historic and Historic periods. It can be divided into three distinct periods:

- » The Early Iron Age (EIA): Most of the first millennium AD.
- » The Middle Iron Age (MIA): 10th to 13th centuries AD.
- » The Late Iron Age (LIA): 14th century to colonial period.

No Early or Middle Iron Age sites have been recorded in the larger region. Iron Age occupation in the region date to the Later Iron Age after climatic conditions became favourable in the region for LIA settlement and agricultural activities. Iron Age communities in the region are associated with Sotho, Tswana, and Nguni speaking ancestors who entered and settled in the region. LIA stone-walling complexes can be found spread across the broader landscape with associated artefacts. These LIA settlements can be widely found on flat-topped ridges and hills throughout the landscape (Dreyer 2006). The stonewalled complexes have been found to have all used variations of a similar spatial organisations.

6.2.3. Historical Period

Anglo-Boer War structures and ruins have been identified in the larger region as the British were pursuing General De Wet and General De la Rey through the landscape (Huffman 1994). Potential sangars were identified near the Driefontein mines which was erected by the British as low windbreaks (Huffman 1994).

The discovery of the gold reef on the Witwatersrand in 1886 resulted in widespread mining developments in and around Johannesburg. During the 1930s, prospecting took place in the region in an attempt to discover the gold fields. This led to the subsequent development of ten gold mines in the region (Pistorius 2019). The town of Carletonville was established on the farm Twyfelvlakte by the West Witwatersrand Areas gold mining company in 1948 and was named after Guy Carleton James who was the director of Consolidated Gold Fields (Raper 2004). Carletonville is home to some of the richest gold mines in South Africa including West Driefontein, East Driefontein, Western Deep Levels and Blyvooruitzicht. The gold fields, known as the West Wits Line is the richest gold among the Witwatersrand fields.

7 Description of the Physical Environment

The vegetation and landscape are described by Mucina and Rutherford (2006) as Carletonville Dolomite Grassland and Mesic Highveld Grassland. The landscape consists of slightly undulating plains dissected by prominent rocky chert ridges. The Mesic Highveld Grassland are considered to be 'sour' grasslands, and are dominated primarily by andropogonoid grasses. The different grassland units are distinguished on the basis of geology and other substrate properties, as well as elevation, topography and rainfall. The proposed project area is situated about 18km west of Carletonville on a large farm situated on the Gauteng and North West border.

The 'Mooirivierloop' river is located along the southern part of the proposed project area. An existing railway line is located along the northern edges of the proposed project area from Carletonville towards Ventersdorp. The surrounding environment consists mainly of expansive open fields with dense grass cover. Scattered trees and shrubs occur across the landscape. Subsurface bedrock consisting of primarily dolomite and chert is located close to the surface with various rocky outcrops visible. The study area is divided into large grazing camps that are mainly used for cattle and horses. These camps are fenced off with low wire fences and have small gravel roads along the outer edges. These gravel roads resulted in cleared areas in the dense grass cover often exposing Stone Age lithics. General site conditions are illustrated in Figure 7.1 and 7.6.



Figure 7.1. General view of the proposed PV 1 area taken from the southern edge facing northeast showing open landscapes with dense grass cover.



Figure 7.2. General view of the gravel roads along the fence lines often exposing Stone Age artefacts.



Figure 7.3. Various rocky outcrops of chert are visible throughout the study area.



Figure 7.4. General view of the proposed PV1 area as seen from the northern corner facing south showing the flat topography of the study area.



Figure 7.5. Small trees and shrubs are visible across the landscape.



Figure 7.6. Existing powerlines in the proposed project area.

8 Findings of the Survey

8.1 Heritage Resources

The study area consists of slightly undulating plains and rocky chert outcrops. Isolated and low density MSA artefacts are found across the wider landscape. These artefacts are mainly made from the abundant locally occurring chert and Cryptocrystalline silica (CCS) and is considered to form part of the background scatter (Orton 2016) of the area.

Heritage observations within the study area is limited to low density MSA scatters and were recorded as Waypoints. General site conditions and site distribution of the recorded observations are illustrated in Figure 8.1 and briefly described in Table 7. Recorded features in relation to the study area are illustrated in Figure 8.2 to 8.5.

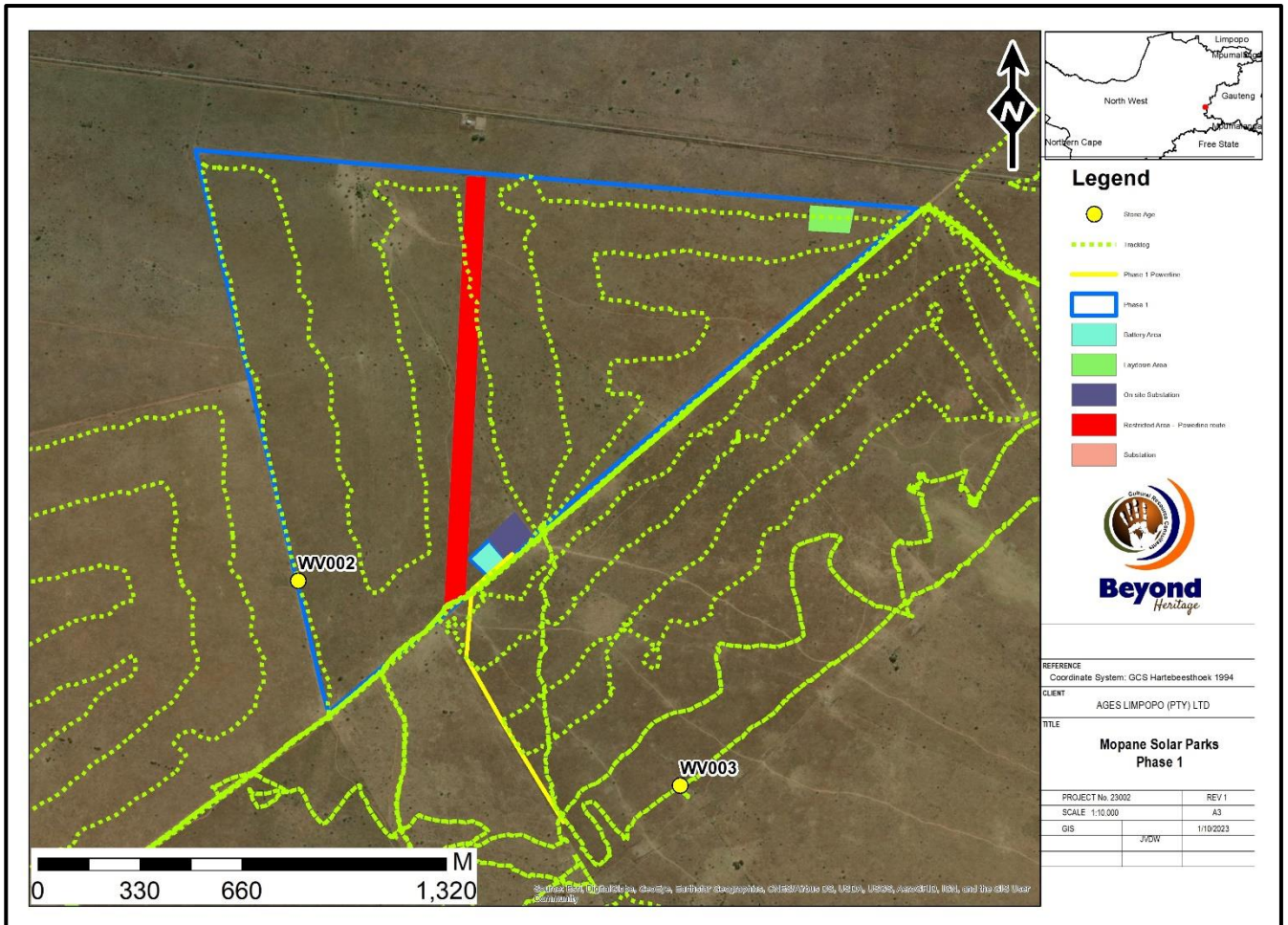


Figure 8.1. Site distribution map.

Table 7. Recorded finds in the study area.

Label	Description	Longitude	Latitude	Significance/ Field Rating
WV002	Small, low-density scatter of isolated MSA lithic artefacts with less than 1 artefact p.m2 discovered along a gravel road next to a fence line.	27° 11' 11.6592" E	26° 22' 27.6060" S	Low Significance GP C
WV003	The site consists of a low-density Middle Stone Age scatter approximately 1x1m in size located at a low lying rock outcrop. The artefact ratio is <5 artefacts p.m2. No diagnostic pieces were noted but based on size some LSA flakes might be present.	27° 11' 51.6841" E	26° 22' 49.0655" S	Low Significance GP C



Figure 8.2. Dorsal and ventral view of small scatter of MSA lithic artefact at WV002



Figure 8.3. The low-density scatter at WV002 was located within the gravel road along a fence line.



Figure 8.4. Collection of Stone Age lithics on chert at WV003.



Figure 8.5. General view of the low lying rocky outcrop and surrounding environment at WV003.

8.2 Cultural Landscape

The cultural landscape of the area consisted of areas of cultivation and low scale developments such as railway lines and powerlines (Figure 8.6 to 8.9).

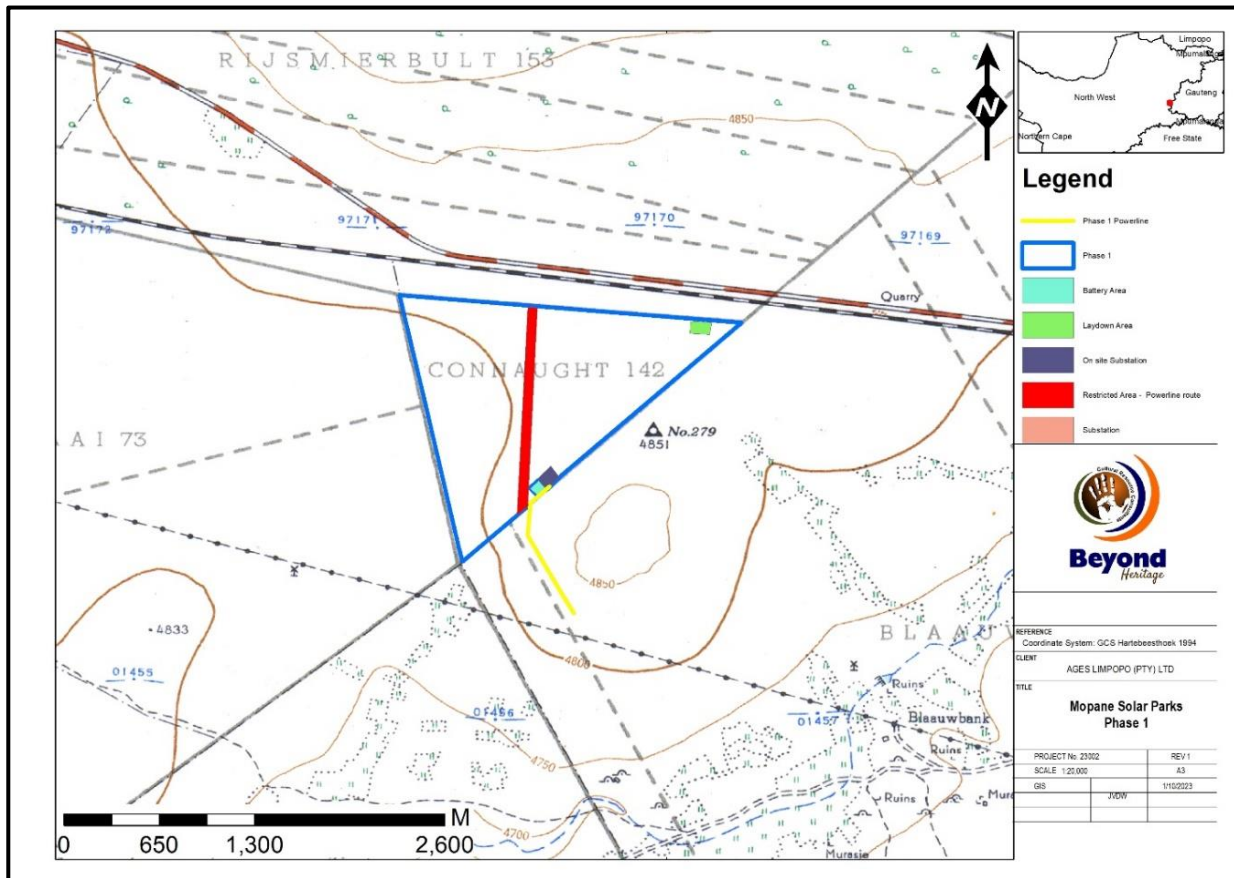


Figure 8.6. 1953 Topographic map of the project area indicating no developments in the study area. Ruins and huts can be seen south of the project area.

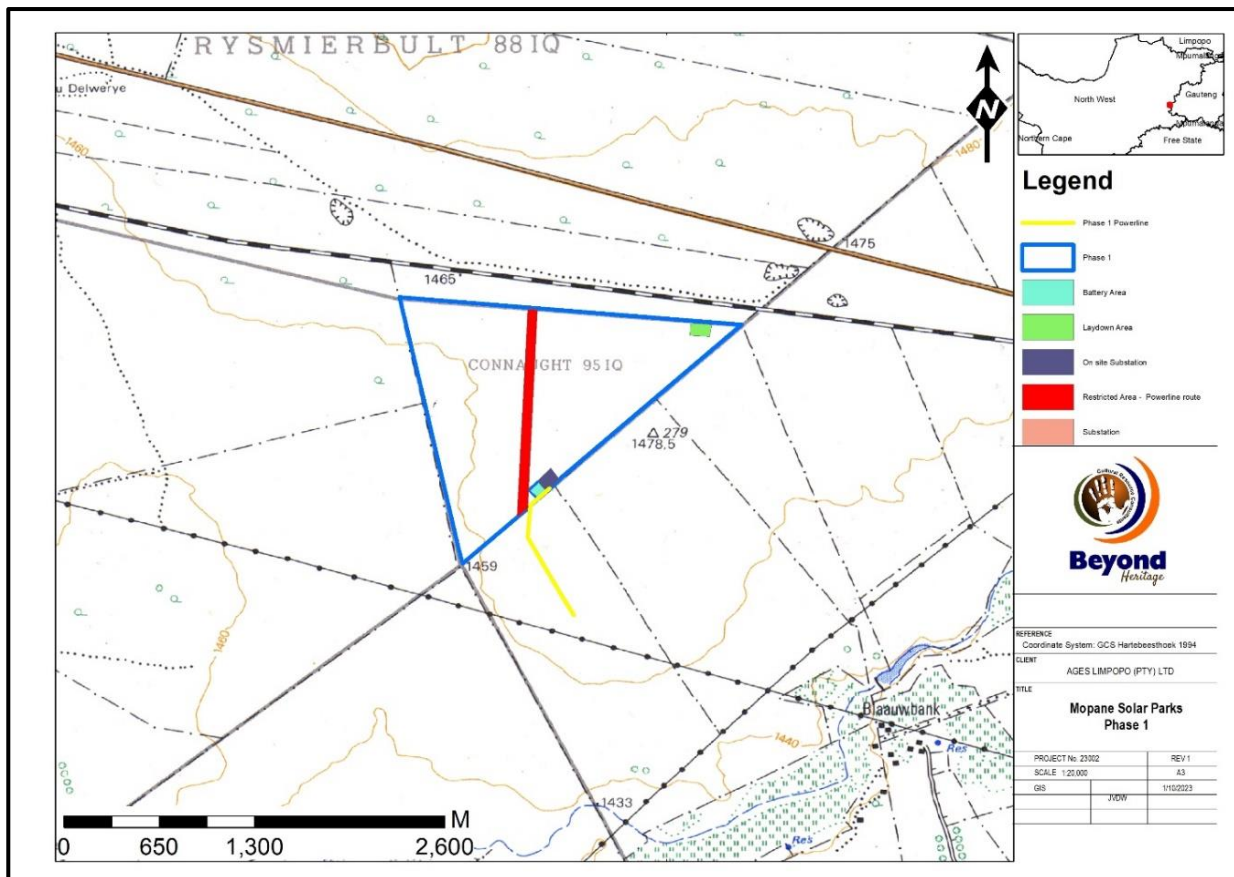


Figure 8.7. 1975 Topographic map of the project area indicating no developments in the study area.

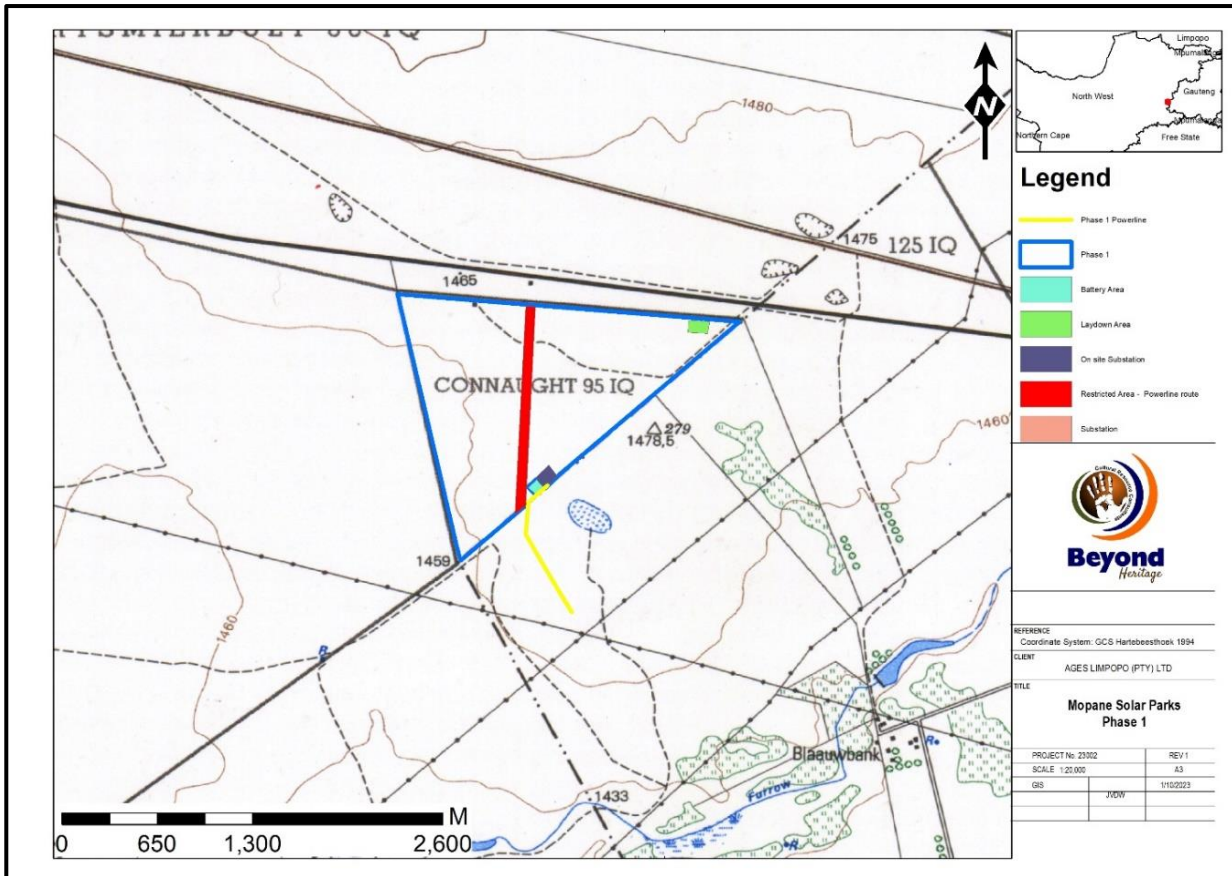


Figure 8.8. 1995 Topographic map indicating a structure on the northern border of the study area that was not visible during the survey.

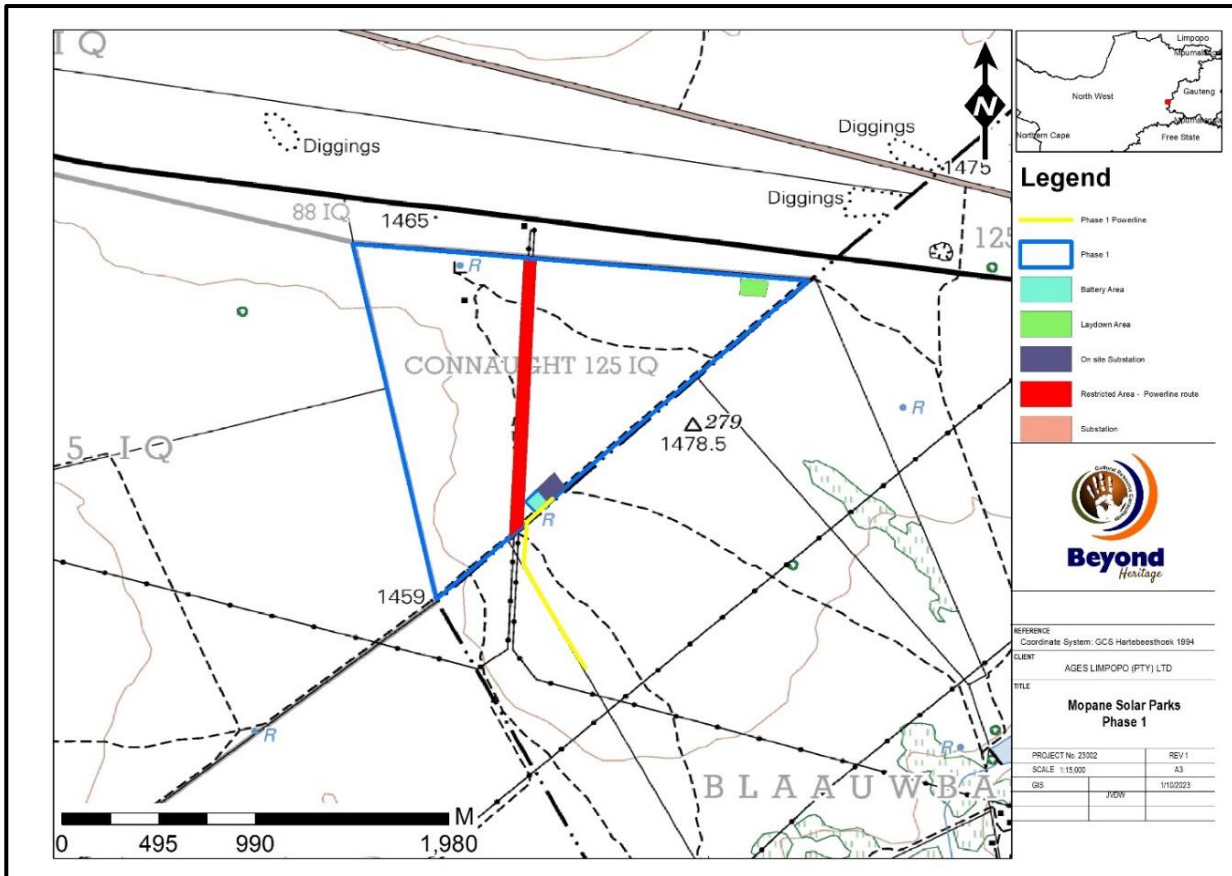
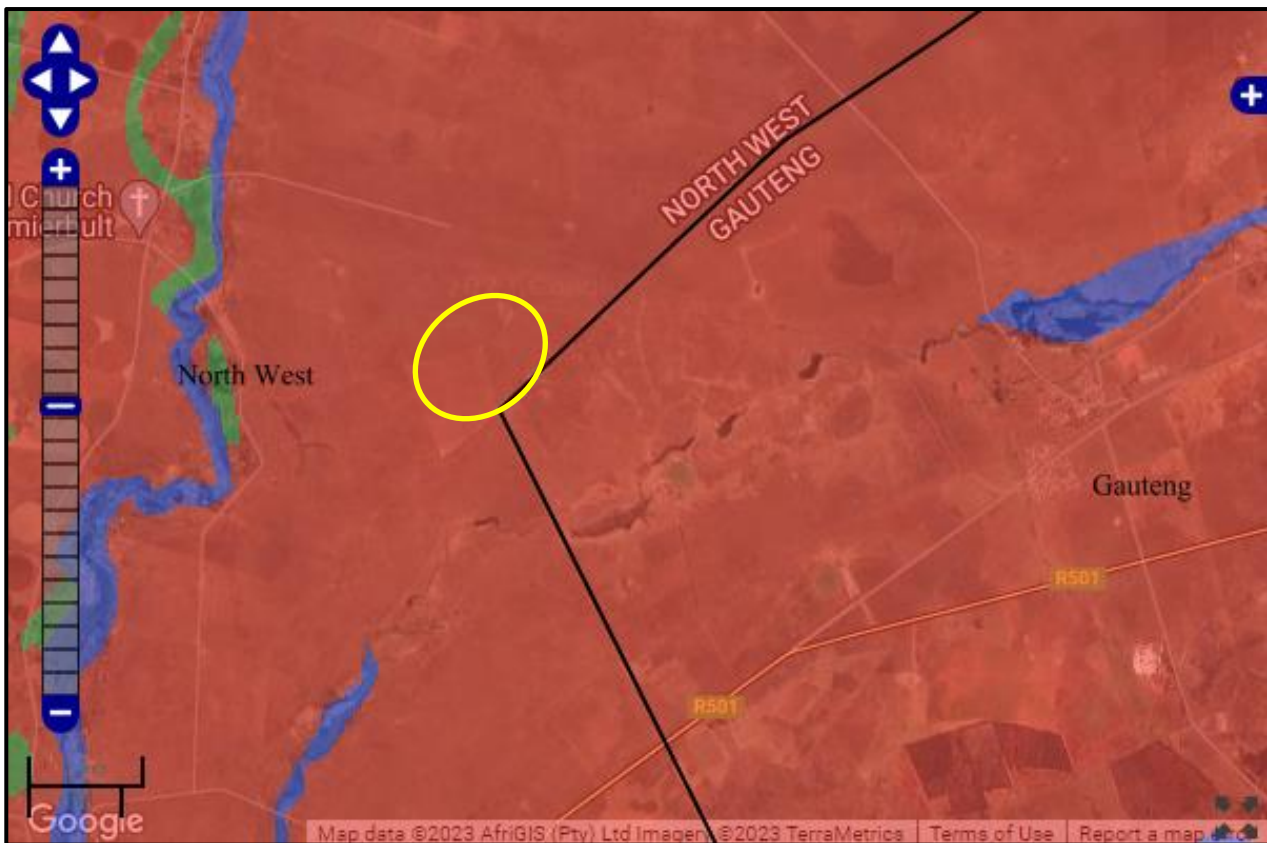


Figure 8.9. 2006 Topographic map of the project area indicating another structure that has since been demolished within the study area along a gravel road as well as a reservoir on the northern border.

8.3 Paleontological Heritage

The study area is indicated as of very high paleontological significance on the SAHRA Paleontological map (Figure 8.10) and an independent study (Bamford 2023) was commissioned for this aspect. Bamford (2023) found that the proposed site lies on the potentially fossiliferous Malmani Subgroup (Transvaal Supergroup) that could preserve trace fossils such as stromatolites or microbialites in the dolomites. The site visit and walk through in December 2022 by the palaeontologist confirmed that weathered dolomites and cherts were fairly common in the area for the proposed solar collectors and substation. NO FOSSILS, such as stromatolites, were seen in the dolomite outcrops. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr.



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

9 Potential Impact

Isolated Stone Age scatters are out of context and scattered too sparsely to be of significance apart from mentioning them in this report. 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 8).

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.

9.1.4 Impact Assessment for the project

Table 8. Impact assessment of isolated finds at WV002 and WV003.

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
	Without mitigation	With mitigation (Preservation/excavation of site)
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	16 (Low)	16 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	NA	NA
Mitigation:		
<ul style="list-style-type: none"> Regular monitoring of the development footprint by the ECO to implement the Chance Find Procedure for heritage and palaeontology resources (outlined in Section 10.2) in case heritage resources are uncovered during the course of construction; Any changes to the layout should be subjected to a heritage walkdown prior to development. 		
Cumulative impacts:		
The proposed project will have a low cumulative impact as no significant heritage resources will be adversely affected.		
Residual Impacts:		
Although surface sites can be avoided or mitigated, there is a chance that completely buried sites would still be impacted on, but this cannot be quantified.		

10 Conclusion and recommendations

The regional landscape in which the project is located consists of slightly undulating plains dissected by chert outcrops. No major topographic features that would have been focal points for human activity occur in the study area, but the randomly available raw material for lithic manufacture resulted in a background scatter (Orton 2016) of Stone Age artefacts to be present and attest to human occupation of the wider area from the MSA onwards. During the survey no ESA material were noted. Heritage observations within the study area is limited to two low density MSA scatters with few diagnostic artefacts and no formal tools. These tools are out of context and scattered too sparsely to be of significance apart from mentioning them in this report. Due to the low artefact ratio and open-air context of these artefacts further mitigation is not warranted as it will not further contribute to our understanding of the Stone Age settlement of the area.

The project area consists of expansive open fields with dense grass cover that is divided into large grazing camps that are mainly used for cattle and horses. These camps are fenced off with low wire fences and have small gravel roads along the outer edges. These gravel roads resulted in cleared areas in the dense grass cover often exposing Stone Age lithics.

The palaeontological sensitivity of the study area is very high, and an independent study was conducted by Marion Bamford (2023) for this aspect. The palaeontological site visit found no fossils present within the proposed project area. Nonetheless, a Fossil Chance Find Protocol should be added to the EMP. As far as the palaeontology is concerned, the project may be authorised. The impact to heritage resources is medium 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

No adverse impact to 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 EMP 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:

- Regular monitoring of the development footprint by the ECO to implement the Chance Find Procedure for heritage and palaeontology resources (outlined in Section 10.2) in case heritage resources are uncovered during construction;
- Any changes to the layout should be subjected to a heritage walkdown prior to development.

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 EMP. A short summary of chance find procedures is discussed below and monitoring guidelines applicable to the Chance Find procedure 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 and discard must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone or trace fossils) 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 trace fossils such as stromatolites in the dolomites or the Quaternary bones, rhizoliths, traces. 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, sub surface cultural material and unrecorded burial sites. This can cause delays during construction, as well as additional costs involved in mitigation, as well as 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 9. Monitoring requirements for the project

Heritage Monitoring					
Aspect	Area	Responsible for monitoring and measuring	Frequency	Proactive or reactive measurement	Method
Cultural Resources chance finds	Entire project area	ECO	Weekly (Pre construction and construction phase)	Proactively	<ul style="list-style-type: none"> • If risks are manifested (accidental discovery of heritage resources) the chance find procedure should be implemented: <ol style="list-style-type: none"> 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.

Heritage Monitoring					
Aspect	Area	Responsible for monitoring and measuring	Frequency	Proactive or reactive measurement	Method
					<ul style="list-style-type: none">• Only recommence operations once impacts have been mitigated.

10.6 Management Measures for inclusion in the EMPr

Table 10. 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 project	Applicant EAP	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA	ECO Checklist/Report
General Project area	Regular monitoring of the development footprint by the ECO	Construction	Throughout the project	Applicant EAP	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35, 36 and 38 of NHRA	ECO Checklist/Report

11 References

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