Phase 1 Cultural Heritage Impact Assessment:

THE PROPOSED KUTLWANO SOLAR POWER PLANT NEAR LICHTENBURG, NORTH WEST PROVINCE

Prepared for:

Environamics: Ms C Steenkamp

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Prepared by:

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Report No: 2021/JvS/023

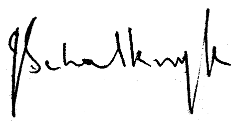
- Status: Final
- Date: July 2021
- Revision No: -
- Date: -

Submission of the report:

It remains the responsibility of the client to submit the report to the South African Heritage Resources Agency (SAHRA) or relevant Provincial Heritage Resources Agency (PHRA) by means of the online SAHRIS System.

Specialist competency:

Johan A van Schalkwyk, D Litt et Phil, heritage consultant, has been working in the field of heritage management for more than 40 years. Originally based at the National Museum of Cultural History, Pretoria, he has actively done research in the fields of anthropology, archaeology, museology, tourism and impact assessment. This work was done in Limpopo Province, Gauteng, Mpumalanga, North West Province, Eastern Cape Province, Northern Cape Province, Botswana, Zimbabwe, Malawi, Lesotho and Swaziland. Based on this work, he has curated various exhibitions at different museums and has published more than 70 papers, most in scientifically accredited journals. During this period, he has done more than 2000 impact assessments (archaeological, anthropological, historical and social) for various government departments and developers. Projects include environmental management frameworks, roads, pipeline-, and power line developments, dams, mining, water purification works, historical landscapes, refuse dumps and urban developments.



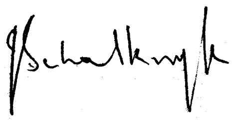
J A van Schalkwyk
Heritage Consultant
July 2021

SPECIALIST DECLARATION

I, J A van Schalkwyk, as the appointed independent specialist, in terms of the 2014 EIA Regulations (as amended), hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 (as amended) and any specific environmental management Act;
- 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 have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study 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 of the specialist



J A van Schalkwyk
July 2021

EXECUTIVE SUMMARY

Phase 1 Cultural Heritage Impact Assessment:
THE PROPOSED KUTLWANO SOLAR POWER PLANT NEAR LICHTENBURG, NORTH WEST PROVINCE

Environamics was appointed to conduct the basic assessment process for the development of a Solar Power Plant and associated infrastructure on Portion 4 of the Farm Houthaaldoorns No. 2, Registration Division IP, North West Province situated within the Ditsobotla Local Municipality area of jurisdiction.

In accordance with Section 38 of the NHRA, an independent heritage consultant was appointed by *Environamics* to conduct a cultural heritage assessment to determine if the development of the solar power plant, associated infrastructure and power line corridor would have an impact on any sites, features or objects of cultural heritage significance.

This report describes the methodology used, the limitations encountered, the heritage features that were identified and the recommendations and mitigation measures proposed relevant to this. The investigation consisted of a desktop study (archival sources, database survey, maps and aerial imagery) and a physical survey that also included the interviewing of relevant people. It should be noted that the implementation of the mitigation measures is subject to SAHRA/PHRA's approval.

The cultural landscape qualities of the region essentially consist of a rural area in which the human occupation is made up of a limited Stone Age occupation. This was followed much later by Tswana-speaking agro-pasturalist that settled in the larger region. They were soon followed by a colonial (farmer) component, which gave rise to the development of small villages and towns that dot the larger landscape. The final transformation was brought about by the development of infrastructure in the region, such as roads and railway lines, which was extended due to large scale diamond mining activities.

<u>Identified sites</u>

During the survey the following sites, features or objects of cultural significance were identified.

- 7.3.1 An informal burial site with probably more than 30 graves. Most are only marked with stone cairns.
- 7.3.2 An informal burial site with probably more than 50 graves. Most are only marked with stone cairns.

<u>Limitations encountered</u>

- For the alternative corridor (South west of the farm) a new line of approximately 11km will be constructed to the Watershed MTS. The proposed power line would have a 100m wide corridor except where existing lines are already located where it should be approximately 150m. The proposed power line corridor was surveyed only at desktop level as access to the relevant properties was not possible. It is proposed that once the power line route has been confirmed within the 100m corridor a heritage walk-though needs to be undertaken.

<u>Impact assessment and proposed mitigation measures</u>

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development:

- For the current study, the following mitigation measures are proposed.

Site type	**NHRA category**	**Field rating**	**Impact rating: Before/After mitigation**
7.3.1 Burial sites and Graves	Section 36	Generally protected 4A: High significance	Negative medium (30) Low (6)
Mitigation: (1) Avoidance/Preserve: This is viewed to be the primary form of mitigation and the site should be retained *in situ* and a buffer zone should be created around it, either temporary (by means of danger tape) or permanently (wire fence or built wall) of 20m.			

Site type	**NHRA category**	**Field rating**	**Impact rating: Before/After mitigation**
7.3.2 Burial sites and Graves	Section 36	Generally protected 4A: High significance	Negative medium (48) Low (6)
Mitigation: (1) Avoidance/Preserve: This is viewed to be the primary form of mitigation and the site should be retained *in situ* and a buffer zone should be created around it, either temporary (by means of danger tape) or permanently (wire fence or built wall) of 20m.			

Technical Alternatives: Power lines

Two grid connection options were proposed to tie in with the Watershed Substation to the south. From a heritage point of view, it is recommended that the eastern, preferred grid connection is selected for development. If the corridor to the west is selected, a heritage walk-though needs to be undertaken.

Cumulative assessment

Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare. Because of the low likelihood of finding further significant heritage resources in the area of the proposed for development and the generally low density of sites in the wider landscape the overall impacts to heritage are expected to be of generally low significance before mitigation.

For the project area, the impacts to heritage sites are expected to be of medium significance. However, this can be ameliorated by implementing mitigation measures, include isolating sites, relocating sites (e.g. burials) and excavating or sampling any significant archaeological material found to occur within the project area. The chances of further such material being found, however, are considered to be negligible. After mitigation, the overall impact significance would therefore be low.

Legal requirements

The legal requirements related to heritage specifically are specified in Section 3 of this report.

- For this proposed project, the assessment has determined that sites, features or objects of cultural heritage significance occur in the project area, therefore various permits are required from SAHRA or the PHRA if these sites are to be impacted upon.
- If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

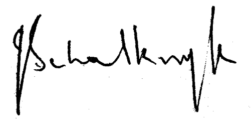
Reasoned opinion as to whether the proposed activity should be authorised:

- From a heritage point of view, it is recommended that the Proposed Project be allowed to continue on acceptance of the conditions proposed below.

Conditions for inclusion in the environmental authorisation:

- It is proposed that if the South West corridor for the power line route is selected a heritage walk-though needs to be undertaken.

- The Palaeontological Sensitivity Map (http://www.sahra.org.za/sahris/map/palaeo) indicate that the project area has a very high sensitivity of fossil remains to be found and therefore a field assessment and protocol for finds is required.
- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. The appropriate steps to take are indicated in Section 9 of the report, as well as in the **Management Plan: Burial Grounds and Graves, with reference to general heritage sites**, in the Addendum, Section 13.5.



J A van Schalkwyk
Heritage Consultant
July 2021

TECHNICAL SUMMARY

Project description	
Description	Development of a solar power plant and associated infrastructure
Project name	Kutlwano Solar Power Plant

Applicant
Kutlwano Solar Power Plant (RF) (Pty) Ltd

Environmental assessment practitioner
Ms C Steenkamp
Environamics

Property details						
Province	North West					
Magisterial district	Lichtenburg					
Local Municipality	Ditsobotla					
Topo-cadastral map	2626AA					
Farm name	Portion 4 of the Farm Houthaaldoorns No. 2					
Closest town	Lichtenburg					
Coordinates	Centre point (approximate)					
	No	Latitude	Longitude	No	Latitude	Longitude
	1	S 26,03151	E 26,11179			
	.kml files[1]					

Development criteria in terms of Section 38(1) of the NHR Act	Yes/No
Construction of road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length	Yes
Construction of bridge or similar structure exceeding 50m in length	No
Development exceeding 5000 sq m	Yes
Development involving three or more existing erven or subdivisions	No
Development involving three or more erven or divisions that have been consolidated within past five years	No
Rezoning of site exceeding 10 000 sq m	No
Any other development category, public open space, squares, parks, recreation grounds	No

Land use	
Previous land use	Farming
Current land use	Farming

[1] Left click on the coloured icon to open the file in Google Earth, if installed on the computer. Alternatively, right click on the icon. In dialog box, select "Save Embedded File to Disk" and save to folder of choice.

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GLOSSARY OF TERMS AND ABBREVIATIONS

TERMS

Bioturbation: The burrowing by small mammals, insects and termites that disturb archaeological deposits.

Cumulative impacts: In relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Debitage: Stone chips discarded during the manufacture of stone tools.

Factory site: A specialised archaeological site where a specific set of technological activities has taken place – usually used to describe a place where stone tools were made.

Historic Period: Since the arrival of the white settlers - c. AD 1830 - in this part of the country.

Holocene: The most recent time period, which commenced c. 10 000 years ago.

Iron Age (also referred to as **Early Farming Communities**)**:** Period covering the last 1800 years, when new people brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and herded cattle, sheep and goats. As they produced their own iron tools, archaeologists call this the Iron Age.

Early Iron Age	AD 200 - AD 900
Middle Iron Age	AD 900 - AD 1300
Later Iron Age	AD 1300 - AD 1830

Midden: The accumulated debris resulting from human occupation of a site.

Mitigation, means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

National Estate: The collective heritage assets of the Nation.

Pleistocene: Geological time period of 3 000 000 to 20 000 years ago.

Stone Age: The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.

Early Stone Age	2 500 000 - 250 000 Before Present
Middle Stone Age	250 000 - 40-25 000 BP
Later Stone Age	40-25 000 - until c. AD 200

Tradition: As used in archaeology, it is a seriated sequence of artefact assemblages, particularly ceramics.

ACRONYMS and ABBREVIATIONS

AD	Anno Domini (the year 0)
ASAPA	Association of Southern African Professional Archaeologists

BC	Before the Birth of Christ (the year 0)
BCE	Before the Common Era (the year 0)
BP	Before Present (calculated from 1950 when radio-carbon dating was established)
CE	Common Era (the year 0)
CRM	Cultural Resources Management
CS-G	Chief Surveyor-General
DMRE	Department of Mineral Resources and Energy
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Early Iron Age
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Early Stone Age
HIA	Heritage Impact Assessment
I & AP’s	Interested and Affected Parties
ICOMOS	International Council on Monuments and Sites
LIA	Late Iron Age
LSA	Later Stone Age
MIA	Middle Iron Age
MSA	Middle Stone Age
NASA	National Archives of South Africa
NEMA	National Environmental Management Act 107 of 1998
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Agency
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
WUL	Water Use Licence

COMPLIANCE WITH APPENDIX 6 OF THE 2014 EIA REGULATIONS (AS AMENDED)

Requirements of Appendix 6 – GN R982	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- 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;	 Front page Page i Addendum Section 7
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page ii
c) an 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 4
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 8
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 4
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 4
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 7; Figure 11
g) an identification of any areas to be avoided, including buffers;	Section 8
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;	Figure 11 Section 7 & 8
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 7
k) any mitigation measures for inclusion in the EMPr;	Section 8 & 11
l) any conditions for inclusion in the environmental authorisation;	Section 11
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9
n) a reasoned opinion- i. 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 11 Section 8, 9 & 10
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	-
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	-
q) any other information requested by the competent authority.	-
(2) Where a government notice 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.	-

Phase 1 Cultural Heritage Impact Assessment:
THE PROPOSED KUTLWANO SOLAR POWER PLANT NEAR LICHTENBURG, NORTH WEST PROVINCE

1. INTRODUCTION

1.1 Background

Environamics was appointed to conduct the basic assessment process for the development of a Solar Power Plant and associated infrastructure on Portion 4 of the Farm Houthaaldoorns No. 2, Registration Division IP, North West Province situated within the Ditsobotla Local Municipality area of jurisdiction.

The project entails the generation of up to 150MW electrical power through photovoltaic (PV) panels. The total footprint of the project will approximately be 300 hectares within the assessed 421ha (including supporting infrastructure on site). The property on which the facility is to be constructed will be leased by Kutlwano Solar Power Plant (RF) (Pty) Ltd from the property owner, Kuhn & Kuhn (Pty) Ltd, for the lifespan of the project (minimum of 20 years).

The site is located in Renewable Energy Development Zone (REDZ) and therefore a 'basic assessment (BA) process' is required as described in Regulation 19 – 20.

South Africa's heritage resources, also described as the 'national estate', comprise a wide range of sites, features, objects and beliefs. However, according to Section 27(18) of the National Heritage Resources Act, No. 25 of 1999 (NHRA), no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site.

In accordance with Section 38 of the NHRA, an independent heritage consultant was appointed by *Environamics* to conduct a cultural heritage assessment to determine if the development of the solar power plant, associated infrastructure and power line corridor would have an impact on any sites, features or objects of cultural heritage significance.

This report forms part of the Basic Assessment as required by the EIA Regulations in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended and is intended for submission to the South African Heritage Resources Agency (SAHRA).

1.2 Terms and references

The aim of a full heritage impact assessment (HIA) investigation is to provide an informed heritage-related opinion about the proposed development by an appropriate heritage specialist. The objectives are to identify heritage resources (involving site inspections, existing heritage data and additional heritage specialists if necessary); assess their significances; assess alternatives in order to promote heritage conservation issues; and to assess the acceptability of the proposed development from a heritage perspective.

The result of this investigation is a HIA report indicating the presence / absence of heritage resources and how to manage them in the context of the proposed development.

Depending on SAHRA's acceptance of this report, the developer may receive permission to proceed with the proposed development, on condition of successful implementation of proposed mitigation measures.

1.2.1 *Scope of work*

The aim of this study is to determine the cultural heritage significance of the area where the solar power plant, associated infrastructure and a 100m wide grid connection corridor within which the power line will be located, is to take place. This included:

- Conducting a desk-top investigation of the project area; and
- A visit to the proposed project area.

The project area includes the following properties:

- The Solar Power Plant is to be located on Portion 4 of the Farm Houthaaldoorns No. 2;
- The grid connection corridor will cross over the farm Houthaalboomen No. 31.

The objectives were to:

- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources;
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance; and
- Provide guideline measures to manage any impacts that might occur during the proposed project's construction and implementation phases.

1.2.2 *Assumptions and Limitations*

The investigation has been influenced by the following:

- It is assumed that the description of the proposed project, provided by the client, is accurate;
- It is assumed that the public consultation process undertaken as part of the Basic Assessment is sufficient and that it does not have to be repeated as part of the HIA;
- It is assumed that the information contained in existing databases, reports and publications is correct;
- The unpredictability of buried archaeological remains;
- The vegetation cover encountered during a site visit can have serious limitations on ground visibility, obscuring features (artefacts, structures) that might be an indication of human settlement;
- No subsurface investigation (i.e. excavations or sampling) were undertaken, since a permit from SAHRA is required for such activities.

2. LEGISLATIVE FRAMEWORK

2.1 Background

HIAs are governed by national legislation and standards and International Best Practise. These include:

- South African Legislation
    - National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA);
    - Mineral and Petroleum Resources Development Act, 2002 (Act No. 22 of 2002) (MPRDA);
    - National Environmental Management Act 1998 (Act No. 107 of 1998) (NEMA); and
    - National Water Act, 1998 (Act No. 36 of 1998) (NWA).
- Standards and Regulations
    - South African Heritage Resources Agency (SAHRA) Minimum Standards;

  - Association of Southern African Professional Archaeologists (ASAPA) Constitution and Code of Ethics;
  - Anthropological Association of Southern Africa Constitution and Code of Ethics.
- International Best Practise and Guidelines
  - ICOMOS Standards (Guidance on Heritage Impact Assessments for Cultural World Heritage Properties); and
  - The UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage (1972).

2.2 Heritage Impact Assessment Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the NHRA (Section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority, subject to the provisions of Section 38(8) of the NHRA.

The NHRA, Section 38, contains requirements for Cultural Resources Management and prospective developments:

"38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as:

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site:

(i) exceeding 5 000 m2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within he past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."

And:

"38 (3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): Provided that the following must be included:

(a) The identification and mapping of all heritage resources in the area affected;

(b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;

(c) an assessment of the impact of the development on such heritage resources;

(d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(g) plans for mitigation of any adverse effects during and after the completion of the proposed development."

3. HERITAGE RESOURCES

3.1 The National Estate

The NHRA defines the heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations that must be considered part of the national estate to include:

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, including-
    - ancestral graves;
    - royal graves and graves of traditional leaders;
    - graves of victims of conflict;
    - graves of individuals designated by the Minister by notice in the Gazette;
    - historical graves and cemeteries; and
    - other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
- sites of significance relating to the history of slavery in South Africa;
- movable objects, including-
    - objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
    - objects to which oral traditions are attached or which are associated with living heritage;
    - ethnographic art and objects;
    - military objects;
    - objects of decorative or fine art;
    - objects of scientific or technological interest; and
    - books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

3.2 Cultural significance

In the NHRA, Section 2 (vi), it is stated that ‘‘cultural significance’’ means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. This is determined in relation to a site or feature’s uniqueness, condition of preservation and research potential.

According to Section 3(3) of the NHRA, a place or object is to be considered part of the national estate if it has cultural significance or other special value because of

- its importance in 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; and
- sites of significance relating to the history of slavery in South Africa.

A matrix (see Section 2 of Addendum) was developed whereby the above criteria were applied for the determination of the significance of each identified site. This allowed some form of control over the application of similar values for similar identified sites.

4. PROJECT DESCRIPTION

4.1 Site location

The development of the photovoltaic solar facility and associated infrastructure will be on Portion 4 of the Farm Houthaaldoorns No. 2 and Houthaalboomen No 31 in the Ditsobotla Local Municipality area of North West Province. The town of Lichtenburg is located approximately 15km to the south of the proposed development (Fig. 1). For more information, see the Technical Summary on p. V above.

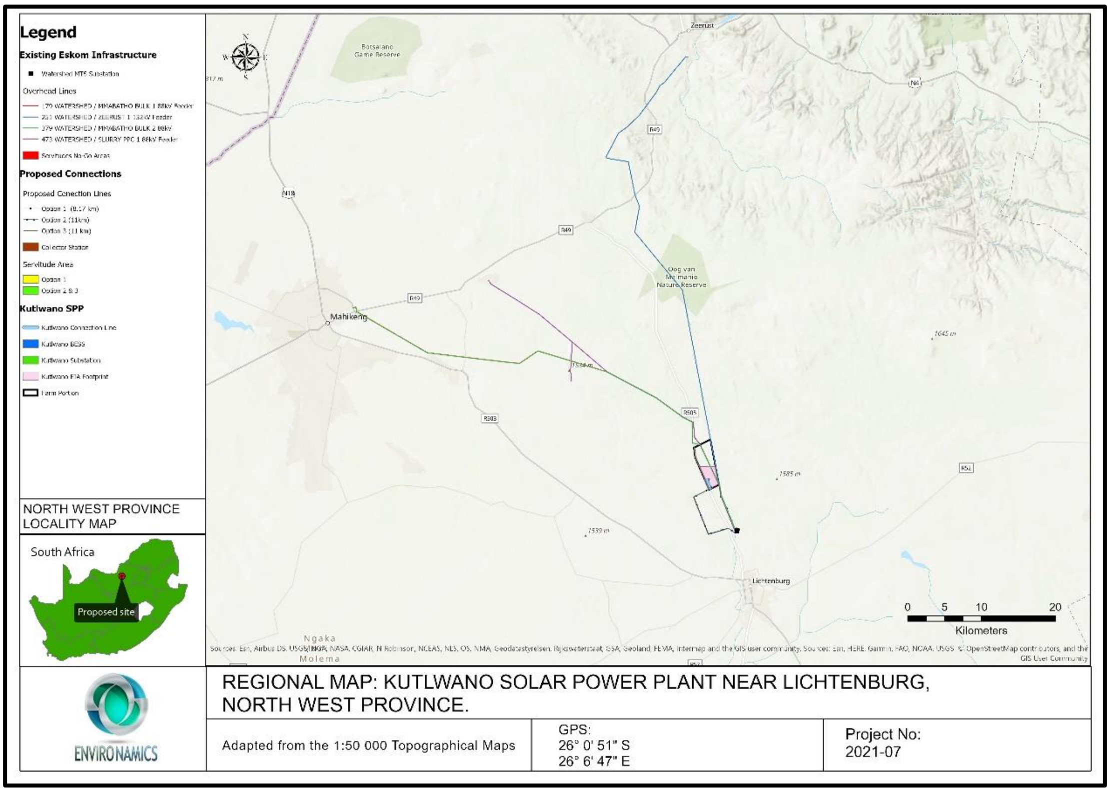


Figure 1. Location of the project area in regional context
(Map supplied by Environamics)

4.2 Development proposal

The project entails the generation of up to 150MW electrical power through photovoltaic (PV) panels. The total footprint of the project will approximately be 300 hectares within the assessed 421ha.

The information presented below was taken *ad verbum* from the *Final Project Description Document* as prepared by Environamics (2021):

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce up to 150MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted at a northern angle in order to capture the most sun, or using one-axis tracker structures to follow the sun to increase the Yield.

- Wiring to Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is 480V and this is fed into step up transformers to 132kV. An onsite substation will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid. Whilst Kutlwano Solar Power Plant (RF) (Pty) Ltd has not yet received a cost estimate letter from Eskom, it is expected that generation from the facility will tie in with Watershed 275/132/88 MTS Substation. The Project will inject up to 100MW into the National Grid. The installed capacity will be approximately 150MW.

  One route is proposed from the onsite substation to the collector station situated on the property. Whereas two possible connection corridor routes are proposed from the collector station to the Watershed 275/132/88 MTS Substation. Within the preferred corridor (South east of farm) a new line of approximately 9km will be constructed to the Watershed MTS or alternatively, one of the existing Eskom lines will be upgraded. For the alternative corridor (South west of the farm) a new line of approximately 11km will be constructed to the Watershed MTS. The proposed power line routes should be assessed within a 100m wide corridor except where existing lines are already located where it should be approximately 150m (See KMZ). The area surrounding the substation should also be assessed.

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4m underground as far as practically possible.

- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on site:

  - Office (~200m²);
  - Switch gear and relay room (~400m²);
  - Staff lockers and changing room (~200m²); and

- Security control (~60m²)

- Battery storage – A Battery Storage Facility with a maximum height of 8m and a maximum volume of 1,740 m3 of batteries and associated operational, safety and control infrastructure.

- Roads – Access will be obtained from the R505 Regional Road onto a proposed new gravel access road situated adjacent the development footprint where direct access will be obtained to the facility. An internal site road network will also be required to provide access to the solar field and associated infrastructure. The access and internal roads will be constructed within a 25-meter corridor.

- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a height of 2.5 meters will be used.

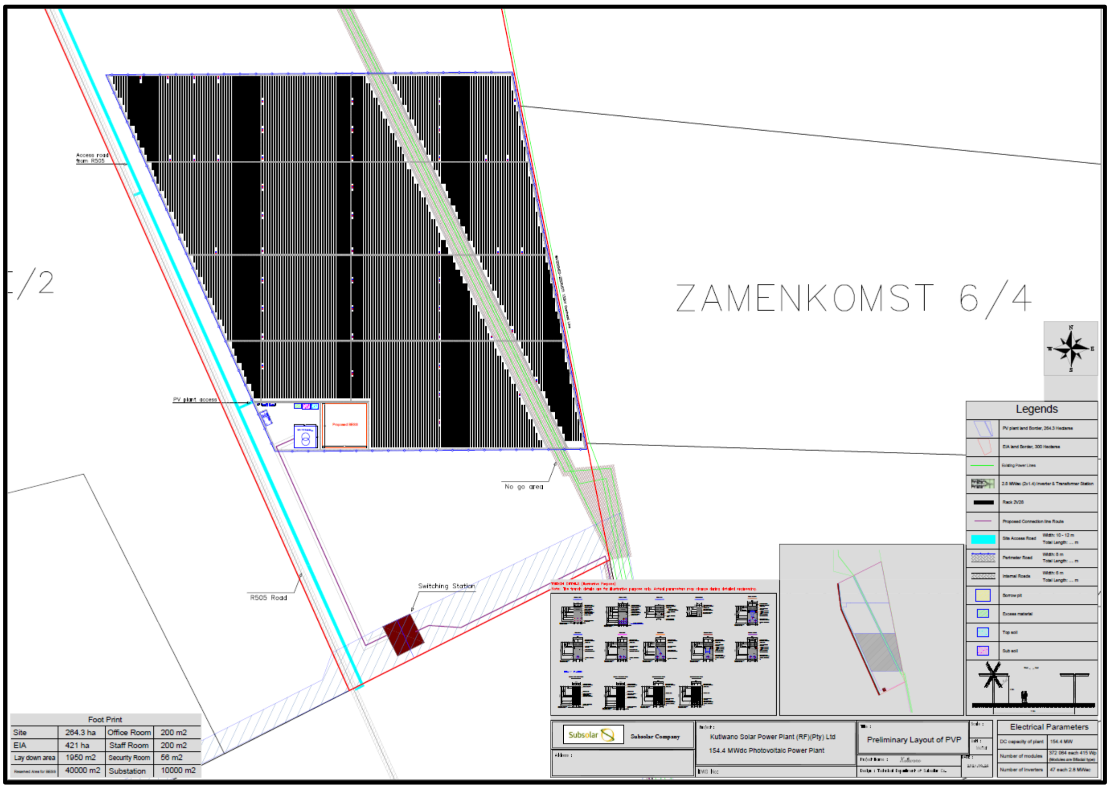


Figure 2. Layout of the proposed project
(Map supplied by Environamics)

5. STUDY APPROACH AND METHODOLOGY

5.1 Extent of the Study

This survey and impact assessment cover all facets of cultural heritage located in the project area, including the 100m wide power line corridor, as presented in Section 4 above and illustrated in Figures 1 & 2.

5.2 Methodology

5.2.1 Pre-feasibility assessment
The objectives of this review were to:

- Gain an understanding of the cultural landscape within which the project is located;
- Inform the field survey.

5.2.1.1 Survey of the literature
A survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area. In this regard, various anthropological, archaeological and historical sources were consulted – see list of references in Section 12.

- Information on events, sites and features in the larger region were obtained from these sources.

5.2.1.2 Survey of heritage impact assessments (HIAs)
A survey of HIAs done for projects in the region by various heritage consultants was conducted with the aim of determining the heritage potential of the area – see list of references in Section 12.

- Information on sites and features in the larger region were obtained from these sources.

5.2.1.3 Data bases
The *Heritage Atlas Database,* various SAHRA databases, the *Environmental Potential Atlas*, the *Chief Surveyor General* and the *National Archives of South Africa* were consulted.

- Database surveys produced a number of sites located in the larger region of the proposed development.

5.2.1.4 Other sources
Aerial photographs and topocadastral and other maps were also studied - see the list of references below.

- Information of a very general nature were obtained from these sources.

5.2.1.5 Results

The results of the above investigation are presented in Table 1 and Figure 3 below – see list of references in Section 12 – and can be summarised as follows:

- Reports indicate that Stone Age tools occur in very limited numbers sporadically across the larger region;
- Stone walled sites dating to the Late Iron Age occur some distance to the east and the north of the project area;
- Historic structures, inclusive of buildings, monuments and bridges, occur sporadically across the larger region;
- Formal and informal burial sites occur sporadically throughout the region.

Based on the above assessment, the probability of cultural heritage sites, features and objects occurring in the project area is predicted to be ***low****.*

Table 1: Pre-Feasibility Assessment

Category	Period	Probability	Reference
Landscapes			

Natural/Cultural		Low	Historic maps & aerial photographs
Early hominin	Pliocene – Lower Pleistocene		
	Early hominin	None	-
Stone Age	Lower Pleistocene – Holocene		
	Early Stone Age	Low	Heritage Atlas Database
	Middle Stone Age	Low	Heritage Atlas Database
	Later Stone Age	None	-
	Rock Art	None	-
Iron age	Holocene		
	Early Iron Age	None	-
	Middle Iron Age	None	-
	Late Iron Age	Low	Breutz (1957)
Colonial period	Holocene		
	Contact period/Early historic	Possible	Breutz (1957)
	Recent history	Possible	Heritage Database; Professional Grave Solutions (2009, 2014); Van Schalkwyk (2006); Van Schalkwyk & De Jong (1995); Van den Bergh (1996)
	Industrial heritage	Low	Heritage Database; Schepers (1950); Van Schalkwyk & De Jong (1995)

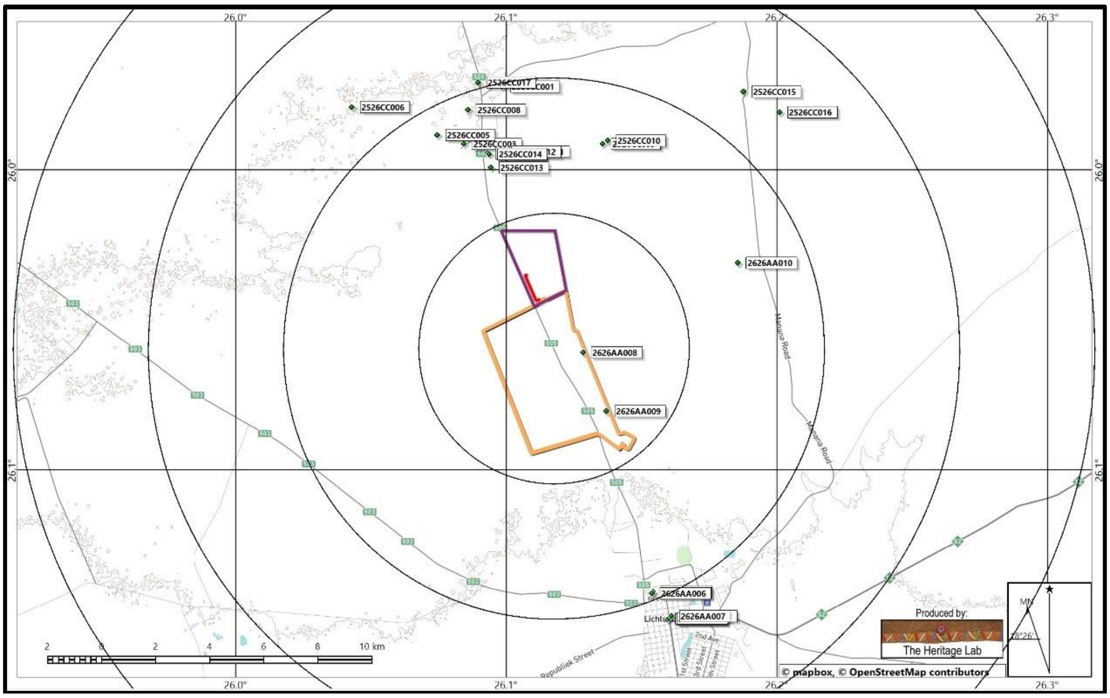


Figure 3. Location of known heritage sites and features in relation to the project area
(Circles spaced at a distance of 3km: heritage sites = coded green dots)

5.2.2 *Field survey*

The field survey was done according to generally accepted archaeological practices, and was aimed at locating all possible heritage sites, objects and structures. The area that had to be investigated was identified by *Environamics* by means of maps and .k*ml* files indicating the project area, including the power line corridor. This was loaded onto a Samsung digital device and used in Google Earth during the field survey to access the project area.

The project area was visited on 17 July 2021 and was investigated by accessing it by means of the various farm tracks and then walking transects (Fig. 4). Sites and features identified during the preliminary investigation were specifically investigated.

The preferred power line corridor (southeast of the farm) connection to the Watershed Substation, for which a new line of approximately 9km will be constructed or alternatively, one of the existing Eskom lines will be upgraded, was surveyed in 2010 for the then proposed 88kV power line from Watershed Substation, Lichtenburg, to the Mmabatho Substation (Van Schalkwyk 2010). The information contained in this latter report is taken to be relevant for the current project.

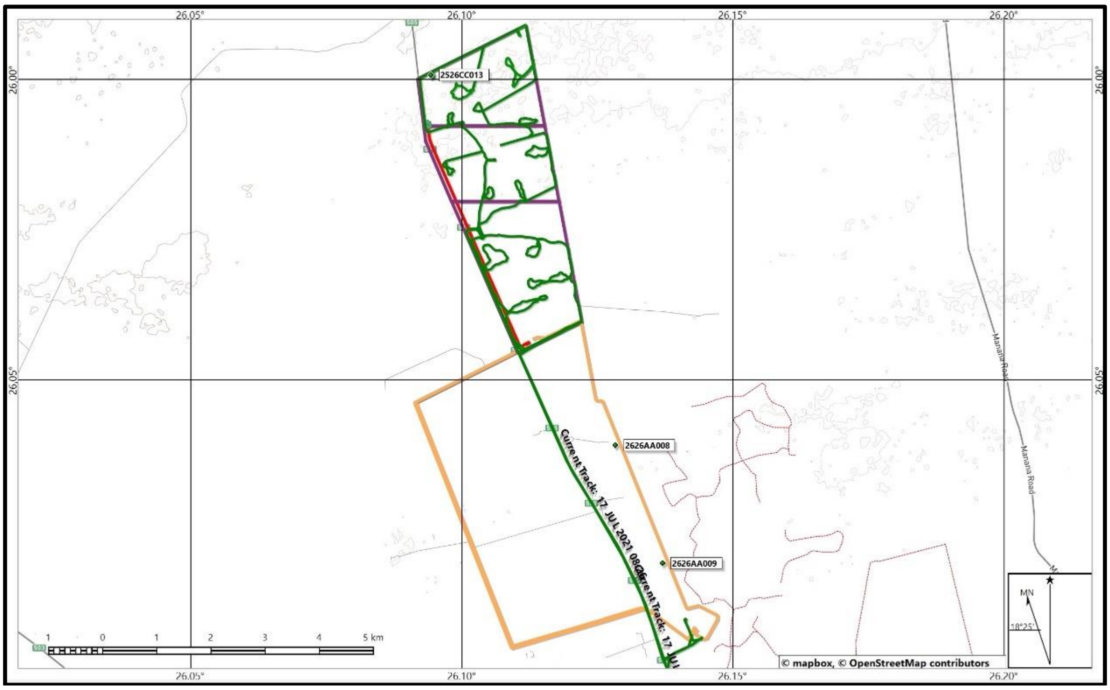


Figure 4. Map indicating the track log of the field survey
(Site = purple polygon; track log = green line)

5.2.3 *Documentation*

All sites, objects and structures that were identified are documented according to the general minimum standards accepted by the archaeological profession. Coordinates of individual localities are determined by means of the *Global Positioning System* (GPS) and plotted on a map. This information is added to the description to facilitate the identification of each locality. Map datum used: Hartebeeshoek 94 (WGS84).

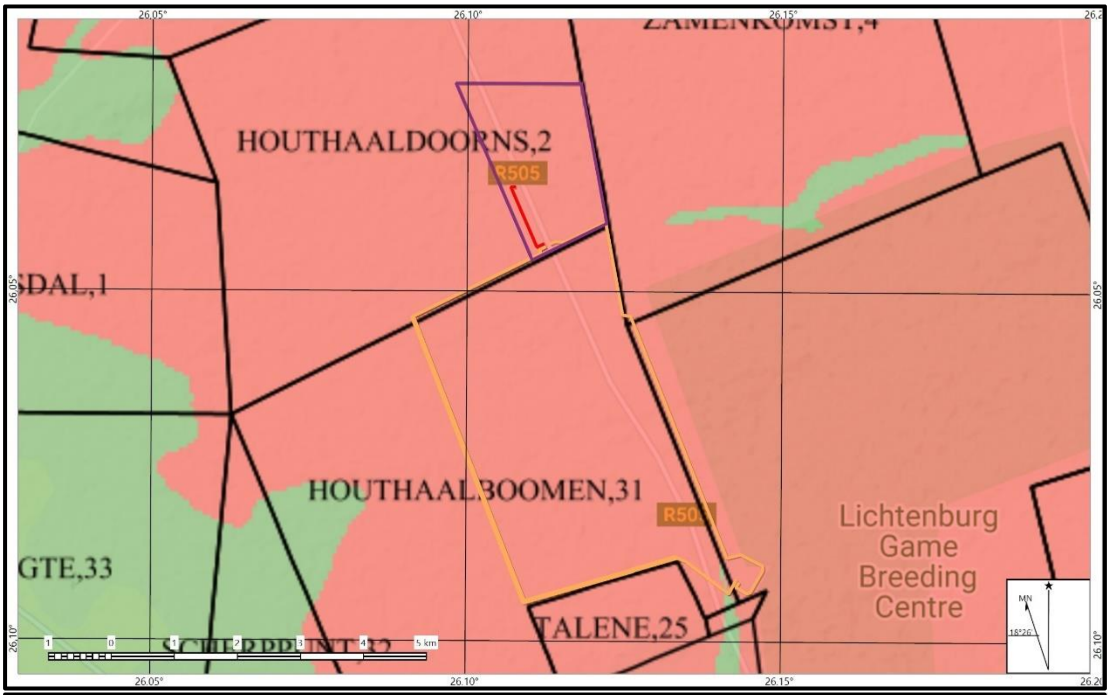
The track log and identified sites were recorded by means of a Garmin Oregon 550 handheld GPS device. Photographic recording was done by means of a Canon EOS 550D digital camera. Geo-rectifying of the aerial photographs and historic maps was done by means of a professional software package: ExpertGPS.

6. DESCRIPTION OF THE AFFECTED ENVIRONMENT

6.1 Natural Environment

The geology of the region is made up of dolomite, subordinate chert, minor carbonaceous shale, limestone and quartzite of the Malmani Subgroup of the Chuniespoort Group of the Transvaal Supergroup. This bedrocks are known to contain fossil stromatolites of various shapes and sizes.

The Palaeontological Sensitivity Map (http://www.sahra.org.za/sahris/map/palaeo) indicate that the project area (Fig. 5) has a very high sensitivity of fossil remains to be found and therefore a field assessment and protocol for finds is required.



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 5. The Palaeontological sensitivity of the project area

The original vegetation is classified as Carletonville Dolomite Grassland, a grassland biome, forming part of the Dry Highveld Grassland Bioregion. However, in the project area, most of this has been transformed due to agricultural activities (Fig. 6).

The topography of the region is classified as plains and pans and no hills or river are known to exist in the vicinity of the project area.

General overview

Clusters of trees

Outcrops

Old diamond diggings

Figure 6. Views over the project area

6.2 Cultural Landscape

The aim of this section is to present an overview of the history of the larger region in order to eventually determine the significance of heritage sites identified in the project area, within the context of their historic, aesthetic, scientific and social value, rarity and representivity.

The cultural landscape qualities of the region essentially consist of a rural area in which the human occupation is made up of a limited Stone Age occupation. This was followed much later by Tswana-speaking agro-pasturalist that settled in the larger region. They were soon followed by a colonial (farmer) component, which gave rise to the development of small villages and towns that dot the larger landscape. The final transformation was brought about by the development of infrastructure in the region, such as roads and railway lines, which was extended due to large scale diamond mining activities.

6.2.1 *Stone Age*

Very little habitation of the central highveld area took place during Stone Age times. Tools dating to the Early Stone Age period are mostly found in the vicinity of larger watercourses, e.g. the Vaal River or the Harts River and especially in sheltered areas such as at the Taung fossil site. During Middle Stone Age (MSA) times (c. 150 000 – 30 000 BP), people became more mobile, occupying areas formerly avoided. In many cases, tools dating to this period are found on the banks of the many pans that occur all over. The MSA is a technological stage characterized by flakes and flake-blades with faceted platforms, produced from prepared cores, as distinct from the core tool-based ESA technology.
Tools dating to the ESA and MSA periods are found in the vicinity of watercourses, e.g. the Molopo River and large numbers were also unearthed by the diamond mining activities in the Bakerville area.

Late Stone Age (LSA) people had even more advanced technology than the MSA people and therefore succeeded in occupying even more diverse habitats. Some sites are known to occur in the region. These are mostly open sites located near river and pans. For the first time we also get evidence of people's activities derived from material other than stone tools. Ostrich eggshell beads, ground bone arrowheads, small bored stones and wood fragments with incised markings are traditionally linked with the LSA.

6.2.2 *Iron Age*

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known sites at Broederstroom south of Hartebeespoort Dam dating to AD 470. Having only had cereals (sorghum, millet) that need summer rainfall, Early Iron Age (EIA) people did not move outside this rainfall zone, and neither did they occupy the central interior highveld area.

As yet, no sites dating to the Early Iron Age have been reported from the region and most sites date to the Late Iron Age. The occupation of the larger geographical area (including the study area) did not start much before the 1500s. By the 16th century things changed, with the climate becoming warmer and wetter, creating conditions that allowed Late Iron Age (LIA) farmers to occupy areas previously unsuitable, for example the treeless plains of the Free State.

The earliest Iron Age settlers who moved into the North West Province region were Tswana-speakers such as the Tlhaping, Hurutshe, Fokeng, Kgatla and Rolong. In the region of the study area, it was mostly the booRapulana and booRatlou sections of the Rolong (Breutz 1957). To the east of them is found the baTloung, who, it is said, originally are of Ndebele origin. They left the Pretoria region and settled in the Rustenburg region, from where they moved to the Klerksdorp area. By the early 1800s they moved to the farm Putfontein, where the Hermannsburg Mission Society had established a mission station.

6.2.3 *Historic period*

The area was occupied by white farmers since the 1850s. As resources were few they depended on farming and hunting to survive. The town of Lichtenburg was founded in 1866 and proclaimed in 1873. During the Anglo-Boer War, a number of skirmishes took place in the larger region. Most famous of these was the siege of Mafikeng, although a short battle was also fought in the town of Lichtenburg in March 1901 (Van den Berg 1996).

In the early twentieth century, diamonds were found in various places in the Lichtenburg district of the former Transvaal Province. However, it was only during the early 1920s that large quantities of diamonds were found, resulting in the proclamation of the Bakerville diamond fields (more correctly: the Lichtenburg-diamond field) in 1926. Thousands of miners swarmed to the area in search of wealth. At the height of activity, in 1927, an estimated 90 000 people were involved at the diamond fields. Bakerville was the most important of a number of settlements where the miners congregated. It was laid out in 1927 and is named after A W Baker, the then owner of the farm Uitgevonden 355JP. As early as 1928, activities started to decline - and continued to decline. Currently only a few people are involved in diamond mining in this area.

6.3 Site specific review

> *Although landscapes with cultural significance are not explicitly described in the NHRA, they are protected under the broad definition of the National Estate (Section 3): Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate.*
>
> *The examination of historical maps and aerial photographs help us to reconstruct how the cultural landscape has changed over time as is show how humans have used the land.*

From a review of the available old maps and aerial photographs it can be seen that the project area has always been open space, with the main activity being grazing or the making of agricultural fields. The Imperial Map of South Africa (Fig. 7) indicates the farm Houthaaldoorns, but shows the road to Mafikeng located to the east of the farm.

South of Bakerville, the area is so devoid of natural as well as human made features (Fig. 8), that it makes the georectification of the images virtually impossible. This is also the case even until the 1972 version of the 1:50 000 topographic map (Fig. 9), where no built features are shown in the project area. This is even he case on the 2021 Google Earth image of the project area (Fig. 10).

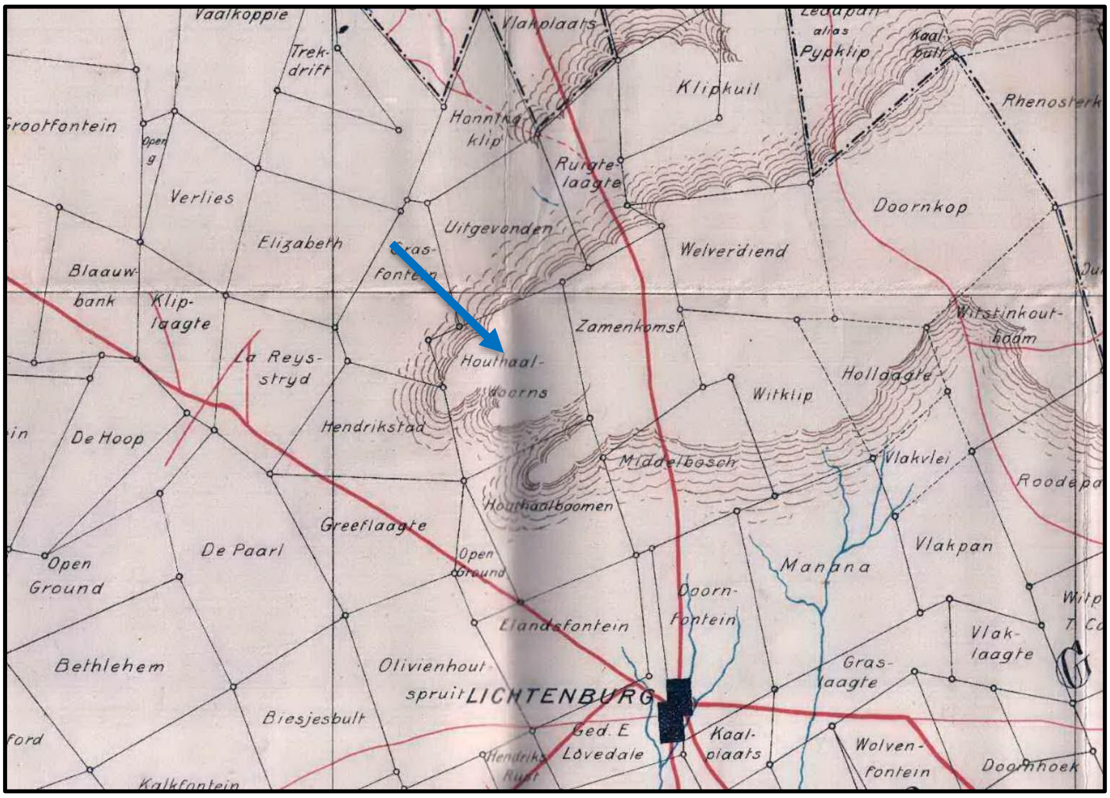


Figure 7. Imperial Map of South Africa: Mafikeng (1900)

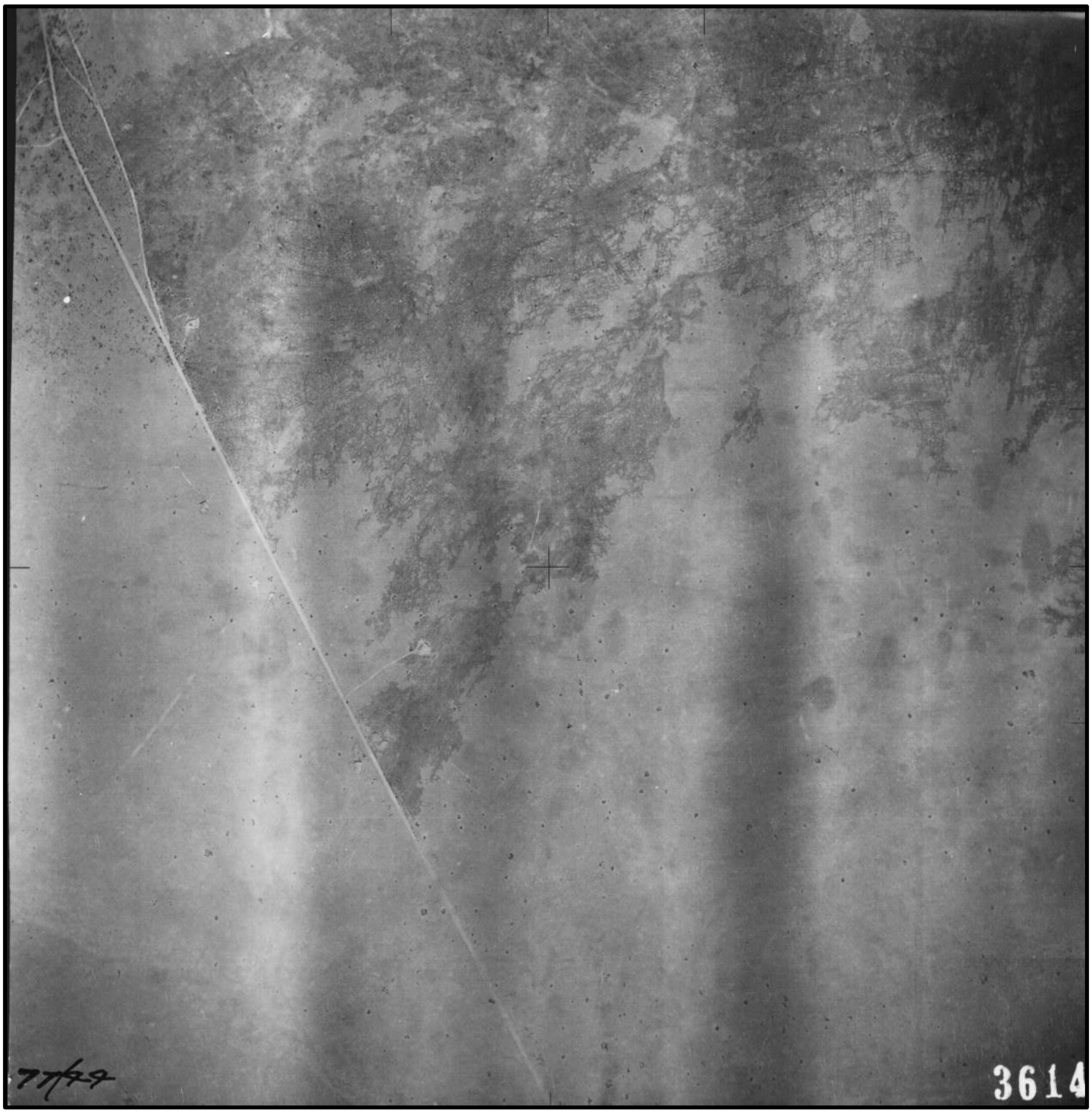


Figure 8. The project area on the 1944 version of the official aerial photograph
(CS-G Photograph: 77_003_03614)

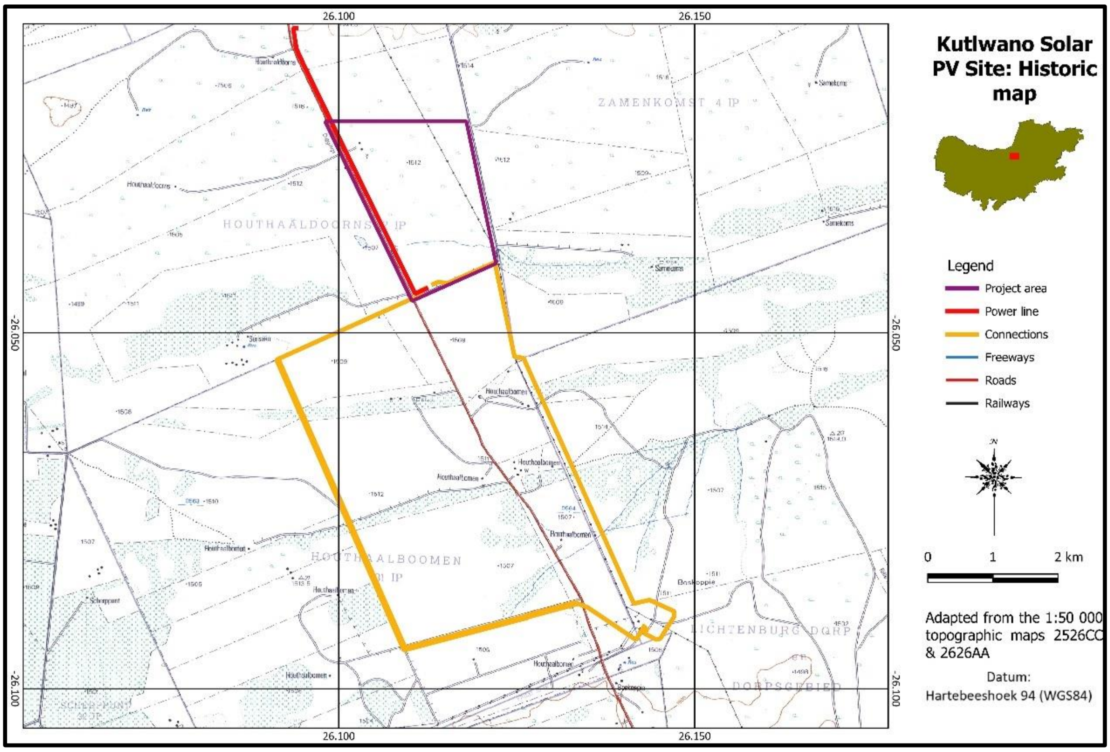


Figure 9. The project area on the 1972 version of the 1:50 000 topographic map

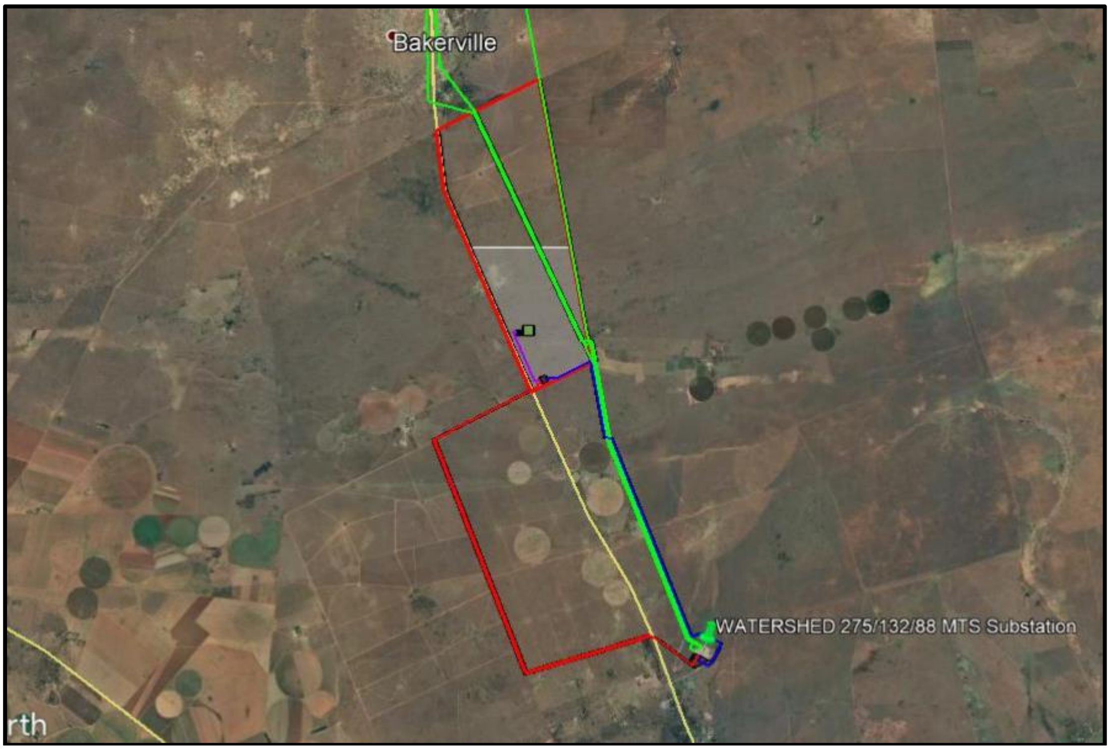


Figure 10. Aerial view of the project area dating to 2021
(Image: Google Earth)

7. SURVEY RESULTS

During the survey, the following sites, features and objects of cultural significance were identified in the project area (Fig. 11).

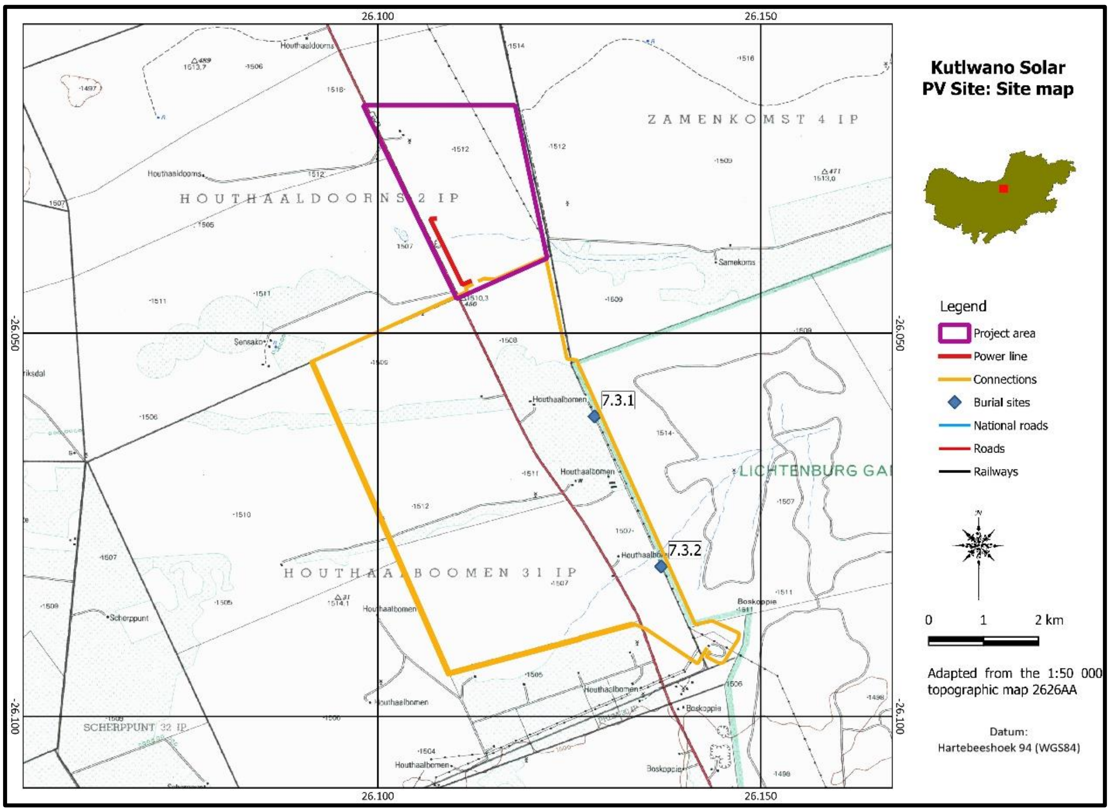


Figure 11. Location of heritage sites in the project area

7.1 Stone Age

- No sites, features or objects of cultural significance dating to the Stone Age were identified in the project area.

7.2 Iron Age

- No sites, features or objects of cultural significance dating to the Iron Age were identified in the project area.

7.3 Historic period

NHRA Category	**Graves, Cemeteries and Burial Grounds - Section 36**

7.3.1. Type: Burial site. **Farm**: Houthaaldoorns 2IP. **Coordinates**: S 26,06059; E 26,12813
Description: An informal burial site with probably more than 30 graves. Most are only marked with stone cairns. It is not fenced off and occur in close proximity of some houses.

Significance of site/feature	Generally protected 4A: High/medium significance - Should be mitigated before destruction.
Reasoned opinion: Burial sites are viewed as having high emotional and sentimental value. However, mitigation is possible if proper procedures have been followed.	
References: Van Schalkwyk (2010)	

 General view of the burial site	 View of some of the graves

Figure 12. Views of the burial site

7.3.2. Type: Burial site. **Farm**: Houthaaldoorns 2IP **Coordinates**: S 26,08059; E 26,13685	
Description: An informal burial site with probably 50 graves, most marked only with stone cairns. The site is not fenced off and seems to be abandoned and no houses occur in it immediate vicinity.	
Significance of site/feature	Generally protected 4A: High/medium significance - Should be mitigated before destruction.
Reasoned opinion: Burial sites are viewed as having high emotional and sentimental value. However, mitigation is possible if proper procedures have been followed.	
References: Van Schalkwyk (2010)	

 General view of the burial site	 View of some of the graves

Figure 13. Views of the burial site

8. IMPACT ASSESSMENT RATINGS AND MITIGATION MEASURES

8.1 Impact assessment

Heritage impacts are categorised as:

- Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries;
- Indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment;
- Cumulative impacts that are combinations of the above.

The geographic area of evaluation is the spatial boundary in which the cumulative effects analysis was undertaken. The spatial boundary evaluated in this cumulative effects analysis generally includes an area of a 30km radius surrounding the proposed development (Environamics 2021).

The geographic spread of PV solar projects, administrative boundaries and any environmental features (the nature of the landscape) were considered when determining the geographic area of investigation. It was argued that a radius of 30km would generally confine the potential for cumulative effects within this particular environmental landscape. The geographic area includes projects located within the North West province. A larger geographic area may be used to analyse cumulative impacts based on the specific temporal or spatial impacts of a resource. For example, the socioeconomic cumulative analysis may include a larger area, as the construction workforce may draw from a much wider area. The geographic area of analysis is specified in the discussion of the cumulative impacts for that resource where it differs from the general area of evaluation described above (Environamics 2021).

The cumulative impact of the proposed Lerato project is to be assessed by adding impacts from this proposed development to existing and other proposed developments with similar impacts within a 30 km radius. The existing and proposed developments that were taken into consideration for cumulative impacts include a total of 9 other plants and are listed in Table 2.

Table 2: Existing and planned alternative energy generation facilities in the larger region

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Hibernia solar Energy Facility	23.3 km	-	14/12/16/3/3/2/1062	Scoping and EIA	Approved
ACSA PV	20.3 km	3 MW	12/12/20/2149	BAR	Approved
Lichtenburg 1 solar PV energy	1.6 km	100 MW	14/12/16/3/3/2/1091	Scoping and EIA	Approved
Lichtenburg 2 solar PV energy	1.7 km	100 MW	14/12/16/3/3/2/1092	Scoping and EIA	Approved
Lichtenburg 3 solar PV energy	2 km	100 MW	14/12/16/3/3/2/1093	Scoping and EIA	Approved
Lichtenburg Solar Park	10 km	70 MW	14/12/16/3/3/2/270	Scoping and EIA	Approved
Tlisitseng PV1 SEF	8 km	75 MW	14/12/16/3/3/2/974	Scoping and EIA	Approved
Tlisitseng PV2 SEF	8.5 km	75 MW	14/12/16/3/3/2/975	Scoping and EIA	Approved
Watershed Solar Energy Facility	11 km	75 MW	14/12/16/3/3/2/557	Scoping and EIA	Approved

However, meaningful assessment of cumulative impacts require a comprehensive review of all developments in the larger region of the project area and not only those involving renewable energy.

From a review of available databases, publications, as well as available[2] heritage impact assessments done for the purpose of developments in the region, see list of references in Section 12.2 below, it was determined that the Boitumelo project is located in an area with a very low presence of heritage sites and features.

- The cultural heritage profile of the larger region is very low. Most frequently found are farmsteads, formal and informal burial sites and site relating to diamond mining activities. For this review, heritage sites located in urban areas have been excluded.

Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare. Because of the low likelihood of finding further significant heritage resources in the area of the proposed for development and the generally low density of sites in the wider landscape the overall impacts to heritage are expected to be of generally low significance before mitigation.

For the project area, the impacts to heritage sites are expected to be of medium significance. However, this can be ameliorated by implementing mitigation measures, include isolating sites, relocating sites (e.g. burials) and excavating or sampling any significant archaeological material found to occur within the project area. The chances of further such material being found, however, are negligible. After mitigation, the overall impact significance would therefore be low.

- The potential impact that the proposed development might have, has been calculated and is presented for each individual site in Table 3 below (this also include the cumulative impact assessment).

Table 3: Impact assessment

Kutlwano Solar Power Plant			
7.3.1. Type: Burial site			
Impact assessment: This site is located adjacent to the power line. Due to its location, it would, theoretically, be possible to retain it *in situ*.			
		Without mitigation	With mitigation
Geographical Extent		Local area (1)	Local area (1)
Probability		Probable (3)	Unlikely (1)
Duration		Permanent (4)	Short term (1)
Intensity/Magnitude		Medium (2)	Low (1)
Reversibility		Partly reversible (2)	Completely reversible (1)
Irreplaceable loss of resources?		Marginal loss of resources (2)	No loss of resources (1)
Cumulative Effect		Medium (3)	Negligible (1)
Significance			
Site type	**NHRA category**	**Field rating**	**Impact rating: Before/After mitigation**
Burial sites and Graves	Section 36	Generally protected 4A: High significance	Negative medium (30) Negative Low (6)

7.3.2. Type: Burial site		
Impact assessment: This site is located adjacent to the power line. Due to its location, it would, theoretically, be possible to retain it *in situ*.		
	Without mitigation	With mitigation
Geographical Extent	Local area (1)	Local area (1)

[2] Only reports that were available on the SAHRIS database were consulted.

Probability		Definite (3)	Unlikely (1)
Duration		Permanent (4)	Short term (1)
Intensity/Magnitude		Medium (2)	Low (1)
Reversibility		Partly reversible (2)	Completely reversible (1)
Irreplaceable loss of resources?		Marginal loss of resources (2)	No loss of resources (1)
Cumulative Effect		Medium (3)	Negligible (1)
Significance			
Site type	**NHRA category**	**Field rating**	**Impact rating: Before/After mitigation**
Burial sites and Graves	Section 36	Generally protected 4A: High significance	Negative medium (30) Negative Low (6)

8.2 Mitigation measures

Mitigation: means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

- For the current study, the following mitigation measures are proposed.

<table>
<tr><td>7.3.1. Type: Burial site</td></tr>
<tr><td>Mitigation</td></tr>
<tr><td>Due to its locality close to the boundary of the proposed powerline route, the following mitigation measure is proposed:
(1) Avoidance/Preserve: This is viewed to be the primary form of mitigation and applies where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources.
• If it is decided to retain the burial site, and its exact size has been determined it should be fenced off permanently by means of a wire fence or brick wall, with a buffer zone of at least 20m.
• Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation to ensure that no accidental damaged is caused to the features or that undetected heritage/remains are destroyed.</td></tr>
<tr><td>Requirements</td></tr>
<tr><td>In the event of an impact occurring on the identified site or feature, a permit for mitigation and/or destruction must be obtained from SAHRA/PHRA prior to any work being carried out.
• The appropriate steps to take are indicated in Section 9 of the report, as well as in the Management Plan: Burial Grounds and Graves, with reference to general heritage sites, in the Addendum, Section 13.5.</td></tr>
</table>

<table>
<tr><td>7.3.2. Type: Burial site</td></tr>
<tr><td>Mitigation</td></tr>
<tr><td>Due to its locality close to the boundary of the proposed powerline route, the following mitigation measure is proposed:
(1) Avoidance/Preserve: This is viewed to be the primary form of mitigation and applies where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources.
• If it is decided to retain the burial site, and its exact size has been determined it should be fenced off permanently by means of a wire fence or brick wall, with a buffer zone of at least 20m.</td></tr>
</table>

• Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation to ensure that no accidental damaged is caused to the features or that undetected heritage/remains are destroyed.
Requirements
In the event of an impact occurring on the identified site or feature, a permit for mitigation and/or destruction must be obtained from SAHRA/PHRA prior to any work being carried out. • The appropriate steps to take are indicated in Section 9 of the report, as well as in the **Management Plan: Burial Grounds and Graves, with reference to general heritage sites**, in the Addendum, Section 13.5.

9. MANAGEMENT MEASURES

Heritage sites are fixed features in the environment, occurring within specific spatial confines. Any impact upon them is permanent and non-reversible. Those resources that cannot be avoided and are directly impacted by the proposed development can be excavated/recorded and a management plan can be developed for future action. Those sites that are not impacted on can be written into the management plan, whence they can be avoided or cared for in the future.

Sources of risk were considered with regards to development activities defined in Section 2(viii) of the NHRA that may be triggered and are summarised in Table 4A and 4B below. These issues formed the basis of the impact assessment described. The potential risks are discussed according to the various phases of the project below.

9.1 Objectives

- Protection of archaeological, historical and any other site or land considered being of cultural value within the Project Area against vandalism, destruction and theft.
- The preservation and appropriate management of new discoveries in accordance with the NHRA, should these be discovered during construction activities.

The following shall apply:

- Known sites should be clearly marked, so that they can be avoided during construction activities;
- The contractors and workers should be notified that archaeological sites might be exposed during the construction activities;
- Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer (ECO) shall be notified as soon as possible;
- All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the ECO will advise the necessary actions to be taken;
- Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and
- Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA, Section 51(1).

9.2 Control

In order to achieve this, the following should be in place:

- A person or entity, e.g. the ECO, should be tasked to take responsibility for the maintenance heritage sites.
- In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures.

Table 4A: Construction Phase: Environmental Management Programme for the project

Action required	Protection of heritage sites, features and objects		
Potential Impact	The identified risk is damage or changes to resources that are generally protected in terms of Sections 27, 28, 31, 32, 34, 35, 36 and 37 of the NHRA that may occur in the Project Area.		
Risk if impact is not mitigated	Loss or damage to sites, features or objects of cultural heritage significance		
Activity / issue	**Mitigation: Action/control**	**Responsibility**	**Timeframe**
1. Removal of Vegetation 2. Construction of required infrastructure, e.g. access roads, water pipelines	See discussion in Section 9.1 above	Environmental Control Officer & the Contractor	During construction only
Monitoring	See discussion in Section 9.2 above		

Table 4B: Operation Phase: Environmental Management Programme for the project

Action required	Protection of heritage sites, features and objects		
Potential Impact	It is unlikely that the negative impacts identified for pre-mitigation will occur if the recommendations are followed.		
Risk if impact is not mitigated	Loss or damage to sites, features or objects of cultural heritage significance		
Activity / issue	**Mitigation: Action/control**	**Responsibility**	**Timeframe**
1. Additional construction / development of required infrastructure, e.g. access roads, water pipelines	See discussion in Section 9.1 above	Environmental Control Officer	During construction only
Monitoring	See discussion in Section 9.2 above		

9.3 Legal requirements

The legal requirements related to heritage specifically are specified in Section 3 of this report. For this proposed project, the assessment has determined that sites, features or objects of heritage significance occur in the project area. Therefore, various permits might be required from SAHRA or the PHRA.

- If the identified graves are to be relocated for the purposes of the development of the solar power plant and its associated power lines, proper procedures must be followed after obtaining all the necessary permits – see Section 13.5.
- If the site of the old hospital area is to be impacted on for the purposes of the development of the solar power plant, proper excavation procedures must be followed after obtaining all the necessary permits – see Section 13.5.
- If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

10. CONSIDERATION OF ALTERNATIVES

- The information presented below was taken *ad verbum* from the *Final Project Description Document* as prepared by Environamics (2021):

The DEAT 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives namely, the no-go, location, activity, and design alternatives. It is however, important to note that the regulation and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and EAP, which in some instances culminates in a single preferred project proposal. An initial site assessment was conducted by the developer on Portion 4 of the Farm Houthaaldoorns No. 2 and the farm was found favourable due to its proximity to grid connections, solar radiation, ecology and relative flat terrain. Some parts of the farm have been deemed less suitable for the proposed development such as areas with high agricultural sensitivities. These factors were then taken into consideration and avoided as far as possible.

The following alternatives were considered in relation to the proposed activity and all specialists should also make mention of these:

<u>No-go alternative</u>
This alternative considers the option of 'do nothing' and maintaining the status quo. The site is currently zoned for agricultural land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for agricultural purposes. The potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost if the status quo persist.

<u>Location alternatives</u>
Other possible sites were identified on the Portion 4 of the Farm Houthaaldoorns No. 2, but is earmarked to be developed for two other PV solar facilities. This site is referred to as the preferred site. Some limited sensitive features occur on the site. The size of the site makes provision for the exclusion of any sensitive environmental features that may arise as a result of the EIA proses. The 132kV overhead transmission line is the only preferred alternative for the applicant at this stage.

<u>Technical Alternatives: Power lines</u>
It is expected that generation from the facility will tie in with the Watershed 275/132/88 MTS Substation. The preferred power line route is located east of the project footprint, heading south towards the substation. It is proposed that from this substation one power line will be constructed to connect the project to the Watershed 275/132/88 MTS substation located approximately 10 kilometres south-east of the site.

<u>Battery storage facility</u>
It is proposed that a nominal up to 500 MWh Battery Storage Facility for grid storage would be housed in stacked containers, or multi-storey building, with a maximum height of 8m and a maximum volume of 1,740m3 of batteries and associated operational, safety and control infrastructure. Three types of battery technologies are being considered for the proposed project: Lithium-ion, Sodium-sulphur or Vanadium Redox flow battery. The preferred battery technology is Lithium-ion.

Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the base load and peak power generation market and therefore can compete directly with fossil fuel sources of power generation and offer a truly sustainable electricity supply option.

<u>Design and layout alternatives</u>

Design alternatives will be considered throughout the planning and design phase and specialist studies are expected to inform the final layout of the proposed development.

Technology alternatives

There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon, thin film or bifacial PV panels. The technology that (at this stage) proves more feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels, due to it being non-reflective, more efficient, and with a higher durability. However, due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project.

11. CONCLUSIONS AND RECOMMENDATIONS

Environamics was appointed to conduct the basic assessment process for the development of a Solar Power Plant and associated infrastructure on Portion 4 of the Farm Houthaaldoorns No. 2, Registration Division IP, North West Province situated within the Ditsobotla Local Municipality area of jurisdiction.

This report describes the methodology used, the limitations encountered, the heritage features that were identified and the recommendations and mitigation measures proposed relevant to this. The investigation consisted of a desktop study (archival sources, database survey, maps and aerial imagery) and a physical survey that also included the interviewing of relevant people. It should be noted that the implementation of the mitigation measures is subject to SAHRA/PHRA’s approval.

The cultural landscape qualities of the region essentially consist of a rural area in which the human occupation is made up of a limited Stone Age occupation. This was followed much later by Tswana-speaking agro-pasturalist that settled in the larger region. They were soon followed by a colonial (farmer) component, which gave rise to the development of small villages and towns that dot the larger landscape. The final transformation was brought about by the development of infrastructure in the region, such as roads and railway lines, which was extended due to large scale diamond mining activities.

Identified sites

During the survey the following sites, features or objects of cultural significance were identified.

- 7.3.1 An informal burial site with probably more than 30 graves. Most are only marked with stone cairns.

- 7.3.2 An informal burial site with probably more than 50 graves. Most are only marked with stone cairns.

Limitations encountered

- For the alternative corridor (South west of the farm) a new line of approximately 11km will be constructed to the Watershed MTS. The proposed power line would have a 100m wide corridor except where existing lines are already located where it should be approximately 150m. The proposed power line corridor was surveyed only at desktop level as access to the relevant properties was not possible. It is proposed that once the power line route has been confirmed within the 100m corridor a heritage walk-though needs to be undertaken.

Impact assessment and proposed mitigation measures

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development:

- For the current study, the following mitigation measures are proposed.

<table>
<tr><th>Site type</th><th>NHRA category</th><th>Field rating</th><th>Impact rating: Before/After mitigation</th></tr>
<tr><td rowspan="2">7.3.1 Burial sites and Graves</td><td rowspan="2">Section 36</td><td rowspan="2">Generally protected 4A: High significance</td><td>Negative medium (30)</td></tr>
<tr><td>Low (6)</td></tr>
<tr><td colspan="4">Mitigation: (1) Avoidance/Preserve: This is viewed to be the primary form of mitigation and the site should be retained in situ and a buffer zone should be created around it, either temporary (by means of danger tape) or permanently (wire fence or built wall) of 20m.</td></tr>
</table>

<table>
<tr><th>Site type</th><th>NHRA category</th><th>Field rating</th><th>Impact rating: Before/After mitigation</th></tr>
<tr><td rowspan="2">7.3.2 Burial sites and Graves</td><td rowspan="2">Section 36</td><td rowspan="2">Generally protected 4A: High significance</td><td>Negative medium (48)</td></tr>
<tr><td>Low (6)</td></tr>
<tr><td colspan="4">Mitigation: (1) Avoidance/Preserve: This is viewed to be the primary form of mitigation and the site should be retained in situ and a buffer zone should be created around it, either temporary (by means of danger tape) or permanently (wire fence or built wall) of 20m.</td></tr>
</table>

Technical Alternatives: Power lines

Two grid connection options were proposed to tie in with the Watershed Substation to the south. From a heritage point of view, it is recommended that the eastern, preferred grid connection is selected for development. If the corridor to the west is selected, a heritage walk-though needs to be undertaken.

Cumulative assessment

Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare. Because of the low likelihood of finding further significant heritage resources in the area of the proposed for development and the generally low density of sites in the wider landscape the overall impacts to heritage are expected to be of generally low significance before mitigation.

For the project area, the impacts to heritage sites are expected to be of medium significance. However, this can be ameliorated by implementing mitigation measures, include isolating sites, relocating sites (e.g. burials) and excavating or sampling any significant archaeological material found to occur within the project area. The chances of further such material being found, however, are considered to be negligible. After mitigation, the overall impact significance would therefore be low.

Legal requirements

The legal requirements related to heritage specifically are specified in Section 3 of this report.

- For this proposed project, the assessment has determined that sites, features or objects of cultural heritage significance occur in the project area, therefore various permits are required from SAHRA or the PHRA if these sites are to be impacted upon.
- If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

Reasoned opinion as to whether the proposed activity should be authorised:

- From a heritage point of view, it is recommended that the Proposed Project be allowed to continue on acceptance of the conditions proposed below.

Conditions for inclusion in the environmental authorisation:

- It is proposed that if the South West corridor for the power line route is selected a heritage walk-though needs to be undertaken.
- The Palaeontological Sensitivity Map (http://www.sahra.org.za/sahris/map/palaeo) indicate that the project area has a very high sensitivity of fossil remains to be found and therefore a field assessment and protocol for finds is required.
- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. The appropriate steps to take are indicated in Section 9 of the report, as well as in the **Management Plan: Burial Grounds and Graves, with reference to general heritage sites**, in the Addendum, Section 13.5.

12. REFERENCES

12.1 Data bases

Chief Surveyor General
Environmental Potential Atlas, Department of Environmental Affairs and Tourism.
Heritage Atlas Database, Pretoria
National Archives of South Africa
SAHRA Archaeology and Palaeontology Report Mapping Project (2009)
SAHRIS Database

12.2 Literature

Archean Resources (Pty) Ltd, 2018. *Scoping report for a Diamond Prospecting Right with bulk sampling application by Steyn Delwery Trust on Portion 2 of the Farm La Reys Stryd 53 IO in the Lichtenburg magisterial district, North West*. Unpublished report: Pretoria.

Breutz, P-L. 1957. *Die stamme van die distrikte Lichtenburg en Delareyville*. Etnologiese Reeks No. 37. Pretoria: Staatsdrukker.

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Van den Bergh, G. 1996. *24 Battles and Battle Fields of the North West Province*. Potchefstroom: The North West Tourism Association.

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Van Schalkwyk, J.A. 2010. *Heritage impact report for the proposed 88kV power line from Watershed Substation, Lichtenburg, to the Mmabatho Substation, North West Province*. Pretoria: Unpublished report 2010JvS055.

Van Schalkwyk, J.A. 2018. *Phase 1 Cultural Heritage Impact Assessment: Application of prospecting with bulk sampling of diamonds on Portion 2 of the Farm La Reys Stryd 53IO, Lichtenburg region, Ditsobotla Local Municipality, North West Province*. Pretoria: Unpublished report 2018JvS026.

Van Schalkwyk, J.A. & De Jong, R.C. 1995. *Reconnaissance of remaining cultural resources in the Bakerville Diamond Fields*. Unpublished report 1995KH07. Pretoria: National Cultural History Museum.

12.3 Archival sources, maps and aerial photographs

1: 50 000 Topographic maps
Google Earth
Aerial Photographs: Chief Surveyor-General
http://artefacts.co.za
http://*vmus*.adu.org.za
http://www.sahra.org.za/sahris/map/palaeo

13. ADDENDUM

1. Indemnity and terms of use of this report

The findings, results, 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 and the author reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. The author of this report will not be held liable for such oversights or for costs incurred as a result of such oversights.

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

2. Assessing the significance of heritage resources

A system for site grading was established by the NHRA and further developed by the South African Heritage Resources Agency (SAHRA 2007) and has been approved by ASAPA for use in southern Africa and was utilised during this assessment.

2.1 *Significance of the identified heritage resources*

According to the NHRA, Section 2(vi) the **significance** of a heritage sites and artefacts is determined by it aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

Matrix used for assessing the significance of each identified site/feature

1. SITE EVALUATION			
1.1 Historic value			
Is it important in the community, or pattern of history			
Does it have strong or special association with the life or work of a person, group or organisation of importance in history			
Does it have significance relating to the history of slavery			
1.2 Aesthetic value			
It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group			
1.3 Scientific value			
Does it have potential to yield information that will contribute to an understanding of natural or cultural heritage			
Is it important in demonstrating a high degree of creative or technical achievement at a particular period			
1.4 Social value			
Does it have strong or special association with a particular community or cultural group for social, cultural or spiritual reasons			
1.5 Rarity			
Does it possess uncommon, rare or endangered aspects of natural or cultural heritage			
1.6 Representivity			
Is it important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects			
Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class			
Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.			
2. Sphere of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			
Local			
Specific community			
3. Field Register Rating			
1.	National/Grade 1: High significance - No alteration whatsoever without permit from SAHRA		
2.	Provincial/Grade 2: High significance - No alteration whatsoever without permit from provincial heritage authority.		
3.	Local/Grade 3A: High significance - Mitigation as part of development process not advised.		

4.	Local/Grade 3B: High significance - Could be mitigated and (part) retained as heritage register site	
5.	Generally protected 4A: High/medium significance - Should be mitigated before destruction	
6.	Generally protected 4B: Medium significance - Should be recorded before destruction	
7.	Generally protected 4C: Low significance - Requires no further recording before destruction	

3. Method of Environmental Assessment

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in the Table below.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System
Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

Table 1: The rating system

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		

This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.

2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

4. Mitigation measures

- *Mitigation: means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.*

Impacts can be managed through one or a combination of the following mitigation measures:

- Avoidance
- Investigation (archaeological)
- Rehabilitation
- Interpretation
- Memorialisation
- Enhancement (positive impacts)

For the current study, the following mitigation measures are proposed, to be implemented only if any of the identified sites or features are to be impacted on by the proposed development activities:

- (1) Avoidance/Preserve: This is viewed to be the primary form of mitigation and applies where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources. The site should be retained *in situ* and a buffer zone should be created around it, either temporary (by means of danger tape) or permanently (wire fence or built wall). Depending on the type of site, the buffer zone can vary from
    - o 10 metres for a single grave, or a built structure, to
    - o 50 metres where the boundaries are less obvious, e.g. a Late Iron Age site.

- (2) Archaeological investigation/Relocation of graves: This option can be implemented with additional design and construction inputs. This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated. Mitigation is to excavate the site by archaeological techniques, document the site (map and photograph) and analyse the recovered material to acceptable standards. This can only be done by a suitably qualified archaeologist.
    - o This option should be implemented when it is impossible to avoid impacting on an identified site or feature.
    - o This also applies for graves older than 60 years that are to be relocated. For graves younger than 60 years a permit from SAHRA is not required. However, all other legal requirements must be adhered to.
        - ▪ Impacts can be beneficial – e.g. mitigation contribute to knowledge

- (3) Rehabilitation: When features, e.g. buildings or other structures are to be re-used. Rehabilitation is considered in heritage management terms as an intervention typically involving the adding of a new heritage layer to enable a new sustainable use.
    - o The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.
    - o Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal loss of historical fabric.
        - ▪ Conservation measures would be to record the buildings/structures as they are (at a particular point in time). The records and recordings would then become the 'artefacts' to be preserved and managed as heritage features or (movable) objects.
        - ▪ This approach automatically also leads to the enhancement of the sites or features that are re-used.

- (4) Mitigation is also possible with additional design and construction inputs. Although linked to the previous measure (rehabilitation) a secondary though 'indirect' conservation measure would be to use the existing architectural 'vocabulary' of the structure as guideline for any new designs.
    - The following principle should be considered: **heritage informs design**.
        - This approach automatically also leads to the enhancement of the sites or features that are re-used.

- (5) No further action required: This is applicable only where sites or features have been rated to be of such low significance that it does not warrant further documentation, as it is viewed to be fully documented after inclusion in this report.
    - Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation to ensure that no undetected heritage/remains are destroyed.

5. Management Plan: Burial Grounds and Graves, with reference to general heritage sites

1. Background

Burial grounds and graves are viewed as having high emotional and sentimental value and accordingly always carry a high cultural heritage significance rating. Best practice principles dictate that they should preferably be preserved *in situ*. It is only when it is unavoidable and the site cannot be retained, that the graves should be exhumed and relocated after all due processes had been successfully implemented.

For retaining the burial sites and graves, the SAHRA Burial Grounds and Graves (BGG) unit requires a detailed Heritage Management Plan (HMP) clearly outlining a grave management plan that provides details of grave management and access protocols. In addition, the HMP should also provide detailed change finds protocol or procedures in the case of the identification human remains.

The primary aim of the Burial Grounds and Graves Management Plan therefore is to assist in the implementation of mitigation measures to reduce potential negative impacts through the modification of the proposed project development design.

2. Legal Implications

South Africa's unique and non-renewable archaeological and palaeontological heritage sites, inclusive of burial grounds and graves, are 'generally' protected in terms various laws and by-laws:

- Nationally: National Heritage Resources Act, No. 25 of 1999;

In addition, the following also refer specifically to burial grounds and graves:
- Human Tissue Act, No. 65 of 1983;
- Section 46 of the National Health Act, No. 61 of 2003;
- Removal of Graves and Dead Bodies Ordinance (Ordinance No. 7 of 1925)
- By-laws:
    - R363 of 2013: Regulations Relating to the Management of Human Remains
    - Local Authorities Notice 34 of 2017, Cemeteries, Crematoria and Funeral Undertakers By-Laws as per Provincial Gazette of 7 April 2017 No. 2800.

In terms of the National Heritage Resources Act, No. 25 of 1999, graves and burial grounds are divided into the following categories:
- Ancestral graves;
- Royal graves and graves of traditional leaders;
- Graves of victims of conflict;
- Graves of individuals designated by the Minister by notice in the Gazette;
- Historical graves and cemeteries; and
- Other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);

In terms of Section 36(3) of the National Heritage Resources Act, no person may, without a permit issued by the relevant heritage resources authority:
- Destroy, damage, alter, exhume or remove from its original position of otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- Destroy, damage, alter, exhume or remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

- Bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation, or any equipment which assists in the detection or recovery of metals.

Marked graves younger than 60 years do not fall under the protection of the NHRA (Act No. 25 of 1999) with the result that exhumation, relocation and reburial can be conducted by a register undertaker. This will include logistical aspects such as social consultation, purchasing of plots in cemeteries, procurement of coffins, etc.

Marked graves older than 60 years are protected by the NHRA (Act No. 25 of 1999) an as a result an archaeologist must be in attendance to assist with the exhumation and documentation of the graves. Unmarked graves are by default regarded as older than 60 years and therefore also falls under the NHRA (Act No. 25 of 1999, Section 36).

3. Management Plan

3.1 *Definitions*

Heritage Site Management: Heritage site management is the control of the elements that make up physical and social environment of a site, its physical condition, land use, human visitors, interpretation, etc. Management may be aimed at preservation or, if necessary, at minimizing damage or destruction or at presentation of the site to the public. A site management plan is designed to retain the significance of the place. It ensures that the preservation, enhancement, presentation and maintenance of the place/site is deliberately and thoughtfully designed to protect the heritage values of the place (from: *SAHRA Site management plans: guidelines for the development of plans for the management of heritage sites or places*).

Mitigation: means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

3.2 *Heritage management plan (HMP)*

3.2.1 Phase 1: Site identification and verification

This part of the process usually take place during the Phase 1 heritage impact assessment and is discussed in Section 7 of the main body of the HIA.

Locality and identification:
- The location of the identified site (e.g. farm name, GPS coordinates) is given;
- Determination of the number of graves and the date range of the burials.

The physical condition of the site is also described in terms of:
- The condition of the burial grounds and graves, e.g. has the headstones been pushed over;
- The approximate number of graves and the date range of the graves;
- Is the site fenced off;
- Is there access to the site, in the case it is fenced off;
- Has the site recently been visited by next of kin or other individuals;
- The status of the vegetation cover on the site.

3.2.2 Phase 2: Determination of the potential impact on the identified sites

Identified impacts on the graves and burial sites are calculated and discussed in Section 8.1 of the main body of the HIA.

The second phase consists of information that should be collected in order to develop the conservation management plan. This includes:
- The needs of the client;
- External needs, i.e. the next of kin;
- Requirements for the maintenance of the cultural significance.

From the above an evaluation is made of the impact of the proposed development project on the status of each of the identified burial grounds and graves.

3.2.3 Phase 3: Mitigation measures

Proposed mitigation measures for each identified burial ground or graves are developed and is discussed in the main body of the HIA (Section 8.2).

The main aim of the mitigation measures, as far as is feasible, is to remove any physical, direct impacts on the burial grounds and graves.

- A minimum buffer of 20m must be established around known burial grounds and graves for the duration of the mining/construction phase. This is relevant where the burial site has been static for a considerable period of time and has already been fenced off;
- In cases the burial site is still in use and might expand in the future and is not fenced off, a minimum buffer of 100m should be implemented;
- In the case where blasting takes place during mining activities, the buffers should increase correspondingly to 200m;
- The buffers must be clearly demarcated, and signage placed during the construction/mining period;
- Access to the graves should be allowed to the descendants. However, they should adhere to the managing authorities' conditions regarding permissions, appointments, health, environment and safety.
- The areas with graves should be kept clean and the grass short so that visitors may enter it without any concerns.
    - However, this might create problems as in many cases not all graves are well-marked, carrying the possibility that they might inadvertently be damaged and therefore contractors/land-owners might not be will to accept this responsibility. The descendants should therefore be held responsible for the maintenance of the site.
- Sites that are located close to access/haul roads might need additional mitigation. All personnel and especially drivers of heavy haul vehicles should be informed where these sites are, and they should keep to the speed limits (usually 30km/h on mining sites);
- Any change in the development layout, future development plans, condition of the grave sites and individual graves should immediately be reported to the heritage inspector/SAHRA for guidance;
- Relevant strategies should be put in place for the managing of the burial grounds and graves after the closure of the mine or the completion of the project. It needs to be stated that the land-owner or developer always will be responsible for the preservation of the site. Therefore, measures should be put in place to ensure that the site is handled appropriately after closure, which, in essence would entail the continuation measures already put in place;

3.3 *Management strategy*

A general approach to this is set out in Section 9 of the main body of the HIA report and is equally applicable to general heritage sites and feature as well as to burial grounds and graves.

A strategy for the implementation of the conservation plan is developed:

- A heritage practitioner should be appointed to develop a heritage induction program and conduct training for the ECO, as well as team leaders, in the identification of heritage resources and artefacts;
- Known sites must be demarcated and fenced off and signage placed during the construction/mining period;
- This management strategy should be applicable to the construction, operation as well as the post operation phases of the development/mining activities.
- Relevant strategies should be put in place for the managing of the burial grounds and graves after the closure of the mine or the completion of the project. It needs to be stated that the land-owner or developer always will be responsible for the preservation of the site. Therefore, measures should be put in place to ensure that the site is handled appropriately after closure, which, in essence would entail the continuation measures already put in place;
- The managing authority should be able to regularly inspect the sites in order to ensure that construction and other such activities do not damage the graves;
    - SAHRA and the relevant PHRA are the competent authorities responsible for the regulation of the HMP in terms of the national legislative framework. The NHRA states:

        36(1) *Where it is not the responsibility of any other authority, SAHRA must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make the necessary arrangement for their conservation as they see fit.*

4. Relocation of graves

Once it has been decided to relocate particular graves, the following steps should be taken:

- Notices of the intention to relocate the graves need to be put up at the burial site for a period of 60 days. This should contain information where communities and family members can contact the developer/archaeologist/public-relations officer/undertaker. All information pertaining to the identification of the graves needs to be documented for the application of a SAHRA permit. The notices need to be in at least 3 languages, English, and two other languages. This is a requirement by law.
- Notices of the intention needs to be placed in at least two local newspapers and have the same information as the above point. This is a requirement by law.
- Local radio stations can also be used to try contact family members. This is not required by law, but is helpful in trying to contact family members.
- During this time (60 days) a suitable cemetery need to be identified close to the development area or otherwise one specified by the family of the deceased.
- An open day for family members should be arranged after the period of 60 days so that they can gather to discuss the way forward, and to sort out any problems. The developer needs to take the families requirements into account. This is a requirement by law.
- Once the 60 days has passed and all the information from the family members have been received, a permit can be requested from SAHRA. This is a requirement by law.
- Once the permit has been received, the graves may be exhumed and relocated.
- All headstones must be relocated with the graves as well as any items found in the grave.

Information needed for the SAHRA permit application:

- The permit application needs to be done by an archaeologist.
- A map of the area where the graves have been located.
- A survey report of the area prepared by an archaeologist.
- All the information on the families that have identified graves.

- If graves have not been identified and there are no headstones to indicate the grave, these are then unknown graves and should be handled as if they are older than 60 years. This information also needs to be given to SAHRA.
- A letter from the landowner giving permission to the developer to exhume and relocate the graves.
- A letter from the new cemetery confirming that the graves will be reburied there.
- Details of the farm name and number, magisterial district and GPS coordinates of the gravesite.

5. Defining next of kin

An extensive Burial Grounds and Graves Consultation process must be implemented in accordance with NHRA Regulations to identify bona fide next of kin and reach agreement regarding relocation of graves.

Anthropologically speaking three type of kin are distinguished: patrilineal (called *agnates*), maternal (*uterine* kin) and kin by marriage (*affines*). All three categories have their important part to play in social life.

In terminologies used in the west the close-knit group of family members is clearly marked off from other kin - family terms, such as 'father', 'mother', 'brother' and 'sister' are never used for aunts, uncles and cousins.

In many non-western societies this is not the case and the family is merged with the wider group of kin and the family terms are applied much more widely. Next of kin for the Southern Bantu-language speakers is based on a classificatory system where a man uses a term to refer to three significant relatives – his father, his father's brother and his mother's brother.

For example, a man (A) may call his father's brother (i.e. uncle) also a father. All of that latter person's children will then also be called his (A) brothers and sisters, prohibiting him from marrying any of them (however, *vide* preferred marriages). In Anthropology this system is referred to as the Iroquois system (with reference to the North American Indian tribe where it was first described). When a man calls his father's brother 'father' a suffix is usually added to indicate whether he is an elder or junior brother (e.g. (*ra)mogolo* = elder brother; (*ra)ngwane* = junior brother; also (*ra)kgadi* = younger sister; (*ma)lome* = mother's brother)(SePedi terminology is used).

Consultants having to relocate graves might find it confusing if they do not have insight into this complex system of kinship, where, for example a single individual can have more than one father or mother.

6. Chance find procedures

A general approach to this is set out in Section 9 of the main body of the HIA report and is equally applicable to general heritage sites and features as to burial grounds and graves.

- A heritage practitioner should be appointed to develop a heritage induction program and conduct training for the ECO, as well as team leaders, in the identification of heritage resources and artefacts;
- An appropriately qualified heritage consultant should be identified to be called upon if any possible heritage resources or artefacts are identified;
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities be halted;

- The qualified archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and impact on the heritage resource;
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered;
- Should the heritage consultant conclude that the find is a heritage resource protected in terms of the NHRA (1999) Sections 34, 35, 37 and NHRA (1999) Regulations (Regulation 38, 39, 40), he or she should notify SAHRA and/or the relevant PHRA;
- Based on the comments received from SAHRA and/or the PHRA, the heritage consultant would present the relevant terms of reference to the client for implementation;
- Construction/Operational activities can commence as soon as the site has been cleared and signed off by the archaeologist.

7. Curriculum vitae

Johan Abraham van Schalkwyk

Personal particulars

Date of birth:	14 April 1952
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Qualifications

1995 DLitt et Phil (Anthropology), University of South Africa
1985 MA (Anthropology), University of Pretoria
1981 BA (Hons), Anthropology, University of Pretoria
1979 Post Graduate Diploma in Museology, University of Pretoria
1978 BA (Hons), Archaeology, University of Pretoria
1976 BA, University of Pretoria

Non-academic qualifications

12th HSRC-School in Research Methodology - July 1990
Dept. of Education and Training Management Course - June 1992
Social Assessment Professional Development Course - 1994
Integrated Environmental Management Course, UCT - 1994

Professional experience

Private Practice
2017 - current: Professional Heritage Consultant

National Museum of Cultural History
1992 - 2017: Senior researcher: Head of Department of Research. Manage an average of seven researchers in this department and supervise them in their research projects. Did various projects relating to Anthropology and Archaeology in Limpopo Province, Mpumalanga, North West Province and Gauteng. Headed the Museum's Section for Heritage Impact Assessments.
1978 - 1991: Curator of the Anthropological Department of the Museum. Carried out extensive fieldwork in both anthropology and archaeology

Department of Archaeology, University of Pretoria
1976 - 1977: Assistant researcher responsible for excavations at various sites in Limpopo Province and Mpumalanga.

Awards and grants

1. Hanisch Book Prize for the best final year Archaeology student, University of Pretoria - 1976.
2. Special merit award, National Cultural History Museum - 1986.
3. Special merit award, National Cultural History Museum - 1991.
4. Grant by the Department of Arts, Culture, Science and Technology, to visit the various African countries to study museums, sites and cultural programmes - 1993.
5. Grant by the USA National Parks Service, to visit the United States of America to study museums, sites, tourism development, cultural programmes and impact assessment programmes - 1998.
6. Grant by the USA embassy, Pretoria, under the Bi-national Commission Exchange Support Fund, to visit cultural institutions in the USA and to attend a conference in Charleston - 2000.
7. Grant by the National Research Foundation to develop a model for community-based tourism - 2001.

8. Grant by the National Research Foundation to develop a model for community-based tourism - 2013. In association with RARI, Wits University.

Publications
Published more than 70 papers, mostly in scientifically accredited journals, but also as chapters in books.

Conference Contributions
Regularly presented papers at conferences, locally as well as internationally, on various research topics, ranging in scope from archaeology, anthropological, historical, cultural historical and tourism development.

Heritage Impact Assessments
Since 1992, I have done more than 2000 Phase 1 and Phase 2 impact assessments (archaeological, anthropological, historical and social) for various government departments and developers. Projects include environmental management frameworks, roads, pipeline-, and power line developments, dams, mining, water purification works, historical landscapes, refuse dumps and urban developments.

Latest publications
Van Schalkwyk, J.A. 2020. A cognitive approach to ordering of the world: some case studies from the Sotho- and Tswana-speaking people of South Africa. In Whitley, D.S., Loubser, J.H.N. & Whitelaw, G. (eds.) *Cognitive Archaeology. Mind, Ethnography, and the Past in South African and Beyond*. London: Routledge. Pp. 184-200.

Namono, C. & Van Schalkwyk, J.A. 2020. Appropriating colonial dress in the rock art of the Makgabeng plateau, South Africa. In Wingfield, C., Giblin, J. & King, R. (eds) *The pasts and presence of art in South Africa: Technologies, Ontologies and Agents*. University of Cambridge: McDonald Institute for Archaeological Research. Pp. 51-62.