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PHASE I ARCHAEOLOGICAL AND CULTURAL HERITAGE IMPACT ASSESSMENT SPECIALIST REPORT FOR THE PROPOSED BUSHVELD VAMETCO'S PHASE 2 SOLAR PV PARK PROJECT –WITHIN MADIBENG LOCAL MUNICIPALITY OF BOJANALA DISTRICT MUNICIPALITY, NORTH WEST PROVINCE

October, 2023

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DECLARATION

ABILITY TO CONDUCT THE PROJECT

Alvord Nhundu is a professional archaeologist. He completed his Bachelor of Science with Honours degree in archaeology with the University of the Witwatersrand (Wits) and Masters in Archaeology with the University of Pretoria (UP). His research interest lies in old and new world archaeology, palaeoenvironmental and climatology, archaeological theory, Later Stone Age, rock art, hunter-gatherers, hunter-gatherer interactions, several aspects of Southern African Iron Age and Indigenous archaeologies. Alvord is an accredited Cultural Resource Management (CRM) member of the Association of southern African Professional Archaeologists (ASAPA #338) with Director Status in Stone Age and Iron Age archaeology, and Field Supervisor Status in Rock Art. He is also affiliated to Society of South Africanist Archaeologists (SAfA) and the International Council of Archaeozoology (ICAZ). He has been practising CRM for more than 10 years, and has completed over 100 Archaeological Impact Assessments (AIA) for developmental projects in the Limpopo, Mpumalanga, North-West, Eastern Cape, Free State and KwaZulu Natal provinces of South Africa. The projects include establishment and upgrade of power substations, road construction, and establishment and expansion of mines. He has also conducted the relocation of graves. His detailed CV is available on request.

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We, Alvord Nhundu and Munyadziwa Magoma declare that this report has been prepared independently of any influence as may be specified by all relevant department, institution and organization. We act as the independent specialists in this application, and will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant. We declare that there are no circumstances that may compromise our objectivity in performing such work, we vow to comply with all relevant Act, Regulations and applicable legislation. Furthermore, Vhubvo Consultancy Cc, which is a company we represent in this application, is an independent service provider and apart from fair remuneration for services rendered, it has no financial interest or vested interest in the proposed project.

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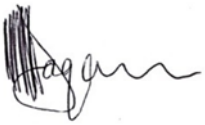

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EXECUTIVE SUMMARY

Introduction

Vhubvo Consultancy Cc was appointed by Nsovo Environmental Consulting to conduct an Archaeological Cultural Heritage Impact Assessment study for the proposed Bushveld Vametco's Phase 2 Solar PV Park Project within the jurisdiction of Madibeng Local Municipality of Bojanala District Municipality in the North-West Province. The aim of the study was to outline the archaeological sites, cultural resources, sites associated with oral histories, graves, cultural landscapes, and any structure of historical significance that may be affected by the proposed development, and to advise mitigation should any be affected and these will in turn assist the developer to make a decision on the most appropriate option in line with the National Heritage Resource Act, 1999 (Act 25 of 1999).

Methodology and Approach

The study method refers to the SAHRA Policy Guidelines for impact assessment, 2012. As part of this impact assessment, the following processes were followed:

- Literature Review: To understand the background archaeology of the area, a background study was undertaken and relevant institutions were consulted. These studies entail the view of archaeological and heritage impact assessment studies that have been conducted around the proposed area thorough SAHRIS. In addition, E-journal platforms such as J-stor, Google scholars and History Resource Centre were searched. The University of Pretoria's Library collection was also pursued;
- The field survey was conducted on **19 May 2023** by an archaeologist from Vhubvo.
- The final step involved the recording and documentation of relevant archaeological resources, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and useful recommendations.

The applicable maps, tables, and figures are included as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002).

Restrictions and Assumptions

Most portions of the proposed site are characterised by dense vegetation which made it difficult to see the ground surface clearly, however, a thorough survey was done to cover as much ground as possible. As with any survey, archaeological materials may be under the surface and therefore unidentifiable to the surveyor until they are exposed once construction resume. As a result, if any archaeological/ or gravesite is observed during construction, a heritage specialist must be notified immediately.

Survey Findings and Discussions

The main aim of the survey was to evaluate potential heritage resources that would occur within the boundaries of the proposed area (s), as well as to determine if there is any hamartia that may prevent the proposed development from taking place. The Phase I Archaeological and Cultural Heritage Impact Assessment for the proposed development did not yield any heritage resources within the footprint of the surveyed area. Although there were certain constraints and limitations that may have inhibited identification, it is highly unlikely that any surface archaeology was not identified.

Recommendations and Discussions

Although no archaeological objects were observed during the survey, the client is reminded that the archaeological objects can be discovered underground, as such should any archaeological material be unearthed accidentally during construction, SAHRA should be alerted immediately, and construction activities be stopped within a radius of at least 10m of such indicator. The area should then be demarcated by a danger tape. Accordingly, a professional archaeologist or SAHRA officer should be contacted immediately. In the meantime, it is the responsibility of the Environmental officer and the contractor to protect the site from publicity (i.e., media) until a mutual agreement is reached. It is mandatory to report any incident of human remains encountered to the South African Police Services, SAHRA staff member and professional archaeologist. Any attempts to cover up the suspected archaeological material or to collect any resources are illegal and punishable by law under Section 35(4) and 36(3) of the National Heritage Resources Act, Act 25 of 1999. The developer should induct field workers about archaeology, and steps that should be taken in the case of exposing archaeological materials.

Pre-construction education and awareness training

Prior to construction, contractors should be given training on how to identify and protect archaeological remains that may be discovered during the project. The pre-construction training should include some limited site recognition training for the types of archaeological sites that may occur in the construction areas. Below are some of the indicators of archaeological site that may be found during construction:

- ✓ Flaked stone tools, bone tools and loose pieces of flaked stone;
- ✓ Ash and charcoal;
- ✓ Bones and shell fragments;
- ✓ Artefacts (e.g., beads or hearths);
- ✓ Packed stones which might be uncounted underground, and might indicate a grave or collapse stone walling.

Conclusions

A thorough background study and survey of the proposed development was conducted, and findings were recorded in line with SAHRA guidelines. It is recommended that the developer proceed with planning of the project subject to the recommendations given above.

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ACRONYMS AND ABBREVIATIONS

AIA	Archaeological Impact Assessment
EMP	Environmental Management Plan
HIA	Heritage Impact Assessment
LIA	Late Iron Age
MIA	Middle Iron Age
EIA	Early Iron Age
HMP	Heritage Management Plan
LSA	Late Stone Age
MSA	Middle Stone Age
ESA	Early Stone Age
NASA	National Archives of South Africa
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency

GLOSSARY OF TERMS

The following terms used in this Archaeology are defined in the National Heritage Resources Act [NHRA], Act Nr. 25 of 1999, South African Heritage Resources Agency [SAHRA] Policies as well as the Australia ICOMOS Charter *(Burra Charter)*:

Archaeological Material: remains resulting from human activities, which are in a state of disuse and are in, or on, land and which are older than 100 years, including artifacts, human and hominid remains, and artificial features and structures.

Artefact: Any movable object that has been used modified or manufactured by humans.

Conservation: All the processes of looking after a site/heritage place or landscape including maintenance, preservation, restoration, reconstruction, and adaptation.

Cultural Heritage Resources: refers to physical cultural properties such as archaeological sites, paleontological sites, historic and prehistorical places, buildings, structures, and material remains, cultural sites such as places of rituals, burial sites or graves and their associated materials, geological or natural features of cultural importance or scientific significance. This includes intangible resources such religion practices, ritual ceremonies, oral histories, memories indigenous knowledge.

Cultural landscape: "the combined works of nature and man" and demonstrate "the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both internal and external".

Cultural Resources Management (CRM): the conservation of cultural heritage resources, management, and sustainable utilization and present for present and for the future generations

Cultural Significance: is the aesthetic, historical, scientific, -and social value for past, present, and future generations.

Chance Finds: means Archaeological artefacts, features, structures, or historical cultural remains such as human burials that are found accidentally in context previously not identified during

cultural heritage scoping, screening, and assessment studies. Such finds are usually found during earth moving activities such as water pipeline trench excavations.

Compatible use: means a use, which respects the cultural significance of a place. Such a use involves no, or minimal, impact on cultural significance.

Conservation means all the processes of looking after a place so as to retain its cultural significance.

Expansion: means the modification, extension, alteration or upgrading of a facility, structure or infrastructure at which an activity takes place in such a manner that the capacity of the facility or the footprint of the activity is increased.

Grave: A place of interment (variably referred to as burial), including the contents, headstone or other marker of such a place, and any other structure on or associated with such place.

Heritage impact assessment (HIA): Refers to the process of identifying, predicting and assessing the potential positive and negative cultural, social, economic and biophysical impacts of any proposed project, plan, programme or policy which requires authorisation of permission by law and which may significantly affect the cultural and natural heritage resources. The HIA includes recommendations for appropriate mitigation measures for minimising or avoiding negative impacts, measures enhancing the positive aspects of the proposal and heritage management and monitoring measures.

Historic Material: remains resulting from human activities, which are younger than 100 years, but no longer in use, including artifacts, human remains and artificial features and structures.

Impact: the positive or negative effects on human well-being and / or on the environment.

***In situ* material:** means material culture and surrounding deposits in their original location and context, for instance archaeological remains that have not been disturbed.

Interested and affected parties Individuals: communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by the proposal or activity and/ or who are concerned with a proposal or activity and its consequences.

Interpretation: means all the ways of presenting the cultural significance of a place.

Late Iron Age: this period is associated with the development of complex societies and state systems in southern Africa.

Material culture means buildings, structure, features, tools and other artefacts that constitute the remains from past societies.

Mitigate: The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.

Place: means site, area, land, landscape, building or other work, group of buildings or other works, and may include components, contents, spaces and views.

Protected area: means those protected areas contemplated in section 9 of the NEMPAA and the core area of a biosphere reserve and shall include their buffers.

Public participation process: A process of involving the public in order to identify issues and concerns, and obtain feedback on options and impacts associated with a proposed project, programme or development. Public Participation Process in terms of NEMA refers to: a process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to specific matters.

Setting: means the area around a place, which may include the visual catchment.

Significance: can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e., intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e., level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgments and science-based criteria (i.e., biophysical, physical cultural, social and economic).

Site: a spatial cluster of artefacts, structures, and organic and environmental remains, as residues of past human activity.

1. Introduction

This Archaeological Impact Assessment (AIA) has been prepared by Vhubvo Consultancy cc for Nsovo Environmental Consulting. The study aims to conduct an Archaeological Impact Assessment for the proposed Bushveld Vametco's Phase 2 Solar PV Park Project within the jurisdiction of Madibeng Local Municipality in the North-West Province. The study aims to outline the archaeological sites, cultural resources, sites associated with oral histories, graves, cultural landscapes, and any structure of historical significance that may be affected by the proposed construction, and to advise mitigation should any be affected and these will in turn assist the developer to make a decision on the most appropriate option in line with the National Heritage Resource Act, 1999 (Act 25 of 1999).

The Vametco Phase 2 Renewable Energy Facility builds upon the foundational concepts established in Phase 1 of the project, which encompasses a 3.5 MW solar photovoltaic (PV) plant and a 1 MW / 4 MWh Vanadium Redox Flow Battery (VRFB). Phase 2 of the project is dedicated to the development of a solar PV plant with a potential capacity of up to 400 MWp and a battery energy storage system (BESS) facility with a capacity of up to 200 MW / 800 MWh. To accommodate this expansion, a 400-hectare land parcel located to the north of the Vametco mine was carefully selected. The choice of this location was primarily influenced by the availability of land, in consideration of future mining expansion plans, and the advantageous fact that the land is situated within the mining rights leased area.

2. Sites Location and Description

The proposed development is situated at Rankotea village, 16, 4 km north-west of Brits. In terms of geology, the study area is situated within the Bushveld Complex, more specifically within the Rustenburg Layered Suite with intrusive rocks comprising of Bierkraal Magnetite Gabbro and the Pyramid Gabbro-norite that dominate the study area and its surroundings. The Gabbros weather to form well-structured soils such as the vertics found on site. The vegetation is dominated by thick grass with scattered trees, although some portions of the sites have thorny bushes. There is a stream running through the site.

Below is a brief description of the proposed area:

Summary of Project Location Details

Province:	North-West
Local:	Madibeng
District:	Bojanala Platinum
GPS Coordinates	**S**25° 33' 32" **E**27° 54' 03"

Figure 1: Locality map of the study area.

Figure 2: Google Earth view of the area proposed for the development.

Figure 3: A general view of the site proposed for the development.

Figure 4: View of the western section of the area proposed for the development.

Figure 5: View of the northern section of the site encroached by vegetation.

Figure 6: View of portion of the site with Vametco's mine on the southern section of the site.

Figure 7: A section of the site showing the access road to the site.

Figure 8: View of the northern section of the site proposed for the development.

Figure 9: View of the powerlines noted on the margins of the site.

3. Nature and need of the Proposed Project

The project's primary objectives are to:

- Reduce the Bushveld Vametco Alloys mine's dependence on traditional energy sources, thereby ensuring a sustainable and cost-effective energy supply; and
- Facilitate the distribution of excess power to third-party off-takers through the Eskom network.

The Vametco Hybrid Mini Grid project will comprises the following key components:

- Solar PV Array: Up to 400 MWp capacity;
- BESS: Up to 200 MW / 800 MWh capacity;
- Associated activities: Earthworks, Civils, Substations, Transmission Lines etc; and
- The project aims to power a significant portion of Bushveld Vametco's load, reducing dependence on Eskom. Wheel power to third party off takers through the Eskom network.

The following are what will constitute the renewable energy facility:

a) **Solar Panels (Photovoltaic Modules):** These are the heart of the solar PV system. Solar panels are made up of multiple solar cells that contain semiconductor materials, typically

silicon. When sunlight strikes these cells, it excites electrons, generating a flow of electricity known as direct current (DC).

b) **Inverters:** Solar panels produce DC electricity, but most appliances and the grid use alternating current (AC). Inverters are used to convert DC power into AC power, making it compatible with the electrical grid and usable by appliances.

c) **Mounting Structures:** Solar panels need to be securely positioned to capture sunlight optimally. There are two primary types of mounting structures used in solar PV installations:

- **Fixed Tilt (Fixed-Angle Mounting):** In fixed tilt systems, solar panels are mounted at a fixed angle to the ground or rooftop. This angle is usually set to maximize energy production based on the average sun position throughout the year. While cost-effective and low-maintenance, fixed tilt systems do not adjust to follow the sun's path, which means they are most efficient during specific times of the day.
- **Tracking Systems:** Tracking systems, also known as solar trackers, are designed to move solar panels to follow the sun as it moves across the sky. This dynamic adjustment optimizes the angle at which sunlight strikes the panels, resulting in higher energy production throughout the day. Although tracking systems are more expensive and require regular maintenance, they can significantly increase the overall energy output of a solar PV system.

The choice between fixed tilt and tracking systems depends on factors such as project budget, available space, and the desired energy output. In the case of the Vametco Hybrid Mini Grid project, the specific solar PV design will be decided during detailed design phase.

Substation Design and Functionality:

a) **Voltage Compatibility:** The substation is designed to step up the voltage of the electricity generated by the solar PV and VRFB system to a level suitable for transmission through the high-voltage grid. In this case, the voltage level is planned to be up to 132 kV, matching Eskom local transmission line voltage.

b) **Transformers:** Transformers play a central role in the substation by converting the voltage from the medium voltage level generated by the solar PV and VRFB system to the high-voltage level required for grid connection. The substation will incorporate transformers with appropriate ratings to ensure safe and efficient voltage transformation.

c) **Switchgear and Circuit Breakers:** The substation is equipped with switchgear and circuit breakers that allow for the control, protection, and isolation of electrical circuits. These

components ensure that the system can be safely connected to and disconnected from the grid when necessary.

d) **Metering and Monitoring Equipment:** To monitor the flow of electricity, ensure grid stability, and facilitate accurate billing, the substation will include metering equipment to measure the amount of energy exported to the grid and other relevant electrical parameters.

The substation and high-voltage connection are fundamental elements of the Vametco Hybrid Mini Grid project, enabling the efficient integration of renewable energy into the local electrical grid at up to 132 kV. The robust design and adherence to industry standards reflect our commitment to safe, reliable, and sustainable electricity generation and distribution.

Key Aspects of Civil Works:

a) **Foundation Construction:** To support heavy equipment and ensure structural stability, reinforced concrete foundations are constructed. These foundations are tailored to the specific needs of various project components, including batteries, transformers, and electrical equipment. The design adheres to engineering standards and factors in load-bearing capacity and soil conditions at the site.

b) **Access Roads and Paths:** A network of access roads, pathways, and driveways is built to facilitate the transportation of equipment, materials, and personnel to and from various project locations, including battery sites and the substation. These pathways ensure efficient project operations during construction, maintenance, and emergencies.

c) **Plinths for Batteries:** Plinths are constructed to support the installation of the BESS units. These plinths are engineered to accommodate the weight and configuration of the batteries, ensuring a stable and secure platform for their operation.

d) **Spares and Security Rooms:** Infrastructure such as security rooms and storage facilities for spare parts and maintenance equipment are constructed. These rooms serve as critical components for operational efficiency, equipment maintenance, and overall project security.

e) **Drainage Systems:** Proper drainage is vital to prevent water accumulation around project components, safeguarding equipment from potential damage and operational disruptions. Stormwater drainage systems, including culverts and ditches, are designed and implemented to manage rainwater effectively.

f) **Security Measures:** Security measures, including fencing, access control systems, surveillance cameras, and intrusion detection systems, are implemented to protect critical project infrastructure, deter unauthorized access, and mitigate potential security risks.

g) **Environmental Considerations:** Environmental preservation and mitigation measures are an integral part of civil works. Erosion control measures, soil stabilization, and landscaping are employed to minimize the environmental impact of construction activities and promote sustainability.

h) **Compliance with Regulatory Standards:** All civil works adhere rigorously to relevant regulatory and safety standards, ensuring the safety of project personnel, the surrounding community, and the environment.

Key Aspects of the BESS:

Height and Electrolyte Quantity Considerations:

a) **Height Considerations:** Notably, the BESS, especially when employing VRFB technology, can stand as tall as 10 meters.

b) **Electrolyte Quantity:** It is important to underscore that the BESS involves the use of substantial quantities of electrolyte (hazardous substance), exceeding 500 cubic meters.

c) Layout:

a. **Containerized BESS:** The BESS may be configured within purpose-built containers, offering modularity and ease of deployment. Containerized solutions provide flexibility in scaling the energy storage capacity as per project requirements.

b. **Bespoke BESS:** Tailored BESS configurations may be designed to suit the specific needs of the project, allowing for optimization of space, capacity, and performance based on site constraints and operational demands.

c. **DC-Coupled BESS:** Alternatively, the BESS can be integrated in a DC-coupled configuration, positioned at the end of strings within the solar PV array. This approach minimizes energy losses and optimizes energy capture by interfacing directly with the PV system.

4. Purpose of the Cultural Heritage Study

The purpose of this Archaeological and Cultural Heritage Impact Assessment study was to identify and document archaeological sites, cultural resources, sites associated with oral histories, graves, cultural landscapes, and any structure of historical significance that may be affected by the proposed development. Therefore, this study involves the following:

- Identification and recording of heritage resources that may be affected by the proposed construction;

- Providing recommendations on how best to appropriately safeguard identified heritage sites. Mitigation is an important aspect of any development on areas where heritage sites have been identified.

5. Methodology and Approach

Background study introduction

The methodological approach is informed by the 2012 SAHRA Policy Guidelines for impact assessment. As part of this study, the following tasks were conducted: 1) literature review, 2), consultations with the developer and appointed consultants, 3), completion of a field survey and 4), analysis of the acquired data, leading to the production of this report.

Physical survey

The survey was conducted successfully by an archaeologist from Vhubvo on the **19th** of **May 2023.** The survey therefore constitutes walking on the entire study area.

Documentation

The general project area was documented. This documentation included taking photographs using cameras a 10.1 mega-pixel Sony Cybershort Digital Camera. Plotting of finds was done by a Garmin etrex Venture HC.

Restrictions and Assumptions

Most portions of the site are covered in grass, and hence difficult to see the surface clearly, however, a thorough study was done to cover as much ground as possible. As with any survey, archaeological materials may be under the surface and therefore unidentifiable to the surveyor until they are exposed once construction resume. As a result, if any archaeological/ or gravesite is observed during construction, a heritage specialist must be notified.

6. Applicable Heritage Legislation

Several legislations provide the legal basis for the protection and preservation of both cultural and natural resources. These include the National Environment Management Act (No. 107 of 1998); Mineral Amendment Act (No 103 of 1993); Tourism Act (No. 72 of 1993); Cultural Institution Act (No. 119 of 1998), and the National Heritage Resources Act (Act 25 of 1999). Section 38 (1) of the National Heritage Resources Act requires that where relevant, an Impact Assessment is undertaken in case where a listed activity is triggered. Such activities include:

(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 50 m in length; and

(c) any development or other activity which will change the character of an area of land, or water -

(i) exceeding 5 000 m² in extent;

(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 the 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.

Section 3 of the National Heritage Resources Act (25 of 1999) lists a wide range of national resources protected under the act as they are deemed to be national estate. When conducting Heritage Impact Assessment (HIA) the following heritage resources must be identified:

(a) Places, buildings, structures and equipment of cultural significance

(b) Places to which oral traditions are attached or which are associated with living heritage

(c) Historical settlements and townscapes

(d) Landscapes and natural features of cultural significance

(e) Geological sites of scientific or cultural importance

(f) Archaeological and paleontological sites

(g) Graves and burial grounds including-

(i) ancestral graves

(ii) royal graves and graves of traditional leaders

(iii) graves of victims of conflict

(iv) graves of individuals designated by the Minister by notice in the Gazette

(v) historical graves and cemeteries; and

(vi) other human remains which are not covered by in terms of the Human Tissue Act,1983 (Act No. 65 of 1983)

(h) Sites of significance relating to the history of slavery in South Africa

(i) moveable objects, including -

(i) objects recovered from the soil or waters of South Africa, including archaeological and paleontological objects and material, meteorites and rare geological specimens

(ii) objects to which oral traditions are attached or which are associated with living heritage

(iii) ethnographic art and objects

(iv) military objects

(v) objects of decorative or fine art

(vi) objects of scientific or technological interest; and

(vii) 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 of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

Other sections of the Act with a direct relevance to the AIA are the following:

Section 34(1) *No person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.*

Section 35(4) *No person may, without a permit issued by the responsible heritage resources authority:*

- *destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site or any meteorite*

Section 36 (3) *No person may, without a permit issued by SAHRA or a provincial heritage resources authority:*

- *destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside formal cemetery administered by a local authority; or*
- *bring onto or use at a burial ground or grave any excavation equipment, or any equipment which assists in detection or recovery of metals.*

7. Degree of Significance

This category requires a broad, but detailed knowledge of the various disciplines that might be involved. Large sites, for example, may not be very important, but a small site, on the other hand, may have great significance, as it is unique for the region. The following table is used to grade heritage resources.

Table 1: Grading system for heritage resources identified on sites in terms of the NHRA (Act 25 of 1999).

Level	Significance	Possible action
National (Grade I)	Site of National Value	Nominated to be declared by SAHRA
Provincial (Grade II)	Site of Provincial Value	Nominated to be declared by PHRA
Local Grade (IIIA)	Site of High Value Locally	Retained as heritage
Local Grade (IIIB)	Site of High Value Locally	Mitigated and part retained as heritage
General Protected Area A	Site of High to Medium	Mitigation necessary before destruction
General Protected Area B	Medium Value	Recording before destruction
General Protected Area C	Low Value	No action required before destruction

Significance rating of sites

(i) High (ii) Medium (iii) Low

These categories relate to the actual artifact or site in terms of its actual value as it is found today and refer more specifically to the condition that the item is in. For example, an archaeological site may be the only one of its kind in the region. It will thus be considered to be of high regional significance, however, should there be heavy erosion of the more significant part of the site, its significance rating would be medium to low. The following are guidelines for the nature of the mitigation that must take place in Phase 2 of the project.

High

This is a 'do not touch' situation; alternative must be sought for the project; examples would be natural and cultural landscapes like the Mapungubwe Cultural Landscape World Heritage Site, or the house in which John Langalibalele resided.

Specific sites, or features may be significant but do not warrant leaving entirely alone. In such cases, detailed mapping of the site and all its features is imperative, as is the collection of diagnostic artefactual material on the surface of the site. Extensive excavations must be done to retrieve as much information as possible before destruction. Such excavations might cover more than half the site and would be mandatory; it would also be advisable to negotiate with the client to see what mutual agreement in writing could be reached, whereby part of the site is left for future research.

Medium

Sites of medium significance require detailed mapping of all the features and the collection of diagnostic artefactual material from the surface of the site. Test trenches and test pits should be excavated to retrieve essential information before destruction.

Low

These sites require minimum or no mitigation. The minimum mitigation recommended could be a collection of all surface materials and/ or detailed site mapping and documentation. No excavations would be necessary.

In all the above scenarios, permits will be required from the South African Heritage Resources Agency (ECHRA) or the appropriate PHRA per the legislation (the National Heritage Resources Act, no. 25 of 1999). Destruction of any heritage site may only occur when the appropriate heritage authority has issued a permit. The following table is used to determine the rating system on the receiving environment.

Table 2: Impact rating system for heritage resources.

THE STATUS OF THE IMPACT		
Status		**Description**
Positive:		a benefit to the holistic environment
Negative:		a cost to the holistic environment
Neutral:		no cost or benefit
The Duration of the Impact		
Score	Duration	Description
1	Short term	Immediate/ short term (less than 3 months)
2	Medium term	Construction or decommissioning period
3	Long term	For the life of the operation
5	Permanent	Permanent
The Extent of the Impact		
Score	Extent	Description
1	Footprint	Within the site boundary
2	Site	Affects immediate surrounding areas
3	Local	Local area / district (neighbouring properties, transport routes and adjacent towns) is affected
4	Regional	Extends to almost entire province or larger region
5	National	Affects the country.
The Reversibility of the Impact		
Score	Reversibility	Description
1	Completely reversible	Reverses with minimal rehabilitation & negligible residual affects
3	Reversible	Requires mitigation and rehabilitation to ensure reversibility
5	Irreversible	Cannot be rehabilitated completely/rehabilitation not viable
The Magnitude (severe or beneficial) of the Impact		
Score	Severe/beneficial effect	Description

1	Zero	Natural and/or social functions and/or processes remain unaltered.
2	Very Low	Natural and/or social functions and/or processes are negligibly altered.
3	Low	Natural and/or social functions and/or processes are slightly altered and are reversible with time.
4	Moderate	Natural and/or social functions and/or processes are notably altered and are reversible with rehabilitation.
5	High	Natural and/or social functions and/or processes are permanently altered.
The Probability of the Impact		
Score	Rating	Description
1	Unlikely	The chance of this impact occurring is zero (0%).
2	Possible	May occur. The chances of this impact occurring is defined as 25%.
3	Probable	Likely to occur. The chances of this impact occurring is defined as 50%.
4	Highly Probable	The chances of this impact occurring is defined as 75%.
5	Definite	Will certainly occur. The chance of this impact occurring is defined as 100%.
The Consequence		= Magnitude (5) + Extent (1) + Duration (3) + Reversibility (5).
The Significance		= Consequence x Probability. 13×3=39

8. Discussion of (Pre-) History of the Area

Stone Age

The larger region of the North West Province has been inhabited by humans since Early Stone Age (ESA) times. Most of the tools dating to this period are mostly, found in the vicinity of channels. The original dating and evolutionary scheme for the development of tools during this early period is based on a study of the river terrace gravels. The oldest of these tools are known as choppers, roughly produced from large pebbles found in the river. Later, *Homo erectus* and early *Homo sapiens* people made tools shaped on both sides, called bifaces. Biface technology is known as the Acheulean tradition, from St Acheul in France, where bifaces were first identified in the mid-19th century. The Middle Stone Age (MSA) times spanning to some (C. 150 000 – 30 000 BP) saw people became more mobile, occupying areas formerly avoided. The MSA is a period that still remains somewhat murky, as much of the MSA lies beyond the limits of conventional radiocarbon dating. The MSA is followed by the LSA which is the period when stone tools became smaller and more effective. The LSA is also associated with rock art in form of paintings and engravings.

There are no Early Stone Age sites that have been found in the study area or its immediate surroundings thus far. However, as for the Middle Stone Age, Huffman (1991) identified some MSA lithics in the general surroundings of the study area. The Later Stone Age is more prominent in the surroundings of the study area. The Magaliesburg Mountains have yielded large collections of LSA sites. The caves and rock shelters exhibit occupational deposits left behind by generations of LSA foragers. The deposits are well preserved consisting of organic materials and rock art along the walls. The study region also boasts of the Jubilee Shelter (Lombard *et al.* 2012) which had yielded microliths, thumbnails, spoke shaves, adzes, some backed tools, some backed tools, rims of ground stone bows and rock art. In addition to the known LSA sites in the region, Van der Walt (2009) identified some LSA lithics in the general surroundings of the study area during an archaeological survey.

Iron Age

The Iron Age of the North West Province is rich in LIA cultural materials which include the sites of Olifantspoort and Madikwe of the Urewe tradition dating to AD 1500-1700 (Huffman 2007). Other LIA sites in the study region date to AD 1650-1840, and these include Uikmost, Rooiberg and Buispoort faces of the Urewe stream (Huffman 2007). The study region has also a rich ancient metallurgy; it is endowed with ancient copper mines that date back to the pre-colonial period in the Dwarsberg. The presence of copper ore, slag and tuyeres is a clear testimony to prehistoric copper production (Huffman 2007). The LIA Tswana communities indirectly engaged with the Indian Ocean Trade exporting ivory and getting consumables such as cloth and glass beads in exchange. The trading point was Delagoa. This brought the Tswana people in touch with the Indo-Asian and first Europeans that is Portuguese. It was the arrival of the Dutch and the English traders that opened up the Delagoa Bay to more trading with an international flare marking the beginning of historical period in the region (Huffman 2007). Despite the fact that the region has a rich Iron Age cultural tradition, no Iron Age cultural material were noted during the study, however, Wan der Walt (2009) found some undecorated potsherds and Schalkwyk (2017) found a stone wall also in the wider surroundings.

Historical Archaeology

The Historical period is about the spread, infiltration and domineering of European influence in southern Africa. The time also witnessed the spread of Christianity by missionaries, adventures by explorers and compilation of maps by military personnel and hunters. The study area has a rich historical archaeology.

The first arrivals were mostly travelers, explorers, traders, missionaries, hunters and fortune seekers. With time, there was a mass flooding of white immigrants during the 1830s when a mass migration of approximately 2 540 Afrikaner families comprising of 12 000 individuals from the Cape Colony frontier arrived in the region (Ross 2002; Visagie 2011). As the historical period carried on, the study area and its general surroundings underwent significant changes and developments during the 20th Century including extensive developments in the form of granite, iron mining, railway and transportation development as well as the establishment of nearby towns such as Brits. Brits is situated on the Crocodile River, some 50km north west of Pretoria. The town was founded on 25 May 1924 on the farm Rode Kopjes, and was named after the farm owner Gert Brits. The town got its municipal status in 1944 (Raper 1987). With time the development continues to spread to villages like Renkotea. It is a village located just outside the town of Brits. The village has a vanadium extracting mine called Bushveld Vametco (https//dpedia.org). There is no historical cultural material that were found during the survey, however, Schalkwyk (2017) found some historical structures in the wider study area. Mabuda (2020) also found some dilapidated historical structures during his study of the expansion of Bushveld Vametco mine.

9. Survey Findings

The main aim of the survey was to evaluate potential heritage resources that would occur within the boundaries of the proposed area (s), as well as to determine if there is any hamartia that may prevent the proposed development. The Phase I Archaeological and Cultural Heritage Impact Assessment for the proposed development did not yield any heritage resources within the footprint of the surveyed area. In addition, the area was generally found to be disturbed by activity related to past farming. It is thus highly unlikely that any surface archaeological site could have been not identified.

9.1 Impact Assessment

Below is a description of the Phase 2 Solar PV Park Project and related impact ratings. These ratings are for archaeological and cultural heritage sites known to exist in the proposed area and include Stone and Iron Age, as well as Historical era materials. Note that these impacts are assessed as per Table 2:

Table 3: Anticipated impact rating

Issue	Corrective Measures	Impact Rating Criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Heritage and Archaeology	No	Negative	1	2	4	2	Low
	Yes	Negative	1	2	4	2	Low
Corrective Actions	• Should any archaeological material be discovered accidentally during the construction phase, SAHRA should be alerted immediately, and construction activities be stopped within a radius of at least 10m of such indicator. • Prior to construction, contractors should be given training on how to identify and protect archaeological remains that may be discovered during construction;						

10. Recommendations

Despite that no archaeological objects were observed during the survey, the client is reminded that should any archaeological material be discovered accidentally during the construction phase, SAHRA should be alerted immediately, and construction activities be stopped within a radius of at least 10m of such indicator. The area should then be demarcated by a danger tape. Accordingly, a professional archaeologist or SAHRA officer should be contacted immediately. In the meantime, it is the responsibility of the Environmental officer and the contractor to protect the site from publicity (i.e., media) until a mutual agreement is reached. It is mandatory to report any incident of human remains encountered to the South African Police Services, SAHRA staff member and professional archaeologist. Any attempts to cover up the suspected archaeological material or to collect any resources are illegal and punishable by law under Section 35(4) and 36(3) of the National Heritage Resources Act, Act 25 of 1999. The developer should induct field workers about archaeology, and steps that should be taken in the case of exposing archaeological materials.

Pre-construction education and awareness training

Prior to construction, contractors should be given training on how to identify and protect archaeological remains that may be discovered during construction. The pre-construction training should include some limited site recognition training for the types of archaeological sites that may occur in the construction areas. Below are some of the indicators of archaeological site that may be found during construction:

- Flaked stone tools, bone tools and loose pieces of flaked stone;
- Ash and charcoal;

- Bones and shell fragments;
- Artefacts (e.g., beads or hearths);
- Packed stones which might be uncounted underground, and might indicate a grave or collapse stone walling.

11. Conclusions

A thorough background study and survey of the proposed development was conducted, and findings were recorded in line with SAHRA guidelines. It is recommended that the developer proceed with planning of the project subject to the recommendations given above.

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APPENDIX 1: SITE SIGNIFICANCE

The following guidelines for determining site *significance*were developed by SAHRA in 2003. 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.

(a) 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 organization of importance in history?
- Does it have significance relating to the history of slavery?

(b) Aesthetic value

- Is it important in exhibiting particular aesthetic characteristics valued by a community or cultural group?

(c) 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?

(d) Social value

- Does it have strong or special association with a particular community or cultural group for social, cultural or spiritual reasons?

(e) Rarity

- Does it possess uncommon, rare or endangered aspects of natural or cultural heritage?

(f) Presentively

- Is it important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects?
- What is the 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?
- Is it important 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?