Phase 1 Cultural Heritage Impact Assessment:

THE PROPOSED NEO I 20MW PHOTOVOLTAIC POWER GENERATION DEVELOPMENT PROJECT, MAFETENG DISTRICT, LESOTHO

Prepared for:

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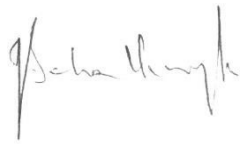
Specialist competency:

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 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.



J A van Schalkwyk
Heritage Consultant
September 2018

EXECUTIVE SUMMARY

Phase 1 Cultural Heritage Impact Assessment:
THE PROPOSED NEO I 20MW PHOTOVOLTAIC POWER GENERATION DEVELOPMENT PROJECT, MAFETENG DISTRICT, LESOTHO

OnePower Consortium propose the construction of the NEO I 20MW Photvoltaic Power Generation plant near Mafeteng in Lesotho.

Lesotho's heritage resources comprise a wide range of sites, features, objects and beliefs. However, according to Section 27 to 30 of the National Heritage Act 2006, 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 the National Heritage Act 2006, an independent heritage consultant was appointed by *Royal HaskoningDHV* to conduct a cultural heritage assessment to determine if the proposed construction of the photo voltaic plant would have an impact on any sites, features or objects of cultural heritage significance.

A vast amount of data is available on the Stone Age archaeology of Lesotho, but less so on the Iron Age. Ironically, due to the border disputes between the SeSotho-speaking occupants and the white settlers that entered the region from the early 1800s onwards, we have more information on the recent history of the region. Fortunately, early missionaries produced a large volume of information which helped to balance out the one-sidedness of the early settler reports.

Identified sites

During the physical survey, a number of sites of heritage significance were identified. It was determined that only one would be impacted on as a result of the proposed development of the power line.

- Material dating to all phases of the Stone Age were identified to occur in a number of places.
  - All of the sites are open surface scatters, which usually are viewed to have low significance. However, one identified site, No. 7.1.4, is viewed to have high significance due to its complexity (inclusive of ESA, MSA and LSA material) as well as the density of the material on the site.

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:

Site No.	Site category	Field rating	Impact rating: Before/After	Proposed mitigation (Refer to definitions in Section 4 of the Addendum)
7.1.4	Stone Age site	Grade 3	Medium-High impact 12 Low 4	(2) Archaeological investigation: It is recommended that an area with a diameter of 100m, calculated from the highest point on the hill (see coordinate in Section 5 of Addendum), is set out as a buffer zone and that this area is fenced off with danger tape during construction activities. If that is not possible and development takes place in this area, a systematic collection should be done by an archaeologist to recover as many of the stone tools as possible.

Legal requirements

The legal requirements related to heritage specifically are specified in Section 3 and **Section 2** of **Addendum** of this report. For this proposed project, the assessment has determined that sites, features or objects of heritage significance occur in the study area.

- For the removal of Stone Age artefacts, a valid permit would be required from the Heritage Commission.

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

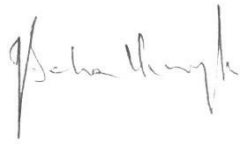
- From a heritage point of view, it is recommended that the proposed development be allowed to continue on acceptance of the proposed mitigation measures.

- If the proposed mitigation measures are successfully implemented, no further walk through of the site will be required prior to construction.

Conditions for inclusion in the environmental authorisation:

- If heritage features are identified during construction activities, 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.

- The mitigation measures as indicated for the various identified heritage sites and features should be implemented.



J A van Schalkwyk
Heritage Consultant
September 2018

TECHNICAL SUMMARY

Project description	
Description	Development of a 20 MW PV Generation Facility
Project name	NEO I 20 MW PV Generation Project

Applicant
OnePower Consortium

Environmental assessors
Ms S Gumbi
Royal HaskoningDHV

Property details						
District	Mafeteng					
Local community	Tšana-Talana					
Topo-cadastral map	2927CD					
Closest town	Mafeteng					
Coordinates	Centre point (approximate)					
	No	Latitude	Longitude	No	Latitude	Longitude
	1	S 29,79789	E 27,33821			

Land use	
Previous land use	Farming (planting & grazing)
Current land use	Farming (planting & grazing)

TABLE OF CONTENTS

LIST OF FIGURES

GLOSSARY OF TERMS AND ABBREVIATIONS

TERMS

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

Cumulative impacts: "Cumulative Impact", 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.

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.

Early Stone Age	2 500 000 - 150 000 Before Present
Middle Stone Age	150 000 - 30 000 BP
Later Stone Age	30 000 - until c. AD 200

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

ACRONYMS and ABBREVIATIONS

ASAPA	Association of Southern African Professional Archaeologists
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)
DDCC	District Development Coordinating Committee
ESA	Early Stone Age

EIA	Early Iron Age
HIA	Heritage Impact Assessment
I & AP's	Interested and Affected Parties
LIA	Late Iron Age
LSA	Later Stone Age
MIA	Middle Iron Age
MSA	Middle Stone Age
NHA	National Heritage Act

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1. INTRODUCTION

1.1 Background

Royal HaskoningDHV was contracted by OnePower Consortium as independent environmental consultant to undertake the Environmental Authorisation for the proposed construction of the NEO I 20MW Photvoltaic Power Generation development near Mafeteng in Lesotho.

Lesotho's heritage resources comprise a wide range of sites, features, objects and beliefs. However, according to Section 27 to 30 of the National Heritage Act 2006, 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 the National Heritage Act 2006, an independent heritage consultant was appointed by *Royal HaskoningDHV* to conduct a cultural heritage assessment to determine if the proposed construction of the photo voltaic plant would have an impact on any sites, features or objects of cultural heritage significance.

This report forms part of the Environmental Impact Assessment (EIA) as required by the Environment Act 2008.

1.2 Terms and references

The aim of a full 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 heritage impact assessment report indicating the presence/ absence of heritage resources and how to manage them in the context of the proposed development.

Depending on the Heritage Commission's acceptance of this report, the developer will 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 if any sites, features or objects of cultural heritage significance occur within the boundaries of the area where the construction of the proposed PV site and associated infrastructure is to take place. This included:

- Conducting a desk-top investigation of the area;
- A visit to the proposed development site.

The objectives were to:

- Identify possible archaeological, cultural and historic sites within the proposed development areas;

- 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.

1.2.2 Assumptions and Limitations

The investigation has been influenced by the following factors:

- It is assumed that the description of the proposed project, provided by the client, is accurate.
- The unpredictability of buried archaeological remains.
- No subsurface investigation (i.e. excavations or sampling) were undertaken.
- It is assumed that the public consultation process undertaken as part of the Environmental Impact Assessment (EIA) is sufficient and that is does not have to be repeated as part of the heritage impact assessment.
- This report does not consider the palaeontological potential of the site.

2. LEGISLATIVE FRAMEWORK

2.1 Background

Heritage Impact Assessments are governed by national legislation and standards and International Best Practise. These include:

- Lesotho Legislation
  - The Historical Monuments, Relics, Fauna & Flora Act No. 41 of 1967 (amended);
  - National Heritage Act 2006;
  - Environment Act 2008;
- 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

Lesotho's unique and non-renewable archaeological and palaeontological heritage sites are protected in terms of the National Heritage Act 2006 and may not be disturbed at all without a permit from the relevant heritage resources authority.

The National Heritage Act 2006 provides guidelines for Cultural Resources Management and prospective developments (for more detail, see **Section 2** of **Addendum**):

33. (1) The Impact assessment study will be undertaken in accordance with the Environment Act and the Environment Impact Assessment Regulations with respect to all developments that are likely to

affect the heritage resources and which are clearly specified in the First Schedule to the Environment Act.
(2) It shall be the responsibility of the Commission or any other relevant heritage authority in whose area of jurisdiction a development or project referred to in subsection (1) takes place, to participate in the EIA process as appropriate, to ensure that the EIA study conducted has adequately covered the heritage impact assessment with respect to the development or project intended.

3. HERITAGE RESOURCES

3.1 National heritage

According to the National Heritage Act 2006, national heritage is constituted by the heritage resources which are of cultural significance or other special value for enjoyment by the present generation and for future generation and should fall within the purview of the bodies entrusted with heritage management and may include-

(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 significance;
(f) archaeological and palaeontological sites;
(g) graves and burial grounds, including- ancestral graves, royal and traditional leaders graves, graves of individuals designated by Minister by notice in the Gazette, historical graves and cemeteries;
(h) sites of significance relating to history of "lifaqane/cannibalism;
(i) movable objects including-

(i) objects recovered from the soil or waters, including archaeological and palaeontological objects or materials 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) objects of decorative or fine art;
(v) objects of scientific or technological interest;
(vi) books, records, documents, photographic positives and negatives, graphic, film or video or sound recordings;

(j) a place or object is to be considered part of national heritage if it has cultural significance or other special value due to –

(i) its importance in the community;
(ii) its possession of uncommon, rare or endangered aspects of Lesotho's natural or cultural heritage;
(iii) its potential to yield information that will contribute to an understanding of Lesotho's natural or cultural heritage;
(iv) its importance in demonstrating the principal characteristics of a particular class of Lesotho's natural or cultural places or objects;
(v) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(vi) its importance in demonstrating a high degree of creative or technical achievements at a particular period;
(vii) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
(viii) its strong or special association with the life or work of a person, group, organization of importance in the history of Lesotho;

3.2 Heritage assessment criteria and grading

In the FIRST SCHEDULE (Section 3) of the National Heritage Act 2006 it is stated that the heritage authorities must establish a system of grading of places and objects which form part of national heritage and which distinguishes between the following categories-

(a) Grade 1 – Heritage resources with qualities so exceptional that they are of special national significance;
(b) Grade 2 – Heritage resources which, although forming part of national heritage, can be considered to have special qualities which make them significant within the context of local communities;
(c) Grade 3 – other heritage worthy of conservation.

The system of grading must prescribe an assessment criteria which must be used by bodies involved with heritage management to assess the intrinsic, comparative and contextual significance of a heritage resource and the relative benefits and costs of its protection so that the appropriate level of grading of the resource and the consequent responsibility for its management may be properly allocated.

3.3 Cultural significance

In the NHA 2006, it is stated that ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

A matrix was developed whereby the above criteria were applied for the determination of the significance of each identified site/feature. This allowed some form of control over the application of similar values for similar identified sites – see **Section 3** of the **Addendum** below.

4. STUDY APPROACH AND METHODOLOGY

4.1 Extent of the Study

This survey and impact assessment cover all facets of cultural heritage located in the study area as presented in Section 5 below and illustrated in Figure 3.

4.2 Methodology

4.2.1 Desktop review

4.2.1.1 Survey of the literature
A survey of the relevant literature, published as well as unpublished, 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 11.

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

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

- Features such as areas with a lack of vegetation, possible buildings, hills and pans, were identified and marked for investigation during the field survey.

4.2.1.3 Interpretation

The results of the above investigation are summarised in Table 1 & Fig. 1 below – see list of references in Section 11 – and can be summarised as follows:

- Stone Age tools, dating to the MSA and LSA occur as low-density scatters on the banks of the streams and rivers and on some outcrops and caves in the larger region;
- Rock art occur in small caves or shelters in a limited number of cases in the larger region to the south and east of the study region;
- Historic structures, inclusive of buildings, monuments and bridges, occur mostly in an urban environment although they also occur in the country side or alongside infrastructure facilities such as roads and railway lines;
- Formal burial sites occur in urban settings, with a number of informal ones occurring sporadically throughout the country side;

Based on the above assessment, the probability of cultural heritage sites, features and objects occurring in the study area, i.e. the PV development site, is deemed to be **low**.

Table 1: Pre-Feasibility Assessment (surrounding countryside)

Category	Period	Presence	Reference
Early hominin	Pliocene – Lower Pleistocene		
	Early hominin	None	
Stone Age	Lower Pleistocene – Holocene		
	Early Stone Age	None	
	Middle Stone Age	Low	Mitchell (1992); Stewart *et al* (2012, 2016)
	Later Stone Age	Low	Mitchell (1992); Stewart *et al* (2012, 2016)
	Rock Art	Low	Smits (1973, 1975)
Iron Age	Holocene		
	Early Iron Age	None	
	Middle Iron Age	None	
	Late Iron Age	Low	Eldredge (1993)
Colonial period	Holocene		
	Early history	Low	Arbousset & Daumas (1968 (1846)); Ashton (1967); Couzens (2004); Ellenberger (1912); Schoeman (1985)
	Recent history	Low	Ashton (1967)
	Industrial heritage	Low	Heritage Database

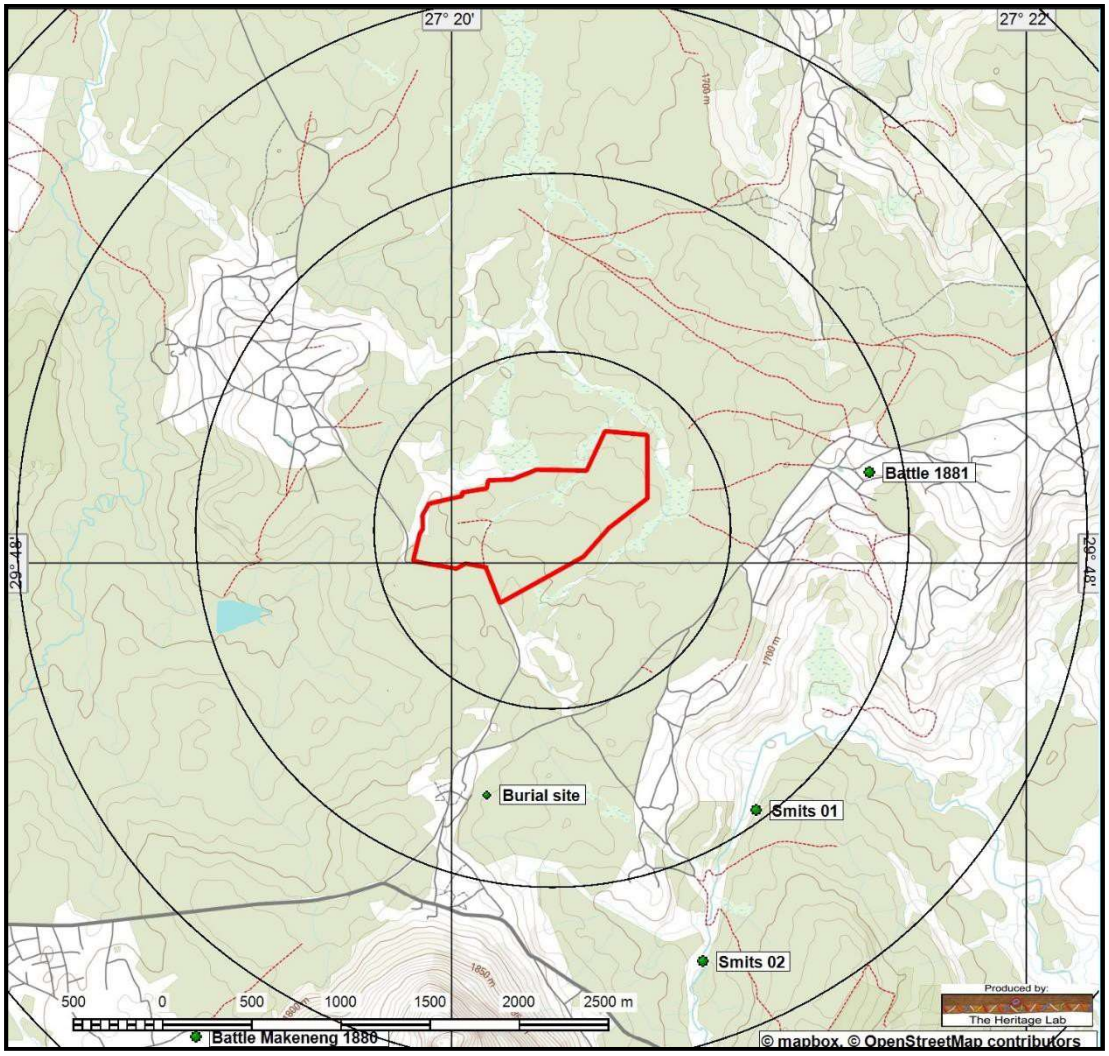


Figure 1. Heritage screening: known heritage sites and features in the larger region
(Sites = coded green dots; Circles spaced at 1km apart; Base map = ExpertGPS)

4.2.2 Field survey

The field survey was done according to generally accepted archaeological practices, and was aimed at locating all possible sites, objects and structures. The area that had to be investigated was identified by means of maps and .k*ml* files indicating the development area. This was loaded onto an ASUS digital device and used in Google Earth during the field survey to access the areas.

- The survey was conducted on 12 September 2018. The site was surveyed by intensive pedestrian investigation – see Fig. 2 below for the track log. Several transects were walked across the site. In addition, the powerline route and existing access road was also surveyed. Special attention was given to outcrops, areas of erosion and streams.

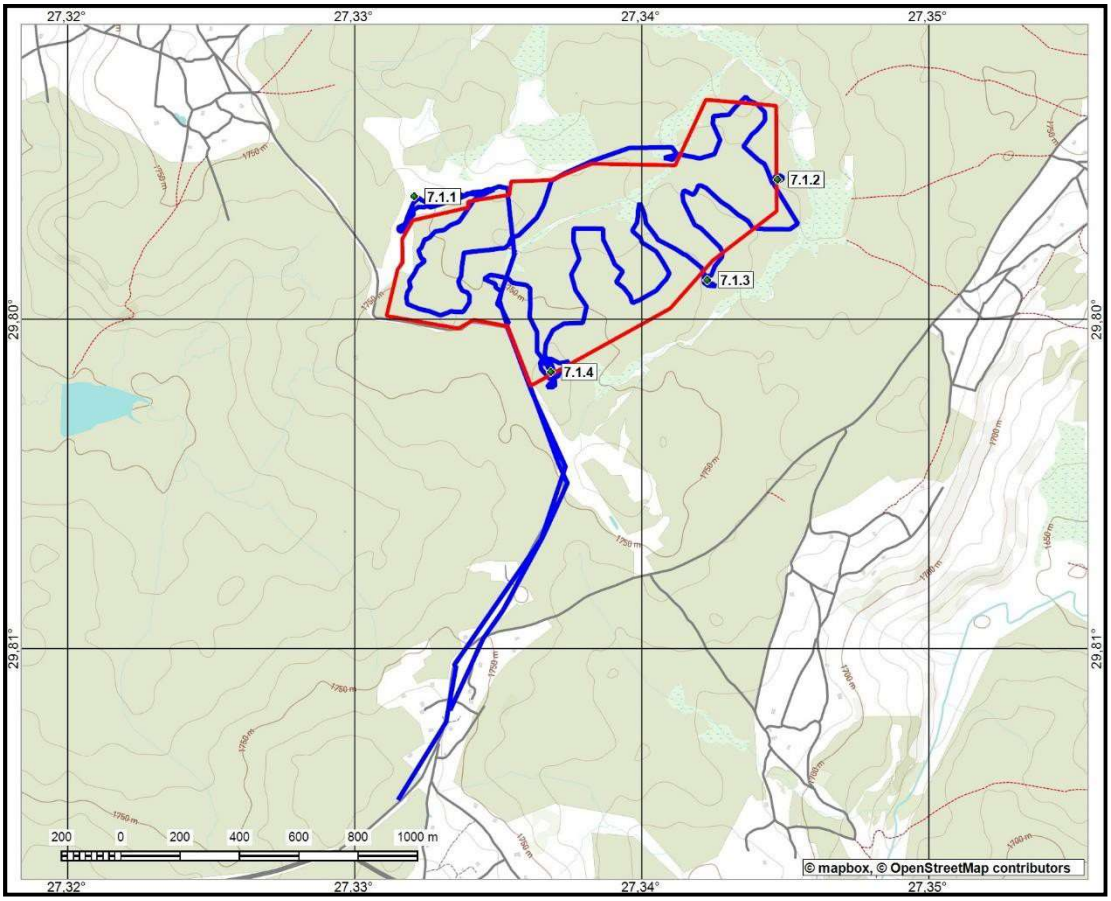


Figure 2. Map indicating the track log of the field survey
(Study area = red; tracklog = blue)

4.2.3 Documentation

All sites, objects and structures that are 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 in order to facilitate the identification of each locality.

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.

Map datum used: Hartebeeshoek 94 (WGS84).

4.3 Public participation

It is taken that the public participation done during the initial OnePower site selection was sufficient and that it is still current. The following statement was included in their report:

> Based on preliminary investigations, the selected site is devoid of any specific artefacts of cultural or historical value, including graves, religious sites, historical buildings, cave paintings, dinosaur fossils, or other potentially affected items.

5. PROJECT DESCRIPTION

5.1 Site location

Due to the mountainous terrain of Lesotho and the prevalence of high irradiance in the western lowlands, the site selection focused on areas adjacent to the existing LEC 132kV line and substation in the Mafeteng district (Fig. 3 below).

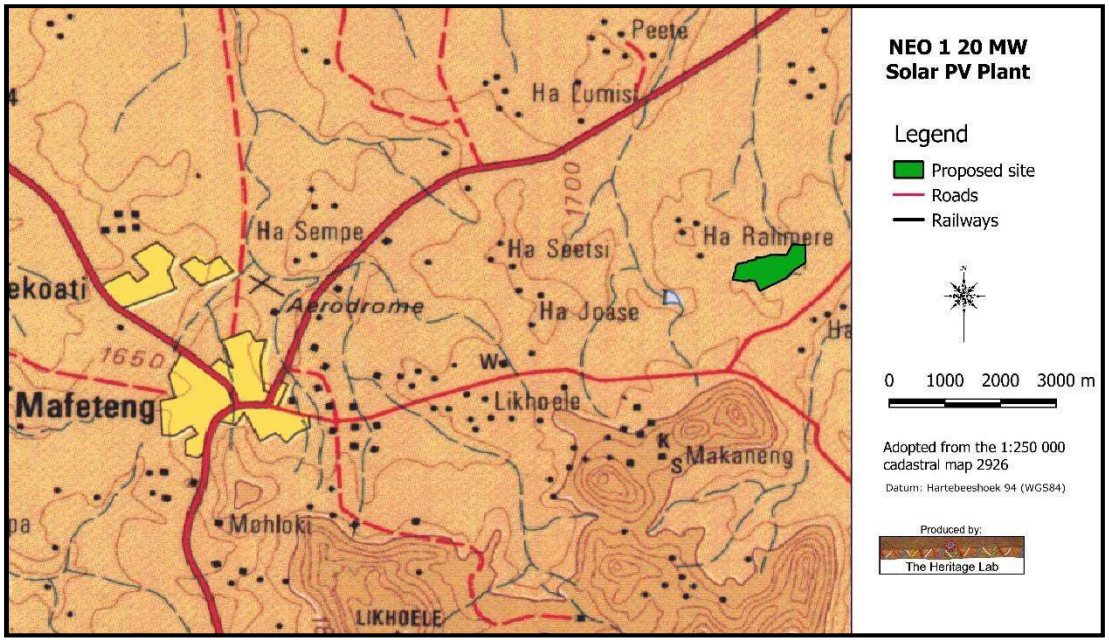


Figure 3. Location of the study area (green polygon) in regional context

5.2 Development proposal

The following information was supplied by OnePower:

5.2.1 Project description

The Project will entail construction of a Photovoltaic Power Generation Plant that will include operation of the plant and generation of solar power that will be sold to Lesotho Electricity Corporation (LEC) and maintenance of the plant for up to 25 years (Figure 5). Approximately 70 000 solar panels will be used in construction of the generation plant. The project will also include the following infrastructures:

- Construction of a 33kV Powerline from the PV Plant to the Ramathole substation. The exact voltage and tower position will be subjected to a final design and agreement with the Lesotho Electricity Corporation. The powerline will be approximately 1.1km in length and with a servitude corridor of approximately 22m (11m in each side);
- Operation and Maintenance Building;
- Laydown areas;
- Inverter Station (internal substation) to increase ("step-up") the voltage of the electricity for transmission into the grid;
- The main site entrance road is gravel, 10m in length and 6m wide and will be connecting from the existing access road; and
- Total area to be fenced is approximately 66 hectares.

As a Corporate Social Responsibility (CSR) initiative the Project will build a standalone solar PV-battery-backup generation (LPG or Diesel) mini grid in the Raliemere community. The CSR initiative will operate as a micro-utility in the village providing modern energy access to 184 Households, 1 School and 4 Small Enterprises. The electricity will be supplied via Pay As You Go (PAYG) prepaid, metered 220VAC electricity through a Lesotho Grid Code compliant distribution network at the uniform retail tariff rate set by the Lesotho Electricity and Water Authority (LEWA). The village has been informed and surveyed through a consultative process.
The solar farm will sell electricity to LEC. There are existing access roads leading to the project site from the main road.

5.2.2 Project Technology

The power plant will use crystalline silicon PV technology to convert sunlight into electricity. This project employs tier 1 solar PV panels mounted on single axis East to West trackers. It is anticipated that Direct Current combiners will be utilized to route power to six 4MW Inverter blocks including a step-up transformer for a medium voltage connection to the off-takers electric grid.

5.2.3 Project construction

It is anticipated that construction will commence in the fourth quarter of 2019 however, this is dependent on finalization of negotiations with the Government of Lesotho and a Lenders due diligence process.

The site would be accessed from an existing, gravel access road. A 10 m long and 6 m wide, gravel access road would be constructed from the existing access road to the site. The existing access road would need to be graded for a length of approximately 1.3 km to ensure an acceptable surface for construction traffic. Temporary access roads will only be constructed, where necessary, and rehabilitated upon completion of construction. Solar panels will be shipped to the nearest port and transported to site via road transport (flatbed trucks) as normal loads.

It is anticipated that construction traffic will consist of seven vehicles per hour, of which four will be heavy duty and three will be motor vehicles.

Approximately 200 workers will be employed during the 9-11 month construction phase and this will consist of unskilled labourers from local communities who will perform general work and imported skilled labourers.

Minor levelling of the site may be needed. This would entail some cutting and filling but most likely more filling is required than cutting. Any additional fill material required will be obtained from commercial sources. Topsoil will be removed from any cut or fill areas and replaced once levelling has taken place. The grass/low vegetation on site will not be scraped clear in order to keep dust to a minimum. Small shrubs or trees may be removed, if required.

A permanent on-site Operations and Maintenance (O&M) building will be constructed for the operation of the plant and will include rain water harvesting tanks for domestic water usage and will be powered by the plant. All buildings will be single story.

Piles will be emplaced in predrilled pilot holes for anchoring the PV array structures to the subsurface, and concrete slabs will be poured for the inverters, step up transformers and switchgear, the power house (offices and control room), the parking lot, the back-up LPG generator and fuel tank and the security guard house.

Crews for the solar field will mount tracking frames onto the concrete poles and completed tracking frames will have PV panels installed with mounting brackets. Wiring between panels and the inverter will be underground.

A security gate and associated guardhouse may be placed at the entrance to site. This is aimed at preventing unauthorised vehicular access to site during both construction and operation. The site will be fenced in with chain link fence or similarly visually permeable materials.

If possible, water will be sourced from an onsite borehole and stored on site in JoJo style tanks alternatively water will be trucked in from a municipal source. Approximately 150m^3/MW (or 3000 m^3 in total) of water is required for construction.

General and hazardous construction waste will be disposed of at an appropriate, licensed landfill facility. If there are no licenced facilities in Lesotho then waste will be disposed of at a licenced facility in South Africa such as in Bloemfontein.

Temporary holding tanks will be utilized during construction to hold wastewater and waste will be disposed of in terms of relevant legislation / regulations.

5.2.4 Project operation

The project will sell power to LEC for a period of 25 years and has the option to extend this period. Activities during operation will be limited to maintenance, occasional visits by LEC, LEWA, government personnel or visitors and minimal delivery of supplies and materials.

Project traffic during operation will consist of an average of six vehicles per day of which one will be a heavy duty and five will be motor vehicles. It is anticipated that approximately 11 people will be employed for the operational phase of the project and will maintain the facilities mechanical and electrical systems and conduct routine maintenance and repairs (technical oversight, safety compliance, maintenance, reporting, site work, cleaning and security). Periodically, as indicated by visual inspection and metered output, the solar field will be cleaned with water.

Approximately 20m^3/year of water is required during operation. Water will be sourced from onsite borehole (if possible) or trucked in from a municipal source and stored on site in JoJo style tanks.

It is proposed to build septic tanks on site for wastewater and designs will comply with relevant legislation and regulations.

General and hazardous waste will be disposed of at an appropriate, licensed landfill facility.

Electricity during operation would be obtained from the site or from a back-up generator.

5.2.5 Project decommissioning

Should operations not be extended past the initial 25 years then full decommissioning will occur and the land will be returned as close as reasonably possible to its original state or better. Concrete foundations, should they be required for the panels, may be removed in totality or will be broken down such that they can be covered with topsoil and revegetated. Decommissioning is likely to be of similar duration to construction namely 9-11 months.

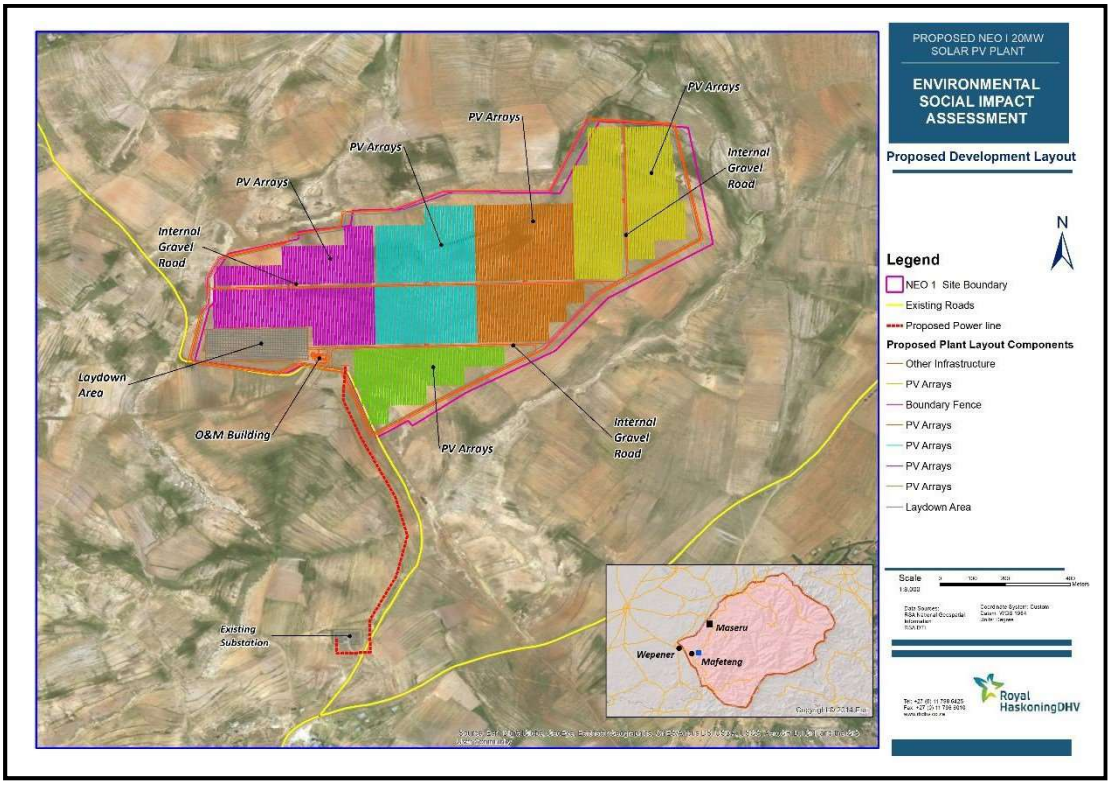


Figure 4. Layout of the proposed 20MW power plant

5.3 Alternatives considered

The following information was taken from the OnePower (2016) proposal:

Using satellite imagery, four sites near the substation existing LEC 132kV line and substation in the Mafeteng district were initially identified for investigation (Fig. 5).

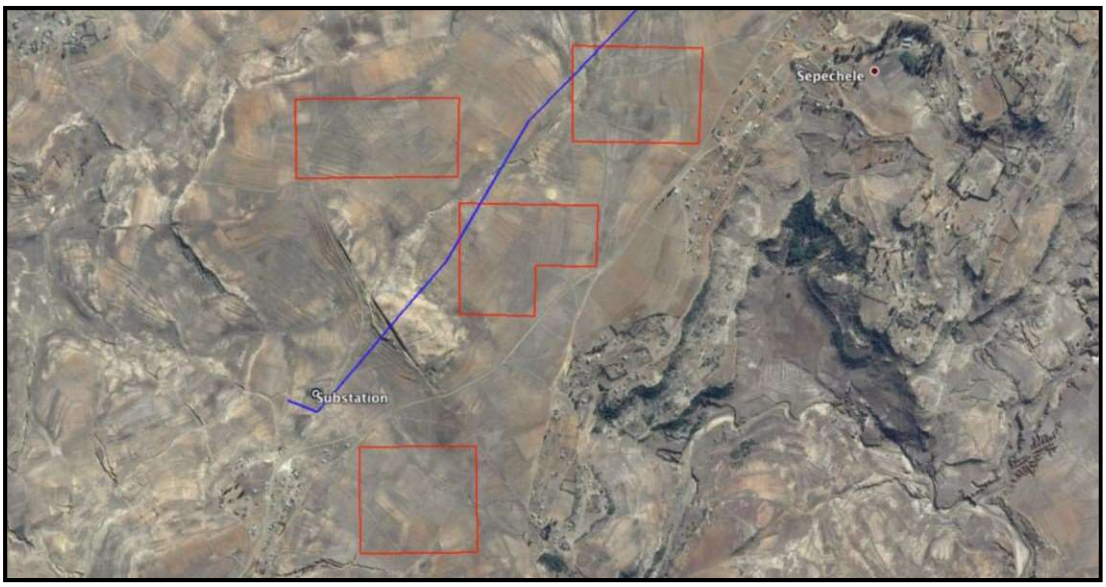


Figure 5. Location of the initial four proposed sites

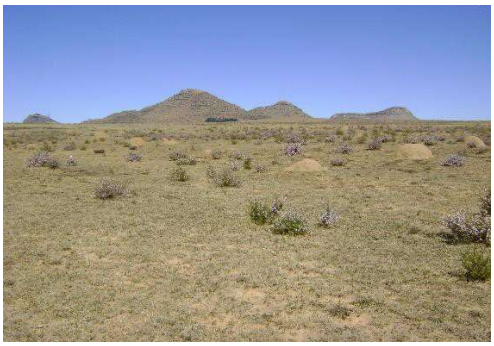
Following this, a series of site visits were conducted to meet with the local chief about prospective sites, assess the elevation gradient, soil stability and erosion, access points, proximity to village areas, schools, clinics and institutions, and documenting the layout of the substation. After further considering the length of high voltage wire to connect the PV plant with the substation and the topography of the area, a final site was down selected to meet major requirements in terms of feasibility, performance and cost. A road of approximately 1 km length will be constructed to give site access; permission has already been secured for a right-of-way through adjacent properties.

6. DESCRIPTION OF THE AFFECTED ENVIRONMENT

6.1 Physical environment

"The proposed project site is located in the southern lowland to foothill regions of Lesotho. Geology of this area is dominated by eroded sandstone, and soils tend to be shallow and highly erodible. The foothills range from 1800-2000m elevation and have similarly high population density. The Senqu Valley region ranges from 1400-1800m elevation and is mainly grassland shallow soils used for livestock and farming" (OnePower 2016).

"The proposed project site is previously disturbed land that is farmed under customary land tenure and is not part of any conservation or biodiversity protection area. The main economic activity in the Ts'ana Talana council is subsistence agriculture and herding. The land designated for the PV power plant is currently an agricultural field that is planted and ploughed annually for staple crops including maize, sorghum, and wheat and potentially potatoes, vegetables, cucurbits, and other marketable or domestic crops. The land is also traversed by livestock herds when it is not in production for crop harvests" (OnePower 2016).

 Looking north	 Looking south
 Looking east	 Looking west

 Grazing	 Agricultural fields

Figure 6. Overview of the study area

Figure 7. Aerial image showing the extent of the cultivation of the study area
(Image: Google Earth)

6.2 Historical overview of the region

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 study area, within the context of their historic, aesthetic, scientific and social value, rarity and representivity.

6.2.1 Stone Age

Geographically Lesotho can be divided into a lowland area that borders the Free State in the west, and the inland highlands with major and minor river valleys, mountains and foothills. The region has been occupied over millions of years. Sites generally occur along river systems between 1600 and 2000 m in altitude (Cain 2009). Earlier Stone Age (ESA) occurrences are rare and usually located in river valleys. Several sites with ESA lithics have been recorded at Leribe and Botha Bothe, consisting of usually medium-sized quartzite handaxes and large flakes 70-100 mm in length (Cain 2009). Middle Stone Age (MSA) assemblages have been documented at many open sites and rock shelters, the latter containing deep stratigraphic occupation sequences. Quartzite, dolerite and hornfels dominate MSA assemblages but cryptocrystalline silicas (CCS) have also been used. Leribe and Botha Bothe feature prominently in MSA localities and the typology is characteristic of MSA technologies in the use of the prepared core technique to obtain primary flaked products that were used to produce formal tool types such as points, knives and scrapers (Cain 2009).

Most parts of Lesotho were inhabited during the latter part of the Holocene. LSA occupations are more recognizable through the utilization of rock shelters and rock art localities (Cain 2009). Hunting and gathering groups survived in Lesotho until the late nineteenth century (Dornan 1909; How 1962; Jolly 1995, 1996, 2003; Mitchell 2002). Some of them were still living on farms in the late 1920s and van Riet Lowe interviewed one of them on his knowledge of stone tools (Bousman & Sampson 1997). Interviews in 1971 by Patricia Vinnicombe (2009b) with two old men who lived near Sehonghong contributed to the ethnographic observations. They gave accounts on their lifestyle, interaction with black farmers, and skirmishes with them.

The publications of Orpen (1874), Dornan (1909) and Arbousset and Daumas (1968) contain vital contemporary observations on San groups. Dornan (1909:438) wrote there were different groups of Bushmen and that some of them exhibited signs of admixture with the Sotho, in being taller and with clan names derivative from Sotho: “These Bushmen were not numerous. There were two small clans, one at Qeme, the other at Qoaling, a mountain beyond the Phutiatsana, nearer Maseru. Moshesh found them there when he settled at Thaba Bosiu.”

In the 1860s travellers and missionaries recorded stone tools from open sites, river terraces and rock shelters that were mostly ascribed to these people and their ancestors. Dornan (1909:439) also reported on the Bushmen groups who lived in a cave on the river Melikane and those who lived at Sehonghong Cave in the Upper Senqu or Orange River Valley. Vivian Ellenberger (1953) wrote a synthesis on the San. P. Ellenberger noted in particular sites within the western lowlands and he also conducted excavations at shelters in the Leribe District.

Berry D. Malan recorded ESA Acheulean and MSA artefacts from terraces along the Makhaleng River and from open sites near Leribe. However, it was only around the late 1960s/1970s that archaeological research in the highlands was initiated by Pat Carter at Moshebi's Shelter in the south-eastern Qacha's Nek District. His long-term project focused on the eastern part of Lesotho were he excavated several large shelters including Ha Soloja and Moshebi's Shelter in the Sehlabathebe Basin; and at Melikane and Sehonghong on tributaries of the Orange River (Mitchell 1992). All of these contained LSA deposits underlain by extensive MSA occupations. One of the last chiefs of the Maluti Bushmen, Swai, lived at Sehonghong (Dornan 1909:449). Carter and Patricia Vinnicombe recorded more than 300 sites during their survey.

Contract archaeology contributed to the archaeology data set on Lesotho beginning when Parkington *et al*. (1978) surveyed the footprint of the Southern Perimeter road. The Lesotho Highlands Water Project and subsequent mitigation measures preceding infrastructural development documented numerous heritage resources. Mitchell (1999) undertook excavations at Sehonghong where he noted similarities in the MSA and LSA sequences with Rose Cottage Cave (RCC).

A survey of all heritage resources in Lesotho was conducted in 2005-2006 in view of the Maloti-Drakensberg Transfrontier Project (MDTP). Dense concentrations of LSA sites were recorded in the Leribe district. The LSA lithic sequence includes a range of formal tool types made on primary flaked

blanks, including a range of scrapers (Clarke 1958), segments, borers, spokeshaves and adzes (Deacon 1984a, 1984b; Mitchell 2002). The small microlithic tools were probably hafted with mastic onto bone and wooden handles, similar to examples found in archaeological contexts (Clarke 1958; Deacon 1976; Deacon & Deacon 1980).

Mitchell (1999) commented on the presence of bifacially pressure-flaked bladelets, points and tanged arrowheads in Holocene Wilton assemblages from several sites. These include Ha Soloja, and Moshebi's Shelter in the Sehlabathebe Basin; Sehonghong Shelter and Lehaha-la-Masekou in the eastern Lesotho highlands; in southern Lesotho Bolahla, Ha Mototane; in southwestern Lesotho and Mount Moorosi; and finally, in the Phuthiatsana-ea-Thaba Bosiu Basin (PTB), Central Lesotho Lowlands at Leqhetsoana and at 2927DA11. These artefact forms date from at least the last 2000 years and probably served as inserts and for barbed arrowheads. Similar pressure-flaked points have been recorded in the Free State from Dewetsdorp, Harrismith, Ladybrand, RCC, Smithfield, Thaba Nchu and Wepener (Humphreys 1991; Mitchell 1994; Mitchell *et al*. 1994; Wadley 1997; Mitchell 1999).

A vast amount of data is therefore available on the Stone Age archaeology of Lesotho. The PTB Basin entails an area of around 1000 km^2 that can be divided into lowlands, foothills and mountain zones (Mitchell 2000). Most of the shelters are located in the foothills. Excavations were initiated in 1988 and complemented a systematic rock art recording project undertaken through the ARAL project (Smits 1967, 1983). An excavation by Peter Mitchell in 1990 at a large rock shelter near the southern bank of the Koro-Koro River, a major tributary of the Phuthiatsana-ea-Thaba Bosiu in the Maseru District yielded LSA tool types such as adzes, bladelets, backed microliths and scrapers mostly made on CCS and dating to the last 1000 years (Mitchell 1994).

The dense concentrations of occupied Stone Age localities are significant for the reconstruction of prehistoric demographics. Tloutle, Ha Makotoko, Ntloana Tsoana and Leqhetsoana are all located within the Phuthiatsana-ea-Thaba Bosiu Basin, with Ha Makotoko and Ntloana Tsoana also not far from the Phuthiatsana River. Tloutle is close to the Liphiring River, and Leqhetsoana near the Koro-Koro River, both tributaries of the Phuthiatsana (Plug 1997). The Free State localities are also focussed on suitable shelters within an ecozone where lithic resource availability and the earlier extensive subsistence resources supported stable occupations. The lithic assemblages are mainly late LSA, with or without ceramics, at these localities but Liphofung, Muela and RCC also have evidence for earlier occupations during the Holocene as evidenced by Early Wilton and Oakhurst sequences (Kaplan & Mitchell 2012).

Localities in the Caledon Basin that contain important MSA sequences in addition to Ntloana Tsoana are Ha Makotoko in Lesotho and RCC on the Platberg near Ladybrand in the Free State. The latter is well-known for an intensive research programme where excavations of the deep deposits provided evidence for stratified representative MSA and LSA sequences and allowed a reconstruction of the palaeo-environment (Mitchell & Steinberg 1992; Mitchell 1993a). All of these localities have LSA rock art traditions. Ntloana Tsoana is in close proximity to RCC lying at a distance of about 2 km. The CCS and tuffs used mainly as raw materials at Ntloana Tsoana are similar to the suite of materials used at RCC. A small shelter 2 km upstream from Ntloana Tsoana also has MSA deposits (Mitchell & Arthur 2010).

Excavations at Tloutle rock shelter in the Roma Valley, also in western Lesotho, yielded a representative Holocene lithic sequence. It comprises an ephemeral Robberg (18 000 to 12 000 years ago) at the base of the deposit, followed by a late Oakhurst assemblage and early and later phases of the Wilton in the upper occupation levels. Tloutle is the largest of several shelters in this part of Lesotho (Mitchell 1990). Archaeological investigations were also undertaken at three shelters in western Lesotho for the LHWP. Muela, and Lithakong, located within the highveld grasslands (Plug 1997) near the Hololo River in the upper Senqunyane Valley, northern Lesotho, were both subsequently drowned, while Liphofung is now a protected site. Liphofung was the first excavated shelter in this part of Lesotho that delivered evidence for the presence of hunter-gatherers during the second half of the Holocene (Kaplan & Mitchell 2012).

Arthur and Mitchell (2010) undertook an assessment of archaeological resources of the area impacted by the Metolong Dam, western Lesotho. The dam would inundate an area of 14 km along the Phuthiatsana River between the villages of Ha Makhale and Ha Monamoleli. Some 30 rock shelters, 29 with paintings and three with substantial deposits, will be impacted (Arthur et al. 2010). Ha Baroana also contain rock paintings (Mitchell 1992). The project revisited 27 rock art sites previously recorded by Smits (1983). They documented additional open-air lithic scatters. Several MSA lithic scatters were also recorded.

Historical accounts by Stow, Arbousset and Daumas and others reflect the complex social and political processes in this area during the nineteenth century (Klatzow 2010). Oral histories and several historic observations confirm that the Sotho, hunter-gatherers and people of mixed descent lived at caves and shelters, which often also served as places of refuge (Orpen 1874; Dornan 1909; Stow 1910; Vinnicombe 2009b; Hampson 2014).

The rich alluvial soils of the Caledon Valley encouraged the settlement of agriculturists. Caroline Thorp (1996, 2000) in her research investigated the ways in which the Caledon Valley served as a frontier and how the forms of interrelationships that resulted between hunter-gatherers and African farmers were reflected in the archaeological record. Forager and farmer contact during the last 1800 years is evident at several sites close to the Metolong area of the Phuthiatsana River in western Lesotho and across the Caledon north of Ladybrand in the eastern Free State at Mauermanshoek (Korannaberg), Rose Cottage Cave, Roosfontein, Tandjiesberg, Tienfontein, De Hoop and Westbury (Wadley 1992, 2001; Klatzow 1994, 2010; Thorp 1996; Ouzman 2005; King *et al*. 2014).

All the contact occupations date to the final LSA or a ceramic final LSA (Lombard *et al*. 2012). The ceramics from contact levels at RCC include rare grass-tempered vessels and mostly Iron Age ceramics, the latter probably obtained through exchange networks (Thorp 1996, 1998) and also some undiagnostic ceramics (Klatzow 2010). Twyfelpoort near Marquard also yielded ceramics, glass beads and peach stones, which suggest a late contact period. Small-scale excavations at Westbury located approximately 22 km north-west of Ficksburg yielded stone tools in association with grit-tempered ceramics (Thorp 1996).

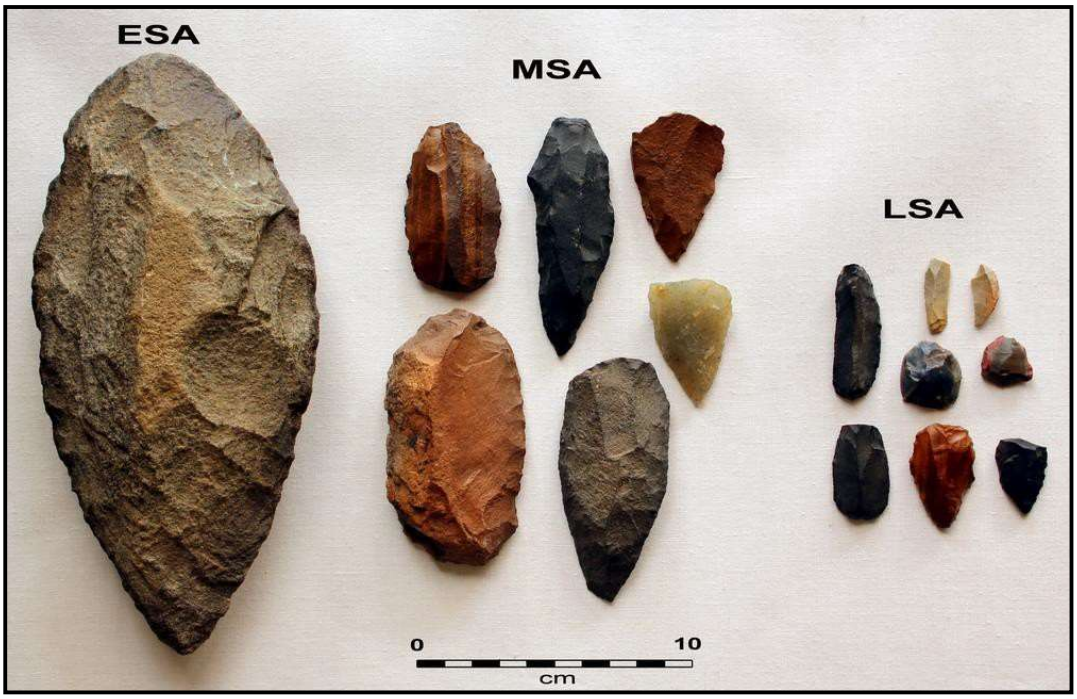


Figure 8. Simplified presentation of the different Stone Age periods

- Rock art

Rock art localities abound in differential densities within Lesotho and the Free State and occur on both sides of the border between the two regions (Herbert 1998). Most, if not all, painted and archaeological shelter sites are located in the sandstones of the Clarens Formation of the Karoo System. Deposition occurred during an arid climate. The massive sandstone formations form prominent features on the landscape. It is overlain by the basalts of the Drakensberg Formation. Underlying the Clarens Formation is the Elliot Formation comprised of mudstones, siltstones and sandstones (Castro & Bell 1995; Plug 1997).

Whereas most of the painted panels are in rock shelters, many of the shelters with occupation deposits are devoid of rock art. Through the Analysis Rock Art Lesotho project (ARAL) Lucas Smits (1967, 1973, 1975, 1983) and other researchers documented the rock art distribution. Lesotho is said to be one of the richest rock art regions in the world with an excess of 5000 sites with more than 10 000 paintings that have been documented. It is estimated that the number of paintings could be around 100 000 (Smits 1975:75). High concentrations have been recorded in areas such as the Tsoelike River Valley in the Quacha's Neck District to the southeast of the study area, and in shelters recorded to be occupied during the historical period up to the 20th century (Cain 2009). Vinnicombe's (1976) rock art survey references most of the major rock art sites in Lesotho.

Through the ARAL project Smits (1983) focused on four study areas, namely the Phuthiatsana, Qhoqhoane and Sebapala and Sehlabathe areas (Smits 1983). It is significant that many shelters around Leribe and Botha Bothe in western Lesotho, where numerous LSA localities have been recorded, also contain rock art. Most of the rock art is ascribed to the hunter-gatherers, with some panels depicting contact images such as horses, cattle and confrontational incidents between the hunter-gatherers and inmoving groups. The most recent paintings have been created by the Mountain Bushmen, also known as the Baroa (Smits 1975).

Figure 9. Rock art at Liphofung shelter in Lesotho.

Observations and accounts by early travellers, missionaries and linguists (e.g. Orpen 1874; Stow 1910; Dornan 1909; Bleek and Lloyd 1911; Arbousset & Daumas 1968) are important in deciphering the meaning of the rock art of southern Africa. Dornan (1909) supplied data on several of the painted shelters in Lesotho. Accounts on painted shelters in Lesotho and the Free State feature prominently in our understanding of the rock art of southern Africa. Ethnographic observations are extensively used to interpret the art (Mitchell et al. 2011). The rock art displays aspects of the ideology and beliefs of the hunter-gatherers such as the complex depictions of shamanic practices in the rock art at Kerkenberg (RARI RSA ABE1) in the Harrismith district (Blundell 1998).

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. Because of their specific technology and economy, Iron Age people preferred to settle on the alluvial soils near rivers for agricultural purposes, but also for firewood and water.

No traces of Early Iron Age occupation (during the first millennium CE) have yet been discovered on the Highveld or in the Free State.

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 condition that allowed Late Iron Age (LIA) farmers to occupy areas previously unsuitable, for example the treeless plains of the Free State.

These early farming communities built numerous stone-walled settlements throughout the western and northern parts of the Highveld of the Free State and in the grasslands of KwaZulu-Natal. In the Free State these sites are associated with the predecessors of the Sotho-Tswana. Oral traditions clearly identify the fifteenth to sixteenth century settlement at Ntsuanatsatsi as a capital of the Fokeng, and this identification has been accepted for some time (Maggs 1976).

The origin of the various Sotho-speaking groups in southern Africa is quite complex and we will suffice with a short synopsis.

According to various sources (e.g. Ellenberger; Legassick) the Sotho stem from four parent groups: Hurutshe, Kgatla, Fokeng and Rolong. By 1500 they had already settled in the areas what was to become North-West Province and it was from this area that large numbers of groups hived off forming new clans and family lines, some of which eventually came to settle in what was to become the Free State and Lesotho. In addition to the Sotho-speakers, groups speaking Nguni-languages and originated on the banks of the Tugela River, also entered the region, settling first in the Witsies Hoek region and later in the Caledon valley. Others moved further east settling in the central region of Lesotho.

This wet period came to a sudden end sometime between 1800 and 1820 by a major drought lasting 3 to 5 years. The drought must have caused an agricultural collapse on a large, subcontinent scale.

This was also a period of great military tension. Military pressure from Zululand spilled onto the highveld by at least 1821. Various marauding groups of displaced Sotho-Tswana moved across the plateau in the 1820s. Mzilikazi raided the plateau extensively between 1825 and 1837. The Boers trekked into this area in the 1830s. And throughout this time settled communities of Tswana people also attacked each other.

6.2.3 Early Colonial Period

European hunting parties allegedly crossed the Orange River in the first two decades of the 19th century, exploring as far as the current Wepener district. On the heels of these explorers cattle farmers from the Cape Colony started moving out of the northern Cape Colony borders from 1821 for seasonal grazing, but did not encounter any Bantu tribes. Driven by droughts in the Cape, loss of livestock during the seasonal travels and the uninhabited district of the Transgariep led to numerous farmers settling themselves permanently in the area after 1824.

Between 1825 and 1841 European settlers started to occupy the area of the Modder River between the Orange and Caledon Rivers, west of Langeberg. In 1829 Rudolph van Wyk settled on the farm Rietpoort, where the town of Smithfield was founded in 1848, and P.E. Wepener claimed the farm Zuurbult, which would become Rouxville in 1863. Roughly at the same time fifteen families occupied the farm Zevenfontein which eventually became the Beersheba Mission Station. The town of Zastron was founded on the farm named Verliesfontein, which was settled between 1836 and 1840, and by that time nearly 300 families had settled in the area currently known as the Eastern Free State. During the beginnings of the 1830's a new, organised group of European settlers, the forerunners of the Groot Trek, saw a large but temporary influx of settlers. During this time A.H. Potgieter also bought land from the Bataung captain Makwana in 1836.

It was only after the annexation of Natal in 1843 that many Trekkers returned to the Transgariep as well as to the northern parts of the Eastern Free State's Borderbelt. Notable amongst these settlers were J.I.J.Fick, after whom Ficksburg was named, W. van de Venter - founder of Fouriesburg and P.R. Botha who settled in Rietvlei. French missionaries were the last to settle in the area, and in 1833 E. Casalis and T. Arbusset opened the Missionary Station at Morija after a request from Moshoeshoe. North of Smithfield hon. S. Rolland, accepting the jurisdiction of Moshoeshoe without any reservation, founded the Beersheba Mission Station in 1835. This meant that a part of the southeast Transgariep immediately became declared as a Basotho region, and ensured that Moshoeshoe received ownership over a region where no Basotho lived. French missionaries also founded mission stations Carmel (near Smithfield), Hebron (near Zastron) and Mequatling (in the Ladybrand district) and their influence would play a crucial role in the relationship between European settlers and the Basotho in the Transgariep future.

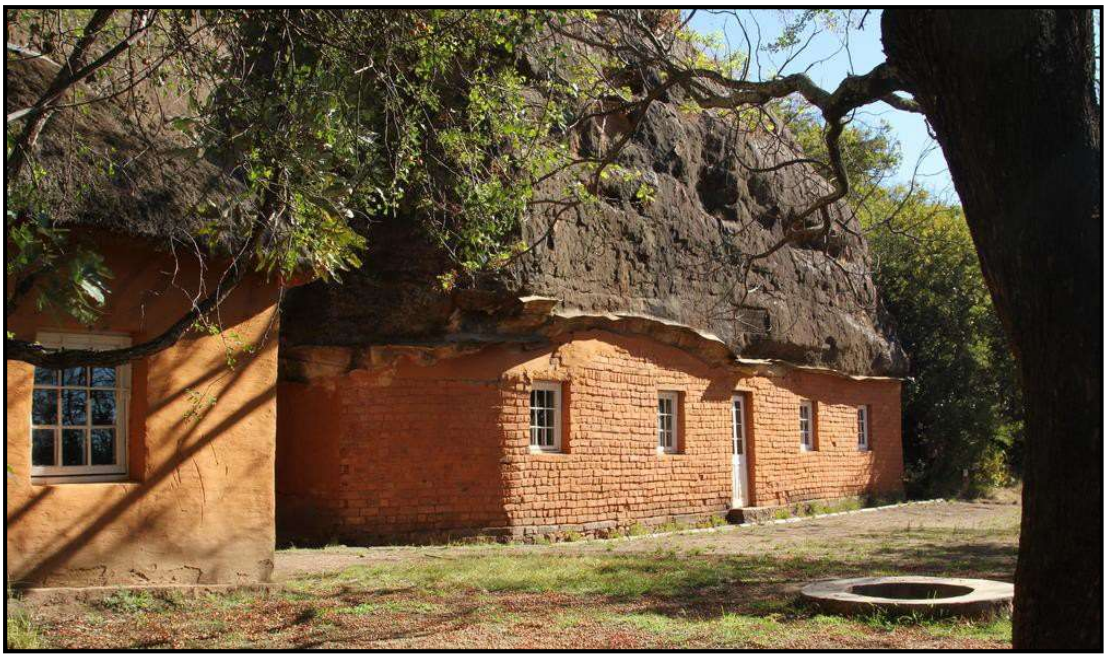


Figure 10. House of early missionary, Revd D.F. Ellenberger (1866-1904)

The settling of the Eastern Free State and Transgariep areas did not occur without conflict however, as the permanent settling of Europeans and the start of the Groot Trek out of the Cape colony meant that Moshoeshoe, although originally amicable towards the settlers, was suddenly faced with a much larger number of European farmers than originally anticipated. Where the settlers had first served as a buffer between Moshoeshoe and the Korannas, the vast number of new farmers unsettled the chief and made him fearful of his rulership over the area. Ironically it was actually the Voortrekkers that facilitated the expansion of the Basotho people from their traditionally isolated stronghold at Thaba Bosigo into the bordering, unsettled areas around them. The European migrants also served to break the might of Mzilikazi and ended the reign of the much feared Zoeloe nation. During the 1930's the migration of European settlers deeper into the Transgariep and the Basotho's own expansion further west and southwest wards led to inescapable clashes over land rights and ownership. The settlers based their claim on the principals of first occupation, while Moshoeshoe - eager to increase the size of his cattle herds and land ownership - laid claim based on the historical ownership of the region by his forefathers. This would usher in an era in which Moshoeshoe, with the help of the French missionaries and the sympathetic British rulers of the Cape Colony, aimed to rapidly expand the living area for his steadily growing followers. The Basotho were already better organised in the expansion and settlement of the area, whereas the European settlers lived outside of any official governing and did not have a chosen leader that could represent them in the matter of land ownership. The difference in nationalities and politics further divided the European settlers. Particularly after 1839 Moshoeshoe complained to A. Stokenstrom who was the Lieutenant Governor of the Eastern Province that the Europeans were living on his property without permission. Because of this, many settlers took it as a given to seek permission from Moshoeshoe to settle on farms in the southeast Transgariep area. J.P. Hoffman, who would later become the President of the Orange Free State, asked Moshoeshoe permission to settle a farm called Hoffmansrust near the current Wepener.

In September of 1842 the Cape Governor, Sir George Napier, proclaimed that the farmers in the Transgariep violated the Basotho landownership and warned them that in future they should conduct themselves in a quiet and respectful manner and refrain from settling on any property of Basotho and other Banto groups. A year later in 1843 Napier signed a treaty with Moshoeshoe that outlined the rightful borders of the Basotho land, which included the entire western bank of the Caledon River. This was named the Napier-Line that included Smithfield, Rouxville, Zastron, DeWetsdorp, Wepener, Hobhouse, Ladybrand, Clocolan and Ficksburg up to the Hlotse River, and sowed the seeds for future unrest. Sir P. Maitland, Cape Governor after Napier, was of the opinion that Napier's agreement with Moshoeshoe was not a solution as to the land claim dispute between the Boere and the Basotho. Therefore he was a proponent of territorial segregation of land claims and requested that a section of the Basotho land be given to the Boers. Moshoeshoe then offered them a triangular section which lay above the conjunction of the Orange and Caledon Rivers and in the north bordered by a line that ran from Commissiedrif that lay on the Caledon River up to Buffelsvleidrift on the Orange River. At the same time he demanded that all European settlers that already lived outside said area immediately returned to the agreed upon area. Maitland requested G. D. Joubert to investigate where all European settlers were currently based both within and without the area agreed upon. Only 37 farms were found within the agreed area whereas a 100 were located outside the new border, therefore they wanted to extend the border further northeast into Moshoeshoe's territory but this request was denied. Despite the grant of land from Moshoeshoe no attempt was made to relocate the Boers living outside of the triangle. In an effort to maintain peace in the Transgariep Captain Henry Douglas Warden was appointed as British resident in Bloemfontein in 1846. However, as he was tasked with mediating between the Boer and Basotho communities outside of British rule, his attempts were futile. Instead of paying attention to settling the land claim disputes he rather attempted to woe the Basotho, refusing to declare Moshoeshoe as a treat to the peace and went as far as to place the blame for the unrest in the Transgariep area solely on the shoulders of the European settlers.

- Lesotho

It becomes clear that the kingdom of Lesotho owes its origins largely to the genius of Moshoeshoe, who lived from 1786 to 1870. During the wide-spread dispersal of Sotho-speaking peoples, Moshoeshoe's ancestors settled close to the Vaal River in what is now the Free State Province. As the eldest son Moshoeshoe took as his principal wife the daughter of the chief of the Bafokeng clan, which started the the Basotho royal lineage. By 1825 Moshoeshoe had entrenched himself and his followers in the mountain stronghold at Thaba Bosiu near modern day Maseru, where he managed to keep at bay the war and chaos caused by the *Difaqane* through successful military and diplomatic strategies, and his kingdom gave refuge to thousands of displaced peoples. Before the end of that decade Moshoeshoe asserted his sovereignty over some 20 groups of defeated people which he would eventually forge into the Basotho nation. 1933 saw the French Protestant Missionaries, under Moshoeshoe's protection, started their work at Morija although the king himself never converted. Numerous other protestant groups and the Roman Catholic missionaries followed suit by 1862, which brought literacy, medicine, modern agriculture and building methods to the Basotho nation. Because they were often consulted by the king and the chiefs they would exert a lasting influence over the Basotho people. The arrival of white settlers in the 1830's saw a shift in power in the area, and the various skirmishes and outright war between the OVS and the Basotho people led to Moshoeshoe being forced to sign agreements giving away much of his best land to secure British protection. The British maintained their sovereignty over the chiefs largely through a policy of indirect rule, and Basutoland would only become a British protectorate in 1884 after over a decade of being part of the Cape Colony. This occurred during the reign of Moshoeshoe's eldest son King Letsie I who succeeded his father upon his death in 1870. Moshoeshoe's royal lineage would continue its rule over Basutoland, although by the 1950's rapid social, economic and political change in both Basutoland and South Africa would see educated commoners beginning to take more prominent roles in Basutoland, displacing the historical power of the chiefs.

In 1952 Ntsu Mokhele established the Basutoland African Congress, later renamed the Basutoland Congress Party (BCP), that immediately started to campaign for self-government and fought against the racial discrimination that had started to filter across the border from South Africa. By 1960 a nominated national council became a legislative council responsible for all internal matters pertaining to Basutoland. It was accepted that the paramount chief would become the constitutional monarch, and various parties struggled to gain control of the new government structures. Although the BPC had a broad following among the Basotho splits soon began to appear and numerous other political parties were started. Oxford-educated crown prince Constantine Bereng was proclaimed King Moshoeshoe II on 12 March 1960 and became the progressive, dynamic leader for the MFP party, while Chief Leabua Jonathan established the conservative Basutoland National Party (BNP). In the elections for the legislative council the BCP took 32 of the 40 seats. Moshoeshoe II appointed another commission to draft the constitution under which Lesotho would become independent in 1961. Britain approved the independence constitution in 1964, and in 1966 it was the BNP that led Lesotho to independence on 4 October 1966.

Figure 11. Small-stock outposts located in the mountain regions occupied seasonally (summer)

7. SURVEY RESULTS

During the physical survey, the following sites, features and objects of cultural significance were identified in the study area (Fig. 12). For a detailed discussion of each of the identified sites, see **Section 5** of the **Addendum** below.

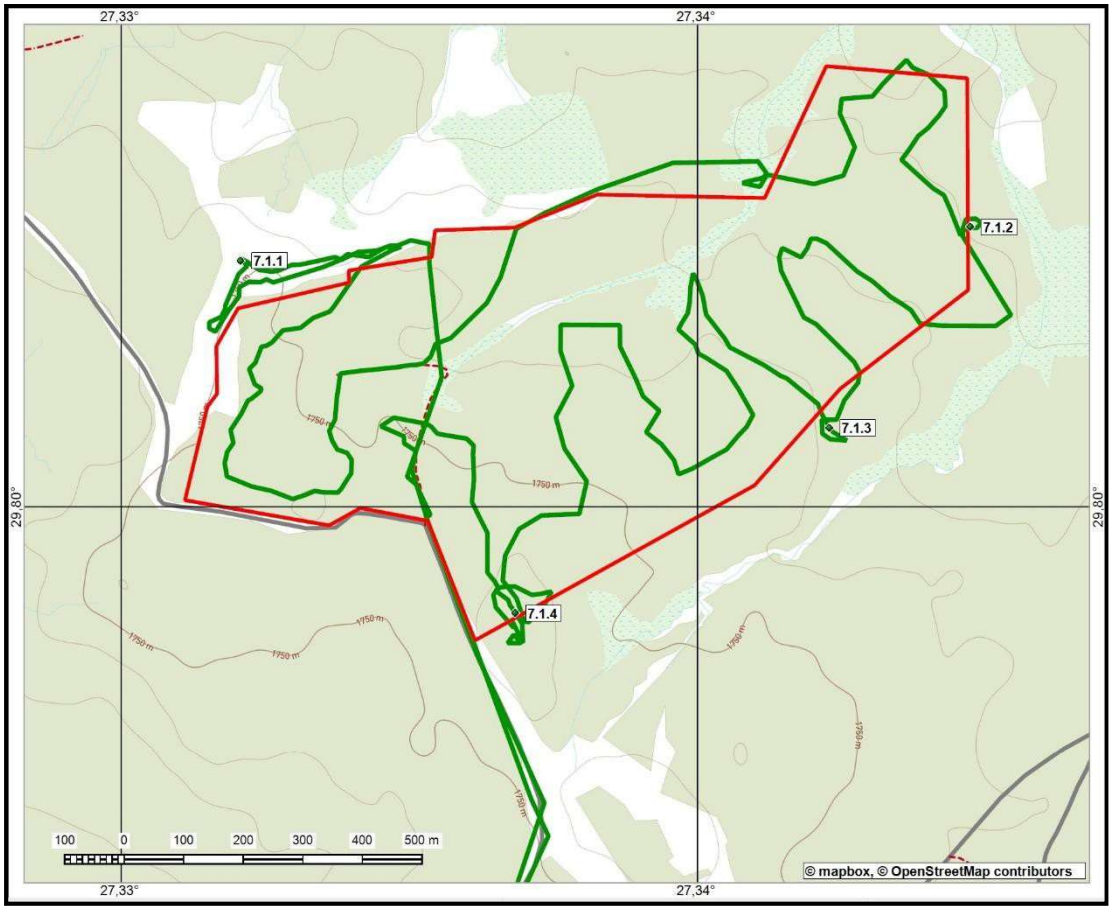
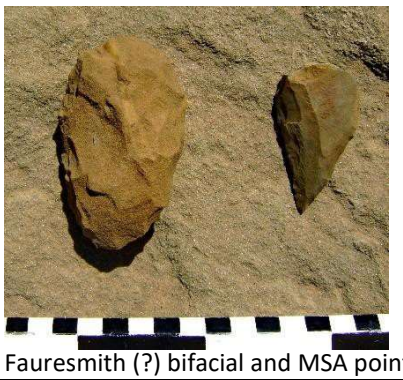


Figure 12. Location of the identified sites
For a detailed discussion of each of the identified sites, see **Section 5** of the **Addendum** below.

7.1 Stone Age

- Material dating to all phases of the Stone Age were identified to occur in a number of places.
  - All of these are open surface scatters, which usually are viewed to have low significance. However, one identified site, No. 7.1.4, is viewed to have high significance due to its complexity (inclusive of ESA, MSA and LSA material) as well as the density of the material on the site.

 Fauresmith (?) bifacial and MSA point: Site 7.1.4	 LSA material: Site 7.1.1

7.2 Iron Age

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

7.3 Historic period

- A number of features dating to recent times were identified in the study area.
    - Piles of stones that are interpreted to be field clearing cairns. These features are viewed not to have any significance.
    - Engraved game boards, called *morabaraba* (Afrikaans = meul), a number of which were found to be engraved on level outcrops. This is a practice that is found all over southern Africa and therefore these are not viewed to be significant.

 Field clearing cairns	 Engraved game boards

8. RESULTS: STATEMENT OF SIGNIFICANCE AND IMPACT RATINGS

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.

Impact analysis of cultural heritage resources under threat of the proposed development, is based on the present understanding of the development and its significance is calculated and presented below:

- The impact on identified sites is calculated as follows:

Table 2: Calculation of the impact on the identified heritage features

7.1.1 – 7.1.3 Stone Age sites		
Nature: This area is actually located across the boundary of the proposed PV development area and it is highly likely that it would be would impact on.		
	Without mitigation	With mitigation

Extent	Site (1)	Site (1)
Duration	Short-term (2)	Short-term (2)
Intensity	Low (1)	Low (1)
Probability	Improbable (1)	Improbable (1)
Significance	Low (5)	Low (5)
Low impact (4 - 6 points)	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.	
Reversibility	Non-reversible	Non-reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	n/a	
Mitigation: No further action required		
Cumulative impact: n/a		

7.1.4 Stone Age site		
Nature: This area is actually located across the boundary of the proposed PV development area and it is highly likely that it would be would impact on.		
	Without mitigation	With mitigation
Extent	Site (1)	Site (1)
Duration	Medium (2)	Short-term (2)
Intensity	High (3)	Low (1)
Probability	Possible (2)	Improbable (1)
Significance	Moderate (8)	Low (5)
Medium-High impact (7 -9 points)	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment	
Reversibility	Non-reversible	Non-reversible
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated	Yes	
Mitigation: (2) Archaeological investigation: It is recommended that an area with a diameter of 100m, calculated from the highest point on the hill, is set out as a buffer zone and that this area is fenced off with danger tape during construction activities. If that is not possible and development takes place in this area, a systematic collection should be done by an archaeologist to recover as many of the stone tools as possible.		
Cumulative impact: n/a		

9. MANAGEMENT AND MITIGATION 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 that 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 are summarised in Table 3A and 3B 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 boundary 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 in order 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 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 Environmental Control Officer 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 National Heritage Act 2006.

9.2 Control

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

- A person or entity, e.g. the Environmental Control Officer, should be tasked to take responsibility for the heritage sites and should be held accountable for any damage.
- Known sites should be located and isolated, e.g. by fencing them off. All construction workers should be informed that these are no-go areas, unless accompanied by the individual or persons representing the Environmental Control Officer as identified above.
- 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 the Heritage Commission. A heritage official should be part of the team executing these measures.

Table 3A: 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, 29 and 30 of the NHA that may occur in the proposed 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	During construction only
Monitoring	See discussion in Section 9.2 above		

Table 3B: Operation Phase: Environmental Management Programme for the project

Action required	Protection of heritage sites, features and objects		
Potential Impact	It is unlike 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. Removal of Vegetation 2. Construction 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 Mitigation measures

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

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 (see **Section 4** of the **Addendum** for a discussion of all mitigation measures):
    - Stone Age Site 7.1.4: (2) Archaeological investigation: It is recommended that an area with a diameter of 100m, calculated from the highest point on the hill, is set out as a buffer zone and that this area is fenced off with danger tape during construction activities. If that is not possible and development takes place in this area, a systematic collection should be done by an archaeologist to recover as many of the stone tools as possible.

10. CONCLUSIONS AND RECOMMENDATIONS

OnePower Consortium propose the construction of the NEO I 20MW Photvoltaic Power Generation plant near Mafeteng in Lesotho.

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. It should be noted that the implementation of the mitigation measures is subject to the Heritage Commission's approval.

Identified sites

During the physical survey, a number of sites of heritage significance were identified. It was determined that only one would be impacted on as a result of the proposed development of the powerline.

- Material dating to all phases of the Stone Age were identified to occur in a number of places.
    - All of the sites are open surface scatters, which usually are viewed to have low significance. However, one identified site, No. 7.1.4, is viewed to have high significance due to its complexity (inclusive of ESA, MSA and LSA material) as well as the density of the material on the site.

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:

Site No.	Site category	Field rating	Impact rating: Before/After	Proposed mitigation (Refer to definitions in Section 4 of the Addendum)
7.1.4	Stone Age site	Grade 3	Medium impact 8	(2) Archaeological investigation: It is recommended that an area with a diameter of 100m, calculated from the highest point on the hill (see coordinate in Section 5 of Addendum), is set out as a buffer zone and that this area is fenced off with danger tape during construction activities. If that is not possible and development takes place in this area, a systematic collection should be done by an archaeologist to recover as many of the stone tools as possible.
			Low 5	

Legal requirements

The legal requirements related to heritage specifically are specified in Section 3 and **Section 2** of **Addendum** of this report. For this proposed project, the assessment has determined that sites, features or objects of heritage significance occur in the study area.

- For the removal of Stone Age artefacts, a valid permit would be required from the Heritage Commission.

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

- From a heritage point of view, it is recommended that the proposed development be allowed to continue on acceptance of the proposed mitigation measures.

- If the proposed mitigation measures are successfully implemented, no further walk through of the site will be required prior to construction.

Conditions for inclusion in the environmental authorisation:

- If heritage features are identified during construction activities, 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.

- The mitigation measures as indicated for the various identified heritage sites and features should be implemented.

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Wallis, J.P.R. (ed.) 1946. *The northern goldfields diaries of Thomas Baines Vol. III. Second journey 1871-1872*. London: Chatto and Windus.

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11.3 Maps and aerial photographs

1: 50 000 Topocadastral maps.
Google Earth.

12. 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. Aspects of Heritage Management according to the National Heritage Act 2006

Structures

27. (1) No person shall alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the Commission.

(2) The Commission may at its discretion, by notice published in the Gazette, make exemption from the requirements of subsection (1) provided that it is satisfied that the heritage concerned has been identified and is adequately provided for in terms of this Act.

Archeology and palaeontology

28. (1) The Commission or the DDCC shall ensure that archeological and palaeontological objects within their respective jurisdictions are lodged with a museum or other public institution that has a collection policy acceptable to its heritage policy and may in so doing establish such terms and conditions as it deems fit for the conservation of the objects in question.

(2) A person who discovers archeological or palaeontological objects or material in the course of development or agricultural or any other activity shall immediately report it to the Commission or the local authority or museum.

(3) No person shall without a permit issued by the Commission -

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archeological or palaeontological site;

(b) destroy, damage or excavate, remove from its original position, collect or own any archeological or palaeontological object;

(c) trade in, sell, export or attempt to export from the country any archeological or palaeontological object.

(4) Whenever the Commission or the DDCC as the case may be, has reasonable cause to believe that any activity or development which will destroy, damage, or alter any archeological or palaeontological site is underway, and no application for a permit has been submitted and no heritage management plan has been followed, it may-

(a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;

(b) carry out an investigation for the purpose of obtaining information on whether or not an archeological or palaeontological site exists and whether mitigation is necessary;

(c) if mitigation is deemed necessary by the Commission or the DDCC or any other heritage authority, assist the person on who the order has been served to apply for a required permit;

(d) recover the costs of the investigation from the owner or occupier of the land on which it is believed an archeological or palaeontological site, serve a notice on the owner to prevent activities within a specified distance from such site.

Burial grounds, graves, prison cells

29. (1) Where it is not the responsibility of any other authority, the Commission or the relevant heritage authority shall conserve and care for burial grounds, graves, protected in terms of this Act and shall make arrangements for their conservation as it sees fit.

(2) The Commission or relevant heritage authority shall identify and make record of burial grounds and graves, which it deems to be of cultural significance.

(3) No person shall without a permit issued by the Commission or relevant heritage 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 a formal cemetery administered by a local authority.

(4) The Commission may not issue a permit for any activity under this section unless it is satisfied that the applicant has, in accordance with the regulations made hereunder-

(a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave, burial ground or post;

(b) reached agreements with such communities and individuals regarding the future of such grave, burial ground or post.

Public monuments and memorials

30. Public monuments and memorials shall be protected without a need to publish a notice to this effect.

Living heritage

31. (1) The Commission or relevant heritage authority shall in consultation with relevant local communities, groups and non-governmental organizations safeguard and protect all living heritage existing within its area of jurisdiction through-

(a) conducting of research;
(b) identification;
(c) preservation;
(d) protection;
(e) promotion;
(e) enhancement;
(f) transmission
(g) conducting formal and non- formal education

3. Assessing the significance of heritage resources and potential impacts

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.

3.1 Significance of the identified heritage resources

In the NHA 2006, it is stated that ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

This is usually determined in relation to the uniqueness, condition of preservation and research potential of a particular site, feature or object. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site or features 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 "lifaqane/cannibalism			
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 Retrospectivity			
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			
Regional			
Local			
Specific community			
3. Field Register Rating			
a.	Grade 1 – Heritage resources with qualities so exceptional that they are of special national significance		

b.	Grade 2 – Heritage resources which, although forming part of national heritage, can be considered to have special qualities which make them significant within the context of local communities	
c.	Grade 3 – other heritage worthy of conservation.	

3.2 Significance of the anticipated impact on heritage resources

All impacts identified during the HIA stage of the study will be classified in terms of their significance. Issues would be assessed in terms of the following criteria:

Criteria	Description			
EXTENT	**National (4)** The whole of South Africa	**Regional (3)** Provincial and parts of neighbouring provinces	**Local (2)** Within a radius of 2 km of the construction site	**Site (1)** Within the construction site
DURATION	**Permanent (4)** Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.	**Long-term (3)** The impact 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. The only class of impact which will be non-transitory.	**Medium-term (2)** The impact will last for the period of the construction phase, where after it will be entirely negated.	**Short-term (1)** The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase
INTENSITY	**Very High (4)** Natural, cultural and social functions and processes are altered to extent that they permanently cease	**High (3)** Natural, cultural and social functions and processes are altered to extent that they temporarily cease.	**Moderate (2)** Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way	**Low (1)** Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
PROBABILITY OF OCCURRENCE	**Definite (4)** Impact will certainly occur	**Highly Probable (3)** Most likely that the impact will occur	**Possible (2)** The impact may occur	**Improbable (1)** Likelihood of the impact materialising is very low

DESCRIPTIVE CRITERIA		
Nature	Category	
Extent (E)	Categories 1 – 4	
	1	Footprint / site
	2	Local (within a radius of 2 kms of site)
	3	Regional
	4	National
Duration (D)	Categories 1 – 4	
	1	Short (less than five years)
	2	Medium term (5-15 years)
	3	Long term (15-30 years)
	4	Permanent
Intensity (I)	Categories 1 – 4	
	1	Low
	2	Moderate
	3	High
	4	Very High
Probability (P)	Categories 1 – 4	
	1	Improbable
	2	Probable
	3	Highly Probable
	4	Definite
IMPACT: Cumulative		
Extent (E)		
Duration (D)		
Intensity (I)		
Probability (P)		
Significance	Significance = E + D + I + P	
	Minimum value of 1, maximum of 16	
	Status determines if positive / negative	
Neg (13 - 16 points) NEGATIVE VERY HIGH	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.	
Neg (10 - 12 points) NEGATIVE HIGH	These are impacts which individually or combined pose a significantly high negative risk to the environment. These impacts pose a high risk to the quality of the receiving environment. The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.	

Neg (7 - 9 points) NEGATIVE MODERATE	These are impacts which individually or combined pose a moderate negative risk to the quality of health of the receiving environment. These systems would not generally require immediate action, but the deficiencies should be rectified to avoid future problems and associated cost to rectify once in HIGH risk. Aesthetically and/or physically non-compliance can be expected over a medium term. In this case the impact is medium term, moderate in extent, mildly intense in its effect and probable. Mitigation is possible with additional design and construction inputs.
Neg (4 - 6 points) NEGATIVE LOW	These are impacts which individually or combined pose a deleterious or adverse impact and low negative risk to the quality of the receiving environment, and may lead to potential health, safety and environmental concerns. Aesthetically and/or physical non-compliance can be expected for short periods. In this case the impact is short term, local in extent, not intense in its effect and may not be likely to occur. A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
Pos (4 - 6 points) POSITIVE LOW	These are impacts which individually or combined pose a low positive impact to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is short term, local in extent, not intense in its effect and may not be likely to occur. A low impact has no permanent impact of significance.
Pos (7 - 9 points) POSITIVE MODERATE	These are impacts which individually or combined pose a moderate positive effect to the quality of health of the receiving environment. In this case the impact is medium term, moderate in extent, mildly intense in its effect and probable.
Pos (10 - 12 points) POSITIVE HIGH	These are impacts which individually or combined pose a significantly high positive impact on the environment. These impacts pose a high benefit to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is longer term, greater in extent, intense in its effect and highly likely to occur. The effects of the impact may affect the broader environment.
Pos (13 - 16 points) POSITIVE VERY HIGH	These are permanent and important beneficial impacts which may arise. Individually or combined, these pose a significantly high positive impact on the environment. These impacts pose a very high benefit to the quality of the receiving environment and health, and may lead to potential health, safety and environmental benefits. In this case the impact is long term, greater in extent, intense in its effect and highly likely or definite to occur. The effects of the impact may affect the broader environment.

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
    - 10 metres for a single grave, or a built structure, to
    - 50 metres where the boundaries are less obvious, e.g. a Late Iron Age site.

- (2) Archaeological investigation: 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.
    - This option should be implemented when it is impossible to avoid impacting on an identified site or feature.
    - This also applies for graves older than 60 years that are to be relocated. For graves younger than 60 years a permit from the Heritage Council is not required. However, all other legal requirements must be adhered to.
        - Impacts can be beneficial – e.g. mitigation contribute to knowledge

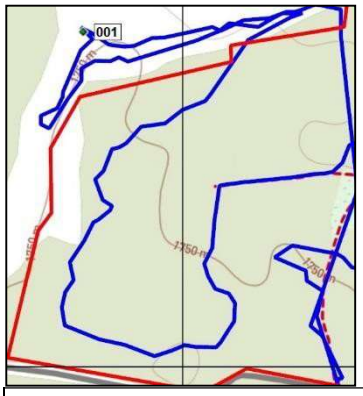
- (3) Rehabilitation: When features, e.g. buildings or other structures are to be re-used. Rehabilitation is considered in heritage management terms as an intervention typically involving the adding of a new heritage layer to enable a new sustainable use.
    - The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.
    - 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 in order to ensure that no undetected heritage/remains are destroyed.

5. Inventory of identified cultural heritage sites

Description
7.1.1 **Coordinates**: -29,79628; 27,33207 (S 29 47 46.6; E 27 19 55.4): Surface scatter, c. 3 artefacts/cores/flakes per 2m^2. Discussion: Overhanging rock forming a small shelter. No archaeological deposit present. Stone artefacts (tools, cores and flakes) occur as medium density scatter surface material in the vicinity of the overhang. Most material date to MSA, but also LSA. Quartzite and hornfels dominate the MSA material, but possible LSA tools are of fine-grained silicates (CCS). Although most of the tools are poorly formed, it is possible to distinguish end-scrapers and side-scrapers.



7.1.1

7.1.1

Significance of site/feature	Grade 3 – other heritage worthy of conservation.
Reasoned opinion: As these are surface finds, they are not in their original context and are therefore viewed to have little significance.	

Impact assessment
This area is actually located outside the proposed PV development area and it is unlikely that it would be impact on.

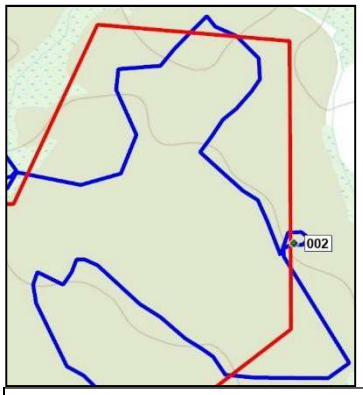
Mitigation
(5) No further action required: They are seen to be fully recorded after having been included in this report.

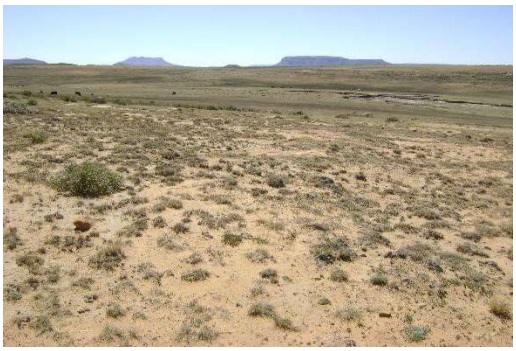
Significance of impact: before/after mitigation					
Extent	**Duration**	**Intensity**	**Probability**	**Significance**	**Weight**
1	1	1	1	4	Low
1	1	1	1	4	Low
Requirements					

None

References
-

Description
7.1.2 **Coordinates**: -29,79577; 27,34473 (S29 47 44.7; E 27 20 41.1): Surface scatter, c. 1 artefact/core/flake per 5m^2. Discussion: MSA material (tools and flakes) occur as a low density surface scatter in an area of sheet erosion. The material used is quartzite and hornfels. Although most of the tools are poorly formed, it is possible to distinguish points, scrapers and side-scrapers.




7.1.2


7.1.2

Significance of site/feature	Grade 3 – other heritage worthy of conservation.
Reasoned opinion: As these are surface finds, they are not in their original context and are therefore viewed to have little significance.	

Impact assessment
This area is actually located on the border of the proposed PV development area and it is unlikely that it would be would impact on.

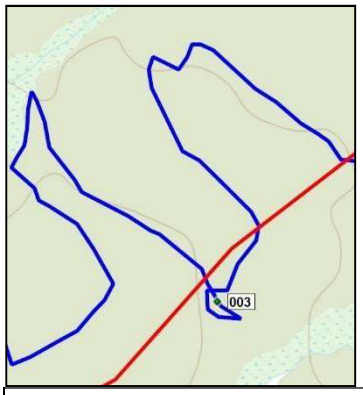
Mitigation
(5) No further action required: They are seen to be fully recorded after having been included in this report.

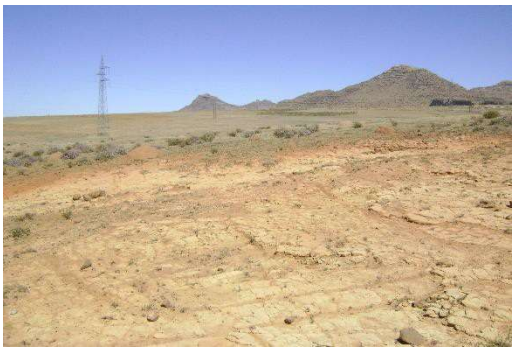
Significance of impact: before/after mitigation					
Extent	**Duration**	**Intensity**	**Probability**	**Significance**	**Weight**
1	1	1	1	4	Low
1	1	1	1	4	Low

Requirements
None

References
-

Description
7.1.3 **Coordinates**: -29,79881; 27,34228 (S 29 47 55.7; E 27 20 32.2): Surface scatter, c. 3 artefacts/cores/flakes per 2m^2. Discussion: MSA material (tools and flakes) occur as surface scatter in an area of sheet erosion. The material used is quartzite and hornfels. Although most of the tools are poorly formed, it is possible to distinguish points, blades, scrapers and side-scrapers.




7.1.3


7.1.3

Significance of site/feature	Grade 3 – other heritage worthy of conservation.
Reasoned opinion: As these are surface finds, they are not in their original context and are therefore viewed to have little significance.	

Impact assessment
This area is actually located on the border of the proposed PV development area and it is unlikely that it would be would impact on.

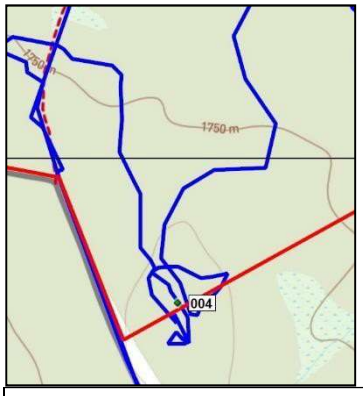
Mitigation
(5) No further action required: They are seen to be fully recorded after having been included in this report.

Significance of impact: before/after mitigation					
Extent	**Duration**	**Intensity**	**Probability**	**Significance**	**Weight**
1	1	1	1	4	Low
1	1	1	1	4	Low

Requirements
None

References
-

Description
7.1.4 **Coordinates**: -29,80161; 27,33683 (S 29 48 05.8; E 27 20 12.5): Surface scatter, c. 5 artefacts/cores/flakes per 2m^2. Discussion: Stone artefacts (tools, cores and flakes) occur over a large area on a low hill. ESA-MSA transition (Fauresmith), MSA and LSA material was identified. The material used for the MSA is mostly hornfels and quartzite, whereas fine-grained silicates were used for the LSA material. Although most of the tools are poorly formed, it is possible to distinguish points, blades, scrapers and side-scrapers. Significant of this area is the occurrence of possible Fauresmith bifaces and Levallois type cores.




7.1.4


7.1.4


Levallois type core


Possible Fauresmith biface

Significance of site/feature	Grade 3 – other heritage worthy of conservation.
Reasoned opinion: Although these are surface finds, and not in their original context, the number and are therefore viewed to have little significance.	

Impact assessment

This area is actually located across the boundary of the proposed PV development area and it is highly likely that it would be would impact on.

Mitigation
(2) Archaeological investigation: It is recommended that an area with a diameter of 100m, calculated from the highest point on the hill, is set out as a buffer zone and that this area is fenced off with danger tape during construction activities. If that is not possible and development takes place in this area, a systematic collection should be done by an archaeologist to recover as many of the stone tools as possible.

Significance of impact: before/after mitigation					
Extent	**Duration**	**Intensity**	**Probability**	**Significance**	**Weight**
1	2	3	2	8	Medium-impact
1	1	1	1	4	Low

Requirements
Collection permit

References
-

6. Curriculum vitae

Johan Abraham van Schalkwyk

Personal particulars

Date of birth:	14 April 1952
Identity number:	520414 5099 08 4
Marital status:	Married; one daughter
Nationality:	South African

Current address: home

62 Coetzer Ave, Monument Park, Pretoria, 0181
Mobile: 076 790 6777; E-mail: jvschalkwyk@mweb.co.za

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 present papers at conferences, locally as well as internationally, on various research topics, ranging in scope from archaeology, anthropological, history, 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.